Transmission Gully Project

Assessment of Environmental Effects report

Prepared by Beca in association with Incite and SKM

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NZ TRANSPORT AGENCY
WAKA KOTAHI

PORIRUA CITY COUNCIL

Report prepared by Beca

in association with Incite and SKM

for the NZ Transport Agency and Porirua City Council

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Introduction

The Transmission Gully Project (the Project) is being promoted by the NZ Transport Agency (NZTA) and Porirua City Council (PCC). The Project consists of three components:

- The Transmission Gully Main Alignment (the Main Alignment) involves the construction, operation and maintenance of a State highway formed to an expressway standard from Linden (Wellington City) to MacKays Crossing (Kapiti Coast). The NZTA is responsible for the Main Alignment.

- The Kenepuru Link Road involves the construction, operation and maintenance of a limited access State highway connecting the Main Alignment to the existing western Porirua road network. The NZTA is responsible for the Kenepuru Link Road.

- The Porirua Link Roads involves the construction, operation and maintenance of two local roads (the Whitby Link Road and the Waitangirua Link Road) connecting the Main Alignment to the existing eastern Porirua road network. PCC is responsible for the Porirua Link Roads.

The NZTA and PCC are lodging notices of requirement for designations (NoRs) and applications for resource consents for their respective components of the Project under the relevant provisions of the RMA. The Project is a proposal of national significance and has been lodged with the Environmental Protection Authority (EPA). The NZTA and PCC request that the Minister for the Environment makes a direction that the Project be referred to a board of inquiry for determination.

Background to the Project

The Project has a long history with the concept of an inland alternative route for SH1 between Wellington City and the Kapiti Coast being discussed for many decades. A number of strategic studies and investigations have concluded that an inland alternative for SH1 is preferable to an upgrade of the existing coastal route for SH1 as it will provide greater benefits in terms of travel time savings, safety and route security. Accordingly, the Project is a key component of a number of national, regional and local transport strategies, policies and plans.

Benefits of the Project

The Project will provide the following benefits:

- improved **route security and resilience** of the Wellington Region's State highway network;

- improved **safety** performance as compared to the existing State Highway 1 between Linden and MacKays Crossing;

- reduced **travel times** and improved travel time reliability along key routes and increased accessibility across many parts of the Region's road network;

- reduced severance for existing SH1 coastal **communities**;
- **economic benefits** resulting from travel time savings, improved trip time reliability and increased accessibility to and throughout the Wellington Region; and
- improved **accessibility** to eastern (the Porirua Link Road) and western (the Kenepuru Link Road) Porirua.

Statutory context

The NZTA has lodged four NoRs for the Main Alignment across four districts; Kapiti Coast District, Upper Hutt City, Porirua City and Wellington City. The NZTA has lodged two NoRs for the Kenepuru Link Road in the districts of Porirua City and Wellington City. PCC has lodged two NoRs for two other Link Roads within Porirua City. Applications for resource consent have also been lodged.

The consenting authority (which may be a Board of Inquiry) who considers the NoRs and applications for resource consent must have regard to various matters, including the relevant provisions of national, regional and district level planning documents, the alternatives, reasonable necessity, as well as other matters.

Description of the environment

The Project mainly traverses through rural land. However, the southern end of the Project area lies in the vicinity of the residential suburbs of Whitby, Waitangirua, Cannons Creek, Ranui Heights, Linden and Tawa. Whitby is one of the region's most affluent suburbs, while Waitangirua and Cannons Creek are two of the poorest suburbs.

The Project area is highly modified and consists almost entirely of pasture. Within this, however, there are pockets of both native and exotic (mainly forestry) vegetation. The highly modified nature of the area means that is holds little ecological value in terms of providing habitat for terrestrial species. The Project traverses nine hydrological catchments which are part of four different watersheds. The ecological value of the streams in these catchments varies from high to low but all streams are in highly modified catchments. Five of the catchments (approximately 65% of the length of the Project area) drain into the Pauatahanui Inlet. This Onepoto Arm is of significant ecological value, supporting a wetland and estuarine ecosystem.

A range of network utilities are present throughout the Project area, the most significant being a 110kV electricity transmission line (from which the Project takes its name).

An assessment of the Project area has concluded that there are relatively few archaeological, historical or cultural features of note.

Description of the Project

The Main Alignment has been designed to an expressway standard, which comprises a minimum of four lanes with continuous median separation. Direct access to and from the Main Alignment will not be permitted, except via three new interchanges and the northern and southern tie-ins. At all interchanges the Main Alignment will go over the connecting roads. Along some parts of the Main Alignment where grades will be steeper, crawler lanes will be provided for slow moving vehicles (e.g. heavy vehicles). The Kenepuru Link Road has been designed as a State highway with strictly controlled direct access. The Porirua Link Roads have been designed to local road standards.

The Project involves approximately 112 stream crossings by either bridges or culverts. All bridges have been designed so there are no piers in the wetted stream channel. Culverts and bridges will include necessary erosion protection. The Project will require the permanent realignment of approximately 6.5km of streams.

A range of options are proposed for the treatment of cut slope and fill embankments. The three main options are reinforced soil embankments, mechanically stabilised earth walls (typically around bridges) and soil nail walls. Indicative landscaping has been developed for finished cut and fill slope faces. Stormwater runoff will be collected and treated using wetlands and proprietary treatment devices.

Enabling works will involve works to the existing electricity transmission lines (the Transmission Line Relocation Project) and the formation of construction access tracks and site compounds. The main site compound will be located next to the proposed SH58 Interchange and will be accessed directly from SH58. This will contain a concrete batching plant.

Construction will be staged with a number of crews working simultaneously on different fronts. It is expected that there will be up to 12 earthworks crews and eight bridge crews working during peak construction. Comprehensive erosion and sediment control measures will be used for all earthworks and for works in and around streams. Construction will involve approximately 6.3M m^3 of cut material and approximately 5.8M m^3 of fill material. Potential disposal sites for surplus fill have also been identified.

Construction of the Project is expected to take approximately six years. Construction will cause minimal disruption to the existing State highway network with works only needed to the existing State highway for the northern and southern tie-ins of the Main Alignment and around SH58 at Pauatahanui.

Consideration of alternatives

A consideration of alternatives is required under the provisions of the RMA; in relation to the NoRs and in relation to some aspects of the activities for which resource consent is sought.

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

During the most recent engineering and environmental assessment phase, further design refinements have been made. Relatively minor alignment changes have avoided the loss of some features, such as a significant area of native bush through the Wainui Saddle and a heritage feature (WWII brick fuel tank) at the bottom of the Te Puka valley.

Consultation and engagement

Consultation has been undertaken in accordance with recognised good practice. Consultation during this phase of the Project has involved engagement with local, regional and national stakeholders. Consultation has involved a number of methods, as appropriate, including one-on-one meetings, group meetings, public open days, newsletters and online material.

On-going consultation and communication with the relevant regulatory agencies has also been undertaken as part of the preparation of consenting documentation. Consultation and engagement with tangata whenua (Te Runanga o Toa Rangatira Inc) has been undertaken by the NZTA , following on from previous engagement during the development of the Project design. Te Runanga o Toa Rangatira Inc (Ngati Toa) has prepared a cultural impact assessment for the Project.

Assessment of effects on the environment

In accordance with best practice and the relevant provisions of the RMA, an Assessment of Effects on the Environment (AEE) of the Project has been carried out. The process built on relevant environmental assessment information, from the scheme assessment (Phase 1). The environmental assessment undertaken for Phase 2 has been further informed by the work of a wide range of engineering and environmental specialists working together on the design and assessment of the Project. The AEE concludes that the Project will have a number of positive benefits as well as some actual or potential adverse effects (particularly during construction). The latter will vary in significance, scale (local, regional and national), intensity and duration.

Traffic and transport

The Project will have significant positive transport effects at a local, regional and national scale, including:

- improved route security and resilience for the region's State highway network
- improved safety and reduced crash risk;
- significant travel time savings;
- more efficient freight movement and associated economic benefits;
- improved connections to regional freight hubs, including the port, airport and distribution centres; and
- improved access to eastern Porirua (Porirua Link Roads) and western Porirua (Kenepuru Link Road).

During construction of the Project there will be some potentially adverse traffic effects, including delays or inconvenience, arising from increased heavy construction traffic using local roads. These effects can be effectively managed through traffic management plans which include means to manage such effects.

Land use and property effects

The main property effects of the Project can be separated into three broad categories:

- properties with land that is directly required (either the whole or in part) for the Project;
- land with an easement or other property right (including rights of way and water rights, for example) that is directly affected by the Project; and
- properties within close proximity to the Project.

The land holdings range from Crown Land, Council owned land including road and reserves, and private land. By far the largest land requirement is land already owned by the Crown for roading purposes. There are some properties where part acquisition will be required. All property owners whose land is directly affected have been consulted and are aware of the property required. There are a number of instances where the Project will affect other property rights such as physical access to a property, forestry logging accesses or a water supply arrangement. It is considered that effects on other property rights have been well identified through both property agreements and consultation.

Properties within close proximity to the route that have been identified as being subject to or particularly sensitive to effects have been identified through the technical studies. Actual and potential effects on these properties have been identified in relation to specific technical areas and appropriate mitigation has been devised. Actual and potential (including perceived) effects on property values is not considered to be a relevant consideration under the RMA. Effects on amenity values are a relevant consideration, and those that are affected by the Project are considered through assessment of other actual and potential effects including noise, landscape and access.

Network utilities

The Project will affect a number of existing and proposed network utilities within the Project area. This will require the protection and/or relocation of these utilities. Largely these works will be undertaken as enabling works for the Project. The most significant network utility affected is the electricity transmission line which runs much of the length of the Main Alignment. The NZTA, in liaison with PCC, has worked closely with the relevant organisations and are jointly confident that all adverse effects on network utilities will be able to be managed appropriately.

Noise and vibration

The rural and sparsely populated nature of the majority of the Project area means that specific noise and vibration mitigation is not required for most of the Project.

Construction noise will generally be within the limits of NZS 6803:1999 and where construction works are proposed in close proximity to sensitive receivers (such as residential dwellings), a construction noise and vibration management plan is proposed which outlines protocols for engaging with affected parties and processes or measures which will minimise noise and disruption. Consequently, the AEE concludes that any potential adverse noise effects arising from construction will be able to be adequately managed.

Based on an acoustics assessment, a small number of areas potentially requiring specific noise mitigation were identified and assessed using the process set out in NZS 6806:2010. Proposed mitigation consists of noise barriers of varying types, and the modification of one building. With this mitigation in place, the effects of noise will be adequately mitigated.

The noise and vibration assessment concludes that any potential vibration effects, both from construction and operation of the Project, will be such that no specific mitigation will be necessary.

Air quality

Construction of the Project (particularly the earthworks and concrete batching) has the potential to generate dust which could have an adverse effect on air quality. This potential effect can be mitigated to an acceptable level through dust management measures, outlined in the construction air quality management plan.

The air quality assessment concludes that on a regional basis, there will be an overall reduction to public exposure to vehicle emissions on completion of the Project. There will be no material adverse effects on air quality arising from the Project's operation and hence, no mitigation is considered necessary.

Contaminated land

The majority of the existing areas identified as currently contaminated do not present a significant risk to human health or ecology. The highest risk areas are the portions of MacKays Crossing where the potential for unexploded ordinances (UXO) has been identified, the identified soil contamination at the Porirua Gun Club and former nursery and the potential presence of asbestos in building materials.

Contaminated land has the potential to affect human health and ecology during construction and operation of the Project. This potential effect can be avoided through remedial work and by placing a road on the contaminated soils and essentially capping the contamination. The soil will be excavated as part of construction and the upper layer of soil will be mixed with deeper layers that are not impacted by contaminants, essentially reducing concentrations of contaminants in the soil. The adverse effects associated with UXO can be avoided through investigation, careful excavation and management/ disposal methods, and by observing appropriate protocols in the event of accidental UXO discovery. Remedial action may also be required.

Implementation of these measures, through the draft Contaminated Land Management Plan (CLMP), will enable any adverse effects arising from contaminated land during construction and operation of the Project to be appropriately managed.

Hydrology

The Project will result in changes to existing hydrology from land use changes and from changes to stream morphology. Hydrological and hydraulic modelling has been undertaken to inform the design and environmental assessment process. As a result of this closely integrated process, the majority of potential adverse hydrological affects have been avoided through refinements to the road and drainage design.

There are small changes in flood risk in Q100 events (i.e. extreme weather events) on some properties. In other locations, changes in flood flows are negligible and in some instances the Project results in a small reduction in downstream flood risk by containing and managing flows.

The stream realignments for the Project and the stream crossings (bridges and culverts) have been assessed in the AEE and will result in negligible changes to hydraulic performance of the affected stream. This potential effect is largely able to be mitigated by constructing realigned streams as close as possible to their existing form. While this reconstruction is primarily being done for ecological reasons, it also minimises changes to hydraulic performance.

Water quality

The construction and operation of the Project has the potential to adversely affect water quality in streams and the marine environment. Construction of the Project will involve major earthworks and has the potential to increase sediment run off to streams and the coast. Operation of the Project has the potential to increase contaminant levels in streams and the marine environment associated with stormwater runoff from road surfaces.

Existing freshwater quality in streams is variable. Virtually all streams affected by the Project have elevated nutrient levels, which is typical of the predominantly pastoral land use through most of the Project area. Levels of turbidity and metals are generally within guideline values with the exceptions being the more urbanised catchments of Kenepuru and Porirua. Water quality within Porirua Harbour varies but contaminant levels (zinc, copper and lead) are typically elevated around stormwater outfalls in the Onepoto Arm. DDT concentrations are elevated in the Porirua Harbour, which is likely to be as a result of historical land uses.

Land use within catchments draining into the Harbour also influences sediment entering the Harbour. Pastoral farming and forestry activities both result in high levels of sediment reaching the harbor. Significantly less sediment runoff is generated from native forested land.

A high level of erosion and sediment control will be used to manage sediment from the construction of the Project entering waterbodies. High rainfall events could cause an increase in sediment reaching the streams and the Harbour. Increases in suspended sediment will occur but will mimic what currently occurs during these events and will not cause any lasting adverse effects. Increases in sediment deposited in streams from these events will be minimal. For most events, the additional sediment entering the Harbour will deposit in areas where high levels of sediment deposition is already occurring and therefore is likely to have minimal impact. An exception to this is in when specific combinations of wind and rainfall events occur when large areas of earthworks are in progress. If all these things occur together, deposition is predicted in the intertidal zones near the coast.

All stormwater runoff from finished road surfaces will be treated. As a result, contaminants entering the Wainui Stream mouth and Onepoto Arm will decrease, providing a positive effect. Contaminant levels entering the Pauatahanui Inlet will mostly remain unchanged, with the exception of total petroleum hydrocarbons which will increase. This increase will not cause conspicuous oil or grease in the water or any change in odour.

Terrestrial ecology

The Project traverses highly modified land, which has mainly been converted to pasture with relatively few areas of native vegetation remaining. Within this modified landscape populations of indigenous fauna are small and species of conservation interest are restricted to specific sites, typically associated with fragments of native vegetation.

A conservative approach has been taken to quantifying the loss of vegetation and terrestrial habitats and to developing mitigation measures. Mitigation sites have been identified for retirement and revegetation, including the early retirement sites established in recent years by the NZTA. The sites have been chosen for the range of potential ecological and hydrological benefits they can provide.

Adverse effects of construction can be adequately addressed by mitigation in these areas, and will include retirement from farming and replanting in some areas. The retirement and revegetation of land above the Project alignment will provide additional benefits such as reduced erosion, and improved water quality.

There will be some potential effects on the habitat of terrestrial fauna. This will be minor as they can be effectively managed by the translocation of some species (e.g. lizards) and/or habitats (e.g. logs and boulders providing *Peripatus* habitat) and by careful construction management methods.

Freshwater ecology

The Project involves works in nine separate catchments across four watersheds. The streams in these catchments currently provide varying qualities of habitat for freshwater species, although all are in heavily modified catchments and the habitat values and species composition are reflective of this.

During construction, sediment runoff from the earthworks has the potential to adversely affect freshwater habitats and species. A high level of erosion and sediment control measures are proposed and based on sediment modelling, levels of sediment entering streams during normal conditions are predicted to be low and the ecological impact of this is assessed to be negligible. As currently occurs, during, and immediately after high rainfall events, sediment levels in streams will rise. During the construction period the additional earthworks area for the Project will increase sediment levels in streams between 1 to 30% (in a Q2 event). The AEE concludes that given current experience this will not be considered to be ecologically significant because:

- freshwater species in these streams are currently able to tolerate temporary increases in sediment levels higher than this; and
- by definition, these events coincide with increased stream flows and the hydraulically active nature of the streams (e.g. they are in relatively steep terrain) means that sediment is rapidly transported downstream, rather than being deposited on stream beds (where greatest effect occurs).

The long term operation of the Project will require the modification of streams in eight of the nine catchments. Primarily this modification involves construction of culverts and bridges and the re-alignment of parts of streams as part of the hydraulic design of the Project. The AEE acknowledges that while considerable efforts have been made to reduce the degree of modification to streams, this cannot be avoided completely. The adverse effects on freshwater ecology resulting from stream works can be remediated and/or mitigated by restoring and protecting other streams to enable no net loss of freshwater habitat. In total, approximately 10.5km of streams will be affected (through stream realignment and/or armoring) and this will require the restoration and protection of approximately

26.5km of streams to remedy and mitigate this. As part of the overall mitigation package of the Project, approximately 30km of streams will actually be restored and protected, meaning the Project will result in a net gain in freshwater habitat across the Project area. This positive effect will be on-going as the areas retired from pasture (predominantly in the Te Puka and Horokiri catchments) are to be re-planted in native vegetation.

Stormwater runoff from the road surfaces will be treated to a high standard and will have negligible, if any, impacts on freshwater ecology against the anticipated background contaminant loading.

Marine ecology

Although the Project does not involve works or the discharge of contaminants into the coastal marine area, the marine environment is the ultimate receiving environment for sediment laden water from construction of the Project and stormwater runoff from the road surfaces from the operation of the Project. There are two marine receiving environments of relevance:

- the Kapiti Coast, comprising the mouths of the Wainui and Whareroa Streams; and
- the Porirua Harbour, comprising the Pauatahanui Inlet and the Onepoto Arm.

The mouths of the Wainui and Whareroa Streams are dynamic environments on the open coast. In contrast, the Porirua Harbour is more enclosed, accessible to the open coastal by a narrow 100m channel. Due to this and the fact that the Harbour is the receiving environment for approximately 80% of the discharges associated with the Project, ecological investigations have focused more (but not exclusively) on effects on the Harbour ecosystem.

Construction of the Project will result in increased levels of sediment entering the Harbour. Increased levels of suspended sediment as a result of high rainfall events are assessed to have negligible ecological effects. There are two rain events that, if they coincide with certain wind conditions, where deposited sediment on the seabed is predicted to have (Onepoto Arm) and (Pauatahanui Inlet) adverse ecological effects. While the potential ecological effects of sediment deposition resulting from these events is adverse, the number of factors required to occur simultaneously means that the actual chance of them occurring together relatively low.

Operation of the Project will involve the discharge of treated road runoff to the Porirua Harbour which will contribute to the long term accumulation of contaminants in central subtidal basins. Operational phase discharges to the marine environment adjacent to the Wainui and Whareroa Streams will be diluted and widely dispersed given the large, high energy receiving environment. Operational water quality effects are assessed as being minor

Tangata whenua

The protection of stream habitats and resident native fish species is the key matter of interest to Ngati Toa both during the construction and operational phases of the Project. Ngati Toa undertake customary food gathering within the Project area and there are areas of historical and cultural significance that must be taken into account. Part 2 of the RMA provides a framework for assessing the actual and potential effects of the Project on tangata whenua. Section 7(a) is of particular importance, where particular regard is given to kaitiakitanga.

There will be direct and indirect effects of construction on waterbodies during construction, the most significant of which is the potential for increased levels of sediment entering waterways from the large scale earthworks required for the Project. Once the Project is operational, there is potential for the discharge of contaminated stormwater from the road surface to local streams, with potential impacts on water and habitat quality, and effects on sensitive species; and a potential increase of stormwater and contaminant discharge to Porirua Harbour with potential impacts on habitats and sensitive species.

Ngati Toa has provided a cultural impact assessment for the Project, which concludes that the methods taken by the applicants to manage adverse effects on the environment are supported.

Landscape and visual

The proposed route and the significant engineering required to construct the Project means there are potential adverse effects on the natural character of wetlands, rivers and their margins, outstanding natural landscapes, visual amenity values, and physical landscape features. The scale of these effects varies as the road traverses through the landscape. Conversely, there is the potential for positive visual effects for users of the road who will travel through the bold natural landscapes that are largely inaccessible at present.

A number of general and specific measures are proposed which will avoid, remedy, mitigate or offset the adverse landscape and visual effects resulting from the construction and operation of the Project. These measures have been informed by the urban and landscape design principles developed for the Project and documented in the Urban and Landscape Design Framework.

The scale of the Project means that it will create a significant change to the environment. The landscape and visual effects of this change cannot be fully avoided. The approach taken has been to avoid effects as far as practicable and to implement a range of proposed measures will adequately manage the remaining adverse effects.

Archaeology and built heritage

There are no known archaeological or built heritage sites within the area proposed for the Main Alignment. However, there are two sites of built heritage significance in close proximity to the Main Alignment, which have the potential to be adversely affected by aspects of the Project's construction and operation.

At both locations, appropriate mitigation, monitoring and remedial action will be implemented (if required) to manage effects appropriately. One site of heritage significance (WWII brick fuel tank) is not easily viewed or accessible as it is located on private land. To increase public appreciation of the structure, the NZTA will provide a track to allow it to be accessed by the public, which would be a positive effect of the Project.

In addition, protocols will be followed in the event of accidental discovery of potential archaeological material appropriate protocols are followed.

Social effects

Construction and operation of the Project has the potential to generate adverse social effects as a result of noise and vibration, air quality, and traffic and access, affecting amenity, connectivity and movement, local character and recreation values. Measures outlined within the CEMP and its subsidiary plans for traffic, noise/ vibration and air quality will be used to manage any adverse effect on the social environment arising from construction. Once the Project is operational, it is anticipated that many of the proposed mitigation measures will also continue to mitigate any adverse social effects.

Management of environmental effects

Where practicable, potential adverse operational effects have been avoided or reduced through the integrated design process which involved a combination of disciplines working together through the process (e.g. changes made to improve the route, amending the designation footprint etc.). Measures to avoid, remedy and mitigate potential adverse construction effects have been developed through an iterative process with a particular focus on managing stream diversion, reclamation and structures. Potential on-going effects from operation of the Project will be appropriately managed through various measures including, for example, noise barriers, stormwater treatment, significant landscaping and land retirement across the Project area.

Monitoring will be undertaken prior to, during and following construction to provide a mechanism through which additional mitigation measures may be put in place, if necessary, to mitigate any actual or potential environmental effects. A comprehensive suite of conditions for the designations and resource consents has been proposed. A significant feature of the set of proposed conditions is to establish the proposed management plan and environmental monitoring framework.

As a result of the mitigation proposed, which can be delivered as conditions of the consents and designations, the potential adverse effects of the Project will be adequately and appropriately avoided, remedied or mitigated.

Statutory assessment

In this case, the NZTA's resource consent applications that relate to all streamworks and bulk earthworks are bundled together as they cannot occur separately. In this regard, under the GWRC Regional Plan, the NZTA streamworks and bulk earthworks are a non-complying activity (with the exception of the concrete batching plant, which is a discretionary activity) and the PCC Project is a discretionary activity.

There are a large number of objectives and policies relevant to the Project (from national, regional and district planning documents). The main conclusions of the statutory assessment contained in the AEE are:

- Overall, the Project is not inconsistent, and will give effect to (as relevant), the relevant objectives and policies of the statutory planning documents;

- The Project is a key part of the Wellington RoNS programme which will, as a whole, bring significant travel time savings between Wellington Airport and Levin, and ease freight movements into and out of Wellington – which is entirely consistent with the transport related policy in both the regional planning documents and the district plans;
- The Project will sustain the potential of natural and physical resources for future generations. It is intended to meet the growing transportation needs of the region and does not preclude future opportunities for other land transport development, such as public transport;
- The Project safe-guards the life supporting capacity of air, soils, water and ecosystems;
- The Project's adverse effects on the environment are proposed to be avoided, remedied, or mitigated;
- The Project recognises and provides for the matters in section 6 of the RMA;
- The Project has also appropriately responded to those matters in sections 7 and 8 of the RMA.

Overall, the AEE concludes that the Project meets the statutory tests of the RMA.

The AEE concludes that the benefits of the Project, weighed alongside the proposed measures to avoid, remedy and mitigate the adverse effects, means the Project is consistent with the purpose and principles of the RMA, and consequently, the sustainable management purpose of the RMA will be achieved.

PART A: INTRODUCTION AND BACKGROUND TO THE PROJECT

1. Introduction

Overview

The NZTA and PCC are lodging NoRs and applications for resource consent ('the matters') for their respective components of the Transmission Gully Project, namely:

- the Main Alignment (the NZTA);
- the Kenepuru Link Road (the NZTA); and
- the Porirua Link Roads (PCC).

The Project is a proposal of national significance and the matters have been lodged with the EPA. The NZTA and PCC request that the Minister for the Environment makes a direction that the matters be referred to a Board of Inquiry for determination.

1.1 The requiring authorities / applicants

1.1.1 NZ Transport Agency

The NZ Transport Agency (the NZTA) is a Crown entity responsible for providing an integrated approach to transport planning, funding and delivery in New Zealand. The NZTA's objective, as set out in section 94 of the Land Transport Management Act 2003 (LTMA), is to "undertake its functions in a way that contributes to an affordable, integrated, safe, responsive and sustainable land transport system". One of the NZTA's specific objectives is delivering the roads of national significance (RoNS) programme1.

1.1.2 Porirua City Council

Porirua City Council (PCC) is a territorial authority under the Local Government Act 2002 (LGA).[2] Under the LGA, PCC must have particular regard to the contribution that network infrastructure (which includes roads) makes to its community.[3]

1. NZ Transport Agency, Statement of intent 2011 – 2014, p.6.

2. Under Part 2 of Schedule 2 of the LGA.

3. Sections 11A and 197 of the LGA.

1.2 Transmission Gully Project

The Transmission Gully Project (the Project) consists of three components:

- The Transmission Gully Main Alignment (the Main Alignment) involves the construction, operation and maintenance of a State highway formed to an expressway standard from Linden (Wellington City) to MacKays Crossing (Kapiti Coast). The NZTA is responsible for the Main Alignment.
- The Kenepuru Link Road involves the construction, operation and maintenance of a limited access State highway connecting the Main Alignment to the existing western Porirua road network. The NZTA is responsible for the Kenepuru Link Road.
- The Porirua Link Roads involves the construction, operation and maintenance of two local roads (the Whitby Link Road and the Waitangirua Link Road) connecting the Main Alignment to the existing eastern Porirua road network. PCC is responsible for the Porirua Link Roads.

These components are shown in Figure 1.1 and described in further detail below.

Under the Resource Management Act 1991 (RMA), the respective components delivered by the NZTA and PCC are separate projects. This is relevant to some aspects of this report, particularly the various statutory assessments required under the RMA. For clarity:

- the 'NZTA Project' refers to the Main Alignment and Kenepuru Link Road; and
- the 'PCC Project' refers to the Porirua Link Roads.

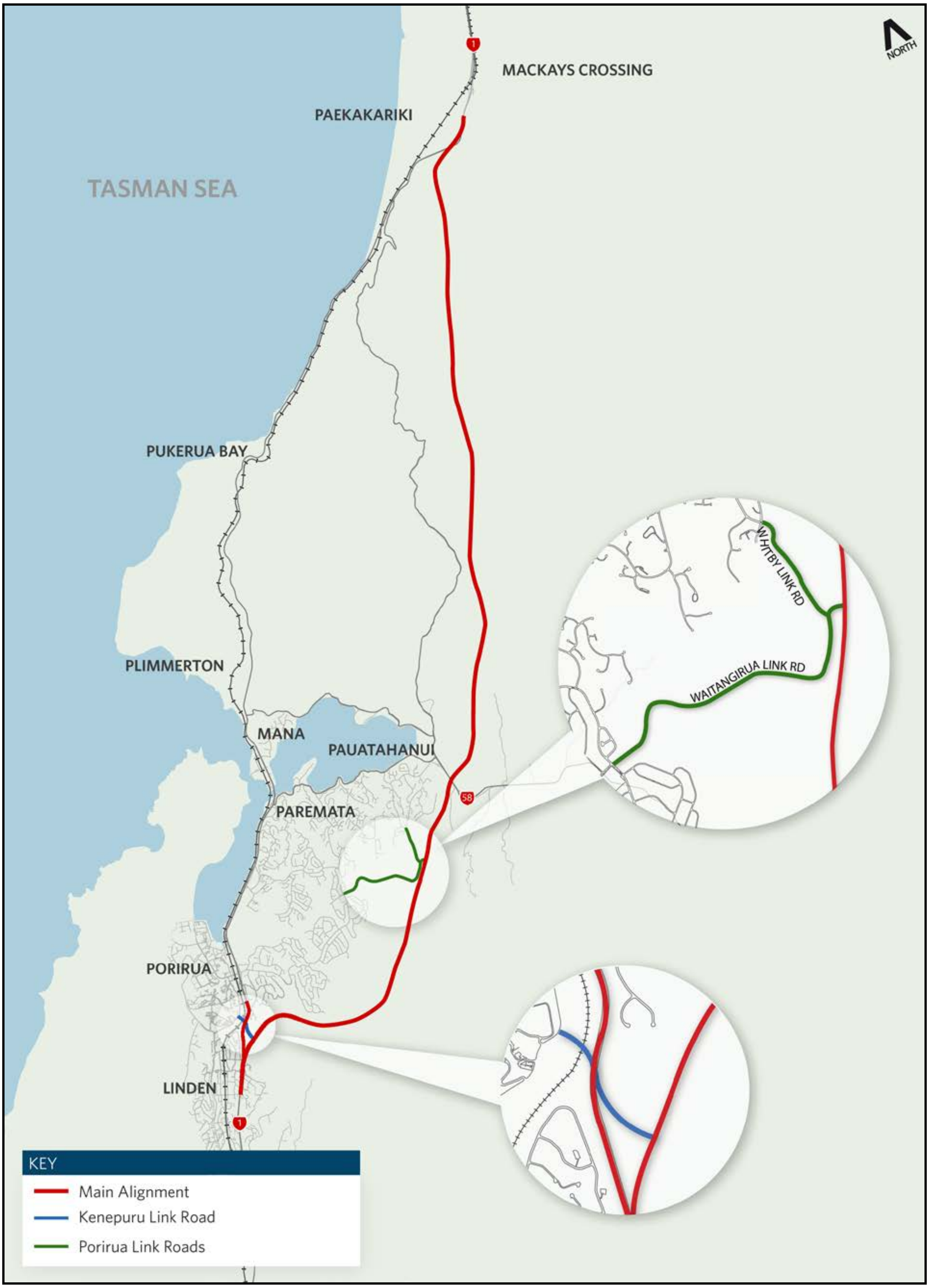

Figure 1.1: Components of the Project

1.2.1 Main Alignment

The Main Alignment will provide an inland State highway between Wellington City (Linden) and the Kapiti Coast (MacKays Crossing). Once completed, the Main Alignment will become part of State Highway 1. The Main Alignment is part of the Wellington Northern Corridor (Wellington to Levin) road of national significance (the Wellington RoNS) programme.

The proposed route is approximately 27 kilometres in length and requires land in four separate districts: Kapiti Coast District, Upper Hutt City, Porirua City and Wellington City[4].

In accordance with the Wellington RoNS programme, the broad design objective for the Main Alignment is to construct a road to an expressway standard. The key design features of the Main Alignment are:

- four lanes (two lanes in each direction with continuous median barrier separation);
- rigid access control;
- grade separated interchanges;
- minimum horizontal and vertical design speeds of 100km/hr and 110km/hr respectively;
- maximum gradient of 8%; and
- crawler lanes in some steep gradient sections (both uphill and downhill) to account for the significant speed differences between heavy and light vehicles.

The Main Alignment will be declared a motorway[5] and hence will not be available for use by cyclists, pedestrians or horse riders.

1.2.1.1 Tolling of the Main Alignment

At this stage no decision has been made as to whether or not the Main Alignment will be tolled.

For the purposes of the AEE preparation, it has been assumed that the Main Alignment will not be tolled. It is anticipated that if the Main Alignment were to be tolled, then there would be little, if any change, to the scale of effects reported in this assessment.

With respect to traffic effects, in general, tolling would be expected to result in a reduction in the number of vehicles using the Main Alignment. If the Main Alignment was tolled, tolls would be set at a level to balance revenue opportunities against the impact of traffic diversion to alternative routes.

Like the rest of the Project, the physical infrastructure required for tolling (such as gantries) would be subject to the outline plan process, as discussed in section 3.5 of this report.

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4. Although the new length of State highway created by the Project will be approximately 27km, the total length of the designation required for the Main Alignment is approximately 28.1km. This additional 1,100m accounts for the designation of a small section of existing SH1 to provide for the works needed at the northern and southern tie-ins of the Main Alignment to existing SH1.

5. Under section 71 of the Government Roading Powers Act 1989.

1.2.2 Kenepuru Link Road

The Kenepuru Link Road will connect the Main Alignment to western Porirua. It will provide access from Kenepuru Drive to the Kenepuru Interchange. This road will be a State highway designed to the following standards:

- two lanes (one in each direction);
- design speeds of 50km/hr;
- maximum gradient of 10%;
- limited side access; and
- crawler lane.

The Kenepuru Link Road requires land in Porirua City and Wellington City.

1.2.3 Porirua Link Roads

The Porirua Link Roads will connect eastern Porirua to the Main Alignment. The Whitby Link Road will provide access from James Cook Drive in Whitby, while the Waitangirua Link Road will provide access from Warspite Avenue in Waitangirua.

The Porirua Link Roads will be local roads designed to the following standards:

- two lanes (one in each direction);
- design speeds of 50km/hr;
- maximum gradient of 10%;
- some side accesses will be permitted;
- provision for cyclists; and
- provision for footpaths.

The Porirua Link Roads will be constructed, operated, and maintained by PCC.

1.3 Purpose and scope of this report

This report (and the supporting information contained in Volumes 3, 4 and 5) has been prepared in support of the Notices of Requirement for designations (NoR) and applications for resource consent (collectively referred to as 'matters') which would authorise, under the Resource Management Act 1991 (RMA), the construction, operation and maintenance of the Project[6]. These matters are being lodged with the Environmental Protection Authority (EPA) as being part of a proposal of national significance.

In total, eight (8) NoRs are being lodged by the NZTA and PCC for their respective components for the Project. These are listed in Table 1.1 and illustrated in Figure 1.2.

6. Enabling works to the existing electricity transmission line are covered separately in Volume 6.

Table 1.1: NoRs for the Project

Project	Component		District			
			Kapiti Coast District	Upper Hutt City	Porirua City	Wellington City
NZTA Project	Main Alignment		NoR 1	NoR 2	NoR 3	NoR 4
	Kenepuru Link Road		-	-	NoR 5	NoR 6
PCC Project	Porirua Link Roads	Whitby Link Road	-	-	NoR 7	-
		Waitangirua Link Road	-	-	NoR 8	

In addition to the eight notices, the NZTA and PCC are also lodging applications for the resource consents needed for their respective components of the Project. Specifically:

- the NZTA is lodging 16 applications for resource consent with the EPA (under section 145(1)(a) of the RMA) for activities required for the construction, operation and maintenance of the Main Alignment and the Kenepuru Link Road, which require resource consents under Wellington regional plans; and
- PCC is lodging four (4) applications for resource consent with the EPA (under section 145(1)(a) of the RMA) for activities required for the construction, operation and maintenance of the Porirua Link Roads, which require resource consents under Wellington regional plans.

Further information on the statutory context for the Project is provided in Part B of this report.

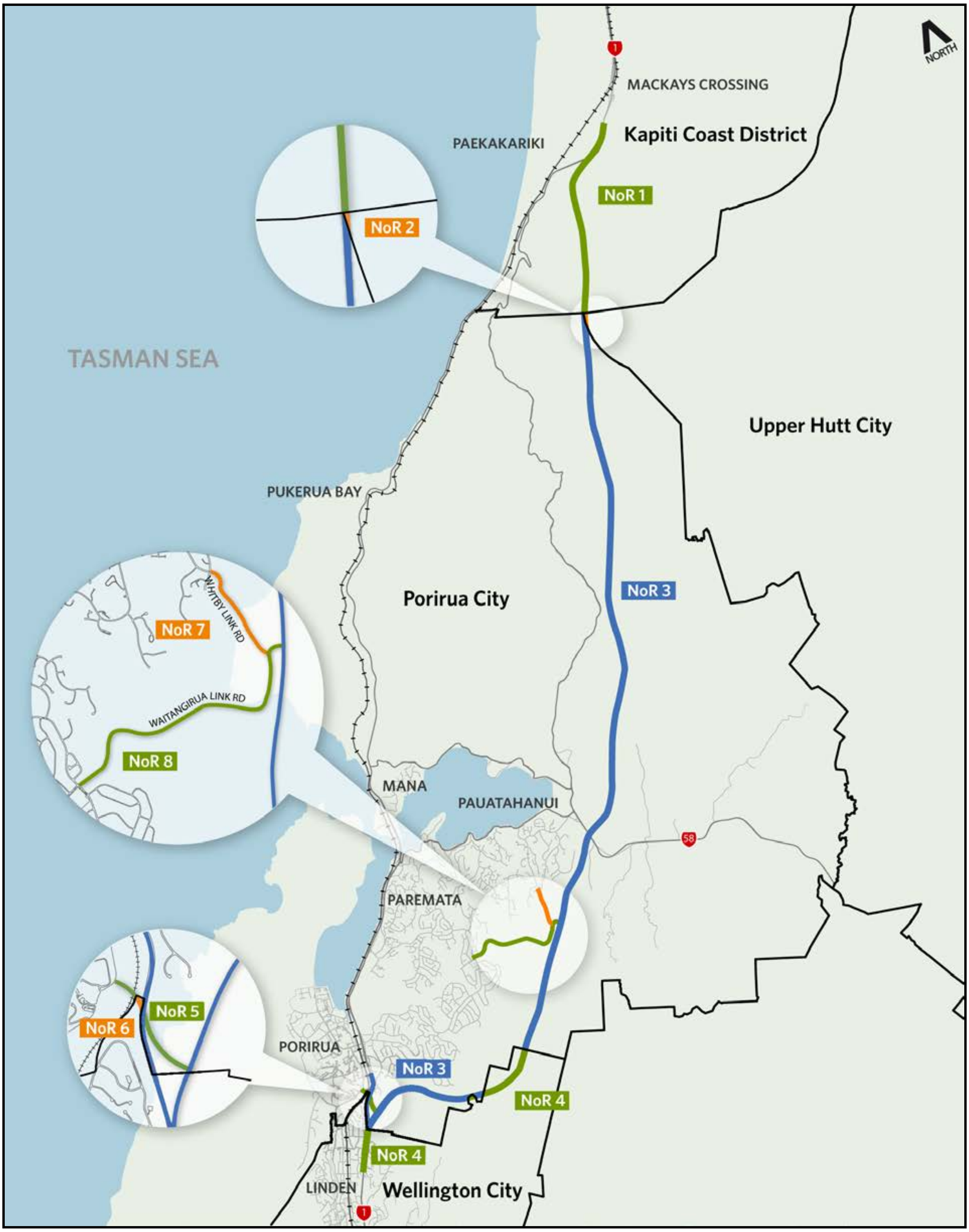

Figure 1.2: Notices of Requirement for the Project

1.4 Integrated engineering and environmental assessment process

The information presented in this set of documents for the RMA authorisations is the culmination of an extensive design and environmental assessment exercise undertaken since 2007. In particular the most recent phase (Engineering and environmental assessment, commencing in mid-2009) has involved the close integration of the Project designers (i.e. engineering teams) with the environmental assessment teams.

Throughout Phase 2, all the E&EA teams met together monthly and meetings between specific teams occurred more frequently, as required. This close working relationship resulted in a high level of integration between the design and mitigation processes. Specific details about how particular potential adverse environmental effects are proposed to be managed are provided in Parts G and H of this report, but in general terms the approach has been:

- To modify the design of the Project to avoid, or reduce to the extent practicable, potential adverse effects.
- Where avoidance of adverse effects was not possible, to develop measures to adequately remedy and/or mitigate potential adverse effects.
- Where mitigation and/or remediation is required, to co-ordinate these measures as much as possible to promote good environmental outcomes.

A further feature of the E&EA process has been the involvement of a wide range of stakeholders (i.e. wider than just the E&EA teams). In particular, a Regulatory Authorities Technical Advisory Group (RATAG) comprising a representative from the five relevant local authorities met monthly with the Project team. The purpose of these regular meetings was to keep the local authorities informed of the preparation of the lodgement documentation. They also acted in a review capacity, providing feedback to the Project team about various aspects of the Project.

A number of other stakeholders also provided input into the E&EA process, including:

- local authorities[7];
- network utility providers;
- tangata whenua;
- the Department of Conservation;
- the NZ Historic Places Trust;
- community organisations (e.g. public health, schools etc.);
- advocacy groups (e.g. environmental groups);
- directly affected landowners; and
- the general public.

7. In addition to their RATAG role, local authorities were also involved in other capacities including as asset owners and operators, land owners and in terms of strategic and policy.

1.5 Structure of this report

This report (in conjunction with the technical reports and supporting information (Volume 3), the plans (Volume 4) and the draft management plans (Volume 5)) contains the information required in support of the matters lodged with the EPA[8], including:

- a description of the existing environment, including a description of the receiving environment (as necessary);
- a description of the Project;
- an assessment of alternative sites, routes and methods (as necessary);
- identification of the persons affected by the Project and a description of consultation undertaken in the development of the Project;
- an assessment of the actual or potential effects on the environment of the construction, operation and maintenance of the Project including, where necessary, a description of proposed mitigation measures;
- an assessment of the Project against relevant provisions of policies and plans (both statutory and non-statutory); and
- suggested conditions (including proposed management plans and monitoring) for the designations and resource consents.

The structure of this report is set out in Table 1.2.

Table 1.2: Structure of this report

Part	Chapters	Name	Contents
A	1 - 2	INTRODUCTION AND BACKGROUND TO THE PROJECT	An introduction to the Project, including the strategic context, benefits and objectives of the Project.
B	3 - 5	STATUTORY CONTEXT	Details of the statutory matters relevant to the development and consideration of the Project.
C	6	DESCRIPTION OF THE ENVIRONMENT	A description of the existing environment, including a description of the receiving environment as necessary.
D	7 - 8	DESCRIPTION OF THE PROJECT	A description of the operation (including maintenance) and construction of the Project.
E	9	CONSIDERATION OF ALTERNATIVES	An assessment of the alternatives considered in the development of the Project.

8. In order to assist readers to familiarise themselves with the structure of the lodgement documentation and the key naming conventions used, a '*Guide to the lodgement documentation*' has been prepared.

Part	Chapters	Name	Contents
F	10	CONSULTATION AND ENGAGEMENT	Identification of the persons affected by the Project and details of the methods and outcomes of consultation undertaken for the Project.
G	11 - 27	ASSESSMENT OF EFFECTS ON THE ENVIRONMENT	An assessment of the effects on the environment of the Project.
H	28 - 30	MANAGEMENT OF ENVIRONMENTAL EFFECTS	Details of proposed management and monitoring and proposed designation and resource consent conditions.
I	31 - 32	STATUTORY ASSESSMENT	An assessment of the Project against all relevant statutory considerations, including Part 2 of the RMA.

As has been explained above, although some components of the Project are to be funded and delivered by the NZTA (i.e. the NZTA Project) and some by PCC (i.e. the PCC Project), they have been developed as a holistic Project. However, this does not prevent components of the Transmission Gully Project being delivered separately, if necessary.

Similarly, although a single AEE report has been prepared covering all components of the Project, some aspects of the report will only be relevant to:

- specific geographical areas and / or jurisdictional areas; or
- the notices of requirement and / or applications for resource consent; or
- specific components of the Project.

The RMA forms (Volume 2) set out what information is relevant to specific statutory aspects.

1.6 Requiring authority status

A notice of requirement for a designation may only be issued by a requiring authority.

Under section 166 of the RMA, a requiring authority is defined as:

"(a) a Minister of the Crown; or

(b) a local authority; or

(c) a network utility operator approved as a requiring authority under section 167."

The NZTA is the requiring authority for the Main Alignment and the Kenepuru Link Road. The NZTA was approved under section 167(3) of the RMA as a requiring authority by the Resource Management

(Approval of Transit New Zealand as Requiring Authority) Notice 1994, which was notified in the Gazette on 3 March 1994.[9] A copy of this Gazette Notice is contained in **Appendix A** of this report.

PCC is a requiring authority in accordance with section 166(b) of the RMA and is the requiring authority for the Porirua Link Roads.

1.7 Consideration of the Project as a proposal of national significance

On 10 September 2010 the Minister for the Environment made a direction that the Project is a proposal of national significance[10]. The Minister's reasons for his direction were that the Project:

- has aroused widespread public concern or interest regarding its actual or likely effect on the environment (including the global environment) (s142)(3)(a));
- involves or is likely to involve significant use of natural and physical resources (s142)(3)(b));
- affects or is likely to affect a structure, feature, place, or area of national significance (s142)(3)(c));
- results or is likely to result in or contribute to significant or irreversible changes to the environment (including the global environment) (s142)(3)(e));
- will assist the Crown in fulfilling its public health, welfare, security, or safety obligations or functions (s142)(3)(h));
- affects or is likely to affect more than 1 region or district (s142)(3)(i)); and
- relates to a network utility operation that extends or is proposed to extend to more than 1 district or region (s142)(3)(j)).

The NZTA and PCC request that the matters be directed to a Board of Inquiry made up of the same people as the Board of Inquiry which the NZTA's request for a change to the Regional Freshwater Plan was directed to.

1.8 Aspects not covered in this report

There are some aspects which are related to the Project which are not covered in this report. These are:

- the relocation of existing electricity transmission lines;
- the alteration or removal of existing designations;
- works to existing State highways[11];

9. Under clause 29 of Schedule 2 of the Land Transport Management Amendment Act 2008, the NZTA replaced Transit New Zealand as the requiring authority approved under this Gazette Notice.

10. Hon Dr Nick Smith, Ministerial direction to refer the New Zealand Transport Agency's request for a plan change to the Wellington Regional Freshwater Plan to a Board of Inquiry, 10 September 2010.

- a request by the NZTA for a change to the Regional Freshwater Plan for the Wellington Region; and
- authorisations required under other legislation.

1.8.1 Relocation of existing electricity transmission lines

The Transmission Gully Project is named as such because it generally follows the existing 110kV electricity transmission line between Takapu Road and Paekakariki. This line is part of the Nation Grid, owned and operated by Transpower New Zealand Limited (Transpower). In order to construct and operate the Project, some sections of this transmission line will need to be relocated (and/or existing towers strengthened). This work is referred to as the 'Transpower Line Relocation Project.

The NZTA and Transpower have an ongoing Memorandum of Understanding (MoU) for the management of their respective assets across the country. Both organisations have agreed that it would be preferable to have a distinct set of documents specifically for the applications for resource consent for the Transpower Project (contained in Volume 6). The reasons for this are:

- Transpower (rather than the NZTA or PCC) is the applicant for the resource consents required for the Transpower Project;
- applications for the resource consents required for the Transpower Project will be made under the Resource Management (National Environmental Standards for Electricity Transmission Activities) Regulations 2009 (NES ET). The NES ET specifically provides for the relocation of existing lines but does not apply to the Project itself; and
- lodging a distinct set of documents for the Transpower Project will allow better differentiation between Transpower's dual roles as an applicant for the resource consents required for the transmission line relocation and as an affected party in relation to the Project; and
- the transmission line relocation (i.e. the Transpower Project) will largely be undertaken as a separate activity from the Project (but in conjunction with the enabling works for the Project).

Transpower is lodging its application with the EPA (under section 145(1)(a) of the RMA) as a matter that is part of a proposal of national significance. This is being done at the same time as the NZTA and PCC lodge its matters with the EPA for the Transmission Gully Project. The NZTA, PCC and Transpower believe these matters would best be heard by the same BoI, allowing them to be considered together.

1.8.2 Alteration or removal of existing designations

There are a number of designations already in the various district plans which relate to previous Transmission Gully alignments and associated link roads. There are also a number of designations for existing State highways. Table 1.3 contains the details of these existing designations.

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11. Except as required for the northern and southern tie-ins with SH1 and for the proposed SH58 Interchange.

Table 1.3: Existing Transmission Gully, State highway and link road designations

Designation name	District plan [identifier]	Requiring authority
Kapiti Coast District		
State Highway 1	KCDP [D0101]	NZ Transport Agency
Transmission Gully Motorway	KCDP [D0103]	NZ Transport Agency
State Highway 1 (MacKays Crossing)	KCDP [D0104]	NZ Transport Agency
Upper Hutt City		
Transmission Gully Motorway	UHCDP [TNZ4][12]	NZ Transport Agency
Porirua City		
Motorway (State Highway 1)	PCDP [K0403]	NZ Transport Agency
Limited Access Road (State Highway 58)	PCDP [K0404]	NZ Transport Agency
Transmission Gully Motorway	PCDP [K0405]	NZ Transport Agency
Kenepuru Link Road	PCDP [K0406]	NZ Transport Agency
Warspite Avenue Link Road	PCDP [K1051][13]	Porirua City Council
Wellington City		
Transmission Gully Motorway	WCDP [H5]	NZ Transport Agency
Motorway (State Highway 1)	WCDP [H1]	NZ Transport Agency
Warspite Link Road and Interchange	WCDP [X1]	Porirua City Council

These existing designations are noted for information purposes only. The NoRs given in this set of documents do not relate to the alteration or removal of any of the existing designations listed in Table 1.3. Where works within an existing State highway designation are required (at the northern and southern tie-ins with SH1 and the new interchange with SH58), these works have been provided for in the extent of the designations sought for the Project[14]. As such, no works for the Project will be undertaken pursuant to any of the existing designations listed in Table 1.3.

Once the Project has been constructed, the designations currently sought will be reviewed with a view to reducing the extent of the designations to only that required for the continued operation and maintenance of the Project.

1.8.3 Works to existing State highways

The Project will allow existing SH1 between Linden and MacKays Crossing and SH58 to the west of the Main Alignment to be developed into a safe multi-functional alternative route, in accordance with the Project objectives, and the benefits and effects of the Project have been assessed based on this assumption. It is emphasised, however, that any redevelopment of existing SH1 and the relevant section

12. On Rural Map 8 of the UHCDP, designation TNZ4 is labelled as ‘State Highway 2’. Upper Hutt City Council has confirmed (telecommunication between P. McGimpsey (Beca) and M. Yu (Upper Hutt City Council), 2 March 2010) that this labelling is an error and this designation is for the ‘Transmission Gully Motorway’. The schedule of designations (Chapter 36 of the UHCDP) lists designation TNZ4 for the ‘Transmission Gully Motorway’.

13. Based on the PCDP available online (www.pcc.govt.nz), the requirement for designation K1051 has not been confirmed in the PCDP.

14. For the northern tie-in, this is within the designation sought by NoR 1 and for the southern tie-in, this is within the designations sought by NoR 4 and NoR 5.

of SH58, does not form part of the Project. Decisions about the redevelopment of existing SH1 and SH58 have not yet been made. These decisions will be made in the future in conjunction with local authorities and the community.

1.8.4 Request for a change to the Regional Freshwater Plan for the Wellington Region

On 6 September 2010, the NZTA lodged a request for a change to the Regional Freshwater Plan for the Wellington Region (the Request). The Request was lodged with the EPA (under section 145(1)(c) of the RMA) as a matter which is part of a proposal of national significance (i.e. the Transmission Gully Project). The Request seeks the addition of a new policy, changes to policies and two new definitions in the Regional Freshwater Plan (RFP). The objective of the Request is to allow greater flexibility for implementation of the Project, which will better align the RFP with the Proposed Wellington Regional Policy Statement and the Wellington Regional Land Transport Strategy. It also seeks to provide greater clarity regarding the management of environmental effects of activities in streams classified in the RFP as *'surface water to be managed for aquatic ecosystem purposes'*.

The Minister for the Environment directed the Request to a BoI on 10 September 2010. The Request was publically notified on 12 February 2011, with further submissions called for on 4 April 2011.

At the time of lodgement of the NoRs and applications for resource consent for the Project by the NZTA and PCC (August 2011), the BoI has heard the Request but has not released its final decision.

The provisions of the proposed plan change will not become operative until the BoI has released its final decision on the Request and (if their decision requires amendment of the RFP) the decision has been implemented by GWRC (in accordance with section 149W of the RMA). As such, for the purposes of the assessment of the Project (contained in Part I of this report), the Request is not relevant (under sections 104(1)(b)(vi) and 171(1)(a)(iv) of the RMA) as it is not part of a proposed plan[15].

1.8.5 Authorisations required under other legislation

The construction, operation and maintenance of the Project will also require authorisations under other legislation, including:

- approval from the Minister of Conservation for the use and occupation of land classified as recreation reserve or scenic reserve under the Reserves Act 1977;
- an archaeological authorisation from the NZ Historic Places Trust under the Historic Places Act 1993; and
- approval from the Director-General of Conservation for the construction of culverts where the passage of fish would be impeded under the Freshwater Fisheries Regulations 1983.

This set of documents only pertains to the authorisations required under the RMA for the Project. Authorisations required under other legislation will be sought subsequently from the appropriate authorities.

15. The definition of 'proposed plan' under section 43AAC of the RMA does not include private plan change requests.

2. Background to the Project

Overview

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

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

2.1 Introduction

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

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

2.2 Development of the Project

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

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

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

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

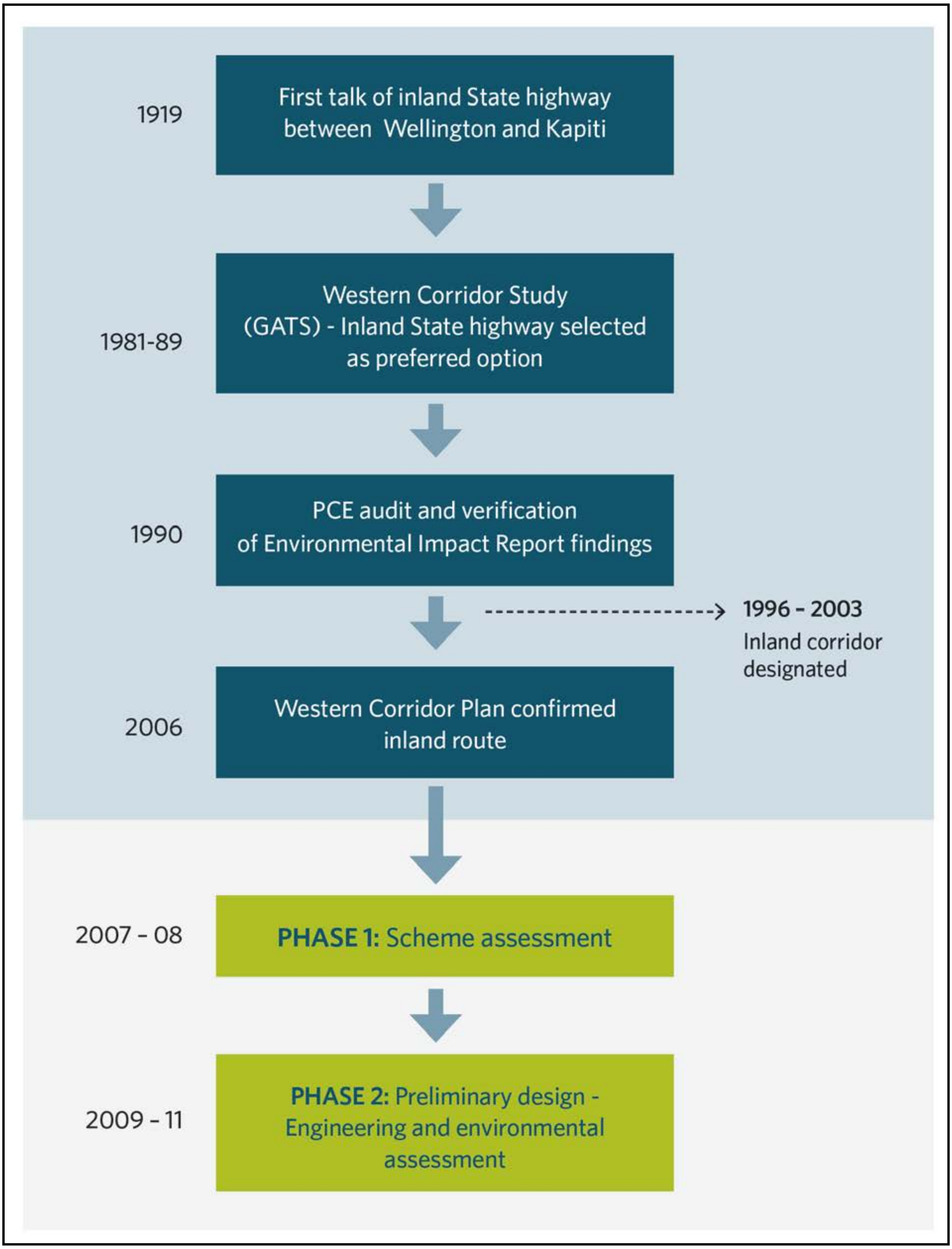

Figure 2.1: Key events in the development of the Project

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

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

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

Part of this study focused on the coastal section of SH1 and its limited capacity to provide for the predicted future growth and development of the Wellington region. The GATS review led to the preparation of an Environmental Impact Report (EIR) which considered the impacts of options to address capacity issues. The GATS review also examined public transport improvements as an alternative to road options but concluded that public transport improvements alone would not be sufficient to address the capacity issues. The broad road options assessed were:

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

The EIR also examined public transport improvements as an alternative to road options, but concluded road improvements would better address the growing congestion on SH1. The EIR found that the inland route was more environmentally and socially acceptable than upgrading the coastal route and also better than the "Do Minimum option". The favoured inland route was from MacKays Crossing in the north, connecting to SH1 at Grenada North in the south.

The EIR was audited by the Parliamentary Commissioner for the Environment (PCE) who agreed in principle with the findings of the EIR, with some reservations and recommendations. The main

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

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

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

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

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

2.2.2 Designation of the Inland Route (1996 – 2003)

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

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

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

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

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

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

These southern alignment options are shown in Figure 2.2.

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

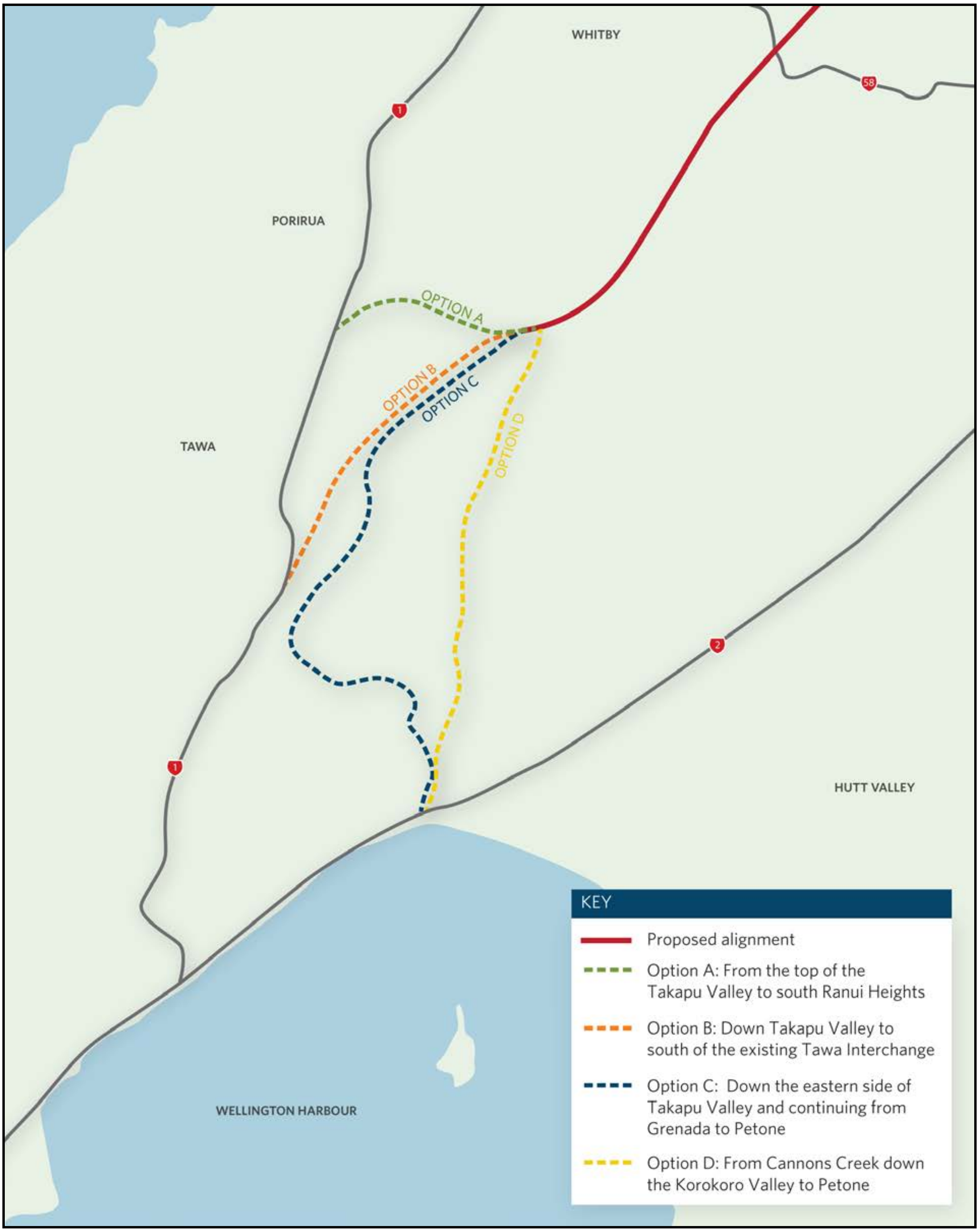

Figure 2.2: Southern connection options considered

The key findings of the evaluation[21] were:

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

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

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

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

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

2.2.3 Western Corridor Study (2004 – 06)

In 2004 GWRC, in conjunction with the then Transit NZ commissioned the Western Corridor Study (WCS) as a key input into a review of the Regional Land Transport Strategy. The Western Corridor[22] is one of four transport corridors in the region with the other three being: Hutt; Ngauranga to Airport; and Wairarapa. Similar to the earlier GATS review, this study found that "although further modal shift from private motor vehicles to public transport is desirable, this, in itself, will not replace the need for substantial upgrade of the roading infrastructure in the Western Corridor"[23]. The broad options considered for the Western Corridor roading solution were either an upgrade of the existing SH1 or construction of an alternative inland route.

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

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

23. Western Corridor Plan, 2007.

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

After a call for submissions, the WCS was put before a Hearings Sub–committee. The Hearings Sub-committee made the following comments[25]:

> *"The Sub-committee found that the Western Corridor faces a series of serious reliability, resilience and congestion problems that are impacting negatively on the region, and on the main arterial transport link between Auckland, the Capital, and the South Island.*
>
> *All modelling and the experience of affected communities suggests that these problems are likely to increase over the next 20 years even under conservative forecasts of population and economic growth. Commuters in the Region already show strong usage of public transport. Although further modal shift from private motor vehicles to public passenger transport is desirable, this, in itself, will not replace the need for substantial upgrade of the roading infrastructure in the Western Corridor.*

and:

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

and:

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

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

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

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

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

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

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

2.2.4 Work from 2007 - now

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

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

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

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

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

2.3 Strategic context of the Project

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

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

The objectives of the Wellington RoNS are[28]:

- to enhance inter regional and national economic growth and productivity;
- to improve access to Wellington's CBD, key industrial and employment centres, port, airport and hospital;
- to provide relief from severe congestion on the State highway and local road networks;
- to improve the journey time reliability of travel on the section of SH1 between Levin and the Wellington International Airport; and
- to improve the safety of travel on State highways.

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

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

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

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

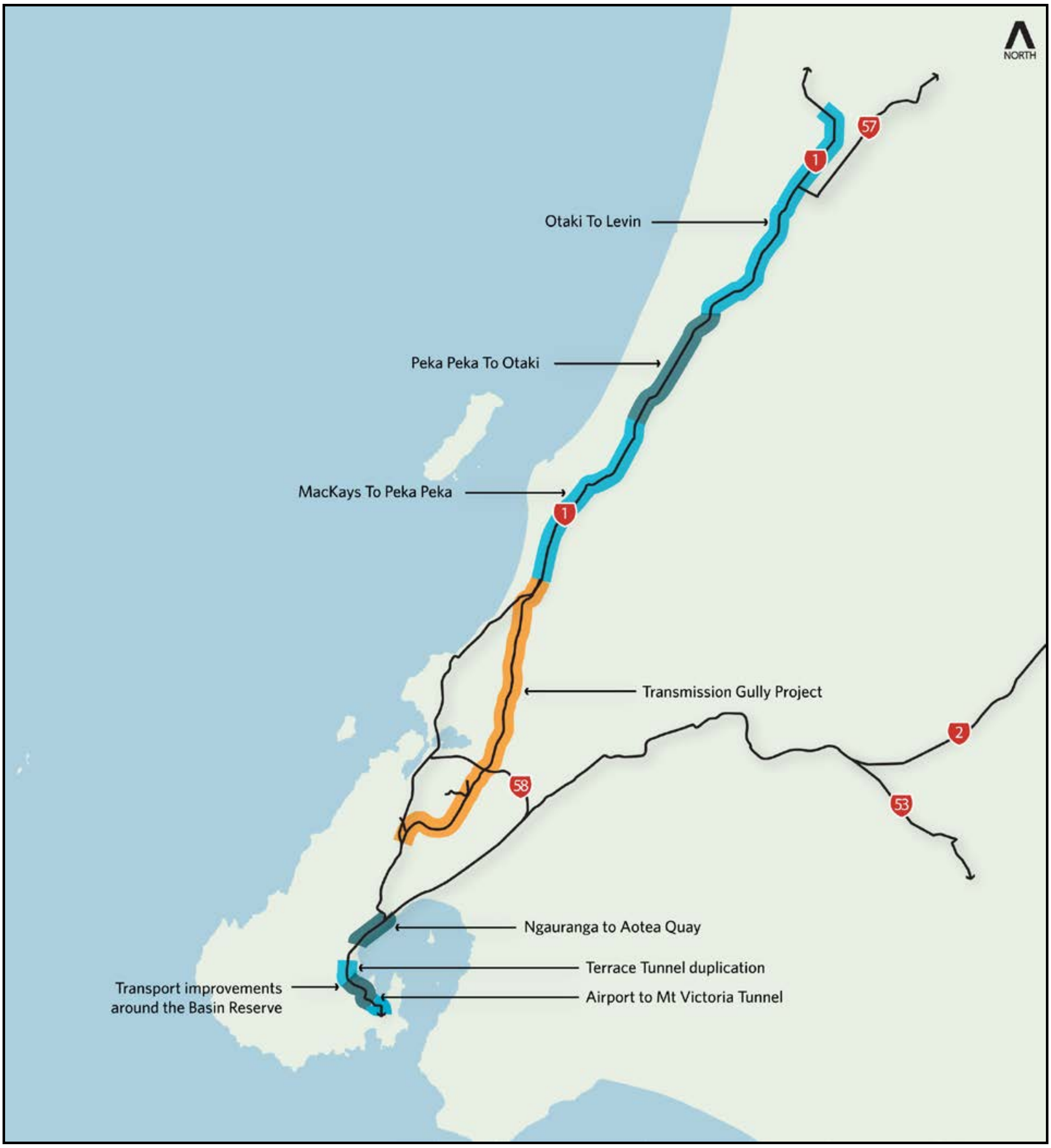

Figure 2.3: The Project within the context of the Wellington RoNS

2.3.1 National context

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

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

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

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

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

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

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

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

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

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

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

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

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30. National Infrastructure Plan 2011, p.11.

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

The objectives of the NZTS are:

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

The GPS states that[32]:

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

2.3.2 Regional context

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

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

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

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

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

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

The vision of the RLTS is:[33]

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

The objectives of the RLTS are to:

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

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

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

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

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

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

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

2.3.3 Context of the Porirua Link Roads

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

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

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

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

2.4 Benefits of the Project

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

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

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

2.4.1 Route security and resilience benefits

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

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

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

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

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

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

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

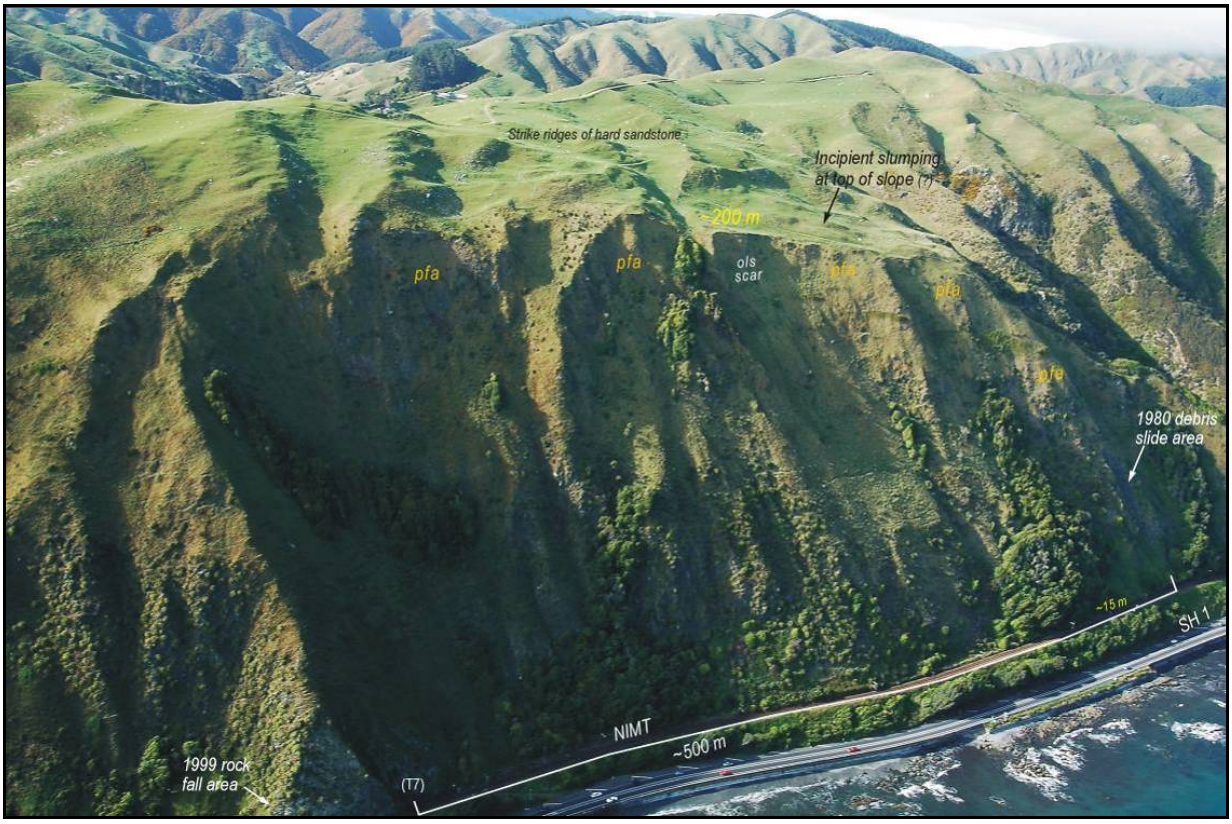

Figure 2.4: Aerial view of a coastal section of existing SH1 between Paekakariki and Pukerua Bay

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

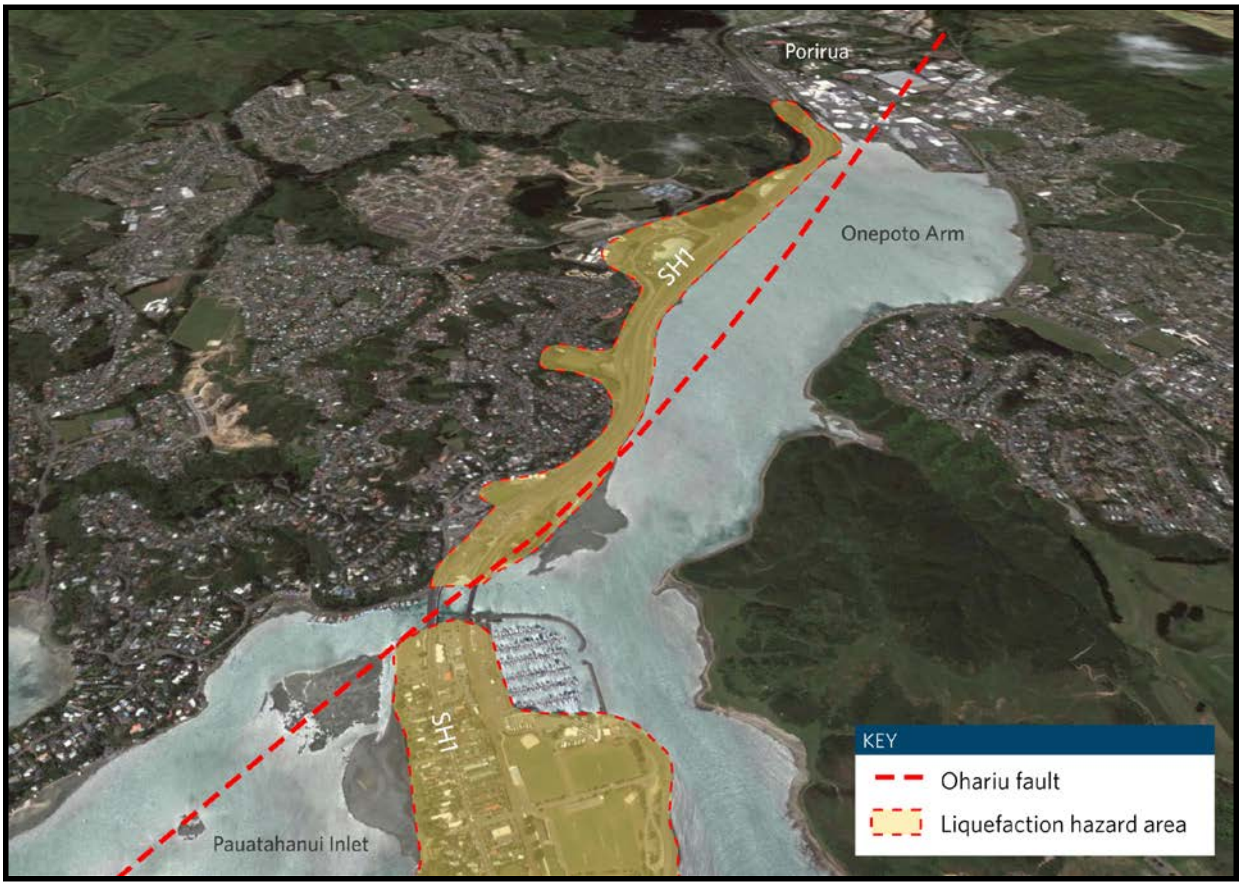

Figure 2.5: Liquefaction hazard area along existing SH1 between Linden and MacKays Crossing

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

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

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

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

2.4.1.1 Resilience to major earthquakes

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

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

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

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

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

Summary of post- earthquake availability

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

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

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

The characteristics of both events are shown in Table 2.1.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

2.4.1.2 Resilience to severe weather events and other events

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

2.4.2 Safety benefits

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

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

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

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

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

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

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

2.4.3 Travel time benefits

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

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

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

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

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

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

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

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

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

2.4.4 Community benefits

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

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

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

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

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

2.4.5 Economic development benefits

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

Access to areas such as parts of the Hutt Valley and eastern Porirua will also be enhanced. Improved levels of accessibility could create opportunities for land use development, although it is recognised that this is controlled by the land use provisions in district plans. Construction of the Kenepuru Link Road will provide a more direct connection into Porirua town centre, as well as Broken Hill and Elsdon industrial estates from Wellington, the Hutt Valley and centres further north. Opportunities for land use development will also be created along the existing SH1 route.

2.5 NZTA and PCC objectives

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

2.5.1 NZTA objectives

The NZTA's objectives for the NZTA Project are:

- to provide an alternative strategic link for Wellington that improves regional network security;
- to assist in remedying the safety concerns of, and projected capacity problems on, the existing State Highway 1 by providing a safe and reliable route between Linden and MacKays Crossing in an environmentally sustainable manner;
- to assist in enabling wider national economic development by providing a cost-optimised route that better provides for the through movement of freight and people; and
- to assist integration of the land transport system by enabling the existing State Highway 1 to be developed into a safe multi-functional alternative to the proposed strategic link.

2.5.2 PCC objectives

PCC's objectives for the PCC Project are:

- to provide more efficient, safer and more reliable road access between eastern Porirua suburbs and the Hutt Valley, Wellington City and Kapiti Coast;
- to improve amenity values and the quality of the environment in Porirua by encouraging the use of Transmission Gully for regional and inter-regional trips as opposed to the existing State Highway 1 route through Mana, Plimmerton, Pukerua Bay and Paekakariki;
- to reduce the adverse effects of traffic on the environment in Porirua by encouraging the use of Transmission Gully for regional and inter-regional trips, as opposed to roads directly adjacent to the Pauatahanui and Onepoto Inlets of the Porirua Harbour;
- to provide alternative arterial routes and connectivity within eastern Porirua suburbs to support an integrated approach to regional and local land transport and development; and
- to support the development and revitalisation of Waitangirua Village Centre as a focus for activity within the community by improving connectivity.

PART B: STATUTORY CONTEXT

3. Resource Management Act 1991

Overview

The RMA prescribes a number of relevant considerations for the determination of NoRs and applications for resource consent. NoRs have been lodged by the NZTA and PCC for their respective components (i.e. the NZTA Project and the PCC Project) of the Project across the four districts. Applications for resource consent have also been lodged. The Project is a proposal of national significance and the matters have been lodged with the EPA.

3.1 Introduction

In this chapter the key statutory matters (under the RMA) of relevance to the Project are set out, namely:

- the purpose and principles of the RMA (Part 2);
- consideration of proposals of national significance (Part 6AA);
- NoRs for designations (Part 8); and
- applications for resource consent (Part 6).

In this chapter the relevant statutory matters are set out but are <u>not</u> assessed. The assessment of the Project in relation to these matters is provided in Part I of this report. This chapter also contains details of the NoRs for designations and the applications for resource consent, sought for the Project.

3.2 Purpose and principles of the RMA

The consideration of effects of the Project is subject to Part 2 of the RMA (purpose and principles).

Section 5 states that:

> *"(1) The purpose of this Act is to promote the sustainable management of natural and physical resources.*
>
> *(2) In this Act, sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while -*

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment."

Matters of national importance are set out in section 6:

"In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:

(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:

(b) the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:

(c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:

(d) the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:

(e) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga:

(f) the protection of historic heritage from inappropriate subdivision, use, and development:

(g) the protection of recognised customary activities."

'Other matters' are set out in section 7:

"In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to -

(a) kaitiakitanga:

(aa) the ethic of stewardship:

(b) the efficient use and development of natural and physical resources:

(ba) the efficiency of the end use of energy:

(c) the maintenance and enhancement of amenity values:

(d) intrinsic values of ecosystems:

(e) [Repealed]

(f) maintenance and enhancement of the quality of the environment:

(g) any finite characteristics of natural and physical resources:

(h) the protection of the habitat of trout and salmon:

(i) the effects of climate change:

(j) the benefits to be derived from the use and development of renewable energy."

Section 8 directs that:

> *"In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi)."*

3.3 Proposals of national significance

Part 6AA of the RMA provides for the consideration of matters which, singularly or collectively, constitute a proposal of national significance. Section 145 allows certain matters to be lodged directly with the EPA. These include:

- an application for a resource consent (s145(1)(a)); and
- a notice of requirement for a designation or to alter a designation (s145(3)).

As has been explained elsewhere, the NZTA and PCC are lodging their applications for resource consent and NoRs for the Project with the EPA , in accordance with these sections of the RMA.

Concurrent to the lodgement of the NZTA and PCC's matters with the EPA, they have also been served on the relevant local authorities (Wellington City Council, Porirua City Council, Upper Hutt City Council, Kapiti Coast District Council and Greater Wellington Regional Council), in accordance with section 145(10) of the RMA.

As discussed in Section 1.7 of this report, the Minister has confirmed that the Project is a proposal of national significance. The NZTA and PCC consider that the NoRs and application for resource consent for the Project should be heard by a Board of Inquiry made up of the same people as the Board of Inquiry which has been assigned to determine the NZTA's Freshwater Plan Change Request.

The Minister's direction on the matter (under section 147(1)) cannot be appealed. If the Minister makes a direction that the matter be heard by a board of inquiry or the Environment Court, the process to be followed is set out in sections 149A to 149U. If the matter is referred to a BoI, the board must release its final decision on the matter within nine months of the matter being publically notified by the EPA (section 149R(2)). The Minister may extend this time period if he or she sees fit (under section 149S).

Section 149V directs that the decision of a BoI or of the Environment Court can only be appealed on a question of law.

3.4 Notices of Requirement by the NZTA and PCC

The NZTA is lodging four (4) notices for the designation of land required for the construction, operation and maintenance of the Main Alignment in the following district plans:

- the Kapiti Coast District Plan (NoR 1);
- the Upper Hutt City District Plan (NoR 2);
- the Porirua City District Plan (NoR 3); and
- the Wellington City District Plan (NoR 4).

The NZTA is lodging two (2) notices for the designation of land required for the construction, operation and maintenance of the Kenepuru Link Road in the following district plans:

- the Porirua City District Plan (NoR 5); and
- the Wellington City District Plan (NoR 6).

PCC is lodging two (2) notices for the designation of land in the Porirua City District Plan for the construction, operation and maintenance of:

- the Whitby Link Road (NoR 7); and
- the Waitangirua Link Road (NoR 8).

These eight notices are being lodged under section 145(3) of the RMA. Section 145(7) directs that where a notice is lodged with the EPA, section 168 applies, except that every reference in that section to a territorial authority must be read as a reference to the EPA.

Section 168(2) applies to the notices lodged by the NZTA:

> *"A requiring authority for the purposes approved under section 167 may at any time give notice in the prescribed form to a territorial authority of its requirement for a designation -*
>
> > *(a) for a project or work; or*
> >
> > *(b) in respect of any land, water, subsoil, or airspace where a restriction is reasonably necessary for the safe or efficient functioning or operation of such a project or work."*

Section 168(1) applies to the notices lodged by PCC:

> *"A Minister of the Crown who, or a local authority which, has financial responsibility for a public work, may at any time give notice in the prescribed form to a territorial authority of its requirement for a designation—*
>
> > *(a) for a public work; or*
> >
> > *(b) in respect of any land, water, subsoil, or airspace where a restriction is necessary for the safe or efficient functioning or operation of a public work."*

The prescribed form for a NoR is set out in Form 18 of the Resource Management (Forms, Fees, and Procedure) Regulations 2003. The notices (contained in Volume 2) have been prepared in accordance with these regulations.

If the matters are directed to a BoI, all of the NoRs will be considered under section 149P. Section 149P(4) directs that a board:

> "*(a) must have regard to the matters set out in section 171(1) and comply with section 171(1A) as if it were a territorial authority; and*
>
> *(b) may -*
>
> > *(i) cancel the requirement; or*
> >
> > *(ii) confirm the requirement; or*
> >
> > *(iii) confirm the requirement, but modify it or impose conditions on it as the board thinks fit; and*
>
> *(c) may waive the requirement for an outline plan to be submitted under section 176A."*

The matters set out in section 171(1A) and (1) are:

> *"(1A) When considering a requirement and any submissions received, a territorial authority must not have regard to trade competition or the effects of trade competition.*
>
> *(1) When considering a requirement and any submissions received, a territorial authority must, subject to Part 2, consider the effects on the environment of allowing the requirement, having particular regard to -*
>
> > *(a) any relevant provisions of -*
> >
> > > *(i) a national policy statement:*
> > >
> > > *(ii) a New Zealand coastal policy statement:*

(iii) a regional policy statement or proposed regional policy statement:

(iv) a plan or proposed plan; and

(b) whether adequate consideration has been given to alternative sites, routes, or methods of undertaking the work if -

(i) the requiring authority does not have an interest in the land sufficient for undertaking the work; or

(ii) it is likely that the work will have a significant adverse effect on the environment; and

(c) whether the work and designation are reasonably necessary for achieving the objectives of the requiring authority for which the designation is sought; and

(d) any other matter the territorial authority considers reasonably necessary in order to make a recommendation on the requirement."

If the Minister directs the NoRs to a BoI, the BoI, rather than the NZTA and PCC as the requiring authorities, will make the final decision on the NoRs.

3.5 Outline plans

Section 176A sets out the circumstances when an outline plan must be submitted to a territorial authority before commencing construction of a project or work under a designation. In accordance with section 176A(3):

"An outline plan must show -

(a) the height, shape, and bulk of the public work, project, or work; and

(b) the location on the site of the public work, project, or work; and

(c) the likely finished contour of the site; and

(d) the vehicular access, circulation, and the provision for parking; and

(e) the landscaping proposed; and

(f) any other matters to avoid, remedy, or mitigate any adverse effects on the environment."

Upon receiving an outline plan, a territorial authority has 20 working days to request any changes to the outline plan. The requiring authority may accept or reject the requested changes.

Under section 176A(2) the submission of an outline plan may not be required if:

> *"(a) the proposed public work, project, or work has been otherwise approved under this Act; or*
>
> *(b) the details of the proposed public work, project, or work, as referred to in subsection (3), are incorporated into the designation; or*
>
> *(c) the territorial authority waives the requirement for an outline plan."*

The BoI have the ability to waive the requirement for an outline plan under section 149P(4)(c). However, the NZTA and PCC intend to submit outline plans to the relevant territorial authorities prior to the commencement of works onsite, for relevant aspects of the Project (in conjunction with addressing various matters via management plans).

3.6 Land subject to existing designations

Some of the land to be designated for the Project is already subject to existing designations, as outlined in Table 3.1.

Table 3.1: Existing designations over land to which the NoRs relate

Designation name	District plan [identifier]	Requiring authority	Proposed new designation for the Project
North Island Main Truck railway line	PCDP [K0101]	NZ Railways Corporation	NoR 5 for the Kenepuru Link Road (NZTA)
Battle Hill Regional Park	PCDP [K0703]	Wellington Regional Council	NoR 3 for the Main Alignment (NZTA)
Akatarawa and Whakatiki Water Catchment	UHCDP [WRC6]	Wellington Regional Council	NoR 2 for the Main Alignment (NZTA)
Takapu Road Substation	WCDP [F4]	Transpower New Zealand Ltd	NoR 4 for the Main Alignment (NZTA)

Section 177 applies where an area of land is subject to two designations:

> *"(1) Subject to sections 9(2) and 11 to 15, where a designation is included in a district plan, and the land that is the subject of the designation is already the subject of an earlier designation or heritage order, -*
>
> > *(a) The requiring authority responsible for the later designation may do anything that is in accordance with that designation only if that authority has first obtained the written consent of the authority responsible for the earlier designation or order; and*
> >
> > *(b) The authority responsible for the earlier designation or order may, notwithstanding section 176(1)(b) and without obtaining the prior written consent of the later requiring authority, do anything that is in accordance with the earlier designation or order."*

In order to undertake work in accordance with a designation on land where there is an existing (earlier) designation in place, the written consent of the requiring authority for the earlier designation is required under section 177(1)(a).

As such, approval under section 177(1)(a) will be required from:

- the NZ Railways Corporation;
- the Wellington Regional Council; and
- Transpower New Zealand Ltd.

This written consent is required in order to be able to undertake works in accordance with the later designation, rather than to designate the land itself for those later works. For this reason, written consent under section 177(1)(a) has not yet been obtained. Approval from these requiring authorities will be obtained by the NZTA at the same time as outline plans are submitted to the relevant territorial authorities, once the detailed design phase of the Project has been completed. This requirement does not apply to PCC as none of the land proposed to be designated for the PCC Project is subject to existing designations.

3.7 Project designations to be reviewed after construction

Once the Project has been constructed and is operational, the area of land required for the on-going operation and maintenance of the Project is likely to reduce (i.e. some of the designated land will be surplus to requirements as it will only be required for the construction of the Project).

It is intended that once construction has been completed, the NZTA and PCC will review their designations and determine whether or not to uplift any part(s) of the designation(s) on the grounds that they are no longer required. Review of the Project designations is included as a proposed condition of the designations.

3.8 Applications for resource consent

Applications by the NZTA and PCC for resource consents are being lodged under section 145(1)(a) and in accordance with section 88 (section 145(5)).

Under section 88(2):

> "*An application must -*
>
> *(a) be made in the prescribed form and manner; and*
>
> *(b) include, in accordance with Schedule 4, an assessment of environmental effects in such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.*"

The prescribed form for an application for resource consent is set out in Form 9 of the Resource Management (Forms, Fees, and Procedure) Regulations 2003. The forms (Volume 2) have been prepared in accordance with these regulations.

The matters that should be included in an assessment of effects on the environment are set out in clause 1 of Schedule 4 of the RMA:

> *"Subject to the provisions of any policy statement or plan, an assessment of effects on the environment for the purposes of section 88 should include -*
>
> > *(a) a description of the proposal:*
> >
> > *(b) where it is likely that an activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity:*
> >
> > *(c) [Repealed]*
> >
> > *(d) an assessment of the actual or potential effect on the environment of the proposed activity:*
> >
> > *(e) where the activity includes the use of hazardous substances and installations, an assessment of any risks to the environment which are likely to arise from such use:*
> >
> > *(f) where the activity includes the discharge of any contaminant, a description of -*
> >
> > > *(i) the nature of the discharge and the sensitivity of the proposed receiving environment to adverse effects; and*
> > >
> > > *(ii) any possible alternative methods of discharge, including discharge into any other receiving environment:*
> >
> > *(g) a description of the mitigation measures (safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect:*
> >
> > *(h) identification of the persons affected by the proposal, the consultation undertaken, if any, and any response to the views of any person consulted:*
> >
> > *(i) where the scale or significance of the activity's effect are such that monitoring is required, a description of how, once the proposal is approved, effects will be monitored and by whom."*

Furthermore, clause 1AA of Schedule 4 directs that:

> *"To avoid doubt, clause 1(h) obliges an applicant to report as to the persons identified as being affected by the proposal, but does not -*
>
> > *(a) oblige the applicant to consult with any person; or*
> >
> > *(b) create any ground for expecting that the applicant will consult with any person."*

Clause 2 of Schedule 4 provides direction on further matters that should be considered when preparing an assessment of effects on the environment:

> *"Subject to the provisions of any policy statement or plan, any person preparing an assessment of the effects on the environment should consider the following matters:*
>
> > *(a) any effect on those in the neighbourhood and, where relevant, the wider community including any socio-economic and cultural effects:*
> >
> > *(b) any physical effect on the locality, including any landscape and visual effects:*
> >
> > *(c) any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity:*
> >
> > *(d) any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural, or other special value for present or future generations:*
> >
> > *(e) any discharge of contaminants into the environment, including any unreasonable emission of noise and options for the treatment and disposal of contaminants:*
> >
> > *(f) any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances or hazardous installations."*

The assessment of environmental effects process (as documented in this report) has been undertaken in accordance with Schedule 4. It also fulfils the requirements of the assessment of effects on the environment required in support of the NoRs[42].

3.9 Activities requiring resource consent

The Project involves activities which require resource consents under Wellington regional plans. The NZTA is applying for resource consents for the construction and operation of the Main Alignment and the Kenepuru Link Road. PCC is applying for resource consents required under Wellington regional plans for the construction and operation of the Porirua Link Roads.

Relevant activities that are restricted under the RMA are as follows.

3.9.1 Land use consents

Section 9 imposes restrictions of the use of land. Under section 9(2):

> *"No person may use land in a manner that contravenes a regional rule unless the use -*

42. An NoR must include details of the effects that the project will have on the environment and the ways in which any adverse effects will be mitigated (Form 18 of the Resource Management (Forms, Fees, and Procedure) Regulations 2003. The effects are then assessed by the Board under section 171(1) of the RMA.

(a) is expressly allowed by a resource consent"

Activities requiring resource consent (land use consent) under a regional rule in relation to the use of land are:

- earthworks (soil disturbance and associated vegetation clearance).

Section 9(3) also imposes restriction on the use of land in relation to rules in district plans. Under Section 176(1)(a), however:

"section 9(3) does not apply to a public work or project or work undertaken by a requiring authority under the designation".

Section 13 imposes restrictions on certain uses of beds of lakes and rivers. Under section 13(1):

"No person may, in relation to the bed of any lake or river, -

(a) use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed; or

(b) excavate, drill, tunnel, or otherwise disturb the bed; or

(c) introduce or plant any plant or any part of any plant (whether exotic or indigenous) in, on, or under the bed; or

(d) deposit any substance in, on, or under the bed; or

(e) reclaim or drain the bed -

unless expressly allowed by a national environmental standard, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent."

Activities requiring resource consent (land use consent) in relation to the use of beds of rivers are:

- the disturbance of river beds;
- the placement of structures in river beds; and
- the reclamation of river beds.

3.9.2 Water permits

Section 14 imposes restriction in relation to water. Under section 14(2):

"No person may take, use, dam, or divert any of the following, unless the taking, using, damming, or diverting is allowed by subsection (3):

(a) water other than open coastal water; or"

Under subsection (3):

> *"A person is not prohibited by subsection (2) from taking, using, damming, or diverting any water, heat, or energy if -*
>
> > *(a) the taking, using, damming, or diverting is expressly allowed by a national environmental standard, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent; or…"*

Activities requiring resource consent (water permit) in relation to water are:

- the diversion of water (surface water).

3.9.3 Discharge permits

Section 15 places restrictions on the discharge of contaminants. Contaminant is defined in section 2 as:

> *"any substance (including gases, odorous compounds, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat -*
>
> > *(a) when discharged into water, changes or is likely to change the physical, chemical, or biological condition of water; or*
> >
> > *(b) when discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged."*

Under section 15(1):

> *"No person may discharge any -*
>
> > *(a) contaminant or water into water; or*
> >
> > *(b) contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or*
> >
> > *(c) contaminant from any industrial or trade premises into air; or*
> >
> > *(d) contaminant from any industrial or trade premises onto or into land -*
>
> *unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent."*

Under section 15(2):

> *"No person may discharge a contaminant into the air, or into or onto land, from a place or any other source, whether moveable or not, in a manner that contravenes a national environmental standard unless the discharge -*
>
> > *(a) is expressly allowed by other regulations; or*
> >
> > *(b) is expressly allowed by a resource consent; or".*

Under section 15(2A):

> *"No person may discharge a contaminant into the air, or into or onto land, from a place or any other source, whether moveable or not, in a manner that contravenes a regional rule unless the discharge -*
>
> > *(a) is expressly allowed by a national environmental standard or other regulations; or*
> >
> > *(b) is expressly allowed by a resource consent; or…".*

Activities requiring resource consent (discharge permit) in relation to the discharge of contaminants are:

- the discharge of chemically treated sediment laden water from erosion and sediment control devices to land and to water during construction; and
- the discharge of contaminants to air and to land from concrete batching.

3.10 Resource consents sought for the Project

The NZTA and PCC are applying for resource consents for their respective components of the Project:

- the NZTA is applying for 16 resource consents under Wellington regional plans for the NZTA Project; and
- PCC is applying for four (4) resource consents under Wellington regional plans for the PCC Project.

The approach to consenting has been to group activities on the basis of how they are likely to be undertaken and, consequently, how the potential environmental effects associated with them will be managed.

As such, the NZTA and PCC are applying for resource consents for the following broad groups of activities for their respective projects:

- bulk earthworks;
- the discharge of chemically treated sediment laden water from construction;
- stream crossings (the placement of structures in stream);

- stream realignment (diversions and reclamations) (NZTA Project only); and
- discharge from the concrete batching plant (NZTA Project only).

For activities in and around streams, a catchment-based approach to the grouping of applications has been used. This is appropriate because:

- the assessment of effects of works in streams has been undertaken on a catchment basis;
- the management of effects of works in streams will be undertaken on a catchment basis; and
- the activity status differs between some catchments.

On this basis, activities have been grouped as set out in Table 3.2. This table also lists what forms the NZTA and PCC have completed (in addition to GWRC Form 1). Some forms (such as those relating to culverts and bridges) relate to multiple resource consent applications. The application forms are contained in Volume 2.

Table 3.2: Groups of activities resource consent is being sought for

Group	General activity	Application ref #	Relevant GWRC form(s)
Resource consents sought by the NZTA for the construction and operation of the Main Alignment and the Kenepuru Link Road			
A	Bulk earthworks and construction erosion and sediment control	RC 1 – RC 3	6E (Soil disturbance) 3A (Discharge to land) 4A (Discharge to water)
B	Crossing, occupation and realignment of streams	RC 4 – RC 14	6A (Works in the bed of stream) 6C (Bridges) 6D (Culverts) 2A (Diversion of water)
C	Concrete batching	RC 15 – RC 16	5A (Discharge to air) 3A (Discharge to land)
Resource consents sought by PCC for the construction and operation of the Porirua Link Roads			
D	Bulk earthworks and construction erosion and sediment control	RC 17 – RC 19	6E (Soil disturbance) 3A (Discharge to land) 4A (Discharge to water)
E	Occupation of Duck Creek and its tributaries	RC 20	6A (Works in the bed of stream) 6C (Bridges) 6D (Culverts)

The specific resource consents which the NZTA and PCC are seeking for the Project are listed in Table 3.3.

Table 3.3: Resource consents sought for the Project

Application ref #	Consent type	Activity	Regional rule	Activity class	Scope of the application
GROUP A: Bulk earthworks and construction erosion and sediment control					
RC 1	Land use consent – s9(2)	Roading and tracking in Area 2 of the RSP having a continuous length of new upslope batter extending for greater than 200 metres, with a height of greater than 2 metres measured vertically.	RSP Rule 1	Restricted discretionary	Application for bulk earthworks and vegetation disturbance activities (including plantation forestry) for the construction of the Main Alignment and the Kenepuru Link Road (and associated access tracks and fill sites) as a **restricted discretionary activity**.
	Land use consent – s9(2)	Large scale vegetation disturbance on erosion prone land.	RSP Rule 4	Restricted discretionary	
RC 2	Discharge permit – s15(1)(b)	Discharge of chemically treated sediment laden water to land that may enter water.	RDLP Rule 2	Discretionary	Application for the discharge of chemically treated sediment laden water from erosion and sediment control devices to land in such a way that it may enter water as a **discretionary activity**.
RC 3	Discharge permit – s15(1)(a)	Discharge of chemically treated sediment laden water to water.	RFWP Rule 5	Discretionary	Application for the discharge of chemically treated sediment laden water from erosion and sediment control devices to water as a **discretionary activity**.
GROUP B: Crossing, occupation and realignment of streams					
RC 4	Land use consent - s13(1)(a)	Use, placement and erection of structures in the bed of Wainui Stream and its tributaries for the purposes of a river crossing (pipe culverts and associated erosion protection control structures and stormwater outlet structures listed in **Schedule A**).	RFWP Rule 49	Discretionary	Application for the placement of structures in Wainui Stream and its tributaries and the realignment of part of the river bed in this catchment as a **discretionary activity**.
	Land use consent - s13(1)(e)	Realignment of approximately 91m of Wainui Stream and its tributaries (reclamation and diversion).	RFWP Rule 49	Discretionary	
	Water permit - s14(1)		RFWP Rule 16	Discretionary	

<table>
<tr><th>Application ref #</th><th>Consent type</th><th>Activity</th><th>Regional rule</th><th>Activity class</th><th>Scope of the application</th></tr>
<tr><td rowspan="3">RC 5</td><td>Land use consent - s13(1)(a)</td><td>Use, placement and erection of structures in the bed of Te Puka Stream and its tributaries for the purposes of a river crossing (pipe culverts, bridges and associated erosion protection control structures and stormwater outlet structures listed in Schedule A (culverts) and Schedule B (bridges).</td><td>RFWP Rule 49</td><td>Discretionary</td><td rowspan="3">Application for the placement of structures in Te Puka Stream and its tributaries and the diversion and reclamation of part of the river bed in this catchment as a discretionary activity.</td></tr>
<tr><td>Land use consent - s13(1)(e)</td><td rowspan="2">Realignment of approximately 1,867m of Te Puka Stream and its tributaries (reclamation and diversion).</td><td>RFWP Rule 49</td><td>Discretionary</td></tr>
<tr><td>Water permit - s14(1)</td><td>RFWP Rule 16</td><td>Discretionary</td></tr>
<tr><td rowspan="3">RC 6</td><td>Land use consent - s13(1)(a)</td><td>Structures in the bed of Horokiri Stream and its tributaries for the purposes of a river crossing (pipe culverts, bridges and associated erosion protection control structures and stormwater outlet structures listed in Schedule A (culverts) and Schedule B (bridges).</td><td>RFWP Rule 49</td><td>Discretionary</td><td rowspan="3">Application for the placement of structures in the Horokiri Stream and it tributaries and the associated diversion and reclamation of part of the river bed in this catchment as a non- complying activity.</td></tr>
<tr><td>Land use consent - s13(1)(e)</td><td rowspan="2">Realignment of approximately 1,013m of Horokiri Stream and its tributaries (reclamation and diversion).</td><td>RFWP Rule 50</td><td>Non-complying</td></tr>
<tr><td>Water permit - s14(1)</td><td>RFWP Rule 16</td><td>Discretionary</td></tr>
<tr><td>RC 7</td><td>Land use consent - s13(1)(a)</td><td>Structures in the bed of Ration Stream and its tributaries for the purposes of a river crossing (pipe culverts, bridges and associated erosion protection control structures and stormwater outlet structures listed in Schedule A (culverts) and Schedule B (bridges).</td><td>RFWP Rule 49</td><td>Discretionary</td><td>Application for the placement of structures in Ration Stream and its tributaries and the associated diversion and reclamation of part of the river bed in this catchment as a non- complying activity.</td></tr>
</table>

Application ref #	Consent type	Activity	Regional rule	Activity class	Scope of the application
	Land use consent - s13(1)(e)	Realignment of approximately 896m of Ration Stream and its tributaries (reclamation and diversion).	RFWP Rule 50	Non-complying	
	Water permit - s14(1)		RFWP Rule 16	Discretionary	
RC 8	Land use consent - s13(1)(a)	Structure in the bed of Collins Stream and its tributaries for the purposes of a river crossing (pipe culverts and associated erosion protection control structures and stormwater outlet structures listed in **Schedule A** (culverts).	RFWP Rule 49	Discretionary	Application for the placement of a structure in Collins Stream as a **discretionary activity**.
RC 9	Land use consent - s13(1)(a)	Structures in the bed of Pauatahanui Stream and its tributaries for the purposes of a river crossing (pipe culverts, bridges and associated erosion protection control structures and stormwater outlet structures listed in **Schedule A** (culverts) and **Schedule B** (bridges).	RFWP Rule 49	Discretionary	Application for the placement of structures in Pauatahanui Stream and its tributaries and the associated diversion and reclamation of part of the river bed in this catchment as a **non- complying activity**.
	Land use consent - s13(1)(e)	Realignment of approximately 1,829m of Pauatahanui Stream and its tributaries (reclamation and diversion).	RFWP Rule 50	Non-complying	
	Water permit - s14(1)		RFWP Rule 16	Discretionary	
RC 10	Land use consent - s13(1)(a)	Structures in the bed of Duck Creek and its tributaries for the purposes of a river crossing (pipe culverts, bridges and associated erosion protection control structures and stormwater outlet structures listed in **Schedule A** (culverts) and **Schedule B** (bridges).	RFWP Rule 49	Discretionary	Application for the placement of structures in Duck Creek and its tributaries and the associated diversion and reclamation of part of the river bed in this catchment as a **discretionary activity**.
	Land use consent - s13(1)(e)	Realignment of approximately 221m of Duck Creek and its tributaries (reclamation and diversion).	RFWP Rule 49	Discretionary	

Application ref #	Consent type	Activity	Regional rule	Activity class	Scope of the application
	Water permit - s14(1)		RFWP Rule 16	Discretionary	
RC 11	Land use consent - s13(1)(a)	Structures in the bed of Kenepuru Stream and its tributaries for the purposes of a river crossing (pipe culverts, bridges and associated erosion protection control structures and stormwater outlet structures listed in **Schedule A** (culverts) and **Schedule B** (bridges).	RFWP Rule 49	Discretionary	Application for the placement of structures in Kenepuru Stream and its tributaries and the associated diversion and reclamation of part of the river bed in this catchment as a **discretionary activity**.
	Land use consent - s13(1)(e)	Realignment of approximately 169m of Kenepuru Stream and its tributaries (reclamation and diversion).	RFWP Rule 49	Discretionary	
	Water permit - s14(1)	Installation of approximately 870m of subsoil drains in Kenepuru Stream and its tributaries (as reclamation).	RFWP Rule 16	Discretionary	
RC 12	Land use consent - s13(1)(a)	Structures in the bed of Porirua Stream and its tributaries for the purposes of a river crossing (pipe culverts, bridges and associated erosion protection control structures and stormwater outlet structures listed in **Schedule A** (culverts) and **Schedule B** (bridges).	RFWP Rule 49	Discretionary	Application for the placement of structures in Porirua Stream and its tributaries and the associated diversion and reclamation of part of the river bed in this catchment as a **discretionary activity**.
	Land use consent - s13(1)(e)	Realignment of approximately 474m of Porirua Stream and its tributaries (reclamation and diversion).	RFWP Rule 49	Discretionary	
	Water permit - s14(1)		RFWP Rule 16	Discretionary	
RC 13	Land use consent - s13(1)(a)	Use, placement and erection of structures (8 pipe culverts listed in **Schedule A** and associated erosion protection control structures and stormwater outlet structures) in the bed of Duck Creek for the purposes of a river crossing.	RFWP Rule 49	Discretionary	Application for the replacement of eight (8) existing perched culverts in Duck Creek with culverts providing fish passage as a **discretionary activity**.

Application ref #	Consent type	Activity	Regional rule	Activity class	Scope of the application
RC 14	Land use consent - s13(1)(a)	Use, placement and erection of structures (temporary culverts, listed in **Schedule C**) in the bed of streams (and their tributaries) for the purposes of a river crossing.	RFWP Rule 49	Discretionary	Application for temporary stream crossings in streams required for temporary construction access tracks for the construction of the Main Alignment and the Kenepuru Link Road as a **discretionary activity**.
GROUP C: Concrete batching					
RC 15	Discharge permit – s15(1)(c)	Discharge of contaminants to air from concrete batching activities.	RAQMP Rule 23	Discretionary	Application for the discharge of contaminants to air from an industrial or trade premises as a **discretionary activity**.
RC 16	Discharge permit – s15(1)(b)	Discharge of contaminants in stormwater to water from concrete batching activities.	RDLP Rule 2	Discretionary	Application for the discharge of contaminants in stormwater to land from an industrial or trade premises as a **discretionary activity**.
GROUP D: Bulk earthworks and erosion and sediment control (Porirua Link Roads)					
RC 17	Land use consent – s9(2)	Roading and tracking in Area 2 of the RSP having a continuous length of new upslope batter extending for greater than 200 metres, with a height of greater than 2 metres measured vertically.	RSP Rule 1	Restricted discretionary	Application for bulk earthworks and vegetation disturbance activities for the construction of the Porirua Link Roads as a **restricted discretionary activity**.
	Land use consent – s9(2)	Large scale vegetation disturbance on erosion prone land.	RSP Rule 4	Restricted discretionary	
RC 18	Discharge permit – s15(1)(b)	Discharge of chemically treated sediment laden water to land that may enter water.	RDLP Rule 2	Discretionary	Application for the discharge of chemically treated sediment laden water from erosion and sediment control devices to land in such a way that it may enter water as a **discretionary activity**.
RC 19	Discharge permit – s15(1)(a)	Discharge of chemically treated sediment laden water to water.	RFWP Rule 5	Discretionary	Application for the discharge of chemically treated sediment laden water from erosion and sediment control devices to water as a **discretionary activity**.

Application ref #	Consent type	Activity	Regional rule	Activity class	Scope of the application
GROUP E: Occupation of Duck Creek and its tributaries (Porirua Link Roads)					
RC 20	Land use consent - s13(1)(a)	Structures in the bed of Duck Creek and its tributaries for the purposes of a river crossing (pipe culverts, bridges and associated erosion protection control structures and stormwater outlet structures listed in **Schedule A** (culverts) and **Schedule B** (bridges).	RFWP Rule 49	Discretionary	Application for the placement of structures in Duck Creek as a **discretionary activity**.

3.11 Consideration of applications for resource consent

If the Project is directed to a BoI, the BoI will consider the applications under sections 149P(1) and (2). Section 149P(2) provides that a BoI considering an application for resource consent must apply sections 104 to 112 and 138A as if it were a consent authority.

As set out in Table 3.2, the activities for which resource consents are sought fall into a variety of differing activity classes, ranging from controlled activities to non-complying activities. All applications must be considered under section 104 of the RMA but there are also additional considerations specific to certain classes of activity (Section 149P(2)).

Under section 104:

> *"(1) When considering an application for a resource consent and any submissions received, the consent authority must, subject to Part 2, have regard to -*
>
> > *(a) any actual and potential effects on the environment of allowing the activity; and*
> >
> > *(b) any relevant provisions of -*
> >
> > > *(i) a national environmental standard:*
> > >
> > > *(ii) other regulations:*
> > >
> > > *(iii) a national policy statement:*
> > >
> > > *(iv) a New Zealand coastal policy statement:*
> > >
> > > *(v) a regional policy statement or proposed regional policy statement:*
> > >
> > > *(vi) a plan or proposed plan; and*
> >
> > *(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.*
>
> *(2) When forming an opinion for the purposes of subsection (1)(a), a consent authority may disregard an adverse effect of the activity on the environment if a national environmental standard or the plan permits an activity with that effect."*

In addition to consideration under section 104, there are further considerations for particular classes of activities:

- discretionary and non-complying activities, under section 104B;
- restricted discretionary activities, under section 104C;
- non-complying activities, under section 104D; and

- discharge permits, under section 105 and section 107.

3.11.1 Discretionary and non- complying activities

Under section 104B:

"After considering an application for a resource consent for a discretionary activity or non-complying activity, a consent authority -

(a) may grant or refuse the application; and

(b) if it grants the application, may impose conditions under section 108."

3.11.2 Restricted discretionary activities

Under section 104C there are particular restrictions for restricted discretionary activities:

"(1) When considering an application for a resource consent for a restricted discretionary activity, a consent authority must consider only those matters over which -

(a) a discretion is restricted in national environmental standards or other regulations:

(b) it has restricted the exercise of its discretion in its plan or proposed plan.

(2) The consent authority may grant or refuse the application.

(3) However, if it grants the application, the consent authority may impose conditions under section 108 only for those matters over which -

(a) a discretion is restricted in national environmental standards or other regulations:

(b) it has restricted the exercise of its discretion in its plan or proposed plan."

3.11.3 Non- complying activities

Under section 104D there are particular restrictions for non-complying activities:

"(1) Despite any decision made for the purpose of section 95A(2)(a) in relation to adverse effects, a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either -

(a) the adverse effects of the activity on the environment (other than any effect to which section 104(3)(a)(ii) applies) will be minor; or

(b) the application is for an activity that will not be contrary to the objectives and policies of -

(i) the relevant plan, if there is a plan but no proposed plan in respect of the activity; or

(ii) the relevant proposed plan, if there is a proposed plan but no relevant plan in respect of the activity; or

(iii) both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity."

3.11.4 Discharge permits

Section 105 sets out further matters which are specifically relevant to discharge permits:

"(1) If an application is for a discharge permit or coastal permit to do something that would contravene section 15 or section 15B, the consent authority must, in addition to the matters in section 104(1), have regard to -

(a) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and

(b) the applicant's reasons for the proposed choice; and

(c) any possible alternative methods of discharge, including discharge into any other receiving environment."

Furthermore, under section 107:

"(1) Except as provided in subsection (2), a consent authority shall not grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 or section 15A allowing -

(a) the discharge of a contaminant or water into water; or

(b) a discharge of a contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or

(ba) the dumping in the coastal marine area from any ship, aircraft, or offshore installation of any waste or other matter that is a contaminant, -

if, after reasonable mixing, the contaminant or water discharged (either by itself or in combination with the same, similar, or other contaminants or water), is likely to give rise to all or any of the following effects in the receiving waters:

(c) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials:

(d) any conspicuous change in the colour or visual clarity:

(e) any emission of objectionable odour:

(f) the rendering of fresh water unsuitable for consumption by farm animals:

(g) any significant adverse effects on aquatic life.

(2) A consent authority may grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 or section 15A that may allow any of the effects described in subsection (1) if it is satisfied -

(a) that exceptional circumstances justify the granting of the permit; or

(b) that the discharge is of a temporary nature; or

(c) that the discharge is associated with necessary maintenance work -

and that it is consistent with the purpose of this Act to do so."

4. Statutory considerations

Overview

Consideration of the NoRs and applications for resource consent must have regard to various matters, principally the relevant provisions of national, regional and district level planning documents. In addition, there are a range of 'other matters' that may be considered. The RMA does not define what 'other matters' are to be considered under these sections, however, it is accepted that these can include matters outside the RMA, including non-statutory processes.

No assessment of these matters is provided in this section. This chapter provides a brief description of the main statutory considerations of relevance to the Project. The assessment of each of these considerations is provided is presented in Part I of this report.

4.1 Introduction

When considering the NoRs (under section 171) and the applications for resource consent (under section 104), the BoI must have regard to various matters.

Section 171 requires the consideration of any relevant provisions of:

- a national policy statement;
- a New Zealand coastal policy statement;
- a regional policy statement or proposed regional policy statement;
- a plan or proposed plan; and
- any other relevant matters.

Section 104 requires the consideration of all of the same matters, as well as any relevant provisions of:

- national environmental standards; and
- other regulations.

This chapter provides a brief description of the main documents of relevance to the Project for each of these matters is provided. No assessment of these matters is provided in this chapter. The assessment is provided in Part I of this report. The full wording of the relevant provisions is contained in **Technical Report 21**.

4.2 National policy statements

The purpose of a national policy statement (NPS) (other than the New Zealand Coastal Policy Statement) is to state objectives and policies for matters of national significance that are relevant to achieving the purpose of the RMA (section 45(1)). There are two relevant operative NPSs made pursuant to this section:

- the National Policy Statement for Freshwater Management (NPS FM); and
- the National Policy Statement on Electricity Transmission (NPS ET).

The only other relevant NPS is the New Zealand Coastal Policy Statement 2010 (NZCPS). The purpose of the NZCPS is to state policies in order to achieve the purpose of the RMA in relation to the coastal environment of New Zealand (section 56).

4.2.1 National Policy Statement for Freshwater Management 2011

The NPS FM came into effect on 1 July 2011.

It contains five groups of objectives and policies:

- water quality (A);
- water quantity (B);
- integrated management (C);
- tangata whenua roles and interests (D); and
- progressive implementation programme (E).

An assessment of the Project in relation to the NPS FM is provided in Section 32.2 of this report.

4.2.2 National Policy Statement on Electricity Transmission 2008

The NPS ET came into effect on 10 April 2008.

The objective of the NPS ET is:

> *"[t]o recognise the national significance of the electricity transmission network by facilitating the operation, maintenance and upgrade of the existing transmission network and the establishment of new transmission resources to meet the needs of present and future generations, while:*
>
> · *managing the adverse environmental effects of the network; and*
>
> · *managing the adverse effects of other activities on the network."*

The effects of the Project on the electricity transmission network will need to be considered and managed.

An assessment of the Project in relation to the NPS ET is provided in Section 32.3 of this report.

4.3 New Zealand Coastal Policy Statement 2010

The NZCPS came into effect on 3 December 2010 and contains objectives and policies relating to New Zealand's coastal environment. Although the Project does not involve any activities in the coastal marine area (CMA), some of the activities involved in the Project do have the potential to cause effects on the coastal environment.

The relevant objectives of the NZCPS are in relation to safeguarding and preserving the natural character of the coastal environment, whilst taking into account the principles of the Treaty of Waitangi and maintaining public open space opportunities in the coastal environment.

Policies in relation to the following matters are considered to be relevant:

- the extent and characteristics of the coastal environment (Policy 1);
- the Treaty of Waitangi, tangata whenua and Maori heritage (Policy 2);
- integration (Policy 4);
- the activities in the coastal environment (Policy 6)
- indigenous biological diversity (Policy 11);
- preservation of natural character (Policy 13);
- the restoration of natural character (Policy 14);
- enhancement of water quality (Policy 21);
- sedimentation (Policy 22); and
- discharge of contaminants (Policy 23).

An assessment of the Project in relation to the NZCPS is provided in Section 32.4 of this report.

4.4 Regional policy statements and proposed regional policy statements

Relevant to the Project are:

- the operative Regional Policy Statement for the Wellington Region 1995; and
- the proposed Regional Policy Statement for the Wellington Region.

4.4.1 Wellington Regional Policy Statement 1995

The operative Regional Policy Statement for the Wellington Region (RPS) became operative on 15 May 1995.

The RPS identifies the regionally significant issues around the management of the region's natural and physical resources and sets out what needs to be achieved (objectives) and the way in which objectives will be achieved (policies and methods).

Relevant chapters of the RPS are:

- the iwi environmental management system (Chapter 4);
- freshwater (Chapter 5);
- soils and minerals (Chapter 6);
- the coastal environment (Chapter 7);
- air (Chapter 8);
- ecosystems (Chapter 9);
- landscape and heritage (Chapter 10);
- natural hazards (Chapter 11); and
- the built environment and transportation (Chapter 14).

An assessment of the Project in relation to the RPS is provided in Section 32.7 of this report

4.4.2 Proposed Wellington Regional Policy Statement

Although the operative RPS still has effect, there is also a Proposed Regional Policy Statement for the Wellington Region (PRPS). The PRPS was publically notified on 21 March 2009. Hearings were held in November 2009 and GRWC's decisions were released in May 2010. The PRPS is currently subject to appeals to the Environment Court, although none of the points of appeal are directly relevant to the Project. The NZTA has not lodged an appeal on the PRPS. PCC has lodged an appeal, but it is on a matter which is of no relevance to the Project.

Relevant resource management issues addressed in the PRPS are:

- air quality (Section 3.1);
- coastal environment (including public access) (Section 3.2);
- energy, infrastructure and waste (Section 3.3);
- fresh water (including public access) (Section 3.4);
- historic heritage (Section 3.5);
- indigenous ecosystems (Section 3.6);
- landscape (Section 3.7);
- natural hazards (Section 3.8);
- regional form, design and function (Section 3.9);
- resource management with tangata whenua (Section 3.10); and
- soils and minerals (Section 3.11).

The PRPS also defines 'regionally significant infrastructure' and addresses the provision of regionally significant infrastructure in the proposed objectives. The strategic transport network, which includes the State highway network, is included in the definition of 'regionally significant infrastructure'.

An assessment of the Project in relation to the PRPS is provided in Section 32.6 of this report.

4.5 Regional plans

There are five regional plans that are relevant to the Project. These are:

- Regional Freshwater Plan for the Wellington Region 1999;
- Regional Air Quality Management Plan for the Wellington Region 2000;
- Regional Coastal Plan for the Wellington Region 2000;
- Regional Plan for Discharges to Land for the Wellington Region 1999; and
- Regional Soil Plan for the Wellington Region 2000.

4.5.1 Regional Freshwater Plan for the Wellington Region 1999

The Regional Freshwater Plan for the Wellington Region (RFP) became operative on 17 December 1999. There have been three plan changes which have been made operative since 1999. As noted in Section 1.8.4, the NZTA has lodged a request for a change to the RFP.

The RFP applies to all freshwater in the region, including water in rivers, lakes, streams, ponds, aquifers and artificial water courses, but excluding freshwater in the coastal marine area. It also applies to all land in river and lake beds. The RFP applies to all types of activities that use freshwater or that occur in the beds of rivers and lakes. Activities covered by the RFP which are relevant to the Project include:

- discharges to freshwater;
- the taking, using, damming or diverting of freshwater;
- building and modifying structures in river and lake beds;
- disturbing river and lake beds;
- reclaiming or draining river and lake beds;
- development on the flood plain; and
- flood mitigation.

An assessment of the Project in relation to the RFP is provided in Section 32.8 of this report.

4.5.2 Regional Air Quality Management Plan for the Wellington Region 2000

The Regional Air Quality Management Plan for the Wellington Region (RAQMP) became operative on 8 May 2000. There has been one plan change to the RAQMP, which was made operative in 2003.The Plan applies to discharges to air in the whole of the region, except for the CMA. The RAQMP contains objectives, policies, methods and rules related to managing the air quality impacts of the discharge of contaminants to air. This RAQMP is relevant to the application to discharge contaminants to air from the concrete batching plant.

An assessment of the Project in relation to the RAQMP is provided in Section 32.9 of this report.

4.5.3 Regional Coastal Plan for the Wellington Region 2000

The Regional Coastal Plan for the Wellington Region (RCP) became operative on 19 June 2000. There are no proposed plan changes to the RCP currently notified. The RCP applies to the CMA of the region. The CMA is the foreshore, seabed and coastal water, and the air space above the water, between the outer limits of the territorial sea and the line of mean high water springs. The RCP also identifies areas of significant conservation value (ASCV), including the Pauatahanui Inlet ASCV which is relevant to the Project[43].

The Project does not involve any activities in the CMA and resource consents are not being sought under the RCP. However, some of the activities involved in the Project do have the potential to cause effects on the coastal environment. This relates to potential effects of the Project on streams, all of which ultimately discharge to the coastal environment. Policies in relation to the following aspects are considered to be relevant:

- general objectives and policies (Chapter 4).

An assessment of the Project in relation to the RCP is provided in Section 32.10 of this report.

4.5.4 Regional Plan for Discharges to Land for the Wellington Region 1999

The Regional Plan for Discharges to Land for the Wellington Region (RPDL) became operative on 17 December 1999. There has been one plan change to the RPDL, which was made operative in 2003.The RPDL applies to the whole of the Region, except the CMA. It aims to manage the discharge of contaminants to land, whether or not the discharge enters water, in order for the receiving environment to be sustainably managed. Provisions of relevance to the Project are:

- the discharge of chemically treated sediment laden water to land.

An assessment of the Project in relation to the RDLP is provided in Section 32.11 of this report.

4.5.5 Regional Soil Plan for the Wellington Region 2000

The Regional Soil Plan for the Wellington Region (RSP) became operative on 9 October 2000.

The Project is located entirely within Area 2 of the RSP. Area 2 of the RSP defines ‘erosion prone land’ as including “any land within Area 2… with a slope greater than 28 degrees”. Parts of the Project are on erosion prone land. The RSP identifies issues to be addressed so that the effects of soil disturbance and vegetation clearance can be sustainably managed. Objectives, policies, and methods (including rules) are set out in the RSP to address these issues. The applications for resource consent for bulk earthworks (including large scale vegetation clearance) are being made under the RSP.

An assessment of the Project in relation to the RSP is provided in Section 32.12 of this report.

43. Pauatahanui Inlet ASCV, shown in Planning Map 2B of the RCP.

4.6 District plans

The Project requires the use of land in four districts:

- Kapiti Coast District, administered under the Kapiti Coast District Plan 1999;
- Upper Hutt City, administered under the Upper Hutt City District Plan 2004;
- Porirua City, administered under the Porirua City District Plan 1999; and
- Wellington City, administered under the Wellington City District Plan 2000.

The following sections provide a high-level overview of the District Plans of relevance to the Project, including contextual information on the relevant zones, plan notations, key objectives and policies. No assessment of these plans is provided in this chapter.

4.6.1 Kapiti Coast District Plan 1999

The Kapiti Coast District Plan (KCDP) became operative on 30 July 1999.

The Project requires land in the Rural Zone of the KCDP. In addition to the underlying zoning, there are a number of other KCDP notations recorded against parts of the area proposed to be designated:

- Water Collection Area;
- Faultline;
- Ecological sites K111 (Wainui Stream Bush – DOC 711), K139 (Rowans Bush) and E17 (Tararua Ranges - DOC 281);
- Outstanding Landscape; and
- Noise Contour.

There are no proposed plan changes relevant to the Project.

The key objectives of the KCDP are to provide for a variety of lifestyles, recreational and cultural experiences and basic infrastructure, whilst protecting the natural environment and cultural heritage of the district. The KCDP also seeks to provide and maintain public utility services, and a transport system which meets high standards of environmental protection and provides for the safe and efficient movement of people and freight through the district, and between communities. The KCDP also recognises the district as a major growth centre in the region, and therefore sets an objective to continue to provide water, essential public utility systems, efficient arterial traffic links and employment opportunities for the community, whilst conserving and enhancing natural resources, valuable agricultural land, visual values and taonga (treasures, spiritual, physical) and protecting land, air and water from pollution.

The Project requires land in the Rural Zone. The rural environment as a whole comprises the bulk of the district, although less than 10% of the district’s population live in the Rural Zone. The qualities of the district’s rural environment have encouraged a diversity of activities with varying impacts on the environment. As such, the KCDP seeks to control the scale and intensity of land use activities, while recognising the character and values of the natural environment. The Rural Zone also seeks to maintain and enhance a safe and efficient main road network, protect the district's significant indigenous flora and fauna, outstanding landscapes and sites of cultural significance, and maintain, enhance and protect the district's rural landscape.

An assessment of the Project in relation to the KCDP is provided in Section 32.13.1 of this report.

4.6.2 Upper Hutt City District Plan 2004

The Upper Hutt City District Plan (UHCDP) became operative on 1 September 2004.

The Project requires land in the following UHCDP zone:

- the Rural Hill Zone.

In addition to the underlying zoning, part of the area proposed to be designated is subject to Designation WRC6 (Akatarawa and Whakatiki Water Catchment).

There are no proposed plan changes relevant to the Project.

Key objectives of the UHCDP are to recognise the different qualities and characteristics of the city's unique environments, to recognise special resource or environmental issues which exist within the city, and to ensure the establishment, operation, maintenance and upgrading of essential utilities in the city. In relation to transport, key objectives of the UHCDP include the promotion of accessibility between the city and neighbouring areas.

The Project will require a small amount of land in the Rural Hill Zone. The rural area contains much of the city's agriculture and primary productive land resources, which are an important part of the city's economic and social well-being. The area also forms the immediate backdrop to the city in terms of landscape. Areas for rural lifestyle, passive and active recreation and leisure opportunities, and other mixed urban/rural activities also form part of the character of this environment.

The Rural Hill sub-zone is the largest area within the rural environment. The sub-zone comprises the hill areas surrounding the valley floor and many open space areas which are largely undeveloped and valued for their recreation, scenic, heritage, habitat, ecological, landscape and scientific values. This includes the Tararua Forest Park, the GWRC water catchment areas, plantation forests and the Kaitoke Regional Park. These areas are used for both passive and active recreation. A key objective of this zone is the maintenance and enhancement of the open spaces, natural features and ecological systems which comprise its rural character and amenity.

An assessment of the Project in relation to the UHCDP is provided in Section 32.13.2 of this report.

4.6.3 Porirua City District Plan 1999

The Porirua City District Plan (PCDP) became operative on 1 November 1999.

The Project requires land in the following PCDP zones:

- the Industrial Zone;
- the Suburban Zone;
- the Rural Zone;
- the Judgeford Hills Zone;
- the Recreation Zone; and
- the Public Open Space Zone.

In addition to the underlying zoning, there are a number of other PCDP notations recorded against the area proposed to be designated:

- the Whitby Landscape Protection Area;
- Designation K0101 (North Island Main Truck railway line); and
- Designation K0703 (Battle Hill Regional Park).

There are no proposed plan changes relevant to the Project.

The PCDP identifies eight areas within the city for which resource management issues are clearly differentiated. The key objectives for the eight zones include ensuring an environment which is healthy, attractive and safe, and recognising the importance of the city centre as a built resource and the need for it to continue to develop to meet changing needs and demands of the population. The PCDP also seeks to create suburban environments which are attractive places to live, and rural areas where there is a balance between rural activities and the natural environment. The objectives of the zones relevant to the Project are summarised below.

The industrial areas of Porirua are modern, purpose built industrial subdivisions. They are well defined geographically and well serviced. These areas represent both a significant investment in infrastructure and a significant resource where existing and future industrial development can locate. The key objective of the Industrial Zone is to promote the sustainable management of the city's industrial resource, by encouraging the establishment of a wide range of activities, and supporting industry and industrial growth into the future.

The suburban areas of Porirua are diverse, ranging from the redeveloped holiday homes in Plimmerton, to the large areas of state built housing in Cannons Creek and Waitangirua, and the extensive privately planned Whitby development. This diversity has led to the establishment of a set of standards to protect neighbourhood amenity and overall residential character throughout the suburban zones of the city. The key objectives of the Suburban Zone are to encourage suburban activities on land most suitable for that purpose and to create attractive, healthy and safe places to live, which protect and enhance the amenity and character of the residential resource, suburban shopping centres, and open spaces. The Suburban

Zone also seeks to enable the creation of a range of residential development types and densities to reflect the diversity of needs and housing choices in the community.

The PCDP identifies that Porirua's rural area is a significant resource of outstanding character and beauty. In particular, Pauatahanui Inlet and the surrounding rural land, is of considerable scenic, ecological and recreational value. The principal activity in the Rural Zone is pastoral farming. The objectives and policies of the PCDP recognise the need for the Rural Zone to continue as a working rural landscape, and for a wide variety of farm related activities to be allowed in order to maximise both the present viability and future potential of the area. The PCDP seeks to allow rural activities while ensuring the rural area remains a sustainable resource for present and future generations. The PCDP also recognises that one of the most significant resource management issues facing the Rural Zone, and the Pauatahanui / Judgeford area in particular, is the Transmission Gully Project, and that the PCDP may need to react to this by way of policies and potential plan changes.

The Whitby Landscape Protection Area is an area of land that has been identified as having significant landscape qualities, which are important elements in defining the landscape character of Whitby and Porirua City. Duck Creek is an important feature in terms of ecology and landscape values, and contributes significantly to Whitby's open space network. Resolution Ridge at the eastern end of Whitby is a major ridgeline feature with a central summit. This ridge provides a landscape connection between the Belmont area and the Pauatahanui Inlet and provides a logical landscape delineation of the eastern extent of urban Whitby.

The Judgeford Hills Zone was the result of a private plan change request and it is intended to provide the opportunity for development of the land within the zone whilst maintaining and enhancing its natural and physical characteristics. The key objectives of the zone are to provide for continuing primary production activity in appropriate areas within the zone, in order to maintain the rural character and rural amenity by limiting the extent of built development and by providing open space areas. The eastern side of the Judgeford Hills Zone adjoins one of the existing designations for the Project. As a consequence, the plan provisions for the zone also require the consideration of the effects of the Project on the landscape and natural character of the land within the zone, as well as seeking to limit any future new or upgraded vehicle access within the zone to or from the new State highway.

The provision and maintenance of public recreation areas and open spaces is a key issue for the city. In addition, the non-recreation and non-community activities in the Recreation and Open Space Zone include key network utilities and transport corridors. These uses form part of the existing environment, contribute to the well-being of the city and/or have regional or national significance, including the existing Transmission Gully designations. An objective of the Open space zone is that the use and development of public open spaces and recreation areas in Porirua provides for and complements the demand for recreation and community activities and contributes to the city's amenity and character.

An assessment of the Project in relation to the PCDP is provided in Section 32.13.3 of this report.

4.6.4 Wellington City District Plan 2000

The Wellington City District Plan (WCDP) became operative on 27 July 2000.

The Project requires land in the following WCDP zones:

- the Outer Residential Zone; and
- the Rural Zone.

There are no notations shown in the WCDP for this land.

There are no proposed plan changes relevant to the Project.

The key objectives of the WCDP include the protection and enhancement of the natural areas of the city, as well as the encouragement of more intensive and mixed-use development within the existing urban area to achieve better use of transport, infrastructure and energy. The WCDP also aims to reduce the risks associated with natural and technological hazards, and to manage environmental effects, whilst providing for necessary public works and infrastructure.

The Project includes land in the Outer Residential Zone, which is generally characterised by the WCDP as the suburbs from the inner town belt to the boundary of the Rural Area. Houses are of varying character and are located on larger sections, and most non-residential activities in this zone directly service local residents. The objectives of this zone include the encouragement of subdivision and development of existing sites (infill subdivision or development) to maintain the general character and amenity of such areas, and the encouragement of a greater mix of uses within residential areas, whilst protecting and enhancing character areas and the quality of subdivision design and development.

The Project also includes land in the Rural Zone. This zone represents about 65% of the city's total land area, although only a small proportion of the local population lives there. It extends from the outer boundaries of the city's urban areas to the coast and, in the north, to the boundaries of Hutt City and Porirua City. The generally rugged landscape comprises steep ridges and deep gullies, and contains many sites of importance to Maori. Most of the land is used for pastoral farming, and settlements are small and scattered. However, the increasing demand for rural lifestyle blocks close to the city is creating continued pressure for subdivisions and other development. Therefore, the objectives of this zone include the encouragement of a wide range of rural activities, whilst maintaining rural amenity. This is achieved by limiting housing developments, and protecting ridgelines and hill tops from development.

An assessment of the Project in relation to the WCDP is provided in Section 32.13.4 of this report.

4.7 National environmental standards

A national environmental standard (NES) is a regulation issued under section 43 of the RMA. They generally apply nationally. The relationship between the provisions of the NES and the regional and district plan rules is explained in section 43B.

There are two NESs which are considered relevant to the Project:

- the National Environmental Standards for Air Quality 2004; and
- the National Environmental Standards for Sources of Human Drinking Water 2008.

A NES on contaminants in soil is expected to be gazetted later this year[44]. As it is not yet in effect, it is not known if it is relevant to the resource consents sought for the Project. If it is of relevance, it will be addressed in evidence.

It is also noted that there is a NES for Electricity Transmission Activities (NES ET). This NES contains regulations relating to the relocation of existing transmission lines (amongst other matters), which is one of the activities required as part of the enabling works for the Project. Applications for the relocation of the existing transmission lines and associated activities (under the NES ET) are being made separately by Transpower, as discussed in Section 1.8.1 of this report.

4.7.1 National Environmental Standards for Air Quality 2004

The National Environmental Standards for Air Quality[45] (NES AQ) are intended to protect public health and the environment of New Zealand by, among other things, setting concentration limits for criteria air pollutants. Different parts of the NES AQ came into effect between 2004 and 2006.

There are five ambient air quality standards relevant to the Project. These standards came into effect on 1 September 2005. Schedule 1 of the NES AQ sets out ambient air quality concentration limits for the following:

- carbon monoxide;
- nitrogen dioxide;
- sulphur dioxide;
- ozone; and
- fine particulate matter (PM10).

An assessment of the Project in relation to the NES AQ is provided in Section 32.14 of this report.

4.7.2 National Environmental Standards for Sources of Human Drinking Water 2008

The National Environmental Standard for Sources of Human Drinking Water[46] (NES SHDW) came into effect on 20 June 2008.

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44. http://www.mfe.govt.nz/laws/standards/contaminants-in-soil/index.html

45. Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins and Other Toxics) Regulations 2004, gazetted on 9 September 2004.

46. Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2008, gazetted on 20 December 2007.

The NES SHDW aims to reduce the risk of contamination of drinking water sources by requiring regional councils to consider the effects of certain activities on drinking water sources when granting water permits or discharge permits. Sources of drinking water have been identified in the vicinity of the Project. As the Project requires water permits and discharge permits upstream from a drinking water abstraction point (a KCDC water supply bore, discussed in Section 6.13.5), the NES SHDW needs to be considered.

An assessment of the Project in relation to the NES SHDW is provided in Section 32.14 of this report.

4.8 Other regulations

There are no other regulations (other than the NESs discussed above) that are considered relevant to the Project.

4.9 Other relevant matters

For the resource consent applications, the BoI must have regard to “any other matter the consent authority considers relevant and reasonably necessary to determine the application” (section 104). For the NoRs, a BoI must have regard to any other matter it considers reasonably necessary in order to make its decision (section 171(1)(d)).

The RMA does not define what matters are to be considered under these sections, however, it is accepted that these can include matters outside the RMA, including non-statutory processes. It is considered that there are a number of other matters that are relevant to the Project. Factors that were used to determine what other relevant matters to consider were:

- the subject and spatial relevance of the matter;
- whether the matter had been through a public process; and
- whether the outcome of the matter (e.g. plan or strategy document) was widely publically available.

Some of the matters considered relevant have already been identified (and discussed) in Chapter 6.13.5. These are:

- the Government Policy Statement on Land Transport Funding 2009/10 – 2018/19;
- the National Infrastructure Plan 2011;
- the New Zealand Transport Strategy 2008;
- the Wellington Regional Land Transport Strategy 2010 – 2040;
- the Western Corridor Plan 2006; and
- the Wellington Regional Strategy 2007.

In addition, the following matters are also considered relevant and are now discussed:

- the Porirua Development Framework 2009;
- the Porirua City Community Outcomes Action Plan 2009 – 2015;
- the Draft Porirua Transportation Strategy;
- the Kapiti Coast Sustainable Transport Strategy 2008;
- the Wellington Conservation Management Strategy 1996;
- the Greater Wellington Parks Network Plan 2011;
- the Pauatahanui Inlet Action Plan 2000
- iwi management plans.

4.9.1 Porirua Development Framework 2009

The Porirua Development Framework 2009 (PDF) is a strategic guiding document that anticipates how and where Porirua City will physically develop over time. The PDF is a non-statutory (but nevertheless useful) strategic document that forms the basis for long term management and planning of the development of Porirua City. The document was subject to a formal public consultation process and hearings, as anticipated by the LGA 2002.

The PDF incorporates a spatial plan that anticipates a future pattern of development of Porirua looking forward over a 30-year timeframe, together with a detailed action plan for strategically implementing this pattern of development. One of the key assumptions of the PDF is that the Project will be completed. In this regard, the Project presents a number of issues concerning the form and manner of future development in Porirua.

An assessment of the Project in relation to the PDF is provided in Section 32.15.7 of this report.

4.9.2 Porirua City Community Outcomes Action Plan 2009 – 2015

Section 93 of the LGA 2002 requires local authorities to produce a long-term council community plan which describes the activities of the local authority and the community outcomes of the local authority's district or region (amongst other requirements described in subsection 93(6) of the LGA). The Community Outcomes Action Plan was prepared by the PCC in conjunction with the community to work towards achieving the community outcomes which had been identified through the 2002 LGA plan process. The Action Plan identifies nine high-level community outcomes. One of these, 'Well Connected & On The Move', is of relevance to the Project.

The Action Plan identifies the Project as a clear priority for helping to meet the local community's transport needs.

An assessment of the Project in relation to the action plan is provided in Section 32.15.8 of this report.

4.9.3 Draft Porirua Transportation Strategy

The DPTS was consulted on in May 2011 and sets goals and aspirations for all types of transport in the Porirua District. The strategy is predicated on the construction of the Project with other local roading projects being developed on that basis.

An assessment of the Project in relation to the Draft Transportation Strategy is provided in Section 32.15.9 of this report.

4.9.4 Kapiti Coast Sustainable Transport Strategy

The Sustainable Transport Strategy is one of a number of Kapiti Coast District strategies that set out the long term strategic response to the Community Outcomes. It has very strong links with the Regional Land Transport Strategy and the Wellington Regional Strategy.

The Strategy sets out a framework for decisions about transport development in the wider region that will affect Kapiti in relation to the east/west corridors (the existing corridor at SH58 and the potential east/west link near Ngauranga Gorge). The draft strategy is broken into five broad 'transport focus areas', and how these will affect the Kapiti Coast community.

An assessment of the Project in relation to the Sustainable Transport Strategy is provided in Section 32.15.10 of this report.

4.9.5 Wellington Conservation Management Strategy 1996

The Wellington Conservation Management Strategy 1996 (WCMS) is a statutory document prepared under Part 3A of the Conservation Act 1987. The WCMS implements general policies and establishes objectives for the integrated management of natural (including land and species) and historic resources. It indicates what DOC intends to do and how it can respond to requests to use the natural and historic resources it manages. State highway work within any reserves or conservation areas must address any relevant conservation management strategy, as outlined in the NZTA's guidelines for State highway work within or adjacent to public conservation land[47].

An assessment of the Project in relation to the WCMS is provided in Section 32.15.11 of this report.

4.9.6 Greater Wellington Parks Network Plan 2011

The Greater Wellington Parks Network Plan (GWPNP) came into effect on 1 January 2011. It is a statutory document prepared under section 41 of the Reserves Act 1977. It combines and supersedes previous separate management plans for each of the regional parks in the region.

The GWPNP recognises the future development of the Transmission Gully Project through the Belmont and Battle Hill regional parks. The general direction of the GWPNP is to re-evaluate the management of the area of Belmont Regional Park which will be to the west of the Transmission Gully Project once it is

47. Transit NZ Environmental Plan, 2008

constructed. Regardless of the management decision for this area of the park, access to the park from Porirua (i.e. the west) is a continuing requirement.

For the Battle Hill Farm Forest Park, the GWPNP notes that the Transmission Gully Project will dissect the park and contains policies and objectives aimed at minimising this effect.

An assessment of the Project in relation to the GWPNP is provided in Section 32.15.12 of this report.

4.9.7 Pauatahanui Inlet Action Plan 2000

The Pauatahanui Inlet Action Plan (PIAP) was released in August 2000 by the Pauatahanui Inlet Action Group. The PIAP was prepared by the group with input from a number of stakeholders, including the then Transit NZ. The PIAP's vision for the Inlet involves the protection and restoration of the ecosystem and its use for recreational opportunities. The PIAP contains a set of management actions to achieve this vision. These management actions are grouped into eight themes.

Theme 5 (Roading) is relevant to the Project:

- *Issue 5.3: The construction of the Transmission Gully and/or the upgrading of the existing SH1 corridor, with a new bridge at the entrance of the Inlet are likely to have significant impacts on the Inlet.*
- *Actions 5.2 and 5.3: Ensure that the roading agencies develop and adopt a Memorandum of Understanding based on best practice which includes:*
    - *Management systems for on-going maintenance activities which identify and mitigate adverse environmental effects on the Pauatahanui Inlet; and*
    - *New applications for roading activities under the RMA must recognise that the protection of the Inlet from adverse environmental effects is a critical issue to be addressed.*

An assessment of the Project in relation to the PIAP is provided in Section 32.15.13 of this report.

4.9.8 Iwi management plans

Section 36B of the RMA provides for local authorities to make Joint Management Agreements with other public authorities, or iwi or hapu group(s), in order to perform particular functions powers or duties under the RMA. Protocols for the establishment and disestablishment of such groups are outlined in sections 36B and 36E of the RMA.

4.9.8.1 PCC and Ngati Toa

The only iwi that PCC recognises as tangata whenua within Porirua is Ngati Toa. Ngati Toa has marae at Takapuwahia and Hongoeka. The administrative office for the iwi, Te Runanga O Toa Rangatira Inc., is based at Takapuwahia marae.

PCC and Te Runanga O Toa Rangatira Inc. have both signed a joint "Charter of Understanding" with Terms of Reference which outlines their working relationship. This was established by a Treaty Partnership Group, (set up in 2002), which is a governance level group with equal membership from both parties. The role of the group is to provide governance relationship and to promote the establishment of mutually beneficial relationships between PCC and Ngati Toa, based on treaty notions of partnership and shared decision making.

The only iwi management plan pertaining to Ngati Toa that PCC holds is ‘He Huri Whakamuri Ka Titiro Whakamua’ (1996) by Te Runanga O Toa Rangatira Inc. This iwi management plan is a framework for the management of sites and places of significance to Ngati Toa within Porirua District. The management plan contains includes a comprehensive list of sites and places of Maori heritage. The Cultural Impact Assessment undertaken by Ngati Toa (**Technical Report 18**) did not identify any waahi tapu, or other sites of cultural significance, in the immediate vicinity of the proposed alignment.

5. Additional considerations

Overview

In addition to the matters requiring consideration under the RMA, there are a number of additional considerations that are relevant to the Project. Some of these are not necessarily matters to be taken into account by a BoI in making a decision on the Project, but rather they provide context for the Project and for the NZTA and PCC as the applicants.

5.1 Introduction

In addition to the matters outlined in Chapters 3 and 4, there are some further statutory considerations that are relevant to the Project. They either have relevance to a particular aspect of the Project or they provide direction on how the NZTA or PCC should operate. Some matters also have relevance in terms of section 104(1)(c) or section 171(1)(d) and this is covered in the statutory assessment contained in Part I of this report.

The NZTA's operating principles and functions are discussed in Section 5.2 and PCC's purpose and function are discussed in Section 5.3.

The rest of the chapter sets out additional considerations that are relevant to the Project:

- the acquisition of land required for the Project (Section 5.4);
- archaeological sites affected by the Project (Section 5.5);
- reserves affected by the Project (Section 5.6);
- the relocation of protected species (Section 5.7);
- the provision of fish passage in waterways affected by the Project (Section 5.8); and
- public walkways affected by the Project (Section 5.9).

As discussed in Section 1.8.5 of this report, any authorisations required under other legislation are not applied for as part of this set of documents and the requirement for additional authorisations is merely noted for completeness.

5.2 NZTA's operating principles and functions

The LTMA provides the statutory framework for New Zealand's land transport system. It is also the statute under which the NZTA operates (in conjunction with the Government Roading Powers Act 1989 (*GRPA*).

The NZTA's objective is set out in section 94 of the LTMA as being:

> *"to undertake its functions in a way that contributes to an affordable, integrated, safe, responsive, and sustainable land transport system."*

The NZTA's functions are set out in section 95. Of specific relevance to the Project is:

> *"(1)(a) to promote an affordable, integrated, safe, responsive, and sustainable land transport system:"*
>
> *…[and]*
>
> *"(1)(c) to manage the State highway system, including planning, funding, design, supervision, construction, and maintenance and operations, in accordance with this Act and the Government Roading Powers Act 1989:"*

The principles under which the NZTA must operate are set out in section 96. Of specific relevance to the Project are those in subsection (1):

> *"In meeting its objective and undertaking its functions, the Agency must -*
>
> *(a) exhibit a sense of social and environmental responsibility, which includes -*
>
> *(i) avoiding, to the extent reasonable in the circumstances, adverse effects on the environment; and…"*

5.2.1 Power to construct and operate roads

The GRPA grants the NZTA certain powers in relation to the construction, operation and maintenance of State highways (including motorways).

5.2.1.1 Motorways

Under section 71 of the GRPA the NZTA may request that the Governor-General declare that road, or land where a road will be constructed, be a motorway. Motorway status provides particular restrictions on the use of and access to a road. For example, pedestrians are not permitted to walk on motorways, and horses cannot be ridden on motorways (sections 82 to 84 of GRPA). It is proposed that the Main Alignment will be declared motorway under section 71 of the GRPA.

Section 76 imparts a responsibility on the NZTA to provide alternative access to land cut off or severed by the creation of a motorway in certain circumstances. Subsection (1) directs that:

> *"If the making of a motorway has -*
>
> *(a) cut off all access by road to any land other than Crown land; or*

(b) separated one piece of the land of any person from another piece of land of that person -

and the Agency[48] has not provided access to the land so cut off or between the pieces of land so separated, the Agency shall provide access to the land so cut off or between the pieces of land so separated -

(c) by constructing a road, access way, or service lane; or

(d) by constructing a crossing under or over the motorway between the pieces of land that have been separated."

5.2.1.2 Limited access roads

Under section 88 of the GRPA, the NZTA is also able to declare a State highway, or part of a State highway, a limited access road (LAR). The LAR provisions allow the NZTA a higher level of control over where, and the extent to which, access to a State highway can occur. It is proposed to declare the Kenepuru Link Road a LAR.

5.2.2 Managing the risk from natural hazards

The NZTA has a responsibility to proactively manage natural hazard risks to its State highway network. The Civil Defence Emergency Management Act 2002 identifies road networks (including State highways) as a lifeline utility[49]. Operators need to demonstrate they have made plans to ensure that the lifelines, such as roads, are able to function to the fullest possible extent, even though this may be at a reduced level, during and after a civil defence emergency.[50]

The Project presents an opportunity to substantially improve security of the regional and national State highway network and reduce the vulnerability of SH1 to the north of Wellington to natural hazards. This has been a major consideration in the development of the Project and is discussed in greater detail in Section 2.4.1 of this report.

5.3 PCC's purpose and functions

PCC is a territorial authority under the Local Government Act 2002 (LGA). The LGA provides a purpose and framework for local government, whilst promoting accountability to the public and sustainable development (section 3). The purpose of local government is set out in section 10 as being:

"(a) to enable democratic local decision-making and action by, and on behalf of, communities; and

48. NZ Transport Agency.

49. Clause 6, Schedule 1, Part B

50. Section 60

(b) to promote the social, economic, environmental, and cultural well-being of communities, in the present and for the future."

5.3.1 Power to construct and operate roads

Under the LGA, councils must have particular regard to the contribution that network infrastructure (which includes roads) makes to its community. The provisions for the creation of roads by councils are set out in Part 21 of the Local Government Act 1974.

5.4 Acquisition of land required for the Project

The Public Works Act 1981 (PWA) enables land to be acquired, either by agreement or by compulsion, for public works, including roads. It contains provisions for compensation for owners of land required for public works and for the disposal of land no longer required for a public work.

A notice of requirement for the designation of land and a designation of land (taking effect from the date the notice of requirement for the designation is lodged) also allows the owner of the land that is subject to the notice of requirement or designation to apply to the Environment Court for an order obliging the requiring authority to acquire all or part of the land, in particular circumstances (section 185 of the RMA).

As of August 2011, the Crown has acquired approximately 49% of the land required for the NZTA Project and PCC has acquired approximately 0.6% of the land required for the PCC Project.

5.5 Archaeological sites affected by the Project

The Historic Places Act 1993 (HPA) recognises the NZ Historic Places Trust (NZHPT)'s role in identifying, recording and protecting places of historic interest in New Zealand.

The purpose of the HPA as set out in section 4(1) is:

"to promote the identification, protection, preservation, and conservation of the historical and cultural heritage of New Zealand."

Sections 10 and 99 of the HPA provide that it is an offence to destroy, damage or modify an archaeological site without the authority of the NZTPT. Sections 11 and 12 of the HPA allow persons wishing to destroy, change or modify particular archaeological sites, or archaeological sites within a particular area, to apply for an authority to do so. As a precaution, the NZTA will apply to the NZHPT for a general authority to destroy, damage or modify unknown archaeological sites within the area to be designated for the Project.

5.6 Reserves

The Reserves Act 1977 (RA) provides for the acquisition, preservation and management of areas for their conservation values or public recreational and educational values.

Section 3(1) of the RA states that the purpose of the Act is:

> *"(a) [p]roviding, for the preservation and management for the benefit and enjoyment of the public, areas of New Zealand possessing -*
>
> > *(i) Recreational use or potential, whether active or passive; or*
> >
> > *(ii) Wildlife; or*
> >
> > *(iii) Indigenous flora or fauna; or*
> >
> > *(iv) Environmental and landscape amenity or interest; or*
> >
> > *(v) Natural, scenic, historic, cultural, archaeological, biological, geological, scientific, educational, community, or other special features or value:*
>
> *(b) Ensuring, as far as possible, the survival of all indigenous species of flora and fauna, both rare and commonplace, in their natural communities and habitats, and the preservation of representative samples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character:*
>
> *(c) Ensuring, as far as possible, the preservation of access for the public to and along the sea coast, its bays and inlets and offshore islands, lakeshores, and riverbanks, and fostering and promoting the preservation of the natural character of the coastal environment and of the margins of lakes and rivers and the protection of them from unnecessary subdivision and development."*

Under section 17(1) of the RA, the purpose of a recreation reserve is to provide areas for:

> *"the recreation and sporting activities and the physical welfare and enjoyment of the public, and for the protection of the natural environment and beauty of the countryside, with emphasis on the retention of open spaces and on outdoor recreational activities, including recreational tracks in the countryside."*

Under section 19(1) of the RA, reserves are classified as scenic reserves:

> *"(a) For the purpose of protecting and preserving in perpetuity for their intrinsic worth and for the benefit, enjoyment, and use of the public, suitable areas possessing such qualities of scenic interest, beauty, or natural features or landscape that their protection and preservation are desirable in the public interest:*
>
> *(b) For the purpose of providing, in appropriate circumstances, suitable areas which by development and the introduction of flora, whether indigenous or exotic, will become of such scenic interest or beauty that their development, protection, and preservation are desirable in the public interest."*

The Project requires land classified under the RA and land classified as regional park, as detailed in Table 5.1.

Table 5.1: Parks and reserve land required for the Project

Reserve name	Location (legal description)	Owner	Legal status
Porirua Park	100 Mungavin Avenue (Pt Lot 1 DP 28193)	Porirua City Council	Recreation reserve under the Reserves Act 1977.
Gillies Place	Gillies Place (Lot 55 DP 27640)	Porirua City Council	Scenic reserve under the Reserves Act 1977.
Battle Hill Farm Forest Park	Multiple land parcels	Greater Wellington Regional Council	Regional park under the Local Government Act 1974.
Belmont Regional Park	Multiple land parcels	Porirua City Council Wellington City Council Greater Wellington Regional Council Landcorp Farming Hutt City Council Department of Conservation (Wellington Regional Council appointed to control and manage)	Regional park under the Local Government Act 1974. Includes some recreation reserve under the Reserves Act 1977.

At MacKays Crossing, the Project will be in close proximity to the QE Park which is a regional park under the Local Government Act 1974 and a recreation reserve under the RA. The Park is owned by the Crown and is part of the DOC estate but is managed by GWRC.

Any exchange of reserve land, revocation of reserve status, or disposal of park land required for the Project, will be carried out in accordance with the requirements of the Reserve Act 1977 and Local Government Act 2002, after the designations for the Project have been confirmed.

5.7 Relocation of protected species

The Wildlife Act 1953 (WA) deals with the protection and control of wild animals and birds as well as the management of game. It provides varying levels of protection to different species.

The potential effects of the Project on these species are discussed in Chapters 21 (terrestrial ecology) and 22 (freshwater ecology) of this report. One of the proposed mitigation measures is the pre-construction translocation of species (e.g. lizards, peripatus habitat, some freshwater fish etc), which may require approval from DoC under the WA. This approval will be sought as required.

5.8 Provision of fish passage in certain waterways

The Freshwater Fisheries Regulations 1983 (FFR) are regulations made under the Fisheries Act 1983. Part 6 of the FFR relates to fish passage and applies to "*every dam or diversion structure in any natural river, stream, or water*".

Under regulation 42(1):

> *"no person shall construct any culvert or ford in any natural river, stream, or water in such a way that the passage of fish would be impeded, without the written approval of the Director-General incorporating such conditions as the Director-General thinks appropriate"*

These regulations require that the approval of the Director-General[51] be obtained for culverts where the passage of fish will be impeded. The Director-General can either:

- issue a dispensation from the requirement to provide fish passage; or
- specify that fish passage be provided and maintained.

All river crossings required for the Project, weather by ford, culvert or bridge, have been designed to ensure adequate fish passage is provided where it is necessary.

Approval from the Director-General under the FFR will be sought as required.

5.9 Public walkways affected by the Project

The Walking Access Act 2008 (WAA) contains provision relating to public walkways. The purpose of the WAA, as set out in section 3, is:

> *"(a) to provide the New Zealand public with free, certain, enduring, and practical walking access to the outdoors (including around the coast and lakes, along rivers, and to public resources) so that the public can enjoy the outdoors; and*
>
> *(b) to establish the New Zealand Walking Access Commission with responsibility for leading and supporting the negotiation, establishment, maintenance, and improvement of -*
>
> > *(i) walking access (including walkways, which are one form of walking access) over public and private land; and*
> >
> > *(ii) types of access that may be associated with walking access, such as access with firearms, dogs, bicycles, or motor vehicles."*

Under Part 3 of the WAA, land may be declared to be a walkway (section 20).

The Belmont Walkway was declared a walkway in 1999 with GWRC being the controlling authority[52]. The Belmont Walkway is affected by the Project in two locations in the vicinity of Cannons Creek and the Takapu Road Substation. The effects of the Project on the walkway are discussed in Chapter 27 of this report.

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51. The Director-General of Conservation.

52. Notified in the *Gazette* on 18 March 1999, Notice 2016, Pg. 839, under section 8(6) of the New Zealand Walkways Act 1990.

PART C: DESCRIPTION OF THE ENVIRONMENT

6. Description of the environment

Overview

The Project mainly traverses through rural land. However, the southern end of the Project area lies in the vicinity of the residential suburbs of Whitby, Waitangirua, Cannons Creek, Ranui Heights, Linden and Tawa. Whitby is one of the region's most affluent suburbs, while Waitangirua and Cannons Creek are two of the poorest suburbs.

The Project area is highly modified and consists almost entirely of pasture. Within this, however, there are pockets of both native and exotic (mainly forestry) vegetation. The highly modified nature of the area means that is holds little ecological value in terms of providing habitat for terrestrial species. The Project traverses nine hydrological catchments which are part of three different watersheds. The ecological value of the streams in these catchments varies from high to low but all streams are in highly modified catchments. Five of the catchments (approximately 65% of the length of the Project area) drain into the Pauatahanui Inlet. This inlet is of significant ecological value, supporting a wetland and marine ecosystem.

A range of network utilities are present throughout the Project area, the most significant being the 110kV electricity transmission line (from which the Project takes its name).

Within the Project area there are relatively few archaeological, historical or cultural features of note.

6.1 Introduction

This chapter contains a description of the existing environment. It is based on information from a number of sources, but principally the design and technical reports contained in Volume 3. These reports should be consulted for more detailed information about specific aspects of the existing environment.

Four terms are used throughout this chapter in reference to particular areas[53]:

- the 'Main Alignment corridor' refers generally to the corridor adjacent to the proposed Main Alignment centreline;

53. These four terms refer to general geographical areas of relevance. As such, they include, but are not limited to the extent of the proposed designation.

- the 'Kenepuru Link Road area' refers generally to the area in the vicinity of the proposed Kenepuru Link Road;
- the 'Porirua Link Roads area' refers generally to the area in the vicinity of the proposed Porirua Link Roads; and
- the 'Project area' refers to wider areas of relevance to the Project and varies between topic areas (i.e. traffic, ecology etc.).

Section 6.2 contains a description of the topography and land use of the Main Alignment corridor, the Kenepuru Link Road area and the Porirua Link Roads area. In the rest of the chapter, the following environmental aspects of the Project area are described:

- geology (Section 6.3);
- natural hazards (Section 6.4);
- climate (Section 6.5);
- hydrology (Section 6.6);
- terrestrial ecology (Section 6.7);
- freshwater ecology (Section 6.8);
- marine ecology (Section 6.9);
- air quality (Section 6.10);
- noise (Section 6.11);
- transport networks (Section 6.12);
- network utilities (Section 6.13);
- the social environment (Section 6.14); and
- archaeology, cultural and heritage (Section 6.15).

More detailed information about the environment is provided in the relevant chapters on the assessment of environmental effects in Part G. This also contains further information about particular receiving environments in relation to the discharge of contaminants.

6.2 Land use and topography

This section contains a description of the land use and topography of the following three key areas:

- the Main Alignment corridor;
- the Kenepuru Link Road area; and
- the Porirua Link Roads area.

The general land cover is shown in plan **GA06**, while plans **GA03**, **GA04** and **GA05** show the landform, slope and geomorphology across the Project area, respectively. Plan **GA08** shows the parcel sizes.

6.2.1 Main Alignment corridor

The Main Alignment corridor consists of nine sections as detailed in Table 6.1. Section divisions were broadly determined by changes in topography and proposed connections with the existing road network.

Table 6.1: Sections of the Main Alignment corridor

Section number	Section name	Station value (m)	Length (km)	District
1	MacKays Crossing	0 – 3,500	3.5	Kapiti Coast
2	Wainui Saddle	3,500 – 6,500	3.0	Kapiti Coast, Upper Hutt City, Porirua City
3	Horokiri Stream	6,500 – 9,500	3.0	Porirua City
4	Battle Hill	9,500 – 12,500	3.0	Porirua City
5	Golf Course	12,500 – 15,500	3.0	Porirua City
6	State Highway 58	15,500 – 18,500	3.0	Porirua City
7	James Cook	18,500 – 21,500	3.0	Porirua City
8	Cannons Creek	21,500 – 24,900	3.4	Porirua City, Wellington City
9	Linden	24900 – 27700	2.8	Porirua City, Wellington City

The Main Alignment corridor begins at MacKays Crossing at SH1 and ascends through the Te Puka Stream valley towards the Wainui Saddle. After cresting the saddle the corridor descends to the south, following the Horokiri Stream valley, and on through Battle Hill Farm Forest Park (BHFFP). The corridor then descends through rolling farmland before crossing SH58 approximately 500m to the east of Pauatahanui Roundabout. After crossing Pauatahanui Stream, the corridor climbs again through farmland and an area of exotic forest behind Whitby. It then climbs behind and to the south of Porirua East. From there it continues southwards, crossing the headwaters of Duck Creek and Cannons Creek Valley. The corridor then turns west and descends through plantation forest behind Ranui Heights to finish at SH1 at Linden. Overall, the Main Alignment corridor is approximately 27km long.

Figure 6.1 shows the general location of the nine sections of the Main Alignment corridor, the Porirua Link Roads area and the Kenepuru Link Road area which are described generally in the remainder of the section. The land use maps of each Project section are intended to provide a general overview of the predominant land use and are based on the same data used for Project-wide plan **GA06**.

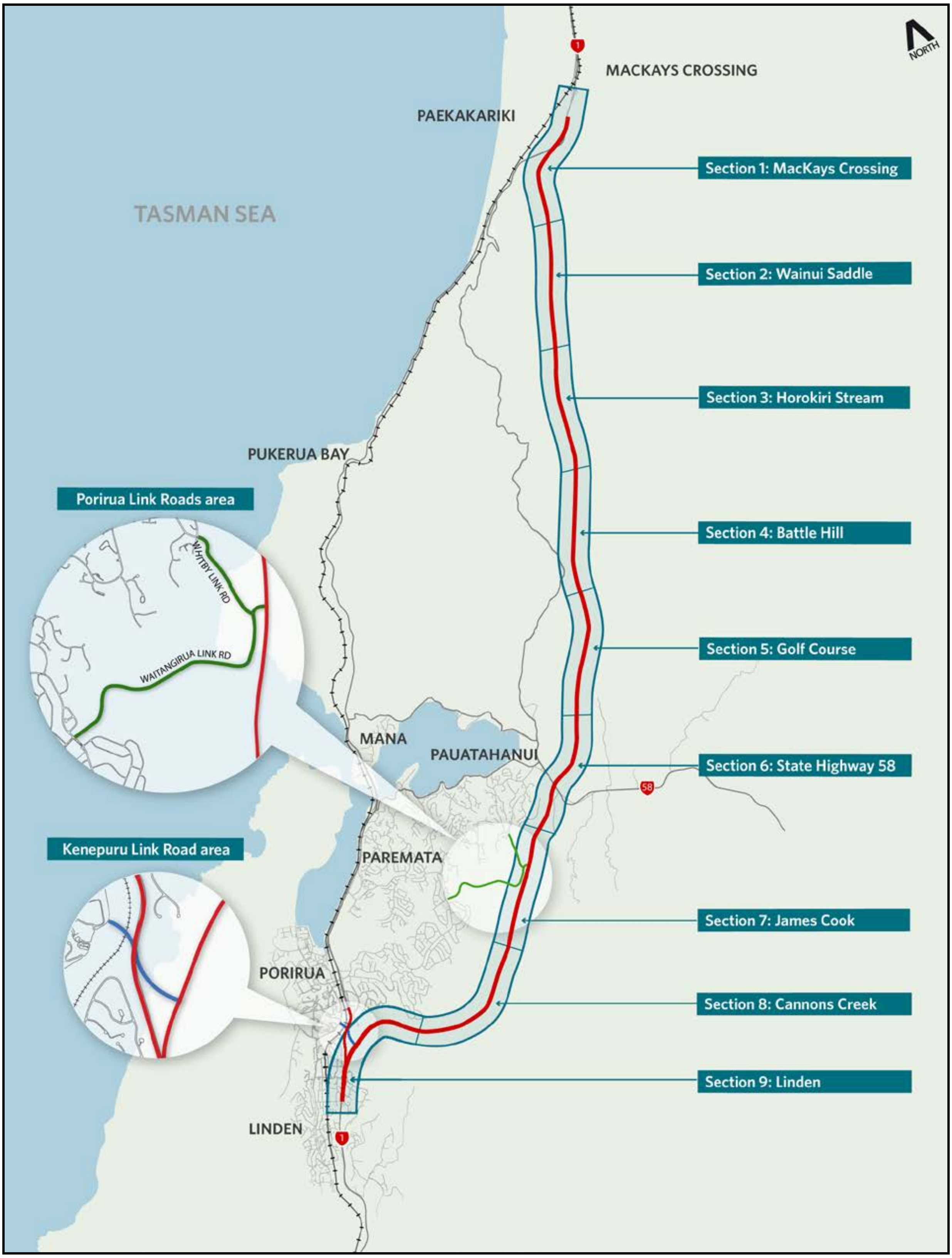

Figure 6.1: The Project area, including the Main Alignment corridor, Kenepuru Link Road area and Porirua Link Roads area

6.2.1.1 Section 1: MacKays Crossing

Section 1 extends from MacKays Crossing (including existing SH1) to the lower part of the Te Puka Stream valley. The topography consists of low-lying flat plains comprising peat lands, dune depressions and low dunes, with the highest dunes rising to about 15m above the surrounding flats. The township of Paekakariki is elevated on dune landforms where the coastal plains meet the Paekakariki Hills.

The landscape features of note are the surrounding hills, which are characterised by steep slopes, large plantation forest on hills east of Te Puka Stream, and extensive pastoral land use on hills west of Te Puka Stream. There is a particularly prominent terrace southeast of MacKays Crossing, the edge of which is a former sea cliff. The terrace has been modified by construction works for the existing SH1. In the vicinity of MacKays Crossing the existing SH1 follows a northeast-southwest alignment along the edge of the coastal plain at the toe of the Ohariu Fault escarpment.

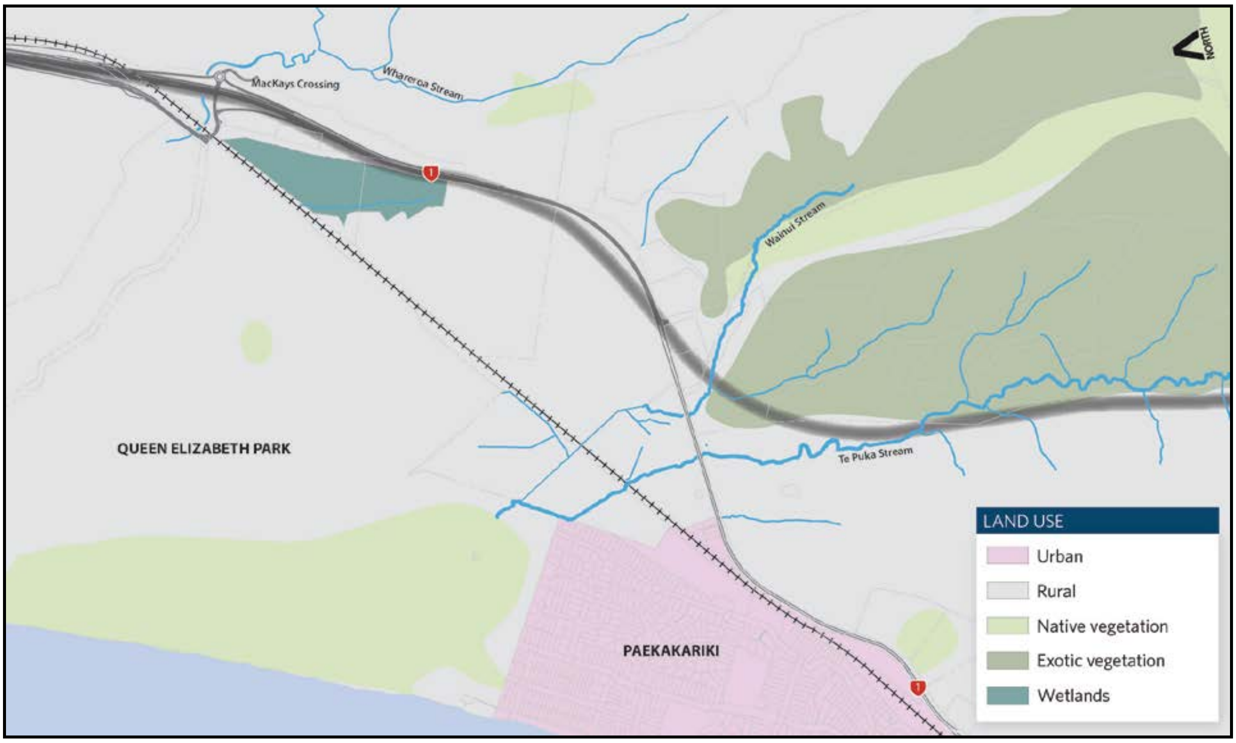

Figure 6.2: Land use in Section 1: MacKays Crossing

As shown in Figure 6.2, land use within the section is predominantly horticultural and pastoral, with some rural residencies. The majority of the land within this section is zoned rural.

6.2.1.2 Section 2: Wainui Saddle

Section 2 extends from approximately half-way up the Te Puka Stream valley, to the south side of the Wainui Saddle. At approximately 262m above sea level, the Wainui Saddle is the highest point of the Main Alignment corridor. The section is characterised by the linear valley of the northward flowing Te Puka Stream, north of Wainui Saddle. The steep greywacke side slopes are forested on the eastern flank and in pasture and regenerating bush on the western slopes. There are a number of alluvial fan deposits at the mouths of main tributary streams. The steep valley generally follows the Ohariu Fault along this section.

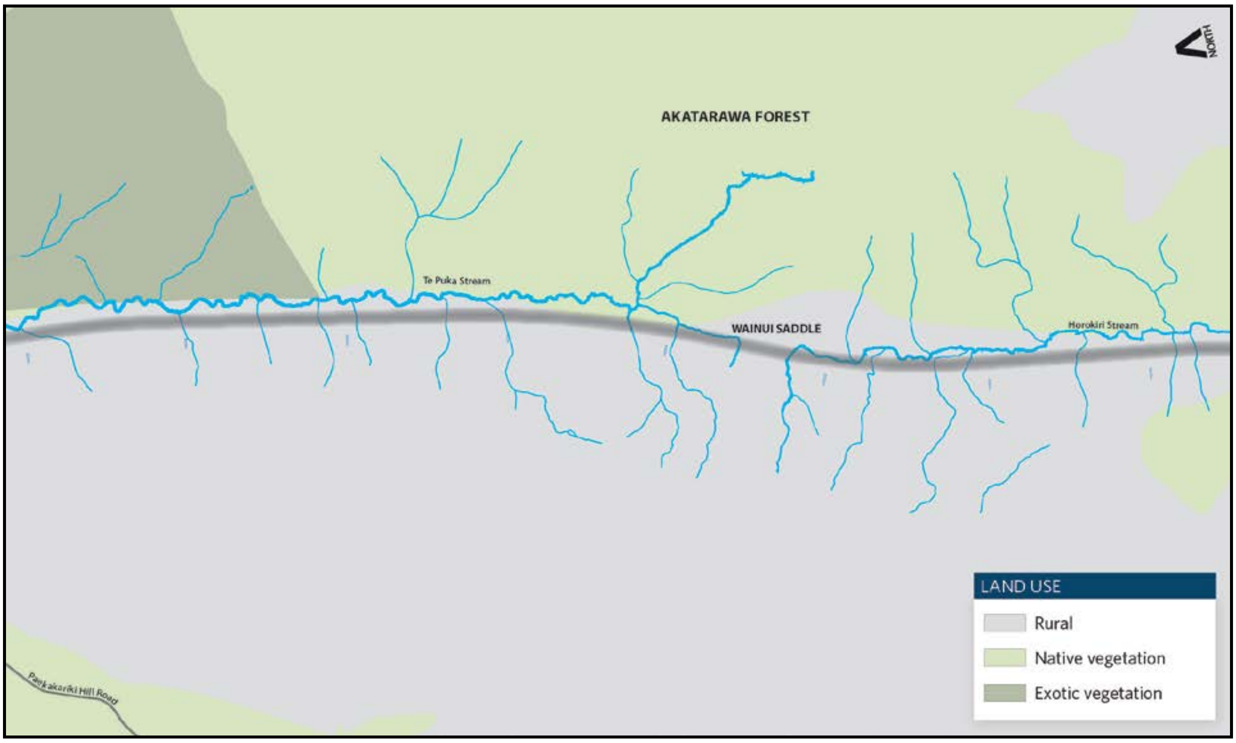

Figure 6.3: Land use in Section 2: Wainui Saddle

As shown in Figure 6.3, Section 2 contains predominantly undeveloped rural land, comprised of exotic and native forest and areas of pastoral land. A significant proportion of this land is particularly steep-sided.

6.2.1.3 Section 3: Horokiri Stream

This section is approximately 3km long and extends from the southern end of the Wainui Saddle to the northern end of BHFFP. It is characterised by the southward flowing Horokiri Stream, south of Wainui Saddle. The steep bedrock slopes are forested on the eastern flank and covered by rough pasture on the western slopes and valley floor. The mouths of steep-sided tributary streams contain alluvial fan deposits. The steep escarpment on the valley's west side has short, steep tributary streams and scree slopes. Rough pasture with extensive areas of regenerating scrub and pockets of remnant indigenous forest are present. On the valley's eastern side, there are larger catchments with tributary streams incised in deep valleys with inter-leaved spurs. Some areas of indigenous and second growth bush are located on the valley side, backed by expansive plantation forest. The stream itself is characterised by a gravel bottom meander with limited riparian vegetation.

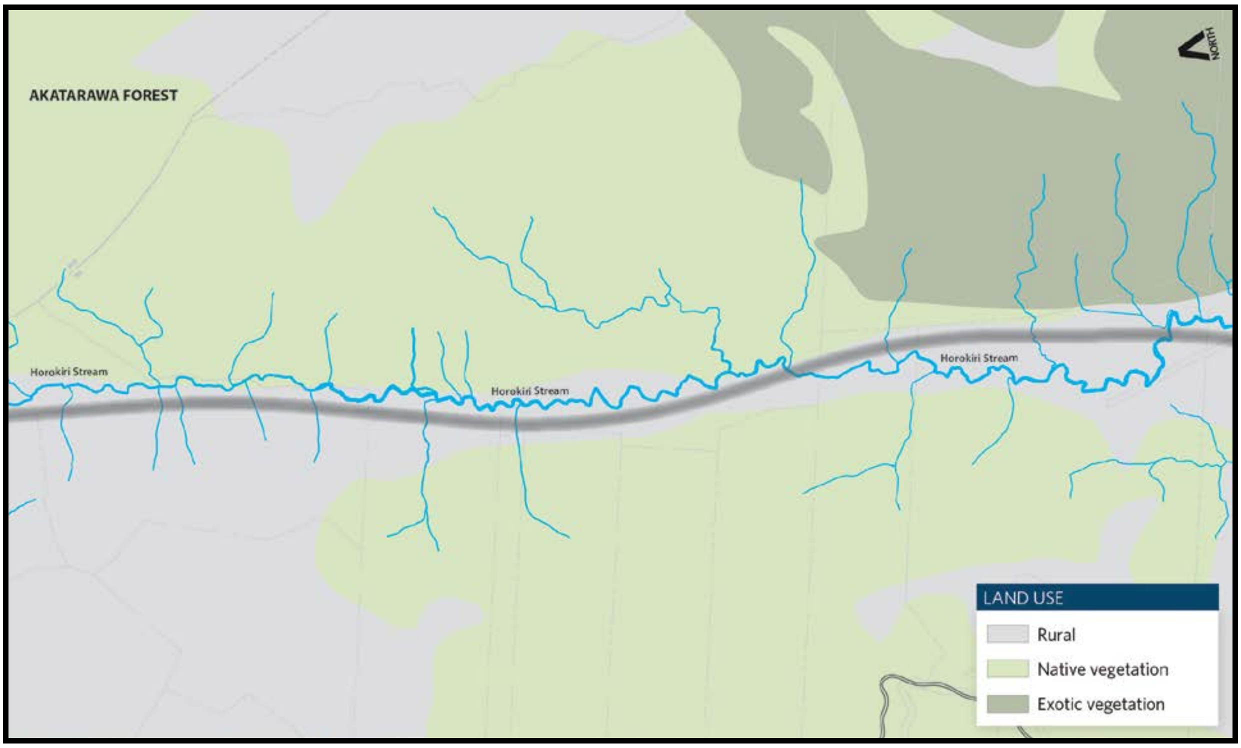

Figure 6.4: Land use in Section 3: Horokiri

As shown in Figure 6.4, land use in this section is predominantly forest and pastoral, however the steep sided valley limits access. Consequently, little development has taken place in the area. There are no residences in this section.

6.2.1.4 Section 4: Battle Hill

This section extends from the northern boundary of the BHFFP to the Pauatahanui Golf Course. It is characterised by the wide, sloping alluvial basin of the Horokiri Stream, with steep sided slopes planted in pine forest on the eastern flank (Akatarawa Forest), and pasture on the valley floor and western hills. The valley is influenced by a straight splinter fault on the north-south alignment, but the Horokiri Stream meanders across the flood plain.

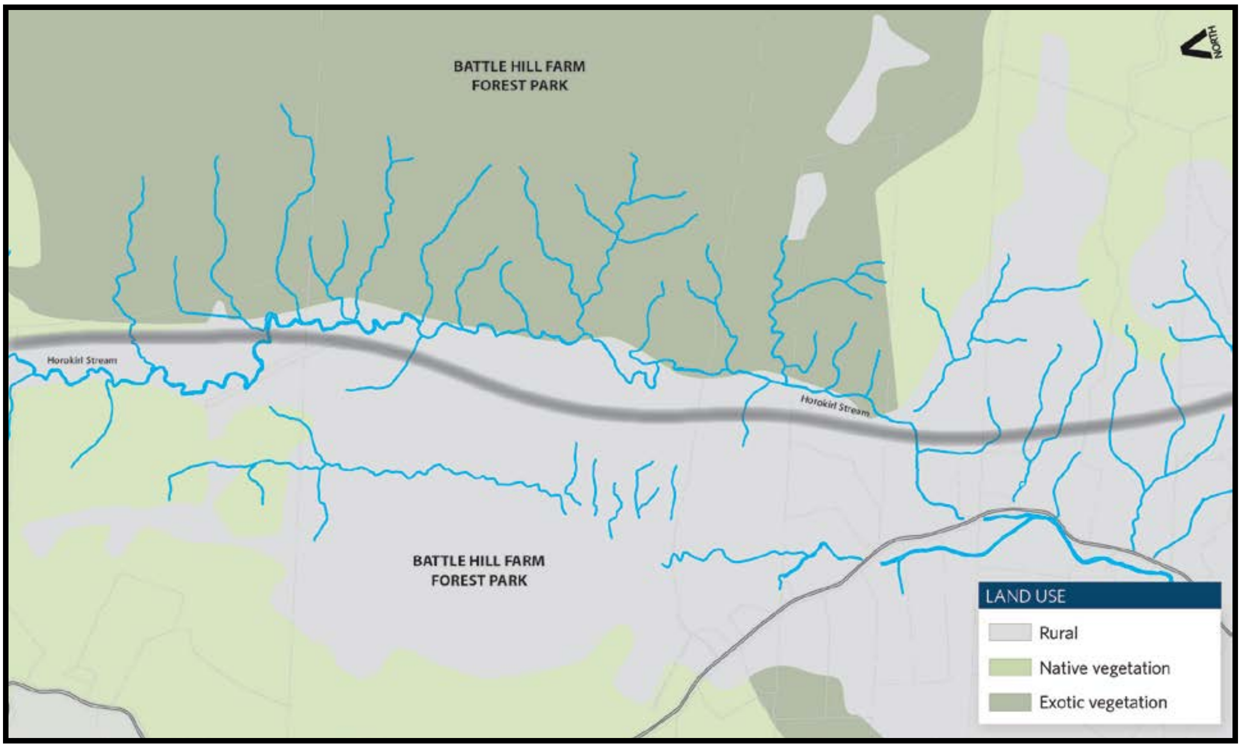

Figure 6.5: Land use in Section 4: Battle Hill

As shown in Figure 6.5, the area through BHFFP is relatively undeveloped and provides for a range of recreational activities, including access to the Akatarawa Ranges. While there is no development within the BHFFP, there are a limited number of rural residential subdivisions and small orchards and farming activities located off Paekakariki Hill Road.

6.2.1.5 Section 5: Golf Course

Section 5 extends from north to south through rural land adjacent to the Pauatahanui Golf Course and Flightys Road. It is characterised by undulating river terraces, gullies and gentle hilltops in pasture and plantation pines, lying between Horokiri Stream and SH58 (in the vicinity of the Pauatahanui Golf Course). The higher hills to the east are characterised by plantation forest and areas of pasture. To the west of the Main Alignment corridor is the Pauatahanui Inlet. To the east of the Main Alignment corridor is Ration Stream bush and Flightys Road. The Main Alignment corridor crosses a number of small tributaries along this section.

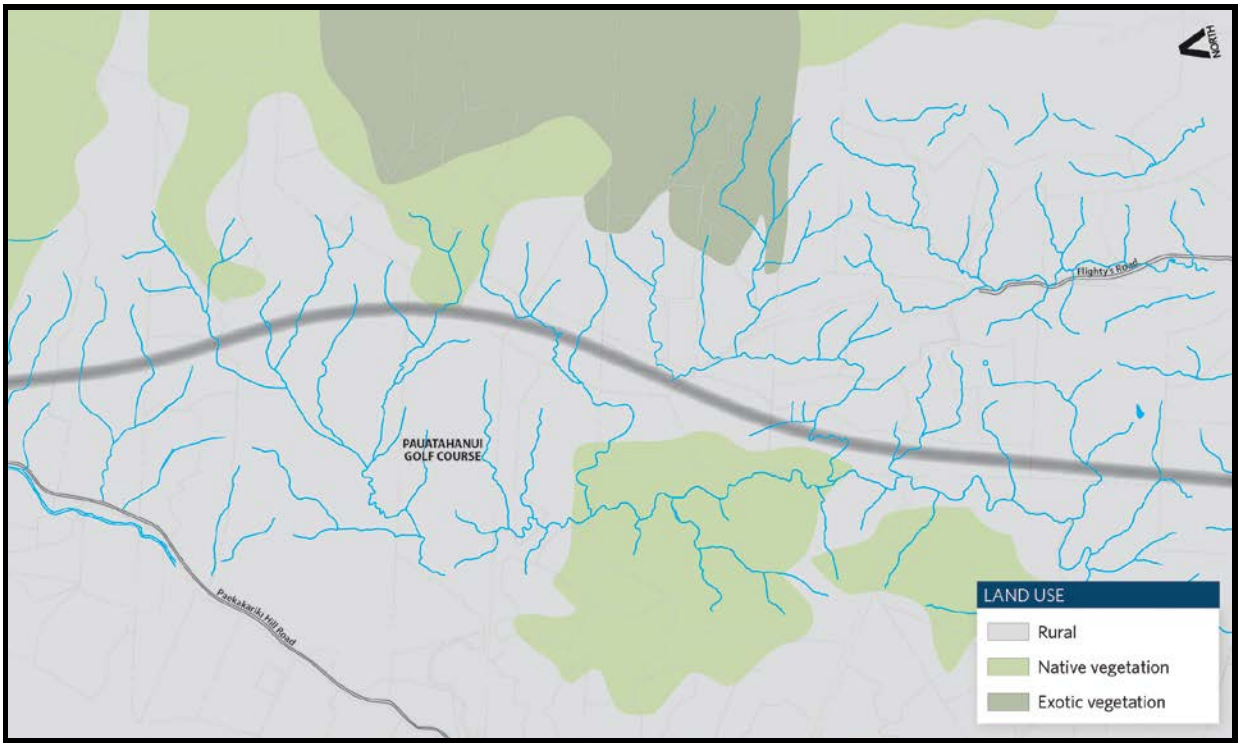

Figure 6.6: Land use in Section 5: Golf Course

As shown in Figure 6.6, land use within this section is a mix of rural activity and rural residential development. Residential dwellings are located on both sides of the Main Alignment and accessed from Paekakariki Hill Road on the western side, and from Flightys Road on the eastern side. There are large areas of forestry either side of the Horokiri Stream.

6.2.1.6 Section 6: State Highway 58

This section extends through rolling rural and rural residential land north of SH58, crosses SH58 and a low-lying marine plain (Lanes Flat) associated with the Pauatahanui Inlet, then climbs the moderately steep terrain to the south.

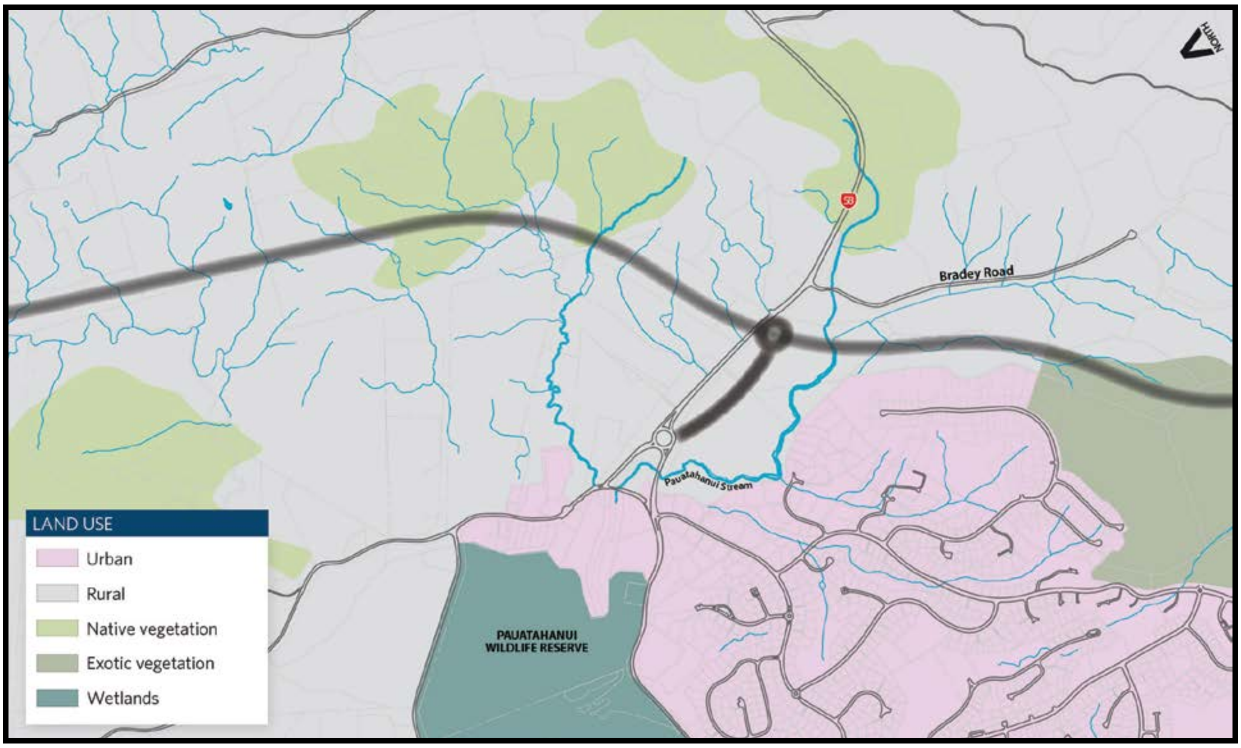

Figure 6.7: Land use in Section 6: State Highway 58

As shown in Figure 6.7, the land north of SH58 is rural. South of SH58, a number of land uses are present. The Lanes Flat area, the land east of Bradey Road and a strip of land west of Bradey Road are all used for rural land use. The Judgeford Hills covers an area of land south of Bradey Road. A number of areas to the south of SH58 have been, or are in the process of being, developed for residential use, including the Silverwood Forest subdivision site and land on either side of Bradey Road.

6.2.1.7 Section 7: James Cook

This section starts just south of SH58, and is approximately 1.8km long. The section flanks a significant tributary of Pauatahanui Stream adjacent to Bradey Road, rises to a saddle in the Duck Creek valley, and then follows the recently deforested east side of the Duck Creek valley, crossing a number of steeply incised tributary streams. The Moonshine fault line is located in Duck Creek valley, to the east of the Main Alignment corridor.

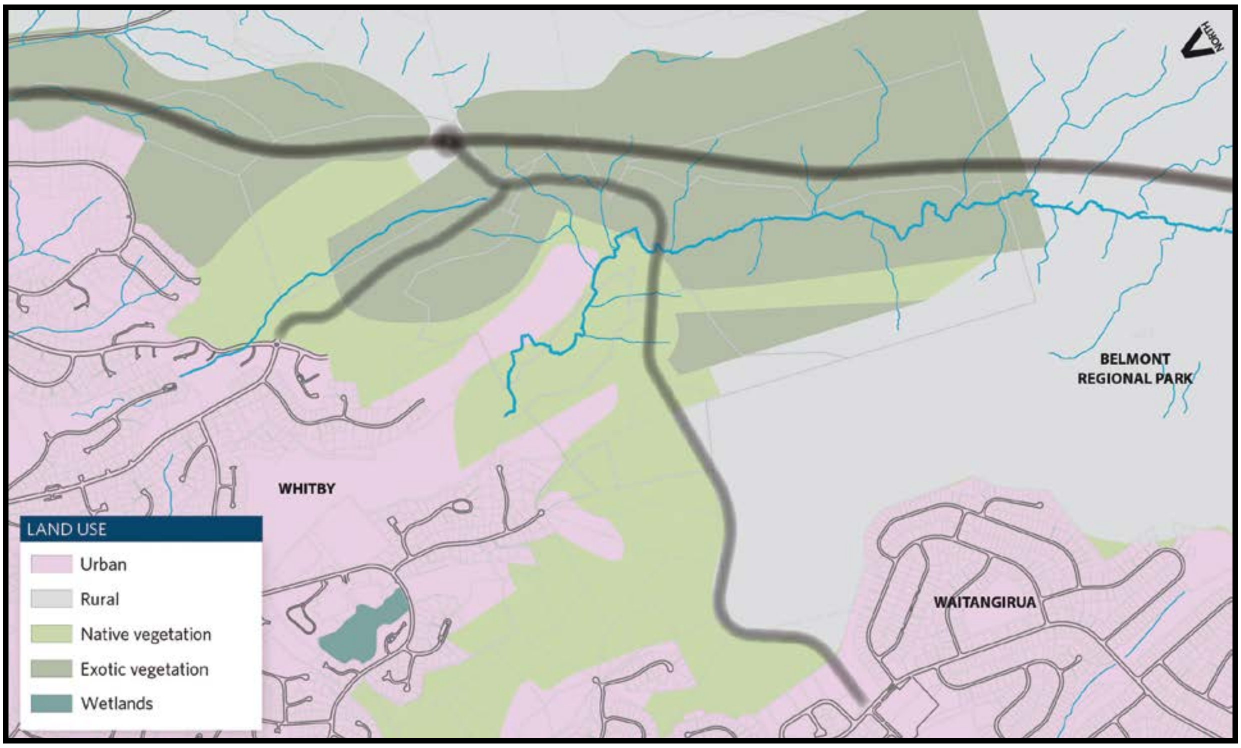

Figure 6.8: Land use in Section 7: James Cook

As shown in Figure 6.8, the land in this section is mostly undeveloped, except for some rural residential subdivisions, and forestry and pastoral farming on the eastern side of the Main Alignment corridor. These are accessed off Bradey Road. There is also a mixture of suburban and rural residential subdivision in the Silverwood Forest Estate, on the western side of the Main Alignment corridor. The residential suburbs of Whitby and Waitangirua are located west of the Main Alignment corridor.

6.2.1.8 Section 8: Cannons Creek

This section is approximately 3.4km long, and stretches from the eastern side of Duck Creek valley, and across an undulating plateau between Duck Creek and Cannons Creeks. It is characterised by the steep-sided Duck Creek Valley (Belmont Hill Country), which is along the Moonshine Fault, and the Cannons Creek area (Porirua East basin).

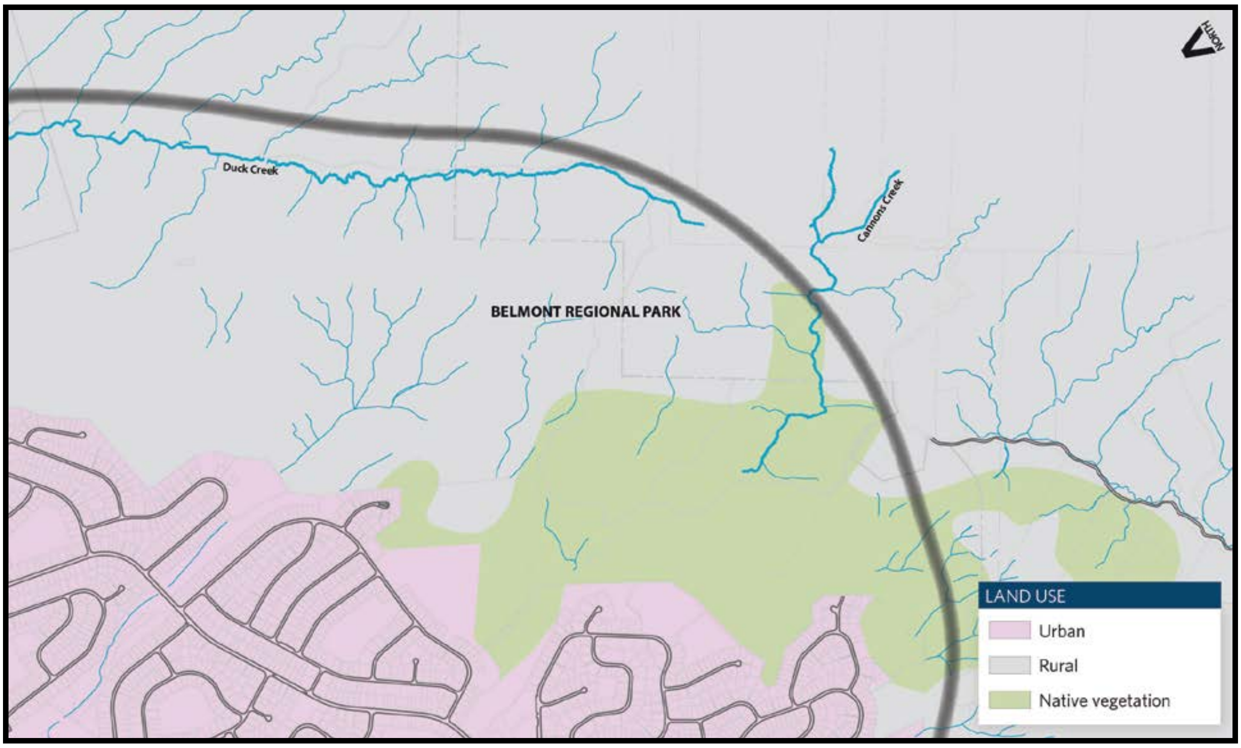

Figure 6.9: Land use in Section 8: Cannons Creek

As shown in Figure 6.9, land use in this section is predominantly rural and includes pasture and a few remnants of native vegetation, some restoration planting and some areas of regenerating scrub. The rolling to steep hills provide a backdrop to the suburbs of Cannons Creek and Waitangirua.

6.2.1.9 Section 9: Linden

This southernmost section is approximately 2.8km long and crosses a number of deep gullies in rough pasture and scrub, to plantation pine at the southern end. This section culminates in the gentle slopes of the Porirua Stream valley at SH1 Linden. Section 9 is characterised as the southern perimeter of the Porirua East basin, with rolling to steep hills, remnant native bush (Gillies Bush Reserve), regenerating gorse and pines, and the existing SH1 motorway corridor and NIMT corridor, at the southern end.

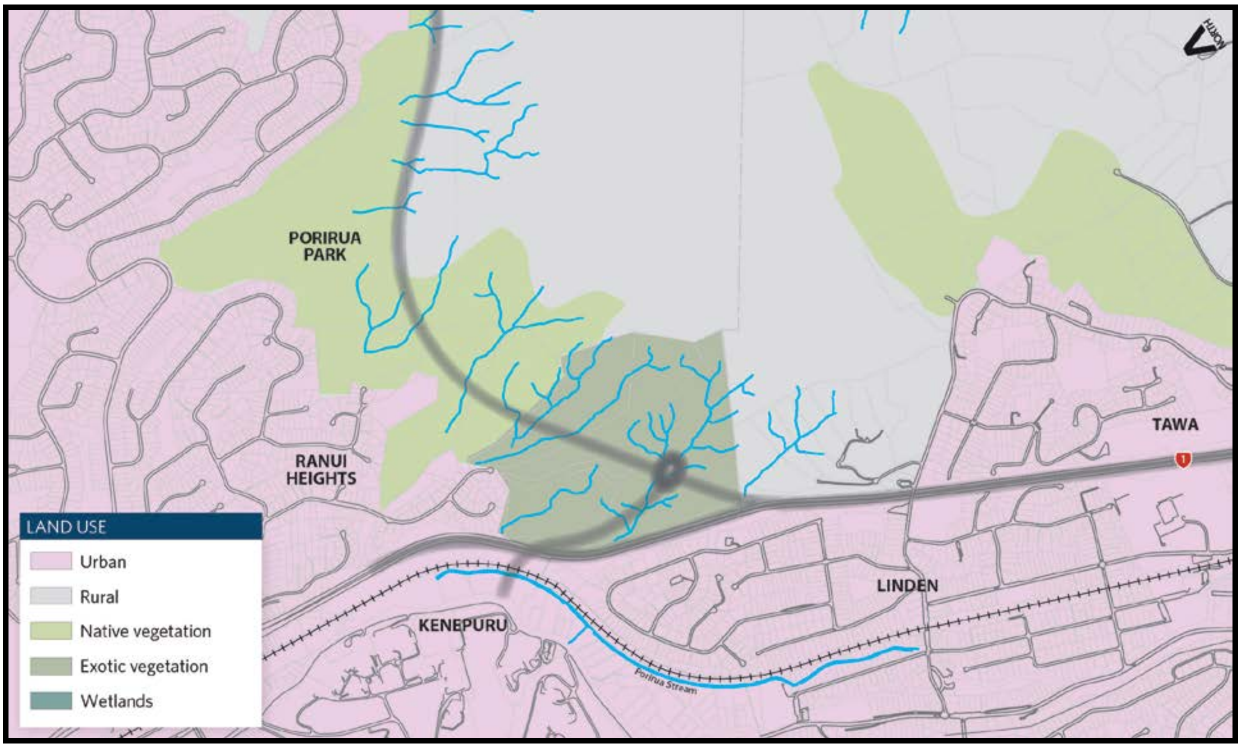

Figure 6.10: Land use in Section 9: Linden

As shown in Figure 6.10, this section is bounded by the residential areas of Cannons Creek and Ranui Heights to the north, with forestry and rural land uses to the south and east.

6.2.2 Kenepuru Link Road area

The Kenepuru Link Road area is similar to Section 9 of the Main Alignment corridor (shown in Figure 6.10) but extends further west. The area consists of a valley from Ranui Heights to the east, through to Kenepuru to the west. Two key transport corridors run through this valley presently, namely existing SH1 and the NIMT rail line. The Porirua Stream also runs through the bottom of the valley. To the west of the area is Kenepuru Drive which is dominated by a number of light industrial sites. Kenepuru Hospital is immediately north of the area.

6.2.3 Porirua Link Roads area

The Porirua Link Roads area is relatively undeveloped with most of the area consisting of pastoral land to the east and lifestyle properties to the northeast (as shown in Figure 6.8). To the west there are a number of rural residential subdivisions and a combination of suburban and rural residential subdivision in the Silverwood Forest Estate. The western edge of the area also borders the eastern Porirua suburbs of Waitangirua and Whitby. There are five waterways in the Porirua Link Roads area, with the most significant being Duck Creek.

At the existing intersection of Niagara Street and Warspite Avenue, there is the Maraeroa Marae, the Tokelau Christian Church, and the carpark of the Waitangirua Mall. The remainder of the Waitangirua area is medium density residential development. The existing intersection of James Cook and Navigation Drive is a roundabout with the surrounding area being relatively low density residential development.

Much of the Porirua Link Roads area is owned by either Silverwood Forest Estate or Whitby Coastal Estates and future subdivision and residential development is planned for this area.

6.3 Geology

The entire length of the Main Alignment corridor is predominantly underlain by greywacke bedrock. However, there are other geological features of note within the Project area. From MacKays Crossing (Section 1), the land is dominated by sand dunes, comprising fine to medium unconsolidated sand.

From Te Puka Terrace, the land is comprised of sandstone and mudstone (greywacke) and underlain with alluvial deposits of sand, gravel, silt and clay, (particularly at its northern end) and steep alluvial and bedrock slopes, which is exposed in the lower walls of the Te Puka Stream valley. The Te Puka Terrace has large amounts of colluvium identified by the truncated spurs faces on the east side of the Te Puka Stream.

The slopes on either side of the Horokiri Valley south of Wainui Saddle (Sections 3 and 4) consist of greywacke, which is typically closely orientated and moderately to highly weathered at the surface. Sections 5 and 6 include alluvial and marine deposits. This alluvium has been cut by streams and is covered by loess. Section 7 is underlain by generally highly weathered, weak greywacke. Completely weathered, very weak rock is exposed along many of the ridge crests with slightly to moderately weathered, strong greywacke exposed in the bed of Duck Creek. In Sections 8 and 9, bedrock exposed in cuttings on the hill slopes is generally moderately to highly weathered. Slightly to moderately weathered, strong greywacke bedrock is exposed in the beds of incised streams.

The geology of the Project area is described further in **Technical Report 3**.

6.4 Natural hazards

Two main types of potential natural hazards have been identified in the Project area:

- earthquakes; and
- storms.

These are also discussed in greater detail in **Technical Report 3**.

6.4.1 Earthquakes

The Wellington region is tectonically active and is prone to earthquakes. The Ohariu Fault and its associated active splinter fault south of the Wainui Saddle and the inactive Moonshine Fault are all within the Project Area, as shown in Figure 6.11.

Within the Project area there are a number of hazards associated with earthquakes, namely:

- ground shaking;
- fault rupture;

- earthquake induced landslides and/or slope instability;
- earthquake induced liquefaction; and
- tsunami.

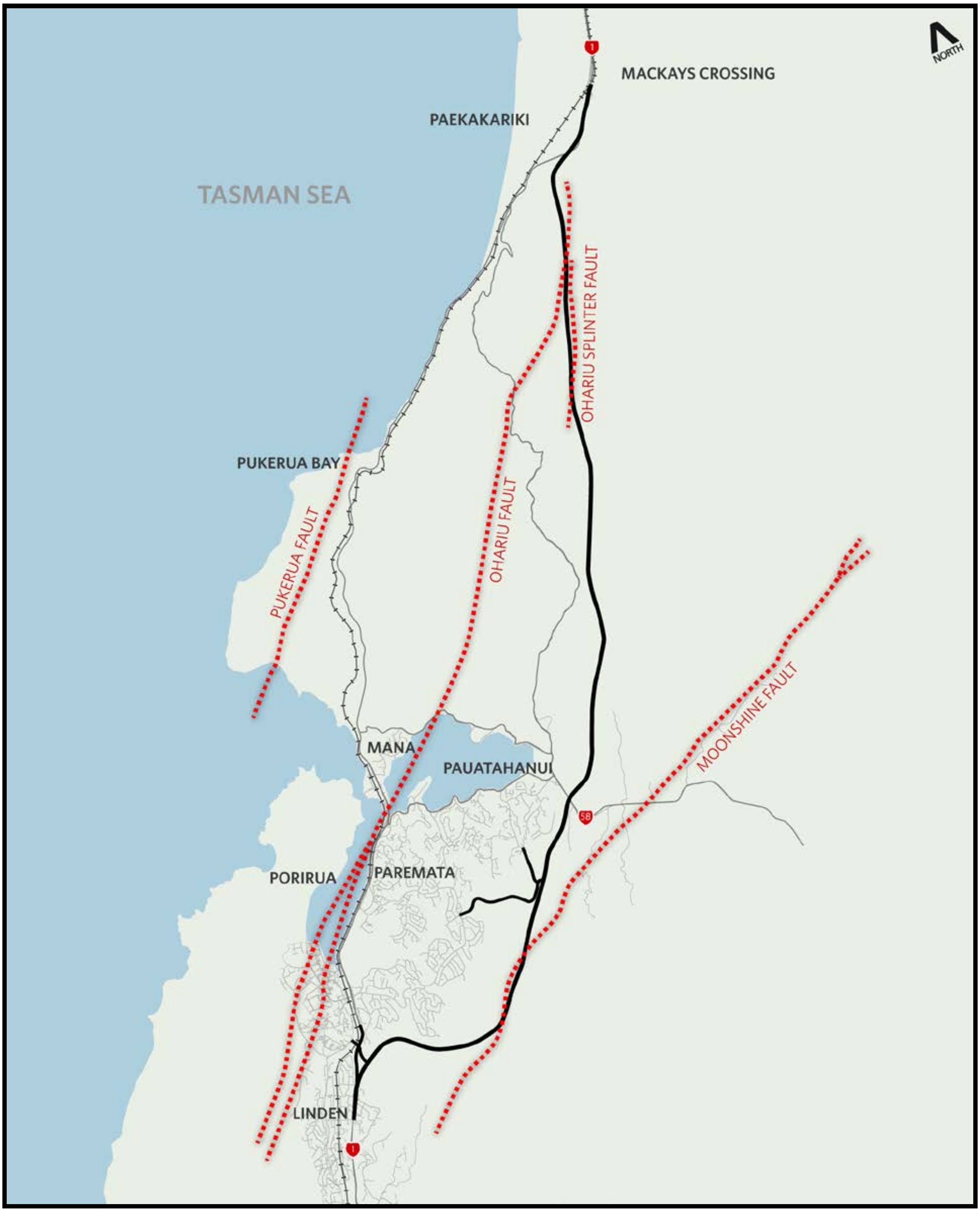

Figure 6.11: Faultlines in the Project area

6.4.1.1 Ground shaking

The Project area and wider Wellington region is an area of high seismicity, and significant levels of ground shaking can be expected to occur.

The regional ground shaking hazard maps[54] indicate a ground shaking along the Main Alignment corridor of Modified Mercalli Intensity (MMI)[55] of MM VIII (Destructive) to IX (Violent) with expected peak ground accelerations of 0.3g to 0.6g in a Wellington Fault (Wellington to Hutt Valley) segment event. The predicted level of ground shaking is not uniform along the Main Alignment corridor with higher levels predicted towards the southern end of the corridor, due to its proximity (6 to 8km), to the Wellington Fault.

6.4.1.2 Fault rupture

The Main Alignment corridor crosses two main faultlines, the Ohariu Fault and the Moonshine Fault. An active splinter fault, considered to be associated with the Ohariu Fault, was discovered as part of the Project's geotechnical investigations, and runs along the western side of Horokiri Stream to the south of Wainui Saddle. Expected recurrence intervals along these faults are outlined in Table 6.2.

Table 6.2: Faults within the Project area

Active fault	Recurrence interval	Fault rupture hazard
Ohariu Fault	1,500 – 2,200 years	The Main Alignment corridor crosses the fault between SH1 at Paekakariki and in the Wainui Saddle area.
Active Splinter of the Ohariu Fault (south of Wainui Saddle)	Estimated 2,000 years	This newly discovered fault also poses a fault rupture hazard where it straddles the Main Alignment corridor, south of Wainui Saddle.
Moonshine Fault	> 11,000 years (inactive)	Investigations indicate that this fault is represented by a wide fault zone in the southern part of the Duck Creek area (in the vicinity of Section 8 of the Main Alignment corridor).

6.4.1.3 Earthquake induced landslides and/or slope instability

Earthquake induced landslide potential in the surrounding area is discussed in detail in Technical Report 3. In general terms, there are several parts of the Main Alignment corridor where the expected effects during strong earthquake shaking (MM VIII – MM X) are rated as moderate, i.e. slides in the order of 1,000 to 10,000 cubic metres.

54. Wellington Regional Council, 1992.

55. The MMI scale relates to how an earthquake is felt by people, ranging from I (Instrumental) to XII (Cataclysmic)

The natural slopes along the Main Alignment corridor are typically 25° to 40°, with few locations where there is evidence of major slope instability.

The main areas of slope instability are:

- a large (approximately 50,000m^2) prehistoric landslide at the north-eastern end of the Te Puka terrace, immediately south of existing SH1 at Paekakariki. This landslide is considered to be inactive, and is thought to have been triggered by a movement on the Ohariu Fault;
- a large landslide (approximately 50,000m^2) on the eastern flank of Te Puka Stream valley, north of Wainui Saddle;
- suspected rock slides on fault facets on the west side of Te Puka Stream; and
- small landslides in Pre-Holocene alluvium are present in the areas of Battle Hill, the Pauatahanui Golf Course and SH58, and numerous shallow instabilities in the areas of SH58, Duck Creek and Cannons Creek.

6.4.1.4 Earthquake induced liquefaction

Liquefaction can lead to subsidence and lateral spreading. The area of highest risk from liquefaction and lateral spreading (and consequent ground damage) is between Porirua and Plimmerton, as shown in Figure 6.11. A large portion of this liquefaction hazard area is reclaimed land.

6.4.1.5 Tsunami

The tsunami hazard for the Project area is very low, with little potential for damage. Seiching (small wave generation as a result of an earthquake) in the Pauatahanui Inlet could result in localised flooding of the existing SH58 at Pauatahanui.

The risks to the coastal sections of existing SH1 between Linden and MacKays Crossing are considerably higher.

6.4.2 Storms

Storms are high rainfall events and have the potential to create a number of hazards within the Project area, namely:

- storm induced slope instability;
- debris flows; and
- flooding.

6.4.2.1 Storm induced slope instability

Storms have the potential to cause slopes to become unstable or trigger landslides where there are weak soils along the route, which can be weakened further when saturated or eroded by precipitation.

The areas vulnerable to storm induced slope instability are generally the same as those vulnerable to earthquake induced slope instability.

6.4.2.2 Debris flows

Debris flows have previously affected the existing SH1 near Paekakariki during major storm events. The most recent event was in October 2003, which also caused debris flows in a number of tributary gullies on the western flank of Te Puka Stream valley. Debris flows remain a risk, particularly where there are colluvium deposits in the Te Puka and Horokiri Stream valleys.

6.4.2.3 Flooding

Flood events with potential to cause damage to properties have been known to occur in the following flood plains:

- Te Puka Stream and Wainui Stream;
- Horokiri Stream;
- Pauatahanui Stream and Lanes Flat; and
- Kenepuru Stream.

6.5 Climate

The Wellington region's climate is relatively temperate and does not typically experience extremes of temperature.

Table 6.3 provides a summary of some of the main climatic conditions for the Wellington region[56].

Table 6.3: Climate of the Wellington region

Climatic aspect	Value
Average annual rainfall	1,249 mm
Average annual sunshine	2065 hours
Average temperature	12.8°C
Average wind speed	22km/hr

The region's average rainfall and number of sunshine hours are fairly typical when compared to the rest of the country. The region typically experiences ground frosts on average of 10 days per year, which is low compared to most of the rest of the country. Of particular note is the wind experienced in the region. The average speed of 22km/hr is the highest in the country (with the exception of the Chatham Islands at 25km/hr). Also of note is that the region has an average of 22 days per year where wind

56. Sourced from NIWA climate data 1971 – 2000.

speed is classed as gale force (greater than 63km/hr), which is the second highest average in the country. The prevailing wind direction is from the north to northeast.

Long term rainfall data indicates that there is considerable variability in extreme rainfall events across the Project area. While a particular catchment can experience heavy rainfall, a neighbouring catchment may be receiving a much lower intensity of rainfall. Lower intensity rainfall events are more uniform across the Project area.

6.6 Hydrology

The Project traverses nine hydrological catchments in four separate watersheds.

Within the Whareroa watershed:

- the Whareroa Stream catchment.

Within the Wainui watershed:

- the Wainui Stream catchment (including the Te Puka sub-catchment).

Within the Pauatahanui Inlet watershed:

- the Horokiri Stream catchment;
- the Ration Stream catchment;
- the Collins Stream catchment;
- the Pauatahanui Stream catchment; and
- the Duck Creek catchment.

Within the Onepoto Arm watershed:

- the Kenepuru Stream catchment; and
- the Porirua Stream catchment.

These catchments and watersheds are shown in Figure 6.12.

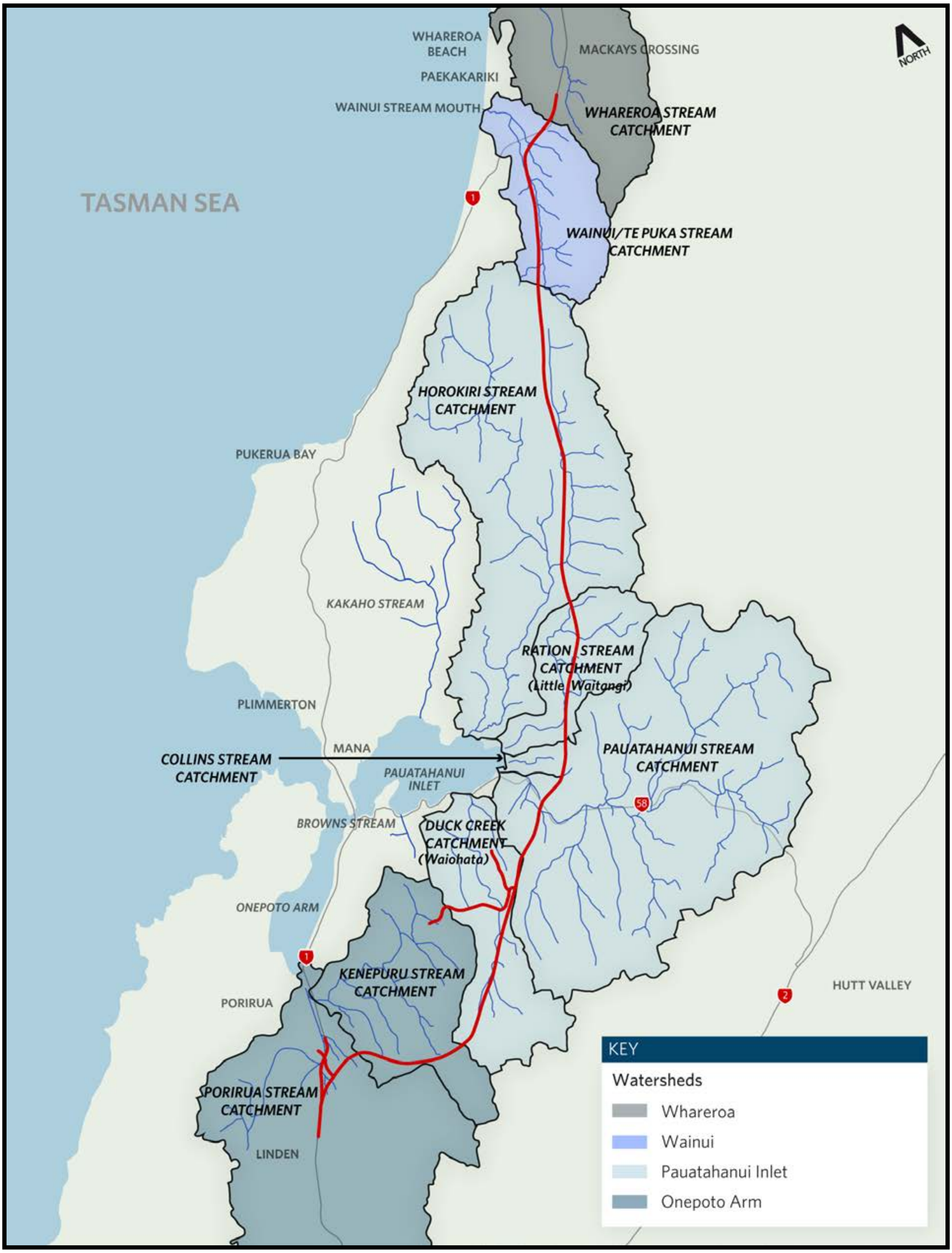

Figure 6.12: Hydrological catchments and watersheds within the Project area

The Whareroa and Wainui catchments both discharge at Whareroa Beach into the Tasman Sea, just north of Paekakariki. The catchments from Horokiri south to Duck Creek all discharge into the Pauatahanui

Inlet, while the Kenepuru and Porirua catchments discharge into the Onepoto Arm of the Porirua Harbour.

This section described the land use in each catchment (as this influences the water quality and hydrology of the catchment), as well as the general water quality parameters found in each catchment. Water quality is discussed in relation to ANZECC[57] water quality guidelines which contain trigger levels for specific contaminants.

The hydrological characteristics of the Project area are described in further detail in **Technical Report 14**, and water quality is described further in **Technical Report 15**.

6.6.1 Whareroa Stream catchment

The Whareroa Stream is the northern most catchment in the Project area, and is 1572ha in size. The stream is primarily influenced by the pastoral and scrub covered hills which it passes through, before crossing the proposed Main Alignment and traversing through QE Park out to the coast.

Water quality within the stream is generally good, although elevated levels of nutrients were recorded. All measured PAHs[58] and metals were below relevant guidelines.

6.6.2 Wainui Stream catchment and Te Puka sub- catchment

The Wainui and Te Puka Streams are small catchments to the north of the Project area, with a combined catchment area of 83ha. Both streams cross the proposed Main Alignment corridor and converge downstream from the Main Alignment and flow into the township of Paekakariki.

The topography traversed by these streams is typical of the Kapiti Coast district. Land use is a mixture of pasture, plantation pine and native bush. The steep upper catchment drops down onto an undulating dune environment. This change in grade between the hills and the coastal zone, combined with the restrictions as the streams runs through the dunes, has resulted in historical flooding problems for the developed land surrounding the streams.

Water quality within the Wainui and Te Puka Streams is generally good although the lower reaches had elevated nutrient levels. All measured PAHs and metals were below relevant guidelines.

6.6.3 Horokiri Stream catchment

The Horokiri Stream catchment is one of the largest catchments within the Project area (at approximately 3,30ha). The catchment drains into the eastern side of the Pauatahanui Inlet. The stream has two main tributaries, one of which crosses the Main Alignment corridor. Land use within this catchment is mostly pastoral with scrub and planted forest evident.

57. Australian and New Zealand Environment and Conservation Council, 1992.

58. PAH refers to polycyclic aromatic hydrocarbons, which are a by-product of the burning of fuel.

The main channel begins at the Wainui Saddle. In the upper catchment the steep sided valleys on the western catchment boundary are predominantly forested, whereas, on the eastern boundary the land use is predominantly pasture. As the lower catchment opens up onto the Horokiri Stream floodplain the major land use is rural pasture with pockets of residential dwellings.

The water quality within the catchment is generally good, although elevated nutrient levels were recorded at all locations, except for in the uppermost reaches. All measured PAHs and metals were below relevant guidelines.

6.6.4 Ration Stream catchment

The Ration Stream catchment comprises 680ha and is one of the smaller catchments in the Project area. The Stream has two tributaries, both of which cross the proposed Main Alignment. Land use within the catchment is mostly high quality pastoral, scrub and planted forest, with an area of coastal wetlands at the stream mouth. The catchment also passes through the Pauatahanui Golf Course.

Overall, water quality within this catchment is generally good (when compared with relevant guidelines) although quality does deteriorate downstream. Nutrients were consistently higher than guideline values throughout the stream. Some metals were also elevated above guideline levels in the lower reaches. All measured PAHs were below relevant guidelines.

6.6.5 Collins Stream catchment

The Collins Stream catchment is small (0.64ha) and is almost entirely in pasture. Unlike most of the other catchments in the Project area it has relatively low grade slopes.

Water quality was not assessed in this catchment due to its relatively small size.

6.6.6 Pauatahanui Stream catchment

The Pauatahanui Stream drains a large catchment of approximately 4,200ha on the eastern side of the Pauatahanui Inlet. The upper Pauatahanui catchment has numerous steep sided valleys which converge and drain northwest out onto the Pauatahanui floodplain. The upper catchment is predominately a mixture of rural pasture land and forestry.

As the lower catchment opens up, the land use becomes a mixture of rural pasture, residential and commercial. The residential suburb of Whitby lies on the western catchment boundary and at the northern catchment boundary is Pauatahanui Village. In the upper extent of the catchment, the stream channel is located in a narrow steep sided gorge. The Stream is constrained as it runs adjacent to SH58 until the topography levels out downstream of the Bradey Road Bridge. Downstream of Bradey Road the grade of the stream flattens out as it skirts the western perimeter of the floodplain before passing beneath SH58 at Paremata Road and the Paremata Road bridge adjacent to Pauatahanui Village, and finally into the Pauatahanui Inlet.

Water quality within the catchment is variable. Dissolved oxygen is low throughout the stream, while lower reaches of the streams recorded elevated levels of metals and turbidity.

6.6.7 Duck Creek catchment

The Duck Creek catchment is 1,030ha and has a mixture of land uses. In the upper reaches of the catchment land use is primarily pastoral. Further downstream the catchment is mostly urbanised with patches of scrub. The Creek has three tributaries which cross the proposed Main Alignment, these converge downstream of the Project area and also pass the proposed Whitby Link Road.

Upstream of the proposed Main Alignment corridor, the Creek is located in pastoral farmland, where stock has regular access to the Creek. The channel is generally small, at approximately 1m wide. Downstream of the proposed Main Alignment and the proposed Link Road to Whitby, land use is mostly prime pastoral and planted forest, with some indigenous forest. The site is wider and flatter than further upstream, with the channel varying between 2m and 3m in width.

At the mouth of the Creek into the Pauatahanui Inlet, the Creek is downstream of residential urban land use in the suburb of Whitby. Upstream of the urban area there is indigenous and planted forest, scrub and high quality pastoral land. At approximately 7m wide the channel here is wider and flatter than upstream locations. It is surrounded by wetlands and scrub which are part of DOC land.

Water quality within the catchment is variable. Nutrient levels are elevated throughout the stream. Elevated levels of metals, in excess of relevant guidelines, were also recorded in the lower reaches of the stream. All measured PAHs were below relevant guidelines.

6.6.8 Kenepuru Stream catchment

The Kenepuru Stream catchment is located adjacent to the Duck Creek and Porirua Stream catchments. The Stream has several tributaries, one of which crosses the proposed Main Alignment. At the lower end of the Kenepuru Stream it flows into the Porirua Stream. The catchment is mostly urbanised; flowing through the Waitangirua and Cannons Creek residential areas (refer Figure 6.9). Above the Waitangirua residential area in the upper reaches of the catchment the stream flows through high quality pastoral and scrub areas.

Water quality in this catchment is generally good, although it does deteriorate noticeably downstream with elevated turbidity and levels of metals in the lower reaches. All measured PAHs were below relevant guidelines.

Figure 6.13: Like many of the waterways in the Kenepuru Stream catchment, parts of Cannons Creek have been significantly modified

6.6.9 Porirua Stream catchment

The Porirua Stream catchment is of comparable size to the Pauatahanui catchment at around 4,100ha in area. A large proportion of the area surrounding the channel in this catchment is urban. Upstream areas are mostly pastoral and scrub. There are several tributaries to the main channel, which drain the surrounding hill catchments.

Water quality in this catchment is poor, with elevated nutrient, turbidity and metal levels in excess of relevant guidelines. This is likely to be reflective of the highly modified and urbanised nature of many parts of this catchment. However, all measured PAHs were below relevant guidelines.

6.6.10 Groundwater

Within the slopes above the main valleys, groundwater levels are typically about 10m to 20m below ground level, but depths of 35m, or greater, have been found during testing on some, but not all, of the higher slopes of Sections 3 and 4 of the Main Alignment corridor. Springs are evident along the Ohariu Fault and its active splinter on the western flank of Horokiri Stream, south of the Wainui Saddle, in Section 4.

Artesian pressures were noted in Section 7 (adjacent to the Pauatahanui Stream), with a head of at least 2m above ground level encountered in a borehole at a depth of 22m below ground level. Artesian pressures were also noted in Section 1 at a depth of 7m below ground level, adjacent to the Te Puka stream. KCDC extracts potable water from a bore located adjacent to the Wainui Stream and in close proximity to the Main Alignment corridor.

6.7 Terrestrial ecology

6.7.1 Flora

The area traversed by the Main Alignment corridor has mostly been cleared and converted to exotic vegetation, including pasture and pine plantation. Areas of extensive grazing land are located on the steeper hill country in Te Puka Stream and Horokiri Stream and the Duck Creek catchment south of SH58. Exotic vegetation can also be seen in the lower lying valley occupied by BHFFP.

There are occasional remnant pockets of indigenous vegetation, including areas in Te Puka Stream and Duck Creek tributaries. There are areas of regenerating second growth bush, notably in the Cannons Creek catchment. There are also extensive areas of former pasture that are reverting to natural vegetation, largely characterised by gorse, tauhinu and other small leafed species such as twiggy coprosma, manuka and kanuka. The other notable indigenous vegetation is the wetland area (wildlife refuge) at the head of Pauatahanui Inlet, adjacent to the Pauatahanui township. There are extensive areas of commercial pine plantation on the hills east of Horokiri Stream (Akatarawa Forest), and smaller areas scattered through the remainder of the route.

Within the BHFFP there are still significant remnants of native vegetation which provide good representations of the types of indigenous flora which would have once been typical of the region. Vegetation includes a small coastal forest remnant (35ha) which can be found in the front (closest to Paekakariki Hill road) of the park, as well as areas of low producing grassland and indigenous forest within the plantation forest at the back of the park. The bush is dominated by tawa and titoki, while the upper slopes are almost pure kohekohe. The bush is valuable, especially considering its proximity to a larger block of bush of similar composition located adjacent to the park. In swampy lower areas, kahikatea, pukatea and swamp maire are present. Within this remnant, is the last remaining self-sustaining population of the plant *Rhabdothamnus solandri* in the region.

The middle part of the Main Alignment corridor (Sections 3 – 7) has a more gently rolling topography and is characterised by a closer pattern settlement; a patchwork pattern of boundary shelter planting and differing land management; a wide variety of vegetation including exotic shelter trees, small plantations, amenity trees, and areas of native re-vegetation.

The area between Linden and Cannons Creek (including the Kenepuru Link Road and Porirua Link Roads areas) comprises rural fringe land. The hills form the backdrop to the Porirua East urban area, and comprise a mosaic of former pasture that has reverted to gorse and mahoe shrubland; rough pasture on the ridgelines; small pine plantations; areas of remnant or regenerating indigenous forest; and peri-urban activities.

Terrestrial vegetation and habitats are described in further detail in **Technical Report 6**.

6.7.2 Herpetofauna and terrestrial macro- invertebrates

The Project area provides potential habitat for herpetofauna and terrestrial macro-invertebrates. Herpetofauna are amphibians and reptiles, whereas terrestrial macro-invertebrates are species without a backbone that are visible with the naked eye. This covers all land-based species (i.e. not fish or amphibians) with the exception of reptiles, birds and mammals. As part of the ecological investigations, an assessment of the prevalence of herpetofauna and terrestrial macro-invertebrates within the Project area was undertaken. This utilised existing information gathered from previous studies, as well as field surveys.

In addition to the following summaries, herpetofauna and terrestrial macro-invertebrates are described in further detail in **Technical Report 7**.

6.7.2.1 Herpetofauna

Most of the Project area is in grazed pasture which provides relatively poor habitat for indigenous herpetofauna, due to the lack of potential refugia and the presence of introduced predators such as rodents, mustelids and cats. The exception to this is the larger scree slopes and stone fields towards the north of the Project area which does provide good potential habitat.

Three herpetofauna species were detected during the field surveys; common geckos, common skinks and common copper skinks. These species were detected in relatively low numbers and are among the most common lizards found throughout the North Island. These species are classified as not threatened. The range and count of species found is considered to be representative of inland pasture throughout the region.

6.7.2.2 Terrestrial macroinvertebrates

Terrestrial macroinvertebrates represent a diverse group of species. Within the Project area, habitats for terrestrial macroinvertebrates were dominated by grazed pasture, with smaller areas of native forest and scrublands and scree rock slopes. A wide range of terrestrial macroinvertebrates were detected including bees and wasps, butterflies and moths, spiders, snails and slugs, centipedes and millipedes, peripatus, beetles, wetas, cockroaches, silverfish, cicadas, hoppers, dragonflies, midges, earwigs, ants, worms and slaters. These species are all relatively common and are as expected for this type of environment. None of the species are considered to be threatened or at risk.

The most notable species found was *Peripatus novaezealandiae* (see Figure 6.14) which is one of five peripatus species found in New Zealand.

Figure 6.14: *Peripatus novaezealandiae*

The northern part of the Project area seems to be something of a stronghold for this species. They were commonly found in moist conditions with sufficient shade, such as under rotting logs and rocks.

6.7.3 Birds and bats

The Project area provides habitat for avifauna (birds) and bats. As part of the ecological investigations, an assessment of the prevalence of birds and bats within the Project area was undertaken. This utilised existing information based on previous studies, as well as field surveys.

In addition to the following summaries, avifauna and bats are described in further detail in **Technical Report 8**.

6.7.3.1 Birds

The prevalence of birds was determined from existing data for the Project area from the Ornithological Society of New Zealand's (OSNZ) data atlas, as well as from field surveys using point counts, incidental observations and nocturnal surveys. Information from the Guardians of the Pauatahanui Inlet (GOPI) was also assessed specifically in relation to bird species located around the Pauatahanui Inlet.

The field surveys recorded the presence of approximately half (48%) of the bird species listed in the OSNZ data atlas for the Project area. This is likely to be a function of the narrower sample area of the field survey and the time of year the survey was undertaken (January – March). Nonetheless, the 37 species observed during the survey are considered to provide an accurate representation of bird species in the area, with the addition of a few more species which were not observed but which are known to be present in the area at various times of the year. Of the 37 species recorded, 20 are native and 17 are introduced. Although introduced species make up less than half of the number of species, approximately two-thirds (69%) of the point counts were introduced species, indicating their relative presence in greater numbers than native species within the area.

In terms of the conservation status of the native species, 16 are classified as not threatened, two as threatened (the bush falcon and the pied shag) and two are considered to be at risk (the black shag and the New Zealand pipit). Of the four threatened or at risk species, all were only recorded in low numbers and only the black shag and New Zealand pipit were observed using the area for basking and/or feeding. The bush falcon and pied shag were only observed traversing the area. Based on known information about the habitat requirements of these four species, the only species likely to be a resident in the immediate Project area (i.e. along the Main Alignment corridor) would be the New Zealand pipit. Bush falcons may also be resident in the wider area but it is considered unlikely that black and pied shags are resident in the area.

6.7.3.2 Bats

There are three native bat species in New Zealand. The only part of the Project area where bats could potentially be present is around the Wainui Saddle and northwards down the Te Puka valley. Field surveys were undertaken during January 2010 around this area. The survey failed to positively identify any bat activity, with the one possible record unable to be positively identified by DoC staff.

As such, it is considered that any bats in the Project area are only present in very low numbers, if at all. Further field surveys will be undertaken during this coming spring (i.e. 2011) to attempt to confirm the presence or absence of bats around the Wainui Saddle.

6.8 Freshwater ecology

The Duck, Horokiri and Te Puka systems provide valuable aquatic fauna and physical habitat, although it is noted that they appear to be deteriorating in the lower reaches, potentially due to current land use practices. In particular, the Horokiri Stream (Figure 6.15) supports a number of threatened native fish and a small wetland area. Nationally threatened native fish (including tuna (long fin eel), red fin bully, inanga, kokopu and occasionally the rare kakahi (freshwater mussel)) have also been found in the Horokiri Stream catchment.

Figure 6.15: The Horokiri Stream provides significant freshwater habitat on the western coast of the Wellington region

Despite their modifications, the lower reaches of the Ration, Cannon Creek (a tributary of the Kenepuru Stream) and Pauatahanui Stream catchments are also considered to be of moderate value as they still retain important fauna species. The Kenepuru and Porirua Stream systems are of lower value, although they still support an array of values, notably components of macro-invertebrate fauna.

Freshwater ecology is described in further detail in **Technical Report 9**.

6.9 Marine ecology

As noted, the Project involves works in four watersheds that drain into the following four marine environments:

- the Whareroa Stream mouth;
- the Wainui Stream mouth;
- the two arms of the Porirua Harbour, being:
    - the Pauatahanui Inlet; and
    - the Onepoto Arm.

In addition to the following summaries, marine ecology is described in further detail in **Technical Report 10**.

6.9.1 Whareroa Stream mouth

The tidal river mouth estuary of the Whareroa Stream is a modified ecosystem that discharges through a sandy beach to the high energy marine environment. The stream mouth is occasionally blocked and as such the mouth is artificially managed and there is a significant amount of drift wood present on the beach and within the lower reaches of the stream. It provides habitat for a number of marine and freshwater fish and birds.

6.9.2 Wainui Stream mouth

The Wainui Stream discharges at Paekakariki to the Tasman Sea. This coastal environment is a sandy, high energy and exposed beach. The abundance and diversity of organisms is low in this marine environment. Like the Whareroa Stream mouth, it provides habitat for a number of marine and freshwater fish and birds.

6.9.3 Porirua Harbour

Porirua Harbour is a natural inlet. The Harbour has an entrance only a few hundred metres in width, close to the suburb of Plimmerton. It opens up into two arms. The arm to the south, Onepoto Arm, has an area of 283 hectares (35% of the Harbour), of which around 80% is subtidal. The eastern arm (the Pauatahanui Inlet) is 524 hectares (65%), of around which 60% is subtidal. The Harbour has been affected by the impacts of both rural and urban development, as approximately 100,000 people reside in the 175km^2 catchment.

6.9.3.1 Pauatahanui Inlet

The Pauatahanui Inlet (Figure 6.16) is a dynamic natural system which is in a constant state of change. While the Inlet is part of the Porirua Harbour, and is flushed with daily tidal flows, it is also influenced by the surrounding catchments which drain into it. The convergence of the sea and freshwater streams provide for fresh water and salt water mixing, and natural sedimentation.

Pauatahanui Inlet is a significant wildlife site, providing habitat for indigenous waterfowl and migratory wading birds. It is also a regionally significant wetland, retaining the only large area of saltmarsh and sea grass in the Wellington region[59]. The Inlet contains many habitats, including intertidal sand flats, salt marsh, rush lands and manuka shrub land.

Figure 6.16: Looking northwest over the Pauatahanui Inlet with the Pauatahanui wetland in the foreground and the suburb of Whitby to the left of the Inlet

The Inlet and catchment streams provide habitat for indigenous freshwater species. All of these freshwater fish species spend part of their lifecycle in the sea, migrating the length of the streams to the estuary. They require streams and rivers that are relatively unmodified from the mouth to the headwaters. Three of the plant species growing (as shore vegetation at the Inlet) are rare or endangered. The Inlet is also nationally important as providing habitat for the threatened/rare crustacean *Parastenhelia*.

In addition to its importance as a wildlife and plant sanctuary, the Inlet and its biota provide for a range of functions vital for the continuing health of the ecosystems and associated communities. The saltmarsh vegetation acts as a natural trap for the sediment arriving in the Inlet. As ground builds up behind the rushes and shrubs of the high marsh, there is a degree of regulation over the amount of sediment that enters into the waters of the estuary.

6.9.3.2 Onepoto Arm

The Onepoto Arm is the southern arm of the Porirua Harbour and contains large areas of mud flats, shell beds, populations of coastal fish and small areas of salt marsh. Part of the Onepoto Arm was reclaimed for a causeway for the NIMT Railway. The construction of this causeway created three shallow lagoons from the Harbour. When SH1 was re-aligned in the 1970s along the railway, these lagoons were partially filled in and Aotea Lagoon was developed into a recreational area. The modification of a significant

59. It is identified in the Regional Coastal Plan for the Wellington Region as an area of significant conservation value (ASCV) due to its natural, conservation, geological and scientific values.

portion of the coast means that the Onepoto Arm has lower biological diversity, as compared to the Pauatahanui Inlet.

6.10 Air quality

The Project area is within the Porirua and Kapiti Coast airsheds, as defined by GWRC. In terms of air quality within the Project area, vehicle emissions and domestic solid heating from the residential areas are the biggest contributors to air contaminants, namely particulate matter (PM_{10}), nitrogen dioxide (NO_2), oxides of nitrogen (NO_x), carbon monoxide (CO) and benzene. Vehicle emissions in this area predominantly arise from SH1, SH58, Kenepuru Drive and suburban streets and contribute to background levels of PM_{10},NO_2, NO_x, CO and benzene. Contaminants arising from solid fuel heating at Paekakariki, Cannons Creek and other residential areas are also contributors of background levels of PM_{10} and CO within the environment. Estimated worst-case contaminant levels for urban settings are shown in Table 6.4.

Table 6.4: Estimated worst- case background contaminant levels for air quality in urban settings in the Project area

Contaminant	Averaging period	Background concentration	NES AQ / AAQG threshold[60]
PM_{10}	24-hour	39 µg/m³	50 µg/m³
	Annual	16 µg/m³	20 µg/m³
NO_2	1-hour	45 µg/m³	200 µg/m³
	24-hour	29 µg/m³	100 µg/m³
NO_x	1-hour	425 µg/m³	-
	24-hour	213 µg/m³	-
CO	1-hour	3.4 mg/m³	30 mg/m³
	8-hour	3.1 mg/m³	10 mg/m³
Benzene	Annual	1.0 µg/m³	3.6 µg/m³

The estimated background concentration levels in urban settings are all below the relevant thresholds, indicating a good overall level of existing air quality. Air quality in rural settings (i.e. throughout most of the Project area) is likely to be considerably better than the worst-case levels estimated for the urban settings, as shown by the estimated levels shown in Table 6.5.

Table 6.5: Estimated worst- case background contaminant levels for air quality in rural settings within the Project area

Contaminant	Averaging period	Background concentration	NES AQ threshold
PM_{10}	24-hour	15 µg/m³	50 µg/m³
NO_2	1-hour	15 µg/m³	200 µg/m³
CO	8-hour	0 mg/m³	10 mg/m³

60. NES AQ refers to the National Environmental Standards for Air Quality, while AAQR refers to the Ambient Air Quality Guidelines issued by MfE in 2002.

Existing air quality is discussed in further detail in **Technical Report 13**.

6.11 Noise

The Project area is characterised by a number of different land uses, which provide differing noise environments. These land uses are predominantly suburban and rural.

The Main Alignment corridor passes through areas of small rural holdings, such as the Paekakariki Hill Road area and in the Horokiri Valley. In these areas the noise environment is of an isolated rural area with larger holdings and forest plantations, where natural noises (such as cicadas, birds and wind in trees) are the dominant noises. Where these rural areas are located near SH1, for example towards Paekakariki, the noise environment becomes consistent with its proximity to a State highway, with traffic noise from the significant daily traffic flows as the dominant noise.

The suburban areas in the vicinity of the Main Alignment corridor, such as Cannons Creek and Waitangirua, also have a natural noise environment (such as birds, cicadas and wind in trees), but these environments also commonly feature people-oriented noise, such as music, machinery and household noises, including pets. Where vehicles are present, traffic noise tends to dominate. Some of the suburban areas in the Project area are within existing State highway noise environments, including Linden and Ranui Heights, which are close to SH1. The Pauatahanui Village has a noise environment consistent with its location near the intersection of a local road and SH58, with significant daily traffic flows.

Existing noise is discussed in further detail in **Technical Report 12**.

6.12 Transport networks

There are a number of existing transport networks within the Project area, including:

- the State highway network;
- the local road network;
- the rail network;
- the bus network; and
- walkways, cycleways and bridleways.

In addition to the following descriptions, the existing transport networks are also discussed in further detail in **Technical Report 4**.

6.12.1 State highway network

There are two key State highways that provide connections from Wellington northwards:

- SH1, which connects Wellington to the Kapiti Coast and further northwards to the central North Island; and

- SH2, which provides a local link between Wellington and the Hutt Valley, and continuing to the Wairarapa and Hawkes Bay.

SH1 is the main road lifeline for Wellington, providing a strategic connection for freight movement to and from the north, as well as catering for other traffic. The two state highways intersect at Ngauranga Interchange on the northern outskirts of Wellington. A cross-connection between SH1 in Porirua and SH2 in the Hutt Valley is provided by SH58.

In the Wellington region SH1, and part of SH2, are ‘national strategic’ State highways[61], signifying their high importance in terms of strategic connections for freight traffic and other vehicles to Wellington City, CentrePort, the Interislander ferry, and Wellington International Airport.

6.12.2 Local road network

There are a number of important local road connections within the Project area. At Paekakariki, Beach Road is the main vehicular access point to Paekakariki, which joins to the existing SH1 south of MacKays Crossing.

Despite being a steep, narrow, and winding rural road, the Paekakariki Hill Road is used by a significant number of vehicles as a route between SH1 at Paekakariki and SH58 at Pauatahanui. This route also provides access to a number of rural residential properties located to the west of the Main Alignment.

Flightys Road heads north from SH58 and provides access to a number of rural residential properties. An existing ROW off the end of Flightys Road will be crossed by the Main Alignment corridor.

Grays Road is another route used by traffic between SH1 (at Plimmerton) and SH58 (at Pauatahanui). Tight bends on the western part of this route preclude its desirability for use by larger trucks.

The Whitby and eastern Porirua areas are serviced by a network of local roads which intersect with either SH58 (Joseph Banks Drive, James Cook Drive, Spinnaker Drive and Postgate Drive) or SH1 (Whitford Brown Avenue, Mungavin Avenue). Traffic distribution internal to this area is principally provided by Discovery Drive, Omapere Street, and Warspite Avenue.

To the west of SH1, the principal local routes are Titahi Bay Road and Kenepuru Drive, providing access to the Porirua CBD, retail and commercial areas and the Kenepuru Hospital.

6.12.3 Rail network

The North Island Main Trunk (NIMT) railway line generally follows the alignment of existing SH1 between Wellington City and the Kapiti Coast. As such, it is only adjacent to the Main Alignment corridor at the northern (MacKays Crossing) and southern (Tawa) ends of the corridor. The NIMT also runs directly through the Kenepuru Link Road area.

61. NZTA, State highway classification, June 2011.

The NIMT transports both passengers and freight. It carries approximately ten freight trains daily in each direction, while commuter trains operate between Wellington and Waikanae every 20 minutes during peak times, in addition to a small number of longer distance services.

6.12.4 Bus network

Bus services are currently precluded from operating in the corridor where these would compete with the subsidised rail service. Accordingly, the extensive network of local bus services across the corridor area is primarily orientated towards providing connectivity between residential areas and the rail network.

6.12.5 Walkways, cycleways and bridleways

There are a number of key tracks used by walkers, cyclists and horse riders in the Project area; including QE Park, Paekakariki, and Pauatahanui Inlet, BHFFP and Belmont Regional Park.

There are three entrances to QE Park; at Paekakariki, MacKays Crossing off SH1, and an entrance at Raumati. Pedestrian links between Paekakariki and the Park are currently provided along residential roads, namely The Parade and Wellington Road.

BHFFP is an important destination for pedestrians, cyclists and horse riders, with a number of walking and multi-use (walking, mountain biking and horse riding) tracks provided. It is accessed from Paekakariki Hill Road and provides entry to the Akatarawa's for trampers. Belmont Regional Park is also used widely by walkers and mountain bikers. Most users gain access from the eastern (Hutt Valley) side, although access from the west (Cannon Creek) is also available.

The Kapiti Coast cycle route generally follows the coastline from Paekakariki to Peka Peka. In Paekakariki, the route is accessed from Ames Street and The Parade. The route then enters QE Park, where it follows off-road paths and re-joins the street network at The Esplanade in Raumati South. Both SH1 and the Kapiti Coast Cycle Route are part of the regional cycling network. Although there are currently no formal cycle lanes along SH1, a parallel cycle path is available between Paekakariki and Paremata, part of which is Ara Harakeke, a joint cycle / walking facility between Pukerua Bay and Paremata. SH58 is part of the regional cycling network, however there are currently no formal cycle lanes or paths along SH58 and cyclists share the carriageway with vehicles or use the road shoulders.

Kenepuru Drive is also part of the regional cycling network. There are no formal cycle lanes or paths along Kenepuru Drive and cyclists share the carriageway with vehicles or use the road shoulders. As cyclists are not permitted along SH1 south of Porirua[62], cyclists heading towards Linden, Tawa and Wellington are compelled to use Kenepuru Drive.

6.13 Network utilities

There are a number of existing network utilities within the Project area, namely:

- electricity transmission infrastructure;

62. As this section of State Highway has been declared motorway.

- electricity distribution infrastructure;
- gas transmission infrastructure;
- gas distribution infrastructure;
- water supply infrastructure; and
- telecommunications infrastructure.

6.13.1 Electricity transmission infrastructure

The Transmission Gully Project is named as such because the Main Alignment corridor generally follows Transpower's existing 110kV electricity transmission line between Paekakariki and Takapu Road (PKK-TKR-A). This 110kV double circuit line is carried on steel lattice towers. It runs most of the length of the Main Alignment corridor, from MacKays Crossing to the Takapu Road Substation, which is located at approximately 24,000m. The line also passes through the Pauatahanui Substation which is located on SH58 along the Main Alignment corridor at approximately 17,500m.

In addition to the PKK-TKR-A line there are a number of other electricity transmission lines within the Project area. There are three other 110kV transmission lines which start or terminate at the Takapu Road Substation, namely:

- the Takapu to Wilton A line (TKR-WIL A) from the south;
- the Khandallah to Takapu A line (KHD-TKR A) from the south; and
- the Haywards to Takapu A line (HAY-TKR A) from the east.

The 220kV Bunnythorpe to Wilton A line (BPE-WIL A) also runs in a general north-south direction on the eastern side of the Main Alignment corridor, only coming close to the alignment in the vicinity of the Takapu Road Substation. All of these transmission lines are operated by Transpower.

Figure 6.17: The existing PKK- TKR- A line looking southwards down the Horokiri Stream valley

6.13.2 Electricity distribution infrastructure

Throughout most of the Project area, electricity distribution assets are owned and operated by Vector (Wellington Electricity). The only exception to this is in the Kapiti Coast District where assets are owned and operated by Electra.

There are five locations (listed in Chapter 15) within the Project area where Wellington Electricity's assets will be affected by the Project.

Within the Project area Electra's sole assets are their overhead 33kV lines running along SH1 at MacKays Crossing.

6.13.3 Gas transmission infrastructure

High pressure gas transmission pipelines run most of the length of the Main Alignment corridor, from MacKays Crossing to approximately 24,000m. These pipelines are part of the North Island natural gas transmission network, owned and operated by Vector Gas Limited.

6.13.4 Gas distribution infrastructure

There are four locations (listed in Chapter 15) within the Project area where local gas distribution assets are situated in the vicinity of the Main Alignment corridor. These assets are owned and operated by Powerco (Gas).

6.13.5 Water supply infrastructure

There are four locations (listed in Chapter 15) where GWRC water supply assets cross the Main Alignment corridor.

At the northern end of the Main Alignment corridor (at approximately 2,100m) there are two groundwater abstraction bores operated by KCDC. The water from these bores supplies potable water to the Paekakariki township.

6.13.6 Telecommunications infrastructure

There are six locations (listed in Chapter 15) within the Project area where Chorus has underground copper and/or fibre lines.

Telstra Clear also has two underground single fibre cables within the Project area. One runs along SH58, providing a connection between the Hutt Valley and the Kapiti Coast and the other runs along Kenepuru Drive.

Vodafone NZ also has a cell tower located in State highway road reserve on the Main Alignment corridor at approximately 27,000m.

6.14 Social environment

This section contains a description of two key aspects of the social environment of the Project area:

- the main communities; and
- the open space areas.

It is recognised that there are a number of other aspects which contribute to the social environment of the Project area and these aspects are described elsewhere in this chapter.

6.14.1 Main communities

For the purposes of the social impact assessment (**Technical Report 17**), the route has been divided into six 'Community Areas', which represent broadly identifiable communities within the wider environs of the Project area:

- Community Area 1 – Paekakariki: includes MacKays Crossing Interchange on SH1 and the coastal community of Paekakariki;

- Community Area 2 - Rural communities: includes Maungakotukutuku and Paekakariki Hill, which is predominantly rural land, with several rural residential dwellings;
- Community Area 3 - Pauatahanui and Whitby: extends through rolling rural and rural residential land north of SH58, crosses SH58 and a low-lying marine plain associated with the Pauatahanui Inlet, then climbs the moderately steep terrain to the south, into Whitby;
- Community Area 4 - Eastern Porirua: includes the communities of Ascot Park, Waitangirua, Cannons Creek and Ranui Heights;
- Community Area 5 - Linden and Tawa: traverses a number of steep gullies, and ends in the gentle slopes of the Porirua Stream Valley at Linden. It includes the communities of Linden, Tawa, Greenacres, and Porirua Central; and
- Community Area 6 - Coastal communities: Pukerua Bay, Plimmerton, Mana-Camborne, Paremata, and Papakowhai. These communities fall within the wider study area, but are not directly adjacent to the Project route. Existing SH1 severs a number of these coastal communities.

These six Community Areas have been identified for the purposes of profiling the existing environment and for assessing local social impacts associated with the Project. It is also noted that the Community Areas are made up of Census Area Units (CAU), which are developed and used for statistical analysis purposes.

These Community Areas are described in more detail within the SIA. The following provides a summary of the key features of the existing social environment for each of the six community areas.

6.14.1.1 Community Area 1: Paekakariki

Community Area 1 includes the MacKays Crossing Interchange on SH1 (the northern Project tie-in) and, the surrounding area, which is predominantly horticultural and pastoral. There are also several rural residential properties in this area.

The wider study area for this Community Area also includes Paekakariki which lies within the Kapiti Coast District. Paekakariki Village is to the south of the Project area and is separated from it by the NIMT railway line. Paekakariki is accessed directly off SH1, although SH1 does not travel through the townshipe proper. The majority of people in the Community Area 1 catchment reside in Paekakariki.

Paekakariki is a well-established coastal residential community, which includes a small retail centre that serves the surrounding area, a school (Paekakariki School) and two early childhood centres (Te Kohanga Reo o Paekakariki, and Paekakariki Playcentre). Residents within the area generally work within the Kapiti Coast District or in Wellington City.

6.14.1.2 Community Area 2: Rural communities

Community Area 2 encompasses predominantly rural land, comprised of forest and areas of steep pastoral land. There are several rural residential dwellings within this Community Area, the majority of which are located in the vicinity of Paekakariki Hill Road; however, there is limited community infrastructure and resources. There are no educational facilities, nor places of religious assembly. Residents travel to the surrounding areas (north to the Kapiti Coast or south to Pauatahanui, Whitby, and Paremata, or into Porirua Central) for retail areas, places of religious assembly and schools. Paekakariki Hill Road is a popular alternative road into/out of Pauatahanui, and is also used by recreational horse riders.

Pauatahanui Golf Course, located on Paekakariki Hill Road is a significant feature of Community Area 2. The Club is directly affected by the Project. The 500 hectare BHFFP is also located within Community Area 2, and is used for walking, horse riding, mountain biking, camping and picnicking.

6.14.1.3 Community Area 3: Pauatahanui and Whitby

Community Area 3 extends through rolling rural and rural residential land north of SH58, crosses SH58 and a low-lying marine plain associated with the Pauatahanui Inlet, then climbs the moderately-steep terrain to the south. The wider study area includes the communities of Pauatahanui and Whitby, both of which are within the Porirua District. Pauatahanui and Whitby are located to the west of the Main Alignment. Whitby will also be joined to the Main Alignment by the Whitby Link Road, which will feed into the James Cook Drive/ Navigation Drive Intersection.

The Pauatahanui Village includes a cluster of shops on Paekakariki Hill Road that serves both the wider local community and visitors to the Inlet. Pauatahanui School is located within the Pauatahanui Village, and is a state primary school with a roll of 232 students (in 2010). Its students come from the local area. The Pauatahanui Preschool is also located on Paekakariki Hill Road.

St Joseph's Catholic Church, which is located on SH58, is the oldest Catholic Church building still in use in Wellington and was the first Catholic Church building in the Porirua basin. Adjacent to the church is a graveyard where a number of early settlers to the Pauatahanui area are buried. It is registered by the New Zealand Historic Places Trust as a Category One Historic Place.

The Whitby Village Mall also includes a number of retail shops, as well as community and health care facilities. The PCC Development Framework (2009) identifies the area surrounding the Whitby shops as being suitable for further comprehensive development.

6.14.1.4 Community Area 4: Eastern Porirua

The residential suburbs that make up Community Area 4 are Ascot Park, Waitangirua, Cannons Creek and Ranui Heights, which are situated to the west of the Main Alignment, sitting within the wider study area.

The Waitangirua neighbourhood centre includes a shopping mall which is predominantly vacant, except for a number of small retail units along the eastern façade. A number of community facilities are located around the neighbourhood centre; including the Maraeroa Marae and associated health centre and the Tokelauan Church. A Mana Coach Services bus depot is situated north-east of the neighbourhood centre within a cluster of small-scale industrial activities. There are a large number of early childhood centres and primary schools in Waitangirua. Waitangirua will also be joined to the Main Alignment by the

Waitangirua Link Road, which will feed into the Warspite Avenue/ Niagara Street Intersection. The Cannons Creek neighbourhood centre is located on Warspite Avenue, and includes retail stores, and a number of community facilities. There are a significant number of HNZC owned properties within eastern Porirua.

Figure 6.18: Recently upgraded Waitangirua park

There are active residents' associations in Waitangirua, including the Maraeroa Marae Executive. PCC, in association with the Eastern Porirua Residents Association, Cannons Creek Opportunity Centre, and the Maraeroa Marae, have developed Village Plans for Cannons Creek, Ranui Heights and Waitangirua, after periods of consultation with the local communities. In Waitangirua, the Village Plan was predominantly focused around the development of a new community park, which is now situated opposite Maraeroa Marae. The park includes exercise and playground equipment and landscaping and other features, and has been developed in close collaboration with the community, incorporating Pacifica and Maori cultural influences.

Ascot Park and Ranui Heights are smaller neighbourhood centres within Community Area 4, both of which contain a number of community facilities, including schools and neighbourhood parks and reserves.

6.14.1.5 Community Area 5: Linden and Tawa

West of the Main Alignment, in the vicinity of the Kenepuru Link Road, is the suburb of Linden, which is predominantly residential with associated uses such as schools. Some limited commercial activity takes place within the suburb. For example; there is a number of small retail shops located on Collins Avenue. For a larger selection of general interest shops, local residents generally travel to Tawa or into Porirua City.

Linden Primary School adjoins the existing SH1 and proposed Main Alignment. Tawa Intermediate and Tawa College also adjoin SH1 further south. Northwest of Linden is a commercial and light industrial area, located between Kenepuru Drive and the NIMT. East of the Main Alignment and south of Collins Avenue is the residential area of Greenacres.

The existing SH1 motorway and NIMT corridor are features of the surrounding community (as demonstrated in Figure 6.19 below), following a north-south alignment along Porirua Stream valley. The Tawa and Linden suburban areas are aligned along the valley.

Figure 6.19: Existing SH1 at Linden

6.14.1.6 Community Area 6: Coastal communities

Community Area 6 includes the coastal communities that fall within the wider study area, but are not directly adjacent to the Transmission Gully route; namely, Pukerua Bay, Plimmerton, Mana-Camborne, Paremata, and Papakowhai[63]. Residential activity is the predominant land use within these areas. The existing SH1 severs a number of these coastal communities.

63. Titahi Bay was not considered within these coastal communities, due to its distance from SH1 and the Project area.

6.14.2 Open space areas

There are a number of open space areas within the vicinity of the Project, including several regional parks, as shown in Figure 6.20.

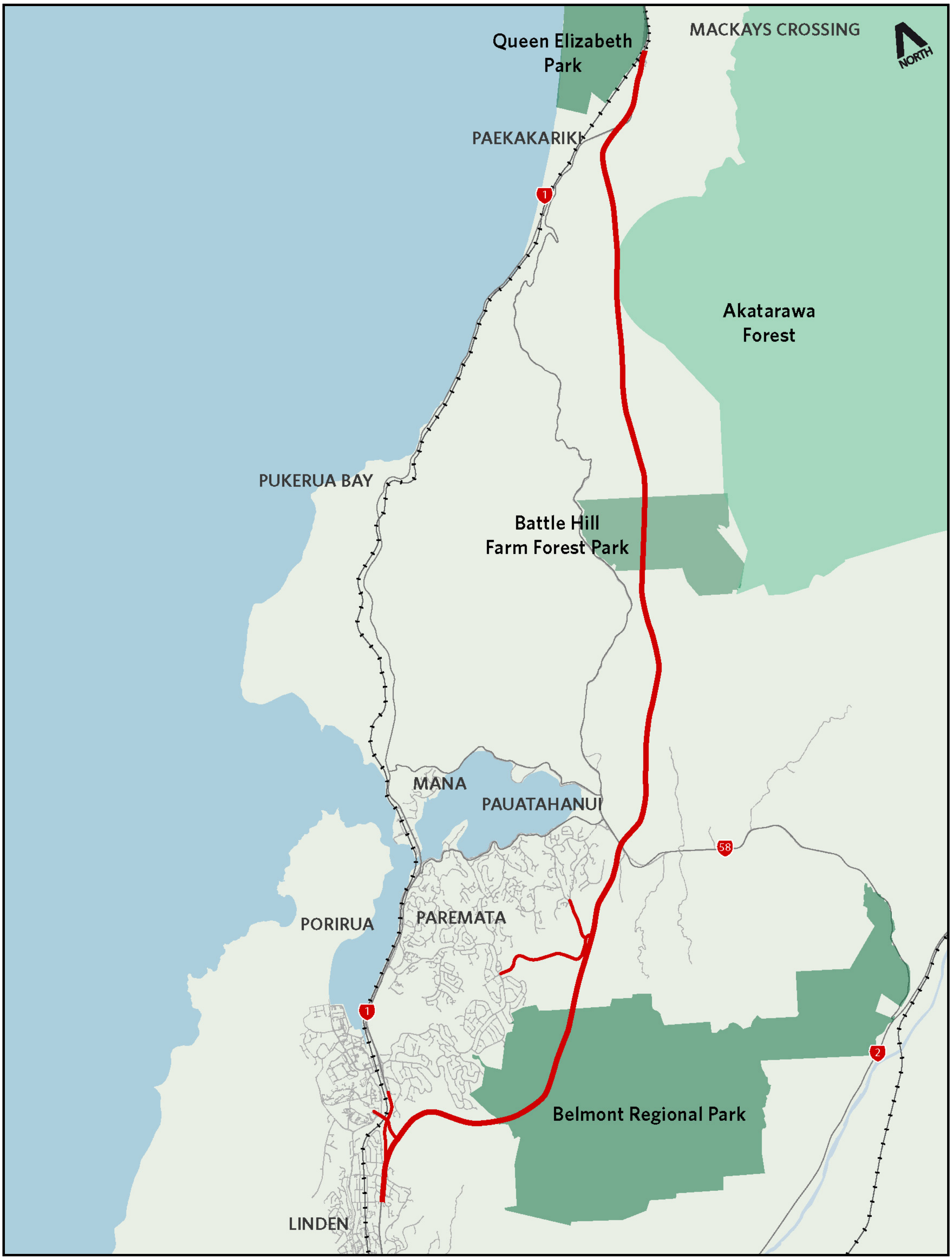

Figure 6.20: Regional parks in the Project area

To the north west of MacKays Crossing are three significant areas; Whareroa Farm Reserve, QE Park and the MacKays Crossing Wildlife Reserve and Wetlands. Whareroa Farm Reserve is a recreational and nature reserve that is open to the public. QE Park is a Wellington Regional Park of 650ha. It is zoned Open Space in the KCDP. QE Park provides for a number of recreation facilities, including the Wellington Tramway Museum, picnic areas and large areas of open space. MacKays Crossing Wildlife Reserve and Wetlands (west of SH1 and south of the rail crossing) is considered regionally significant and is protected as a wildlife management reserve[64].

Figure 6.21: Queen Elizabeth Park

BHFFP and Belmont Regional Park are also significant open space areas. BHFFP, which is generally accessed from Paekakariki Hill Road (approximately 6km north of SH58 and Pauatahanui), provides for a range of recreational activities, including access to the Akatarawa Ranges. School groups frequently visit, especially to the Ken Gray Education Centre, which is an educational centre within a working wool shed, located at the Park. Belmont Regional Park provides recreational activity opportunities, including walking, mountain biking and horseback riding tracks. Waitangirua Farm is a 1200ha working farm (with sheep and cattle) and is a key central component of the Belmont Regional Park.

64. Under section 14A of the Wildlife Act 1953.

Figure 6.22: Belmont Regional Park

Figure 6.23: Battle Hill Farm Forest Park

The Pauatahanui Golf Course, accessed off Paekakariki Hill Road, occupies a large area and has significant recreation value for Pauatahanui and the wider environment, as its members predominantly travel from Johnsonville, Tawa, the Hutt Valley and Porirua. The nine-hole golf course has more than 200 members.

Also located in Pauatahanui is the Pauatahanui Wildlife Reserve, a 50-hectare reserve that lies at the head of the Pauatahanui Inlet. This reserve is an important community recreational feature, incorporating regionally significant flora and fauna. The reserve features a plant nursery and visitor centre and tracks, boardwalks and hides for observing birdlife. There is also a 13km track provided around the edge of the Inlet – the Te Ara Piko (Meandering Path) Pauatahanui Inlet Walkway. There are active community groups that promote and protect the ecological, recreational and cultural values of the Harbour and its catchment area.

Other areas of open space offer recreational opportunities, such as Porirua Park, Gillies Place, and Cardiff Park, which are close to the Main Alignment corridor. Porirua Park has a 1,900 seat covered grandstand with four senior playing fields and a softball diamond, and is home to the Northern United Rugby Clubrooms, while Cardiff Park offers one rugby practice field. The gully between existing SH1 and Kenepuru Drive contains Kenepuru Drive Reverse which is a local purpose reserve for drainage purposes.

6.15 Archaeology, culture and heritage

There are a number of archaeological and heritage sites in the wider environs of the Project area, which remain from Maori occupation and subsistence and also past military presence in the area. These sites include Maori storage pits, midden, pa and urupa and evidence of the World War II military camps (Camps Russell and MacKay[65]).

Further evidence of military presence exists in the area, including the historic battle fought at Battle Hill. The BHFFP was the site of the last battle in the region between Ngati Toa Rangatira and the Crown in 1846. There are two groups of archaeological sites in the BHFFP; the location of the military camp below the battle site, and the site of the battle on the hill behind. The grave sites and site of the battle itself on the ridge leading up to Battle Hill summit are regarded as waahi tapu by Ngati Toa Rangatira.

Early European settlement is also evident in the area surrounding Pauatahanui. St Joseph's Church is located on SH58, opposite Bradey Road, and St Albans Church, is also located on SH58. These Churches are both listed on the PCC Heritage Register, and are also registered by the New Zealand Historic Places Trust as Category 1 (St Josephs) and Category 2 (St Albans) Historic Places.

In the vicinity of MacKays Crossing there is a World War II splinter proof blast containment structure (referred to as 'brick fuel storage tank'). The structure is listed in the KCDP as a significant site and it is identified within the Assessment of Built Heritage Values as a heritage feature. No other heritage assessment or a conservation plan is known to have been written about the structure and it is not registered under the HPA. This brick fuel tank is shown in Figure 6.24.

65. The Project does not encroach on either of these camps.

Figure 6.24: Brick fuel tank at the bottom of the Te Puka Valley, near MacKays Crossing

This area is also recognised as an environment that was rich in resources for early Maori. As a result there are numerous midden sites and pits located around the edge of the Pauatahanui Inlet, reflecting the richness of the sea-based resources. Traditionally the Inlet sustained an abundance of fish and shellfish which was highly valued by Ngati Toa Rangatira for customary fishing. It is still regarded as a mahinga mataitai[66] by Ngati Toa Rangatira who believe it has the capacity to regenerate if it is protected and nurtured into the future.

Several of the streams in the area (including Te Puka Stream, Horokiri Stream, Pauatahanui Stream and Duck Creek) were highly valued historically by Ngati Toa Rangatira as important mahinga kai or food resources and many continue to provide an important habitat for native fish species, including tuna (long and short finned eel), bully, inanga, kokopu and occasionally the rare kakahi (freshwater mussel). These species continue to be highly prized by Ngati Toa Rangatira who still exercise their customary fishing rights throughout the catchment.

QE Park is located within a historic Ngati Toa Rangatira reserve (extending from Paremata to Wainui) that was set aside by the Crown as part of the purchase of Porirua in 1847. It includes areas of early Ngati Toa Rangatira settlement and contains a number of important waahi tapu, including urupa, and pa sites.

66. Mahinga mataitai is a traditional seafood gathering place.

Two significant streams also pass through the park, the Wainui and Whareroa Streams, which were traditionally used for fishing and still retain important cultural associations. Whareroa Farm (which takes its name from the historical site of Whareroa Pa, on a high dune close to the mouth of the Whareroa Stream) is also located within the vicinity of the wider Project area, within an early area of Ngati Toa Rangatira settlement. Whareroa Farm also contains a number of waahi tapu, including urupa.

PART D: DESCRIPTION OF THE PROJECT

7. Operation of the Project

Overview

The Main Alignment has been designed to an expressway standard, which comprises a minimum of four lanes with continuous median separation. Direct access to and from the Main Alignment will not be permitted, except via three new interchanges and the northern and southern tie-ins. At all interchanges the Main Alignment will go over the connecting roads. Along some parts of the Main Alignment where grades will be steeper, crawler lanes have been provided for slow moving vehicles (e.g. heavy vehicles). The Kenepuru Link Road has been designed as a State highway with strictly controlled direct access. The Porirua Link Roads have been designed to local road standards.

The Project involves approximately 112 stream crossings by either bridges (14) or culverts (98). All bridges have been designed so there are no piers in the wetted stream channel. Culverts and bridges will include necessary erosion protection. The Project will require the permanent realignment of some streams. In total, approximately 6.5km of stream will be realigned.

A range of options are proposed for the treatment of cut slope and fill embankments. The three main options are reinforced soil embankments, mechanically stabilised earth walls (typically around bridges) and soil nail walls. Indicative landscaping has been developed for finished cut and fill slope faces.

Stormwater runoff will be collected and treated using wetlands and proprietary treatment devices.

7.1 Introduction

In this chapter the operation of the Project is described. Specifically, the following aspects are described:

- the design philosophy (Section 7.2);
- road design (Section 7.3);
- traffic services (Section 7.4);
- interchanges (Section 7.5);
- pavements and surfaces (Section 7.6);
- walkways, cycleways and bridleways (Section 7.7);
- permanent access tracks for maintenance activities (Section 7.8);
- cut and fill slopes (Section 7.9);
- bridges (Section 7.10);

- vertical retaining walls (Section 7.11);
- noise attenuation (Section 7.12).
- culverts and erosion control and protection structures (Section 7.13);
- permanent stream realignment (Section 7.14)
- operational drainage and stormwater treatment (Section 7.15); and
- landscaping (Section 7.16).

The information provided in this chapter should be treated as being indicative only and is intended to provide sufficient detail on the Project to assess the potential environmental effects and to identify any necessary measures to avoid, remedy, or mitigate these effects, where appropriate. Through subsequent phases of the Project, the design will be further refined. This will be undertaken within the scope of the conditions which will have been put in place to manage the environmental effects. Prior to construction, the Project will be subject to the outline plan process.

7.2 Design philosophy of the Project

Detailed information about the design philosophy of the Project is contained in the relevant technical reports in Volume 3 in relation to:

- roading design (Technical Report 1)
- structures (**Technical Report 2**); and
- geotechnical engineering (**Technical Report 3**).

This section provides a summary of the key design elements of the Project.

7.2.1 Design objectives

In accordance with the Wellington RoNS programme, the broad design objective for the Main Alignment is to construct and operate a road to an expressway standard. The Kenepuru Link Road and the Porirua Link Roads will serve as local link roads and have therefore been designed to local road standards, although it is noted that the Kenepuru Link Road will be a State highway.

7.2.2 Road capacity

The level of service (LOS) is a qualitative measure of the capacity of a road to convey motor vehicles. The LOS is related to the quality of service available to a given traffic flow (volume) and ranges from LOS A to LOS F. LOS A represents the best quality of service, permitting drivers to drive unimpeded at free-flow speed. LOS F represents heavily congested conditions, where queuing and delays result.

For the Main Alignment, LOS C has been selected as an appropriate minimum performance level for the 2026 design year, as it was considered an acceptable balance between cost and service. LOS C represents stable flow, but with most drivers somewhat restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream.

A higher LOS was considered inappropriate, because the associated increase in cost was not commensurate with the associated performance improvement, and would fail to meet the NZTA's objective of providing a cost-optimised route. Similarly, a lower LOS was considered inappropriate, because of the likelihood of the Main Alignment failing to deliver the required safety and reliability objectives. It would also be extremely disruptive and expensive to retrofit significant lengths of the Main Alignment if additional capacity was required in the future.

Predicted traffic volumes are such that, for a minimum LOS C, a total of four lanes (two in each direction) are required along the entire length of the Main Alignment.

7.2.3 Geometric design

The geometric design standards for this Project are based on the following standards and guidelines:

- the NZTA Draft State Highway Geometric Design Manual (SHGDM);
- the Manual of Traffic Signs and Markings: Part III Motorways (MOTSAM);
- the Austroads: Guide to Traffic Engineering Practice: Part 6 – Roundabouts;
- the Austroads: Rural Road Design Guide; and
- the Austroads: Urban Road Design Guide.

The SHGDM specifies minimum horizontal and vertical design speeds for dual carriageway State highways. For expressways, the horizontal design speeds are 110km/hr, 100km/hr and 80km/hr for flat, rolling and mountainous terrain, respectively. The Main Alignment will go through a combination of mountainous, rolling, and flat terrain (as defined in the SHGDM) at different points in the route. A varying design speed along the Main Alignment would be difficult to achieve in the areas of mountainous terrain as the road will have long straight lengths with limited opportunity to introduce tighter curvature to control speed. Where steeper grades may reduce vehicle speeds (particularly for heavy vehicles) crawler lanes have been provided. This is discussed further in Section 7.2.8 of this report.

As such, a 100km/hr horizontal design speed was considered to be appropriate for the entire Main Alignment. Under the SHGDM it is good design practice for the vertical design speed to be at least 10km/hr higher than the horizontal design speed. As such, a vertical design speed of 110km/hr was considered to be appropriate for the entire Main Alignment.

A design speed of 50km/hr was considered appropriate for the Kenepuru Link Road and the Porirua Link Roads.

7.2.4 Route security

It is generally recognised that Wellington City will be cut off from the rest of New Zealand following a large earthquake and perhaps a large storm event, as both the existing SH1 and SH2 routes and the North Island Main Trunk Line (NIMT) are vulnerable and likely to be closed for many weeks. A major concern is that this transport disruption would seriously impede Wellington's ability to recover after such an event. The Project represents a unique opportunity to improve regional and national route security by reducing the vulnerability of SH1 between Linden and MacKays Crossing. As such, a major driver in the development and design of the Project has been to reduce the vulnerability of SH1 to natural hazards, particularly earthquakes and landslides.

Avoidance of natural hazards is the optimal response to the risk they pose. However, for a significant piece of linear infrastructure, such as the Main Alignment, this is not always possible. Specifically in relation to active faults, it is accepted that some crossing of these faults (and associated splinter faults) will be required for the Main Alignment. On this basis, the approach has been to minimise the number of times faults are crossed. Where it is necessary to cross an active fault, the method of crossing has been carefully considered to minimise the potential damage risk. In general this has meant that crossing active faults with structures, such as bridges or tunnels, has been avoided. Instead, the preference for crossing active faults has been:

- embankments, where access after a rupture event (and potential 3m to 5m horizontal movement) can be reinstated within days; or
- cuttings, where embankments are unfeasible.

A key tenet of the design philosophy is that the road does not collapse, and limited access can be restored quickly in the event of a major earthquake.

Improvements on earlier proposals for the Main Alignment include:

- the removal of significant viaducts to increase the route's resilience to earthquake damage, revisions to road geometry to improve the alignment, particularly in terms of avoiding geological hazards and ecologically sensitive areas and reducing effects on existing streams; and
- enhanced route security through changes to cut and fill slopes in line with the results of detailed geotechnical assessments.

7.2.5 The regional road network

Once operational, the Main Alignment will become the main arterial road between Wellington City and the Kapiti Coast. Part of the existing State highway network (SH1 between Linden and MacKays Crossing and SH58 to the west of the Main Alignment) will likely become local road.

The Main Alignment will serve the wider Wellington region and will be easily accessible from all the main urban centres, namely:

- Wellington City, via existing SH1 at Linden;
- western Porirua, via the Kenepuru Link Road;
- eastern Porirua, via the Porirua Link Roads and the SH58 Interchange with existing SH58;
- the Hutt Valley, via the SH58 Interchange with existing SH58; and
- the Kapiti Coast, via existing SH1 at MacKays Crossing.

7.2.6 Traffic volumes

Traffic volumes for the Project have been modelled for 2026, 2031 and 2041. Table 7.1 shows the estimated traffic volumes for 2026 at a number of key points along the proposed new roads.

Table 7.1: Estimated traffic volumes for the Project

Mid-point	Estimated traffic volume (vpd, weekday)
MacKays Crossing to Pauatahanui Interchange	22,300
Pauatahanui Interchange to James Cook Interchange	20,000
James Cook Interchange to Kenepuru Interchange	18,900
Kenepuru Interchange to Tawa (tie-in with existing SH1)	18,300
Kenepuru Link Road	13,000
Waitangirua Link Road	3,300
Whitby Link Road	3,400

7.2.7 Travel speeds

The Main Alignment between Linden and MacKays Crossing will be approximately 27km long and will have a speed limit of 100km/hr. Travelling the Main Alignment at the speed limit will take approximately 17 minutes.

For heavy vehicles, travel speeds will be lower along some parts of the Main Alignment, because of the gradient of some sections. Where gradient will result in a significant travel speed difference between heavy and light vehicles, crawler and auxiliary lanes will be provided. Figure 7.1 shows the gradient of the Main Alignment and predicted travel speeds for heavy vehicles. It also shows where crawler / auxiliary lanes will be provided to account for reduced speeds by heavy vehicles.

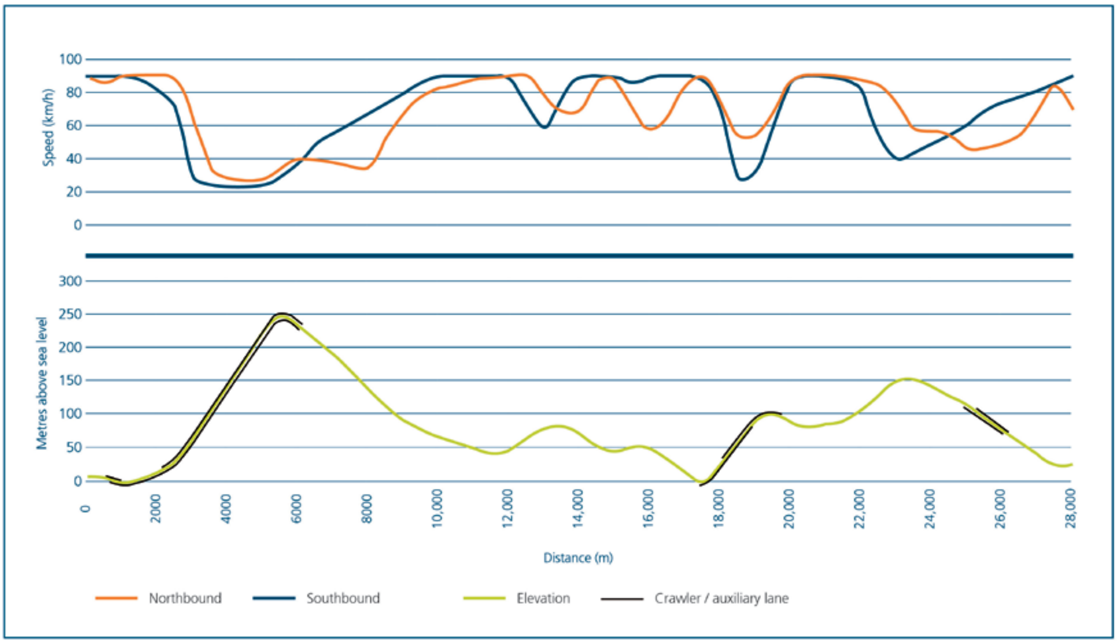

Figure 7.1: Longitudinal profile of the Main Alignment showing the predicted heavy vehicle travel speeds and the location of crawler / auxiliary lanes

7.2.8 Crawler and auxiliary lanes

Crawler lanes are additional lanes provided for slow moving vehicles where their speed has been reduced because of a steep grade. Auxiliary lanes are extensions to on or off ramps where the grades are such that slow moving vehicles are not able to accelerate to their normal operating speed within the traffic stream, or where they must decelerate early from their normal operating speed.

Currently, crawler and auxiliary lanes are proposed in the following sections:

- between MacKays Crossing and the northbound connection from existing SH1 (auxiliary lane);
- between MacKays Crossing and just south of Wainui Saddle at approximately 6,000m in both the northbound and southbound carriageways (crawler lanes);
- between the SH58 Interchange and the James Cook Interchange (auxiliary lane);
- northwards from the Kenepuru Interchange:
- from the Kenepuru Interchange to approximately 25,000m in the northbound (ascending) carriageway (auxiliary lane); and
- from approximately 25,900m to the Kenepuru Interchange in the southbound (descending) carriageway (auxiliary lane).

7.2.9 Escape ramps

The descent northbound from the summit of the Wainui Saddle has a gradient of approximately 8% and a right hand curve towards the bottom of the descent. The curve starts approximately 2.7km downhill from the summit. It is proposed that an emergency escape ramps and an arrestor bed[67] will be provided for downhill vehicles. No other gradients are considered long enough or steep enough to warrant construction of an arrestor bed.

7.2.10 Brake check areas

A brake check area for both north and south bound traffic on the Main Alignment is proposed just south of the summit of the Wainui Saddle (at approximately 5,600m). This will allow both north and south bound vehicles (but predominantly heavy vehicles) to check their brakes before commencing their descent from the Wainui Saddle.

Brake check areas are not considered necessary anywhere else along the Main Alignment.

67. An arrestor bed is an area of deep gravel or similar (directly next to the downhill carriageway) that allows a vehicle that is not able to stop normally due to brake failure or loss of engine power to safely come to a halt, and be able to be retrieved safely without impacting on other traffic. Suitable advanced warning signage would alert drivers to the presence of, and distance to, the arrestor bed.

7.3 Road design

The form of the proposed road is shown in the road layout plans **GM01-21** which should be read in conjunction with this section. The bridges and subways referred to in this section can be viewed on the plans **S01-29**.

7.3.1 Main Alignment

The Main Alignment will be approximately 27km long and has been designed to the following general specifications:

- four lanes (two lanes in each direction with continuous median barrier separation);
- rigid access control;
- grade separated interchanges;
- minimum horizontal and vertical design speeds of 100km/hr and 110km/hr respectively;
- maximum gradient of 8%; and
- crawler lanes in some steep gradient sections to account for the significant speed differences between heavy and light vehicles.

7.3.1.1 Section 1: MacKays Crossing

This section is approximately 3.5km long, and extends from the tie-in at the existing MacKays Crossing Interchange on SH1 to the lower part of the Te Puka Stream valley. The Main Alignment will connect to the existing SH1 at approximately 700m. The first 700m is the existing State Highway 1 alignment which is a grade separated interchange providing access across the NIMT. Any alteration to the existing MacKays Crossing Interchange will be minor.

This section of the Main Alignment will provide for three lanes in the northbound carriageway from 700m and from 2,100m in the southbound carriageway. Southbound traffic will be able to exit the Main Alignment at approximately 1,250m. This exit will pass under the Main Alignment at approximately 1,800m and will connect to the existing SH1 heading south towards Paekakariki. Traffic heading northbound from Paekakariki will be able to join the Main Alignment from a connection at approximately 1,200m.

A subway at approximately 2,000m (Bridge 2) will provide vehicular access across the state highway to three properties. This subway will also provide access across the Main Alignment for pedestrians, cyclists and stock. For the rest of this section heading south, the carriageway will be three lanes in both directions as it rises up the Te Puka Stream valley. At approximately 2,900m there will be an arrestor bed adjacent to the northbound carriageway for any out of control vehicles heading downhill. This section finishes at 3,500m.

7.3.1.2 Section 2: Wainui Saddle

Section 2 starts at approximately 3,500m and will continue climbing for about 2km to the top of the Wainui Saddle at approximately 262m above sea level (at about 5,500m). This will be the highest point of the Main Alignment. Just south of the Wainui Saddle summit (at about 5,600m), there will be a brake check area for both northbound and southbound carriageways. Slightly further south, at approximately 6,000m, three lanes in each direction will be reduced to two lanes in each direction. Section 2 finishes at 6,500m.

7.3.1.3 Section 3: Horokiri Stream

This section is approximately 3km long and extends from the southern end of the Wainui Saddle to the northern end of Battle Hill Farm Forest Park (BHFFP). For the entire length of this section, the Main Alignment will run generally parallel to the Horokiri Stream. From 6,500m to approximately 8,550m the Main Alignment will be to the west of the Horokiri Stream, while from 8,550m to 9,500m it will be to the east of the stream. As the Main Alignment runs parallel to the stream it will cross a number of its minor tributaries which generally run perpendicular to the Horokiri Stream and the Main Alignment.

Over this section, the Main Alignment will cross the Horokiri Stream once, with a bridge at 8,540m (Bridge 4). The section finishes towards the northern boundary of the BHFFP, at approximately 9,500m.

7.3.1.4 Section 4: Battle Hill

This section is approximately 3km long and extends from the northern boundary of the BHFFP to the Pauatahanui Golf Course. Shortly after the Main Alignment enters the BHFFP from the north it crosses over the Horokiri Stream with a bridge at approximately 9,720m (Bridge 6). Over the remainder of this section the Main Alignment will follow the Horokiri Valley floor which widens from north to south through the BHFFP.

Access across the Main Alignment for park users will be provided by a subway located at approximately 10,500m (Bridge 7). This will provide a connection between the eastern and western parts of the park for pedestrians, cyclists and stock. The Main Alignment will continue south from the BHFFP boundary towards the Pauatahanui Golf Course. At about 11,750m it will cross the Horokiri Stream with a bridge (Bridge 8). Access across the Main Alignment will be available underneath this bridge. The section finishes at 12,500m where there will be a subway providing pedestrian and stock access across the Main Alignment (Bridge 10).

7.3.1.5 Section 5: Golf Course

This section is approximately 3km long, and extends from north to south through rural land adjacent to the Pauatahanui Golf Course and Flightys Road. The Main Alignment will cross a number of small tributaries along this section but there will be no major stream crossings requiring bridges. At approximately 14,000m an underpass will provide access across the Main Alignment for two lots to the west of the Main Alignment. In conjunction with this, existing Flightys Road will be extended northwards by approximately 800m, broadly following an existing right-of-way (ROW) off the end of Flightys Road.

This will ensure that access is still available to properties to the east of the Main Alignment that currently use this ROW.

7.3.1.6 Section 6: State Highway 58

This section is approximately 3km long and starts at 15,500m. The SH58 Interchange will be located at approximately 17,500m. At this interchange the Main Alignment will be elevated above a roundabout which will provide access to and from the Main Alignment for traffic travelling in both directions on existing SH58. Immediately south of this interchange, at approximately 17,690m, there will be a bridge (Bridge 15) across the Pauatahanui Stream.

At approximately 18,250m the Main Alignment will widen to provide three lanes in each direction. This section finishes at approximately 18,500m.

7.3.1.7 Section 7: James Cook

This section starts just south of the SH58 Interchange, at approximately 18,500m. Three lanes will be provided for both the northbound and southbound carriageways. The James Cook Interchange will be located at approximately 19,500m. This will be a dumbbell interchange with the Main Alignment being elevated above the local road connections. These roads will provide access to the Main Alignment in both directions to and from the Porirua Link Roads. In the vicinity of this interchange, the number of lanes in each direction on the Main Alignment will be reduced from three to two. This will occur at approximately 18,900m in the northbound carriageway and at approximately 19,500m in the southbound carriageway. From the James Cook Interchange, the Main Alignment will continue southwards for a further 2km. This section finishes at approximately 21,500m.

7.3.1.8 Section 8: Cannons Creek

This section begins at 21,500m and is approximately 3.4km long. Throughout this section the Main Alignment will run along the eastern side of Duck Creek valley, and across an undulating, weathered greywacke plateau between Duck and Cannons Creeks.

There will be four major bridges in this section:

- a 140m long bridge starting at 21,555m, crossing a tributary of Duck Creek (Bridge 17);
- a 150m long bridge starting at 21,860m, crossing a tributary of Duck Creek (Bridge 18);
- a 160m long bridge starting at 22,780m, crossing a tributary of Duck Creek (Bridge 19); and
- a 260m long bridge starting at 23,550m, crossing Cannons Creek (Bridge 20).

These bridges will follow the horizontal alignment of the Main Alignment. This section finishes at 24,900m.

7.3.1.9 Section 9: Linden

This section is approximately 2.8km long. From the start of the section at approximately 24,900m, a third lane will be provided in the northbound carriageway heading uphill.

There will be two bridges:

- a 70m long bridge starting at 25,795m, crossing an unnamed stream that flows into the Onepoto Inlet of the Porirua Harbour (Bridge 21); and
- a 110m long bridge starting at 26,010m, crossing an unnamed stream that flows into the Onepoto Arm of the Porirua Harbour (Bridge 22).

The Kenepuru Interchange will be located at approximately 26,700m. This interchange will involve the Main Alignment being elevated above a roundabout which will connect to the Kenepuru Link Road.

South of the Kenepuru Interchange, the Main Alignment will continue downhill to where it will tie into the existing SH1 along the Tawa straight at Linden. For traffic joining the Main Alignment in a northbound direction, the carriageway will be elevated and will pass over the existing southbound SH1 carriageway. Traffic continuing to Porirua will be able to do so by taking the left lane exit from the existing SH1.

7.3.2 Kenepuru Link Road

The Kenepuru Link Road will provide a connection from the Main Alignment to western Porirua. This link road will provide a connection from the Kenepuru Interchange to Kenepuru Drive and will be approximately 600m long. There will be a roundabout at the intersection with Kenepuru Drive. The Kenepuru Link Road will be a State highway (limited access road) designed to the following standards:

- two lanes (one in each direction);
- design speeds of 50km/hr;
- maximum gradient of 10%;
- limited access only; and
- crawler lane.

The Kenepuru Link Road will run under the existing SH1 (which will be raised slightly) and will be bridged over the NIMT and Porirua Stream (Bridge 28).

7.3.3 Porirua Link Roads

The Porirua Link Roads will connect the Main Alignment to the eastern Porirua suburbs of Whitby and Waitangirua. The Porirua Link Roads will be local roads designed to the following standards:

- two lanes (one in each direction);
- design speeds of 50km/hr;

- maximum gradient of 10%;
- some side access will be permitted;
- provision for cyclists and pedestrians.

The Waitangirua Link Road will be approximately 2.5km long and will run from the western side of the James Cook Interchange to the existing intersection of Niagara Street and Warspite Avenue. This will be a signalised intersection. The Waitangirua Link Road will cross five waterways. The most significant of these will be a crossing of Duck Creek requiring a box culvert (Bridge 29).

The Whitby Link Road will be approximately 900m long and will run from the existing roundabout at the intersection of James Cook Drive and Navigation Drive to the Waitangirua Link Road. The new intersection of the proposed Waitangirua and Whitby Link Roads will be an unsignalised T-intersection with traffic from the Whitby Link Road giving way to Waitangirua Link Road traffic.

7.4 Traffic services

Traffic services include features such as:

- permanent road signs (including variable message signs);
- road lighting;
- road markings; and
- barrier protection.

The traffic services that are to be in place when the Project initially opens to traffic will be considered and finalised during the specimen design phase and will be designed in accordance with the relevant standards at the time the Project is constructed. Throughout the life of the Project, it is anticipated that traffic services will be renewed and upgraded as required, to ensure the continued safe and efficient operation of the State highway.

Design of all road signs and markings will be in accordance with the appropriate versions at the time of:

- the manual of traffic signs and markings (MOTSAM); and
- Land Transport Rule: Traffic Control Devices.

Lighting design for the Main Alignment will comply with AS/NZS 1158:2005 (Standards New Zealand and Standards Australia, 2005) to a V3 category, or whatever equivalent standard applies at the time the Project is constructed. This is the appropriate standard for an expressway with no property accesses and carrying large volumes of traffic at high speeds. Provision has been made for lighting at interchanges and between closely spaced interchanges as follows:

- from MacKays Crossing south to the tie in to the existing SH1 near Paekakariki;
- between SH58 and the James Cook Interchange; and
- between the Kenepuru Interchange and the tie-in to existing SH1 at Linden.

Lighting is not currently proposed for the Porirua Link Roads.

All barrier protection will be designed in accordance with the appropriate versions at the time of the following standards:

- the Transit NZ M/23:2000 Guide for Road Safety Barrier Systems;
- NZS 3114:1987 Concrete Surface Finishes;
- AS/NZS 3845:1999 Road Safety Barrier Systems;
- the NCHRP Report 350 - Recommended Procedures for the Safety and Performance Evaluation of Highway Features (NCHRP 350);
- the State Highway Geometric Design Manual (SHGDM); and
- the Transit NZ Bridge Manual, September 2004 Revision.

7.5 Interchanges

There will be three interchanges on the Main Alignment:

- the SH58 Interchange with existing SH58;
- the James Cook Interchange with the Porirua Link Roads; and
- the Kenepuru Interchange with the Kenepuru Link Road.

For all three new interchanges, the Main Alignment will be elevated above the connecting roads.

7.5.1.1 SH58 Interchange

The SH58 Interchange will be located at approximately 17,500m on the Main Alignment where existing SH58 crosses the Main Alignment. The Main Alignment will be elevated approximately 7m above the new roundabout which will connect to existing SH58 to the east and west of the Main Alignment allowing vehicles to join or exit the Main Alignment in both directions. To the east, a new access road will provide access to five properties and St Joseph's Church. To the west, a new road between the new SH58 Interchange roundabout and the existing SH58 roundabout will be formed. The existing part of SH58 between the new interchange and the existing roundabout will become a cul-de-sac, providing access to two existing residential properties and the Pauatahanui Substation.

7.5.1.2 James Cook Interchange

The James Cook Interchange will be located at approximately 19,500m on the Main Alignment. It will be a dumbbell shaped formation allowing vehicles to join or exit the Main Alignment in both directions. The western side of the dumbbell formation will connect to the Waitangirua Link Road.

The dumbbell formation has been selected because of the lower vehicle operating speeds associated with this formation, as compared to a regular roundabout formation. This lower operating speed is desirable at this interchange because it is situated at the connection between the local road network (with a speed limit of 50km/hr) and the State highway network (with a speed limit of 100km/hr).

7.5.1.3 Kenepuru Interchange

The Kenepuru Interchange will be located at approximately 26,750m on the Main Alignment. The Main Alignment will be elevated over a new roundabout which will connect to the proposed Kenepuru Link Road to the west. Both north and south-bound traffic will be able to join or exit the Main Alignment at this interchange.

7.6 Pavements and surfacing

Final design of the pavement will be undertaken during the detailed design phase of the Project. Design will be based on the Austroads Pavement Design Manual 2004 (Austroads, 2004), its accompanying supplement for light traffic, and the 2007 Transit New Zealand supplement to the Austroads Pavement Design Manual (Transit, 2007) or whatever appropriate relevant standards apply at the time.

This detailed design phase will consider factors such as:

- predicted traffic volumes and proportion of heavy vehicles;
- predicted seal design life;
- the type of pavement being sealed; and
- existing road surface types, where the carriageway connects to the existing road network.

In general terms the pavement design will be based on a flexible granular pavement in a 100km/hr rural road setting. Predicted traffic volumes of up to 25,000 vehicles per day distributed over four traffic lanes indicate that a chipseal type surface is likely to be the most appropriate as the default surface.

There will be areas where chipseal may not be suitable, such as locations where:

- high turning stresses occur on interchange roundabouts; or
- short lengths of different pavement surfaces would provide inconsistent surface friction and surface appearance; or
- to sensibly tie-in with existing surfacing types and maintenance regimes.

Where high stresses are likely to occur from braking and accelerating at interchange roundabouts, it is currently proposed to use a structural asphaltic concrete pavement and surface.

The entire length of the Main Alignment will be surfaced with chipseal, with the exception of the southern end (from 25,300m to the tie-in at Linden) which is likely to be surfaced in open graded porous asphalt (OGPA).

For the three interchanges along the Main Alignment (State Highway 58, James Cook and Kenepuru) the roundabout is currently proposed to be surfaced in stone mastic asphalt while the interchange slip lanes will be chipseal.

The Kenepuru Link Road is currently proposed to be surfaced with OGPA. The first 500m of the Waitangirua Link Road (i.e. closest to the connection with Warspite Avenue) is also currently proposed to be surfaced with OGPA while the remaining length to the connection with the James Cook Interchange will be chipseal. The Whitby Link Road is currently proposed to be surfaced with asphaltic concrete.

7.7 Walkways, cycleways and bridleways

7.7.1 Main Alignment

In accordance with its intending status as a motorway, the Main Alignment will not be able to be used by pedestrians, cyclists or horse riders. Provision for these transport groups has been made where it is practicable. Where the Project is likely to impact on existing tracks, new tracks have been proposed in order to mitigate these effects.

New tracks to mitigate the effects on existing tracks are proposed:

- re-alignment of the Transmission Gully Puketiro loop track at Battle Hill Farm Forest Park to provide access across the Main Alignment (under Bridge 7) to reinstate connectivity;
- a new track along Lanes Flat to provide access across the Pauatahanui Interchange (access will be provided under Bridge 15) to reinstate connectivity and to provide access to Lanes Flat; and
- re-alignment of existing tracks underneath Bridge 19 and the Cannons Creek bridge (Bridge 20) to provide access across the Main Alignment within Belmont Regional Park to reinstate and improve connectivity and to mitigate for effects on the existing registered walkway in Belmont Regional Park.

In other instances the Project has created some opportunities to improve the connection between existing tracks. Where practicable, the NZTA has attempted to realise these opportunities. It should be noted, however, that these improved connections are not required either for the Project itself or as mitigation for the adverse effects of the Project. The NZTA proposes to construct the following tracks which will be available for public use:

- a track connecting Queen Elizabeth Park to BHFFP, running up the Te Puka Stream valley to the Wainui Saddle and down the Horokiri Stream valley to BHFFP;
- north and south bound cycle lanes from Paekakariki (existing SH1) to Queen Elizabeth Park.

The new tracks identified above will use part of the land which is required for the Project. The proposed new and re-aligned tracks are discussed further and shown in the Urban and Landscape Design Framework (**Technical Report 23**).

7.7.1.1 Underpasses providing access for walkers, cyclists and horse riders

Underpasses will be provided at the following locations in order to provide access for walkers, cyclists and horse riders:

- at BHFFP under Bridge 7, as part of the realigned Transmission Gully Puketiro loop track; and
- at the SH58 Interchange, access will be provided under Bridge 15.

7.7.2 Kenepuru Link Road

Pedestrians and cyclists will not be able to use the Kenepuru Link Road as this road will only operate to link vehicles to the Main Alignment. Provision for pedestrians and cyclists will be made, however, at the newly created intersection with Kenepuru Drive, which currently forms part of the regional cycling network. The roundabout at this intersection has been designed to incorporate an underpass to allow safe use by cyclists travelling along Kenepuru Drive and pedestrians crossing Kenepuru Drive.

7.7.3 Porirua Link Roads

As local roads, the Porirua Link Roads will be available for use by pedestrians and cyclists. Cyclists will be able to ride on the road, while footpaths will be provided for pedestrians. This is consistent with the adjoining local road network and the long term intention for the Porirua Link Roads to service residential infill. The intersection of the Waitangirua Link Road with existing Warspite Avenue and Niagara Streets will be signalised with a dedicated pedestrian phase at the crossing. The connection of the Whitby Link Road with existing James Cook and Navigation Drives will be a roundabout with provisions for pedestrian movements.

PCC also has a long term aspiration for a pedestrian and cycle route along Duck Creek into the Belmont Regional Park. This will require a dedicated crossing point along the proposed Waitangirua Link Road to be provided. Provision for an at-grade crossing has been made. The final form of this crossing would be agreed in consultation with key stakeholders and interested parties.

7.8 Permanent access tracks for maintenance activities

Permanent access tracks will be constructed to provide long term access to the State highway. This is required for on-going maintenance of the road, including the maintenance of bridges and culverts. In some locations this track will also provide access to other assets such as electricity transmission lines.

The permanent access track is shown in the plans **AC01-21** but the two proposed track will be:

- a track running parallel to the Main Alignment from the bottom of the Te Puka valley to approximately 12,000m (just south of BHFFP); and
- a track running parallel to the Main Alignment from the James Cook Interchange (at 19,500m) to Takapu Road (approximately 24,250m).

7.9 Cut and fill slopes

The topography of the area means that significant cuts and fills will be needed along most parts of the Project. The form and treatment of these slopes is an important aspect of the Project. Generally throughout the Project:

- cut slopes will generally be between 22° and 35° and will have the first bench at 15m and then benches at 10m intervals thereafter; and
- for steeper cut slopes some form of additional stabilisation measures will be used, such as soil nailing.

The currently anticipated general cut slope configurations are detailed in Table 7.2.

Table 7.2: Cut slope configurations

Location (approximate SV in m)	Cut slopes	
	Slope (°)	Slope form
300 to 2,400m	22	3m wide benches with 15m initial rise and 10m thereafter.
2,400 to 2,850m	40	3m wide benches with 15m initial rise and 10m thereafter.
2,850 to 5,800m	35	3m wide benches with 15m initial rise and 10m thereafter.
5,800 to 8,700m	35	3m wide benches with 15m initial rise and 10m thereafter.
8,700 to 12,500m	25	3m wide benches with 15m initial rise and 10m thereafter.
12,5000 to 17,500m	25 - 35	3m wide benches with 15m initial rise and 10m thereafter.
17,500 to 17,900m	No cut slopes.	
17,900 to 23,300m	35	3m wide benches with 15m initial rise and 10m thereafter.
23,300 to 27,300m	35	3m wide benches with 15m initial rise and 10m thereafter.

Fill slopes are currently proposed to be either:

- 1V: 2H (approximately 25º); or
- 1V: 1H (approximately 45º) with reinforced soil embankments.

All fill faces will be treated and/or vegetated to minimise erosion.

Plans **GM36- 84** show the profile of the proposed cut and fill slopes in cross section.

7.9.1 Cut slopes

An integrated approach of considering cut slope stability, earthquake performance and rock fall management has been used in the design (including type and height), of the cut slopes along the route. Consideration of these approaches has resulted in the development of the cut slope design configurations detailed in Table 7.2.

The standard approach for the Project has been for a 45° (1H: 1V) cut slope with the first bench at 15m and then benching at 10m intervals thereafter for higher slopes. Benches are generally 3m wide. For a cutting of approximately 60m this creates a slope form, like that shown in Figure 7.2.

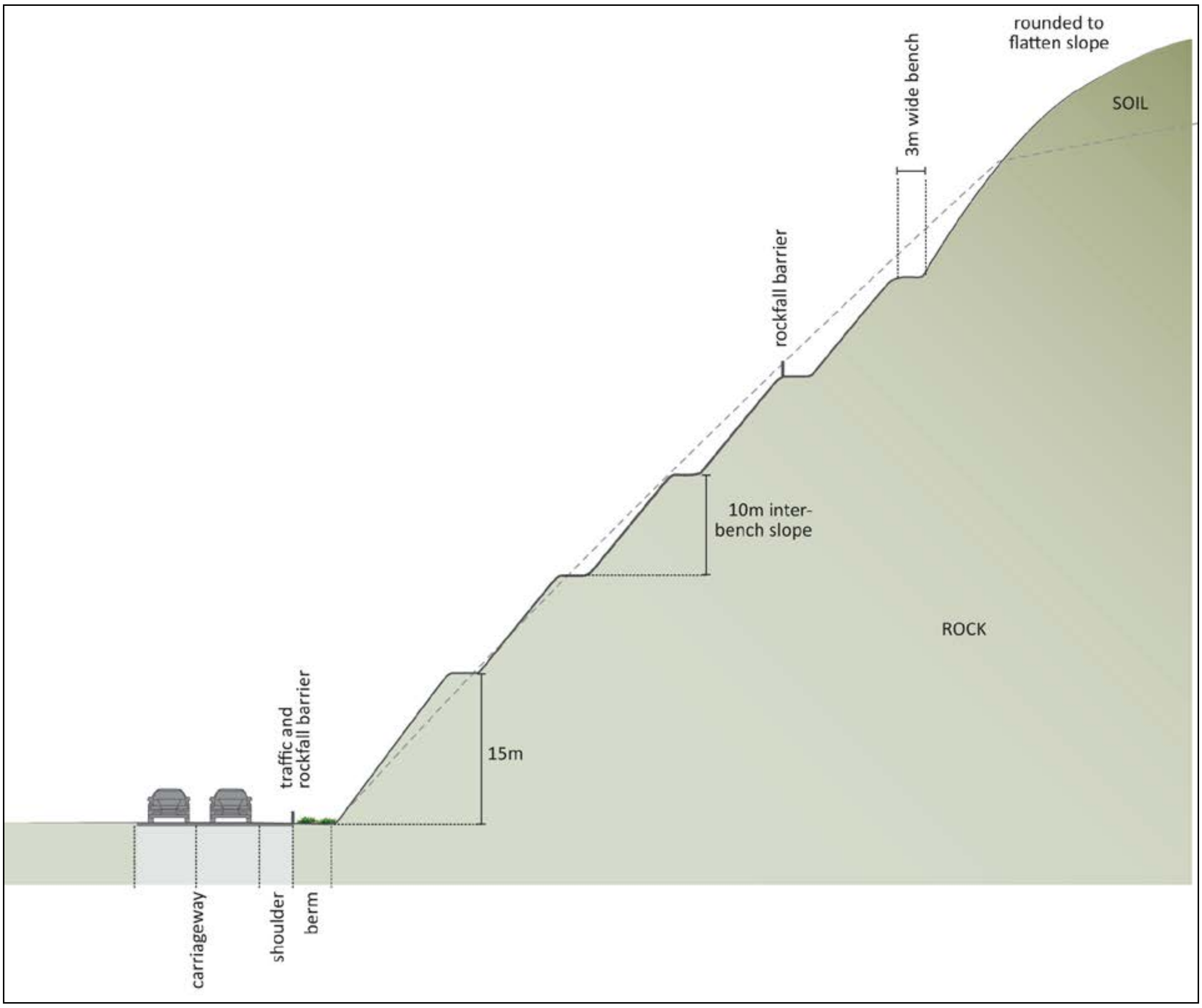

Figure 7.2: Typical form of a benched cut slope

Cut faces will typically be planted with grasses and/or shrubs. Where necessary, rock fall barriers will be installed at the side of the carriageway and/or on benches.

Where steeper cut slopes or additional stabilisation measures are needed, soil nail walls will be used.

7.9.1.1 Soil nail walls

Soil nail walls may be used where additional stabilisation of cut faces is needed. This will generally be in areas where particularly steep cuts are necessary (e.g. for cut slopes of 45 or greater). Soil nails installed into the cut face help to stabilise the face.

Soil nail walls may be needed for some cut faces at the following locations:

- some of the cut slopes in the upper Te Puka valley; and
- the higher (more than 10m) cut faces along parts of Section 3 of the Main Alignment.

7.9.2 Fill slopes

The primary consideration in the design of the fill slopes is the ability to adequately support the carriageway. Most fill slopes are between 22° and 26° with continuous batter slopes (i.e. no benches). For most areas, this form provides adequate structural support for the carriageway and can be planted in grasses and/or scrubs to reduce erosion and improve stability and visual aesthetics.

Where steeper fill slopes are desirable, reinforced soil embankments are likely to be used.

7.9.2.1 Reinforced soil embankments

Reinforced soil embankments (RSE) are proposed to enable fill embankments to be constructed with steeper slopes of 45°. Steeper slopes help to reduce the footprint of fill embankments which reduces the intrusion into streams (and hence the degree of stream realignment required), particularly the Te Puka and Horokiri streams.

RSE will be constructed using a variety of soils from cuttings along the Project. Appropriate fill slopes have been considered based on the performance of precedent slopes in similar soils in the region, and stability analyses. RSE with a face slope not exceeding 45° have been chosen, as they have the ability to be constructed like normal slopes, but incorporating geogrid reinforcement layers (made of high density polyethylene) and without the need for temporary or permanent facing. This will accommodate displacement without significant damage in strong earthquake shaking. This is desirable, given that RSE may be located close to, and in some sections straddling, the Ohariu and associated splinter fault south of the Wainui Saddle. As evident in Figure 7.3, RSE are similar in appearance to standard fill slopes but have increased stability.

Although the Figure 7.3 above is of an unvegetated RSE, all RSE used for the Project will be vegetated with grass and/or low-lying shrubs as significant tree root systems can destabilise the RSE. RSE will be used in the following parts of the Project:

- some of the fill slopes in the upper Te Puka valley; and
- the steeper (45°) fill slopes along parts of Sections 4 and 8 of the Main Alignment.

Figure 7.3: Example of a reinforced soil embankment under construction. Over time the slope face would be expected to re- vegetate

7.10 Bridges

The Project will involve the construction of 29 bridges. Five of the bridges will form part of the interchanges while the remaining 24 are required to take all or part of the carriageway across one or more of the following obstacles:

- existing SH1;
- access roads and local roads;
- streams and gullies; or
- the NIMT railway line.

It is currently considered that six different types of bridges are likely be used for the Project:

- underpass structures;
- pre-stressed concrete hollow core bridges;
- pre-stressed concrete super ‘T’ bridges;

- steel ‘I’ girder bridge;
- post-tensioned box structures; and
- box culverts.

Table 7.3 contains further details about each of these types of bridges, including illustrative examples of existing similar structures. More detailed information about the location and form of all the bridges (including a schedule of bridges) is contained in **Technical Report 2** and the plans **S01- 29**.

Table 7.3: Bridges currently proposed for the Project

Structure type	Description	Illustrative example
Underpass	Underpasses will be used to provide access beneath the Main Alignment for the existing SH1 near the northern tie-in and for access roads and tracks in a number of locations. They will between 6 and 13 metres wide and the walls will generally be made of pre-cast concrete.	
Pre-stressed concrete hollow core bridge	Pre-stressed concrete hollow core bridges are proposed where spans of up to 25m are required. They are a simple bridge form with deck units, which are typically supported on reinforced concrete cap beams founded on bored concrete piles.	

Structure type	Description	Illustrative example
Pre-stressed concrete super 'T' bridges and beam and slab bridge	Pre-stressed concrete super 'T' bridges are proposed where spans of between 25 and 35m are required. And bridge 27 is abeam and slab bridge. Both have a similar form to hollow core bridges but are able to provide greater span lengths.	
Steel 'I' girder bridge	Steel composite bridges are proposed where spans of between 35 and 60m are required. These types of bridges are proposed in a number of locations, particularly where large spans are desirable due to steep topography and/or the need to avoid structures in sensitive waterways.	

Structure type	Description	Illustrative example
Post-tensioned box structure	Post-tensioned box structures are proposed for spans greater than 60m. This is proposed for the bridge over Cannons Creek (Bridge 20).	
Box culvert	A single cell box culvert is proposed for a crossing of Duck Creek by the Waitangirua Link Road (Bridge 29). This crossing requires higher reserves of hydraulic capacity than could be provided by a pipe culvert. It will likely be constructed from in-situ or pre-cast concrete, or a combination of both. It has been designed to allow easy clearing of debris.	

Table 7.4: Schedule of proposed bridges (Schedule B)

Bridge	Location	Obstacle crossed	Bridge type	Special features	Spans	Length (m)	Width (m)
1	1,800m	Main Alignment over existing SH1	Hollow core deck underpass	Integral abutments	1	11.8m	110.4m
2	1,900m	Main Alignment over access road	Hollow core deck underpass	Integral abutments	1	13m	39.75m
3	2,730m	Main Alignment over Te Puka Stream	Steel 'I' girder bridge	Two separate bridge structures. One under northbound and southbound carriageways	N/B and S/B – 2 spans.	N/B 75.6m S/B 59.6m	N/B 13.5m S/B 13.5m
4	8,540m	Main Alignment over Horokiri Stream	Hollow core bridge	Integral abutments	1	27.4m	21.85m
5	9,300m	Main Alignment over access road	Reinforced concrete underpass	-	1	6.9m	27.8m
6	9,720m	Main Alignment over Horokiri Stream	Super 'T' bridge	Integral abutments	1	31.6m	21.80m
7	10,500m	Main Alignment over access road	Reinforced concrete underpass	-	1	5.8m	28.20m
8	11,750m	Main Alignment over Horokiri Stream	Hollow core bridge	Integral abutments & piers	3	67.2m	21.85m
9	N/A	Access road over Horokiri Stream	Hollow core bridge	Integral abutments	1	26m	5.775m
10	12,600m	Main Alignment over access road	Reinforced concrete underpass	-	1	6.9m	34.81m
11	12,840m	Main Alignment over access road	Reinforced concrete underpass	-	1	6.9m	24.8m
12	13,965m	Main Alignment over access road	Reinforced concrete underpass	-	1	6.9m	32m
13	17,400m	Main Alignment over SH58 Interchange	Hollow core bridge	Integral abutments	1	22.2m	21.85m
14	17,520m	Main Alignment over SH58 Interchange	Hollow core bridge	Integral abutments	1	22.2m	21.85m

Bridge	Location	Obstacle crossed	Bridge type	Special features	Spans	Length (m)	Width (m)
15	17,690m	Main Alignment over Pauatahanui Stream	Super 'T' bridge	Integral abutments	3 single span decks	32m	2 @ 10.5m 1 @ 21.80m
16	19,500m	Main Alignment over James Cook Interchange	Super 'T' bridge	Integral abutments	1	27.6m	24.3m
17	21,555m	Main Alignment over Duck Creek	Steel 'I' giver bridge	Base isolated bridge deck	3	142m	21.8m
18	21,860m	Main Alignment over Duck Creek	Steel 'I' giver bridge	Base isolated bridge deck	4	147m	21.8m
19	22,780m	Main Alignment over Duck Creek	Steel 'I' giver bridge	Base isolated bridge deck	4	162m	21.8m
20	23,550m	Main Alignment over Cannons Creek Gully	Post tensioned concrete box bridge	Balanced cantilever bridge form.	3	263.4m x 2 no.	2 x 11m
21	25,795m	Main Alignment over stream and gully	Steel 'I' girder bridge	Two separate bridge structures. One under northbound and southbound carriageways	N/B – 3 spans. S/B – 2 spans	N/B 71.4m S/B 53.4m	N/B 13.5m S/B 11m
22	26,010m	Main Alignment over stream and gully	Steel 'I' girder bridge	Two separate bridge structures. One under northbound and southbound carriageways	N/B – 3 spans. S/B – 3 spans	99.9m N/B & S/B	13.5m N/B & S/B
23	26,660	Main Alignment over Kenepuru Interchange	Hollow core bridge	Integral abutments	1	16m	21.85m
24	26,720m	Main Alignment over Kenepuru Interchange	Hollow core bridge	Integral abutments	1	16m	21.85m
25	27,015m	Main Alignment over existing SH1	Steel box girder bridge	Base isolated bridge deck	3	129m	varies 11m – 16.6m
26	27,510m	Main Alignment over Collins Ave	Hollow core deck underpass	Integral abutments	1	18.6m	36.25m

Bridge	Location	Obstacle crossed	Bridge type	Special features	Spans	Length (m)	Width (m)
27	N/A	Existing SH1 over the Kenepuru Link Road	Pre-stressed beam and slab on pre-cast concrete walls	Day lighting of bridge deck at portals	1	16.7m	123m
28	N/A	Kenepuru Link Road over NIMT railway	Super 'T' bridge	Integral piers.	4	121.5m	13m
29	N/A	Waitangirua Link Road over Duck Creek	Box culvert	-	1	5m	55.7m

7.11 Vertical retaining walls

Mechanically stabilised earth (MSE) walls are currently proposed to be used where vertical retaining walls are needed. These will typically be used for bridge abutments, around interchanges and may be used where walls are needed to support carriageways on steep slopes. The walls comprise metal straps or geotextile grid reinforcement embedded in the fill to provide stability. They are typically faced with patterned concrete panels which provide a more attractive finish, as shown in Figure 7.4.

Figure 7.4: Example of an MSE wall with concrete panel facing

MSE walls are a more attractive and cost-effective solution where vertical walls are required. They are widely used throughout the region's State highway network.

For the Project, they will be used for the following applications:

- the abutments of some bridges;
- around the ramps for all three interchanges and the tie-in to SH1 at Linden; and
- to support a length of the carriageway for the Kenepuru Link Road.

Two other types of retaining walls could also be used in some areas, being:

- continuous bored pile walls; and
- soldier piled walls.

These types of walls could be used where:

- very poor ground is encountered in cuttings requiring particular robust retaining solutions; or
- where top down construction is the constructor's chosen method of bridge construction (possibly around bridges 26 and 27).

7.12 Noise attenuation

Noise barriers are currently proposed in the following areas:

- a 2m high noise bund along the western (northbound) carriageway of the Main Alignment adjacent to the properties at Flightys Road (total length of approximately 378m);
- a 2m high noise barrier along the southern side of the Waitangirua Link Road at the proposed new intersection with Warspite Avenue adjacent to the marae (total length of approximately 150m);
- a 2 – 2.5m high noise barrier along the eastern (southbound) carriageway of the Main Alignment at the Linden tie-in (total length of approximately 532m, not continuous);
- a 2 – 3m high noise barrier along the western (northbound) carriageway of the Main Alignment at the Linden tie-in (total length of approximately 572m, not continuous);
- a 2 - 3m high noise barrier along the eastern (southbound) carriageway of the Main Alignment adjacent to the properties at 37 Apple Terrace - 56A Huanui Street (total length of approximately 151m); and
- a 2m high noise bund along the western (northbound) carriageway of the Main Alignment adjacent to the properties at 86 - 92 Tremewan Street (total length of approximately 100m).

The noise barriers are shown in the plans **GM01-21**. The assessment of noise effects and mitigation options are detailed in Chapter 16 of this report.

7.13 Culverts and erosion control and protection structures

The Project involves 98 permanent culverts for road crossings. Additional crossings by bridges have been detailed in Section 7.10. For most the length of the Main Alignment, the road will run parallel to the main channel of streams. In general, culverts are currently proposed for the small crossing of stream tributaries (which are often ephemeral) while bridges are currently proposed for larger crossings of the main channel of streams.

The design and selection of culvert forms was influenced by a number of factors, including:

- the hydraulic behaviour of the stream;
- Culverts should be capable of conveying the critical duration 10% annual exceedance probability (AEP) rainfall storm event without water rising above the top of the pipe (pipe soffit).
- The road surface level should be at least 500mm above design stormwater levels for a 1% AEP storm event.
- the ecological values of the stream;
- Fish passage should be provided where new culverts will impede the movement of fish.

The design of the culverts has also taken into account likely future development within the catchments and climate change. This will ensure that the culverts will be sized appropriately for their full life. Culverts will predominantly be flush-jointed pre-cast concrete pipes of standard sizing. For culverts handling large flow volumes, alternate designs have been considered.

Table 7.5 outlines the culverts required for the Project and their indicative position is shown in the plans **DR01- 21**. The lengths specified are only the length of the actual culvert itself. Each culvert will include erosion control and protection structures of up to 20m upstream and downstream of each culvert. These structures are described in Section 7.13.2 of this report.

In addition to the culverts required for the crossing of stream by a road, it is proposed to replace eight existing culverts in Duck Creek that current act as barriers to fish passage. The replacement of these existing culverts with countersunk culverts to allow fish passage is part of the proposed ecological mitigation measures (refer to the draft Ecological Management and Monitoring Plan in Volume 5 for further details). These eight existing culverts are labelled as DM (Duck mitigation) on plans **DR16 and DR17**.

Table 7.5: Culverts currently proposed for the Project (Schedule A)

Culvert ID	Location (m)	Length (m)	Diameter (mm) or box culvert dimensions (m)	Type of fish passage required
Wainui Stream catchment				
W1	1,525	155	1,050	Standard design
W2	1,630	109	1,050	Standard design
W3	2,100	96	Two 3m (W) x 2.5m (H) box culverts	Standard design
W4	2,250	95	900	Standard design
Te Puka Stream catchment				
T3	3,075	91	1,050	None
T4	3,300	69	600	New design
T5	3,475	56	1,050	None
T6	3,725	58	600	None
T7	3,900	72	900	None
T8	4,025	85	1,050	None

Culvert ID	Location (m)	Length (m)	Diameter (mm) or box culvert dimensions (m)	Type of fish passage required
T9	4,300	85	1,050	None
T10	4,475	93	1,200	Standard design
T15	4,575	84	600	None
T11	4,775	80	600	None
T12	4,875	65	1,050	None
T13	5,025	58	1,050	None
T14	5,200	245	900	None
Horokiri Stream catchment				
H2	5,375	266	1,050	Standard design
H3	5,650	51	1,050	New design
H4	5,825	72	1,050	New design
H5	5,930	69	750	None
H6A	6,075	61	600	None
H6B	6,150	54	600	None
H7	6,275	84	1,350	Standard design
H8	6,400	73	600	None
H9	6,575	57	900	None
H10	6,625	58	600	None
H11	6,675	80	750	None
H12	6,850	64	900	None
H13	7,050	72	900	None
H14	7,250	93	600	None
H15	7,400	96	1,200	New design
H16	7,675	68	1,200	New design
H17	8,000	64	900	None
H18	8,150	44	1,050	New design
H19	8,375	51	900	New design
H21A	8,850	50	1,200	None
H22	9,000	45	900	None
H23	9,150	33	600	None
H24	9,325	64	3m (W) x 2.5m (H) box culvert	Standard design
H26	9,925	52	600	None
H27	10,175	74	600	None
H29	10,550	66	900	None
H30	10,750	74	600	None
H31	10,800	74	600	None
H32	11,125	73	600	None
H33	11,250	63	900	None
H34	12,025	41	600	None
H35	12,125	49	900	None
H36	12,200	96	900	None
H37	12,400	81	750	None

Culvert ID	Location (m)	Length (m)	Diameter (mm) or box culvert dimensions (m)	Type of fish passage required
Ration Stream catchment				
R2	13,000	33	750	None
R3	13,100	89	1,050	Standard design
R4	13,250	50	600	None
R5	13,400	113	600	None
R6	13,450	86	600	None
R7	13,550	136	3,000	Standard design
R8	13,900	74	1,600	Standard design
R9	13,950	72	750	None
R10	14,775	125	2,100	Standard design
R10A	14,650	110	600	None
R11	15,075	133	1,200	None
R12	15,350	126	600	None
R13	15,600	109	1,200	Standard design
R14	15,800	153	900	None
Collins Stream catchment				
C1	16,125	88	750	None
Pauatahanui Stream catchment				
Pa1	16,625	107	1,200	None
Pa2	16,875	81	1,200	Standard design
Pa3	17,000	55	600	None
Pa4	17,175	63	600	None
Pa5	17,350	128	600	None
Pa6	17,475	40	1,050	Standard design
Pa6A	17,475	40	1,050	None
Pa8	18,225	52	1,200	None
Pa9	18,450	78	600	None
Duck Creek catchment				
D1	19,950	195	600	None
D2	20,100	141	600	None
D3	20,200	128	600	None
D4	20,375	113	600	None
D5	20,525	74	600	None
D6	20,600	154	600	None
D7	20,650	164	1,600	Standard design
D8	21,000	119	1,050	New design
D9	21,225	167	1,200	New design
D10	21,425	109	1,050	None
D13	22,450	62	600	None
D14	22,700	76	1,350	Standard design
D16	23,050	49	600	None
D17	19,550	62	600	None

Culvert ID	Location (m)	Length (m)	Diameter (mm) or box culvert dimensions (m)	Type of fish passage required
Duck Creek catchment (for the Porirua Link Roads)				
D19	Porirua Link Roads	45	600	None
D20	Porirua Link Roads	70	600	None
D21	Porirua Link Roads	46	600	None
D22	Porirua Link Roads	63	600	None
D23	Porirua Link Roads	91	900	None
D24	Porirua Link Roads	95	750	None
D25	Porirua Link Roads	48	600	None
D26	Porirua Link Roads	44	600	None
Duck Creek catchment (existing perched culverts to be replaced to provide fish passage)[68]				
DM1	N/A	10	Replace as existing	Standard design
DM2	N/A	10	Replace as existing	Standard design
DM3	N/A	10	Replace as existing	Standard design
DM4	N/A	10	Replace as existing	Standard design
DM5	N/A	10	Replace as existing	Standard design
DM6	N/A	15	Replace as existing	Standard design
DM7	N/A	15	Replace as existing	Standard design
DM8	N/A	12	Replace as existing	Standard design
Kenepuru Stream catchment				
K2	24,475	39	600	None
K3	24,625	82	600	None
K4	24,700	53	600	None
K5	24,850	72	900	None
K6	24,875	67	600	None
K7	25,100	83	975	None
K8	25,200	49	600	None
K9	25,325	54	1,200	New design
Porirua Stream catchment				
Po2	26,200	73	600	None
Po3	26,325	84	825	None
Po4	26,425	115	900	None
Po5	26,775	149	1,200	None
Po6	27,000	140	975	None

7.13.1 Providing fish passage

Of the culverts for the crossing of a stream by the road, 27 have been identified as requiring fish passage[69]. Fish passage has been determined on the basis of the need to mitigate potential adverse

68. As part of the freshwater mitigation measures it is proposed to replace eight existing perched culverts in the Duck Creek with culverts allowing fish passage. Refer to Chapter 22 of this report and **Technical Report 11** for further details.

69. This number of 27 does not include the replacement of the eight perched culverts in Duck Creek which are considered separately.

effects on freshwater ecology (as detailed in Chapter 22 of this report). For stream crossings not involving structures in the streambed, (i.e. all the bridges except the box culverts), it has been assumed that fish passage will not be affected.

Two methods of providing fish passage are proposed at this stage, depending on culvert and catchment characteristics. The most common design solution for culverts requiring fish passage is to bury the culvert pipe to maintain a constant wetted base. In this situation culverts have been oversized to allow for burial of the inverts up to 300mm (listed as '*standard design*' in Table 7.5). Where this has not been appropriate due to ecological or topographical factors, an alternative fish passage solution will need to be considered (listed as '*new design*' in Table 7.5).

7.13.2 Erosion control and protection structures

Erosion control and protection structures are structures located upstream and downstream of culverts. They are designed to ensure the on-going functioning of culverts by reducing the likelihood of debris blockages and/or erosion of the stream beds.

7.13.2.1 Inlet debris structures

Culvert inlets are susceptible to blockage from debris carried by water flowing down stream channels. Avoiding blockage of the culvert entrance is critical to maintaining the flow capacity of the structure. This will be achieved by creating a debris screen and stilling basin immediately upstream of the inlet structure by excavating the existing stream channel. The stilling basin will slow the velocity of the water in the channel allowing some of the suspended debris that passes through the screen to fall out of suspension before entering the culvert barrel. The stilling basins have been designed for ease of construction and to provide smooth hydraulic transitions. Standard pre-cast wingwall structures at the culvert inlet will also perform this function by directing flow into the culvert barrel.

A coarse debris screen will be installed upstream of the stilling basin. The coarse debris screen will be made up of a series of solid stakes driven into the stream bed. These stakes will be spaced so that debris large enough to block the culvert barrel will be stopped at the screen. The screen will be placed at an angle of 120 degrees to the direction of flow so that floating debris will be driven to one side of the channel by the force of the flow, allowing the other side to remain clear and able to accommodate the full flow.

Both the debris screens and stilling basins will need to be regularly maintained to ensure long term effectiveness. Both will need to be periodically cleared of accumulated debris so that the system does not become so full of debris that it fails.

7.13.2.2 Outlet structures

Excessive outlet velocities can result in significant erosion of stream channels and sizeable scour holes immediately downstream of culverts. To protect downstream channels and reduce water velocity immediately downstream of each culvert, erosion control structures will be installed. In most cases these will be either:

- a rip rap stilling basin and apron; or
- a baffle apron.

Both of these options can be equally effective at controlling culvert outlet velocity. Baffle aprons are a highly engineered structure and generally require a smaller footprint than a rip rap stilling basin with apron. A rip rap stilling basin provides a resting place for migrating fish and has a more natural appearance. For these reasons a rip rap stilling basin is the preferred option where fish passage is required.

The location and preliminary design details of all culverts are detailed in the maps and drawings contained in plans **DR01- 21**. Further information about the design and performance of culverts is also contained in **Technical Report 14**.

7.14 Permanent stream realignment

The Project requires a number of permanent stream realignment. For the purposes of this description of the Project, stream realignment is classified as a diversion of a surface water body not exclusively associated with the crossing of a stream (either by bridge or culvert). This is consistent with the term in the Regional Freshwater Plan[70]. Once water is diverted into the newly created stream channel, the old stream bed can be reclaimed. Stream realignment is typically required to avoid fill embankments.

The permanent stream realignments proposed are:

- realignment of parts of the upper Te Puka Stream to the east through the Te Puka Stream valley;
- realignment of parts of the upper Horokiri Stream to the east through the upper Horokiri Stream valley;
- realignment of parts of the lower Horokiri Stream to the west through the lower Horokiri Stream valley;
- realignment of parts of the Ration Stream to the east;
- realignment of parts of the Pauatahanui Stream to the east and to the west, approximately 500m north of Lanes Flat;
- realignment of the Pauatahanui Stream to the north through Lanes Flat;
- realignment of part of the Pauatahanui Stream to the east, immediately south of Lanes Flat;
- minor realignment of small sections of the Kenepuru Stream; and
- realignment of the Porirua Stream to the southeast around the Kenepuru Interchange and Kenepuru Link Road area.

In total, approximately 6.6km of stream will be realigned, as detailed in Table 7.6.

70. E.g. Rule 47 of the RFP allows for the temporary diversion of water associated with the placement and use of a river crossing. While the stream crossings required for the Project are being applied for under Rule 49, the temporary diversion of water provided for in Rule 47 is still applicable.

Table 7.6: Proposed permanent stream realignment

Catchment	Total length of stream realigned (m)
Wainui Stream	91
Te Puka Stream	1,867
Horokiri Stream	1,013
Ration Stream	896
Pauatahanui Stream	1,829
Duck Creek	221
Kenepuru Stream	169
Porirua Stream	474
TOTAL	**6,560**

The plans **DR01- 21** show the location and form of proposed stream realignments.

7.15 Operational drainage and stormwater treatment

This section contains a description of the drainage and stormwater treatment currently proposed for the on-going operation of the Project. Drainage and stormwater treatment (i.e. erosion and sediment control) needed for the construction of the Project is described in Chapter 8 of this report.

The operational drainage and stormwater treatment design for the Project has been driven by two key requirements:

- ensuring that stormwater does not inhibit the safe and effective operation of the Project; and
- ensuring that the potential adverse environmental effects associated with stormwater are mitigated.

7.15.1 Drainage

Adequate pavement drainage is fundamental to the satisfactory performance of the road pavements. Subsoil drains will be used, where required, to ensure that pavements can drain effectively. A minimum subsoil drainage depth of 1.5m will be provided.

The proposed stormwater collection and conveyance system will be designed so that no more than 4mm of water depth occurs across the traffic lanes for a 5% annual exceedance probability event, 10 minutes duration storm event. Stormwater will be collected and conveyed to catchpits. From these, stormwater will be conveyed to the treatment devices.

7.15.2 Stormwater treatment

The stormwater treatment currently proposed for the Project aims to avoid adverse effects on water bodies and has been guided by the following publications:

- the Regional Freshwater Plan for the Wellington Region (1999);

- the NZTA's Draft Stormwater Treatment Standard for State Highway Infrastructure (2010); and
- Auckland Regional Council's Stormwater Treatment Devices: Design Guidelines Manual (2003) (known as TP10).

The target standard considered as acceptable for long term treatment of stormwater from the Project has been set at removal of 75% of total suspended solids (TSS). This level of removal is considered best practice within existing standards and is known to remove the great proportion of heavy metal solids.

The proposed stormwater treatment system will use two main treatment methods:

- wetlands; and
- proprietary treatment devices.

7.15.2.1 Wetlands

Constructed wetlands are highly effective treatment systems and are capable of removing 77% of influent TSS as well as significant quantities of dissolved heavy metals such as copper, zinc and phosphorous. Wetlands are also capable of providing flow attenuation, flood protection, public amenity and habitat for aquatic life and wildlife. For these reasons, wetlands are the preferred treatment option, where practicable. One of the main requirements for wetlands is sufficient space. The steep nature of many areas has prevented the more widespread use of wetlands throughout the Project.

Five specific areas along the Main Alignment are considered appropriate for wetlands. These areas are detailed in Table 7.7 and marked on the plans **DR01- 21**.

Table 7.7: Proposed wetlands

Wetland #	Location	Approximate location	Length of the Main Alignment treated	Approximate size of wetland (m^2)
1	MacKays Crossing - Te Puka	940m	0m to 2,100m	1,980
2	Horokiri Valley	7,550m	5,550m to 7,550m	1,920
3	Battle Hill Farm Forest Park	10,200m	8,600m to 10,200m	1,650
4	Horokiri Valley south	11,200m	10,200m to 11,800m	1,980
5	SH58 Interchange	17,500m	15,600m to 17,700m	1,650

The areas currently proposed for wetlands will provide stormwater treatment for approximately 34% of the length of the Main Alignment.

7.15.2.2 Proprietary treatment devices

Proprietary treatment devices have few site constraints and can therefore be used in almost any area of the Project. They will be used wherever stormwater treatment via wetlands is not possible. The steep topography of much of the Project area prevents the use of wetlands. Accordingly, proprietary devices are proposed to be used for a significant proportion of the Project.

In total, 26 proprietary treatment devices are proposed along most of the length of the Main Alignment. The proposed location of the devices is shown in the plans contained in **Appendix 15.U** of **Technical Report 15.** The devices have been proposed adjacent to culverts or bridges so that treated runoff from the device can be efficiently discharged into natural waterways. The devices are also located at the low-point of every sub-catchment to ensure that all runoff is captured and treated.

7.16 Landscaping

Considerable landscaping will be undertaken as part of the Project. It will serve a number of purposes, including:

- helping to integrate the Project into the landscape;
- assisting to mitigate the visual and landscape effects of the Project;
- assisting to mitigate the ecological and stormwater effects of the Project; and
- helping to stabilise batter slopes and reduce erosion and sediment runoff.

The specific landscaping measures proposed are detailed Chapter 25 of this report and shown in the plans **LA01- 21**. Broadly, the following roadside landscaping is proposed:

- amenity planting on the cut and fill faces around MacKays Crossing;
- revegetation of the cut and fill faces through the Te Puka Stream valley, Wainui Saddle, Horokiri Stream valley and Battle Hill;
- a mixture of revegetation and grassing of the cut and fill faces though the golf course section to the SH58 Interchange;
- amenity and ecological planting around the SH58 Interchange;
- a kanuka corridor from the SH58 Interchange to just south of the James Cook Interchange;
- amenity planting around the James Cook Interchange;
- a mixture of revegetation and grassing of the cut and fill faces from the James Cook Interchange to the Kenepuru Interchange;
- amenity planting around the Kenepuru Interchange and the Kenepuru Link Road;
- revegetation of the cut and fill faces along the Whitby Link Road; and
- revegetation of the cut and fill faces of the upper half of the Waitangirua Link Road and grassing of the cut and fill faces of the lower half of the Waitangirua Link Road.

Additional landscaping is also proposed for other areas, such as stream restoration and surplus fill sites.

8. Construction of the Project

Overview

Construction of the Project has the potential to cause adverse environmental effects. Some indicative information about key construction activities is provided in this chapter as a basis for the assessment of environmental effects (Part G of this report).

Enabling works will involve works to the existing electricity transmission lines (undertaken as part of the Transpower Project) and the formation of construction access tracks and site compounds. The main site compound will be located next to the proposed SH58 Interchange and will be accessed directly from SH58. This will contain a concrete batching plant.

Construction will be staged with a number of crews working simultaneously on different fronts. It is expected that there will be up to 12 earthworks crews and eight bridge crews working during peak construction. Comprehensive erosion and sediment control measures will be used for all earthworks and for works in and around streams. Construction will involve approximately 6.3 Million (M) m^3 of cut material and approximately 5.8 Million (M) m^3 of fill material. Potential disposal sites for surplus fill have been identified.

Construction of the Project is expected to take approximately six years. Construction will cause minimal disruption to the existing State highway network with works only needed on the highway for the northern and southern tie-ins of the Main Alignment and around SH58 at Pauatahanui.

8.1 Introduction

This chapter contains some high level information about the proposed construction of the Project. The purpose of this information is to provide a basis for the assessment of the environmental effects as part of the consenting process under the RMA. The commencement of works for the Project is not scheduled for a number of years after consenting and many specific details about construction have yet to be determined. Outline plans will be sought with the applicable territorial authorities prior to commencement of construction.

Construction of the Project will be influenced by a number of factors, including:

- the specimen design of the Project which will occur once consents have been obtained;
- the construction duration, and target completion date;
- the procurement method adopted; and
- technological advances.

The information provided in this chapter should be treated as being indicative only and is intended to provide sufficient detail on the proposed construction activities to assess their potential environmental effects and to identify any necessary measures to avoid, remedy or mitigate those effects, where appropriate.

It is recognised that once the contract for the Project has been awarded and a contractor (or contractors) are in place, the construction methodology will be further refined and developed. This will be undertaken within the scope of the conditions which will be in place to manage the environmental effects of the construction activities. Should a contractor wish to undertake construction activities in a manner which is not authorised by the consents held, appropriate authorisations would need to be obtained at that time.

In order to assess the environmental effects associated with the construction of the Project, this chapter contains a description of the following aspects:

- enabling works (Section 8.2);
- site compounds (Section 8.3);
- materials required for construction (Section 8.4);
- water requirements for construction (Section 8.5);
- construction programme (Section 8.6);
- erosion and sediment control measures (Section 8.7);
- works in streams (including diversions) (Section 8.8);
- earthworks (Section 8.9);
- bridges (Section 8.10);
- protection and/or relocation of existing network utilities (Section 8.11); and
- works in existing State highways (Section 8.12).

8.2 Enabling works

Prior to the commencement of construction of the Project, it is proposed that some early enabling works will be undertaken, namely:

- re-alignment of sections of the existing electricity transmission line; and
- creation of some construction access tracks.

Enabling works will require some soil disturbance and vegetation clearance (including felling of plantation forestry). This will be undertaken in accordance with the erosion and sediment control and earthworks principles described further below.

8.2.1 Re- alignment of existing electricity transmission lines

Relocation and strengthening of parts of the existing electricity transmission lines in the Project area will take approximately 12 months and will be undertaken as part of the enabling work before construction of the Project starts. Details of this activity are provided in Transpower's applications (Volume 6) and the proposed re-aligned transmission line is shown in plans **TR01- 12**. It is expected that there will be some efficiencies with Transpower's contractors being able to work with the NZTA's contractors (where appropriate) to coordinate some activities, such as the construction of access tracks and earthworks, and to ensure that they are placed in locations that suit both parties.

8.2.2 Construction access tracks

Access tracks for construction will be needed in a number of locations. The proposed access tracks will be:

The indicative location of proposed construction access tracks is shown in the general layout plans contained in plans **AC01- 21**.

- an existing forestry track off Ribbonwood Terrace (Ranui Heights), providing access to the area where the Kenepuru Interchange will be constructed;
- a new track off Rangatira Street, providing access to the southern tie-in;
- a new track off existing SH1 at Linden, providing access to the southern tie-in;
- an existing access track of Takapu Road, providing access to the Cannons Creek bridge (Bridge 20);
- an existing access track from Takapu Road through the Belmont Regional Park;
- an existing forestry track off Pacific View, providing access to the area where the James Cook Interchange will be constructed;
- a new track off Bradey Road, providing access to the Main Alignment corridor;
- a new track off Flighty Road, providing access to the Main Alignment corridor;
- a new track off Paekakariki Hill Road, providing access to site compound 3;
- an existing track off existing SH1 at MacKays Crossing connecting to an existing access track running up the Te Puka valley; and
- an existing access track from the Te Puka valley through to Battle Hill.

8.2.2.1 Culverts and fords for construction access tracks

The construction access track will requires 61 temporary culverts, as shown on plans **AC01–21** and listed in Table 8.1. Temporary culverts have been sized for a Q2 event and will be approximately 10m long (4m of road width with 3m either side for road build up). Where fish passage is required the culvert pipe will be countersunk by 300mm. In one instance (TC4), it is likely that an alternative design to allow for fish passage will need to be considered.

Table 8.1: Proposed temporary culverts for construction access (Schedule C)

Temporary culvert ID	Diameter (mm)	Fish passage required?
TC1	3060	Yes
TC2	600	No
TC3	600	No
TC4	750	Alternative design
TC5	600	No
TC6	2550	Yes
TC7	2550	Yes
TC8	750	No
TC9	2300	Yes
TC10	1500	Yes
TC11	1950	Yes
TC12	900	No
TC13	900	Yes
TC14	1500	Yes
TC15	1650	Yes
TC16	1200	Yes
TC17	1950	Yes
TC18	1050	No
TC19	2300	Yes
TC20	600	No
TC21	2300	Yes
TC22	2300	Yes
TC23	2300	Yes
TC24	2300	Yes
TC25	2300	Yes
TC26	600	No
TC27	600	No
TC28	2550	Yes
TC29	3060	Yes
TC30	600	No
TC31	1950	Yes
TC32	3060	Yes
TC33	600	No
TC34	600	No
TC35	3000*2800	Yes
TC36	1200	Yes
TC37	750	Yes

Temporary culvert ID	Diameter (mm)	Fish passage required?
TC38	600	Yes
TC39	1500	Yes
TC40	1500	Yes
TC41	1800	Yes
TC42	600	No
TC43	600	No
TC44	1050	Yes
TC45	600	No
TC46	600	No
TC47	600	No
TC48	900	No
TC49	750	No
TC50	3060	Yes
TC51	600	No
TC52	600	No
TC53	600	No
TC54	600	No
TC55	600	No
TC56	600	No
TC57	750	Yes
TC58	1350	Yes
TC59	600	No
TC60	600	No
TC61	750	No

Some of these crossings will be new while others will be an upgrade of existing fords or culverts. It is necessary to upgrade some of the existing crossings to keep vehicles out of the stream channel and the unsuitably of some existing culverts for heavy vehicles.

8.3 Site compounds

The main site compound (Site compound 1) is proposed to be located at Lanes Flat (immediately next to the area to be occupied by the Pauatahanui Interchange). This is the most suitable location for the main site compound because:

- is already owned by the Crown;
- a sufficient area of flat land is available, for both site requirements but also treatment and mitigation of effects;
- it can be accessed directly from the existing State highway network (SH58); and
- it is located towards the middle of the Project area.

The main site compound will contain features commonly associated with construction facilities, including:

- temporary site buildings;
- material laydown areas;
- workers' office and workshop accommodation;
- plant and equipment maintenance facilities;
- fuel storage and refuelling facilities
- wheel washing and cleaning facilities
- car parking; and
- plant and equipment storage areas.

An indicative layout for the main site compound is shown in Figure 8.1.

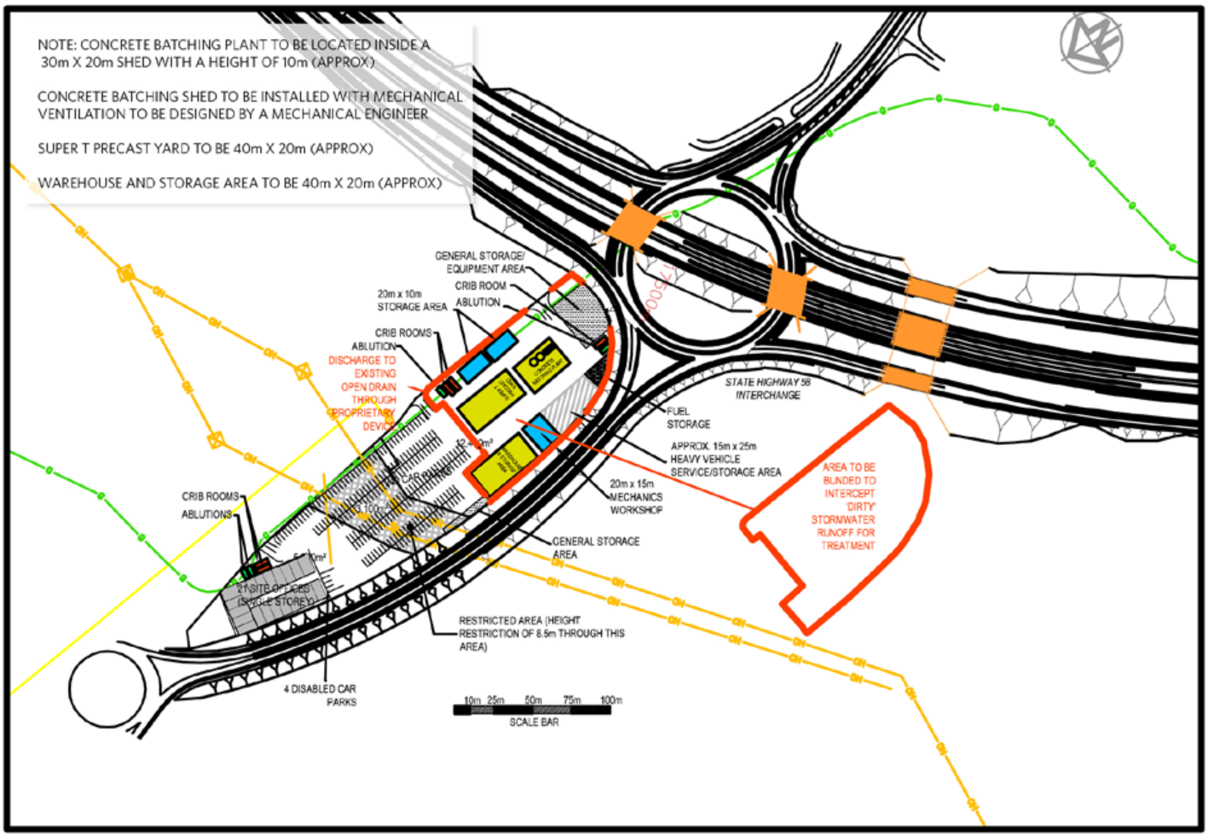

Figure 8.1: Indicative main site compound layout

The eastern-most part of the site compound will contain a concrete batching plant, described further below. In addition to the main site compound, three indicative satellite site compound locations have been identified at:

- approximately 8,500m on the Main Alignment, to the north of BHFFP;

- approximately 11,500m on the Main Alignment, accessed from Paekakariki Hill Road; and
- approximately 27,000m on the Main Alignment, accessed from Little Collins Street.

These will be smaller than the main compound, but will contain similar features. These sites will not contain concrete batching plants but, where appropriate, may contain a mobile rock crushing plant (subject to meeting relevant noise and vibration standards in the CNVMP).

8.3.1 Concrete batching plant

The southern-most part of the Lanes Flat yard will contain a concrete batching plant, with raw materials storage areas and associated pre-cast concrete construction yard and loading areas. Key components are:

- a temporary concrete batching plant unit comprising hoppers, aggregate storage bins, a cement silo, conveyors and a concrete mixing drum;
- aggregate storage bunkers (with covers for fine material);
- a water tank or tanks; and
- precast concrete construction yard – where concrete components are cast, stressed and stored before loading and transporting onto the construction site proper.

The site will have a single designated “dirty” area, comprising the concrete batching plant and the concrete truck access, delivery and loading area. The second area is the surrounding pre-cast construction yard which has its own stormwater controls. The concrete batching plants and the concrete truck access, delivery and loading areas will be located on concrete pads which will drain to the holding tanks described below. The perimeter of the concrete pad will be bunded with a mountable kerb to contain dirty water. The site may also operate a concrete truck wash-out area which will also drain to the tanks.

All runoff from the “dirty” areas of the concrete batching plant will drain to holding tanks. The runoff and washdown water is expected to have high pH and high sediment loads. The tanks will have multiple stages to allow any sediment to settle out in the first stage, and then chemical treatment to reduce pH to suitable levels for discharge if required. The tanks will have the capacity to store a Q10 storm event and will also be used as the main water supply for the concrete batching plant. In the event that a storm event larger than Q10 occurs, the tank will discharged to the treatment device or devices for additional treatment before discharging into the receiving environment. The on-site stormwater treatment device will be designed to Q10. In an event greater than Q10, stormwater will be diluted and discharged through a proprietary device overland or to an open drain.

The remainder of the concrete batching plant activities comprise cast concrete and aggregate storage areas which will be located within the yard area. The water from the yard areas drain to a combination of stormwater treatment devices and/or swales which will be designed to provide treatment before discharging to the receiving environment. The yard area will have bunding around the concrete batching plant, as shown in Figure 8.1.

8.4 Materials required for construction

All of the fill material required for the Project will be sourced from cuts undertaken as part of the Project. As such, no importation of fill material will be needed. A mobile rock crusher will be used throughout the construction site to crush cut material as needed.

Some of the aggregate required for concrete manufacturing (to be undertaken at site compound 1) will be sourced from the other quarries in the region and will be delivered to the concrete batching plant directly from SH58. Steel required for structural components will be manufactured off-site.

All other common components of a State highway will be manufactured off-site and transported in as required, including:

- surfacing materials (including bitumen);
- road furniture; and
- stormwater treatment and erosion and sediment control devices.

8.5 Water requirements for construction

Water will be required for a number of construction activities, including:

- dust suppression;
- general earthworks; and
- concrete production.

The peak water demand (typically full scale construction occurring during the summer months) has been estimated at 1.2 million litres per day. The volume of water required will be reduced during periods of wet weather.

This water needs to be readily available across the construction site. It is considered that storage at a maximum of 4km intervals would be desirable. There are various options to obtain the water required. It has been determined that some water may be able to be abstracted from within the construction site. Additional options include drawing water from existing bulk water supply and transporting water to the site.

The successful contractor will be required to obtain sufficient water supply for construction of the Project. At this stage it is not desirable to confine the contractor to a particular source. If their chosen source required additional resource consents, they will be required to obtain these from GWRC

Although the construction water source has not been determined, the assessment of construction traffic (Chapter 13) and construction noise (Chapter 16) has been undertaken on the basis of all water being transported to the site. From a construction traffic and noise perspective this represents the most conservative case and the worst case scenario. If a contractor did choose to source water locally, any resource consents required would be applied for.

8.6 Construction programme

A preliminary construction programme has been developed to inform the AEE. Construction is expected to take approximately six years and to be undertaken on three fronts, with construction on all fronts starting towards the end of 2015. These fronts are detailed in Table 8.2.

Table 8.2: Potential construction fronts

Front[71]	Location	Station value
1	SH58 to Cannons Creek	16,830m to 23,600m
2	MacKays Crossing to SH58	0m to 16,830m
3	Cannons Creek to Linden	23,600m to 27,700m

The indicative construction programme includes construction of the main components of the Project, namely:

- enabling works;
- earthworks;
- bridges;
- interchanges;
- works on existing State highways; and
- pavements.

This programme has been prepared on the assumption that there will be a reduction in available working hours over winter due to poor weather. The programme also assumes that there will be up to 12 earthworks crews and eight bridging crews working simultaneously at any one time across the Project.

A key driver for the programme has been the consideration of the movement of material around the Project (i.e. approximately 6.3Mm^3 of cut material and approximately 5.8Mm^3 of fill material). The final mass-haul approach to be used will be determined by the contractor but in general terms, the mass-haul distances will be minimised to increase efficiency.

8.7 Erosion and sediment control

The scale of the Project means that a large area of land will be disturbed. Land disturbance refers to the removal of vegetation and/or earth (i.e. soil and/or rock). An overriding principle for the Project has been to minimise the land disturbance required in order to restrict sediment entering streams and in turn, the Pauatahanui Inlet.

This has significant implications for erosion and sediment control requirements. The key erosion and sediment control principle has been to minimise the area and length of time that particular areas of

71. The numbering of front does not necessarily indicate a particular construction sequence.

ground are open. In general, the extent of open areas in any one catchment will be restricted and will be stabilised as soon as practicable.

8.7.1 Site preparation

Prior to any land disturbance, erosion and sediment control measures will be implemented. This will involve one or more of the following approaches:

- installation of perimeter controls (predominantly earth bunds and drains) to:
- divert clean runoff away from the land disturbance area;
- divert sediment laden runoff to the sediment retention devices;
- installation of sediment control devices, being:
- sediment retention ponds, or alternative sediment control devices;
- decanting earth bunds (where there is insufficient space to use ponds);
- sediment fences; or
- silt socks.

The installation of erosion and sediment control measures will be staged in co-ordination with earthworks, with site preparation measures being installed progressively, in advance of land disturbance activities. This is critical to reducing sediment generation.

8.7.2 Sediment control devices

Plans **DR01-21** show the currently proposed location of the various sediment control measures and these are also discussed in Appendix E of the draft CEMP (Volume 5). The size, type and locations of sediment control measures shown on the plans should be treated as indicative only.

8.7.2.1 Sediment retention ponds

Sediment retention ponds operate by withholding sediment laden runoff which causes the sediment to fall out of suspension. The number, sizing and location of sediment retention ponds will be relative to the size and slope of the catchments. Where higher sediment loads are expected (typically in larger catchments and/or on steeper slopes) the effectiveness of ponds will be increased through the addition of a chemical flocculation agent. This causes sediment to bind together and hence fall out of suspension.

In total, approximately 300 sediment retention ponds are proposed throughout the construction phase of the Project. Generally ponds will be formed from bunded earth, but where topographical constraints prevent this, other methods, such as the use of shipping containers, may be employed. The sediment pond size, type and locations as illustrated on the plans show the expected extent of earthworks associated with the assessed pond size. Not all of the ponds will be required or in operation at the same time. Some ponds may be replaced with alternative treatment devices, such as those discussed below.

8.7.2.2 Decanting earth bunds

A decanting earth bund is a temporary berm or ridge of compacted soil constructed to create impoundment areas where ponding of runoff can occur and suspended material can settle before runoff is discharged. They are smaller than sediment retention ponds and can therefore be used where insufficient space exists for ponds. They will be used in a variety of locations in the Project but most commonly at the end of benches to capture runoff from the large benched cuts.

8.7.2.3 Sediment fences

Sediment fences will be used in areas where sediment retention devices (i.e. ponds and earth bunds) are not able to be used. This will typically be on particularly steep slopes. The fences are semi permeable, meaning water is gradually discharged but the majority of sediment is retained. They will be installed down slope of land disturbance areas to capture runoff.

8.7.2.4 Silt socks

Silt socks are used in a similar way to sediment fences but can also be pinned to steep slopes and chemically dosed to provide additional effectiveness. They also allow access to site more conveniently than sediment fences.

8.7.3 Site stabilisation

An essential aspect of the erosion and sediment control measures will be the stabilisation of disturbed land as soon as practicable. In some areas techniques such as top soiling and seeding will be adequate, but in many areas (particularly on steep faces) geotextile, mulching and hydroseeding will be required. Some areas are likely to require stabilisation on multiple occasions throughout the construction period.

8.7.4 Temporary stormwater management

Works in and around urban areas will need to ensure that runoff from the Project construction site does not contaminate the existing stormwater system. This is a potential risk for the works in eastern Porirua and around Linden and Tawa.

The erosion and sediment control measures detailed in section 8.7 will be utilised, but additional bunding and/or diversions may be required to ensure stormwater systems are not contaminated. Where works require the relocation of stormwater pipes, this will be undertaken to ensure that uncontrolled runoff is not able to enter the stormwater network.

8.8 Works in streams

8.8.1 Stream realignment

Where the permanent diversion of streams is required, new channels will be formed to as naturalised state as possible. To the extent possible, new channels will replicate the form and morphology of existing natural channels. The following factors will be considered when forming new channels:

- the composition of the stream bed (material type and particle size);
- the hydraulic characteristics of the channel (including its gradient and flow capacity);
- whether fish passage needs to be provided; and
- the existing riparian vegetation and any proposed new riparian planting to be provided.

8.8.2 Culverts and erosion control and protection structures

Installation of culverts and associated erosion control and protection structures will require the temporary diversion of streams in most instances. Diversion channels will be stabilised using geotextile liner prior to water being diverted. Water will be discharged back into the natural channel downstream of the works.

Culverts and erosion control and protection structures will then be installed in the dry stream bed as quickly as possible. Temporary erosion and sediment control methods (as detailed in section 8.7) will be used around the works to limit sediment runoff into the stream. Once all the in channel works have been completed water will be diverted back to its natural channel.

The area used for temporary diversions will be stabilised as quickly as possible.

8.9 Earthworks

The Project will involve large volumes of earthworks. It will generate approximately 6.3Mm^3 of excavated (cut) material and will require approximately 5.8Mm^3 of material to be placed for fill embankments. As such, an excess of approximately 510,000m^3 of cleanfill will be created.

8.9.1 Cut slopes

As discussed in Chapter 7, cut slopes will be up to 70m in height and 3m wide benches with an initial vertical rise of 15m and 10m thereafter are likely to be used. Material will be excavated mechanically from cut faces and will be stockpiled or loaded directly onto trucks to be transported for use elsewhere on the Project.

This will be a challenging aspect of construction for the largest of the proposed cut slopes. Figure 8.2 provides an indication of how access to the top of the cut slopes will be gained using temporary haul roads across the cut face of up to a 15° gradient.

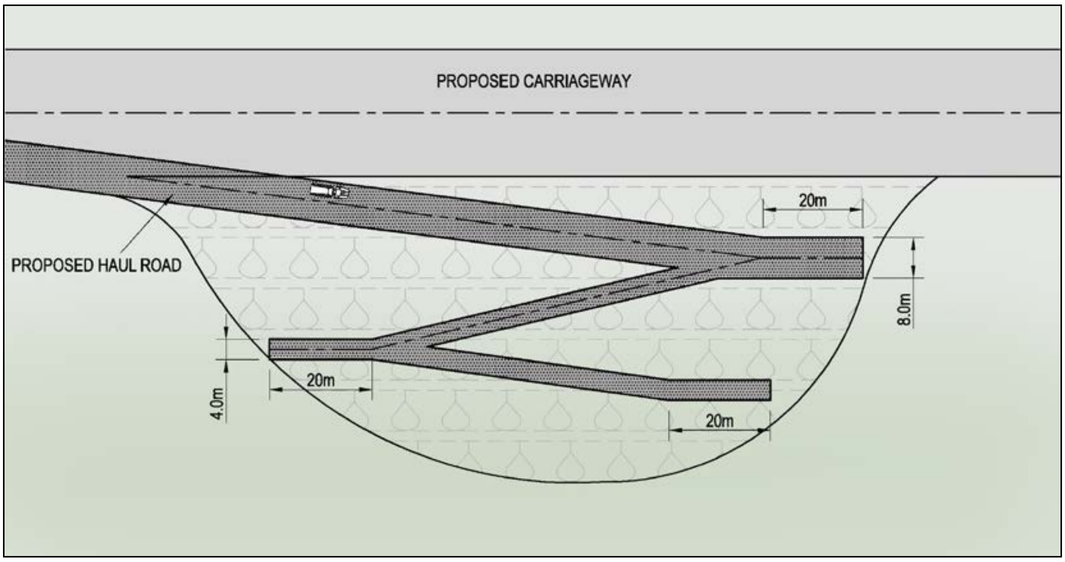

Figure 8.2: Indicative haul road configuration for large cut slopes

Figure 8.3 indicates how material from the upper slope faces will be deposited on lower benches before being loaded onto trucks.

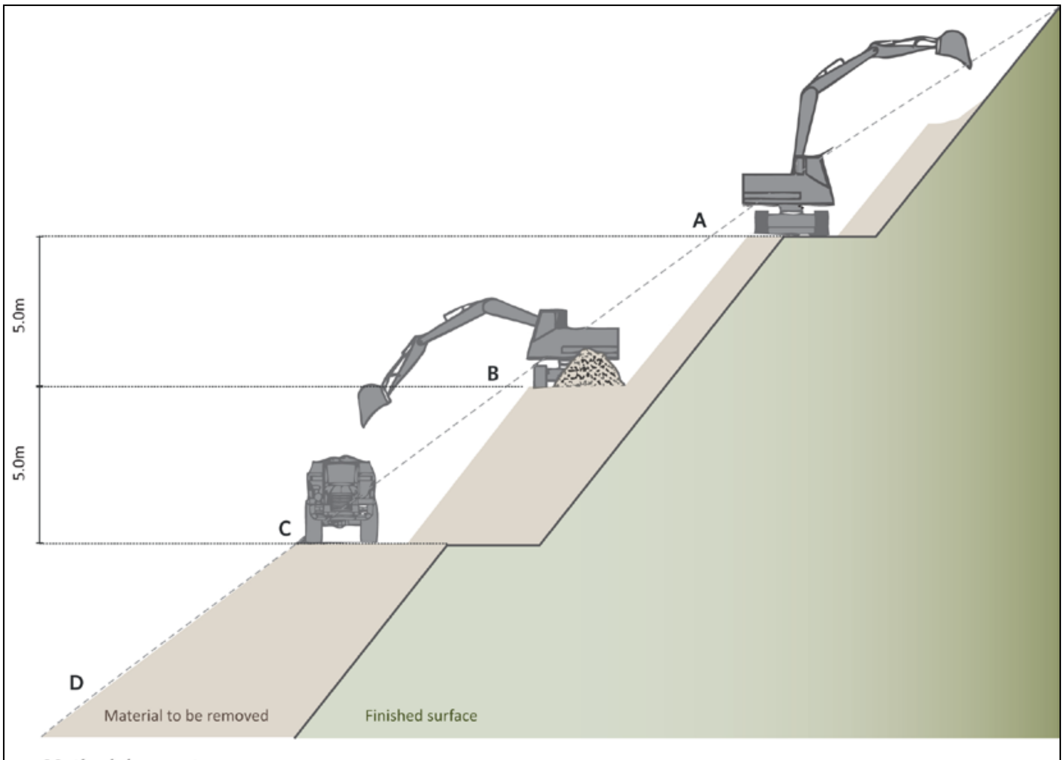

Figure 8.3: Indicative excavation method for cut slopes

8.9.2 Fill embankments

The fill embankment slopes will be formed primarily from materials sourced from cuttings in greywacke rock. Along the route, some older alluvium (silt and gravel) deposits and overburden / completely weathered rock materials are also expected to be suitable for fill embankments. Where the local silty gravels are used for fills, an allowance has be made for treating or drying of the materials and for the provision of drainage layers formed from the rockfill in the deeper cuts.

8.9.3 Disposal of surplus cleanfill

Construction of the Project will generate approximately 510,000m³ of surplus cleanfill material. A number of possible fill disposal sites have been identified as shown in the plans **GM01- 21**. Selection of the potential fill disposal sites involved a range of technical disciplines including road design, structural design, hydrology, ecology and landscape and visual.

In total, six potential fill sites have been identified:

- the upper Duck Creek valley, between 23,000m and 23,500m (plan **GM18**);
- close to the Takapu Road Substation, at approximately 24,250m (plan **GM18**); and
- four sites in the vicinity of the proposed Kenepuru Interchange (plan **GM20**).

These site are all located towards the southern end of the Project which is where these is surplus of material. This means that haulage distances can be reduced. There is more than enough capacity within these sites to accommodate the currently identified volume of surplus fill although the NZTA may also chose to use some of the fill for one or more of their other projects in the region. Selection of volumes for each site will occur as part of the specimen design as part of the overall Project design. The following general principles will be applied:

- Disposal sites should be developed at locations and in such a way that they do not create a hazard to the road, landowners or the environment, either through potential slope failure and/or widespread erosion following heavy rainfall.
- Disposal sites need to be founded on competent ground to avoid failures, though settlement may be accommodated by appropriate design.
- Disposal sites should incorporate good drainage.
- Earthworks and compaction control is important to ensure that disposal sites are stable.
- Unsuitable and wet materials disposed need to be contained behind bunds.
- Disposal areas will be landscaped and vegetated as part of the overall landscaping plan for the Project. This will minimise erosion and assist in integrating the sites into the existing landscape.

The four sites around the Kenepuru Interchange contain existing streams, most of which are ephemeral. Subsoil drains will be aligned at the base of these fill sites. Following completion of works water will either drain around the edge of the fill area or across the surface[72].

8.10 Bridges

The construction of the bridges will be a significant part of the Project. Where possible, bridge components will be pre-cast at the main site compound. Where required, bored piles will be cast in-situ.

Where works in and around streams are required, erosion and sediment control measures (as described in section 8.7) will be employed.

A key aspect of the construction of some of the largest bridges will be gaining access. This will be a particular challenge where bridges span steep gullies. In some cases access will be available to the bottom of gullies using existing tracks. Where this type of access is not available, new tracks will be formed from the top of the gully.

Where such new access is required, erosion and sediment control measures will be employed to protect any streams at the bottom of gullies. These access tracks will only be required for construction of the bridges and accordingly, will be removed once construction is complete. This will involve the contouring and stabilisation of the slopes, including revegetation, where appropriate.

8.11 Protection and/or relocation of existing network utilities

As described in Chapter 6, there are a number of existing network utilities within the Project area. Protection and/or relocation of existing utilities will be an important aspect of the Project's construction.

Protection and/or relocation of existing utilities (with the exception of the previously discussed electricity transmission lines) will generally occur in conjunction with the Project's construction, as it is more efficient to undertake both sets of works at the same time. In virtually all instances, NZTA's contractors will need to work closely with the relevant network utilities owner's contractor to undertaken the necessary protection and/or relocation works. This process will be undertaken in accordance with the network utilities management plan (NUMP) which is proposed as a condition of the designations. Further details about this process are provided in Chapter 15 of this report.

8.12 Works to existing State highways

Construction of the Project will mostly be able to occur without requiring works to the existing State highway network. The exception to this is at the proposed SH58 Interchange and at the southern tie-in with SH1 at Linden.

At the northern tie-in at MacKays Crossing there will be very minimal works to existing SH1.

72. The installation of subsoil drains in these four sites is applied for as part of the reclamation of Kenepuru Stream and its tributaries (as part of application RC 11).

At the SH58 Interchange, a section of approximately 200m of SH58 (between the exiting roundabout and the proposed new interchange) will be realigned to the south. Part of the existing road alignment will be retained to provide ongoing access to the Pauatahanui Substation and a small number of properties.

At Linden, a length of approximately 300m of existing SH1 will be raised by up to 6m to provide adequate clearance for the proposed Kenepuru Link Road, which will pass under the existing State highway. This raised section will also be realigned slightly to improve its horizontal alignment.

The management of State highway traffic during construction is discussed in Chapter 13 and the Construction Traffic Management Plan. Overall, there will be minimal disruption to the existing State highway network.

PART E: CONSIDERATION OF ALTERNATIVES

9. Assessment of alternatives

Overview

A consideration of alternatives in required in two contexts for the Project; in relation to the NoRs and in relation to some aspects of the activities for which resource consent is sought.

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

During the more recent E&EA phase, further design refinements have been made. Relatively minor alignment changes have resulted in avoiding the loss of some features, such as a significant area of native bush through the Wainui Saddle and a heritage feature at the bottom of the Te Puka valley.

9.1 Introduction

This chapter provides a summary of the key aspects of alternatives considered in the development of the Project.

Section 9.3 outlines the design and option evaluation process undertaken through phases 1 and 2 of the Project. Phase 1 involved the consideration of key road alignment alternatives, while Phase 2 involved the refinement of this alignment to arrive at the preferred alignment identified (i.e. the road alignment for which designations and resource consents are being sought).

Although this chapter provides a summary of alternatives considered, a number of the topic chapters in Part G also discuss particular options and alternatives in relation to environmental effects.

9.2 Scope and purpose of assessment

As stated in Chapter 3, a consideration of alternatives is required for two reasons:

- Firstly, in relation to the NoRs, particular regard must be had to whether there has been adequate consideration of alternative sites, routes and methods of undertaking the work; and

- Secondly, the Fourth Schedule requires possible alternative locations or methods for undertaking the activity to be described where it is likely that an activity will result in any significant adverse effect on the environment.

With respect to section 171(1)(b), neither the NZTA nor PCC have an interest in all of the land needed for their respective projects. As of July 2011, the Crown owns approximately 49% of the land required for the NZTA Project and PCC owns approximately 0.6% of the land required for the PCC Project. As such, a consideration of alternative sites, route and methods must be undertaken.

The alternatives to be considered by the NZTA are those that are within its powers (i.e. the purpose for which it is approved as a requiring authority) and will assist in undertaking 'the work' (as stated in the NZTA's objectives for its project). The alternatives to be considered by the PCC are those that are within its powers (under the Local Government Acts) and will assist it to undertake 'the work' (as stated in the PCC's objectives for its project).

In respect of the resource consents, Schedule 4 to the RMA requires alternative locations or methods of undertaking an activity to be described where it is likely that an activity will result in any significant adverse effects. Section 105 also requires decision makers considering applications for discharge permits to have regard to "*any possible alternative methods of discharge, including discharge into any other receiving environment*". These resource consent alternatives are constrained by the project for which designations are sought. That is, it is not appropriate to consider alternatives that will not enable the work for which a designation is sought to the undertaken. For example, it would not be appropriate to describe alternative locations for undertaking diversion activities if the NZTA could not also notify a requirement for a designation to authorise other aspects of the project in that alternative location. In this sense, the alternatives to be considered in relation to both the designations and resource consents must align.

9.2.1 NZTA Project

The NZTA has been approved as a requiring authority:

> *"for its particular network utility operation being the construction and operation (including the maintenance, improvement, enhancement, expansion, realignment and alteration) of any State highway or motorway, pursuant to the [Transit New Zealand Act 1989]."*[73]

73. Resource Management (Approval of Transit New Zealand as Requiring Authority) Notice 1994, notified in the Gazette on 3 March 1994. Under clause 29 of Schedule 2 of the Land Transport Management Amendment Act 2008, the NZTA replaced Transit New Zealand as the requiring authority approved under this Gazette Notice. Under section 47(1)(c) of the Land Transport Management Amendment Act 2008, from1 July 2008 the Transit New Zealand Act 1989 is to be called the Government Roading Powers Act 1989.

As such, the following options are not alternatives to be considered in relation to the NZTA Project:

- an upgrade of existing SH1 between Linden and MacKays Crossing (as this would not achieve one of the NZTA Project's objectives which is to provide an alternative strategic link for Wellington); or
- improvements in public transport between Wellington City and the Kapiti Coast (as the provision of public transport is not within the scope of NZTA's requiring authority approval). As discussed in Chapter 2, the Project itself is part of the Western Corridor Plan which involves a package of transport measures along the Western Corridor, including substantial improvement to public transport along this corridor.

9.2.2 PCC Project

PCC (as a local authority) is a requiring authority under section 166 of the RMA. PCC is constrained in its consideration of alternatives by its functions and powers under the LGA. This includes having particular regard to the contribution that network infrastructure (which includes roads) makes to its community[74].

PCC's objectives for the PCC Project are focused on maximising the benefits of the NZTA Project to the Porirua community.

9.3 Option evaluation and design process (Phases 1 and 2)

As discussed in Chapter 2, following the Western Corridor Study and the inclusion of an Inland Route for SH1 between Linden and MacKays Crossing in the WCP and the RLTS by GWRC, the NZTA (then Transit NZ) commenced investigations for a State highway within the Inland Corridor. This has involved two stages of investigation:

- scheme assessment (Phase 1); and
- engineering and environmental assessment (E&EA) (Phase 2).

The scheme assessment was focused on fundamental road alignment options, while the E&EA phase involved refinements to the design based on environmental and engineering considerations.

Two key terms are used throughout this chapter in relation to various alignment options considered:

- 'In-Designation Alignment' refers to a road alignment contained within the existing designations[75]; and
- 'Unconstrained Alignment' refers to a road alignment unconstrained by the existing designations.

74. Sections 11A and 197 of the LGA.

75. The In-Designation Alignment consists of the following designations: D0103 in the KCDP; TNZ4 in the UHCP; K0405 and K0406 [Kenepuru Link Road] in the PCDP; and H5 in the WCDP.

The In-Designation Alignment effectively formed the starting point at the beginning of the Phase 1 investigations. It also provides a useful reference point, indicating where key design changes have been made along the route.

The process and key decisions made in identifying the Preferred Alignment are set out. This covers:

- key alignment decisions made during the scheme assessment (Phase 1); and
- minor refinements to the alignment made during the preliminary design (Phase 2).

The options evaluation and design process is shown generally in Figure 9.1.

The aim of the scheme assessment phase was to identify the preferred road alignments within the Inland Corridor. It was decided early on that in order to identify the best possible alignment, alignment options should not limited by the existing designations.

Identification of the optimal design involved a process of option development, evaluation and refinement. This process involved experienced road and bridge designers who worked in conjunction with traffic engineers, planning, environmental and geotechnical specialists to identify options, which were subsequently assessed in workshops attended by experts in relevant fields. Workable options were then carried forward and developed as the amount and level of information has increased.

For the option alignment process, the Main Alignment corridor was divided into nine sections, as previously set out[76]. Section divisions were determined largely on the basis of "pinch points" (e.g. at Wainui Saddle), changes in topography and where connections with the existing road network are proposed. Sections were selected such that any alignment option identified in one section could be connected to any other option in the neighbouring section.

Option identification workshops

Option identification involved a series of workshops attended by experts from the Project team, and representing a range of disciplines. These disciplines included road design, bridge design, planning, environment, landscape, traffic engineering, geotechnical, and cost estimating. All participants attended a pre-workshop drive-over of the Inland Corridor.

Alignment options were devised for each of the nine route sections in turn. The workshops identified potential options that appeared to offer benefits over the In-Designation Alignment. Initially, the team sketched possible options on contoured plans. The options considered to have merit were then modelled using MX Roads to superimpose earthworks designs on aerial photographs.

Each identified option was recorded in a register, and given a unique identifier and a description. The status of each option was also recorded, i.e. options failing to meet the Project objectives were given a closed status, options perceived as having merit were assigned a Tier 1 status, while inferior options were rated as Tier 2.

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76. For the road alignment evaluation during the scheme assessment phase, the Kenepuru Link Road was included as part of Section 9 (Linden).

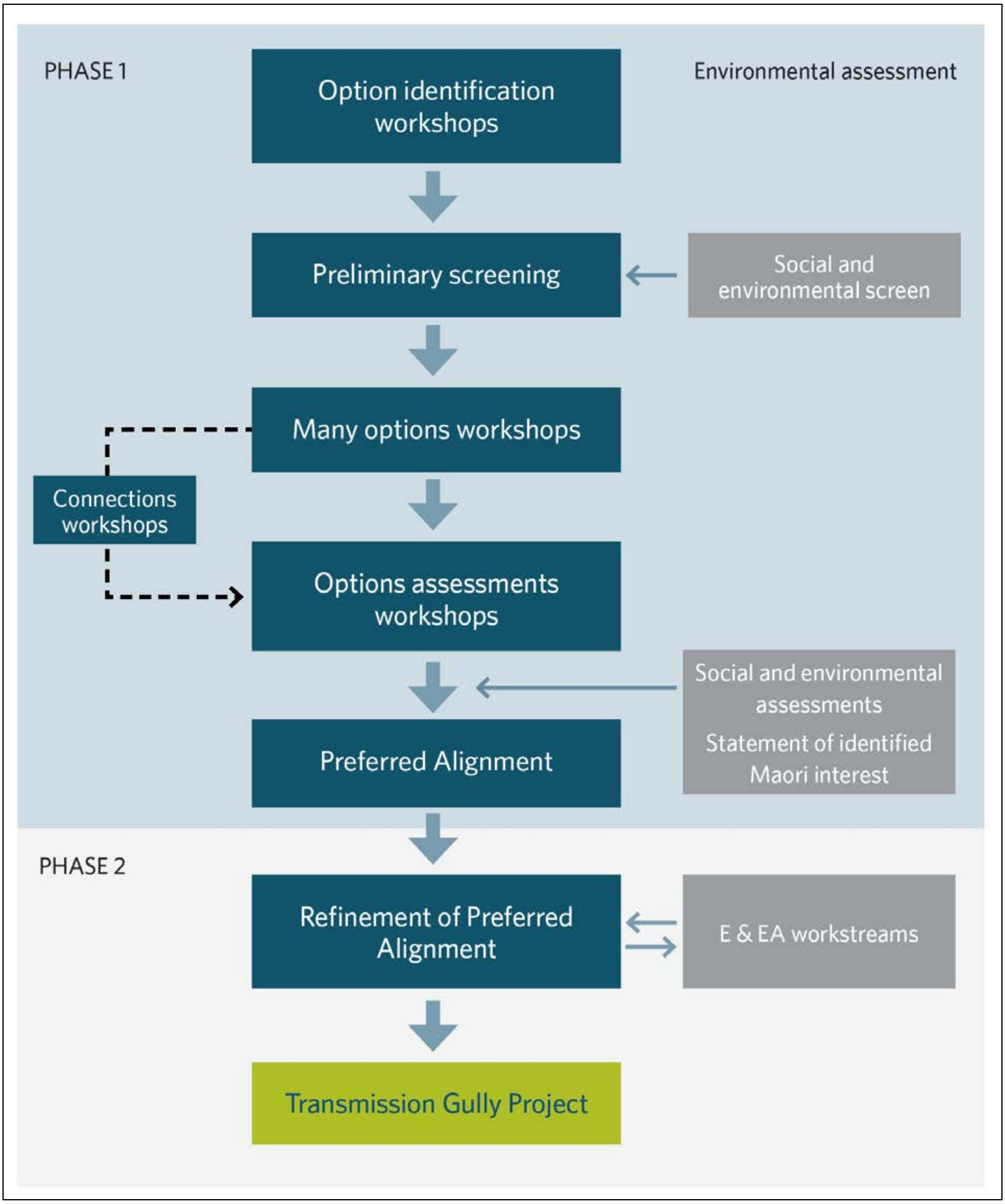

Figure 9.1: Road alignment evaluation process

Preliminary screening

Preliminary screening of alignment options was carried out in a number of workshops attended by experts from the Project team. The preliminary screening process helped to identify any non-viable options, and to provide an initial understanding of the opportunities and constraints of the various design alternatives.

Each option was initially tested against two aspects:

- Does the option contribute to the Project objectives?
- Does the alternative have any fatal flaws?

This step considered the feasibility of gaining consents for an option, and whether it could be constructed within known financial, geotechnical, ecological, cultural, and legal constraints. It was assumed there were no fatal flaws where none were known.

Every option that passed these two tests was then evaluated within respect to the criteria listed in Table 9.1.

Table 9.1: Evaluation criteria for the preliminary screening

Objective	Description
Network security	The extent to which the alternative is expected to be limited in traffic capacity due to a partial or full road closure, for example as a result of a slip during a storm event.
Safety	The likely crash rate for the alternative
Capacity	The level of service provided by the alternative, i.e. congestion related effects.
User benefits	Predicted variation in tangible benefits in EEM terms, i.e. travel time and vehicle operating cost effects.
Property effects	Predicted variation in property severance and property acquisition.
Cost	Predicted cost differential including risk for the alternative
Freight movement	The likely variation in the use of the route by heavy commercial vehicles.
Coastal route	The split in traffic between inland and the coastal routes.
Environmental / social	The likely environmental and social impact of the alternative. This includes but is not limited to ecological, stormwater, noise, visual landscape, urban design, community accessibility, social severance, and cultural or heritage issues.
Adjacent effects	Predicted benefit or disbenefit the alternative will have on neighbouring areas.

Options within each section were ranked according to their potential benefits. This allowed those options with the greatest potential to be investigated first.

In total, the initial option identification and screening process identified 34 different viable options in the 9 Project sections. This number excludes variations in forms of intersections which were considered at a subsequent connections workshop.

Many options workshop

A 'Many options workshop' was held in October 2007[77]. Its primary purpose was to corroborate the outcomes of the option identification and preliminary screening processes. The objective was not to decide which options to take forward, or discard, but to identify the information required to enable robust decisions to be made on these issues during subsequent phases of the Project. Workshop participants were asked to:

- agree on the preliminary screening of each option;
- agree the ranking of the options within each section; and
- identify work required for each option.

Alignments were ranked by workshop participants in order of greatest merit.

Connections workshop

Identifying where and how the Main Alignment and the Kenepuru Link Road should connect with the existing road network formed the next stage of the options identification and development process. A connections workshop was held on 24 October 2007 to review these issues. A wide range of options had been identified prior to the workshop, including such details as interchange form and initial cost estimates. Traffic assessments had also been prepared for connections at the following locations:

- SH1 at MacKays Crossing and Paekakariki;
- SH58 at Pauatahanui;
- James Cook Drive and/or Waitangirua;
- Warspite Avenue;
- Kenepuru Drive; and
- SH1 at Linden.

At the workshop the range of intersection arrangements for each connection were considered. Workshop participants were provided with relative costs and an initial assessment of traffic benefits for each concept.

77. This workshop was attended by NZTA staff and consultants from a variety of engineering and environmental disciplines.

Options assessment workshop

An options assessment workshop was held in March 2008[78]. The purpose of the workshop was to identify and agree on two optimal alignment options from MacKays Crossing to Linden, based on the data developed by the Project team.

The workshop process involved splitting attendees into groups, with each group assigned specific sections of the Project to assess. Groups selected their favoured 'In-Designation' route option, and their preferred option unconstrained by the designation, for each section.

Each of the options was assessed with respect to five key criteria:

- cost;
- network flexibility;
- physical environmental impacts;
- social environmental impacts, and
- timeliness.

Each group then presented their options to the larger workshop for final discussion and agreement. Having selected route options within each section, it was a relatively simple matter to arrive at the "In-Designation Alignment" and the "Un-constrained Alignment" by combining the preferred options for each section.

At the end of Phase 1, the Preferred (Un-constrained) Alignment was taken forward to Phase 2.

9.4 Summary of key options selected during Phase 1

This section describes some of the key alignment decisions made during Phase 1. Although the evaluation of alignment options was not constrained by the existing designation, the existing designation does still provide a useful reference in areas where fundamental changes to the road alignment were made. The alignment options selected in the following key areas are described:

- at MacKays Crossing;
- the Te Puka Stream valley;
- the Horokiri Stream valley;
- through Battle Hill; and
- potential interchange locations for local road connections to eastern Porirua.

78. This workshop ran for three days and was attended by staff from the Transit NZ, Land Transport NZ, GWRC, KCDC, UHCC, HCC, PCC, WCC and selected consultants from a variety of engineering and environmental disciplines.

9.4.1 MacKays Crossing

There were a number of issued considered for alignment options for the northern tie-in at MacKays Crossing. These included:

- potential effects on the nearby wetlands;
- potential effects on adjacent properties ;
- the landslip area and the Ohariu fault, to the east of existing SH1;
- electricity transmission lines and a local electricity substation;
- connections to existing SH1; and
- using as much as possible of the recently upgraded MacKays Crossing Interchange.

Quite a different tie-in option to the designated Alignment was selected to avoid impacts on the wetland and avoid the hazard posed by the landslip area and fault line. The alignment provides a good connection (in terms of road geometry) to the existing MacKays Crossing Interchange.

9.4.2 Te Puka Stream valley

The In-Designation Alignment ran down the eastern side of the Te Puka Stream valley. The alignment was shifted to the western side of the valley for a number of reasons including:

- The previously designated route generally followed the Ohariu Fault at the northern end and crossed the Ohariu Fault twice, on structures, and had considerable lengths of viaducts down the eastern, forested flanks of the Te Puka stream.
- Allowing lower cut heights than the alternative earthworks options previously considered.
- By following the flatter western slopes the risk of landslide debris material coming down over the State highway is reduced.
- With fewer structures the risk of debris build-up and scour damage as a result of a major rainfall event was reduced.
- The adverse ecological effects on the indigenous forest can be largely avoided.
- It allows a series of escape ramps and an arrestor bed to be constructed on the long, steep descent from Wainui Saddle to Paekakariki, providing the ability for an out-of-control vehicle to stop safely.

Technical Report 3 provides further details about the consideration of geotechnical factors in the design of the Project through Te Puka Stream valley.

9.4.3 Horokiri Stream valley

South of the Wainui Saddle, down the Horikiri Stream valley the Designated Alignment ran down the eastern side of the Te Puka Stream valley. The alignment was shifted to the western side of the valley to minimise degree of stream modification required and provide for greater use of bridges (as opposed to culverts) for a number of stream crossings, which has ecological benefits.

9.4.4 Battle Hill

The In-Designation Alignment is elevated approximately 20m above the Horokiri Valley floor through the Battle Hill Farm Forest Park and would have involved removal of vegetation on the eastern flanks. The alignment was shifted to the west onto the valley floor for a number of reasons including:

- The existing designation cuts across the ends of a number of ridges, and relatively steep sided greywacke slopes, and across the eastern tributaries of the Horokiri.
- The large cut faces needed to construct the highway as currently designated would be visible from a much greater area of the park including the main buildings associated with the Park, and from the Paekakariki hill road.
- Significantly less risk of sediment entering the Horokiri stream as a result of construction activities.
- Increased space available to implement erosion and sediment control measures.
- Reduced direct noise effects.
- Construction would be considerably simpler with fewer structures and less earthworks reducing the cost and time to construct this section.

Of these, the ecological and environmental improved outcomes were seen as the most significant advantage of moving the alignment.

9.4.5 Connections into eastern Porirua

The In-Designation Alignment included two interchanges, the Warspite Interchange which would have provided for a local road connection to Waitangirua, and a separate connection into James Cook Drive.

Based on the evaluation at the connections workshop it was considered that combining the two interchanges, and providing a new interchange at its current proposed location (north of the original James Cook Drive connection) would allow improved access to both Waitangirua (the Waitangirua Link Road) and Whitby (the Whitby Link Road). This change had the combined advantages of completely eliminating a proposed interchange from within Belmont Regional Park, and better aligning with the desire for travel from eastern Porirua (Whitby / Waitangirua to Wellington / the Hutt Valley etc.).

This proposed interchange is referred to as the James Cook Interchange.

9.5 Summary of key options selected during Phase 2

The option evaluation and design process for Phase 2 focused on refinement and optimisation of the Preferred Alignment identified through the scheme assessment. Any changes to the road alignment were much more minor than had been undertaken during Phase 1. Design changes in Phase 2 were more focused on:

- minimisation of earthworks;
- stream crossings;

- treatment of fill and cut slopes, including the form of retaining walls; and
- interchange and road connections;

The Phase 2 design and option evaluation process involved a high degree of collaborative design between the various engineering and environmental assessment teams. As discussed further in Chapter 12, an important aspect of Phase 2 was the close integration of the environment assessment work with the design process. In many cases this has resulted in potential adverse effects being reduced or completely avoided by making changes to the design. Avoidance of potential adverse effects is always preferable to remedying, mitigating or offsetting adverse effects.

The iterative and dynamic nature of this process means it is impossible to completely document all outcomes from this process entirely in this AEE report. However, where key design changes were made based on their likely environmental effects, these changes are described in this chapter and/or within the relevant topic assessment chapters in Part G.

9.5.1 Addressing issues raised during consultation

Phase 1 investigations (draft scheme assessment) for the Project were completed in mid 2008. Immediately following the Phase 1 investigations, a public consultation process was undertaken to gauge public views on the preferred alignment for the Project that had been identified during Phase 1.

The consultation process confirmed broad support for the Preferred Alignment and also identified a number of specific items that warranted further investigation during Phase 2, namely:

- pull off and vehicle inspection areas;
- property impacts at Paekakariki;
- parks and reserves / farming operations;
- bulk water mains;
- access to existing properties at SH58;
- the Whitby and Waitangirua Link roads; and
- the Kenepuru link Road.

9.5.1.1 Pull off and vehicle inspection areas

A number of consultation respondents identified the need for additional shoulder width at a few locations to allow drivers of heavy vehicles to safely pull off the carriageway and inspect their vehicles or check loads.

Discussions between the Project team and the NZ Road Transport Association identified that the main area where brake check / vehicle inspection areas would be desirable is adjacent to the Wainui Saddle, to allow heavy vehicle drivers to check their brakes and/or loads before descending (or after ascending) the 3km long 8% gradient between Wainui Saddle and Paekakariki.

Brake check / vehicle inspection areas have now been provided in both directions south of the Wainui Saddle (at approximately 5,500m). Brake check areas are not considered necessary at any other locations because the interchanges at SH58, James Cook and Kenepuru will provide regularly spaced opportunities for heavy vehicles to leave the Main Alignment to stop if necessary.

9.5.1.2 Property impacts around Paekakariki

During the scheme assessment it was identified that the alignment would have a significant land take impact on two properties[79] at Paekakariki. Consultation feedback and further alignment investigation identified opportunities to revise and reduce land take. As a result, the alignment was shifted east by approximately 30m, reducing and avoiding effects on one property. The alternative alignment also ties in more effectively with the newly constructed MacKays Crossing. The change also reduces earthworks effects on the margins of the MacKays Crossing wetland (KCDC eco-site K106).

The design was altered to accommodate the extra width of an earth bund on the northbound verge. The bund provides an alternative form of side protection barrier to a concrete or steel barrier for vehicles travelling northbound down the Te Puka descent. This also improves the protection for KCDC's water infrastructure at the bottom of Te Puka valley.

9.5.1.3 Parks and reserves and farming operations

Both the existing designated route and the Preferred Alignment pass through a number of parks and reserves. Whilst the overall physical, environmental and social impact of the preferred alignment is less than the route within the existing designation, respondents have identified specific impacts which need to be considered in detail. At Battle Hill Farm Forest Park, the potential impact of the Preferred Alignment on the viability of the existing farming operation needed to be considered. Similarly at Belmont Regional Park further consideration needed to be given to access tracks, stock routes, fence lines and yards to ensure farming operations would still be viable.

The Project team and GWRC met to discuss the Battle Hill Farm Forest Park Management Plan and agreed an approach to ensure that the Project can be effectively integrated into the operational management of the Park. The agreed approach is to consider exchanging the land within the Battle Hill park that is required for the Project with areas of Crown owned land adjacent to Battle Hill which was purchased specifically for that purpose) to avoid adversely affecting the Park's farming operation.

9.5.1.4 Bulk water main

GWRC identified that the Preferred Alignment affects its ability to access the bulk water main for inspections and maintenance. The Project team met with GWRC and identified those areas directly affected by the Project and investigated potential options for realigning the water main, including providing a series of culverts and new access tracks to allow for future inspections and maintenance. Even though the potential options are only at concept stage, the Project team and the relevant GWRC

79. Property 4 (Pt Lot 4 DP 714) and Property 5 (Pt Lot 4 DP 4269).

officers agree that the concepts are workable and that this issue will be satisfactorily resolved as the Project progresses.

9.5.1.5 Access from SH58

Access to and from a number of existing properties via a private road / right of way off SH58 adjacent to the proposed SH58 Interchange was originally proposed to be directly onto the interchange roundabout, which was raised as a significant safety concern by the safety auditors. In discussion with the affected land owners, the need was identified for further design work to ensure that access to the properties could be provided safely.

The SH58 Interchange has been subtly re-designed to enable adjacent properties to have access (via their existing private road and the existing SH58 carriageway) onto the realigned SH58 carriageway east of the interchange roundabout, rather than directly onto it.

9.5.1.6 Porirua Link Roads

Discussions with land owners, tenants and with PCC identified opportunities to enhance the proposed design to provide better integration with the existing land boundaries as well as a more favourable solution for proposed developments in the area. A number of land owners, particularly at the western end of the Waitangirua Link Road, offered alternate solutions which needed further consideration.

As part of the urban design workshops and consultation on the Waitangirua Link Road, the proposed intersection with Warspite Avenue was changed from a roundabout to a signalised intersection to improve pedestrian safety at this intersection. This will be a busy intersection in the future, particularly with the recently redeveloped Waitangirua Mall close by.

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

9.5.1.7 Kenepuru Link Road

The scheme road safety audit highlighted a concern with the vertical alignment of this road. In particular, the safety auditors were concerned about the steep downhill grade on the approach to the intersection with Kenepuru Drive. The Project team have made significant changes to both the vertical and horizontal alignment of the link road to address the road safety auditors' concerns.

This has included taking the Kenepuru Link Road under existing SH1, rather than over the top of it, as originally intended.

9.5.2 Further Phase 2 design refinements

Throughout Phase 2, the Preferred Alignment was refined on the basis of further, more detailed environmental and engineering investigations. Many relatively minor alignment changes were made to the design but the most important changes are described, namely:

- though Battle Hill;
- though the Wainui Saddle;
- down the Te Puka valley; and
- avoiding a historic structure (a WWII brick fuel tank).

9.5.2.1 Battle Hill

While the decision to shift the road alignment from the eastern ridge to the lower Horokiri valley floor through Battle Hill was made during the scheme assessment phase, further refinements to integrate the road into the landscape in this area were investigated during the E&EA phase. This involved moving the alignment further west which had two main benefits:

- it followed the natural topography better and meant that Gas line ridge screened to road from the western side of BHFFP; and
- it moved the alignment further from Horokiri Stream which has ecological benefits.

9.5.2.2 Wainui Saddle

During the ecological assessment, an area to the east at the Saddle was identified as of high ecological value. As a result an alternative option was assessed that moved the alignment to the west by 10 metres to reduce impacts on the identified area of ecological value.

9.5.2.3 Te Puka valley

The Te Puka valley section of the Main Alignment is the most vulnerable to natural hazards, in particular earthquakes, and has the potential to reduce the security of the route.

The geotechnical assessment identified risks associated with retaining walls on steep slopes in Te Puka and the vulnerability of bridges directly adjacent to steep slopes due to earthquake induced landslides. The Project's lead geotechnical engineer (P. Brabhaharan) was part of the New Zealand Society for Earthquake Engineering (NZSEE) Learning from Earthquakes team which visited the earthquake damaged areas of China in November 2008[80]. Extensive landslides, in somewhat similar steep terrain to the Te Puka Valley, were observed to have led to closures of many highways in Sichuan. As a result it was recommended to reconsider the options for the Main Alignment through the Te Puka valley.

80. This team observed damage to infrastructure, particularly transport links as a result of the Wenchuan Earthquake that devastated areas of the Sichuan Province of China on 12 May 2008.

Options assessed to address these issues included:

- 25m high vertical retaining walls;
- 45 degree reinforced soil embankments (RSE);
- 51 degree earth embankments;
- 63 degree stepped walls.

The options were discussed with the roading, structures, hydrology and ecology teams. It was agreed that the option of using RSE was the preferred option, because it gives a higher level of route security, and because the stream impacts can be mitigated by additional stream works, without overall additional costs to the Project (additional stream works costs would be more than offset by savings in costs due to elimination of the viaducts and vertical walls).

9.5.2.4 Brick fuel tank

The alignment was shifted east by approximately 20m at the base of the Te Puka Valley in order to avoid impacting on the historic brick blast retention structure. This structure was built by the NZ Public Works Department for the US Army during WWII for storage of fuel and has been recognised by the Historic Places Trust as a feature of significance. It is hoped that public access can be provided to this historic structure as part of the Project.

PART F: CONSULTATION AND ENGAGEMENT

10. Consultation and engagement

Overview

Consultation and engagement has been undertaken in accordance with recognised good practice, as well as the NZTA's and PCC's respective legislative requirements. Consultation during this phase of the Project has involved engagement with local, regional and national stakeholders. Consultation and engagement has involved a number of methods, as appropriate, including one-on-one meetings, group meetings, public open days, newsletters and online material.

On-going consultation and communication with the relevant regulatory agencies has also been undertaken as part of the preparation of consenting documentation. Engagement with tangata whenua has been undertaken on the basis of long established relationships with the NZTA.

10.1 Introduction

This chapter outlines the strategy and methodology for carrying out consultation and engagement on the Project and sets out:

- the statutory framework for consultation and engagement (Section 10.2);
- previous consultation and engagement on the Project (Section 10.3);
- the consultation and engagement objectives (Section 10.4);
- the consultation engagement process (Section 10.5);
- the consultation and engagement methods used (Section 10.6);
- the outcomes from consultation and engagement (Section 10.7);
- consultation undertaken by PCC in relation to the Porirua Link Roads (Section 10.8); and
- proposed future consultation and communications (Section 10.9).

The consultation strategy and methods adopted have been developed to provide targeted and effective engagement with iwi and consultation with stakeholders and the public.

For further detail, including on the public consultation undertaken, including the consultation specifically undertaken in relation to the Porirua Link Roads, reference should be made to the Consultation Summary Report (**Technical Report 22**).

10.2 Statutory framework

There are no specific statutory requirements for consultation under the RMA for either a NoR or an application for resource consent, except in relation to meeting Treaty of Waitangi obligations under section 8. However, consultation with potentially affected parties and key stakeholders reflects NZTA policy and is considered to be good practice.

Within the framework of relevant statutory matters, this consultation and communication in respect of Phase 2 has addressed:

- the potential environmental effects of the Project;
- suitable approaches for avoiding, remedying, mitigating or off-setting effects on the environment;
- consideration of alternative sites, routes and methods for achieving the Project objectives;
- engagement with tangata whenua; and
- construction management of the Project.

Regard has also been had to the following legislation:

- the Land Transport Management Act 2003 (relevant to the NZTA only); and
- the Local Government Act 2002 (relevant to PCC only).

10.2.1 Land Transport Management Act 2003

The Land Transport Management Act 2003 (LTMA) has a much more general emphasis on consultation than the RMA as it relates to the development of land transport programmes. It does not specifically relate to individual projects.

NZTA's operating principles are set out in Section 96 of the Land Transport Management Act 2003 (LTMA). Specifically relevant to consultation, the NZTA must in meeting its objective:

> *"(a) exhibit a sense of social and environmental responsibility, which includes -*
>
> *(i) avoiding, to the extent reasonable in the circumstances, adverse effects on the environment; and*
>
> *(ii) ensuring, in relation to its functions under section 95, and to the extent practicable, that persons or organisations preparing regional land transport programmes -*
>
> *(A) take into account the views of affected communities; and*
>
> *(B) give land transport options and alternatives an early and full consideration in a manner that contributes to the matters in subparagraph (i) and subparagraph (A); and*

(C) provide early and full opportunities to the persons and organisations who are required to be consulted in order to contribute to the development of regional land transport programmes; and

(iii) meeting the requirements of section 18H (Maori contribution to decision making);"

Section 18H further directs that NZTA:

"must, with respect to funding from the national land transport fund, -

(a) establish and maintain processes to provide opportunities for Maori to contribute to the organisation's land transport decision-making processes; and

(b) consider ways in which the organisation may foster the development of Maori capacity to contribute to the organisation's land transport decision-making processes; and

(c) provide relevant information to Maori for the purposes of paragraphs (a) and (b)."

10.2.2 Local Government Act 2002

Under the Local Government Act 2002 (LGA) councils must prepare a consultation policy to be reviewed within six months of each local government election[81]. PCC's Community Consultation Policy was last reviewed on 21 April 2010. It includes the following statement:

"The Council is committed to determining the views of its constituent communities as accurately as possible and will use the appropriate techniques to meet this objective in the most effective and efficient manner".

In particular, the policy addresses each of the LGA requirements including[82]:

"Council will encourage those people who will, or may be affected by, or have an interest in, the matter to present their views"

The policy is supported by the Council's Policy on Significance, adopted on 26 June 2006, and by an operational guide for staff.

In preparing its long term council community plan (LTCCP)[83], PCC uses the special consultative procedure in the LGA and its policy as outlined above. The Porirua City LTCCP includes provision for PCC's future capital expenditure on the provision of the Porirua Link Roads.

81. Under section 40(1)(h).

82. Requirement under section 82(1)(b).

83. Porirua City Long Term Council Community Plan 2009 – 2019, June 2009.

10.3 Previous consultation and engagement on the Project

It is important to understand the scale and length of consultation undertaken throughout the development of the Project before considering the consultation strategy and the consultation that has been completed as part of this current Phase of works – which involves the preparation of RMA applications and associated investigations. Key phases are further detailed in the Consultation Summary Report and are summarised as:

- The existing designation – which was notified in 1996 and confirmed in 2003;
- Western Corridor Plan 2006 – which involved GWRC and Transit NZ (at the time) carrying out a review of options for the western corridor north of Wellington;
- Scheme Assessment Report (SAR) – 2007/2008 – which was prepared following confirmation of the Western Corridor Plan. The SAR process encompassed a re-evaluation of the designated route with the objective of optimising the alignment and providing more certainty;
- Consultation on the preferred route - 2008 – to obtain feedback that would allow the scheme design of the proposed highway to be finalised;

10.3.1 Existing Designation

The most significant of the early milestones in terms of the RMA was the NZTA (then Transit New Zealand) serving NoRs to designate the route in 1996. The last of the NoRs were confirmed in 2003 after the resolution of all appeals. The NoR involved public notification and a total of 281 submissions were received. The majority of these (218) related to the two NoRs lodged with the Porirua City Council. Of the submissions recorded, 221 indicated support for the designations and 57 submissions were in opposition.

10.3.2 Western Corridor Plan

In 2004 Wellington Regional Council and Transit New Zealand (now NZTA), with the assistance of the relevant councils, commenced a review of options for the western corridor north of Wellington. This study resulted in the Western Corridor Plan which involved consultation on alternatives, and options for the transportation corridor and the preparation of the overall package of transportation strategies between Peka Peka in the north and the Ngauranga Gorge in the south. Overall there were 5,993 submitters on the plan, including 3 submissions that were in the form of petitions, which represented 5,880 people.

During consultation in 2005 Transmission Gully was not initially identified as the preferred route. In terms of submissions specifically on Transmission Gully and the Coastal route, approximately 5,780 submitters did not clearly indicate support for an upgrade of the Coastal Route. Of these submissions, approximately 5,000 promoted the construction of Transmission Gully as an alternative. Following submissions and further assessment, Transmission Gully was included in the Western Corridor Plan as the preferred option for SH1 between Linden and MacKays Crossing.

10.3.3 Scheme assessment (Phase 1)

Following confirmation of the Western Corridor Plan, in 2007 the NZTA commenced a scheme assessment of the Project. The SAR process encompassed a re-evaluation of the designated route with the objective of optimising the alignment and providing more certainty. In 2008 the SAR was completed. This process brought about proposals to change the designated alignment and alter the configuration of the connections to eastern Porirua. Key stakeholders from each council were involved in a two day workshop during which options were considered and a preferred alignment selected. There was also general support from the councils in the region for the recommendations arising from this review.

10.3.4 Consultation on the Preferred Route

In July 2008 consultation was undertaken with the public and stakeholders in the Greater Wellington region on the preferred route, to obtain feedback that would allow the scheme design of the Project to be finalised. The prime intention of the consultation process was to provide all interested and affected parties with information on the alternative alignments and methods that were assessed, and to provide means by which their views on the preferred route could be considered by the Project team.

10.4 Consultation and engagement objectives

A series of consultation objectives and principles have been developed to be used for consultation with stakeholders and the public. The NZTA and PCC objectives in relation to engagement and consultation are as follows:

- In relation to GWRC, WCC, PCC, KCDC, HCC and UHCC:
  - to carry out technical engagement in all relevant stages of the assessments of environmental effects, including the development of mitigation measures, to provide RMA and other statutory consents on terms/conditions which reflect an appropriate level of consensus with these stakeholders;
- In relation to tangata whenua:
  - to engage with tangata whenua during assessments of environmental effects and in the development of mitigation measures which satisfies RMA requirements in relation to their values and interests and strengthens NZTA’s relationship with tangata whenua;
- In relation to stakeholders generally:
  - to fully and accurately inform the assessments of environmental effects including the development of mitigation measures, of relevant values and interests and resolve unnecessary conflicts;
- To encourage stakeholders, affected persons and the public to raise any particular concerns they may have in the most appropriate forum for addressing that concern; and
- To comply with legislative requirements and apply good practice to consultation for the purpose of informing RMA processes, including any relevant statutory instruments and NZTA’s principles.

10.5 Consultation and engagement process

The aims for this part of the consultation and engagement process have been to:

- identify and understand iwi and stakeholder issues;
- robustly consider options for integrating issues and ideas into the decision making process;
- make sure the wider community is captured by the consultation process as people will have moved into and out of the area since the last round of consultation in 2008; and
- meet the requirements for consultation under the LGA 2002 (for PCC).

10.6 Consultation and engagement methods

The following methods have been used during the current phase (Phase 2) to consult with different groups, individuals and affected parties. These are detailed further in the Consultation Summary Report:

- Project consultation database;
- one-on-one discussions and meetings;
- Project open days and expo;
- Project website, free-phone number and email;
- focused community and stakeholder meetings; and
- newsletters.

10.7 Summary of Phase 2 consultation and engagement outcomes

10.7.1 Engagement with tangata whenua

The Project team has a Communications and Stakeholder Liaison Manager who manages all contact and engagement with iwi groups that the Project team need to be in contact with on the Project. Other members of the Project team, as well as external consultants, are also involved with iwi engagement, as and when required, to deal with specific technical issues pertaining to the Project.

In the work carried out on the Western Corridor studies and subsequent Western Corridor Plan, Transit New Zealand and GWRC identified Te Runanga o Toa Rangatira (Ngati Toa) as the predominant iwi with tangata whenua status in the area that covered the Western Corridor. Ngati Toa was consequently consulted with during the Western Corridor studies and on the Western Corridor Plan, and was commissioned to produce a Cultural Impact Report for the Western Corridor in October 2005. In this report, Ngati Toa stated that it was the predominant iwi with tangata whenua status in the area that covered the Western Corridor. The report also provided a map illustration of the bottom half of the North Island and Northern part of the South Island which shows the rohe (tribal area) of Ngati Toa. The Project clearly falls within the rohe of Ngati Toa.

Notwithstanding the above, in 2009 the Project team also contacted and engaged with another major iwi group in the Wellington region, the Port Nicholson Block Settlement Trust, to advise the Trust about the Project and to ascertain the nature of any future engagement that the Trust may wish to have with the Project team on the Project. The Trust indicated that it only wished to be kept advised of any news or new developments on the Project. The Project team's relationship with the Trust has been on this basis.

Ngati Toa has prepared a Cultural Impact Assessment report (**Technical Report 18**) for the Project. This report incorporates information from the findings of a number of the other technical studies that have been undertaken.

10.7.2 Consultation with directly affected parties

All persons who own land, who occupy land, or who have registered interests in land, that is directly affected by the designations have been contacted. A full summary of the consultation undertaken with these parties is provided in the Consultation Summary Report (**Technical Report 22**). Key issues discussed include:

- possible land exchanges to provide more useable land areas for farming operations/recreational use;
- noise treatments required on properties;
- maintenance of access to people's properties;
- flood mitigation; and
- visual mitigation.

10.7.3 Engagement with regulatory authorities

Early in the consenting phase of the project (mid-2009), the NZTA and the five local authorities identified the need for a coordinated approach to the preparations for lodgement of the consenting documents. This was prior to the establishment of the EPA. The Regulatory Authorities Technical Advisory Group (RATAG) was set up, and met approximately monthly with key tasks including:

- engagement and use of common consultants and experts where possible;
- a coordinated approach to planning advice where relevant; and
- efficiencies gained in distributing information and key messages.

10.7.4 Other functions of local authorities

In addition to regulatory functions, the five local authorities fulfil multiple roles with regard to the Project:

- Asset owners – all Councils own assets which have the potential to be affected by the project, e.g. regional parks, and water supply and stormwater.

- Specialist technical roles – there are Council officers who have specialist technical advisory roles and the knowledge and experience of these personnel has been acknowledged. Where appropriate (and offered) their expertise has been used.

It is noted that PCC also have an additional role as a requiring authority / applicant for the Porirua Link Roads.

10.7.4.1 Porirua City Council

Numerous discussions have been held with PCC across a wide range of matters regarding the Transmission Gully Project. As the majority of the Project is within the Porirua City boundaries and PCC is the requiring authority for the Porirua Link Roads, the Council's involvement has been crucial. Matters discussed can be broken down into the following subject matters:

- land use/planning policy;
- landscape design;
- infrastructure/transport network; and
- community impacts.

10.7.4.2 Kapiti Coast District Council

Discussions with KCDC have been held across a wide range of matters associated with the Transmission Gully Project. Meetings with various functions of Council have covered the following matters:

- infrastructure assets;
- land use/planning policy; and
- landscape design.

10.7.4.3 Wellington City Council

Discussions with WCC have been held regularly regarding the Project. Meetings with various functions of Council have covered the following matters:

- infrastructure assets; and
- land use/planning policy.

10.7.4.4 Upper Hutt City Council

Consultation with Upper Hutt City Council has been more confined, as the Transmission Gully Project affects only a small section of land within the Upper Hutt District boundaries (at Wainui Saddle).

The Council's primary involvement has been through the RATAG meetings, and technical working group meetings with key infrastructure managers.

10.7.4.5 Greater Wellington Regional Council

Until commencement of Phase 2 of the Project, the NZTA's consultation with GWRC has focussed on land use and transport effects and been carried out through GATS, the Western Corridor Study, and Regional Land Transport Strategy. The scope of this consultation has expanded during Phase 2 of the Project, as environmental effects assessments were prepared in relation to activities requiring regional resource consents. Recent consultation with the GWRC has focussed on the following matters:

- planning matters (particularly regarding NZTA's request for a change to the Regional Freshwater Plan)
- transportation impacts;
- infrastructure impacts;
- flood management;
- land use impacts;
- recreational and landscape impacts;
- property impacts; and
- ecological effects on land, water (fresh and marine).

10.7.5 Department of Conservation

The NZTA has a non-project specific MoU with the Department of Conservation (DOC) which identifies that the two agencies undertake to engage early with each other where there is potential for conflict to occur between both agencies' objectives when working near, adjacent or through Public Conservation Land.

During the preparation of the NoR and AEE documentation, officers from the DOC Wellington regional office have been involved as follows:

- a "kick off" information and briefing presentation by the NZTA staff and technical team to introduce the Project, project methodology and key deliverables to the DOC team;
- attendance at two environmental management plan interactive workshops which were focussed on developing integrated solutions to managing effects of construction and operation in key focus areas; and
- attendance at a workshop with GWRC to discuss ecological effects and mitigation;
- attendance at a conditions drafting workshop, along with an offer to review relevant draft consent and designation conditions;
- supply of draft ecology, water quality, flooding and stormwater reports for comment.

The key issues that the DOC officers have been interested in are:

- managing effects on the natural environment;
- involvement with review of draft consent and designation conditions; and
- review of all the technical reports on ecological and water related topics.

10.7.6 NZ Historic Places Trust

The NZTA has a non-project specific MoU between NZTA and the NZ Historic Places Trust (HPT). There is on-going dialogue between the two organisations, both in relation to the Project and in relation to the wider Wellington RoNS programme.

The HPT has been provided with the draft archaeological assessment and the draft built heritage assessment reports for review and comment.

10.7.7 NZ Railways Corporation

Because the Kenepuru Link Road crosses the NIMT railway lines, consultation with the KiwiRail Land and Asset Manager has taken place to identify and agree to the proposed solution for bridging the NIMT rail line. A Deed of Grant will be developed to address the property related issues.

In order to further the preparation of the Deed of Grant documentation, NZTA and KiwiRail are working together to confirm:

- cross sections at either parcel boundary and at track centreline;
- bridging structure dimensions/details so that appropriate clearances are maintained; and
- an agreement to undertake detailed construction planning with KiwiRail to manage construction impacts and avoid potential delays to the construction of the Project, and identify opportunities when rail closures could be used to undertake key pieces of work.

10.7.8 Network utility providers

The NZTA has undertaken an extensive information gathering and consultation exercise in relation to identifying actual and potential effects on utilities. Further information about the consultation that has been undertaken is set out in the Consultation Summary Report (**Technical Report 22**) and Chapter 15 of this AEE report.

Utility providers whose assets are affected by or are close to the Project route include:

- Transpower – There are a number of towers potentially affected as a result of the Project principally along the northern section of the route (north of State Highway 58). NZTA and Transpower have an agreement in place to jointly oversee design, consent and construction of the solution. The two parties are also preparing agreements to protect assets during construction.

- Vector – There are twenty (approx.) gas main locations affected as a result of the Project. Ongoing consultation with Vector, via Vector's Land Management Coordinator and Key Relationship Manager, has taken place to identify and agree to a proposed solution for changes required to these assets.
- Powerco – There are four locations where Powerco infrastructure is affected by the Transmission Gully project.
- Wellington Electricity Lines (WEL) Company – There are five locations where WEL infrastructure is affected by the Project.
- Electra – 33KV line(s) running along the existing SH1 (north of Paekakariki) are affected by the Project. Consultation with Electra's Network Planning & Development Manager and Network Engineer has taken place to identify and agree to a proposed solution for changes required to these assets.
- TelstraClear – there are two locations where TelstraClear assets are affected by the Project.
- Chorus/Telecom – there are six locations where Telecom assets are affected by the Project.
- Vodafone – the Project will require a single Vodafone cell tower near Linden to be relocated.

10.7.9 Community service providers

10.7.9.1 Emergency services

Emergency services staff have been consulted, including New Zealand Fire Service, New Zealand Police, Wellington Free Ambulance and St John Ambulance. Local fire fighting staff have also attended the Open Days. Emergency services providers have not raised any particular concerns with the Project.

10.7.9.2 Public health organisations

Capital and Coast District Health Board and other public health organisations were asked whether they would like to be consulted on the Project. In response, Regional Public Health (on behalf of a number of health organisations) met with the planning team regarding the Project. Feedback received was predominantly related to the Porirua Link Roads, specifically:

- what impact the proposed Link Road traffic volumes would have on community cohesion and overall health effects on communities from noise and air emissions along the route; and
- what impact the Link Roads will have, in terms of access and connectivity, especially on surrounding disadvantaged communities.

These issues were discussed with Regional Public Health, and have been identified within the Social Impact Assessment (**Technical Report 17**).

10.7.9.3 Schools

The Ministry of Education and 34 schools have been contacted regarding the project. Other than school properties directly affected by the route, no representatives from the schools or Ministry of Education have asked for further meetings or information.

10.7.9.4 Housing NZ Corporation

Housing New Zealand Corporation (HNZC) owns approximately 1900 out of the 4000 houses in Eastern Porirua. HNZC's interest in the Project is primarily around any direct impact on its properties and interests. It has reviewed proposed alignment drawings and consultation material, and identified no issues with the Project. Future detailed construction plans have been requested (when they are completed).

10.7.10 Community advocacy groups

Residential associations, advocacy groups and community boards who have previously expressed an interest in the Project and groups that have since expressed an interest in the Project following newsletters, letters and advertising of public Open Days, have been provided an opportunity to be consulted regarding the Project. The Consultation Summary Report provides a summary of their concerns and how they have been addressed through the Project.

10.7.10.1 Community boards

Tawa Community Board has been consulted in regards to the Project. They did not raise any specific concerns regarding the Project.

10.7.10.2 Residents' associations

Residents associations within the Project area were invited by letter to attend the open days and the associations have been informed of the ability to discuss the Project with the NZTA and PCC through newsletters.

10.7.10.3 Environmental groups

NZTA met with the Royal Forest and Bird Protection Society (Forest and Bird) to discuss the Project and the Proposed Plan Change to the Wellington Regional Freshwater Plan. Forest and Bird wanted to understand what testing of water quality and ecological assessments had occurred. NZTA provided an outline of the reports being produced and later provided draft freshwater, avifauna, herpetofauna and marine ecological reports. The NZTA has supplied the information requested, and no feedback has been received to date.

The following environmental groups requested, and were provided, presentations by NZTA on the Project:

- Pauatahanui Inlet Community Trust (PICT);
- Guardians of Pauatahanui Inlet (GOPI); and
- Pauatahanui Wildlife Reserve Staff.

10.7.10.4 Business groups

The Wellington, Porirua and Kapiti Chambers of Commerce were invited to attend the open days or have follow up meetings regarding the project.

10.7.11 Transport groups

A meeting was held with a representative for both the Road Transport Association and NZ Heavy Haulage Association. At the meeting a presentation was given by the NZTA to explain historic, recent and likely future project development. The presentation highlighted specific issues of interest to heavy vehicle users.

A meeting was held with the Automobile Association, Wellington Region. The NZTA provided a presentation to explain historic, recent and likely future project development, including issues of particular interest to road users, such as effects of the Project on traffic volumes. Various questions were asked by members, but no specific concerns were raised.

10.8 Consultation on the Porirua Link Roads

Following the conclusion of consultation on the preferred route for the Main Alignment in 2008 by the NZTA, PCC continued to inform directly affected land owners and occupiers about the progress of the project. Various link road routing and property access options were explored. A meeting was held with directly affected land owners to discuss the options for each of the two proposed Porirua Link Roads in November 2009 and suggestions made at the meeting were further developed by the project team. Following that work a “preferred option” was selected for each link road.

In February 2010 PCC resolved that there should be public consultation on the preferred options for the Porirua Link Roads before deciding on their alignment and design details. A consultation document was distributed to property owners and occupiers on or close to the proposed alignments, as well as to local and national organisations expected to be affected or to have an interest in proposed Porirua Link Roads. The document was also hand-delivered to businesses near the proposed Waitangirua Link Road intersection with Warspite Avenue and posted on PCC’s website with an online form for responses.

The consultation period commenced on 26 February 2010 after some initial publicity in Kapi Mana News and on Samoan Capital Radio. The consultation period was originally intended to close on 19 March but was extended to 23 March 2010 to include late submissions.

During the four week consultation period, the page on PCC's website was visited 1194 times. While there was a good level of interest, there were only a modest number of submissions received. A total of 34 submissions were received, with 22 of these received electronically through the website.

Respondents were asked if they supported, opposed or "don't mind" the Link Roads design and preferred routes. Most of the submissions received "supported" (19) or "don't mind" (8) with 7 opposed to the proposal.

Most of the respondents lived in Porirua or represented organisations that had an interest in the project, with only two from out of the area. Of the seven respondents who opposed, four were concerned about the possible additional traffic in local streets and two of these believed that the link roads were not needed (or had not been justified to their satisfaction). Two others in opposition were concerned about the details of the connection to the Main Alignment and one was concerned about the possible effects on natural gas pipeline routes. Some of these concerns were also held by those who supported or "didn't mind" the Porirua Link Roads.

The various issues raised by all 34 respondents were reported to Council and considered by the project team. PCC decided to approve the proposed alignments as shown in the consultation document for the purpose of preparing the current NoRs and application for resource consent for the Porirua Link Roads.

10.9 Future consultation and communication

10.9.1 Statutory approval phase

On-going consultation and communications will be welcomed by the NZTA and PCC throughout the statutory approvals phase of the Project and post-lodgement. It is the NZTA's experience that the RMA process benefits from on-going communication and information sharing with the public throughout this phase, both on an on-going basis and in response to any submissions.

10.9.2 Construction phase

The conditions that are proposed by the NZTA and PCC for both the designations and the resource consents will require any future contractor/constructor to set up active communication processes that will be on-going through the construction phase of the project. The types of methods that could be employed are outlined in the Draft Construction Environmental Management Plan. The experience of the NZTA with other major construction projects around the country is that communication and information is one of the best ways to manage the effects of construction on people and communities.

PART G: ASSESSMENT OF EFFECTS ON THE ENVIRONMENT

11. Summary of environmental effects

Overview

The Project will have a number of positive and adverse effects. These will vary in significance, scale (local, regional and national), intensity and duration. The Project will have significant positive transport effects at a local, regional and national scale, including:

- improved route security and resilience for the region's State highway network
- improved safety and reduced crash risk;
- significant travel time savings;
- more efficient freight movement and associated economic benefits;
- improved connections to regional freight hubs, including the port, airport and distribution centres; and
- improved access to eastern Porirua (Porirua Link Roads) and western Porirua (Kenepuru Link Road).

Potential temporary effects during construction of the Project include:

- nuisance effects (e.g. dust, noise, traffic, amenity) from construction activities;
- increased sediment entering streams (and consequently coastal waters); and
- disruption and loss of terrestrial and freshwater habitats.

Potential long term effects from operation of the Project (in addition to transport effects) include:

- significant and noticeable changes to some natural landscapes and some streams;
- extensive landscaping of Lanes Flat;
- the retirement of land and the native revegetation of pasture (inducing riparian planting) predicted to result in a net gain (both in terms of quantity and quality) of terrestrial and freshwater habitat;
- a significant reduction in traffic volumes along existing SH1, leading to:
- reduced severance for coastal communities; and
- a reduction (at a regional scale) in public exposure to vehicle emissions.

11.1 Introduction

The purpose of this chapter is to provide a summary of the actual and potential effects of both the construction and the operation of the Project. This is a summary of the effects discussed in the rest of the chapters in Part G. It is intended to provide an overview of the effects associated with the Project, including whether they are positive or adverse and the scale they are likely to occur at (i.e. local, regional or national). It does not cover proposed mitigation or offsetting.

Section 3 of the RMA defines 'effect' as including:

(a) any positive or adverse effect; and

(b) any temporary or permanent effect; and

(c) any past, present, or future effect; and

(d) any cumulative effect which arises over time or in combination with other effects -

regardless of the scale, intensity, duration, or frequency of the effect, and also includes -

(e) any potential effect of high probability; and

(f) any potential effect of low probability which has a high potential impact.

Further details about effects are described in the following chapters in Part G and in the associated technical reports in Volume 3.

11.2 Summary of effects

The actual and potential effects of the construction and operation of the Project are summarised in Table 11.1. This table only provides a summary of the positive and adverse actual and potential effects of the Project. It does not cover the mitigation and / or remediation of adverse effects.

Table 11.1: Summary of actual and potential environmental effects

Table key:

Construction effects
Operational effects

Actual or potential environmental effect	Positive	Adverse	Local, regional or national level effect(s)
Traffic and transport			
Increased construction traffic movements of both staff vehicles and heavier vehicles are likely to have adverse amenity and safety effects on local roads – including for pedestrians, horse riders and cyclists – and may cause damage to road surfaces.		✓	Local
The Project will result in significant travel time reductions and journey time reliability for travel between the Kapiti Coast, the Hutt Valley, Porirua and Wellington.	✓		Local and regional
Improved travel time reliability will result in: • improved certainty around travel times in the corridor for all road users; • more efficient freight movement and associated economic benefits; and • better links to regional freight hubs, including the port, airport and distribution centres.	✓		Local, regional and national
The Project will result in significant improvements in safety and a reduction in the frequency of crashes	✓		Local and regional
The Project will significantly enhance route security and resilience of the SH network into and out of Wellington.	✓		Local, regional and national
Traffic on existing SH1, SH58 and a number of local roads will be significantly reduced, resulting in improved amenity and accessibility for local communities, especially with significant reductions in the number of commercial vehicles	✓		Local and regional
Increase in traffic on part of Kenepuru Drive could have an adverse effect on the efficiency and safety of local traffic movements.		✓	Local

Actual or potential environmental effect	Positive	Adverse	Local, regional or national level effect(s)
There will be improved accessibility and connectivity to eastern Porirua (Porirua Link Roads) and western Porirua (Kenepuru Drive).	✓		Local, regional
There will be a small modal shift from rail to road for some travel in the corridor as a result of an improvement in road conditions.	✓	✓	Local, regional
Land use and property			
There will be some temporary occupation of private property for construction purposes, including construction site compounds. Some land will be designated, and the requiring authority will review permanent designation needs at the completion of construction.		✓	Local
By improving accessibility, the Project will provide more flexibility for businesses and households to establish in their preferred locations.	✓		Local and regional
Access to some properties will change as a result of the construction of the Project.		✓	Local
Network utilities			
Construction dust has the potential to adversely affect Transpower assets.		✓	Local, regional and potentially national
Potential for physical damage to network utility assets.		✓	Local, regional
Power lines and towers, the water supply bore in Paekakariki, gas line, regional water supply and telecommunications all need to be relocated and continuity of supply needs to be provided in the transition period.		✓	Local, regional
Noise and vibration			
Construction noise and vibration is likely to cause nuisance and disturbance to close neighbours.		✓	Localised areas of work
Construction vibration may cause damage to St Joseph's Church and the brick fuel tank near Paekakariki.		✓	Local
Reduced traffic volumes on existing state highways and local roads will result in reduced traffic noise levels, improving local amenity.	✓		Local
Localised areas will experience an increase in traffic noise levels as a result of the Project, including Flightys Road and at Linden.	✓	✓	local

Actual or potential environmental effect	Positive	Adverse	Local, regional or national level effect(s)
Air quality			
Potential for nuisance effects from construction activities (e.g. dust and vehicle fumes) at nearby sensitive receptors. Those most likely to be affected include residents near the Kenepuru and Waitangirua Link Roads, and Linden Interchange.		✓	Local
The concrete batching plant at Lanes Flat has the potential to have adverse dust effects if not adequately managed.		✓	Local
Reduced congestion will result in a regional improvement in air quality.	✓		Regional
Reduced vehicle movements on the existing State Highway and local roads in some areas will result in an overall reduction in public exposure to vehicle emissions.	✓		Regional
Contaminated land			
Presence of contaminants above human health risk-based guideline values may have adverse effects on human health; or above ecological risk-based guideline values on terrestrial / aquatic life.		✓	Local
There is potential for hazardous materials including asbestos and unexploded ordnance (at MacKays Crossing) to be discovered during construction resulting in human health risk (largely for workers).		✓	Local
In the long term, the Project will result in improved management of contamination, and the potential for human or ecological exposure to contamination will be reduced.	✓		Local, regional
Hydrology			
There will be some temporary changes to the stream environment(s) as part of construction works, including bridging and culverting.		✓	Local
There will be localised effects on the Waitangirua reticulated stormwater system which is under-sized to cope with increased flows which will arise once the Link Road has been constructed.		✓	Local
There will be some increase in flood risk potential in discrete locations.		✓	Local
Changes in stream alignment will result in changes in flow rate and channel shape.		✓	Local, regional and national
Water quality			
Discharges from open construction areas could result in increased sediment discharge to streams.		✓	Local, regional

Actual or potential environmental effect	Positive	Adverse	Local, regional or national level effect(s)
Discharges from the construction sites to streams in the catchments surrounding the Porirua Harbour will result in an increase in sediment levels in some instances.		✓	Local, regional
Overall stormwater discharges to Porirua Harbour will remain similar to the present situation. Contaminant levels in run off entering the Harbour from roads in some areas will be reduced as a result of fewer vehicle movements.	✓	✓	Local, regional
There is a significant improvement in understanding about the sediment and hydrological movements within the Porirua Harbour as a result of the collection of data to inform the technical assessments for the Project. This will benefit the wider community and inform the future management of the Porirua Harbour.	✓		Local, regional and national
Terrestrial ecology			
The construction of the Project will result in the removal of approximately 40 hectares of native and regenerating vegetation.		✓	Local
There is the potential for disturbance of the habitats of some species.		✓	Local
The loss of vegetation during construction will be compensated for through replanting, revegetation of pasture land and retirement of land of a greater quantum than what was removed. As a result there will be a net gain in the amount of vegetated area protected in the long term and a resultant long term benefit.	✓		Local, national
There is a minor chance of bats (if their presence is confirmed during further proposed ecological surveys) getting hit by vehicles – in the vicinity of Wainui Saddle.		✓	Local
Wetland construction within Upper Horokiri Stream catchment may result in rare plant species loss.		✓	Local
Freshwater ecology			
Sediment from worksite(s) could have an adverse effect on freshwater habitat and species.		✓	Local, regional
Works in streams could adversely affect fish species.		✓	Local, regional
Realigned streams could result in degradation of freshwater habitats for fish and freshwater macro invertebrates		✓	Local, regional
Over all the affected catchments there will be a net gain in freshwater habitat quality and only a minimal loss of linear length.	✓		Local, regional

Actual or potential environmental effect	Positive	Adverse	Local, regional or national level effect(s)
There is the potential to adversely affect fish passage. In all instances, fish passage can be provided where required, and the removal of three existing culverts from Duck Creek will result in improved fish passage and opening up additional stream length to fish.	✓	✓	Local, regional
Marine ecology			
Under normal weather conditions with erosion and sediment controls performing well, increased sediment entering the Porirua Harbour could have an adverse effect on marine habitat and species.		✓	Local, regional
In an extreme weather event (i.e. a one in ten year event or worse) with open earthwork areas in the same catchment, there is potential for significant deposition on the bed of the Porirua Harbour. If this happens in sensitive ecosystems within the Harbour, and natural processes (including wind and wave action) do not remove the sediment, there will be adverse effects on benthic communities if sediment remains present for longer than approximately three days.		✓	Local, regional and national
Tangata whenua			
The Project will have adverse effects on traditional mahinga kai, including terrestrial vegetation and, potentially, marine species.		✓	Local, regional
The Project has the potential to result in discovery of, or destruction of, artefacts of importance to tangata whenua.		✓	Local
Improved water quality from upstream land retirement, revegetation and planting will create corridors of riparian communities and stream habitat of increased value, which is important to tangata whenua.	✓		Local, regional
Landscape and visual			
The site construction yards, laydown areas and construction equipment will be present on the site for varying periods of time dependent upon location, having a potential adverse effect on views and outlook for residential neighbours.		✓	Local
Some people enjoy the visual outlook of (or on) construction activity.	✓		Local
Some people do not enjoy being able to see construction activity.		✓	Local

Actual or potential environmental effect	Positive	Adverse	Local, regional or national level effect(s)
The Project will noticeably change the outlook from some properties and public areas, as a result of the proposed roads, associated cuts and fills, new structures, fill sites and maintenance access tracks.		✓	Local, regional
When construction is completed, Lanes Flat will be developed as a public park for informal recreation purposes including with new wetland planting, an extension of the existing wetland areas, new public walkways and cycle tracks.	✓		Local, regional
The Tararua foothills are identified in the Kapiti Coast District Plan as an ONL, and there is potential for adverse effects on the integrity of the landscape.		✓	Local
Archaeology and built heritage			
Potential for adverse dust effects on glacier windows at St Joseph's Church.		✓	Local
Construction vibration may cause damage to St Joseph's Church and brick fuel tank.		✓	Local
Potential for discovery of artefacts during construction.		✓	Local, regional
Altering the design of the Project has meant that the brick fuel tank near the MacKays Crossing end of the Project can be retained and preserved. The NZTA could facilitate future access to the structure in partnership with another party e.g. KCDC, HPT.	✓		Regional, national
Social effects			
Disruption to recreational cyclists, horse riders and pedestrian networks during construction, including at MacKays Crossing, SH58, Warspite Ave and Kenepuru Drive; and potential adverse effects on connectivity through Battle Hill Farm Forest Park and Belmont Regional Park		✓	Local
Local village areas such as Pauatahanui and Waitangirua will experience increased activity as a result of construction workers being present.	✓	✓	Local
Potential for noise effects on surrounding communities during construction		✓	
Disruption to local communities will occur during construction, as a result of traffic, noise, and large crews of construction workers.		✓	Local
Potential for dust nuisance effects at nearby sensitive receptors – most likely to include residents near the Kenepuru and Waitangirua Link Roads, and Linden Interchange.		✓	Local
Potential for amenity effects for contact recreation (e.g. water becomes cloudy and less desirable		✓	Local, regional

Actual or potential environmental effect	Positive	Adverse	Local, regional or national level effect(s)
for swimming) in streams and / or Porirua Harbour.			
Change in amenity for the Marae, Church, schools and other facilities at the tie-in with the Whitby and Waitangirua Link Roads; and for local residents, particularly those with a view of the Main Alignment.		✓	Local, regional
Lanes Flat will become a more useable and pleasant public recreational area from the wetland restoration, public walkway and cycle path construction.	✓		Local
Loss of amenity and tranquillity in local and regional parks; including BHFFP and Belmont Regional Park, and at Mahoe Park and Arthur Carman Park.		✓	Local, regional
The access to St Josephs Church will be realigned and benefit from improved safety and visibility.	✓		Local
The Project will provide an alternative route to the existing SH1 and, as a result, the existing SH1 is expected to have reduced traffic volumes. A less busy road, with fewer vehicles, reduces its severance effects and positively impacts the communities along the existing SH1.	✓		Local

12. Assessment methodology

Overview

The AEE process used relevant previous environmental assessment information, particularly from the scheme assessment (Phase 1). The environmental assessment undertaken for Phase 2 has involved a wide range of engineering and environmental specialists working together on the design and assessment of the Project.

12.1 Introduction

The purpose of this chapter is to outline how the AEE was undertaken for the Project and how previous environmental assessment work has been used. The structure for the remainder of Part G is also set out.

12.2 Purpose of the assessment

The primary purpose of the assessment is to meet the statutory requirements under the RMA which requires an assessment of the environmental effects of the proposed activity.

In addition to the requirements under the RMA, it is also part of the NZTA's environmental policy and its operating principles under section 96(1)(a) of the LTMA to:

> *"exhibit a sense of social and environmental responsibility, which includes -*
>
> *(i) avoiding, to the extent reasonable in the circumstances, adverse effects on the environment; and..."*

The requirements of the RMA and the LTMA formed the basis for the effects' assessment undertaken for the Project.

12.3 Previous environmental assessments

There have been a number of environmental assessments undertaken for previous iterations of the Project, principally:

- an environmental impact report (EIR) in 1987 as part of the Greater Wellington Area Transportation Strategic Review (GATS);
- an AEE in support of the NoRs lodged in 1996; and
- strategic studies undertaken in the development of the WCP in 2006.

As discussed in Chapter 2, the assessments undertaken for the GATS review and the WCP both considered the environmental impacts of options other than an inland route (i.e. a Transmission Gully route). Principally, these involved considering an upgrade to the existing SH1 route between Linden and MacKays Crossing. Both of these strategic level assessments concluded that an inland route would likely result in fewer adverse environmental impacts, as compared to upgrading the existing SH1. This was verified by the Parliamentary Commissioner for the Environment in her review of the EIR in 1990.

As such, the environmental impacts of other options have already been considered at a strategic level and do not need to be re-evaluated at this time. For this reason, the most recent environmental assessments undertaken on the Project (starting with the Phase 1 scheme assessment in 2007 - 2008) have been within the general concept of an inland State highway route (along the Main Alignment corridor) with associated links to the local road network (within the Kenepuru Link Road area and the Porirua Link Roads area).

This AEE process utilised information from previous environmental assessments where it remained relevant. Care needs to be taken, however, when reviewing historical material as many elements of the Project have changed over time. The AEE process has of course assessed the current Project as described in Part D of this report and not previous versions of it.

12.4 Environmental assessment undertaken during Phase 1

The NZTA uses a social and environmental management (SEM) framework to incorporate social and environmental considerations into the early phases of its projects. This framework consists of a series of procedures which starts with a preliminary screening assessment and culminates with the assessment of environmental effects process used to support the necessary statutory approvals for a project (i.e. the AEE process).

Environmental assessment work undertaken during Phase 1 consisted of:

- the social and environmental screen (SES) process leading into a preliminary social and environmental assessment (SEA) of the Project at the scheme assessment stage; and
- a statement of identified Maori interest (SIMI).

The SES process, and subsequent SEA process, involved a preliminary assessment of the Project as against a checklist of potential effects commonly associated with major road projects. This checklist formed a framework for the assessment and comparison of various alignment options and sub-options (as described in Part E of this report). From this process a preferred alignment was identified along with a preliminary identification of the possible environmental impacts of this alignment. This was used to define the scope of the full AEE process documented in this report.

The key potential issues identified, and subsequently assessed in more detail through the AEE process, were:

- noise;
- air quality;

- water resources;
- resource efficiency;
- culture and heritage;
- landscape and visual;
- ecological resources;
- vibration;
- land use and transport integration;
- traffic;
- urban design;
- community cohesion (social effects);
- public health;
- access and mobility; and
- contaminated land.

The assessment of these issues is presented in Part G of this report[84].

12.5 Assessment methodology

The AEE process has involved a wide range of individuals and groups. It was led by the planning team and involved input from 15 different engineering and environmental teams. These teams provided technical and design input into the development and assessment of the Project.

Both the design and assessment teams worked closely together to refine the design of the Project as the assessment was conducted. For most of Phase 2, all technical teams met together most fortnights and meetings between specific technical teams were held as required. This close working relationship was critical to identifying opportunities where potential adverse effects could be avoided by making changes to the design of the Project. The iterative and dynamic nature of this process means it is virtually impossible to satisfactorily document all outcomes from this process entirely in this AEE. However, where key design changes were made based on their likely environmental effects, these changes have been described either in the consideration of alternatives (Part E) or within a specific topic assessment in Part G.

The close working relationship also helped to ensure that appropriate mitigation measures were developed between different technical teams.

In addition to the integrated form of assessment, there are three other aspects of the AEE process worthy of note:

84. Resource efficiency was assessed as part of the development of the Project but is not covered in Part G because it is not relevant to the assessment of environmental effects.

- the use of focus areas;
- the involvement of local authorities in the process; and
- the involvement of other stakeholders.

12.5.1 Focus areas

The Project covers a long corridor. As such, the nature of the environment and the effects associated with the Project in those environments is varied. At six locations (referred to as focus areas) a greater level of design and / or assessment was required to adequately determine likely environmental effects.

These six focus areas are:

- Te Puka Stream;
- Upper Horokiri Stream;
- SH58 Interchange;
- Waitangirua;
- Duck Creek; and
- Kenepuru Interchange.

Generally, each focus area has a greater level of complexity associated with it than for the rest of the Project and accordingly, the focus areas require a greater degree of site specific assessment and management. For each focus area a site specific environmental management plan (SSEMP) has been developed which shows how construction could be undertaken and how environmental management techniques can be effectively used to manage effects. The SSEMPs have been prepared by multi-disciplinary teams and have had input from councils (through RATAG and its advisors) as well as Ngati Toa and DOC. They are used to understand effects that might eventuate and by focussing on the complex areas and provide the confidence that effects can be managed appropriately across the entire route. Ultimately, once consent is granted and ahead of construction commencing, SSEMPs will be prepared to the entire route as needed.

Focus areas, and the associated SSEMPs for each area, will be referred to throughout the assessments described in Part G. Further information about the SSEMPs is also contained in Part H where the role of management plans in relation to the proposed mitigations and conditions is outlined.

12.5.2 Local authority involvement

Local authorities were involved in the AEE process in three key capacities:

- as regulatory authorities;
- as asset and infrastructure owners and / or providers; and
- as owners of land that is required for the Project (only in some cases).

PCC also had an additional role as the requiring authority / applicant for the Porirua Link Roads. The involvement of local authorities has been discussed in Part F (Consultation). In their capacity as regulatory authorities (through the RATAG) the local authorities have provided advice on district and regional planning provisions and other regulatory matters of relevance to the AEE process. As asset and infrastructure owners and / or providers they have provided feedback on the potential effects of the Project on their assets and how these effects could be mitigated, where required. Similarly, in the few instances where they are landowners, they have advised on land use and property effects.

12.5.3 Stakeholder involvement

In addition to the local authorities, a wide range of stakeholders were involved in the AEE process in a number of different capacities. The consultation undertaken with these stakeholders of that consultation is set out in Part F.

In general terms, stakeholders provided feedback on how they believed the Project would affect them or the interests their organisations represented. Due to the long history of the Project, the views of many stakeholders were already well known and, similarly many stakeholders had a high level of knowledge about the Project, prior to the Phase 2 consultation process.

Consultation undertaken with various stakeholders is discussed throughout the topic chapters in Part G as it is relevant.

12.6 Structure of the assessment

The remainder of the chapters in Part G describe the assessment undertaken in the key topic areas (as identified through the Phase 1 preliminary environmental assessment work). For convenience, each assessment topic is described in a separate chapter, although interactions between topic areas are recognised and discussed where relevant. The topic chapters, and the relevant technical reports, are shown in Table 12.1.

Table 12.1: Environmental effects assessment topics

AEE report chapter	Topic	Relevant technical report No.
13	Traffic and transport	4
14	Land use and property effects	-
15	Network utilities	-
16	Noise and vibration	12
17	Air quality	13
18	Contaminated land	16
19	Hydrology	14
20	Water quality	15
21	Terrestrial ecology	6, 7, 8 and 11
22	Freshwater ecology	9 and 11
23	Marine ecology	10 and 11

AEE report chapter	Topic	Relevant technical report No.
24	Tangata whenua	18
25	Landscape and visual	5
26	Archaeology and built heritage	19 and 20
27	Social effects	17

Each chapter provides a summary of the key potential effects and proposed mitigation for each topic. Further information about the assessment, including the assessment methodology used, is contained in the relevant technical report.

The basic structure for each assessment topic is:

- a description of the existing environment (in greater detail than was provided in Chapter 6);
- a description of the key effects (both positive and adverse) predicted as a result of the Project; and
- a description of what measures have been undertaken, or are proposed to be undertaken, to avoid, remedy, mitigate or offset potential adverse effects that have been identified.

Part H sets out the framework by which effects (as identified throughout Part G) will be managed. It also outlines the relationships between the recommended mitigation and proposed management plans.

13. Traffic and transport

Overview

The Project will have a number of significant positive traffic and transport effects (i.e. benefits) to the region, namely:

- improved route security through provision of an alternative route into and out of the capital city;
- reductions in travel times for both uses of the route and parts of the local road network;
- minimising travel time variability;
- improved amenity, accessibility and connectivity for communities along the existing SH1 route;
- improved safety.

These benefits are important for the movement of road-based freight and tourist traffic, and for the general public who will experience improved and more reliable journey times. Local coastal communities will benefit as a result of reduced traffic volumes (especially commercial vehicles) travelling on the existing SH1, and the resulting reduction in community severance, along with improved accessibility and safety. There will also be significant reductions in traffic volumes on some local roads, especially around the Pauatahanui Inlet (Grays Road and SH58), the Paekakariki Hill Road and Titahi Bay Road (east of the Kenepuru Drive intersection)

At a local, regional and national level, benefits include improved route security providing for an alternative route into and out of Wellington City, a significant consideration for the capital city in the event of a natural disaster.

While the Project will have significant positive traffic and transport effects overall, construction of the Project will result in some adverse traffic and transport effects on local communities arising from increased heavy construction traffic using local roads. These effects will be managed through a combination of measures set out in the draft Construction Traffic Management Plan.

13.1 Introduction

This chapter presents the key findings of the assessment of traffic and transport effects undertaken for the Project. This assessment is based on traffic modelling, the key results of which are described in Section 13.5 of this report. The key traffic and transport effects from the operation and construction of the Project are then described in Sections 13.6 and 13.7, respectively.

Further details on the assessment of traffic and transport effects are contained in **Technical Report 4**.

13.2 The existing transportation and traffic environment

The existing transportation network comprises the State highway, local road, rail, bus, walking and cycling networks.

13.2.1 Existing State highway network

State Highway 1

SH1 is the primary strategic route within the Wellington region, providing essential connectivity, not only for the communities situated along it, but also for longer distance traffic movements between Wellington and the north. Key parts of the route are (from south to north):

- Linden to the Mungavin Interchange at Porirua:
    - Motorway status with a 100km/hr speed limit, two lanes in each direction, a grassed median and hard shoulders;
    - Mungavin Interchange is a grade-separated roundabout with full slip roads, whilst the northern Porirua intersection (Ramp Bridges) has north-facing slip roads only; and
    - Whitford Brown intersection (located north of Porirua) is an at-grade intersection controlled by traffic signals.
- Paremata roundabout to north of Plimmerton
    - SH1 is urban in nature with a 50km/hr speed limit, two lanes in each direction, many intersections or private accesses and no physical median barrier,
    - Marina View to Acheron Road: currently operates with the kerbside lanes reserved for high occupancy vehicles during peak periods (i.e. T2 lanes, for vehicles carrying two or more people at peak times[85]).
- North of Plimmerton to just south of Pukerua Bay:
    - The rural section of SH1 provides an expressway standard road with a 100km/hr speed limit, four lanes and a wire rope median barrier;
    - An at-grade intersection provides access to Airlie Road and the northern part of Plimmerton.
- Pukerua Bay to Paekakariki:
    - The road standard drops to one lane in each direction within Pukerua Bay Township, with a 50km/hr speed limit and frequent intersections and accesses. There is also a 70km/hr buffer zone at the northern end of Pukerua Bay;
    - North of Pukerua Bay, the coastal section has a 80km/hr speed restriction, with one lane in each direction separated by a wire rope barrier; and

85. A recent review of the operation of Mana Esplanade, which was required as a condition of the designation, recommended the removal of the T2 lanes. These are now proposed to be removed (expected to occur in late 2011) and replaced with ‘Clearway’ controls which will apply at peak periods.

    - At Paekakariki, the speed limit drops to 70km/hr and an at-grade intersection provides access to the township via Beach Road and to Paekakariki Hill Road.
- Between south of Pukerua Bay and MacKays Crossing overtaking is prohibited for a distance of over 10 kilometres.
- North of Paekakariki
    - the speed limit increases to 80km/hr and then 100km/hr with one lane in each direction;
    - From MacKays Crossing north, four lanes with a median barrier are provided until SH1 reaches the Poplar Avenue intersection, at the southern edge of Raumati.

State Highway 58

SH1 is connected to SH2 via SH58, which runs for a distance of approximately 15kms from SH1 at Paremata to SH2 at Haywards (in Upper Hutt City). To the west of Pauatahanui, SH58 follows the southern edge of the Pauatahanui inlet, with a number of tight bends. This section is subject to periodic closure as a result of slips or flooding. The section of SH58 at Paremata is urban in nature and subject to a 50km/hr speed restriction. The coastal and rural sections of SH58 have 80km/hr or 100km/hr speed limits.

State Highway 2

SH2 connects communities in the Hutt Valley with Wellington City, the Wairarapa and beyond to Hawke's Bay. SH1 and SH2 intersect at the base of the Ngauranga Gorge approximately 11.7kms south of the Transmission Gully alignment at Linden.

13.2.2 Local road network

The State Highway network is supported by a network of local roads. Those local roads that are main links and connectors in the vicinity of the Project include:

- Kenepuru Drive / Main Road Tawa: this is a route broadly parallel to SH1 which links the residential and commercial areas of southern Porirua and Tawa;
- Mungavin Avenue / Warspite Avenue: links SH1 at Porirua with Ranui Heights, Cannons Creek and Waitangirua;
- Titahi Bay Road: links SH1 with the Porirua CBD, Elsdon and Titahi Bay;
- Whitford Brown Avenue: links SH1 north of Porirua with Papakowhai, Aotea, Ascot Park and Whitby;
- Grays Road: links SH1 at Plimmerton with Pauatahanui and SH58 along the northern side of the Pauatahanui inlet. The tight geometry of this road at its western end restricts access for some heavy vehicles and the road is subject to occasional closures due to flooding from streams and high tides / storm surges. There is currently a 60km/hr speed restriction (a temporary safety measure) around the inlet;

- Paekakariki Hill Road: this is a steep, narrow and winding rural road which runs from SH1 at Paekakariki to SH58 at Pauatahanui. This road cannot safely accommodate heavy vehicles or vehicles with long trailers over its full length, and is prone to closure during significant rainfall events primarily from slips and stream debris;
- Akatarawa Road: although providing a more direct route between SH1 at Waikanae and SH2 at Upper Hutt, this road is of a low standard with a poor alignment and several single lane sections. As such, it is not suitable for any significant volumes of traffic, cannot easily accommodate heavy vehicles and is subject to closure during significant rainfall events;
- James Cook Drive: an arterial route in Whitby connecting SH58 to Discovery Drive and Navigation Drive;
- Discovery Drive: an arterial route in Whitby that connects the Whitby Shopping Centre to James Cook Drive and Spinnaker Drive; and
- Navigation Drive: an arterial route on the south side of Whitby that connects to James Cook Drive and links to Pauatahanui Village and SH58 via Joseph Banks Drive.

13.2.3 Rail network

The North Island Main Trunk (NIMT) railway runs between Wellington City and the Kapiti Coast and beyond this to the central North Island and further north. Suburban passenger services operate between Wellington and Waikanae, with a high frequency service during weekday peak periods and frequent trains at other times. Scheduled running times are 60 minutes between Waikanae and Wellington and 30 minutes between Plimmerton and Wellington. Patronage levels are high in the corridor with 4-5 million passenger trips per annum. The “Capital Connection” service operates once a day between Palmerston North and Wellington, providing connectivity to the Horowhenua and northern Kapiti Coast areas. In addition to these commuter services, the Overlander is a mainly tourist-orientated service operating once a day in each direction between Wellington and Auckland. The NIMT also carries a significant volume of freight, with several daily trains in each direction.

The railway network is also currently the subject of an upgrade project, the main elements of which are:

- delivery of new ‘Matangi’ rolling stock, comprising 48 two-car electric units, each providing 149 seats, to progressively replace the English Electric units;
- extension of electrification and double tracked lines to extend commuter services to Waikanae (completed);
- installation of improved power supply equipment and railway signalling;
- addition of another line into Wellington railway station to reduce delays (completed);
- enlargement of the Johnsonville line tunnels (completed);
- improvement of a number of platform and station facilities (completed).

Other network-wide improvements include the implementation of a real-time information system and integrated ticketing.

13.2.4 Bus network

Bus services are currently precluded from operating in the corridor where these would compete with the subsidised rail service. The extensive network of local bus services across the corridor area is primarily orientated towards providing connectivity between residential areas and the rail network.

13.2.5 Walking and cycling network

Walking and cycling are important modes of transportation for shorter distance trips within the corridor. These modes are being actively promoted by local authorities, with the development of more integrated networks. A longer distance cycle route runs parallel to SH1 between Porirua and Kapiti (the Ara Harakeke Pathway), part of which comprises a narrow shared-use path adjacent to SH1 Centennial Highway. The NZTA contributed to the development of this pathway when the Paremata to Plimmerton project was completed by converting the old highway alignment to a cycleway / walkway between Plimmerton and Paremata.

13.3 Traffic and transport issues and objectives

The NZTA and the PCC have specific objectives for the Project which are directly relevant to the traffic and transport assessment. Changes in travel patterns and associated benefits, improved traffic safety and route security are key concerns for the NZTA. The following sections describe key difficulties with the existing network in this regard.

13.3.1 Travel demand patterns

Commuters

Some of the existing travel demands in the corridor, for example commuter travel between Kapiti and Wellington, are jointly serviced by both road and public transport networks. However, there are also significant travel demand patterns which are able to be efficiently serviced by public transport. For example, this includes movements between Kapiti and the Hutt Valley, and between Porirua and the Hutt Valley.

Congestion

Traffic congestion in the SH1 corridor results in increased travel times during weekday peak periods. For example, in 2026 it is expected that a northbound journey from Linden to MacKays Crossing will take 54% longer in the weekday PM peak when compared to the uncongested AM peak. Travel between the Hutt Valley and SH1 (north) requires the use of routes which are indirect, slow and suffer from poor geometry (SH58 and Grays Road around the Pauatahanui inlet and Paekakariki Hill Road).

During weekend and holiday periods severe congestion often occurs as a result of increased road traffic demands. In the event of an incident, such as a crash or natural event, the extent of disruption can be magnified significantly.

Traffic congestion not only increases total travel times but also the variability or uncertainty of travel times in the corridor. The planning of journeys within the corridor can become increasingly difficult, resulting in additional and unnecessary costs being borne by travellers and businesses.

13.3.2 Safety

Between 2005 and 2009, 974 crashes were recorded on SH1 (Linden to MacKays), SH58 and Grays Road. Over this period there has been no discernible downward trend in the total number of crashes. However, a number of improvements have been made in recent years to address specific crash problems and the severity of crashes in localised areas within the corridor, such as the installation of a wire rope median barrier along the coastal section of SH1.

The scope for further reductions in the number of crashes through road improvements is constrained by the topography of the area, as carriageway realignments and widening would be required, with associated land and financial requirements

The Project will address rising traffic demands (especially commercial vehicles) by the provision of an alternative route which has been designed to modern safety standards. Local traffic will typically continue to use the existing route, but through traffic is expected to use the new route. Without the Project, existing crash problems are likely to increase with an increase in traffic over time and this will have a further adverse effect on the reliability of travel times.

13.3.3 Route security

As discussed in Chapter 2, the northern access to Wellington is vulnerable to closure either after a significant earthquake, tsunami or storm event, or due to other unplanned events such as traffic crashes and bad weather. The eastern access to Wellington (via the Rimutaka Hill section of SH2) is also vulnerable to closure, and is regularly closed after heavy rain, as a result of slips, and during periods of high winds. The issue of route security is a significant one for the NZTA and a key reason for constructing the Project is to provide better security of access into and out of the capital city.

Because both SH1 and SH2 are vulnerable to closure as a result of significant damage in an extreme event, these routes and the adjacent railways could be closed for several weeks or months while repair and reinstatement work takes place. Such closures are of significant concern as they would be extremely disruptive and would result in lost productivity both regionally and nationally.

13.4 Methodology for assessing effects

The assessment has been informed using outputs from the Wellington Transport Strategy Model (WTSM) which is a multi-modal model, and from traffic models simulating the performance of the road network (SATURN) and individual intersections (SIDRA). These models have been subjected to rigorous processes of calibration, validation and peer review to ensure that the resulting forecasts are reliable.

Together, these models provide forecasts of travel demands by mode, traffic volumes and conditions on road sections and the detailed performance of intersections, all for representative weekday AM peak, inter-peak and PM peak periods.

13.4.1 Modelling Methodology

Travel demands in the models are based upon household interview survey information, census data and demographic and economic forecasts.

The modelling assessments have been based around two principal scenarios, a ‘Basecase’ scenario without the Project in place, and a ‘with Project’ scenario. The assessments focus upon the evaluation of conditions in 2026, a few years after the expected completion of construction, with further modelling carried out for 2031 and 2041. These two scenarios are described in more detail below.

In addition to these two scenarios, a number of “sensitivity tests” have been undertaken to assess the extent to which the assessments of the Project may be sensitive to changes in some of the key assumptions which form the basis of these scenarios. These tests are described in detail in **Technical Report 4**.

13.4.1.1 Basecase / ’without Project’ scenario

The Basecase represents a realistic future scenario for 2026, but without the Project in place. This has been developed to provide a baseline against which the effects of the Project can then be assessed.

The Basecase recognises that a number of other transportation projects are likely to be progressed and development will continue to occur in the period to 2026, irrespective of the Project. This is an accepted approach in traffic modelling as stated in **Technical Report 4**. The year 2026 is used as it is a few years after the expected opening date of 2021.

The Basecase includes the land use changes forecast by the GWRC, consistent with the assessment of other transportation projects across the region. Transport projects which have not yet been constructed (and have not been consented), but are expected to be completed by 2026 regardless of whether the Project goes ahead are included in the Basecase. The projects included in the Basecase modelling are detailed in **Technical Report 4**. Principal among these are:

- other RoNS projects;
- the Petone (SH2) to Grenada (SH1) Link Road;
- SH58 upgrades; and
- anticipated public transport improvements (i.e. new rolling stock, twin tracking and electrification to Waikanae, integrated ticketing etc).

Other RoNS projects have been included because the Project is only one component of a package of prioritised infrastructural improvements to the SH1 corridor between Wellington Airport and Levin. Sensitivity testing (discussed in **Technical Report 4**) concluded that the assessed benefits of the Project would be largely unaffected by the completion of the other RoNS projects.

13.4.1.2 'With Project' scenario

The 'with Project' scenario is the same as the Basecase, except that it also includes the Project and a number of associated changes to the existing SH1 (or the Coastal Route). The existing coastal route is likely to revert to a local road (under the control of PCC) once the Project is opened to traffic. Regardless, there will be changes to its form and function. This is reinforced by one of the Project objectives which is "To assist in the integration of the land transport system by enabling the existing SH1to be developed into a safe and multi-functional alternative to the proposed new strategic link."

Consistent with this objective, an indicative package of measures to be applied to the coastal route was developed in consultation with the NZTA and PCC – the two agencies that would be involved with making decisions about the future of the existing road. The package of measures is representative of the changes that could feasibly be applied to the coastal route, and these are described in **Technical Report 4**.

The package of measures includes additional traffic signals, retiming of signals to give more time to side road access and reduced speed limits in some locations.

13.4.2 Effects based assessment methods

The two scenarios described above, and the outputs from the models, have been assessed across a range of criteria which measure the performance of the transportation network. The traffic and transport models have been used to provide quantitative forecasts to assist in this process.

The criteria assessed are:

- changes in trip patterns (distribution, length, trip induction, mode transfer);
- traffic impacts analysis (traffic volumes, travel times, overall network performance, interchange performance);
- heavy vehicles (volumes by road sections, travel times);
- route security and trip reliability;
- public transport (patronage, trip patterns, volumes);
- walking and cycling (opportunities, impacts); and
- safety (changes in frequency, severity and location of crashes).

These effects have been assessed by identifying conditions for the Basecase (without the Project) and then assessing the changes which would occur with the Project in place.

Some of this information has been used to inform analyses of other effects undertaken by other technical specialists, including acoustics (traffic noise and vibration), air quality (vehicle emissions) and water quality (discharges to the stormwater system from road runoff).

13.5 Traffic model forecasts

The traffic and transport model outputs are in the form of forecasts of travel demands by mode, and traffic volumes by road section. The following figures show the predicted traffic volumes:

- Along the new roads created by the Project (Figure 13.1);
- Along existing State highways (Figure 13.2); and
- Along existing local roads (Figure 13.3).

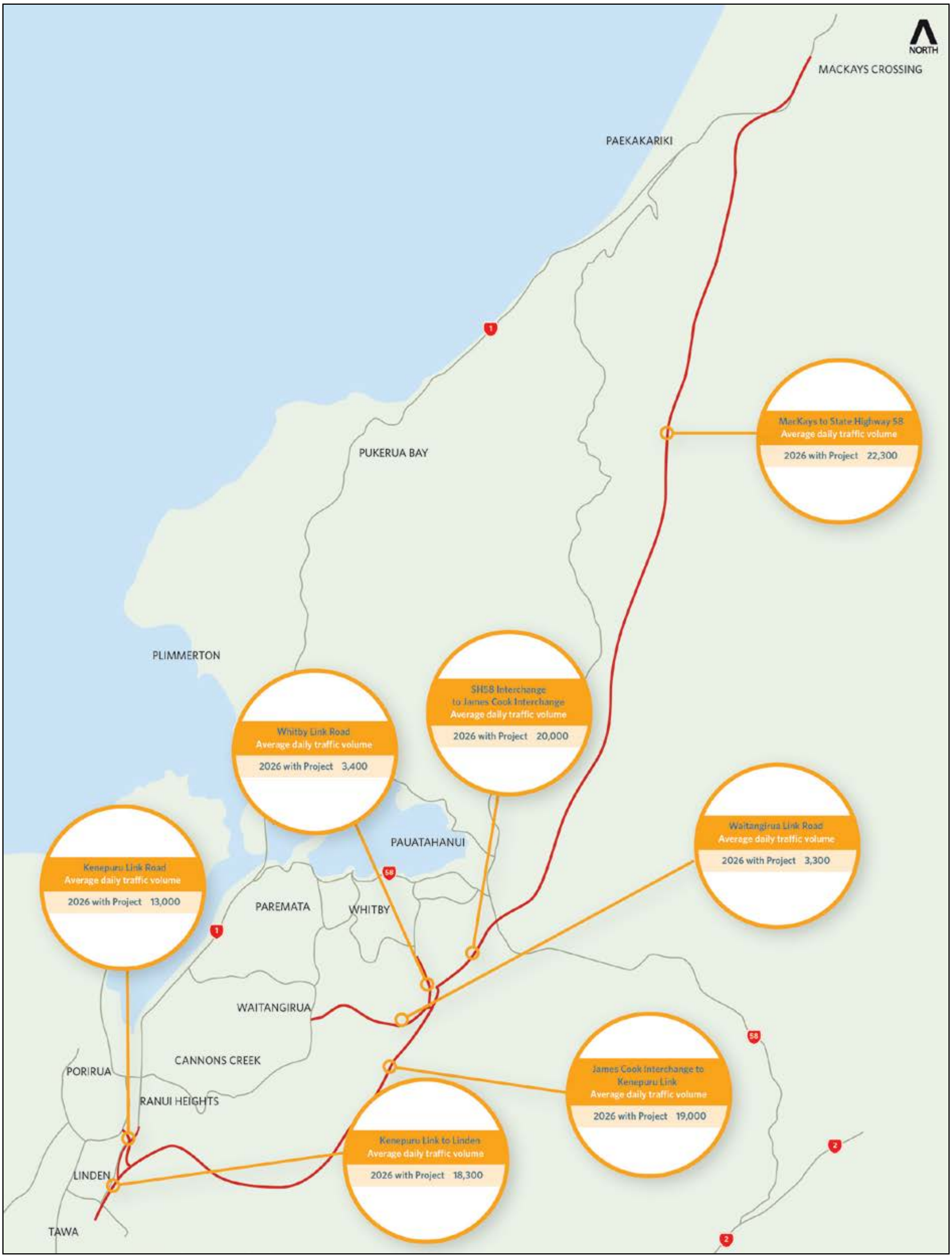

Figure 13.1: Predicted traffic volumes on new roads created by the Project

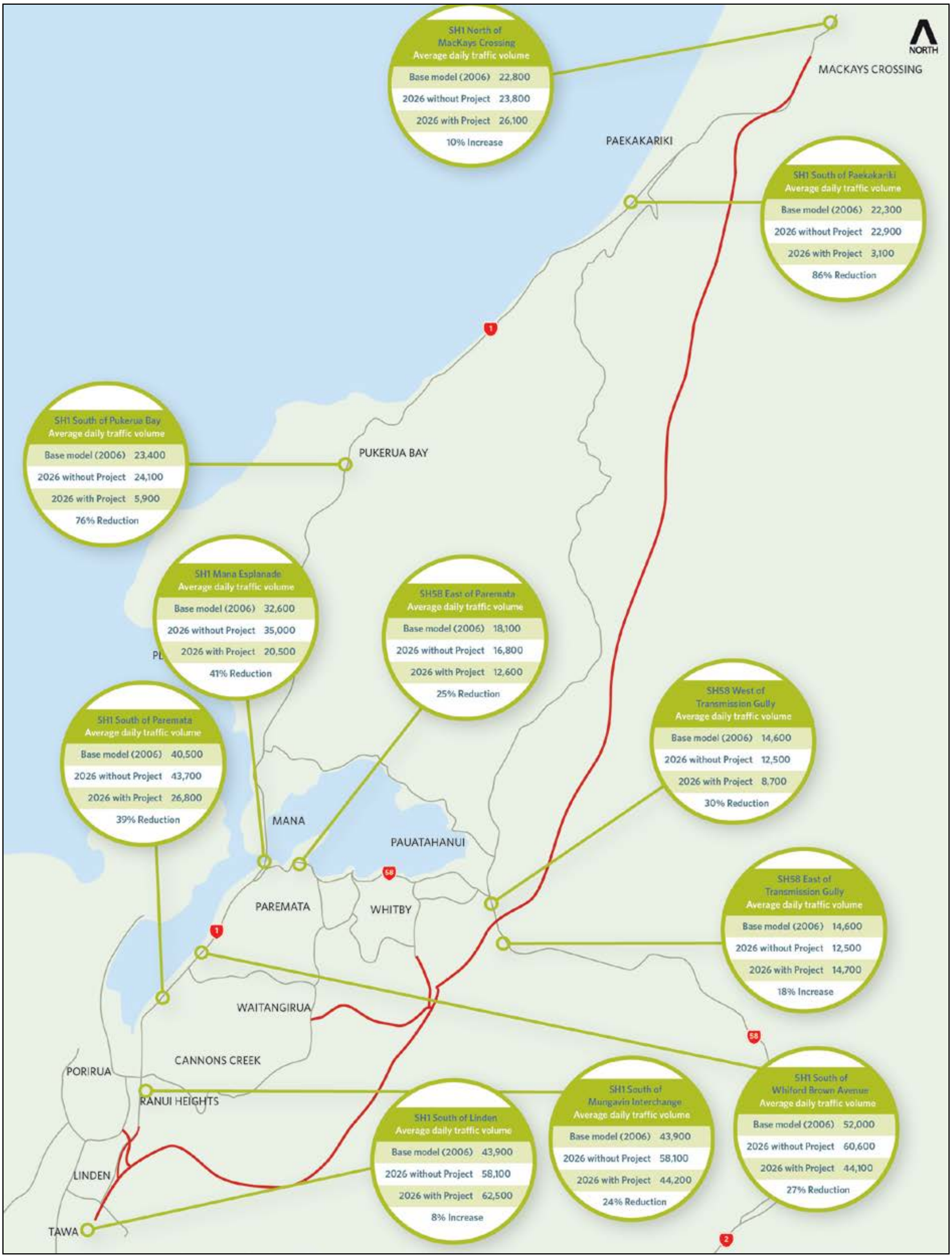

Figure 13.2: Predicted traffic volumes on existing State highways

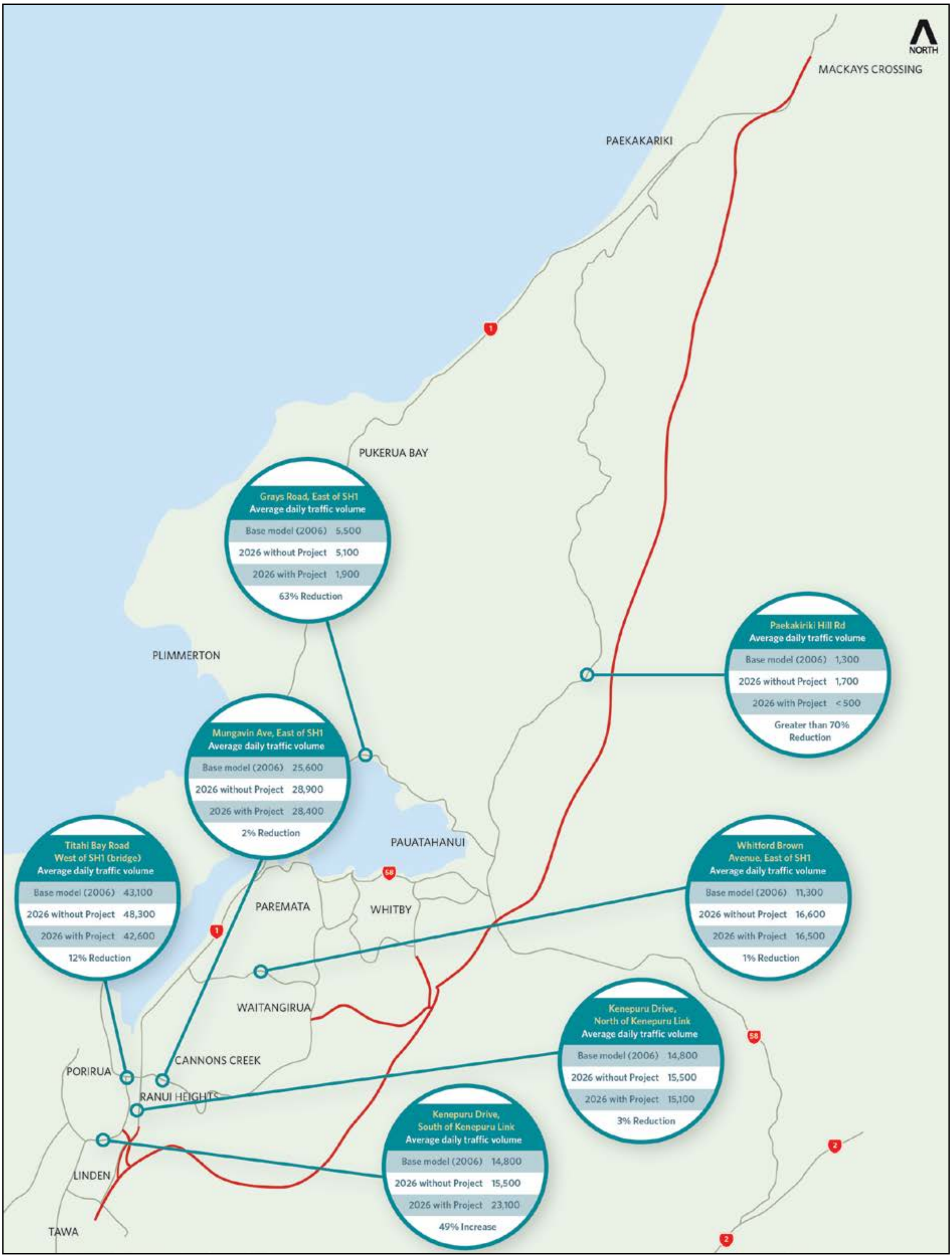

Figure 13.3: Predicted traffic volumes on existing local roads

In summary, the modelling indicates that there will be significant changes in patterns of transportation and traffic demands throughout the region arising as a result of the Project.

Some of the more significant changes in weekday traffic volumes in 2026 include:

- Declining traffic volumes:
    - the existing SH1 route between Linden and MacKays Crossing - significant reductions ranging from 87% south of Paekakariki to 24% south of the Mungavin Interchange at Porirua;
    - Grays Road (west of SH1) – 62% reduction;
    - SH58 East of Paremata – 25% reduction; and
    - Paekakariki Hill Road – more than 70% reduction.
- Increasing traffic volumes:
    - Kenepuru Drive (between Kenepuru Link and Raiha Street) – 49% increase, arising from the anticipated attractiveness of the Kenepuru Link Road ; and
    - SH58 East of Pauatahanui – 17% increase, due to a general increase in traffic activity between the SH1 corridor and the Hutt Valley.

13.6 Operational traffic and transport effects

Once operational, the Project will have a number of significant positive effects including:

- Large reductions in traffic activity along the existing SH1.
- Significant travel time reductions for traffic using the Project. For example, road users between Linden and MacKays Crossing will experience travel time savings of nearly 30% or approximately 7 minutes in uncongested conditions, with larger time savings during weekday peak periods.
- Significant improvements in accessibility between the Hutt Valley and SH1 (north), with the provision of a more direct and much quicker route.
- Greatly improved travel time reliability arising from reduced congestion, meaning that travellers will have more certainty regarding their expected arrival times at their destination, especially important for freight movements (currently travel times are 31-50% higher in peak periods than in the non-peak periods).
- Improved amenity, accessibility and connectivity for communities along the existing SH1 route.
- Improvements in network connectivity across the region, with new linkages between State Highways, and between Kapiti, Porirua and the Hutt Valley.

Detailed effects on the transport network are outlined in the following sections. A series of sensitivity tests to confirm operational assumptions has also been completed, which are described in **Technical Report 4**.

13.6.1 Changes in traffic volumes

Traffic volumes and congestion levels on a number of local roads will be affected by the Project. Table 13.1 outlines key changes and effects on traffic volumes (these changes are presented in the figure above which sets out the modelling predictions). The key local road sections where notable changes in traffic volumes are experienced are summarised in the following table. The locations where significant changes (in percentage terms) will be felt are highlighted with green indicating a significant reduction predicted, and red indicating a significant predicted increase predicted.

Table 13.1: Local road traffic volume changes

Local road section	Traffic volumes (vehicles/day)		
	Basecase (2026)	With the Project (2026)	% change (2026)
Grays Road - east of SH1	5,100	1,900	-62%
Main Road Tawa - Raiha Street to Linden Avenue	22,000	19,100	-13%
Raiha Street - Kenepuru Drive to Prosser Street	10,500	10,500	0%
Kenepuru Drive - Titahi Bay Road to Kenepuru Link Road	15,500	15,100	-3%
Kenepuru Drive - Kenepuru Link Road to Raiha Street	15,500	23,100	49%
Titahi Bay Road - Mungavin Interchange to Hagley Street	48,300	42,600	-12%
Whitford-Brown Avenue - SH1 to Warspite Avenue	16,600	16,500	-1%
Warspite Avenue - Omapere Street to Waitangirua Link Road	6,600	6,900	5%
Warspite Avenue - Waitangirua Link Road to Waihora Crescent	6,800	7,300	7%
James Cook Drive - Navigation Drive to SH58	3,400	2,000	-41%
Discovery Drive-James Cook Drive to Spinnaker Drive	3,600	3,500	-3%
Navigation Drive - James Cook Drive to Joseph Banks Drive	2,500	3,200	28%
Paekakariki Hill Road - SH1 to Grays Road	1,700	100	> -70%

Source: SATURN model and Technical Report 4

Traffic congestion both increases the total length of travel, and the variability or uncertainty of travel times in the corridor. This means that the planning of journeys becomes increasingly difficult due to uncertainty, resulting in additional and unnecessary costs being borne by travellers and businesses.

The change in traffic volumes on the road also gives an indication of the potential for safety improvements – i.e. the number of crashes predicted due to vehicle exposure. Traffic safety is assessed further below.

13.6.2 Effects on total travel demand and mode of travel

The Project will result in a number of changes in travel behaviour, arising from reductions in the costs of road travel and improved accessibility. Trip movements which are currently suppressed due to the effects of congestion and lengthy journey times will be released, leading to an overall increase in road traffic activity, 'induced' trips. **Technical Report 4** concludes that resulting 'induced trips' can occur for a number of reasons including:

- Some people choose to visit destinations in the SH1 corridor in preference to other locations because of the improved accessibility. This could be in the form of a short term response with trips made for shopping or business (for example) or a longer-term response in the form of moving house or business; and
- Some people who previously travelled earlier or later than desired in order to avoid expected congestion (and variability in travel times), especially at peak periods, may choose to travel closer to their desired time of travel because of improvements in the reliability of journey times; and
- Some people who previously use public transport network will travel by private vehicle instead.

The forecast volumes of major travel movements in the corridor for 2026 (summarised in Figure 13.4) indicates that there would be some increase both in the total volume of travel in the corridor and also the proportion of the travel which is undertaken by road, as a result of the Project.

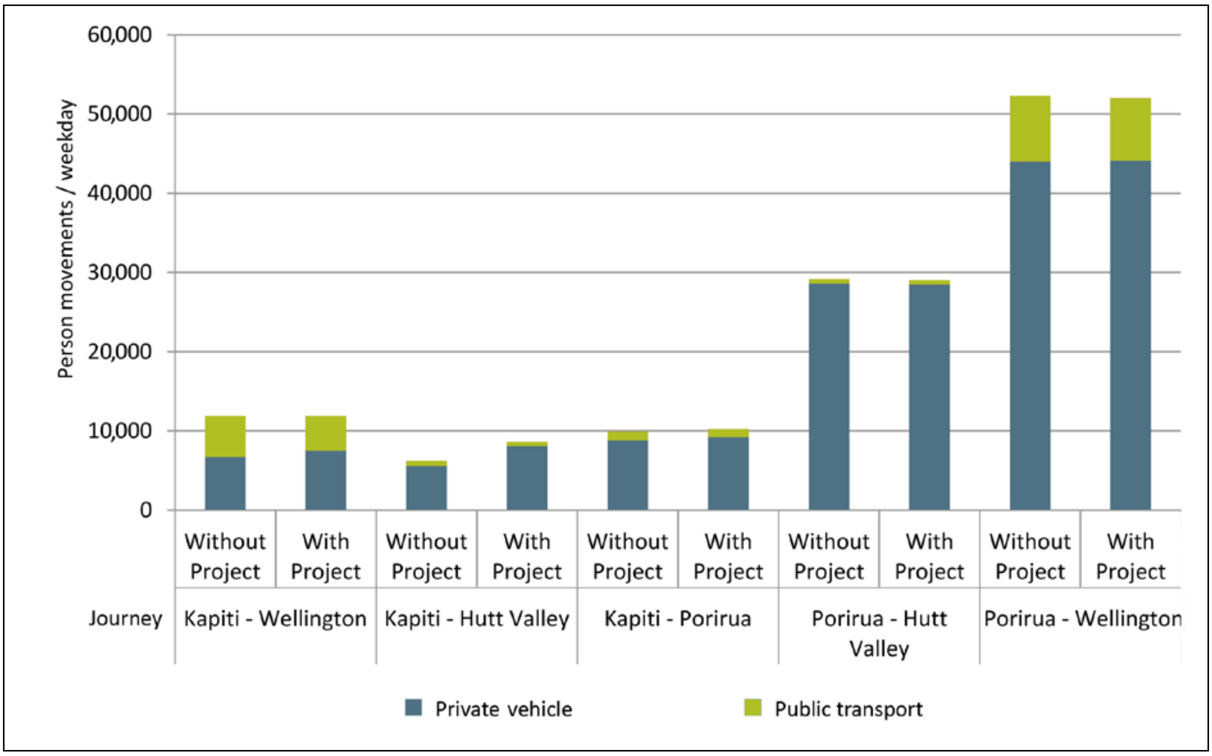

Figure 13.4: Comparison of forecast total travel demand in person trips for key journeys for a typical weekday (2026), with and without the Project

It is important to note that the effects above would occur because the improved accessibility provided by the Project allows people to travel to the destinations they wish, at the times and using the mode of transport which is most convenient to them. All of these responses have an associated benefit to the travellers concerned and in aggregate, to the region as a whole.

13.6.3 Effects on the road network

Actual and potential effects on the wider local and State Highway road network include effects on overall network performance and traffic volumes.

Overall network performance

The Project will have a small impact on the overall road network performance. Whilst the change in the overall number of vehicle trips in the region is expected to be negligible, the Project will have the effect of reducing total travel times within the network as a whole. There will be a small increase in total travel distances, although they will be travelled at increased speeds due to reduced congestion.

Traffic volumes

The Project will result in a large diversion of traffic away from the existing SH1 route between Linden and MacKays Crossing onto the Main Alignment. In addition, there would be a range of more subtle changes in traffic volumes on other sections of the road network (such as on parts of Warspite Ave) as drivers utilise routes which are less congested with the inclusion of Main Alignment. Furthermore, the Project would result in some induction of 'new' trips, as described above.

The Project will result in significant changes in the volumes and patterns of travel on the existing road network. Benefits will be felt in a number of locations, particularly where there is a reduction in the number of vehicles, making for a more pleasant and a safer road environment.

13.6.4 Effects on travel times

Between Linden and MacKays Crossing, the Main Alignment will be marginally longer (approximately 0.7km) than the existing SH1 route. However, the alignment of the route will enable uninterrupted travel at higher speeds, offering significant reductions in travel times when compared to the existing SH1 route.

A vehicle travelling at the posted speed limit of 100km/hr between Linden and MacKays Crossing will take approximately 16 minutes on the Main Alignment, which is nearly 7 minutes (or approximately 30%) less than using the existing SH1, which is approximately 23 minutes.

Travel time savings for vehicles travelling between the Hutt Valley and SH1 (north) will be more significant, arising from a significant reduction in travel distances combined with improvements in speed. For example, a vehicle travelling from MacKays Crossing to Haywards during the AM Peak in 2026 would experience a reduction in travel time of 15.5 minutes (45%). A vehicle in the opposite direction during the PM peak would experience a reduction in travel time of 22.8 minutes (54%).

Peak traffic periods

The benefits of the Project will be more apparent during peak period traffic conditions when congestion commonly affects the existing SH1 route, resulting in delays. With the Project in place, residual traffic using the existing SH1 route would benefit from reduced travel times as a result of reduced congestion with most vehicles using the new route. However, these reduced travel times will be partially offset by measures on the coastal route designed to improve local accessibility, consistent with the change in road status from State Highway to local road.

The net result of these effects would be determined by the time of day and direction of travel. For example, northbound movements on the existing SH1 in the AM peak period would experience some increase in travel times (because these are not currently subjected to significant congestion). Conversely, southbound movements in the AM peak would benefit from reduced travel times because the effects of reducing congestion in this direction will outweigh the impact of the measures to be applied to the route to change the route’s focus from a State Highway to a local access road.

Local accessibility as a result of the Kenepuru Link Road and Porirua Link Roads

The proposed Kenepuru, Waitangirua and Whitby Link Roads will provide improvements in accessibility to the areas they serve, allowing traffic to access the strategic road network more quickly, removing traffic from parts of the local road network.

Effects on travel time variability

The variability or uncertainty of travel times in the existing SH1 corridor is a significant issue. As a result of significant reductions in regular congestion and in random incidents such as crashes, the Project would eliminate virtually all travel time variability between Linden and MacKays Crossing, with a very low residual level of variability in 2026. This is an important benefit of the Project, enabling individuals and businesses to plan their travel with a much greater degree of certainty.

Without the Project, rising traffic demands will increase the frequency, duration and severity of congestion in the corridor. Modelled travel times for the years 2006 and 2026 indicated that under normal traffic flow conditions, travel times may be increased by as much as 14% on existing SH1 over this period. This will be accompanied by increases in the variability of travel times, and magnified as a result of incidents when they occur.

13.6.5 Effects on freight movements

In combination with the package of measures to be applied to the existing coastal route, the Project will enable the removal of a large number of commercial vehicles from the existing SH1 route and in particular, the communities of Paekakariki, Pukerua Bay, Plimmerton, Mana and Paremata.

These reductions would result in noticeable amenity improvements for the communities along the existing SH1. The Road Transport Association (RTA) has indicated that truck drivers have a preference for avoiding urban areas because of the interruptions to travel resulting from frequent intersections. As outlined above, travel time variability is virtually eliminated by the Project. This, together with the predicted significant travel time savings (especially in peak periods) using the Main Alignment is expected to result in virtually all through commercial vehicle movements between Linden and MacKays Crossing using the Main Alignment, in preference to the existing coastal route. This is despite the greater degree of ascent and descent necessary on the Main Alignment and the marginally longer distance involved.

Accordingly, the Project will result in significant reductions in the number of commercial vehicles using the existing SH1 coastal route. The current difficulty of access for heavy vehicles between SH1 and SH58 (to the east of the Main Alignment), due to the poor alignment of SH58 and Grays Road, results in many such vehicles using a longer route through the Ngauranga Gorge between the SH1 and SH2 corridors. By the provision of a more convenient route between SH1 and SH58, the Project would remove many heavy vehicles from the routes on both sides of the Pauatahanui Inlet, and provide more direct accessibility to and from the Hutt Valley.

13.6.6 Effects on route security

One of the key project objectives is to improve transport route security. Through the introduction of a parallel alternative route to SH1, the effects of incidents (crashes and natural events such as slips and earthquakes) would be significantly reduced by the Project. These effects are described in more detail in **Technical Report 4**. This report confirms that the significant route security benefits associated with the construction of the Project are:

- the Project will bypass sections of earthquake vulnerability on existing SH1;
- the Project route is less prone to slips;
- the Project route has been designed to a modern safety standard and will be safer and less prone to traffic crashes than the existing SH1; and
- having two alternative northbound routes into and out of Wellington will provide a greater level of security to the capital city in the event of an emergency.

13.6.7 Effects on intersection performance

13.6.7.1 Existing intersections

Consistent with significant reductions in traffic demands on many existing roads, the Project will lead to an improvement in the performance of a number of key intersections throughout the corridor.

Specific intersection assessments have been undertaken for those intersections where some increases in delays could occur as a result of the Project. Reductions in volumes of through traffic along the existing SH1 route would generate significant benefits to traffic turning to, or from, side roads along the SH1 route.

Examples of locations where key changes occur include:

- Titahi Bay Road / Kenepuru Drive intersection: traffic reductions on Titahi Bay Road (east) and Kenepuru Drive (north of the Kenepuru Link Road) would provide some improvements in the efficiency of this intersection, especially during the Inter Peak period.

- SH1 / Whitford Brown Avenue intersection.
- The removal of large volumes of through traffic will allow delays to be substantially reduced for movements turning to and from Whitford-Brown Avenue.
- Kenepuru Drive / Raiha Street intersection.

The distribution of traffic movements at this intersection will change significantly as a result of the Project. Whilst the overall performance is not expected to change, an alternative intersection is one measure which may be considered as a means of addressing the traffic management and safety issues arising from the increase in traffic volumes expected on this section of Kenepuru Drive.

13.6.7.2 New intersections

For the Kenepuru Drive / Kenepuru Link Road intersection, both roundabout and traffic signal configurations were assessed. A roundabout has currently been adopted as the preferred solution at this location, as this would offer the most efficient means of accommodating the expected traffic demands. Also, pedestrian and cycle movements along Kenepuru Drive are able to be accommodated safely beneath the elevated Kenepuru Link Road approach.

For the Waitangirua Link Road / Warspite Avenue intersection, traffic signals are currently considered to be the preferred form of control, despite these not providing the optimal solution in terms of traffic delays. This was because the needs of pedestrians and cyclists can be more safely accommodated at this location by using traffic signals, rather than a roundabout.

In both of these cases, the proposed solution would not preclude the adoption of an alternative intersection configuration at some point in the future if this was considered appropriate as there will be adequate width in the designation. Any alternative configuration would need to consider the functionality for vehicles, cyclists and pedestrians.

13.6.8 Traffic safety effects

13.6.8.1 Traffic safety effects – State highway network

For the purpose of assessing road safety effects, the existing SH1 was divided into five sections within which the road characteristics are similar:

- Linden (South) to the Paremata Roundabout (motorway / expressway);
- the Paremata Roundabout to Plimmerton (urban);
- Plimmerton to Pukerua Bay (rural-rolling);
- Pukerua Bay (urban); and
- Pukerua Bay to MacKays Crossing (North) (rural-rolling).

These sections were analysed using the Basecase modelling scenario to calculate the estimated number of midblock injury crashes (i.e. crashes that occur in between intersections) on sections of SH1 in the future.

In addition to the five sections of SH1 analysed for the Basecase, the Project was split into three sections for the purposes of forecasting crash numbers on the new alignment:

- the southern tie-in at Linden to the James Cook Interchange;
- the James Cook Interchange to SH58 Interchange; and
- the SH58 Interchange to the northern tie-in at MacKays Crossing.

Once the expected number of crashes on sections of SH1 and the Main Alignment, for both the Basecase and With Project scenarios was calculated, a comparison was made for individual sections of SH1 and for the route as a whole. This calculation shows the expected number of mid-block crashes along SH1 and the Main Alignment for both the Basecase and With Project scenarios.

Overall, a net reduction in the number of crashes of 42% is estimated. This occurs as traffic re-routes from the existing SH1, with poor geometry, limited passing opportunities and frequent intersections, to the Main Alignment, which will be constructed to the latest design standards, with grade separated intersections and passing opportunities throughout.

Table 13.2: Crash analysis summary, detailing expected injury crashes in 2026 - with the Basecase / and with the Project

Location		2026		
		Basecase Injury Crashes per year	With Project Injury Crashes per year	% change from Basecase
Existing SH1	Linden (South) to Paremata Roundabout	11	7	-36%
	Paremata Roundabout to Plimmerton	3	2	-33%
	Plimmerton to Pukerua Bay	5	1	-80%
	Pukerua Bay	3	1	-67%
	Pukerua Bay to MacKays Crossing (North)	10	1	-90%
The Project	Linden (Southern tie in) to James Cook Interchange	-	2	-
	James Cook Interchange to SH58 Interchange	-	2	-
	SH58 Interchange to MacKays (Northern tie in)	-	2	-
Total	SH1	31	12	-61%
	The Project	-	6	-
	Total	**31**	**18**	**- 42%**

Source: SATURN model and EEM2 procedures

13.6.8.2 Traffic safety effects – Local road network

As discussed above, there will be a significant reduction in traffic numbers on some local roads. The percentage change in traffic volumes will affect the number of crashes as a result of changes in exposure to crashes. The following table highlights the locations (in green) where a significant reduction in traffic volumes expected, along with the current number of crashes.

Table 13.3: Local road crashes and traffic volume changes

Local Road Section	Number of crashes (2005-2009)	Traffic Volumes % change (2026)
Grays Road - SH1 to SH58 (includes small section of Paekakariki Hill Road)	28	-62%
Main Road - Raiha Street to Linden Avenue	28	-13%
Raiha Street - Kenepuru Drive to Prosser Street	35	0%
Kenepuru Drive - Titahi Bay Road to Kenepuru Link Road	105	-3%
Kenepuru Drive - Kenepuru Link Road to Raiha Street	34	49%
Titahi Bay Road - Mungavin Interchange to Hagley Street	147	-12%
Whitford-Brown Avenue - SH1 to Warspite Avenue	69	-1%
Warspite Avenue - Omapere Street to Waitangirua Link Road	30	5%
Warspite Avenue - Waitangirua Link Road to Waihora Crescent	37	7%
James Cook Drive - Navigation Drive to SH58	9	-41%
Discovery Drive-James Cook Drive to Spinnaker Drive	14	-3%
Navigation Drive - James Cook Drive to Joseph Banks Drive	3	28%
Paekakariki Road - SH1 to Grays Road (including non-injury)	121	> -70%

The section of Kenepuru Drive between the Kenepuru Link Road and Raiha Street intersections would experience a significant increase in traffic of 49%. As this section of road already carries significant volumes of traffic, a package of appropriate traffic management measures to effectively maintain safety in this area will be implemented to mitigate this potential adverse road safety effect.

Navigation Drive would experience an increase of 28% in traffic volumes. In this case, the existing traffic volumes are low and the wide cross-section means that this road would be able to easily accommodate the increased traffic demands without any deterioration in safety.

13.6.8.3 Traffic safety effects – Intersections

As shown in Table 13.4, a significant number of crashes currently occur at intersections along the SH1 route. The removal of large volumes of through traffic from these intersections will result in a substantial reduction in the frequency of crashes at these locations.

Table 13.4: SH1 intersection crashes and traffic volume reductions

SH1 Intersections	Number of observed crashes (2005-2009	SH1 Traffic Volumes (vehicles/day)		
		Basecase (2026)	With TG (2026)	% change[86] (2026)
Paekakariki / Beach Road	9	26,500	5,700	-79%
Ames Street	2	23,000	4,600	-80%
Pa / Toenga Road	63	23,600	5,200	-78%
Pukerua Beach Road	4	24,600	6,300	-75%
Wairaka Road	2	24,100	5,800	-76%
Teihana Road	12	24,400	6,100	-75%
Gray Street	3	25,200	7,000	-72%
Airlie Road	9	24,100	5,900	-75%
Plimmerton Roundabout	17	25,400	7,300	-71%
Grays Road	9	27,200	9,100	-66%
Steyne Avenue	8	29,500	14,600	-50%
Pope Street	8	28,700	13,900	-51%
Acheron Road	20	30,400	15,700	-48%
Mana View Road	22	32,900	18,400	-44%
Pascoe Avenue	12	35,700	21,200	-41%
Marina View Road	7	35,000	20,500	-41%
Paremata Roundabout	73	48,200	31,200	-35%
Whitford Brown Avenue	24	41,900	33,200	-21%
Mungavin interchange	67	86,500	69,400	-20%

Source: CAS Database and SATURN Model

13.6.9 Wider (regional) effects of the Project

Whilst the primary effects of the Project will be felt in the more immediate SH1 and SH58 corridors, some changes in traffic volumes will occur in areas further away from the Project. However, the modelling indicates that the effects upon more remote parts of the network will be small, and likely to be within the normal day to day variability in traffic volumes.

13.6.10 Effects on public transport

Rail network

One of the effects of the Project will be a transfer of some trips from public transportation, principally the parallel rail network, to road. Without the Project, rail patronage is expected to grow significantly in the period from 2006 to 2026, due principally to the effects of investment in the rail network and increasing congestion on SH1 and other routes.

86. The percentage change is the change in volumes on the road and is indicative only of the likely change in the number of crashes.

This is consistent with the findings and recommendations of the Western Corridor Study. This identified that upgrades to either the roading network or the rail network alone would not adequately address the issues in the corridor, and a combined package was required which improved rail patronage whilst also significantly improving the capacity of the road network.

In practice, the Project is an integral component of a wider and balanced transportation strategy as defined by the RLTS. This package of measures, identified by the Western Corridor Study, will have the net effect of improving overall rail patronage whilst also significantly improving the capacity of the road network.

Bus network

The effects of the Project upon bus patronage will be small and will relate mainly to the use of buses for connection to the rail network.

Some bus routes would benefit from the congestion relief attributable to the Project, allowing for more reliable operation against published timetables. For example, bus services which connect with trains at the Paremata railway station would not be subjected to the high existing delays experienced when exiting onto the Paremata roundabout.

Walking / cycling network

It is expected that the Project would not have any noticeable effect on the number of trips made by the active modes of transport (walking, cycling).

However, the removal of large volumes of traffic from the existing SH1 route and some local roads would create opportunities for improved cycling and walking facilities. Once the Project is constructed, the existing cycleway adjacent to SH1 between Pukerua Bay and Paekakariki would provide a less intimidating and a more pleasant experience, which is likely to result in increased usage.

Similarly, severance will be reduced in communities such as Pukerua Bay, allowing the railway station to be more readily accessed from residential areas to the west of the existing SH1. At Mana, the retail area on the western side of SH1 will become more accessible by pedestrians and cyclists from residential areas to the east.

Proposals for the form of the Kenepuru Link Road / Kenepuru Drive and Waitangirua Link Road / Warspite Avenue intersections have taken account of the needs of pedestrians and cyclists. In this respect, the provisional intersection designs have been developed in close liaison with both PCC officers and the Project's urban design team.

The Project alignment would cross a number of established walking and cycling routes. At these locations, access will be maintained or enhanced through the provision of underpasses, as described in the Urban Design and Landscape Framework (**Technical Report 23**)

13.7 Assessment of construction traffic effects

The majority of works during construction will occur in the rural environment, away from urban areas and any sensitive receptors (such as schools, retirement homes etc.). Once construction traffic is within the route, it is likely to use the Main Alignment to access other parts of the alignment. However, there will be initial phases where local roads will be used for access.

An assessment of the traffic effects expected during construction of the Project has been undertaken based upon the best available information relating to the likely construction methodology. Actual and potential construction traffic effects are expected to be:

- safety effects on local roads;
- other effects arising from an increased volume of large and small construction related vehicles;
- possible damage to local roads; and
- inconvenience from traffic management measures including changing road layouts at intersections.

Associated traffic nuisance effects including noise, vibration, dust and fumes are assessed in the noise and air quality chapters of this report (Chapters 16 and 17, respectively).

The Construction Traffic Management Plan (CTMP) also provides the framework for how any construction traffic effects will be managed. The final methodology will be determined by the contractor appointed to undertake the works, and the CTMP expanded to reflect the adopted methodology.

13.7.1 Actual and potential effects on local roads

The locations where construction activities are likely to affect operating traffic conditions on the existing road networks are:

- Southern tie-in at Linden;
- Kenepuru Drive;
- Waitangirua Link Road (Warspite Avenue);
- Whitby Link Road (James Cook Drive);
- SH58 Interchange;
- Paekakariki Hill Road;
- MacKays Crossing; and
- Takapu Road.

13.7.1.1 Southern tie- in at Linden

At Linden, the majority of the works would be completed offline (i.e. away from the existing highway). However, the tie-in between the Main Alignment and the existing SH1 would need to be carefully managed and programmed. Some works will require operations in, or over, existing traffic lanes, such as the installation of bridge beams. To facilitate this, the CTMP will include measures to manage effects, such as closures of lanes or potentially closure of directions of travel (i.e. complete closure of the north or southbound lanes). All closures would generally be scheduled to occur at night or during other periods of low demand. Where appropriate, signed diversion routes over local roads would be put in place to direct traffic through the affected areas. The management of construction works would require speed restrictions to be put in place to allow for the narrower lanes, which may lead to some reduction in capacity.

13.7.1.2 Kenepuru Drive

At the connection to Kenepuru Drive, vehicle, pedestrian and cycle access would need to be maintained at all times along with property access. This may involve lane narrowing and construction of temporary footways, traffic lanes and property accesses as required. Speed restrictions will be put in place to improve safety for road users using the narrower lanes which may lead to some reduction in capacity. Temporary Traffic Management (TTM) Plans would be developed to minimise impacts or mitigate the effects of the traffic management.

13.7.1.3 Waitangirua Link Road (Warspite Avenue)

The connection to Warspite Avenue would be managed in a similar way to that described for the Kenepuru Drive. Due to the residential nature of this area, it is unlikely that night works would be able to be conducted. Therefore, construction works which requires the closure of the road will be carefully planned for alternating flow (stop / go) operations to be implemented without causing any significant delays. The low traffic volumes on Warspite Avenue outside peak periods will minimise adverse effects.

13.7.1.4 Whitby Link Road

The connection to James Cook Drive / Navigation Drive will be managed in a similar way to that described for the Waitangirua Link above.

13.7.1.5 SH58 Interchange

At the Interchange of SH58 and the Main Alignment, the majority of works will be undertaken offline with traffic lanes moved in stages to allow for construction. Site access points will be installed providing access to the works and the nearby site compound as appropriate. Construction of bridge structures will be staged with traffic diverted over, or around, the construction site.

13.7.1.6 MacKays Crossing

At MacKays Crossing the majority of works will be undertaken offline although the works required to construct the tie- in into the existing State highway will require careful temporary traffic management. This is particularly important given that overnight volumes on the existing SH1 and Paekakariki Hill Road (especially trucks) can be significant and no practical diversionary route is available.

13.7.1.7 Takapu Road

At Takapu Road site access points will be used for up to three years. Maintenance and, in some cases, upgrades, of the existing alignment will be required to accommodate the additional vehicle movements safely.

13.7.2 Site offices and longer term construction access locations

When the construction method developed further, the exact location of construction site offices will be confirmed through the process of finalising the CEMP and the SSEMPs.

The main site compound will be located at Lanes Flat as discussed previously. In addition to the main site compound, three indicative satellite site compound locations have been identified at:

- approximately 8,500m on the Main Alignment, to the north of BHFFP;
- approximately 11,500m on the Main Alignment, accessed from Paekakariki Hill Road; and
- approximately 27,000m on the Main Alignment, accessed from the end of Little Collins Street.

Construction traffic accessing each site has the potential to generate adverse effects, in the form of nuisance effects associated with increased traffic, congestion, queuing around the access points and increased degradation of the local road surface. Options to reduce, or better manage, construction traffic numbers are set out in the CTMP and include carpooling and minibuses for worker transport, active management of shift changeovers, awareness of, and planning around traffic peak periods including school hours. Mitigation measures are set out further in the sections below.

The effect of light and heavy vehicles travelling to and from site offices will be minor, and is able to be accommodated within the existing road network.

In some locations there are specific traffic management requirements which would need to be implemented through the CTMP, namely:

- Paekakariki Hill Road;
- Ranui Heights; and
- Takapu Road.

13.7.2.1 Paekakariki Hill Road

Paekakariki Hill Road would provide light and heavy commercial vehicle (HCV) access to the proposed site office at 548 Paekakariki Hill Road, which is located along the Main Alignment corridor. This Road would provide access to the northern sections of the Project towards the Wainui Saddle, while also providing convenient access to SH58 as a key arterial.

The construction traffic generated by the Project represents an increase of approximately 30% in overall traffic volume during the peak hour (an increase in the order of 140-150 vehicles per day). The volumes are still low and well within the capacity of the road corridor, even considering the narrow and geometrically constrained nature of Paekakariki Hill Road. In order to manage the effects created by the increase in heavy vehicle numbers during the peak period, through consultation with PCC, consideration will be given to implementing road safety improvements along Paekakariki Hill Road to enhance movement of heavy vehicles. Overall, while there would be a large increase in traffic movement, with the planned safety improvements and other traffic management measures being put in place, the effects are likely to be no more than minor.

13.7.2.2 Ranui Heights

Ranui Heights would provide access to the southern end of the Project area for work crews and to the Kenepuru Interchange (via Awatea Street, Apple Terrace and Ribbonwood Terrace) for up to 12 months. Given that these roads are residential, it is recommended that minibuses are used extensively to provide access at this location to reduce potential amenity effects from up to 200 light vehicles using this access route on a daily basis. With a maximum of 20 minibus trips required, this number of movements would have little effect on road safety and amenity. If vehicle numbers are managed through the use of minibuses, the combined effects of light and heavy vehicles using this access are considered to be no more than minor (in the order of 30 vehicles per day).

13.7.2.3 Takapu Road

This Road would provide access to the Cannons Creek Bridge and adjacent sections of the Project. An upper end estimate of 90 light vehicles (if minibuses were not used) and 55 heavy commercial vehicle (HCV) movements could be expected to use Takapu Road between the site access and SH1 on a 'peak day' when all deliveries would be arriving on site at the peak of construction. Typically, the number of vehicles expected to use this route during a 'normal' construction day would be 75 light vehicles (without minibus use) and 10 HCV movements. A peak demand of 25 HCVs over an eight hour day would be fewer than seven HCVs every hour.

The indicative number of vehicles envisaged would not be out of character for a road of this type, which is regularly used by Transpower to access the Takapu Road substation and GWRC to access the Wellington bulk water main within Belmont Regional Park. However, a more detailed review of the use of the road should be completed with WCC in the detailed design phase of the project. Overall, the combined effect of light vehicles and HCVs using this access are considered to be no more than minor.

13.8 Measures to avoid, remedy or mitigate actual and potential adverse traffic and transport effects

The traffic and transport assessment identified a range of significant benefits arising from the operation of the Project. There will be some minor adverse effects associated with the Project, primarily of a temporary or short term nature during construction. The following section outlines the measures which have been identified to avoid, remedy or mitigate actual and potential adverse traffic and transportation effects.

13.8.1 Managing potential traffic effects during construction

During construction, there will be effects from construction traffic using local roads for access. The specific routes and locations that may be affected (depending on the chosen construction methodology) have been identified and assessed.

13.8.1.1 Construction Traffic Management Plan (CTMP)

In all cases, potential effects will be managed using a CTMP, supported by a number of Site Specific Traffic Management Plans (SSTMPs) which will be produced on a case by case basis.

The proposed designation conditions set out the requirements for construction traffic management, and the required contents for the CTMP. A draft CTMP has been prepared for this application (refer to Volume 5) and it sets out the procedures, and objectives required to produce SSTMPs and to manage the actual and potential effects of construction traffic. It details the standards to be adhered to, identifies the objectives in developing SSTMPs and the issues that must be considered, and how the effects of traffic management methods, and construction traffic on local roads could be managed. Key team members' roles and responsibilities are also included.

The CTMP details the following methods for the delivery of Temporary Traffic Management (TTM) during the construction of the Project:

- Compliance with the Code of Practice for Temporary Traffic Management (COPTTM), where practicable. A method for situations where non-compliance or departures from the standard are required is set out in the CTMP.
- Focus on leading industry standards with regard to TTM and safety.
- Minimise disruption on the State highways and local roads, wherever practicable.
- Limit, where possible, the number of construction vehicle trips on local roads and obtain access from arterial roads and State highways.
- Maintain existing flows and travel times on State highways and local roads adjacent to the work site, where practicable.
- Minimise the impact of works on vulnerable road users such as pedestrians and cyclists.
- Minimise the effects of construction traffic on local roads used for access.
- Minimise the impact of construction parking.

- Develop SSTMPs having consideration for all key stakeholders i.e. residents, GWRC, WCC, PCC and KCDC, emergency services etc.
- Identify all issues and have a planned SSTMP submitted and approved to the applicable local authority and the NZTA's network management consultant at least five days before implementation is required.
- Provide effective communication to affected parties.
- Implement TTM that provides stakeholders with exceptional service in terms of functionality and clarity of direction of travel through roadwork sites.

These objectives would be achieved through implementation of the CTMP, which will manage construction effects. It should be noted that construction dust and noise would be managed throughout the construction process. While some reference is made to these issues in the CTMP, their management is dealt with primarily in the Construction Noise and Vibration Management Plan (CNVMP) and the Construction Air Quality Management Plan (CAQMP).

13.8.1.2 Other methods to manage adverse effects from construction traffic

A summary of the actual and potential effects and methods to avoid, remedy or mitigate effects from construction traffic is provided in Table 13.5.

Table 13.5: Proposed methods to manage construction traffic effects

Potential effect	Method to avoid, remedy or mitigate potential effect
Rubbernecking, reduction in capacity on existing roads, increasing travel times and, in some cases reducing inter-regional travel for short periods of time.	• Screens can be installed to avoid rubbernecking from passing motorists. • For road capacity reduction activities, the timing of these would be targeted to low flow conditions. Where road closures take place targeted communication of these closures and diversions would be undertaken.
Construction traffic on local residential roads leads to potential amenity and safety concerns especially through Pauatahanui Village	• Construct alternative access ways where required and practicable. • Use minibuses for access and manage noise and air quality through appropriate management plans to address amenity concerns. • Restrict heavy vehicle movements to avoid school drop off and pick up times. • Minor safety improvements implemented where required. For example to Paekakariki Hill Road such as improved delineation, temporary speed restrictions through Pauatahanui Village, curve easing, inter-visibility improvements etc. • Restrict heavy vehicle access at the intersection of SH1 and Paekakariki Hill Road due to safety deficiencies (visibility and geometric alignment). • Develop a maintenance intervention strategy with Road Controlling Authority (RCA).
Increased construction traffic movements of both light vehicles and heavier vehicles are likely to have adverse amenity and safety effects on local roads.	• Implement a CTMP, • Control construction vehicle movements – for example time of day, day of week etc. Use of the Main Alignment as early as possible for construction vehicles, • Provide controls for traffic movements around shift start / finish

Potential effect	Method to avoid, remedy or mitigate potential effect
	to avoid intensive traffic movement periods, including using mini buses to get workers travelling through to construction sites, • Upgrade some local roads to accommodate construction traffic, • Minor safety improvements / upgrades to local roads in key locations (in consultation with RCA).
Construction traffic may cause shoulder or road closures.	• Use CTMP to manage traffic, alternative routes and communication.
Construction traffic may cause damage to local roads.	• Carry out a condition survey of local roads which will be used for access prior to commencement and post-commencement. Work with the relevant RCA to identify any necessary repairs prior to the completion of construction contract(s).
Disruption to regional cycle and pedestrian networks during construction, including at MacKays Crossing, SH58 and Kenepuru Drive.	• During construction, provide temporary safe and convenient alternative route for cyclists and pedestrians, which are well sign-posted.
Potential for disruption to pedestrian movements along Warspite Avenue	• During construction, provide temporary safe and convenient alternative route for Warspite Avenue pedestrians, which are well sign-posted.

13.8.2 Managing operational traffic effects

The Project will have significant traffic and transport related benefits to the overall transport network. There are some minor actual and potential adverse effects that may arise from the operation of the network which will require management. These are outlined in Table 13.6.

Table 13.6: Methods to manage operational traffic effects

Identified effect	Method to avoid, remedy or mitigate potential effect
Significant increase in traffic volumes using Kenepuru Drive (between the Kenepuru Link Road and Raiha Street) could result in adverse safety and access effects and potential effects on travel times.	• Some form of upgrade to part of Kenepuru Drive is likely to be required to manage safety and capacity issues from the predicted increased traffic along Kenepuru Drive. Detailed design of the Kenepuru Link Road / Kenepuru Drive intersection will consider this. This will need to be undertaken in consultation with the PCC as the road controlling authority.
Reduced safety and amenity of the regional cycle network around the tie-ins / intersections including at MacKays Crossing, SH58 and Kenepuru Drive.	The detailed design phase would need to address this by including: • detailing pedestrian and cycle tie-ins at SH58 and MacKays Crossing • detailed design of a cycle lane (or separated cycle path) will need to be provided for 50m either side of Kenepuru Drive roundabout on the western side.
Loss of pedestrian and cyclist amenity around Collins Avenue replacement bridge.	• Requirement for informal pedestrian path between Raroa Terrace and Collins Avenue to be formalised and vested with WCC.

14. Land use and property effects

Overview

The main property effects of the Project can be separated into three broad categories:

- properties with land that is directly required (either the whole or in part) for the Project;
- land with an easement or other property right (including rights of way and water rights, for example) that is directly affected by the Project; and
- properties within close proximity to the Project.

The land holdings range from Crown Land, Council owned land including road and reserves, and private land. By far the largest land requirement is land already owned by the Crown for roading purposes. There are some properties where part acquisition will be required. All property owners whose land is directly affected have been consulted and are aware of the property required.

There are some examples of properties that will be required for construction of the Project, but that will not be purchased. Examples include properties that are required for construction purposes, but which are not required in the long term for occupation by the road. The effects on these properties can also be managed through the Public Works Act 1981 (PWA) process, although in some cases alternative arrangements can be made with landowners.

There are a number of instances where the Project will affect other property rights such as physical access to a property, forestry logging access or a water supply arrangement. It is considered that effects on other property rights have been well identified through both property agreements and consultation.

Properties within close proximity to the route that have been identified as being subject to or particularly sensitive to effects have been identified through the technical studies. Actual and potential effects on these properties have been identified in relation to specific technical areas and appropriate mitigation has been devised.

Actual and potential (including perceived) effects on property values is not considered to be a relevant consideration under the RMA. Effects on amenity values are a relevant consideration, and those that are affected by the Project are considered through assessment of other actual and potential effects including noise, landscape and access.

14.1 Introduction

The Project involves the construction and operation of a major new transport link. The main property effects of the Project can be separated into three broad categories:

- properties with land that is directly required (either the whole or in part) for the Project;
- land with an easement or other property right (including rights of way and water rights, for example) that is directly affected by the Project; and
- properties within close proximity to the Project.

Land parcels that will be directly affected to a greater or lesser degree by 'land take' requirements to accommodate the Main Alignment are shown in the Land Requirement Plans (**LR01- 20**) and in the accompanying schedule. Seventeen land parcels are directly affected by the Porirua Link Roads.

The land holdings range from Crown Land (Minister of Transport and Minister of Conservation), Council owned land including road and reserves, and private land which is primarily large rural holdings, but also includes some rural-residential lifestyle blocks, and urban rural land and business land.

By far the largest land requirement is land already owned by the Crown for roading purposes. This land comprises approximately 49% of the total land required for the Main Alignment to date. Only a very small amount (0.6%) of land has been required for the Porirua Link Road, but the property owners have all been consulted about the alignment and their suggestions have been able to be taken into account. All land is within the Wellington Region, and the majority of land required is within the jurisdiction of the Porirua City Council. Smaller land requirements are within (from largest to smallest) Kapiti Coast District, Wellington City and Upper Hutt City.

All property owners whose land is directly affected have been consulted and are aware of the property required.

14.2 Land acquisition and occupation

The Crown and the PCC both have the ability to acquire land under the PWA. For the most part the NZTA's property agents have been able to enter into property agreements with landowners to purchase land. Consequently, the NZTA's agents have been able to acquire a significant amount of land for the Project already.

There are some properties where part acquisition will be required. This could result in severance of land, or reduction in the size of land areas such that previous aspirations for property development can no longer be realised. For example, a property may be reduced in size so that it no longer meets district plan rules for subdivision. The property valuation and acquisition process under the PWA will take into account any adverse effects on the value of properties arising from part purchase, and appropriate compensation will be arranged with the land owner.

There are some examples of properties that will be required for construction of the Project, but that will not be purchased. Examples include properties that are required for construction purposes, but which are not required in the long term for occupation by the road. Construction land requirements that may not be required in the long term include:

- construction yards containing (for example) project offices, workers conveniences, machinery and equipment storage, smoko rooms;
- lay down areas including (for example) storage of precast concrete components;
- mitigation measures such as noise barriers;
- fill sites; and

- construction access routes alongside the alignment, which are required in many locations where there is difficult topography, or to use existing tracks.

Those properties are shown in the land requirement plans (and eventually in the relevant district plans should the NoRs be confirmed) as required for roading purposes in the same way as the land that will be purchased. However, on completion of construction, the requiring authority will be required to review the designation, and uplift those parts that are no longer required for roading purposes.

The effects on these properties can also be managed through the PWA process, although in some cases alternative arrangements can be made with landowners, such as a property rental arrangement. Through the PWA process, the requiring authority would be required to return the land in its original state, or as otherwise agreed with the landowner.

It is considered that the effects on property have been well acknowledged through consultation, and will be adequately compensated for through the PWA.

14.3 Access, easements and other property rights

There are a number of instances where the Project will affect other property rights such as physical access to a property, forestry logging accesses or a water supply arrangement. To address this:

- Where accesses are affected, alternative arrangements for access are proposed, and either have been or will be developed in close consultation with the landowner. In some instances underpasses or bridges will be provided for landowners whose accesses are severed by the alignment.
- Forestry logging accesses have been provided for through appropriately designed and sized underpasses.
- Alternative water supplies will be provided for all those with lawfully established water rights that are affected.

It is considered that effects on other property rights have been well identified through both property agreements and consultation.

14.4 Properties within close proximity

Properties within close proximity to the route that have been identified as being subject to or particularly sensitive to effects have been identified through the technical studies. Actual and potential effects on these properties have been identified in relation to specific technical areas and appropriate mitigation has been devised. These include:

- Properties that will be affected by elevated noise levels (during operation of the road) have been identified though noise modelling and where the noise standards are breached, appropriate methods are proposed to manage noise. Methods include noise barriers such as bunds and noise walls.

- Landscape and visual effects assessments have been carried out from key vantage points where the route will be visible from public places and close properties. Where required adverse visual effects will be mitigated.
- Flightys Road will be upgraded (with road surface improvements) and the NZTA will facilitate a process for it to become vested as a legal local road.

Whilst it was raised as an issue during consultation, actual and potential (including perceived) effects on property values is not considered to be a relevant consideration under the RMA. Effects on amenity values is a relevant consideration, and those that are affected by the Project are considered through assessment of other actual and potential effects including those examples (noise, landscape, access) given above.

15. Network utilities

Overview

The Project will affect a number of existing network utilities within the Project area. This will require the protection and / or relocation of these utilities. The NZTA, in liaison with PCC, has worked closely with the relevant organisations and are jointly confident that all adverse effects on network utilities will be able to be managed appropriately.

15.1 Introduction

In this chapter the potential adverse effects of the Project on existing network utilities are considered. Potential adverse effects on utilities will be managed either by providing protection for the utility, or by relocating the utility. The process by which the NZTA, PCC and the relevant agencies will manage the protection and relocation works will be set out at a high level in the proposed Network Utilities Management Plan (NUMP).

Where practicable, the necessary mitigation works will be undertaken as enabling works to the main Project works.

15.2 Existing environment – Network utilities

There are a number of existing network utilities within the Project area relating to:

- electricity transmission;
- electricity distribution;
- gas transmission;
- gas distribution;
- water supply;
- water distribution;
- telecommunications; and
- railways.

15.2.1 Electricity transmission infrastructure

The Transmission Gully Project is named as such because the Main Alignment corridor generally follows the existing 110kV electricity transmission line between Paekakariki and Takapu Road (PKK-TKR-A). This 110kV double circuit line is carried on steel lattice towers. It runs most of the length of the Main Alignment, from MacKays Crossing at 0m to the Takapu Road Substation, which is located at approximately 24,000m. The line also passes through the Pauatahanui Substation, which is located at approximately 17,500m along the Main Alignment.

In addition to the PKK-TKR-A line there are a number of other electricity transmission lines within the Project area. There are three other 110kV transmission lines which either start or terminate at the Takapu Road Substation, namely:

- the Takapu to Wilton A line (TKR-WIL-A) from the south;
- the Khandallah to Takapu A line (KHD-TKR-A) from the south; and
- the Haywards to Takapu A line (HAY-TKR-A) from the east.

The 220kV Bunnythorpe to Wilton A line (BPE-WIL-A) also runs in a general north-south direction on the eastern side of the Main Alignment in the vicinity of 23,100m.

15.2.2 Electricity distribution infrastructure

Throughout most of the Project area, electricity distribution assets are owned and operated by Vector (Wellington Electricity). The only exception to this is in the Kapiti Coast District where assets are owned and operated by Electra.

There are five key locations within the Project area where Wellington Electricity's assets are present:

- between approximately 12,800m and 14,300m there are four locations where separate 11kV overhead lines (including two (2) with pole mounted substations) cross the Main Alignment;
- at approximately 17,500 there are two (2) overhead lines which cross the Main Alignment as well as an 11kV underground cable and associated termination pole;
- at Warspite Avenue and James Cook Drive (where the Waitangirua Link Road and Whitby Link Road are proposed to connect to the Porirua road network, respectively) there are two (2) ground mounted substations and several 11kV underground cables;
- at approximately 24,000m there are two (2) twin circuit 33kV overhead lines crossing the Main Alignment; and
- at approximately 26,700m and Kenepuru Drive there are two (2) 33kV underground cables including overhead termination structures, one (1) twin circuit 33kV overhead line and one (1) 11kV underground cable.

Electra has a 33KV line, including a transformer and overhead switchgear, running along the existing SH1 north of Paekakariki which will be affected as a result of the Project.

Although not a major asset redesign, this line is the backbone of the Electra network and will require considerable planning to move (up to 1 year from start of planning to completion of mitigation works).

15.2.3 Gas transmission infrastructure

There are two high pressure gas transmission lines running most of the length of the Main Alignment corridor, from MacKays Crossing to approximately 24,000m. The two pipes are 12" (305mm) and 8" (203mm) in diameter.

15.2.4 Gas distribution infrastructure

There are four locations within the Project area where local gas distribution assets are in the vicinity of the Main Alignment corridor:

- just south of MacKays Crossing;
- at approximately 2,000m along the Main Alignment corridor (near existing SH1);
- at approximately 18,250m along the Main Alignment corridor; and
- at approximately 19,500m along the Main Alignment corridor.

These assets are owned and operated by Powerco (Gas).

15.2.5 Water supply infrastructure

The Main Alignment will cross the Kaitoke to Karori bulk water main, or branches off it, at the following four (4) locations:

- the 200mm diameter Brady Reservoir Rising Main at approximately 19,000m;
- the 400mm diameter Porirua Branch Mains at approximately 19,500m;
- the 750mm diameter bulk water main at approximately 20,850m; and
- the 750mm diameter bulk water main (in a tunnel) at approximately 23,150m.

At the northern end of the Main Alignment (at approximately 2,100m) there is a groundwater abstraction bore and an up-river surface water abstraction plant operated by KCDC supplying potable water for the Paekakariki township.

KCDC is currently in the process of replacing the up-river surface water abstraction plant, and associated filter tanks, with a second groundwater abstraction bore. The NZTA has worked closely with KCDC to ensure a viable alternative site for the second groundwater abstraction bore as the originally desired site was on the Main Alignment.

15.2.6 Telecommunications infrastructure

There are six (6) locations within the Project area where Chorus has underground copper and / or fibre lines:

- at approximately 1,800m along the Main Alignment, in the vicinity of existing SH1, north of Paekakariki;

- at approximately 14,300m along the Main Alignment, in the Flightys Road reserve;
- at approximately 17,450m along the Main Alignment, at existing SH58 east of Pauatahanui;
- at approximately 24,000m along the Main Alignment, feeding into the Takapu Substation;
- at approximately 27,000m along the Main Alignment, at existing SH1 at Tawa; and
- along Kenepuru Drive.

TelstraClear also has two underground single fibre cables within the Project area. One runs along SH58, providing a connection between the Hutt Valley and the Kapiti Coast and the other runs along Kenepuru Drive.

Vodafone NZ also has a cell tower located in State highway road reserve at approximately 27,000m along the Main Alignment, which will need to be relocated.

15.2.7 Rail infrastructure

The Project will be located in the vicinity of the North Island Main Trunk (NIMT) railway at the northern tie-in (MacKays Crossing). The Kenepuru Link Road will cross the NIMT at the southern (Linden) end (Bridge 28) and the design of the Link Road and bridge will need to provide the necessary clearance envelope for existing and future NZRC needs, and to prevent adversely affecting the associated transformers that exist at this location.

15.3 Assessment of effects on network utilities

The general design philosophy adopted for the Project has been to avoid potential adverse effects of the Project on existing network utilities, wherever practicable. However, not all potential impacts have been able to be avoided, due to the large scale of the Project and the considerable number of network utilities located within the Project area.

Areas where the Project will or may potentially result in adverse effects on utilities have been identified. Collaboration with the relevant network utility provider has been undertaken and through this process, concept solutions for each utility have been discussed, and where possible, developed. These solutions typically involve one or more of the following approaches:

- providing increased protection for the utility so that its operation is not adversely affected by the Project;
- providing access to the utility so that its operation and maintenance is not adversely affected by the Project;
- relocating or realigning part of the network utility to avoid or mitigate potential adverse effects; and
- other specific measures (e.g. dust management) to address potential physical adverse effects.

In some instances, works undertaken on existing network utilities are proposed to be above and beyond what is required purely to avoid, remedy or mitigate the potential adverse effects of the

Project. Generally this is proposed where the network utility operator has identified an opportunity to future-proof its infrastructure as part of the proposed works. Where practicable, the NZTA has sought to accommodate these requests.

The process for engaging with network utility operators (and for the NZTA's contractors undertaking the works in conjunction with the network utility operator's own contractors) will be set out in the NUMP. The NUMP will include the following information:

- protocols for liaison and information exchange between network utility providers and the NZTA during the Project's specimen design phase (Phase 4);
- process for network utility provider approval of proposed works on their utilities (where applicable / necessary);
- process for obtaining any supplementary authorisations (e.g. easements);
- protocols to undertake on-site works, including operating procedures and responsibilities for network utility operators contractors and the NZTA's contractors;
- protocols for utility provider design and supervision services; and
- protocols for inspection and final approval of works by network utility providers.

15.3.1 Electricity transmission infrastructure

There are three components of the National Grid that could potentially be adversely affected by the construction and operation of the Project: transmission lines, the Pauatahanui Substation and the Takapu Road Substation. A small substation exists at Paekakariki but the Project has been designed to avoid affecting this asset.

15.3.1.1 Transmission lines

As noted previously, the 110kV Paekakariki to Takapu Road A transmission line (PKK-TKR-A) currently runs for most of the length of the Main Alignment corridor between MacKays Crossing and Takapu Road. In a number of locations the proximity of the Main Alignment to existing towers and / or lines creates adverse effects for the operation and maintenance on the towers and / or lines. The Main Alignment has been designed to limit this. Potential adverse effects will be caused by:

- transmission towers being situated in locations that the formed carriageway will occupy;
- earthworks being required for the Project which will affect land the existing towers are located on, potentially undermining the integrity of the structures;
- required changes to line alignment required because of the Project may mean that strengthening of existing towers is required; and
- construction of the Project will mean that existing towers will be close to the side of the carriageway, thus creating both a potential safety hazard and a line integrity issue.

Where the location of existing towers and / or lines has been identified as creating a potential adverse effect, a number of different options have been considered. As a result of a design exercise by the

NZTA and Transpower, a preferred solution to accommodate the Main Alignment and the existing transmission line has been agreed by both parties. The preferred solution for the re-alignment of the transmission line has been designed to provide an acceptable design for the Project while allowing for the continued operation and on-going maintenance of the transmission line.

The Transmission Line Relocation Project and its environmental effects are described in resource consent applications to authorise this work (Volume 6). The proposed alignment of the relocated transmission line is shown in the plans **TR01-12**. The key features of the proposed transmission line relocation are:

- the relocation and replacement of 24 towers and the removal of existing towers;
- the strengthening of 10 towers and / or tower foundations;
- the removal of one tower in its entirety;
- tracks for construction and maintenance access; and
- the installation of roadside protection (barriers) to protect some towers.

The proposed realignment of the transmission line will avoid any adverse effects of the Project on the line, with specific conditions being proposed to agree necessary dust management measures with Transpower, to be implemented during construction.

The Project is unlikely to affect any other transmission lines located in the vicinity. Earlier designs of the Main Alignment would have required the re-location of at least one (1) of the 220kV Bunnythorpe to Wilton A line (BPE-WIL A) towers but the design of the Main Alignment was altered to avoid affecting this line. Similarly, the design ensured that none of the many other transmission lines in the vicinity of the Takapu Substation will be affected by the Project.

As such, all adverse effects on existing electricity transmission lines will be able to be avoided or adequately mitigated

15.3.1.2 Pauatahanui Substation

The Pauatahanui Substation is located east of the Pauatahanui township and is currently accessed off SH58 (Haywards Road).

The proposed main construction compound for the Project will be located opposite the substation on the other side of the existing SH58. There are two potential adverse effects on the substation relating to access to the substation and dust from construction activities affecting substation equipment. Direct vehicular access to the substation will be maintained at all times during construction, although access arrangements may change throughout the construction period. Maintenance of access to the substation is covered in the Project MoU between Transpower and the NZTA and this will be implemented as part of the Construction Traffic Management Plan (CTMP).

Electrical components contained in the substation can be adversely affected by dust. Due to the close proximity of the substation to the proposed main site compound, there is the potential for dust to be found at the substation location. The potential effects of dust from the site compound are not limited to the substation and will be managed through the Construction Air Quality Management Plan (CAQMP) and through agreement with Transpower. The primary focus of the CAQMP is to limit the generation of dust at the source using methods such as covering potential dust generating components, suppressing dust with water and washing of lines and / or substations. Implementation of the dust control methods in the CAQMP will ensure that the effects of dust on the substation are no more than minor.

Once constructed, the SH58 Interchange will sit directly to the east of the substation. This interchange will involve the realignment of the section of SH58 that the substation is currently accessed from. Access to the substation will be retained through the creation of a cul-de-sac road along the existing SH58 alignment. This road will only provide access to the substation and a small number of residential properties and will hence have a much lower traffic volume than the existing SH58. There will not be any other operational effects on the substation.

15.3.1.3 Takapu Road Substation

The Takapu Road Substation will sit just to the south of the Main Alignment at approximately 24,000m. The potential effects on the substation relate to vehicular access (both during construction and operation of the Project) and the effect of dust. Vehicular access is currently from Takapu Road. Although the Project requires a small area of the Takapu Road reserve from WCC, the formed road itself will not be altered and the substation will continue to be able to be accessed as it is currently. There may be times during construction of the Project when the use of Takapu Road is restricted (e.g. due to heavy machinery being transported onto site). The CTMP contains communication protocols so that the NZTA and Transpower can manage any potential disruption to the operation and maintenance of the substation.

The potential effects of dust from general construction activities in the vicinity of the substation also need to be considered. In general, there is a reduced potential for the generation of dust at this location, compared to the Pauatahanui Substation. Implementation of the dust control methods in the CAQMP will enable works to be managed such that the effects of dust on the substation will be able to be managed.

15.3.2 Electricity distribution infrastructure

Wellington Electricity and Electra both have assets within the Project area that will be affected by the Project. The NZTA has consulted with both organisations to identify a preferred process for the protection of these assets. This will typically involve the protection of the line where it needs to cross a road (e.g. by ducting under, or traversing over TG) or by re-aligning part of the line so that it is not affected. These solutions will be incorporated into the design of the Project and protection and / or re-alignment of lines will be undertaken in conjunction with the construction of the Project, wherever practicable as enabling works. Protocols for this process will be set out in the NUMP.

The other potential adverse effect on electricity distribution infrastructure is from construction dust settling on insulators, which can interfere with the lines. This potential effect will be managed through the dust suppression measures as part of the CAQMP, as previously outlined. Implementation of these measures will ensure that any adverse effects from dust are no more than minor.

15.3.3 Gas transmission infrastructure

Vector Gas has completed a desktop review of the current proposed Project alignment (as provided by the NZTA) and determined the total length of impacted pipeline sections is approximately 6.3km and the impacts range from minor pipeline servitude encroachments to oblique State highway crossings with extensive cut and / or fill proposed. The affected pipelines are:

- the Kapuni Pipeline;
- the Kapuni – Wellington Duplication South Line Loop; and
- the Waitangirua to Belmont Lateral.

These pipelines service the greater Wellington region and gas flow to the Wellington region must be maintained at all times. Therefore, this critical constraint must be incorporated into any remedial project planning.

In their desktop review, Vector Gas considered that there appears to be at least one or more viable remedial options for each of the impacted pipelines. This may involve protection works but in many cases, gas pipeline realignment will be the only option.

No particular issues are anticipated with any gas pipeline realignment during construction (including during enabling works) of the Project. The NUMP will set out the process to be followed for Vector Gas and the NZTA to work together to during the detailed design and construction phases of the Project. The realignment of the gas pipeline will need to be carefully co-ordinated with the construction works for road construction to allow continuity of gas supply to the region which Vector Gas have identified as being critical. The NZTA will work closely with Vector Gas under the framework of the NUMP to manage potential adverse effects on the gas transmission network.

15.3.4 Gas distribution infrastructure

The NZTA has been in discussion with Powerco Gas and is confident that a design solution can be found at the four locations where the proposed road alignment will impact Powerco’s gas pipeline. Any required protection or re-alignment of the gas distribution pipelines will be co-ordinated with the works for the Project as far as practicable, within the framework established through the NUMP. All potential adverse effects on Powerco’s gas distribution infrastructure will be able to be adequately managed.

15.3.5 Water, wastewater and stormwater infrastructure

There are three water supply assets that are affected by the Project[87]:

- water supply bore for Paekakariki township potable water supply (KCDC);
- bulk water supply mains (GWRC); and
- local Porirua water, wastewater and stormwater pipes (PCC).

15.3.5.1 Existing Paekakariki water supply bore

An existing ground water abstraction bore is located immediately west of the Main Alignment at approximately 2,100m. This bore provides approximately half of the potable water supply for Paekakariki. KCDC identified that the Project could adversely affect this bore. Its concern was that the bore will be located close to the Main Alignment towards the bottom of a reasonably steep descent from Wainui Saddle. KCDC officers were concerned that there was the potential for out of control vehicles to run off the road and impact with the bore or surface run-off (including liquid containers ruptured in a crash) infiltrating the aquifer. The NZTA agreed that the potential effects on the bore did need to be considered and consequently have sought to reduce the likelihood of such events by:

- increasing the height (over-sizing) of the western bund to provide additional protection from out-of-control vehicles;
- providing an arrestor bed in the northbound (descending) carriageway so out-of-control vehicles have an opportunity to stop safely before they reach the bottom of the Te Puka valley; and
- providing a positive surface water catchment system so surface liquids ‘upstream’ of the bore are contained and deposited away from the bore.

These three measures are adequate to mitigate the potential risk of damage to the existing bore.

15.3.5.2 Proposed second Paekakariki water supply bore

As KCDC is currently in the process of replacing the up-river surface water abstraction plant, it will likely have been decommissioned by the time construction of the Project commences. As such, potential effects on this existing abstraction plant have not been considered but the focus has been on potential effects on the proposed replacement bore.

As the originally proposed second Paekakariki water supply bore would have been located beneath the Main Alignment, NZTA and KCDC have worked closely to secure an alternative site to ensure that the KCDC water supply programme is not adversely affected by the Project. The new site is ‘upstream’ of

87. This section only covers the potential physical effects on water supply infrastructure. Effects on water supply areas are discussed in water quality (Chapter 20) and in Chapter 32 in terms of compliance with the NES for Sources of Human Drinking Water.

the Main Alignment thus avoiding any crash and / or contamination related issues potentially associated with the proposed water supply bore.

15.3.5.3 Bulk water supply mains

The Main Alignment will cross GWRC's existing bulk water supply mains in four (4) separate locations. GWRC has indicated its preference is for the three (3) non-tunnel mains to be protected as follows:

- sleeving the 200mm diameter Brady Reservoir Rising Main within a 450mm pipe;
- ducting the twin 400mm diameter Porirua Branch Mains within parallel service ducts;
- housing the 750mm diameter bulk water main within box culvert allowing continuous 24-hour maintenance vehicle access.

In all three instances this can be achieved. The fourth tunnel main does not require additional protection.

The existing bulk water main tunnel at approximately 23,150m is not directly impacted by the Project. In discussion with GWRC the risk of tunnel integrity can be maintained by pre-construction inspection and on-going monitoring during the works in the vicinity of the tunnel.

In some cases, re-alignment of a section of the water main is proposed, generally because it will provide a better design outcome for the Project and / or the water main. In all instances, the re-alignment can be undertaken within the construction footprint of the Project. Generally, re-alignment will involve the construction of a parallel main with water being switched from the old to the new pipe once commissioned. GWRC has indicated that the importance of the bulk water main in the supply of potable water for much of the region means that switch over times must be minimised. The effects of any disruption will be minor.

15.3.5.4 Porirua water, wastewater and stormwater pipes

Existing water, wastewater and stormwater services will be affected at the following two locations:

- at Warspite Avenue, where the Waitangirua Link Road will connect to the local road network; and
- at Kenepuru Drive, where the Kenepuru Link Road will connect to the local road network.

In both locations the stormwater system for the Project will connect to the existing PCC stormwater system.

The existing stormwater system at Waitangirua (Warspite Avenue) is under-capacity and will require upgrading as part of the PCC Project to accommodate the current design flows and the additional flows from the Waitangirua Link Road. This will result in the Project having an overall positive effect on stormwater infrastructure in the Warspite Avenue area.

No particular issues are anticipated with any minor re-alignment of these services during construction of the Project. The NUMP sets out the process to be followed for construction in the vicinity of existing utilities and following the procedures and measures set out in the NUMP will facilitate the management of effects such that any adverse effects on the local water, wastewater and stormwater system will be no more than minor.

15.3.6 Telecommunications infrastructure

TelstraClear and Chorus (Telecom) both have fibre optic cables in the Project area that will be affected by the Project. Chorus also have some copper lines. The NZTA has consulted with both organisations to identify a preferred process for the protection of these assets. This will typically involve the protection of the cable where it needs to cross a road (e.g. by ducting under the State highway) or by re-aligning part of the line so that it is not affected. These solutions will be incorporated into the design of the Project and protection and / or re-alignment of lines will be undertaken in conjunction with construction of the Project. Protocols for this process will be set out in the NUMP.

Vodafone NZ (VNZ) has a cell tower located at the southern end of the Project area in Linden. The land this tower is on is owned by the Crown and leased to VNZ. This lease is on the understanding that if the land is required for State highway purposes (i.e. the Project), VNZ will be required to relocate the cell tower at its own cost. The NZTA are assisting VNZ with potential sites.

Any adverse effects on telecommunications infrastructure will be appropriately mitigated.

15.3.7 Rail infrastructure

The Project has the potential to adversely affect the operation of the NIMT. Two key types of effect have been identified:

- construction of the Project involving works within, and in close proximity to the rail corridor; and
- the erection of a permanent structure (Bridge 28 on the Kenepuru Link Road) across the NIMT.

15.3.7.1 Construction effects

Where works occur within, or in close proximity to, the rail corridor there is the potential for adverse effects on the operation of the rail corridor. Potential effects can include disruption to rail services, compromised safety of workers, dust and changes in ground conditions etc.

At MacKays Crossing, the works will be located a sufficient distance from the rail corridor such that there will be no adverse effects. The MacKays Crossing Project, completed approximately four years ago, was designed to incorporate a new alignment to the south (sometime in the future) and no modification of the carriageway (other than possibly some new line markings) is required for the Project.

At Kenepuru, construction of the Kenepuru Link Road, Bridge 28 and the realignment of existing SH1 will involve works being located in close proximity to the rail corridor. Working within the rail corridor requires a permit to enter from the New Zealand Railways Corporation (NZRC). This permit will be obtained prior to any works commencing in the rail corridor. The permit process will involve NZTA preparing a detailed construction schedule for the bridge and outlining protocols to minimise disruption to rail services, maintain the safety of workers and minimise all other potential adverse effects on the rail corridor. This permit is subject to approval by the NZRC and hence, the NZTA will need to satisfy the NZRC that protocols have been established to cover all potential issues.

Construction of road bridges across the rail corridor is relatively commonplace around the country and the NZRC and the NZTA have well-established protocols for this type of work. Clearances and overhead contact line protection measures, plus suitable design solutions to address any impacts on associated rail substation and transformer infrastructure, will have to meet NZRC requirements to obtain NZRC approval. All potential adverse effects on the rail corridor will be able to be managed, including potential effects of dust from construction.

It should also be noted that the NZRC is the requiring authority with a designation over the land (i.e. designation of the NIMT, K0101 in the PCDP). Accordingly the NZTA will need to obtain written approval from the NZRC pursuant to section 177(1)(a) of the RMA (this would also fulfil the requirements of written approval under section 176(1)(b) of the RMA). The NZRC will not provide its approval unless it is satisfied that all potential issues have been addressed. This document provides further assurance that any adverse effects on the rail corridor will be no more than minor.

15.3.7.2 Operational effects

As a permanent structure across the NIMT, Bridge 28 has the potential to adversely affect the operation of this railway line. The key issue is that the height and width of the bridge structure must provide adequate horizontal and vertical clearance for trains and rail maintenance activities. These requirements[88] were considered and have been incorporated into the bridge design. As such, the original position of the bridge piers was revised to provide at least 6m horizontal clearance. A vertical clearance of at least 6m has also been provided, which meets NZRC's requirements.

In summary, the bridge meets the NZRC's design specifications and hence there will be no adverse effects on the operation of the rail corridor at Kenepuru as a result of the proposed bridge structure.

88. Set out in the NZRC's '"Clearance Envelope for Future for Future Development" and "Obstacle Clearances (prEN50122-1 2008 Annex A (1500v DC Typ Obstacles))".

16. Noise and vibration

Overview

The rural and sparsely populated nature of the majority of the Project area means that specific noise and vibration mitigation is not required for most of the Project.

Construction noise will generally be within the limits of *NZS 6803:1999* and where construction works are proposed in close proximity to sensitive receivers, the Construction Noise and Vibration Management Plan (CNVMP) outlines protocols for engaging with affected parties and minimising noise and disruption. With this process in place, any potential adverse noise effects arising from construction will be able to be adequately managed.

In some areas, noise attenuation benefits will be delivered by OGPA pavement surfaces and proposed solid safety barriers. Based on an acoustics assessment, a small number of areas potentially requiring specific noise mitigation were identified and assessed using the process set out in *NZS 6806:2010*. Proposed mitigation consists of noise walls and bunds of varying heights and the modification of three buildings. With this mitigation in place, the effects of noise will be acceptable.

All potential vibration effects, both from construction and operation of the Project, will be such that no specific mitigation is considered necessary beyond management in accordance with the CNVMP.

16.1 Introduction

This chapter presents the assessment of the noise and vibration effects of both the construction and operation of the Project. The assessment of operational traffic noise should also be read in conjunction with the plan sets **NA, NB and NC**. The information contained in this chapter is based on the Assessment of Acoustics Effects (**Technical Report 12**).

16.2 Existing noise levels

The Project area is currently characterised by a number of different land uses, which provide differing noise and vibration levels. The majority of the area is rural, with areas of suburban development towards the southern end of the Project around eastern Porirua and Wellington City (Linden). In rural areas the noise environment is typical of an isolated area with larger holdings and forest plantations, where natural noises (such as cicadas, birds and wind in trees) are dominant. In these rural locations ambient noise levels were measured as being between 38 and 54 dB $L_{Aeq(24h)}$. Where rural areas are close to existing roads, such as SH1 at MacKays Crossing and SH58 to the east of Pauatahanui, ambient noise levels are higher. At these locations, the proximity to a State highway means that traffic noise from the significant daily traffic flows is dominant and is up to 60 dB $L_{Aeq(24h)}$.

The suburban areas in the vicinity of the Project, such as Cannons Creek and Waitangirua, also have a natural noise environment (such as birds, cicadas and wind in trees), but these environments also commonly feature people-oriented noise, such as music, machinery and household noises, including pets. In these suburban areas, ambient noise levels were measured as between 42 and 53 $L_{Aeq(24h)}$. Where vehicles are present, traffic noise tends to dominate. Some of the suburban areas in the Project area are within existing State highway noise environments, including Linden and Ranui Heights, which are close to SH1 and in the vicinity of SH58. The upper levels of State highway noise around SH1 were recorded as being 59 $L_{Aeq(24h)}$.

Another potential source of noise in a State highway environment is from engine braking by heavy vehicles. Measurements of this were taken at two locations in the region where engine brakes might be expected to be used (Ngauranga Gorge and Haywards Hill). This was undertaken to provide an indication of engine brake use and noise levels, and provide a guide indicating noise effects associated with the hill sections of the Project. Over a two hour period in Ngauranga Gorge, engine brakes were observed on only three occasions with an average maximum noise level of 93 dB L_{AFmax} at 5 metres

16.3 Assessment of noise effects

Noise effects have been assessed for both the construction and operation phases of the Project.

16.3.1 Construction noise

Management of noise from construction activities is guided by *NZS 6803:1999 'Acoustics – Construction Noise* (NZS 6803:1999) which provides noise limits for construction works. It takes into account factors such as the sensitivity of the receiver, the duration of the works and the time of the day and week. In accordance with *NZS 6803:1999*, the Project's construction works will generally only be conducted between 0630h and 2000h from Monday to Saturday inclusive, with particularly noisy activities being further restricted to between 0730h and 1800h. Construction may occur outside these times in some instances but will be subject to the CNVMP.

The rural nature and sparse population through most of the Project area means that noise from construction is not likely to be an issue in most areas. The areas where works will occur in close proximity to residential areas, and therefore have the potential to result in adverse construction noise effects, are:

- at the southern tie-in around Linden, Tawa, Kenepuru and Ranui Heights;
- in the vicinity of the eastern Porirua suburbs of Cannons Creek, Waitangirua and Whitby, from the construction of the Link Roads;
- in the vicinity of SH58 and Flightys Road;
- in the vicinity of Paekakariki Hill Road; and
- in the vicinity of MacKays Crossing.

Even at these locations construction noise is predicted to comply with the limits contained in *NZS 6803:1999*, most of the time. In some locations (particularly in the vicinity of the southern tie-in at Linden) some of the proposed noise walls to mitigate operational road traffic noise (described in

Table 16.4) will be erected during the construction phase to also provide noise attenuation during the construction period. In rare instances (such as where night time works might be needed for a short duration) the CNVMP sets out a process for informing and minimising the disruption to nearby residents.

The relatively low number of dwellings close to the Project construction area and the implementation of the CNVMP mean that any adverse noise effects arising from construction will be able to be managed in accordance with *NZS 6803:1999*.

16.3.2 Operational noise

The assessment of operational noise effects was undertaken in accordance with *NZS 6806:2010 Acoustics - Road-traffic noise - New and altered roads* (NZS 6806:2010). The assessment is described in full in **Technical Report 12** but broadly it involved:

- identifying protected premises and facilities (PPFs) within the vicinity of the proposed roads;
- modelling predicted noise levels without any specific form of mitigation at each PPF; and
- evaluating potential noise mitigation options, where appropriate

16.3.2.1 Protected premises and facilities

PPFs are defined fully in NZS 6806:2010 but include facilities such as:

- buildings used primarily for residential activities;
- marae;
- spaces within buildings used for overnight medical care; and
- teaching areas and sleeping rooms in buildings used as education facilities.

For rural areas defined by Statistics New Zealand (i.e. the Project area north of Battle Hill) PPFs up to 200m from the road are included. In urban areas PPFs up to 100m from the road are included. As such, the following areas were identified as containing one or more PPFs:

- MacKays Crossing;
- Paekakariki Hill Road;
- Flightys Road;
- SH58 east of Pauatahanui;
- proposed Silverwood subdivision area;
- in the vicinity of James Cook Drive (where the Whitby Link Road will connect to the local road network);
- in the vicinity of Warspite Avenue (where the Waitangirua Link Road will connect to the local road network);

- Takapu Road;
- Bluff Road / Kenepuru Drive;
- Ranui Heights;
- Linden;
- Rangatira Road;
- Greenacres; and
- Tawa.

Battle Hill Farm Forest Park (BHFFP) was also considered although there are no locations meeting the definition of a PPF.

16.3.2.2 Modelling

The noise model took into account factors such as predicted traffic volumes, pavement surfaces, topography, proposed safety barriers, and proposed bridges. Noise levels for the NZS 6806 assessment are presented in terms of three categories of predicted noise levels at a PPF, as shown in Table 16.1.

Table 16.1: NZS 6806 categories

Category	Criterion	Altered roads	New roads[89]
A	Primary	64 dB $L_{Aeq(24h)}$	57 dB $L_{Aeq(24h)}$
B	Secondary	67 dB $L_{Aeq(24h)}$	64 dB $L_{Aeq(24h)}$
C	Internal	40 dB $L_{Aeq(24h)}$	40 dB $L_{Aeq(24h)}$

For the assessment, the levels for altered roads have been included as they are relevant in locations where the Project will connect to the existing road network (either the State highway or local road network). Category A and B noise level criteria are measured outside a PPF, and when these are exceeded Category C criteria apply inside the building.

These categories have been developed for assessment, rather than consenting, purposes. However, in general terms:

- **Category A** indicates that no more than minor adverse noise effects are predicted.
- **Category B** indicates a slightly increased level of noise compared to category A but the adverse noise effects would still be considered to be no more than minor in most cases.
- **Category C** indicates that there may be more than minor noise effects outside, and mitigation may be required to achieve an acceptable level of noise inside.

89. With predicted traffic volumes of 2,500 to 75,000 AADT at the design year.

The basic assessment process was to initially model two scenarios for each area:

- **Do nothing** – 2031 without the Project constructed
- **Do minimum** – 2031 with the Project constructed, but with no specific noise mitigation

The purpose of this initial modelling was to determine in which areas noise mitigation should be considered and then to provide a baseline for the evaluation of noise mitigation options.

Generally, the consideration of mitigation options was undertaken where the initial modelling indicated that for the Do Minimum scenario there would be PPFs in categories B or C.

Modelling was undertaken for all of the areas containing one or more PPF and a summary of the results for each of these areas is shown in Table 16.2 and the plans **NB01- 21**.

Table 16.2: Predicted noise levels for the Do Minimum scenario

Area	Key modelling results	Do mitigation options need to be considered?
A: MacKays Crossing	The Project will shift SH1 away from the most affected PPFs, reducing the road-traffic noise levels for these currently affected buildings. It will however increase noise levels at other PPFs. All of the affected PPFs are category A or B, except for one category C. The category C PPF is owned by the Crown and is to be demolished.	Yes
B: Battle Hill Farm Forest Park	Noise levels will increase through BHFFP and this will change the amenity of the area for park users. There are no PPFs in this area that will be affected. The increased noise level in the park will be reduced to a degree by the topography, such as Gas Line Ridge which will provide some acoustics screening. The greatest increase in noise will be experienced by pedestrians crossing under the Main Alignment (via underpass Bridge No. 7) to access the Akatarawa Forest.	No[90]
C: Paekakariki Hill Road D: Flightys Road	There will be an increase in noise levels at a number of PPFs in these two areas but all are either category A or B.	Yes
E: SH58 Interchange	The Project will result in a reduction in noise levels for some PPFs and an increase for others. The PPFs which will experience increased noise levels are predicted to be either category A or B.	Yes
F: Silverwood	The area includes a large consented subdivision to the west of the Main Alignment and a small number of existing properties along Bradey Road to the east of the Main Alignment. The developers of the	Yes[91]

90. Although not required under NZS 6806 (as there are no PPFs), noise mitigation options through BHFFP were considered in recognition of potential noise effects for recreational users of the Park.

91. While noise mitigation options were assessed for this area, noise mitigation for the proposed Silverwood subdivision is to be provided by Silverwood in accordance with an agreement between Silverwood Joint Venture and the NZTA.

Area	Key modelling results	Do mitigation options need to be considered?
	subdivision have entered into an agreement with the NZTA regarding noise effects. This requires acoustic treatment to be provided at the new dwellings (at the cost of the developer).	
G: James Cook Drive	Traffic volumes along James Cook Drive will increase as a result of traffic using the Whitby Link Road. All PPFs are predicted to be within category A.	No
H: Warspite Avenue	Traffic volumes along Warspite Avenue will increase as a result of traffic using the Waitangirua Link Road. All PPFs are predicted to be within category A, with the exception of one of the residential buildings at the back of the marae which will be category B.	Yes
I: Takapu Road	There will be an increase in road-traffic noise audible from Takapu Road but at all PPFs it will be within category A.	No
J: Bluff Road	There will be an increase in road-traffic noise audible from Bluff Road as a result of traffic using the Kenepuru Link Road but at all PPFs it will be within category A.	No
K: Ranui Heights	Parts of Ranui Heights currently experience noise from existing SH1 and noise levels would be expected to increase by about 5 dB through general traffic growth. The (unmitigated) Project would cause several PPFs to be in categories B and C.	Yes
L: Linden	Parts of Linden currently experience noise from existing SH1 and noise levels would be expected to increase by about 5 dB through general traffic growth. The (unmitigated) Project would cause some PPFs to experience decreased noise levels and some increased noise levels. Some of those PPFs with increased levels are predicted to be categories B and C.	Yes
M: Rangatira Road	There are two PPFs on Rangatira Road but both are predicted to be in category A.	No
N: Greenacres	Parts of Greenacres currently experience noise from existing SH1 and noise levels would be expected to increase by about 5 dB through general traffic growth. However, the (unmitigated) Project will, cause several PPFs to be in categories B and C.	Yes
O: Tawa	Parts of Tawa currently experience noise from existing SH1 and noise levels would be expected to increase by about 5 dB through general traffic growth. However, the Project will cause several PPFs (including Linden School and He Huarahi Tamariki Complex) to be in categories B and C.	Yes

As a result of the initial assessment summarised in Table 16.2, noise mitigation options were assessed for a majority of the areas. NZS 6806:2010 sets out a process for the evaluation of mitigation options. The process is not purely based on reaching a specific noise level reduction but aims to achieve the best practicable option (BPO) by taking into account aspects such as the visual and urban design implications, constructability and value-for-money of various mitigation options. This is intended to produce a more integrated solution than if noise mitigation was considered in isolation.

Details about the mitigation options evaluated for each area are contained in **Technical Report 12**. For five areas where mitigation was considered, the BPO was not to provide any noise mitigation. The reasons for this are summarised in Table 16.3.

Table 16.3: Areas were noise mitigation was not recommended

Area	Reason mitigation was not recommended
A: MacKays Crossing	All PPFs are in Categories A or B except one PPF in category C which is owned by the Crown and will be removed. Options tested include use of a low noise road surface and roadside barriers. All options were found to have relatively poor benefit-cost ratios due to the large extent of works required to benefit a small number of PPFs. Furthermore, barriers tested do not provide significant benefit due to the topography, and create adverse visual effects.
B: Battle Hill Farm Forest Park	Using a low noise road surface would not fundamentally alter the change in acoustic amenity in the park and the main visitor area will be screened by the topography of Gas-Line Ridge.
C: Paekakariki Hill Road	All PPFs are in categories A or B. A low road noise surface and / or a bund would have limited effectiveness and a bund would create adverse visual effects.
E: SH58 Interchange	All PPFs are in categories A or B. A low-noise road surface has a poor BCR due to the limited number of PPFs that would benefit from the mitigation.
F Silverwood	The Silverwood subdivision is subject to an agreement between the developers and the NZTA. The agreement required buildings in the subdivision to be constructed to mitigate future road-traffic noise and no noise mitigation as part of the Project is therefore required.

For all the other areas where mitigation was considered, specific noise mitigation is recommended and a summary of currently proposed mitigation is set out in Table 16.4.

Table 16.4: Currently proposed noise mitigation

Area	Currently proposed noise mitigation
D: Flightys Road	2m high noise bund along the western (northbound) carriageway of the Main Alignment adjacent to the properties at Flightys Road (total length of approximately 378m).
H: Warspite Avenue (Marae)	2m high noise barrier along the southern side of the Waitangirua Link Road at the proposed new intersection with Warspite Avenue adjacent to the marae (total length of approximately 150m).
K: Ranui Heights	2 - 3m high noise barrier along the eastern (southbound) carriageway of the Main Alignment adjacent to the properties at 37 Apple Terrace - 56A Huanui Street (total length of approximately 151m).
L: Linden	2m high noise bund along the western (northbound) carriageway of the Main Alignment adjacent to the properties at 86 - 92 Tremewan Street (total length of approximately 100m).
N: Greenacres	2 – 2.5m high noise barrier along the eastern (southbound) carriageway of the Main Alignment at the Linden tie-in (total length of approximately 532m, not continuous). Building modification (acoustic treatment) of 2 Little Collins Street, 2 Raroa Terrace and one bedroom of 8 Allen Terrace.
O: Tawa	2-3m high noise barrier along the western designation boundary of the Main Alignment at the Linden tie-in (total length of 572m).

The proposed noise mitigation measures described in Table 16.4 reflect the BPO to mitigate the potential adverse noise effects from the operation of the Project. Consultation has been undertaken with all landowners where noise walls are proposed and in some cases landowners have requested changes to the heights of the noise wall based on their preference for noise reduction or views. Where possible these requests have been accommodated. The specific design the proposed noise mitigation has not yet been determined could be altered as part of the detailed design of the Project. The NZTA has made a commitment to all landowners that they will be consulted with again as part of the noise mitigation detailed design process.

Although the purpose of noise walls is to provide on-going mitigation of traffic noise from the operation of the Project, the noise walls at Ranui Heights, Greenacres and Tawa will be erected at the start of the construction phase to provide noise reduction benefits during construction as well. The other barriers are dependent on new earthworks, but will still be constructed as early as practicable.

In summary, construction noise can be adequately managed as construction will largely occur in sparsely populated rural areas. Mitigation options for operational noise have been assessed in accordance with NZS 6806:2010 and noise mitigation is proposed in a number of areas, mainly where the Project is in proximity to urban areas. As such, operational road noise will be able to be mitigated to an acceptable level in accordance with NZS 6806:2010.

16.4 Assessment of vibration effects

16.4.1 Vibration effects during construction

The only residential area of the Project where adverse vibration effects from construction could potentially be an issue is around Linden / Tawa where works will occur in close proximity to existing dwellings. In addition, there are two heritage features that could potentially be adversely affected by construction vibration:

- St. Joseph's Church; and
- the brick splinter proof blast containment structure (brick fuel tank) at the bottom of the Te Puka valley.

Vibration will predominantly result from ground compaction work and excavation in bedrock. This has the potential to cause two types of adverse effect:

- nuisance and annoyance from the perception of vibration; and
- cosmetic damage to existing buildings.

Potential nuisance and annoyance can be reduced by not undertaking this type of work at night and by clearly communicating to nearby residents when and for how long compaction will occur. As long as this information is communicated accurately and with adequate forewarning, the public is generally reasonably accepting of these kinds of short-term events. Procedures for this communication are set out in the CNVMP.

Damage to existing structures from construction vibration is considered unlikely but structures that could potentially be affected (including the two aforementioned heritage structures) will be assessed before works commence. The same structures will be monitored during construction and re-assessed once works have been completed and any damage caused as a result of vibration from construction of the Project will be repaired. This process is explained in the CNVMP.

Implementation of the communication procedures will ensure that any potential adverse vibration effects in terms of nuisance will be adequately managed. Any adverse effects on existing buildings will be remedied. As such, the adverse effects from vibration as a result of construction of the Project will be able to be adequately managed and remedied if necessary.

16.4.2 Operational vibration effects

Adverse vibration effects can occur where a building or other structure is located close to a road. For the Project, the only area where this could occur is at the southern tie-in at Linden / Tawa.

Measurements of vibration were undertaken at two dwellings and in a reserve adjacent to SH1 at Linden. Vibration levels reduced rapidly as the distance from the formed carriageway increased. Within 7m of the carriageway, vibration levels were measured at v_{w95} 0.28mm/s, which is below the v_{w95} 0.3mm/s threshold contained in the Norwegian Standard NS 8176E:2005. This indicates good pavement condition and levels complied with the limits contained in NS 8176E:2005.

It is assumed that the new pavements surfaces (i.e. of the Main Alignment and the re-aligned SH1) will be maintained to the same standard as currently occur. Once the Project is complete, the nearest building to any part of the new or re-aligned State highway will be approximately 10m. As this is greater than 7m it is considered that any adverse vibration effects arising from the operation of the Project will be negligible.

17. Air quality

Overview

Construction of the Project (particularly the large scale earthworks and concrete batching) has the potential to generate dust which could have an adverse effect on air quality. This potential effect can be mitigated to an acceptable level through dust management measures.

Overall, the operation of the Project will have a positive effect on air quality. The results of the dispersion modelling indicate that cumulative PM_{10},NO_X, CO and benzene concentrations from the operation of the Project are unlikely to exceed the relevant NES AQ and AAQG thresholds. There will be no material adverse effects on air quality arising from the Project's operation and hence, no mitigation is considered necessary.

17.1 Introduction

This chapter discusses the air quality effects arising from the construction and operation of the Project. Construction effects mainly relate to dust, whereas operational effects arise from vehicle emissions from road users. The information presented in this chapter is based on the assessment of air quality effects (**Technical Report 13**).

17.2 Existing air quality

In order to assess the air quality effects of the Project, information was gathered about the existing air quality in the Project area and about the location of potentially sensitive receptors.

Air quality is influenced by the prevailing meteorological conditions of an area, particularly wind speed and direction. There are no weather stations in the immediate Project area but nearby measurement stations in Tawa and Paraparaumu are considered to be generally indicative of wind conditions experienced within the Project area. Both sites show a prevalence of north to north-easterly winds. However, given the length of the Main Alignment and the variable terrain that it traverses, local winds flows are expected to vary throughout the route.

The Project area is within the Porirua and Kapiti Coast airsheds, as defined by GWRC. In terms of air quality within the Project area, vehicle emissions and domestic solid heating from residential areas are the biggest contributors to air contaminants, namely PM_{10}, NO_2, CO and benzene. Vehicle emissions in this area predominantly arise from SH1, SH58, Kenepuru Drive and suburban streets and contribute to background levels of PM_{10}, NO_2, CO and benzene. Contaminants arising from solid fuel heating at Paekakariki, Cannons Creek and other residential areas are also expected to be contributors of background levels of PM_{10} and CO within the environment. Long term monitoring data is available for all the listed contaminants, except benzene. Benzene is not measured in the Wellington region. However, it is measured by the NZTA in Auckland adjacent to roads with much higher traffic count than SH1 in the Wellington region. As such, using data from Auckland will provide a conservative estimate for the Project area. Estimated worst-case contaminant levels for urban areas within the Project area are shown in Table 17.1.

Table 17.1: Estimated worst- case background contaminant levels for air quality in urban settings in the Project area

Contaminant	Averaging period	Background concentration	NES AQ / AAQG threshold
PM_{10}	24-hour	39 µg/m³	50 µg/m³
	Annual	16 µg/m³	20 µg/m³
NO_2	1-hour	45 µg/m³	200 µg/m³
	24-hour	29 µg/m³	100 µg/m³
NO_x	1-hour	425 µg/m³	-
	24-hour	213 µg/m³	-
CO	1-hour	3.4 mg/m³	30 mg/m³
	8-hour	3.1 mg/m³	10 mg/m³
Benzene	Annual	1.0 µg/m³	3.6 µg/m³

Background contaminant concentration levels in urban areas are all below the relevant NES AQ thresholds, indicating a high level of existing air quality. Air quality in rural settings (i.e. throughout most of the Project area) is likely to be considerably better than the worst-case levels estimated for the urban settings, as shown by the estimated levels for rural settings indicated in Table 17.2.

Table 17.2: Estimated background contaminant levels for air quality in rural settings in the Project area

Contaminant	Averaging period	Background concentration	NES AQ threshold
PM_{10}	24-hour	15 µg/m³	50 µg/m³
NO_2	1-hour	15 µg/m³	200 µg/m³
CO	8-hour	0 mg/m³	10 mg/m³

The estimated background concentration levels in rural areas are also well below the NES AQ thresholds.

17.2.1 Sensitivity of the receiving environment

The sensitivity of the air quality receiving environment relates to the sensitivity of certain activities, and / or individuals, to reductions in air quality. Some activities are considered to be more sensitive to air quality effects. These are typically land uses which involve a cluster of sensitive individuals such as children, elderly persons and the infirm. Typical sensitive receptors include: residential areas, childcare and early learning facilities, schools and hospitals and residential care homes.

In general, the sensitivity of the receiving environment is considered to be low across most of the Project area, with most of the area being in pasture or forestry and being sparsely populated.

For assessment purposes, five key areas of potential increased sensitivity were identified and modelled:

- the proposed Kenepuru Drive intersection;
- existing SH1 at Linden;
- the proposed Warspite Avenue intersection;
- the proposed SH58 Interchange; and
- MacKays Crossing.

Details of individual receptors within these five areas are contained in **Appendix 13.C** of **Technical Report 13**.

17.3 Assessment of effects on air quality

Potential air quality effects can arise from both the construction and the operation of the Project. The potential effects from each phase are quite different and hence have been considered separately.

17.3.1 Construction of the Project

The following aspects of construction of the Project have the potential to cause adverse air quality effects:

- dust generated from earthworks and from rock crushing
- emissions from construction vehicles;
- odour generated during construction; and
- discharges to air from concrete batching.

Each of these potential effects is now discussed.

17.3.1.1 Dust from earthworks

Exposed earthworks can be a significant source of dust, particularly when undertaken on such a large scale as needed for this Project. Dust can be a nuisance to the public but does not normally cause adverse health effects as the larger particle size means that particles have limited penetration into the respiratory tract.

Dust is generated naturally, typically from dry undisturbed surfaces when wind speeds reach above 5 – 10m/s. Where surfaces are disturbed (e.g. by large scale earthworks), the generation of dust typically increases, unless avoidance measures are put in place. The key construction activities that have the potential to generate dust include:

- the use of roads and access tracks by trucks and machinery during dry and windy conditions;

- the excavation and disturbance of dry material;
- the loading and unloading of material to and from trucks; and
- the stockpiling of material (particularly cut material).

The generation of dust is influenced by a number of factors; including particle size, wind speed, rainfall and evaporation rates. In accordance with sound industry practice, the air quality assessment considered potentially sensitive receptors within 100m of significant dust sources. This assessment found that dust is likely to be an issue at the following locations:

- Existing SH1 at Linden; and
- Proposed Warspite Avenue intersection (where the Porirua Link Roads will connect to the existing road network).

Without the proposed management measures put in place it is likely that the adverse effects of dust at these locations could be more than minor.

17.3.1.2 Dust from rock crushing

Although most dust will be of larger particle size, it is possible that a small proportion of particles will be less than PM_{10} (particle size less than 10µm). These smaller particles have the potential to cause adverse health effects on the human respiratory system – as discussed in **Technical Report 13**.

The likely effect of dust from rock crushing is dependent on the proximity of the dust sources to sensitive receptors. There is no New Zealand standard for recommended separation distances but Australian guidelines[92] recommend a minimum distance of 500m for rock crushing plants. These distances are intended to minimise the health, nuisance and amenity effects from dust. These separation distances will be able to be achieved for the Project, thereby reducing the potential adverse effects arising from dust.

Although adequate separation distances will be achieved for rock crushing activities, the Construction Air Quality Management Plan (CAQMP) will also contain protocols aimed at reducing the amount of dust emitted. This will ensure that potential adverse effects on air quality are suitably managed.

17.3.1.3 Emissions from construction vehicles

Construction vehicles have the potential to cause adverse air quality effects, which can cause adverse air quality effects that can create a nuisance at neighbouring sensitive locations, under adverse meteorological conditions. Excessive smoke and odour from diesel-fuelled heavy vehicles, generators and other machinery is primarily caused by poor engine maintenance.

92. EPA Victoria, 1990. Recommended buffer distances for industrial residual air emissions AQ2-86; and EPA South Australia, 2007. Guidelines for Separation Distances.

The CAQMP describes measures to be undertaken to control and monitor vehicle emissions, including requirements to maintain vehicles and equipment in accordance with manufacturer specifications and immediately service units discharging excessive exhaust smoke.

Adherence to the CAQMP practices for construction vehicles will ensure that all potential adverse effects associated with emissions will be adequately managed.

17.3.1.4 Odour

Road construction does not typically involve activities that generate offensive odours. It is possible that during earthworks activities, excavations may disturb a former landfill or offal pit which could result in the temporary discharge of offensive odour. However, the likelihood of this occurring is considered to be very low, as the contaminated land assessment (described in Chapter 18) did not result in the identification of any former landfill sites. In the unlikely event that such a site was uncovered, the Contaminated Land Mangement Plan (CLMP) contains measures to manage odour.

The other source of odour is from bitumen used for the pavement sealing and surfacing. This activity is a common part of road maintenance activities across the region. In addition, there is significant distance from where this activity will occur to any sensitive receptors in most areas. Accordingly, it is not expected that there will be any adverse odour effects of concern, arising from construction of the Project.

17.3.1.5 Concrete batching

Construction of the Project will require significant amounts of concrete, mainly for the key structures such as bridges, culverts and some retaining walls. A concrete batching plant will be established at the main site compound near SH58 Interchange at Pauatahanui to manufacture this concrete. The concrete manufacturing process is described in Chapter 8 of this report and in **Technical Report 13**. An indicative plant layout is also provided in Figure 8.1.

Potential effects associated with concrete manufacturing can arise from the discharge of dust from aggregates and cement powder to air. This type of dust is typically larger (30 - 50µm) than the earthworks dust discussed earlier and has the potential to cause nuisance, rather than respiratory health effects. However, cement dust is also highly alkaline when dissolved in water and can be corrosive to skin. It is also known to be ecotoxic and can cause damage to aquatic animal and plant life if it is discharge in suitable quantities.

The likely effect of dust from concrete batching is also dependant on the proximity of the dust sources to sensitive receptors. As stated above (for rock crushing), there is no New Zealand standard for recommended separation distances but Australian guidelines[93] recommend a minimum distance of 100m from sensitive receptors for concrete batching plants. These distances are intended to minimise the health, nuisance and amenity effects from dust. A separation distance of at least 100m will be able to be achieved for the Project, thereby reducing the potential adverse effects arising from dust.

93. EPA Victoria, 1990. Recommended buffer distances for industrial residual air emissions AQ2-86; and EPA South Australia, 2007. Guidelines for Separation Distances.

Although separation distances of greater than 100m will be achieved for the concrete batching plant, it is recommended that a Concrete Batching Plant Management Plan (CBMP) is prepared, along with consent conditions to manage the potential for effects on the environment. The CBMP will control both discharges to air and water. Additional consent conditions will include the following:

- limit conditions:
  - a buffer zone around the physical boundary of the plant;
  - a requirement that there are no discharges to air, including visible discharges, that are noxious, dangerous, offensive or objectionable in the opinion of an enforcement officer; and
  - controls on hazardous air pollutants beyond the boundary of the site.
- operation and process conditions:
  - vehicle speed controls to limit dust;
  - specific dust management equipment to manage operation of the cement silos, including badfilters and alarms;
  - controls on the deliveries and storage of aggregate and other raw materials to avoid dust generation;
  - use of water sprays; and
  - as a minimum, enclosure of the aggregate conveyors.
- Monitoring and site management conditions:
  - regular maintenance including weekly visual inspections, including inspections of valves and alarms on dust management systems;
  - recording deliveries of aggregate and raw materials;
  - close management of contract drivers to ensure they stay within the driveway areas of the site; and
  - logging and reporting conditions

Along with the greater than 100m separation distance, these measures will allow potential adverse effects on air quality from concrete batching to be suitably managed.

17.3.2 Operation of the Project

The effect on air quality from the operation of the Project will be influenced by a number of different factors, including:

- existing air quality;
- predicted traffic volumes;
- meteorological factors influencing dispersions;
- the location of sensitive receptors; and

- improvements in the performance of the country's vehicle fleet emission rates.

The potential effects on air quality were predicted by modelling of PM_{10}, NO_X, CO and benzene concentrations from vehicle emissions[94]. For the four contaminants, the following scenarios were modelled:

- **Current base year (2006)** – Used to provide a 'baseline' against which to compare future effects, both with and without the Project.
- **2026 With Project (2026 WP)** – Traffic flows and fleet composition predicted for the year 2026, assuming the Project has been completed.
- **2026 Do Minimum (2026 DM)** – For comparison with the 2026 WP scenario. Traffic flows and fleet composition predicted for the year 2026, assuming the Project has not been completed.
- **2031 With Project (2031 WP)** – Traffic flows and fleet composition predicted for the year 2031, assuming the Project has been completed. Higher traffic volumes are predicted for the 2031 scenario, as compared to 2026 scenario. The fleet profile and emission rate also varies from 2026.
- **2031 Do Minimum (2031 DM)** – For comparison with the 2031 WP scenario. This scenario assumes the Project has not been completed.

Further information about the modelling, including the assumptions and limitations associated with the model, is contained in **Technical Report 13**. This report also sets out the relevant thresholds for each of the modelled contaminants.

The results of the emissions modelling are as follows.

17.3.2.1 Predicted particulate concentrations

Maximum concentrations for particulate matter (PM_{10}) at sensitive receptors are predicted to be similar but lower for the 2031 'with Project' and 'do minimum' emission scenarios compared to the 2006 base year. Particulate levels for both 2031 scenarios are predicted to be similar and are predicted to be lower than the NES AQ limits. At the most impacted receptor (the residential property located near the Main Alignment and SH1 interchange) the maximum 24-hour concentration predicted for the 2006, 2031 'do minimum', and 2031 'with Project' emissions scenarios are 5.6µg/m^3, 3.8µg/m^3, and 4.1µg/m^3 respectively. As such, there is not predicted to be any material adverse effect arising from PM10 emissions.

94. NO_2 was not directly modelled. NO_X is a combination of NO_2 and NO. Most emissions of NO_X are in the form of NO but, once emitted into the atmosphere, NO reacts with ozone to form NO_2. Ground level NO_X concentrations were predicted using the dispersion model and then, based on ambient monitoring data, the proportion of NO_X which was likely to be NO_2 was estimated.

17.3.2.2 Predicted nitrogen oxide concentrations

The predicted NO_2 concentrations for all the modelled scenarios are well below the NES AQ limit of 200µg/m³. At the most affected receptor the maximum 99.9 percentile 1-hour average concentration for the 2031 'with Project' scenario is predicted to be 57µg/m³, or approximately 29% of the 1-hour NO_2 NES AQ limit. A comparable maximum 99.9 percentile 1-hour average NO_2 concentration of 56µg/m³ is predicted for the 2031 'do-minimum' emission scenario. Cumulative NO_2 concentrations are also predicted to be less than 60% of GWRC's[95] 'maximum desirable level' of 95µg/m³. The maximum 24-hour average (for the 2031 'with Project' emission scenario) NO_2 concentration is predicted to 33µg/m³, or 33% of the MfE 24-hour average AAQG. As such, there is not predicted to be any material adverse effect arising from NO_2 emissions.

17.3.2.3 Predicted carbon monoxide concentrations

The predicted CO concentrations for all the modelled scenarios are well below the NES AQ limit of 10mg/m³. At the most affected receptor the annual average incremental concentrations are predicted to be less than 0.09mg/m³, or less than 1% of the NES AQ threshold (for the 2031 'with Project' emissions scenario). As such, there is not predicted to be any material adverse effect arising from CO emissions.

17.3.2.4 Predicted benzene concentrations

The predicted benzene concentrations for all the modelled scenarios are well below the AAQG limit of 3.6µg/m³. At the most affected receptor the annual average incremental concentrations associated with emissions from the modelled road sources are predicted to be less than 0.3µg/m³, or less than 8% of the AAQG. A maximum annual average cumulative concentration of 1.3 is 36% of the AAQG. As such, there is not predicted to be any material adverse effect arising from benzene emissions.

17.3.2.5 Summary of dispersion modelling results

The results of the dispersion modelling indicate that cumulative PM_{10}, NO_X, CO and benzene concentrations from the operation of the Project are unlikely to exceed the relevant NES AQ and AAQG thresholds. As such, contaminant levels at sensitive receptors are unlikely to be materially affected regardless of whether the Project is constructed or not.

In summary, there will be no material adverse effects on air quality arising from the Project's operation and hence, no mitigation is considered necessary.

95. Regional Ambient Air Quality Guidelines, contained in Appendix 2 of the Wellington Regional Air Quality Management Plan 2000.

17.3.2.6 Vehicle emissions from the operation of the Project

Although vehicles using the new roads will generate emissions, these emissions will be transferred from the existing SH1. Net vehicle emissions will decrease as a result of smoother traffic flows as compared to traffic currently using existing SH1, which is frequently congested. The movement of traffic away from communities along existing SH1 to a largely rural area also means that public exposure to vehicular emissions will be significantly reduced.

17.4 Measures to avoid, remedy or mitigate potential adverse effects on air quality

From the air quality assessment, the following potential key adverse effects were identified:

- dust from construction activities;
- emissions to air associated with rock crushing activities; and
- emissions to air associated with the concrete batching plant.

Dust from construction activities and rock crushing will be managed through the CAQMP and from the concrete batching plant through the CBMP. The primary management approach will be the suppression of dust at its source, allowing potential adverse effects on air quality to be appropriately managed. For the management of dust at the concrete batching plant, the CAQMP will also set out protocols for covering materials and regular inspections of equipment to check that it is functioning properly and is not leaking. The only monitoring of air contaminants recommended during construction is the continuous real-time monitoring of dust (or total suspended particulates) around the proposed southern tie-in at Linden. This monitoring will be undertaken as part of the implementation of the CAQMP and the information will form part of the adaptive management regime for the management of dust from construction activities.

As the Project will have positive effects on air quality in the long term, no on-going further mitigation or monitoring is considered necessary.

18. Contaminated land

Overview

The majority of the areas identified as contaminated do not present a significant risk to human health or local ecology. The highest risk areas are the portions of MacKays Crossing where the potential for unexploded ordnances (UXO) has been identified, the identified soil contamination at the Porirua Gun Club and a former nursery and the potential presence of asbestos in building materials.

Contaminated land has the potential to affect local ecology and human health during construction and operation of the Project. This potential effect can be avoided through remedial work and by placing a road on the contaminated soils and essentially capping the contamination. The adverse effects associated with UXO can be avoided through investigation, careful excavation and management / disposal methods, and by observing appropriate protocols in the event of accidental UXO discovery. Remedial action may also be required.

Implementation of these measures, through the Contaminated Soil Management Plan (CSMP), will ensure that any adverse effects arising from contaminated land during construction and operation of the Project will be appropriately managed.

18.1 Introduction

In order to assess the potential effects of contaminated land in relation to the Project, a land contamination assessment and investigation of the land within and immediately surrounding the Project was undertaken. This assessment is detailed fully in **Technical Report 16**.

18.2 Existing environment – Contaminated land

The Project area is primarily comprised of greenfields areas, being areas that are used as pastures for grazing, forests and undisturbed lands. There are also areas along the proposed designation where farming, commercial or industrial activities take place, or have taken place in the past and these were the areas selected for intrusive investigation.

Within these areas, the contaminated land assessment identified several sites where contaminants of concern are present, and which could pose a human health risk and / or an ecological risk. These sites were (with the indicative location shown in Figure 18.1):

- **Site A** (Pt Lot 4 DP 4269): A market garden, where hazardous materials have been stored and pesticides, herbicides and fertilisers have been applied;
- **Site B** (Lot 1 DP 53032): An area that was formerly used (prior to purchase by the Crown) for storage of imported cars prior to their distribution around New Zealand;

- **Site C** (Lot 1 DP 47726): Former nursery, where pesticides have been used and heavy metal concentrations have been detected. Asbestos is present in building materials on the site;
- **Site D** (Section 1 SO Plan 402089): A former stockyard site, where metals are present;
- **Site E** (Section 4 SO Plan 38167): Garden supplies store and green waste composting facility, where pesticides have been applied, and treated timber has been stored, used and burned at the site. The site also contained an outhouse and above-ground tanks for fuel storage;
- **Site F** (Section 353 Porirua District): Mana Coach depot, where vehicles are stored and repaired, and fuel and other hazardous materials are stored;
- **Site G** (Pt Lot DP51158): GWRC historic sheep dip site, where pesticides are present; and
- **Site H** (Section 1 SO Plan 36634): Porirua Gun Club, where ammunition and clay targets have contaminated the soil.

The land contamination study also identified that it is possible that there may be UXO present at MacKays Crossing, adjacent to SH1, where past military activities were conducted.

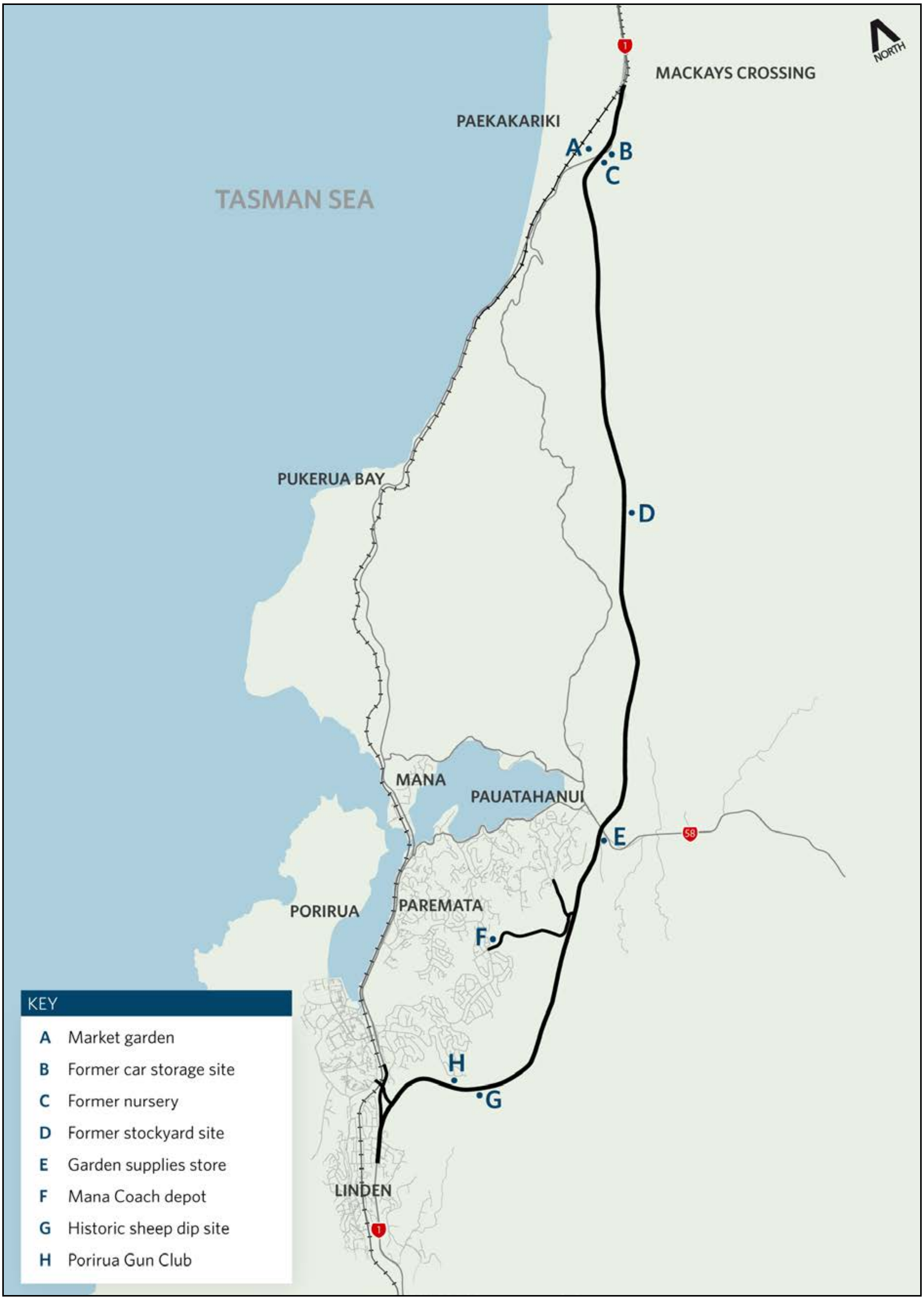

Figure 18.1: Sites investigated for potentially contaminated land

18.3 Assessment of effects

18.3.1 Construction of the Project

Potential effects from contaminated land during construction of the Project are risks to human health and risks to ecology.

18.3.1.1 Human health risk

Several contaminants of concern were present at concentrations above expected background values at most of the sites investigated, with the exception of the Mana Coach depot. This is indicative of anthropogenic activities at the sites, such as the application of fertiliser, pesticides and herbicides, and the presence of galvanised structures. However, at the majority of these sites, the presence of these contaminants is not at concentrations high enough to present a risk to human health.

The highest risk sites are the Porirua Gun Club and the former nursery. At the Gun Club, numerous near-surface samples in the firing range areas returned results above human health risk based guideline values[96] for lead and polycyclic aromatic hydrocarbons (PAH). Several of the corresponding deeper samples were also analysed and all but one returned results at the human health risk based guideline of 3,300mg/kg for lead.

Detectable concentrations of pesticides and higher than background concentrations of metals were detected at the former nursery. However, only arsenic in one sample returned laboratory results above the human health risk based guideline criterion of 70mg/kg. This was in a near-surface soil sample where elevated concentrations of lead, copper and zinc were also detected. Asbestos was detected in two of the building samples collected. The samples collected indicate that asbestos is present in some of the building materials, which has a potential human health risk. As such, additional investigation would be conducted prior to building demolition, to ensure that the risk to human health during construction of the Project is appropriately managed.

During construction, dust arising from areas with soil contamination levels above risk-based guideline values also presents a potential adverse effect. This risk arises for known contaminated land and any contaminated land that may be discovered during construction. Accidental discovery is a hazard of contaminated land, a protocol for which is outlined in the CSMP.

18.3.1.2 Ecological risk

Concentrations of several contaminants, such as antimony, lead, copper, zinc, arsenic, chromium, and nickel, which may present an ecological risk were also present at most of the sites investigated. Pesticide and benzo(a)pyrene were also detected above ecological risk-based guideline values at some sites. This is indicative of anthropogenic activities at the sites. However, at the majority of the identified sites, the ecological risk is believed to be relatively low, based on the analytical results from the samples collected and the disturbed nature of the sites.

96. Ministry for the Environment Contaminated Land Management Guidelines (MfE CLMG) and National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.

The highest risk sites for ecological impacts are identified as the Gun Club and the former nursery. At the Gun Club, antimony, lead, copper, zinc and benzo(a)pyrene concentrations were identified in numerous locations across the site, all of which exceeded the ecological risk based values[97]. These contaminants are particularly noticeable around the firing range area and appear to be present due to discharge of ammunition and clay targets.

Arsenic, chromium, copper, nickel and zinc concentrations at the former nursery were well above ecological risk based criteria and several times above expected background concentrations in several near-surface samples. Low concentrations of pesticides were also present, which is likely because of past activities undertaken at the site.

As is explained further below, although ecological guideline values were exceeded in some instances, the concentrations are not likely to pose a threat to local ecology during construction of the Project because the sites are located within the area proposed for the Main Alignment, limiting potential exposure.

18.3.1.3 Possible unexploded ordnances

The land assessment indicated that it is possible that UXO are present in the land adjacent to SH1 at MacKays Crossing. It is likely that the UXO are present at a depth of less than 1m below ground surface. While UXO are unlikely to spontaneously explode, certain activities which could create large pressure waves, sudden impact or sparking could cause detonation, posing a hazard to construction workers and to the public.

Extreme caution should be exercised when conducting activities in the area that could lead to vibration or similar disturbance of the UXO. Proper excavation and management / disposal are required for those areas which contain suspected UXO and where construction is expected.

There is a possibility that, following detonation of UXO (assuming it is detonated in place) residual contamination could be present, presenting a potential risk to construction workers.

18.3.2 Operation of the Project

During operation, the concentrations of contaminants identified are not likely to pose an adverse effect to human health. Although ecological guideline values were exceeded in some instances, the concentrations are not likely to pose a threat to local ecology because the sites are located within the area proposed for the Main Alignment, limiting exposure and ensuring that that potential adverse effect is largely avoided by placing the road on the affected sites. The soil removed from these sites will not be utilised in ecologically sensitive areas. Stormwater treatment devices and dust control measures will be in place to seek to ensure that adverse ecological effects do not occur. Therefore, the ecological risk of contaminated land associated with the operation of the Project is expected to be low.

97. Ministry for the Environment Contaminated Land Management Guidelines (MfE CLMG).

18.4 Measures to avoid, remedy, mitigate or offset potential adverse effects

From the contaminated land assessment, the sites that present the greatest risk to human health and the environment have been identified as the Gun Club, the former nursery and in the MacKays Crossing area (only in relation to UXO).

At the Gun Club, remedial work will be required, particularly in the firing range areas[98]. This remedial action will be undertaken through a remedial action plan, to be approved by GWRC. At the Gun Club and the former nursery, appropriate on-site soil management will be required if the contaminated soil is left in place. Potential adverse effects are largely avoided by placing a road on the contaminated soils and essentially capping the contamination. Soil from these sites will not be utilised in ecologically sensitive areas and will not be used to construct stormwater management devices. If soil is to be removed, it will need to be disposed of off-site, at a properly licensed landfill. Some soil from the Gun Club may require treatment at a licensed facility prior to disposal. Monitoring will be undertaken to track and record where soil is relocated, to verify that it is appropriately placed and to prevent spread of contamination during future operations (e.g. road maintenance). Dust and erosion control measures will be required as described in the CSMP.

The land assessment indicated that it is possible that UXO is present in the land adjacent to SH1 at MacKays Crossing. Proper excavation and management / disposal are required for those areas which contain suspected UXO and where construction may affect the UXO. Discovery and disposal of UXO is dangerous, but not an uncommon occurrence and protocol is outlined in the CSMP. The Army is normally commissioned to identify and dispose of the UXO. It is recommended that, following detonation of UXO, samples should be collected and analysed to evaluate the potential risk to construction workers from remaining contaminants. Remedial action may be required, with appropriate soil treatment and disposal. This will ensure that potential adverse effects are largely avoided.

A CSMP has been developed to address the management of material with contaminants present. The primary approach of the CSMP is as a framework for the development of particular contaminated soil control practices and procedures to minimise effects on human health and safety and to reduce impacts on the environment.

98. Some of the contaminated area of land is located outside the Main Alignment. Remedial work will be undertaken as part of the wider Project works, when the Gun Club is relocated.

19. Hydrology

Overview

The Project will result in changes to existing hydrology from land use changes and from changes to stream morphology. Hydrological and hydraulic modelling has been undertaken to inform the design and environmental assessment process. As a result of this closely integrated process, the majority of potential adverse hydrological affects have been avoided through refinement to the road and drainage design.

There is only one area (immediately upstream of Bridge 6) where localised protection might be required to mitigate potential increased flood risk in a Q100 event. All other increased flood risk is negligible and in fact, the Project results in a small reduction in downstream flood risk in many areas.

The stream realignments for the Project and the stream crossings (bridges and culverts) have been assessed and will result in negligible changes to hydraulic performance of the affected stream. This potential effect is largely able to be mitigated by constructing realigned streams as close as possible to their existing form. While this reconstruction is primarily being done for ecological reasons, it also minimises changes to hydraulic performance.

In summary, the majority of potential adverse hydrological effects have been avoided through design refinements. In a few areas specific measures (such as localised flood protection or the provision of upstream storage) are required to adequately mitigate the potential adverse effects.

19.1 Introduction

Hydrology refers to the movement and distribution of water across the earth. The hydrological system comprises the continuous movement of water on, above and below the surface of the earth. Hydraulics refers to the physical movement of water.

This chapter describes the potential hydrological effects of the Project in terms of:

- temporary stream crossings for construction access tracks;
- permanent changes to stream hydraulics resulting from;
    - channel diversions;
    - structures (culverts / bridges) across streams;
- stormwater runoff to existing urban stormwater systems; and
- changes to flood risk.

The assessment of hydrological effects has involved hydrological modelling which also informed the design of the proposed stormwater system. The modelling and how it relates to the assessment of hydrological effects is summarised in Section 19.3 and further details are contained in **Technical Report 14**.

Where hydrological effects have the potential to impact on other aspects of the environment, these effects are discussed in the relevant assessment chapters. In particular, this relates to potential effects on:

- water quality (Chapter 20);
- freshwater ecology (Chapter 22);
- cultural values associated with waterbodies (Chapter 24);
- recreational uses of waterbodies (Chapter 27);

19.2 Existing hydrological environment

The following parts of the hydrological environment are relevant:

- surface water (numerous permanent and ephemeral streams and tributaries in nine separate catchments); and
- groundwater.

The relevant marine environments (Porirua Harbour, the Wainui Stream mouth and the Whareroa Stream mouth) are described later in the chapters on water quality (Chapter 20) and marine ecology (Chapter 23).

19.2.1 Surface water

The Project traverses four separate watersheds (from north to south):

- the Whareroa watershed;
- the Wainui watershed;
- the Pauatahanui Inlet watershed; and
- the Onepoto Arm watershed.

The Whareroa watershed discharges to the Kapiti Coast at Whareroa Beach. This watershed has an area of 1,570ha (15.7km²).

The Wainui watershed discharges to the Kapiti Coast north of Paekakariki. It is made up of the Wainui catchment (which contains the Te Puka sub-catchment). This watershed has a combined area of 830ha (8.3km²).

The Pauatahanui watershed includes six catchments: Kakaho Stream, Horokiri Stream West Branch, Horokiri Stream East Branch, Ration Stream, Pauatahanui Stream, and Duck Creek, all of which discharge into Pauatahanui Inlet. Of these the Horokiri East Branch, Ration, Pauatahanui, and Duck catchments would be traversed by this Project. This watershed has a combined area of 10,640ha (106km²).

The Onepoto watershed includes Kenepuru Stream and its smaller tributary Cannons Creek which combine and flow into Porirua Stream a short distance upstream of where the stream discharges into the Onepoto Arm. Cannons Creek and several small tributaries of Porirua Stream are crossed by the Project. This watershed has a combined area of 5,325ha (53km²).

19.2.1.1 Whareroa Stream catchment

The Whareroa Stream is the northern most catchment, and is one of the smaller streams in the Project environment. The Stream is primarily influenced by the pastoral and scrub covered hills in which it passes through, before crossing the proposed Main Alignment and traversing through Queen Elizabeth Park out to the coast.

19.2.1.2 Wainui Stream catchment and Te Puka sub- catchment

The Wainui and Te Puka Streams are small catchments to the north of the route. The streams cross the proposed Main Alignment corridor and converge downstream from the Main Alignment and flow into the township of Paekakariki.

The topography traversed by these streams is typical of the Kapiti Coast district. Land use, which influences the water quality and hydrology of the streams, is a mixture of pasture, plantation pine and native bush. The steep upper catchment drops down onto an undulating dune environment. This change in grade between the hills and the coastal zone, combined with restrictions as the streams runs through the dunes, has resulted in historical flooding problems for the developed land surrounding the streams.

19.2.1.3 Horokiri Stream catchment

The Horokiri Stream catchment is one of the largest catchments within the Project area (approximately 3,300ha). It drains into the eastern side of the Pauatahanui Inlet. The stream has two main tributaries, one of which is crossed by the Main Alignment. Land use within this catchment is mostly pastoral with scrub and planted forest.

The main channel begins at the Wainui Saddle and drains south out into the Pauatahanui Inlet of the Porirua Harbour. In the upper catchment the steep sided valleys on the western catchment boundary are predominantly forested, whereas, on the eastern boundary the land use is predominantly pasture. As the lower catchment opens up onto the Horokiri Stream floodplain the major land use is rural pasture with pockets of residential dwellings. The majority of dwellings are located on the true left bank of the Horokiri Stream and have private access bridges crossing to Paekakariki Hill Road, which runs on the true right bank of the Stream. The upper Horokiri is mostly planted forest, while the downstream area is a combination of scrub, planted forest and pastoral land use.

19.2.1.4 Ration Stream catchment

The Ration Stream catchment is 680ha in area and is one of the smaller catchments in the Project area. The Stream has two tributaries, both of which are crossed by the Main Alignment. Land use within the catchment is mostly good quality pastoral, scrub and planted forest with an area of coastal wetlands at the stream mouth. The catchment also passes through the Pauatahanui Golf Course.

19.2.1.5 Collins Stream catchment

The Collins Stream catchment is small (0.64ha) and is almost entirely in pasture. Unlike most of the other catchments in the Project area it has relatively flat slopes.

19.2.1.6 Pauatahanui Stream catchment

The Pauatahanui Stream drains a catchment of approximately 4,200ha on the eastern side of the Pauatahanui Inlet. The upper catchment has numerous steep sided valleys which converge and drain northwest out onto the Pauatahanui floodplain. The upper catchment is predominately a mixture of rural pasture land and forestry.

As the lower catchment opens up the land use becomes a mixture of rural pasture land, residential and commercial. The residential suburb of Whitby lies on the western boundary and at the northern boundary is Pauatahanui Village. In the upper extent of the catchment the channel is located in a narrow steep sided gorge. The Stream is constrained as it runs adjacent to SH58 until the topography levels out downstream of the Bradey Road Bridge. Downstream of Bradey Road the grade of the stream flattens out as it skirts the western perimeter of the floodplain before passing beneath SH58 at Paremata Rd and the Paremata Rd bridge adjacent to Pauatahanui Village, and finally into Pauatahanui Inlet.

19.2.1.7 Duck Creek catchment

The Duck Creek catchment is 1,030ha in area and has a mixture of land uses. In the upper reaches of the catchment land use is primarily pastoral or recently harvested exotic forest slash. Further downstream the catchment is mostly urbanised with patches of scrub. The creek has three tributaries which are crossed by the Main Alignment, these converge downstream of the Project area and also pass under the proposed Whitby Link Road.

Upstream of the proposed Main Alignment, the creek is located in pastoral farmland, where stock has regular access to the Creek. The channel is typically small at approximately 1 metre wide. Downstream of the Main Alignment and the Link Road to Whitby, land use is mostly pastoral and planted forest, with some indigenous forest. The stream is wider and flatter than further upstream, with the channel varying between 2 and 3 metres in width.

The mouth of the Creek into the Pauatahanui Inlet is downstream of residential urban land use in the suburb of Whitby. At approximately 7 metres wide, the channel here is wider and flatter than upstream locations. It is surrounded by wetlands and scrub which are part of DOC land.

19.2.1.8 Kenepuru Stream catchment

The Kenepuru Stream catchment is located adjacent to the Duck Creek and Porirua Stream catchments. The Stream has several tributaries, one of which is crossed by the Main Alignment. At the lower end of the Kenepuru Stream it flows into the Porirua Stream. The catchment is mostly urbanised, flowing through the Waitangirua residential area. Above the Waitangirua residential area the stream flows through pastoral and scrub areas in the upper reaches of the catchment.

Figure 19.1: Like many of the waterways in the Kenepuru Stream catchment, parts of Cannons Creek have been highly modified

19.2.1.9 Porirua Stream catchment

The Porirua Stream catchment is of comparable size to the Pauatahanui catchment at around 4,100ha in area. A large proportion of the area surrounding the channel in this catchment is urban. Upstream areas are mostly pastoral and scrub. There are several tributaries to the main channel, which drain the surrounding hill catchments.

19.2.2 Groundwater

Within the slopes above the main valleys, groundwater levels are typically about 10m to 20m below ground level, but depths of 35m, or greater, have been found during testing on some, but not all, of the higher slopes of Sections 3 and 4 of the Main Alignment. Springs are evident along the Ohariu Fault and its active splinter on the western flank of Horokiri Stream, south of the Wainui Saddle, in Section 4.

Artesian pressures were noted in Section 7 (adjacent to the Pauatahanui Stream), with a head of at least 2m above ground level encountered in a borehole at a depth of 22m below ground level. Artesian pressures were also noted in Section 1 at a depth of 7m below ground level, adjacent to the Te Puka stream. KCDC extracts potable water from a bore located adjacent to the Wainui Stream and in close proximity to the Main Alignment.

19.3 Hydrological modelling and drainage design

The assessment of hydrological and stormwater effects was based on hydrological modelling. This modelling was also used in the drainage design for the Project. The key aspects of the model were:

- a soil water balance model;
- a hydrological model of rainfall runoff; and
- a hydraulic model of the characteristics of critical catchments.

19.3.1.1 Soil water balance model

The soil water balance model (SWBM) was developed to provide daily timeseries streamflow data for catchments that feed into the Porirua Harbour (i.e. every catchment except the Te Puka / Wainui and the Whareroa). This is required as an input into the hydrological and hydraulic models. The SWBM ultimately provides an estimate for the surface runoff and groundwater discharge from each catchment.

Further information about the SWBM is contained in **Appendix 15.K** of **Technical Report 15.**

19.3.1.2 Hydrological model

Hydrological modelling was undertaken to determine the runoff caused by the Project during both the construction of the Project and its operation. This modelling provided information for the development of the proposed hydraulic scheme (including culverts and erosion control protection etc.) and as a basis for further modelling of stormwater runoff during construction and operation. This modelling was based on information such as:

- meteorological information;
- morphology of the existing hydrological system, including channel characteristics and land use patterns;
- predicted land use changes as a result of the Project; and
- other predicted land use changes within each catchment over the duration of the model (to 2031).

This modelling also incorporated the predicted impacts of climate change, which includes a predicted 16% increase in heavy rainfall events by 2090[99]. The hydrological modelling was used, in conjunction with the relevant design guides[100], to size the culverts and bridges for the stream crossings.

As discussed previously, the drainage scheme has been developed around a number of performance criteria, including:

- Culverts should be capable of conveying the critical duration Q10 rainfall storm event without water levels rising above the pipe soffit.
- The road surface level should be at least 500mm above design stormwater levels for a Q100 event.
- Fish passage should be provided where required[101].
- Culvert inlets should be designed to minimise debris accumulation immediately upstream of inlets, which can lead to blockages. This is typically achieved through the use of stilling basins and debris screens.
- Culvert outlets and downstream channels need to be protected from erosion. Erosion typically creates sediment and can also undermine the structural integrity of culverts. This is important for all culverts, but particularly so for those culverts with steep hydraulic gradients where water velocities are likely to be higher. Outlet protection will typically be provided by construction of either a rip rap stilling basin and apron, or a baffle apron. A rip rap stilling basin and apron provides a more natural appearance as well as a resting place for migrating fish and is therefore the preferred option in culverts where fish passage is required.
- Piers in stream beds should be avoided, wherever possible.

For culverts the above criteria equates to a minimum diameter of 600mm and a freeboard depth of 0.5m. For bridges a freeboard of 0.6m is provided in normal circumstances but this has been doubled to 1.2m where upstream debris from large trees is possible. Culverts and bridges will also include erosion protections, including inlet and outlet protection for culverts. Fish passage will be provided in culverts when required for ecological reasons (discussed further in Chapter 22).

For many of the crossings, particularly those in ephemeral streams, the design of bridges and culverts is relatively simple and presents no particular issues in terms of appropriate sizing of structures or changes to existing hydrological conditions. Streamworks in these catchments present very little risk (and consequently negligible potential hydrological effects) and hence no further assessment was undertaken. Table 19.1 summarises the hydrological risk assessment undertaken for each catchment.

99. Ministry for the Environment. 2008. *Preparing for climate change: A guide for local government in New Zealand*. Ministry for the Environment. Wellington. 40pp.

100. Transit NZ Bridge Manual, 2003; Austroads, 1994; Transit NZ F/3 Specification of pipe culvert construction, 2000.

101. As determined by the Project ecologists. See Chapter 22 for further details on fish passage.

Table 19.1: Summary of hydrological risk assessment

Catchment	Major diversions	Major constraints (stream or floodplain)	Significant downstream flood risk	Freshwater habitat value[102]	Detailed hydraulic modelling required?
Whareroa Stream	No	No	No (little downstream development)	Mostly high	No (no stream works)
Wainui / Te Puka Stream	Yes	Yes	Residential property (Tilley Road)	Mostly high	Yes
Horokiri Stream	Yes	Yes	Flood prone rural properties / dwellings	High	Yes
Pauatahanui Stream	Yes	Yes	Yes	Some high	Yes
Ration Stream	No	Yes	No	Mostly low	No
Collins Stream	No	No	No	Not assessed	No
Duck Creek	No	Yes	Yes	Mostly high	Yes
Kenepuru Stream	No	No	Yes	Low – moderate	Yes
Porirua Stream	No	No	Yes	Low	Yes

For the six catchments identified where further more detailed hydraulic modelling was considered necessary, modelling was undertaken to refine the design and provide a more detailed assessment of hydrological effects. For the Wainui, Horokiri, Pauatahanui and Duck catchment this is in relation to major diversions and / or flood risk. For the Kenepuru and Porirua catchments this relates to the effects of road runoff into existing urban stormwater systems.

19.3.1.3 Detailed hydraulic modelling

The methodology for the hydraulic modelling is described in **Technical Report 14**. However, in general, the modelling incorporated the following information:

- the geometry and roughness of existing streams;
- the gradient and runoff co-efficient of land within the catchment;
- key aspects of the proposed works, namely:
    - structures, such as bridges and culverts;
    - channel diversions;
    - earthworks (cut and fill);
    - vegetation clearance; and
    - road pavement formation.

102. Based on the assessment undertaken by the Project ecologists (refer to Technical Report 9).

In general, two aspects were modelled:

- the existing pre-construction situation (i.e. without the Project); and
- the post-construction scenario (i.e. with the Project).

For some catchments, multiple post-construction scenarios were modelled to inform the design and assessment process.

Specifically, in terms of land use change the modelling of the post-construction scenarios took into account the land use change as a direct result of the Project (conversion to paved road surface and retirement and revegetation of some areas of pasture) and other land use change predicted within the catchment over the next 20 years[103].

Based on this information, avoidance of adverse effects through design modification was the preferred solution but where this was not practicable, mitigation measures were developed.

The hydraulic modelling enabled the following effects to be assessed for each of the six critical catchments:

- hydraulic effects on runoff and overland flow paths;
- hydraulic effects of new stream crossings (culverts and bridges);
- hydraulic effects of realigned waterways;
- stream velocity effects and associated scour and erosion, particularly associated with channel realignment; and
- effects on flood risk, include loss of floodplain storage.

The hydraulic effects in each of the six critical catchments are discussed in Section 19.5.

19.4 Assessment of hydrological effects during construction

The construction access track will require 61 temporary stream crossings, as shown on plans **AC01-21**.

Some of these crossings will be new while others will be an upgrade of existing fords or culverts. It is necessary to upgrade some of the existing crossings to keep vehicles out of the stream channel (i.e. fords) and the unsuitably of some existing culverts for heavy vehicles. Culverts will be about 10m long (4m of road width, and 3m either side to allow for 500 – 600mm of road build up).

103. As discussed in Chapter 14, the Project will not result in widespread land development. Land use change within modelled catchments was determined from subdivision potential etc. in district plans. See **Technical Reports 14** and **15** for further information about the modelling.

Temporary culverts will be used for up to two years. While the construction period of the Project is longer than two years, it is anticipated that, once formed, sections of the Main Alignment itself will be used for construction access.

All temporary culverts have been sized for a Q2 event and this can be achieved in all cases. This equates to a minimum culvert size of 600mm. Flow in larger events will overflow the construction road and may cause some damage to the temporary culverts (as well as the access tracks potentially). After a large event, all culverts and access roads would be checked and repaired prior to use, if necessary.

All temporary culverts will be constructed at grade and within the existing (natural) channel, and hence will not involve any diversion of streams. As with the permanent culverts, erosion protection will be provided. Where necessary, fish passage will also be provided by widening and countersinking culverts by 300mm to form a continuous wetted perimeter, passable to native fish species.

Once culverts are no longer required for construction access, they will be removed and any damage to the streambed or riparian planting will be remediated.

The small scale and temporary nature of the crossings required for the construction access tracks means that any hydrological effects will be negligible.

19.5 Assessment of hydrological effects during operation

As discussed, potential hydrological effects associated with the operation of the Project (including the increase in impervious surface, permanent stream crossing and permanent stream diversions) can include:

- hydraulic effects on runoff and overland flow paths;
- hydraulic effects of new stream crossings (culverts and bridges);
- hydraulic effects of realigned waterways;
- stream velocity effects and associated scour and erosion, particularly associated with channel realignment; and
- effects on flood risk, including loss of floodplain storage.

For catchments where detailed hydraulic modelling was not considered necessary (refer Table 19.1), potential hydrological effects are considered to be negligible.

A summary of the modelling and assessment of hydrological effects for the other six catchments is as follows. The location of the proposed structures (bridges and culverts) and diversions is shown in the drainage plans (**DR01- 21**). Key hydraulic modelling scenario results are shown in plans in **Appendix 14.H** of **Technical Report 14**. The following effects summaries should be read in conjunction with these plans.

19.5.1 Wainui / Te Puka Stream catchment

Works in the Te Puka Stream involve major stream realignment (approximately 45% of the existing stream) as well as a number of structures for stream crossings. The Te Puka Stream valley is a relatively constrained and steep.

There are already flood risks associated with the Wainui / Te Puka catchment. The modelling predicted that an existing triple box culvert conveying the Te Puka Stream under SH1 would overtop in a Q100 event causing shallow (up to 150mm) inundation of pastureland immediately downstream. Existing culverts taking the Wainui Stream under SH1 and the NIMT are both insufficient for Q10 and Q100 events resulting in inundation. For the Q10 event this pond (in excess of 1m) is predicted to occur in an area between SH1 and the NIMT. For the Q100 event, flooding could threaten residential properties along Tilley Road in Paekakariki.

The initial post-construction modelling indicated that there would be minimal loss of storage and additional runoff would be less than1%. From this, two potential effects were considered further:

- flood risk at the foothills of the Te Puka Stream valley (i.e. Paekakariki); and
- water velocity changes on Te Puka Stream.

19.5.1.1 Flood risk

The model showed that in a Q100 event the twin box culvert (W3) will result in localised increase in flood levels of greater than 1m immediately upstream of the culvert (Figure 19.2). This increase is relatively contained due to the topography and the affected area is within the area the NZTA is designating for the Project. Options were assessed to reduce this increase but even a doubling of the size of W3 did not result in any real change to the area affected. Furthermore, the low return period of the event (Q100) means that the increase in flood levels is negligible. Protection can be provided for the road to prevent inundation.

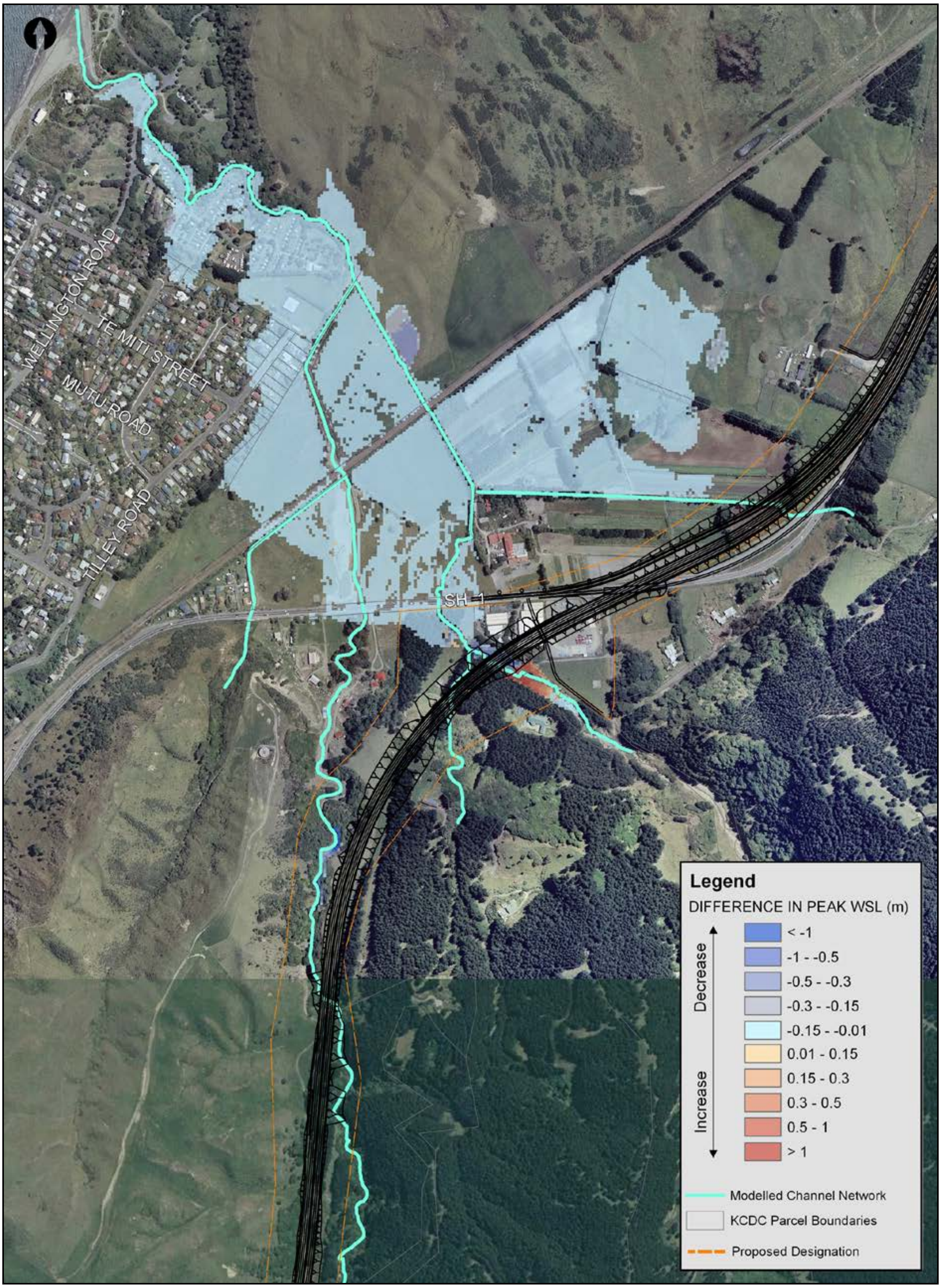

Figure 19.2: Difference in peak water levels with and without the Project for a Q100 event

19.5.1.2 Water velocities in Wainui and Te Puka Streams

The Wainui and Te Puka Streams are both in relatively steep catchments and alterations to the stream have the potential to increase existing stream velocities. Increased stream velocities can lead to increased scour which can undermine stream banks and / or structures in stream beds. Increased stream velocities can also have adverse ecological effects (discussed in Chapter 22).

Figure 19.3 and Figure 19.4 show the comparison between the pre and post-construction stream velocities in Wainui Stream and Te Puka Stream, respectively[104].

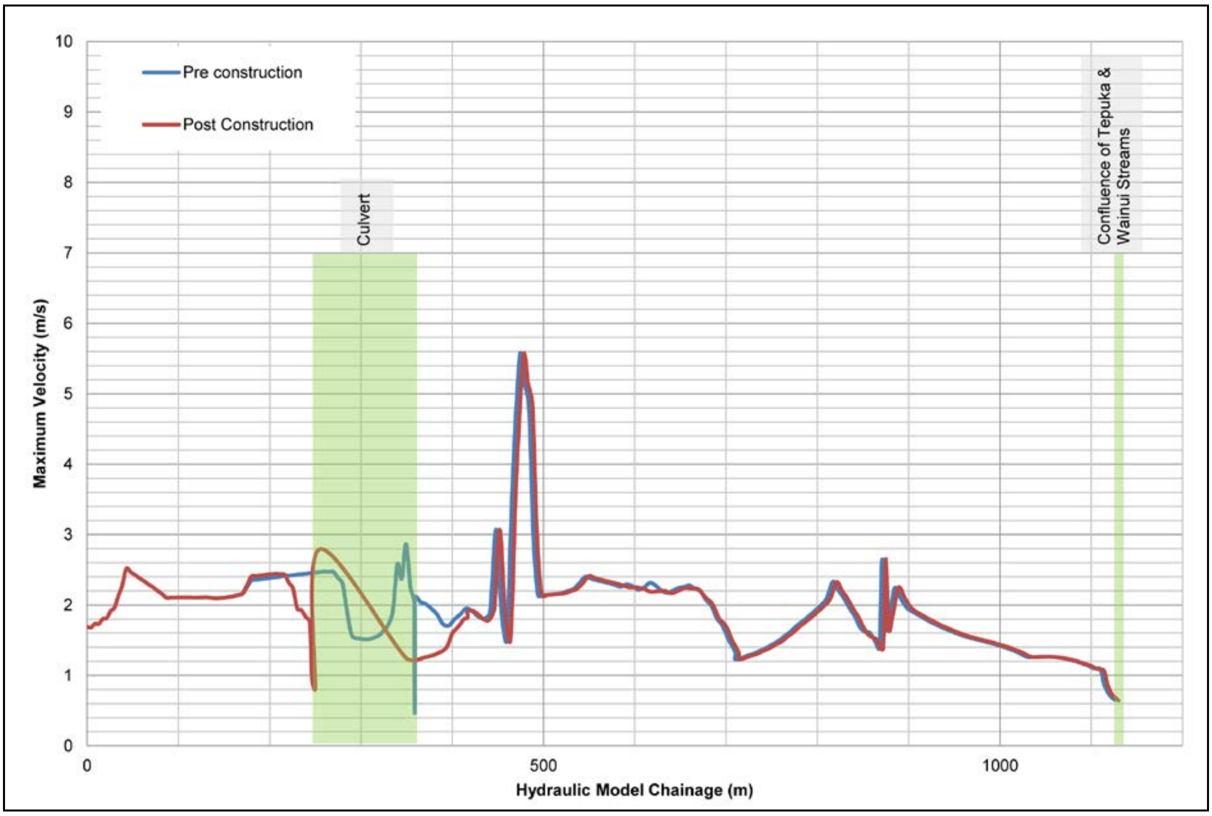

Figure 19.3: Comparison of peak water velocity in Wainui stream between pre and post construction scenarios for a Q10 event

104. The chainage values used in these figures relate to the hydraulic model, not the values used to describe positions along the Main Alignment.

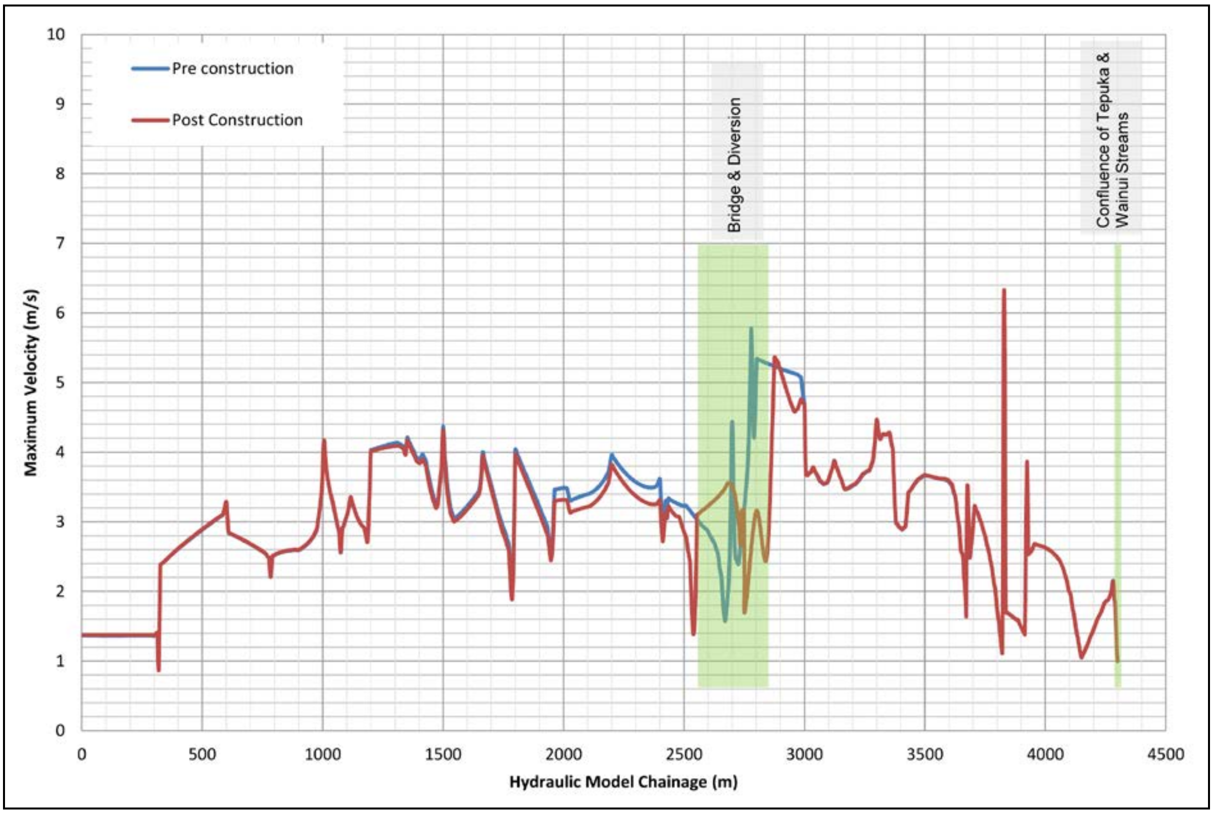

Figure 19.4: Comparison of peak water velocity in Te Puka stream between pre and post construction scenarios for a Q100 event

For the Wainui Stream, the only real change is around culvert W3 where the Project will result in a small decrease (0.5 – 1m/s) in flow velocities in a Q10 event. This will not have any adverse effects.

In the Te Puka Stream a localised increase of 0.5 – 2m/s is predicted around Bridge 3 (and the small upstream diversion) in a Q10 event. This predicted increased is not expected to cause additional scour of the stream bed. Protection as part of the bridge will mitigate any potential increased scour as a result of localised increases in stream velocity.

From Bridge 3 to the Wainui Saddle, parts of Te Puka Stream will be realigned, mainly to move the stream away from the base of the RSE walls used to support the carriage down the Te Puka valley. The re-aligned lengths of the stream will be as close in longitudinal and cross sectional profile as possible to the existing stream channel. There are not predicted to be any significant impediments to this and the hydraulic performance of the stream will remain relatively unchanged. As such, any changes to peak water velocities in Te Puka as a result of stream realignment will be negligible.

19.5.2 Horokiri Stream catchment

The full length of the Horokiri Stream catchment was modelled. The majority of the main stream channel is constrained by the steep valley topography. South of the confluence of the Horokiri Stream with its main tributary (just upstream of the Paekakariki Hill Road bridge) the topography flattens out slightly and the channel is less constrained and in the last 1.5km it flows through the Pauatahanui floodplain. Most of the catchment has been highly modified and is in pasture or plantation forestry. There is some native bush, particularly in the upper parts of the catchment towards the Wainui saddle.

Modelling showed that the stream is currently constrained by an existing box culvert on the Paekakariki Hill Road that would cause localised flooding of this road in a Q100 event. Upstream of this culvert there is little existing flood risk due to the highly constrained channel. Downstream of the culvert some flooding is predicted in a Q10 event threatening four residential properties and seven properties in a Q100 event. Some inundation around the stream mouth is also predicted and this would include some inundation of Grays Road.

The model was then run for the post-construction scenario to assess the hydraulic effects of:

- three bridges across the Horokiri Stream (Bridges 4, 6 and 8); and
- channel diversions.

19.5.2.1 Bridge 4

Bridge 4 is located in the steep sided upper part of the catchment. A small (700mm) increase in flood level directly upstream of the bridge in the Q100 event is predicted. It is considered that the bridge can be sized to provide adequate freeboard and the inundation will have no effect on the road and only a negligible effect on the surrounding land, which does not contain any dwellings.

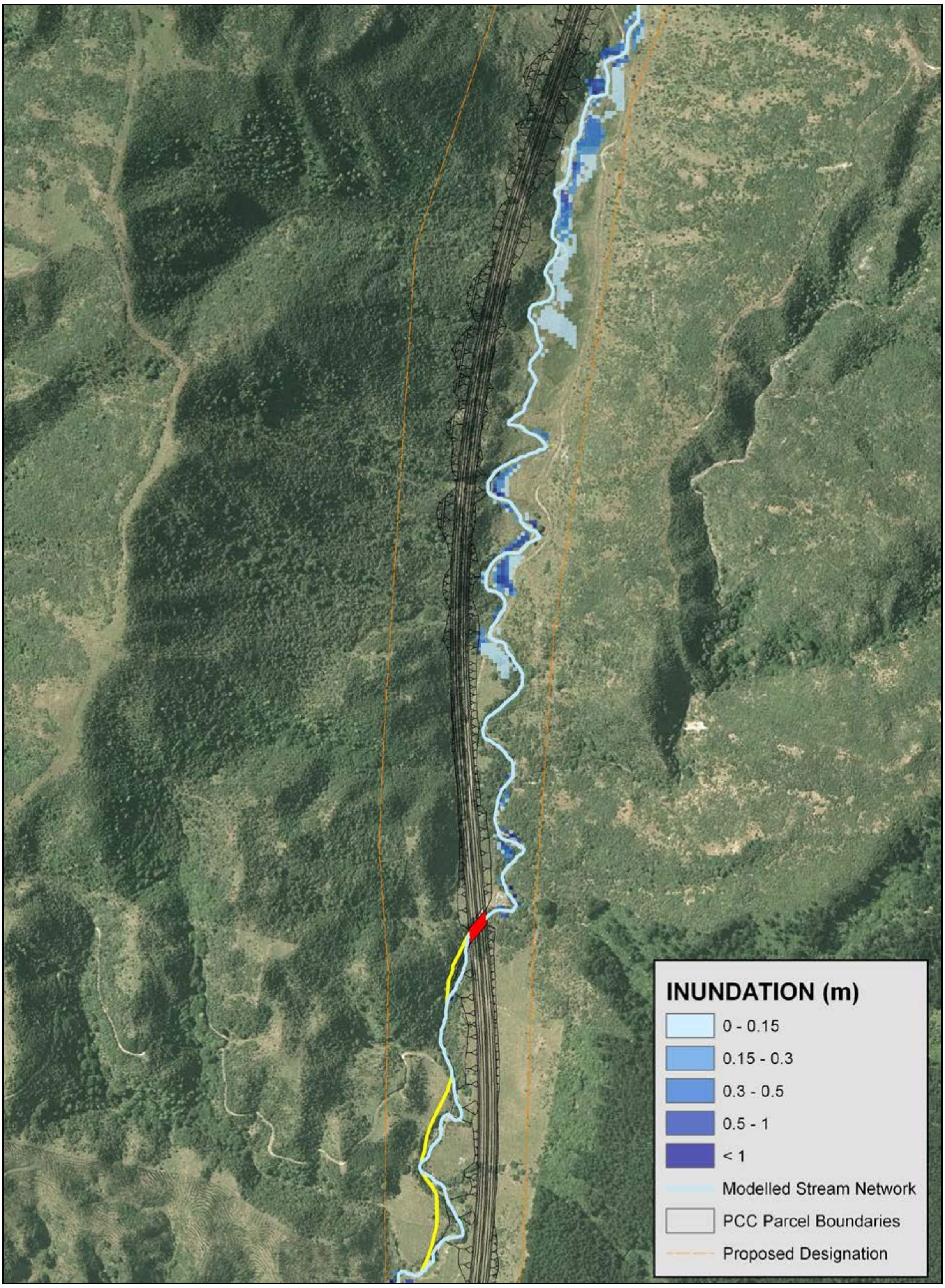

Figure 19.5: Peak inundation levels around Bridge 4, with Project in a Q100 event

Modelling showed that the 30m width for Bridge 4 is sufficient to avoid any adverse flooding effects for both Q10 and Q100 events and no mitigation is required.

19.5.2.2 Bridge 6

Bridge 6 is located at the upper end of the lower Horokiri Valley where the topography flattens out (towards the northern boundary of BHFFP). Modelling indicated that the 25m wide structure originally proposed would likely result in increased upstream water levels that could cover the carriageway. A 28m wide bridge (being the widest single span bridge possible for the crossing) was also modelled but this created unacceptable water level increases. Excavation of a wider stream channel was considered but was discounted due to the potential for a reduction in the depth of base flows, which would have undesirable ecological impacts. The solution chosen was to realign part of the stream channel immediately upstream of the crossing to create a hydraulically smoother approach to the bridge. The longitudinal and cross-sectional profile of the existing channel will be maintained as far as practicable. This realignment also assists with the reduction of flow velocities adjacent to fill areas which could cause erosion. Even with a maximum bridge width of 28m and channel realignment, the modelling indicated that the upstream surface water levels are predicted to increase by up to 1m, as shown in Figure 19.6.

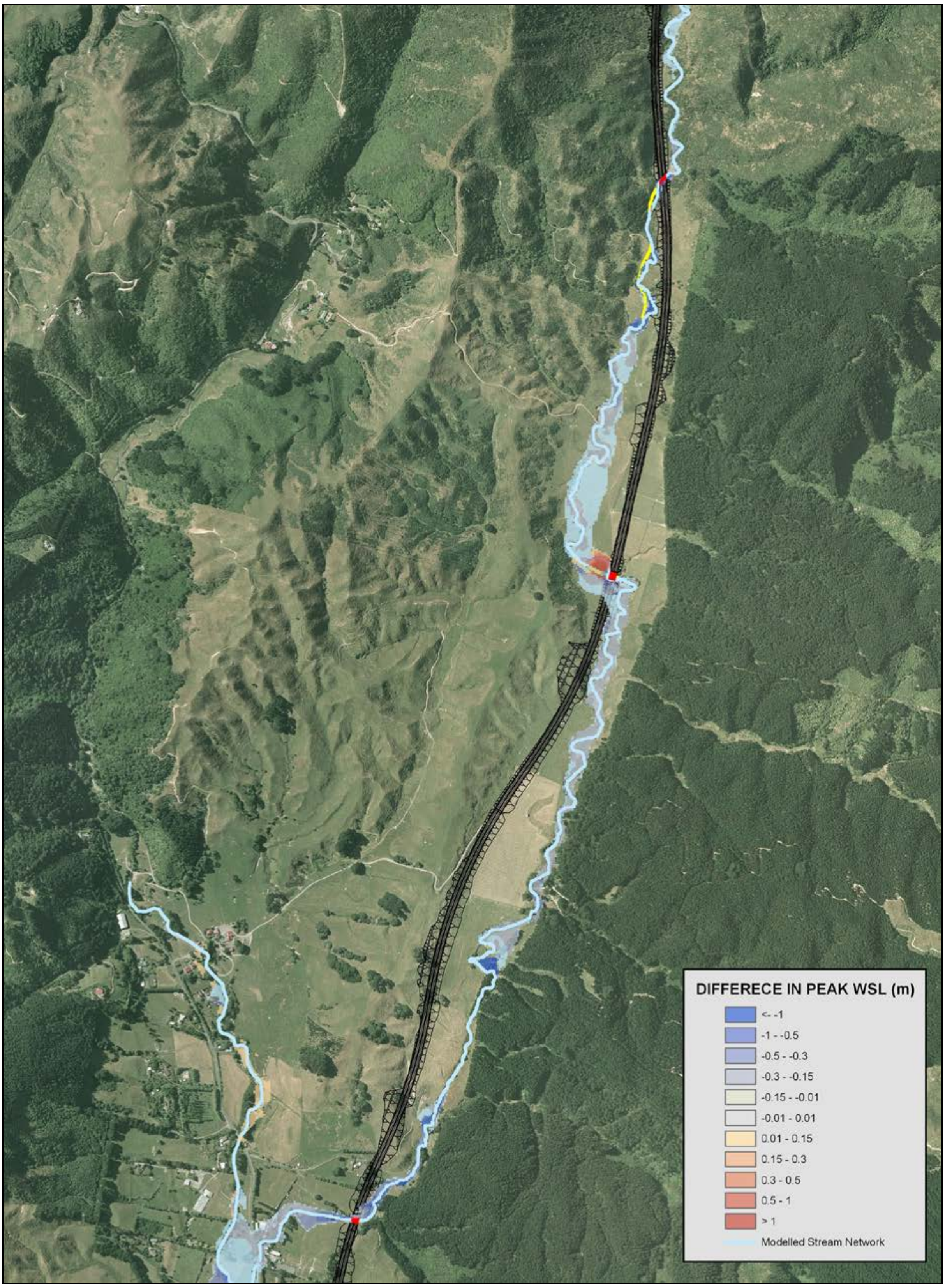

Figure 19.6: Peak inundation levels around Bridge 6, with Project in a Q100 event

Unless filled, the topographic depression south of the new bridge could fill with water during a flood and inundate the carriageway. Mitigation solutions include filling in the depression or by providing localised protection such as stop banks. Any mitigation to be adopted will be implemented in agreement with the adjacent property owner who would otherwise be affected by any flooding.

19.5.2.3 Bridge 8

The other main bridge across Horokiri Stream (Bridge 8) was sized as a 30m wide single span structure. Modelling showed that this would not cause any increase in flood risk upstream in either a Q10 or Q100 event.

19.5.2.4 Stream diversions and loss of storage

In addition to the stream diversion discussed earlier in relation to Bridge 6, there are a number of other diversions needed within the Horokiri Stream. These diversions are required because either Main Alignment cut or fill will impact on the existing stream channel. Due to the constrained nature of the upper part of the catchment, there were often limited options for the alignment of the road relative to the stream.

The modelling shows there is a negligible change in stream velocities in the stream, including around the three bridges. Even in these extreme events there is only a minimal, and localised, increase in inundation levels and these are immediately upstream of bridges. For most of the catchment, the Project will result in a small reduction in inundation levels during extreme events.

19.5.3 Pauatahanui Stream catchment

The reach of the Pauatahanui Stream model extends from the stream mouth to approximately 3.4km upstream. Upstream of the Bradey Road bridge the channel is relatively constrained within a narrow steep sided gorge. Downstream, however, the topography opens out to a natural floodplain.

Currently, for the area below the Bradey Road bridge the model predicts that under existing conditions during a Q10 event the floodwaters would cover much of the floodplain, but are shallow and generally less than 200mm. The model predicts that this shallow flooding could cross SH58 in places, which could result in deep ponding on the northern side of SH58 which is below the road level in a localised hollow. There are a number of residential properties and a substation in this low lying area. In a Q100 event, the floodplain is predicted to be inundated by over 500mm of water. The model predicts extensive and deep flooding across SH58 and in the localised hollow on the far side. In addition, the model indicated that the two existing bridges, near the roundabout that joins SH58 and Paekakariki Road, are constraints to high stream flows and contribute to the upstream flooding. In a Q100 event, the model predicts these constraints will increase upstream flooding by up to 1m. In the current situation during high rainfall events, the flooding upstream of these bridges is expected to inundate the lower back yards of four residential properties on Joseph Banks Drive[105].

The hydraulic modelling of the post-construction scenario indicates that changes to the stream associated with the new crossing (Bridge 15) and the reduction in storage on the floodplain could increase the flooding effects. Channel realignment is proposed in conjunction with the new crossing.

105. Pt Lot 2055 DP 74735, Lot 2056 DP 74735, Lot 2057 DP 74735 and Lot 2726 DP 85792.

In addition, the earthworks required in the area will result in a further loss of storage on the existing floodplain. Filling on the floodplain has the potential to restrict flood flows or to reduce the available flood storage resulting in increased flood levels.

The crossing of the Pauatahanui Stream by the Main Alignment was also closely analysed as it is subject to high flows. The use of a culvert for this crossing was discounted early on as the modelling indicated that a culvert would significantly increase flow velocities and would be likely to cause unacceptable scour and resulting erosion. It would also significantly increase flooding risk upstream of the crossing. For this reason a bridge was selected as the method of crossing. A bridge would also have fewer ecological effects as compared to a culvert.

The modelling also assisted with the sizing of this bridge. For ecological reasons it is desirable for the bridge to have a single span to ensure there were no piers in the stream bed. Within the topographical and road geometry constraints this meant that the maximum length the bridge could be is 28m. The modelling showed that even at this maximum width, there is an approximately 800mm increase in peak water surface levels upstream of the new bridge in a Q100 event, as shown in Figure 19.7.

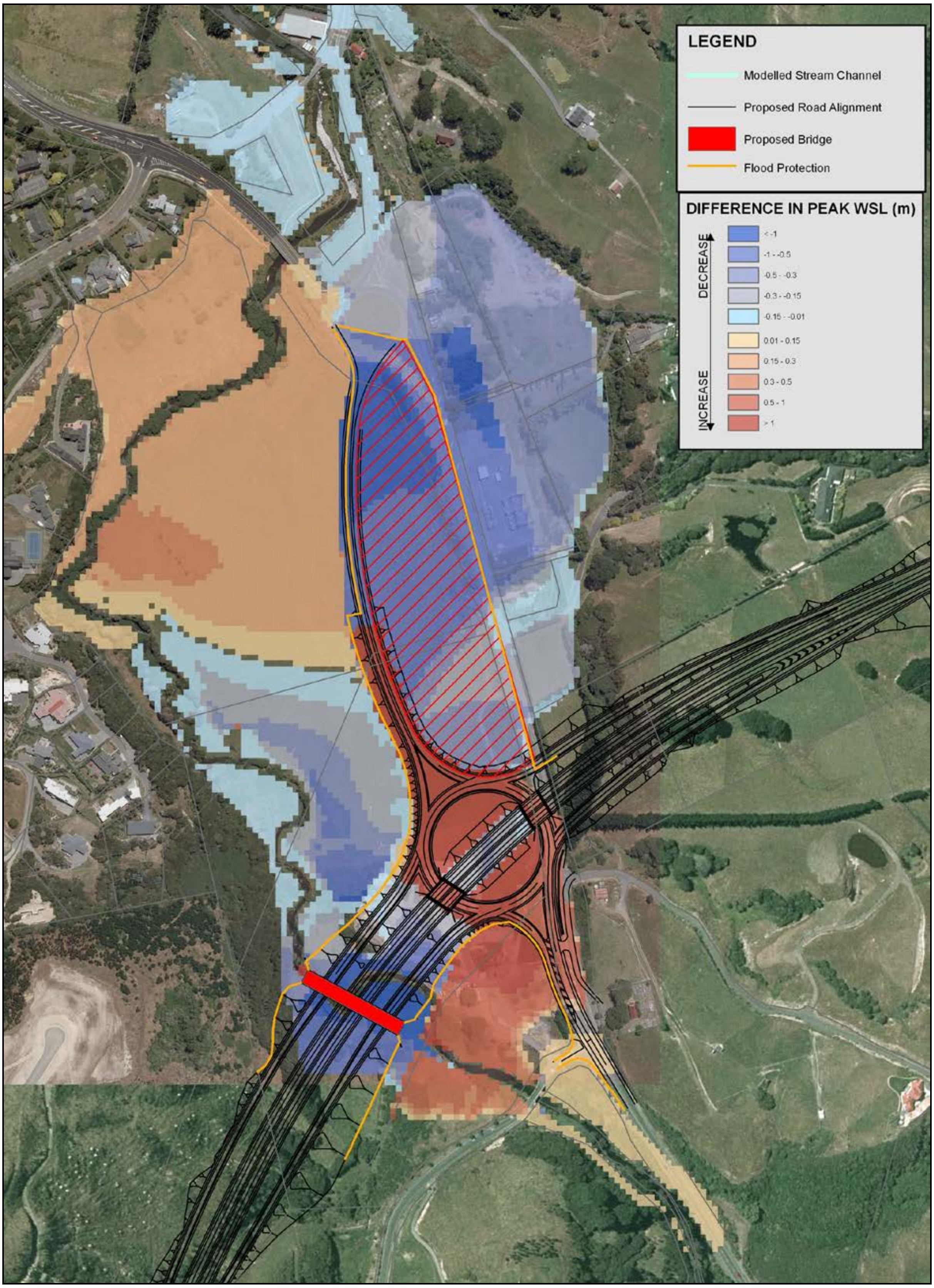

Figure 19.7: Comparison in a Q100 event of the peak water levels in the post and pre-construction situations with the inclusion of a new 28m span bridge across the Pauatahanui Stream

It was decided that an acceptable solution to this would be to allow the lower level of the interchange (i.e. the roundabout underneath the Main Alignment) to be used as a secondary flowpath in a Q100 event. This would see water depths of approximately 500mm across the lower level of the interchange in such an event. This will not make the road unusable (as the Main Alignment running over the interchange roundabout will not be affected) but will reduce the level of service temporarily for road users. Given the low frequency of such an extreme event, this is considered to be an acceptable compromise and it will ensure that flooding effects on land upstream of the interchange are reduced.

The modelling for a Q100 (Figure 19.7) showed changes to peak water levels downstream of the interchange. The peak water levels to the north of the re-aligned Paremata Road (existing SH58) are slightly reduced. This decreased flood risk includes the area where the Pauatahanui Substation is located. Inundation levels to the south of the realigned road will increase slightly (in the order of 0.01 – 0.3m) in a Q100 event. After construction of the Project is complete this area will be landscaped to create a wetland recreation area. It is not necessary to mitigate a small increase in inundation in this area during a rare Q100 event. The only other increased inundation predicted during a Q100 event is to the low lying areas on the four adjacent private properties on Joseph Banks Drive. This increase will be in the order of 100-200mm in a Q100 event and that the area of flooding will only be in the backyards of the properties. The dwellings are not at risk of flooding in this event. This is considered to be a very minor impact, not requiring any mitigation.

The hydraulic model was also used to assess the effects of the proposed stream realignment on peak flow velocities. This showed that there will likely be an approximately 1m/s increase in peak flow velocity immediately upstream of the new bridge. However, downstream of the bridge, there will be a reduction in velocity which is attributed to a reshaped stream channel and the inclusion of a secondary flowpath. It is not considered that the changes in flow velocity, upstream or downstream, will cause any adverse effects in terms of scour and erosion.

19.5.4 Duck Creek catchment

Duck Creek is a north-facing catchment of approximately 1,030ha. The upper part of the catchment is rural, while the lower part runs through the suburb of Whitby prior to discharging in the Pauatahanui Inlet.

The Main Alignment runs parallel to Duck Creek for approximately 3.5km, while the Whitby and Waitangirua Link Roads are also in the catchment. The physical effect on Duck Creek is minimal with only two crossings of the main channel (Bridge 19 on the Main Alignment and Bridge 29 (box culvert) on the Waitangirua Link Road). There are no other crossings proposed for the main stem of Duck Creek. The minor nature of the physical works in Duck Creek and its tributaries means that changes to stream velocities as a result of altered channel morphology are not expected.

The main potential hydrological effect in Duck Creek could be an increase in peak flow volumes as a result of increased runoff from road surfaces. The Project will result in an approximate 2% increase in connected impervious area in the catchment (this is the highest proportional land use change of any of the nine affected catchments). For a Q10 event, this will result in a corresponding 2% increase in peak flow volumes which is considered to be negligible.

For larger Q50 and Q100 events, however, the increase in peak flow volumes (and potential downstream flood risk) is higher and mitigation options required consideration. Mitigation for this potential increased flood risk is in the form of reducing the size of particular culverts so they store water upstream during these Q50 and Q100 events. To adequately mitigate the flood risk, peak flows for these two events should be maintained at existing (i.e. pre-construction) levels. Two culverts were identified as being possible options:

- the Waitangirua Link Road box culvert (Bridge 29); or
- culvert D7.

Hydraulic modelling showed that either one of these two culverts would be able to provide the required volume of upstream storage to mitigate the potential flood risk. The preferred option will be selected during the specimen design phase (Phase 4) from further hydraulic assessment. The NZTA and PCC are confident, however, that this potential effect can be adequately mitigated. Both upstream storage options would involve temporary inundation of parts of the Duck Creek valley on land owned by GWRC. The rarity of this magnitude of event (i.e. Q50 and above) and the temporary nature of the inundation means that it is acceptable.

19.5.5 Waitangirua stormwater network

Stormwater runoff from approximately 600m of the Waitangirua Link Road will drain into the existing Waitangirua stormwater network. Results from a localised hydraulic model showed that the existing network has insufficient capacity for both Q10 and Q100 events. The model was then re-run to determine the additional inundation as a result of runoff from the Waitangirua Link Road. Figure 19.8 shows the results for the Q10 event where most of the network experiences increases of 0.05 – 0.2m.

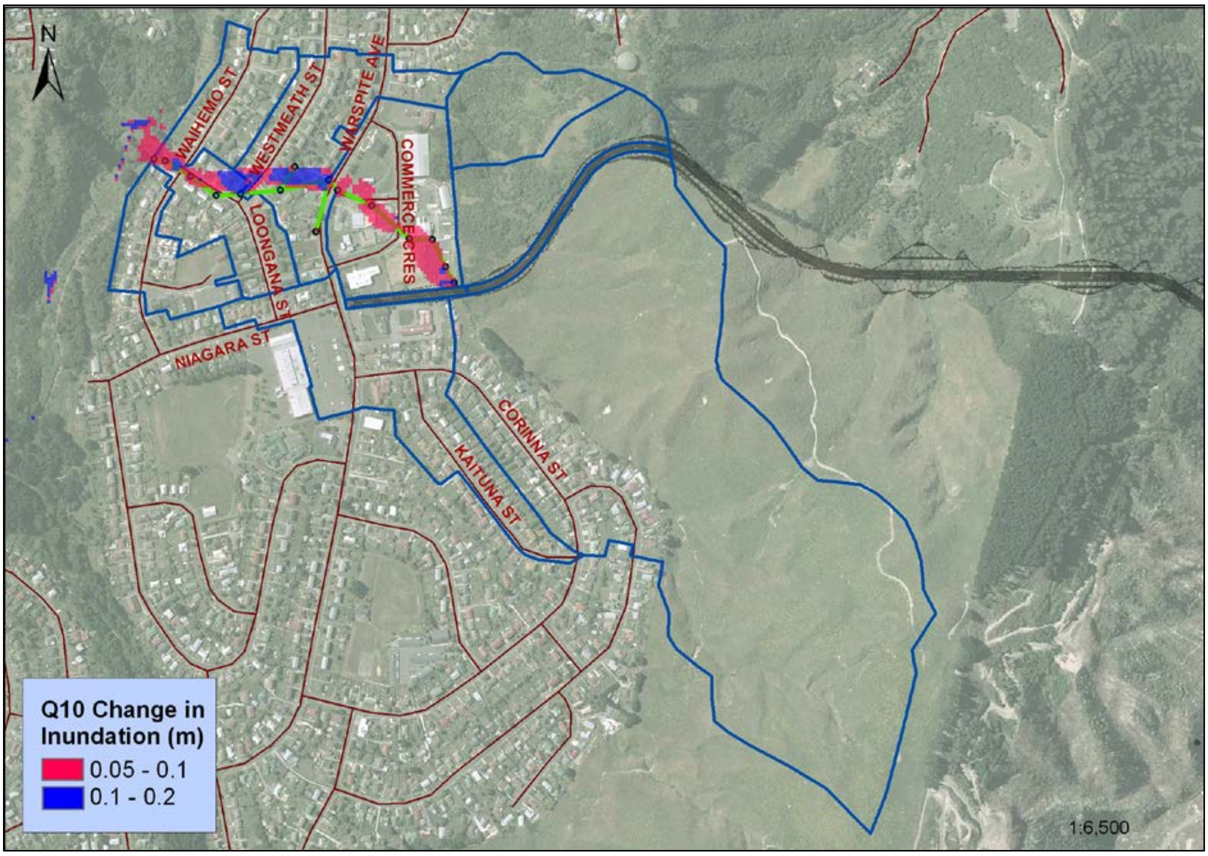

Figure 19.8: Comparison in a Q10 event of the peak water levels in the post and pre-construction on the Waitangirua stormwater network

For a Q100 event, there is virtually no difference in inundation levels because the additional volume from the Waitangirua Link Road is comparatively small in proportion to the flows that would be generated under the existing scenario.

The only real option to mitigate the potential adverse effect of increased stormwater runoff from the Waitangirua Link Road is to upgrade the existing Waitangirua stormwater network to convey a Q100 event. The use of secondary overflow paths is not recommended due to the suburban land use within the catchment.

Upgrading of the Waitangirua stormwater network will be undertaken by PCC prior to the commissioning of the Waitangirua Link Road.

19.5.6 Linden stormwater network

Part of the surface runoff from the Project will run into the existing Linden stormwater network, operated by WCC. Modelling showed that currently, the Linden stormwater network is undersized for a Q10 event and this would result in flooding towards the west of Anthony Street. In a Q100 event, two basins east of Coates Street and west of existing SH1 would be inundated.

Additional runoff to the Linden network was modelled. In a Q10 event, the maximum increase in inundation caused by additional runoff from the Project is 200mm. This occurs in a very limited area downstream of Bell Street, adjacent to the outlet. In the Q100 event, the maximum increase in inundation is 550mm. This occurs between the existing SH1 and Tremewan Street (Figure 19.9).

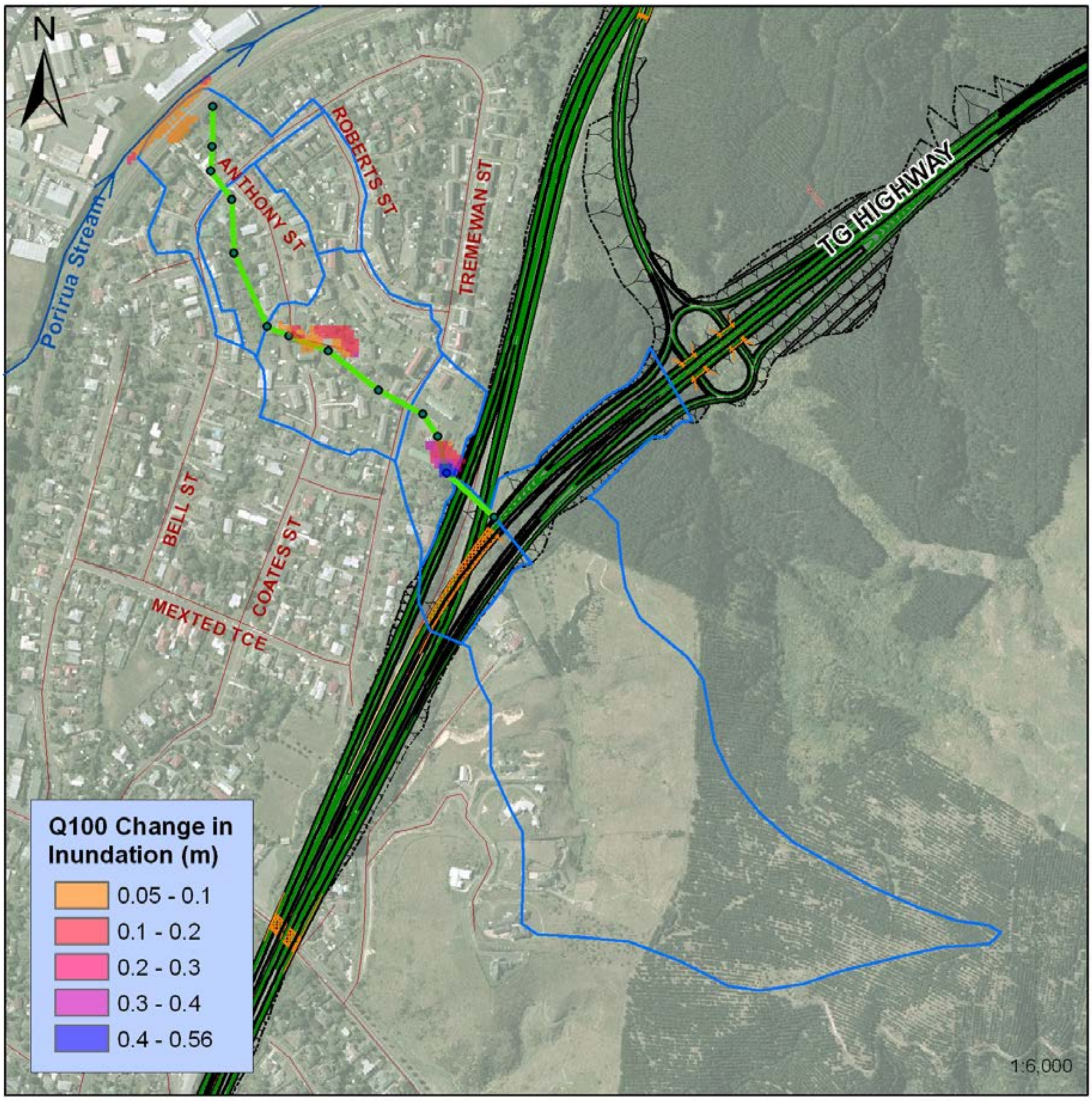

Figure 19.9: Comparison in a Q100 event of the peak water levels in the post and pre-construction on the Linden stormwater network

To mitigate the potential impacts of increased inundation from the Project, three options were considered:

- upgrade the existing stormwater network;
- divert runoff to secondary overflow paths; or
- store peak flows in the upper catchment.

The first two options are not preferred because upgrading the stormwater system through the suburban area is difficult and expensive and is not warranted as mitigation for the relatively minimal increase in inundation levels in Q10 and Q100 events caused by the Project. The suburban nature of the environment also means that diversion to secondary overflow paths is undesirable.

As such, upstream storage in high flow events is the preferred mitigation solution. This would be achieved by reducing the diameter of culvert Po6 so water is retained upstream (on the eastern side of the Main Alignment) during high flow events. Modelling indicates that this will be achievable but will result in a non-compliance with the NZTA's stormwater guidelines in terms of water clearance levels below the road surface. This non-compliance is considered acceptable in this case and it should be noted that the only risk it poses is to the NZTS's own asset (i.e. SH1).

19.6 Effects on groundwater hydraulics

Groundwater conditions within the Project were assessed as part of the geotechnical investigations used to inform the design of the Project.

While groundwater conditions are an aspect of the design, the construction and operation of the Project is expected to have minimal, if any, effects on groundwater movement or levels. As such, no mitigation is required.

20. Water quality

Overview

The construction and operation of the Project has the potential to adversely affect water quality in streams and marine environments. Construction of the Project will involve major earthworks, which has the potential to increase sediment run off to streams and the coast. Operation of the Project has the potential to increase contaminant levels in stream and marine environments associated with stormwater runoff from road surfaces.

Existing freshwater quality in streams is variable. Virtually all streams in the Project area have elevated nutrient levels, which is typical of the predominantly pastoral land use through most of the Project area. Levels of turbidity, metals and hydrocarbons are generally within guideline values with the exceptions being the more urbanised catchments of Kenepuru and Porirua. Water quality within Porirua Harbour varies but contaminant levels (zinc, copper and lead) are typically elevated around stormwater outfalls in the Onepoto Arm. DDT concentrations are elevated in both inlets, which is likely a result of historical pastoral land use.

Land use within catchments draining into the Harbour also influences sediment entering the Harbour. Sediment deposition rates since 1974 have averaged 5.7mm/year in the Onepoto Arm and 9.1mm/year in the Pauatahanui Inlet. Based on current average deposition rates, the Onepoto Arm will be filled-in within the next 290 - 390 years and the Pauatahanui Inlet within the next 145 – 195 years.

A high level of erosion and sediment control will be used to manage sediment from the construction of the Project entering waterbodies. High rainfall events (Q10) would cause an increase in sediment in the streams and the Harbour. Increases in suspended sediment will occur but will mimic what currently occurs during these events and will not cause any lasting adverse effects. Increases in sediment deposited in streams from these events will be minimal. For most events, the additional sediment entering the Harbour will deposit in areas where high levels of sediment deposition is already occurring and therefore is likely to have minimal impact. An exception to this is in three particular combinations of wind and rainfall events where more significant deposition is predicted in the intertidal zones near the coast. In terms of water quality, they will not, in themselves, have a significant adverse effect. In the long term (20 years) additional sediment entering the Harbour from construction of the Project will make a negligible difference to the in-filling of the two inlets.

Operation of the Project will involve treatment of all stormwater runoff from road surfaces. As a result, contaminants entering the Wainui Stream mouth and Onepoto Arm will decrease, providing a positive effect. Contaminant levels entering the Pauatahanui Inlet will mostly remain unchanged, with the exception of total petroleum hydrocarbons which are predicted to increase by 20%. This increase will not cause conspicuous oil or grease in the water or any change in odour. Similarly, it will not adversely affect recreational use (including contact recreation) of the Inlet.

20.1 Introduction

Water quality refers to the physical, chemical and biological characteristics of water.

This chapter discusses the actual and potential water quality effects arising from the construction and operation of the Project. Effects were assessed by gathering information about existing water quality in both freshwater waterbodies (i.e. streams) and in coastal waters. The potential effects on water quality arising from the Project were then modelled and assessed.

The potential effects ecological effects from changes to water quality on freshwater and marine ecology are discussed in Chapters 22 and 23, respectively.

20.2 Existing water quality

Baseline water samples were collected to allow the impacts of road construction on water quality along the length of the Project to be measured. Water quality sampling was undertaken at a number of relevant sites within the Project area. The data collected over a twelve month period shows that water quality in the streams within the affected catchments is mostly within the ANZECC Guidelines (the Guidelines)[106]. There were some exceedances of guidelines, particularly at the downstream sites of the Duck Creek, Kenepuru Stream and Porirua Stream catchments.

Information on the following parameters was collected:

- turbidity;
- metals;
- nutrients; and
- hydrocarbons.

A summary of the water quality in relation to the guideline values is shown in Table 20.1.

106. Australian and New Zealand Environment and Conservation Council (ANZECC). (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

Table 20.1: Summary of water quality measurements in relation to guideline values[107]

Catchment	Sample site	Location in relation to Project	Turbidity	Metals	Nutrients	Hydrocarbons
Whareroa	Whareroa 1	Upstream	✔	✔	✕	✔
Te Puka	Te Puka 1	Upstream	✔	✔	✔	✔
	Te Puka 2	Downstream	✔	✔	✕	✔
Horokiri	Horokiri 1	Upstream	✔	✔	✔	✔
	Horokiri 2	Downstream	✔	✔	✕	✔
	Horokiri 3	Control	✔	✔	✕	✔
	Horokiri 5	Downstream	✔	✔	✕	✔
Ration	Ration 1	Upstream	✔	✔	✕	✔
	Ration 2	Downstream	✔	✕	✕	✔
Pauatahanui	Pauatahanui	Upstream	✔	✔	✕	✔
	Pauatahanui	Downstream	✕	✕	✕	✔
Duck	Duck 1	Upstream	✔	✔	✕	✔
	Duck 2	Downstream	✔	✔	✕	✔
	Duck 3	Downstream	✔	✕	✕	✔
Kenepuru	Kenepuru 1	Upstream	✔	✔	✕	✔
	Kenepuru 2	Downstream	✔	✔	✕	✔
	Kenepuru 3	Downstream	✕	✕	✕	✔
Porirua	Porirua 1	Upstream	✕	✕	✕	✔
	Porirua 2	Downstream	✕	✕	✕	✔

In summary, the baseline data collected for each catchment showed[108]:

Whareroa Stream

Water quality within the stream is generally good, although elevated levels of nutrients presumably from farming operations were recorded.

Wainui and Te Puka Streams

Water quality within these streams is generally good, although the upper reaches of the Te Puka Stream are slightly acidic, while the lower reaches have elevated nutrient levels.

107. '✔' indicates below guideline values, '✕' indicates guideline value exceeded.

108. All references to guideline values refer to the ANZECC 95% ecological guidelines.

Horokiri Stream

The water quality within the catchment is relatively good, although elevated nutrient levels were recorded at all locations except for in the uppermost reaches. The pH was typically slightly acidic.

Ration Stream

Water quality within the catchment is relatively generally good, although it deteriorates downstream, with some elevated levels of metals being detected downstream and nutrient levels consistently higher than guideline levels. Both upstream and downstream reaches are also slightly acidic.

Pauatahanui Stream

Water quality within the catchment is variable. Lower reaches of the streams recorded elevated levels of metals and turbidity, in excess of ANZECC guidelines. Water quality in Collins Stream was not specifically assessed but is likely to be similar to the lower Pauatahanui Stream as there is a high level of interaction between these streams.

Duck Creek

Water quality within the catchment is variable with nutrient levels being elevated. Lower reaches of the stream also recorded elevated levels of metals, in excess of ANZECC guidelines.

Kenepuru Stream

Water quality in this catchment is reasonably good, although it does deteriorate noticeably downstream with turbidity and levels of metals in excess of ANZECC guidelines in the lower reaches.

Porirua Stream

Water quality in this catchment is poor, with elevated nutrient levels and turbidity and metals levels in excess of ANZECC guidelines. This is considered to be reflective of the highly modified and urbanised nature of many parts of this catchment.

20.3 Water quality modelling

A number of models were developed to assist in the assessment of water quality effects associated with the Project's construction and operation. These were:

- to assess construction effects:
    - a sediment yield model;
    - a stream sediment transport model; and
    - a harbour sediment transport model.

- to assess operational effects:
    - a contaminant load model.

20.3.1 Construction effects modelling

A sediment yield model (SYM) was developed to assess predicted sediment yield (both temporally and spatially) across the Project. Models were then developed to predict the behaviour of sediment in the two types of receiving environments (i.e. streams and coastal waters). The key elements of the construction effects modelling are shown in Figure 20.1.

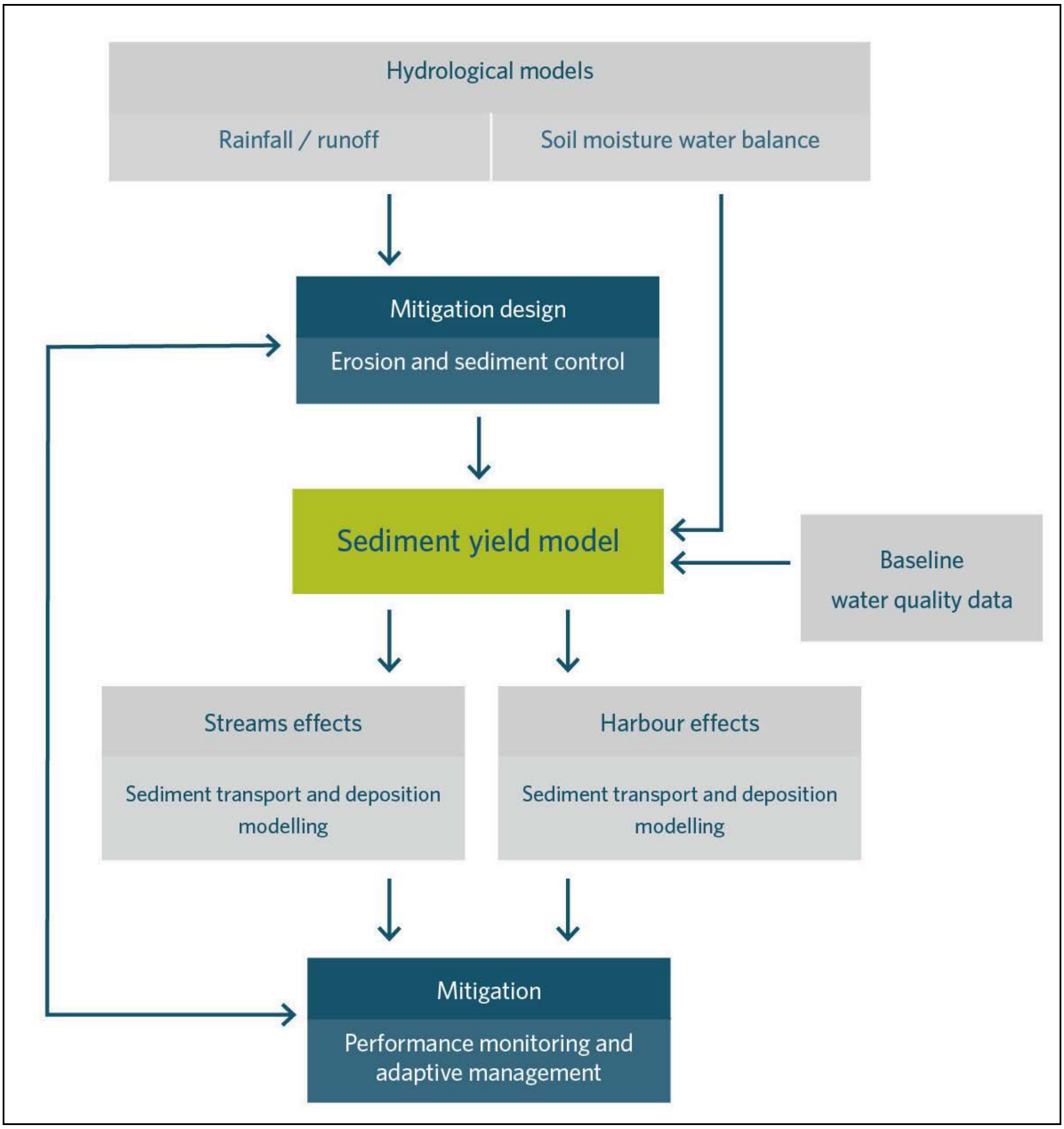

Figure 20.1: Modelling undertaken to assess water quality effects from construction

The SYM is described in **Technical Report 15** but a key aspect is that it relies on the achievement of particular erosion and sediment control (ESC) performance levels. Key performance assumptions are:

- sediment removal efficiency (SRE) of 75%; and
- sediment pond efficiency of 70% for the design storm event.

A stream sediment transport model was developed to assess the level and nature of sediment transport in key streams during the construction of the Project. This model was based on information from the hydraulic model (regarding stream flow etc.) and from the sediment yield information.

A harbour sediment transport model was developed to assess the level and nature of sediment transport in the Porirua Harbour during the construction of the Project. This model required information about the hydrodynamics (the movement of water by wave action and tides etc.) of the Harbour.

The stream and harbour sediment transport models allowed the effects of sediment transport and deposition in these two receiving environments to be assessed.

20.3.2 Operational effects modelling

Two methods were used to assess predicted contaminant levels for stormwater runoff from a specific area. A contaminant load model (CLM) was developed to assess predicted contaminant levels for stormwater runoff for stream catchments. Motorway and catchment data was used to predict contaminant levels for stormwater runoff at specific locations along the road alignment, as well as for whole stream catchment. Key stormwater contaminants considered were:

- total suspended sediment (TSS);
- zinc;
- copper; and
- total petroleum hydrocarbons[109] (TPH).

The key aspects of the modelling of operational water quality effects are shown in Figure 20.2.

109. Contaminant load model only.

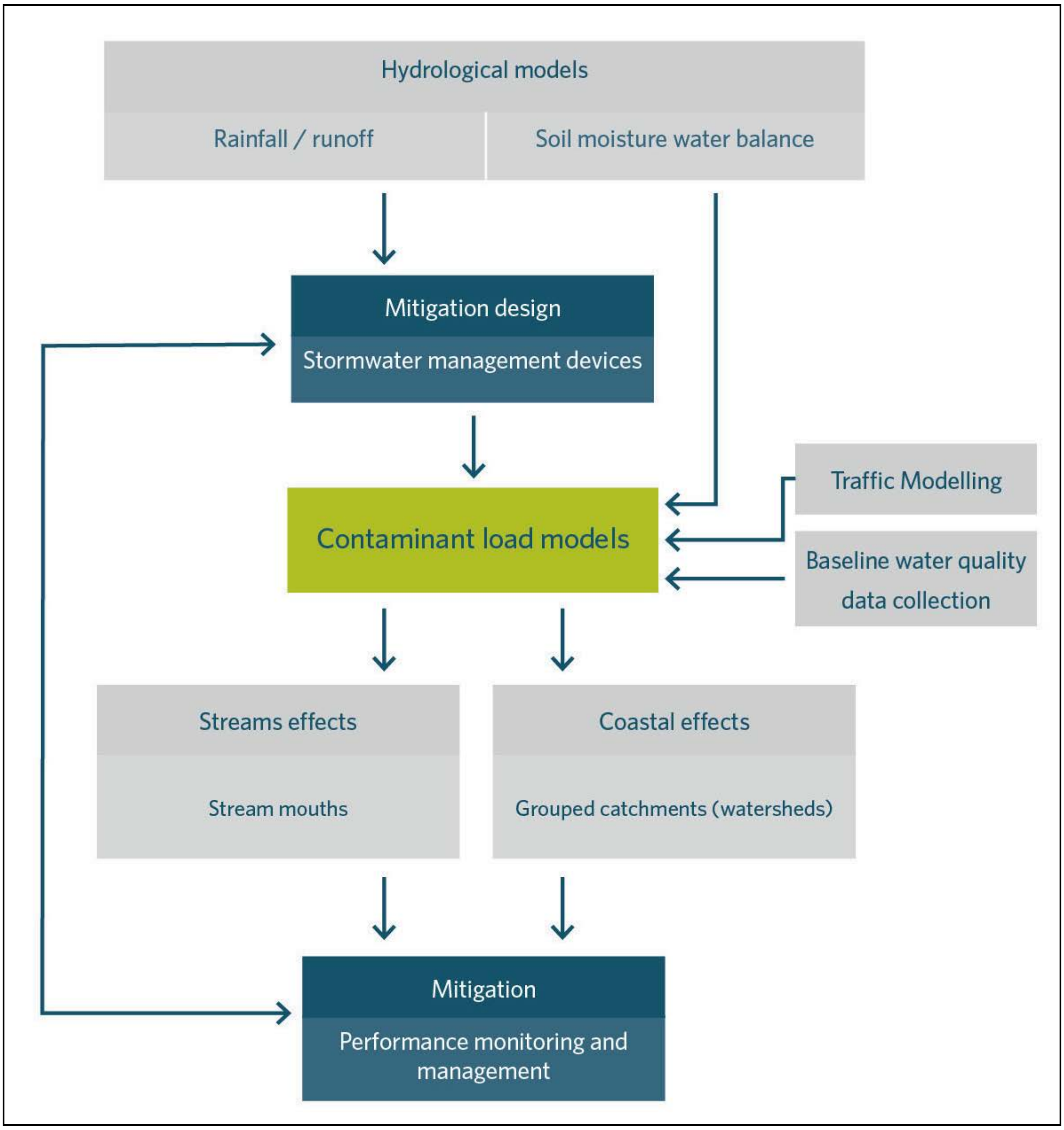

Figure 20.2: Modelling undertaken to assess water quality effects during operation

The CLM takes into account factors such as the predicted change in land use (including change not solely as a result of the Project) in the runoff area and the predicted traffic volumes on key roads. It was used to estimate the stormwater contaminant load for the following 2031 scenarios:

- without the Project;
- with the Project with no stormwater treatment; and
- with the Project and with stormwater treatment.

The information from the CLM allowed the efficiency of proposed treatment measures to be assessed and the stormwater contaminant effects of the Project to be identified.

The motorway and catchment data method does not account for changes in the catchment, other than as a result of the Project. This method was used to estimate the stormwater contaminant load for the following scenarios:

- without the Project;
- with the Project, without stormwater treatment; and
- with the Project, with stormwater treatment.

20.4 Water quality effects during construction

Construction of the Project will involve a number of activities that have the potential to generate sediment, principally:

- earthworks; and
- works in and around streams (e.g. construction of fords, bridges, retaining walls and culverts etc.).

Sediment can be generated in two main ways:

- when rain falls on exposed earth (i.e. un-vegetated cut faces or fill slopes); or
- when works in stream beds disturb and entrain sediment.

Increased sediment levels could have a number of adverse effects, including:

- damaging aquatic (freshwater and marine) habitat;
- altering the morphology of streams and / or harbours (i.e. aggradation / degradation of beds);
- reducing the aesthetic properties of water (e.g. visual clarity and odour).

Sediment has been assessed as the only contaminant with the potential to have adverse environmental effects during construction. It is recognised that there is always risk on a major construction project that accidental spills will result in other contaminants (e.g. fuel) entering waterways. While this risk can never be completely eliminated, it can be effectively managed through good on-site environmental management. The draft CEMP contains protocols for working with contaminants on-site as well as containing emergency spill procedures in the unlikely event that a contaminant is spilt near a waterway. The few areas of contaminated land identified within the Project area are also a potential source of contaminants to waterways but none are particularly close to waterways and the draft CSMP contains procedures for managing contaminated material safely and this includes managing the risk to waterways.

Accordingly, contaminants other than sediment have not been considered further in the assessment of potential water quality effects during construction.

20.4.1 Erosion and sediment control

Preliminary erosion and sediment control (ESC) measures have been developed for the Project, consistent with GWRC[110] and the NZTA (draft)[111] erosion and sediment control guidelines. These principles include:

- minimising disturbance;
- staging construction;
- protecting steep slopes;
- protecting water bodies;
- stabilising exposed areas rapidly;
- installing perimeter controls;
- controlling surface water; and
- using sediment retention devices.

Table 20.2 outlines ESC measures and their proposed application to the Project.

Table 20.2: Proposed erosion and sediment control measures for the Project

ESC measure	Proposed application to the Project
Sediment retention ponds	Sediment retention ponds will be used for the retention and treatment of the majority of sediment laden runoff along the road alignment. Ponds will be fitted within the proposed designation. Alternative methods of pond construction, e.g. the use of tanks or shipping containers, will be used where topography constraints are an issue.
Chemical treatment[112]	All sediment retention ponds and earth decanting bunds will be chemically treated to increase their efficiency.
Sediment fences	Sediment fences provide perimeter controls both around and within earthworks site. Sediment fences may be required in areas where the topography does not allow for construction of sediment retention devices and the catchment area is greater than 0.3ha.
Silt socks	Silt socks can be used in areas requiring continual access and can be pinned to steep slope areas. Another advantage of the silt socks is that they can be chemically dosed which improves their effectiveness.
Decanting earth bunds	Treatment of sediment laden runoff via decanting earth bunds when space requirements restrict the use of sediment retention ponds. They will typically be used on the large cut slope faces.
Stormwater inlet protection	Protection of existing stormwater networks, such as Waitangirua and Linden.

110. GWRC, Erosion and sediment control guidelines for the Wellington region, 2002 (reprinted 2006).

111. NZTA, Draft erosion and sediment control standard for state highway infrastructure, 2011.

112. Chemical treatment is a commonly used ESC method involving the addition of chemicals to sediment retention ponds to improve their effectiveness. It is recommended in GWRC's ESC guidelines where 'the performance of sediment retention ponds needs to be increased to reduce the immediate effect of sediment on the receiving environment and/or reduce the cumulative effect of sediment yield within the catchment'.

Sediment retention ponds (or decanting earth bunds, where space is limited) will be the main sediment control devices used to remove sediment prior to discharge to streams. Sediment fences and silt socks will be used to limit sediment laden runoff entering these devices.

Sediment retention ponds operate by allowing the sediment to settle out from suspension of the main runoff, and be retained in the pond. The rate at which sediment falls is called the particle settling velocity (or particle fall velocity). The settling velocity is governed by the flow regime in the pond, particle size and the density of the particle (relative to water). In general, as particles increase in size they have an increased settling velocity. The effectiveness all ponds will be improved by adding a chemical reagent which binds multiple particles together forming a larger particle with accelerated settling properties.

20.4.2 Effects of sediment on streams

The stream sediment transport model was used to predict the accumulated sediment mass and depth along the length of nine[113] key streams, namely:

- Whareroa Stream;
- Wainui / Te Puka Stream;
- Horokiri Stream;
- Ration Stream;
- Collins Stream;
- Pauatahanui Stream;
- Duck Creek;
- Kenepuru Stream; and
- Porirua Stream.

Sediment quality was assumed to be similar to existing sediment runoff, which would be likely to contain some nutrients (nitrogen and phosphorus) and potentially minor amounts of metals and / or pesticides. As such, only sediment quantity (rather than quality) was assessed by the stream sediment model.

Two particular aspects of sediment quantity are of relevance:

- **suspended sediment** - entrained sediment suspended in the water column, measured as TSS or turbidity; and
- **deposited sediment** - sediment that has fallen out of suspension and deposited on the stream bed, measured as millimetres (mm) of deposition on the bed or by total amount (in tonnes).

113. Collins Stream was modelled separately and the Wainui and Te Puka Streams were modelled together (as they are both part of the same catchment).

20.4.2.1 Suspended sediment

As rain mobilises sediment (through rain drops striking bare ground and also through overland flow) suspended sediment is only an issue during and immediately after a rainfall event. In all streams, TSS currently becomes elevated immediately after a rainfall event. Construction of the Project will result in increased TSS in stream during rainfall events. A 1/3 Q2 event effectively represents a 90th percentile rainfall event which could reasonably be expected to occur on a regular basis throughout the construction period.

Predicted increases in TSS from the Project during a 1/3 Q2 event vary between catchments with the highest increase being in Collins Stream (79%) and the lowest being in Porirua Stream (2%). The Project may result in some noticeable decrease in visual clarity and colour during and immediately after an event but this will have no lasting effect on water quality in streams. Due to the high hydraulic activity of many of the streams, spikes in TSS typically only persist for a matter of hours after an event. As such, increase suspended sediment will have a minor adverse effect on stream water quality.

The potential ecological effects of these brief increases in suspended sediment are discussed in Chapter 22.

20.4.2.2 Deposited sediment

For each stream the modelling involved assessment of deposited sediment for the following events:

- 1/3 Q2;
- Q2;
- Q10; and
- Q50.

For all events, two scenarios where modelled:

- baseline **(without Project)**;
- peak construction of the Project with ESC measures in place **(with Project)**.

Deposited sediment can be described either in terms of the total amount (in tonnes) or in terms of the depth of the deposition on the stream bed (in mm).

Table 20.3 details the percentage increase in sediment amounts deposited in streams from the four modelled events.

Table 20.3: Percentage change in sediment deposition caused by the Project (2021)

Catchment	Change in modelled sediment deposition (%)			
	1/3 Q2	Q2	Q10	Q50
Whareroa	5	6	6	12
Te Puka / Wainui	29	31	19	44
Horokiri	16	14	13	20
Ration	43	17	119	91
Pauatahanui	1	1	1	1
Duck	30	28	6	43
Kenepuru	14	18	19	38
Porirua	2	1	1	1

In percentage terms, the predicted increases in some catchments are significant, particular the Te Puka / Wainui, Ration and Duck. However, the total amount of sediment deposited in streams does not provide any real indication of actual deposition depths on stream beds, which is primarily a function of stream morphology.

Table 20.4 shows the predicted baseline sediment deposition rates and the predicted rates with the Project for the four events and across the streams.

Table 20.4: Stream sediment deposition

Stream	Storm event	Predicted sediment deposition (mm)		
		Without Project	With Project	Change
Whareroa	Q50	11	19	8
	Q10	7	7	0
	Q2	7	7	0
	1/3 Q2	7	7	0
Te Puka / Wainui	Q50	6	9	3
	Q10	4	4	0
	Q2	3	3	0
	1/3 Q2	3	3	0
Horokiri	Q50	5	5	0
	Q10	5	5	0
	Q2	4	4	0
	1/3 Q2	2	2	0
Ration	Q50	7	10	3
	Q10	4	8	4
	Q2	3	3	0
	1/3 Q2	3	3	0
Pauatahanui	Q50	1	1	0
	Q10	2	2	0
	Q2	1	1	0
	1/3 Q2	0	0	0

Stream	Storm event	Predicted sediment deposition (mm)		
		Without Project	With Project	Change
Duck	Q50	1	1	0
	Q10	2	2	0
	Q2	1	1	0
	1/3 Q2	0	0	0
Kenepuru	Q50	5	5	0
	Q10	4	4	0
	Q2	3	3	0
	1/3 Q2	1	1	0
Porirua	Q50	3	3	0
	Q10	3	3	0
	Q2	3	3	0
	1/3 Q2	3	3	0

The figures in Table 20.4 show that the actual deposition depths in most streams in most events are predicted to be negligible. For 1/3 Q2 and Q2 events, a number of which can reasonably be expected to occur throughout the construction period, very minimal, if any, increased deposition depth is predicted.

In summary, addition sediment deposition on stream beds is predicted to occur in relatively few instances (typically a Q50 event, with the exception of a Q10 event in Ration Stream). Even in these few instances, the predicted rates (of between 3 and 8mm) are not predicted to fundamentally alter the morphology or hydraulic characteristics of affected streams and, as such, are not significant in hydraulic terms. Deposition on stream beds does have the potential to have adverse ecological effects and this is discussed in Chapter 22.

20.4.3 Effects on harbour sedimentation

Sediment generated during construction of the Project will be transported via streams to either the Kapiti Coast or the Porirua Harbour. The Wainui Stream mouth is a high energy environment whereas the Porirua Harbour is a low energy environment. This difference has significant implications for sediment entering these two environments. In the high energy Wainui Stream mouth, the predicted low percentage of additional sediment is rapidly transported off shore and hence has negligible, if any, environmental effect. Sediment entering a low energy environment, however, may not be transported to the open sea and has the potential to cause adverse effects, particularly in terms of:

- deposition on harbour beds contributing to in-fill of the Harbour; and
- a reduction of the ecological, cultural and recreational values of the Harbour.

Due to the potential environmental effects of increased sediment entering the Porirua Harbour during construction of the Project, the fate of this sediment has also been modelled.

The Project will not involve the discharge of sediment directly to coastal water. Any sediment entering coastal water will be transported by streams. As discussed in relation to the consideration of sedimentation effects on streams, the high level of ESC measures proposed means that sediment is only likely to cause potentially adverse effects after significant rainfall events. Like the modelling undertaken to assess potential effects on streams, the Harbour modelling was 'event-based' scenario modelling. The two key event magnitudes modelled were:

- Q2 events; and
- Q10 events.

Examination of meteorological data demonstrates that rainfall events are often localised and so while a Q10 event might occur in the Horokiri catchment, Q2 or lower events might be occurring at the same time in other catchments.

In consultation with the Project ecologists, Q50 events for the Harbour were not modelled because of the unlikelihood of this magnitude of event occurring during the peak construction period and the limited additional impact of the Project likely in this magnitude of event.

As well as event-based modelling of sediment entering the Harbour, potential long term (i.e. after 20 years from the start of construction) increases in sediment deposition were also modelled. It is recognised that, as the receiving environment for much of the sediment runoff from the construction of the Project, there could be potential adverse cumulative effects on the Harbour from increased sediment loads over the entire construction period.

20.4.3.1 Event based modelling results

One of the most important determinants of the fate of sediment in the Harbour is the wind strength and direction, as this influences wave motion and hydrodynamics. In general terms, strong winds create stronger currents and wave motion which keeps sediment in suspension or re-suspends deposited sediment. For this reason, the 'with Project' and 'without Project' scenarios for each event were modelled for a range of different wind scenarios. As discussed is Chapter 6 in relation to meteorological conditions across the Project area, the intensity of rainfall events can vary between catchments and is certainly not uniform.

Based on the wind records from the gauging stations in the region of the Harbour it is clear that there are three dominant wind directions that act on the Harbour; these are the northerly, southerly and calm wind conditions. The analysis of the available data indicates similar probabilities of heavy rainfall occurring during all three wind directions with possibly a slightly higher coincidence of heavy rain occurring during a northerly wind direction.

Based on this analysis a number of coincident rainfall and wind scenarios were modelled, as listed in Table 20.5. The flow records in the streams were compared to develop a realistic rainfall distribution during a Q10 over part of the catchments feeding into the Harbour.

Table 20.5: Scenarios for event- based modelling of sediment in the Harbour

Wind direction	Freshwater and sediment inflows
Calm	Q2 for all catchments
Northerly	Q2 for all catchments
Southerly	Q2 for all catchments
Calm	Q10 in Kenepuru and Porirua catchments, Q2 elsewhere
Calm	Q10 in Pauatahanui and Duck catchments, Q2 elsewhere
Calm	Q10 in Horokiri catchment, Q2 elsewhere
Northerly	Q10 in Kenepuru and Porirua catchments, Q2 elsewhere
Northerly	Q10 in Pauatahanui and Duck catchments, Q2 elsewhere
Northerly	Q10 in Horokiri catchment, Q2 elsewhere
Southerly	Q10 in Kenepuru and Porirua catchments, Q2 elsewhere
Southerly	Q10 in Pauatahanui and Duck catchments, Q2 elsewhere
Southerly	Q10 in Horokiri catchment, Q2 elsewhere

The modelled scenarios are considered to cover a sufficient range of events that could realistically occur during the construction period.

Overall, the sediment yield model predicts increases of terrestrial sediment entering the Harbour in a Q2 and Q10 events of up to 4.7% and 4.9% respectively. In terms of suspended sediment, the model predicts that three days following a Q2 or Q10 event, TSS concentrations will be no greater than 0.25kg/m^3 (250g/m^3).

The ecological significance of this is discussed in Chapter 23.

In terms of sediment deposition, the model results show that much of the terrestrial sediment entering the Harbour deposits near the stream mouths. This is also the areas of highest TSS concentrations which are made worse by the wave induced suspension of bed material in the shallows. The finer sediment material which has lower settling velocities is transported via fluvial, tidal and / or wave induced currents around the arms of the Harbour. There are noticeably lower TSS concentrations in the main channels at the entrances to each of the Harbour arms as the catchment runoff mixes with the sea water.

The Harbour sediment modelling provided the following predictions in relation to the influence of a 90th percentile wind over three days on deposition (modelled to ascertain the worst case scenario):

- Both northerly and southerly wind conditions help keep sediment in suspension as well as re-suspending some deposited sediment. This results in the TSS concentrations being higher and more persistent than in the calm situations.
- The sediment distribution under calm conditions is less widespread and, therefore, contains deeper deposits in some areas, particularly near the stream mouths.

- Under northerly wind conditions, the TSS concentrations and bed deposition tends towards the eastern side of the Onepoto Arm and towards the southern side of the Pauatahanui Inlet. In contrast, under southerly wind conditions the TSS concentrations and bed deposition tends towards the western side of the Onepoto Arm and the northern side of the Pauatahanui Inlet.

The Harbour modelling team worked closely with the Project ecologists to determine what information about sediment deposition in the Harbour was required to assess the potential effects on marine ecology. The ecologists indicated that effects on marine species were predominantly a function of:

- sensitivity of species (not related to modelling);
- level of exposure to sediment (the depth of sediment on the bed); and
- the duration of exposure to sediment (the length of time sediment remains on the bed).

The deposition modelling focused on providing information on the last two aspects. The ecologists determined key threshold criteria for both deposition depth (less than 5mm; 5 – 10mm; more than 10mm) and duration (less than 3 days; 3 – 7 days; more than 7 days). The ecological significance of these thresholds is discussed in Chapter 23 on marine ecology but they are used in this chapter as a basis for the discussion of event based sediment deposition in the Harbour.

Modelling results are reported in terms of changed in areas (measured in m^2) above or below sediment deposition thresholds (5mm or 10mm).

Technical Report 15 provides details, including maps, of the deposition levels and locations predicted under different rainfall and wind scenarios modelled. A summary of the key results for Q2 and Q10 events (which have been modelled as worst case scenarios) is as follows.

20.4.3.2 Q2 events

A Q2 rainfall event during construction could contribute up to an additional 200 tonnes of sediment to the Harbour. This equates to an approximately 5% increase from what would be expected from the same rainfall event if the Project was not being constructed. The model predicts that there will be little impact on sediment deposition patterns. Additional deposition caused by the Project is likely to be in isolated pockets, typically less than 5mm deep, and in locations already heavily impacted and largely in the sub-tidal areas of the Harbour.

20.4.3.3 Q10 events

A Q10 rainfall event during construction could contribute up to an additional 270 - 650 tonnes of sediment. This equates to an approximately 4 - 9% increase from what would be expected from the same rainfall event if the Project was not being constructed. Under most wind and Q10 rainfall conditions, the model predicts that the additional sediment deposits in less ecologically sensitive areas, with sediment predominantly being deposited in sub-tidal zones in locations already receiving significant deposition. However, the modelling did indicate that in three particular Q10 events, there was a higher probability of greater quantities of the additional sediment being deposited at depths that exceed the 5mm threshold in potentially sensitive locations (predominantly the inter-tidal zones).

These three events of interest would only occur during a worst case scenario (being up to 35ha of open earthworks and a 90th percentile wind (10m/s or greater) blowing at a given direction for three consecutive days at the same time as the particular rainfall event) are:

- northerly wind direction with a Q10 event in the Pauatahanui and Duck catchments, Q2 events elsewhere;
- northerly wind direction with a Q10 event in Horokiri catchment and Q2 events elsewhere; and
- southerly wind direction with a Q10 event in the Kenepuru and Porirua catchments and Q2 events elsewhere.

These three events have been identified as those with the potential to cause deposition at levels and in locations which could have an adverse ecological effect. From a water quality perspective they are not particularly significant as they do not fundamentally alter the morphology of the Harbour, nor will they lead to any lasting reductions in visual clarity of the water.

The potential ecological effects of two[114] of these events are discussed in Chapter 23.

20.4.3.4 Long term modelling results

In the long term simulation an additional 3000 tonnes of sediment is estimated to enter the Harbour as a result of all the construction activities[115]. This represents an increase of around 2% of the total terrestrial sediment load entering the Harbour over a 20 year period. The long term model results indicated that there was little loss of terrestrial sediment from the Harbour and that much of the sediment would be deposited over time in the deeper central basins. Table 20.6 shows how the total area of each inlet predicted to receive >100mm, >200mm or >300mm, both with and without the Project.

Table 20.6: Areas of Porirua Harbour predicted to receive greater than 100mm, 200mm and 300mm of sediment deposition 20 years after commencement of construction of the Project

	Onepoto Arm		Pauatahanui Inlet	
	Without Project	With Project	Without Project	With Project
Total area (m^2)	2,400,000		4,600,000	
Total area > 100mm (m^2)	576,822	577,708	1,141,842	1,152,769
Total area > 200mm (m^2)	37,556	41,478	577,968	589,065
Total area > 300mm (m^2)	0	28	321,156	332,077

114. The northerly wind direction with a Q10 event in Horokiri catchment and Q2 events elsewhere was initially considered but further analysis showed that this event would not result in deposition in the Pauatahanui Inlet and hence was not considered further in relation to potential effects on marine ecology.

115. Based on average weather conditions occurring over the period of construction comprising Q2 and Q10 events.

It can be seen that in the long term, the vast majority of sediment predicted to enter the Harbour will not be from construction of the Project. 20 years from the start of construction of the Project there would be almost no detectable increase in sedimentation rates in the Onepoto Arm of the Harbour and only an average increase of between 0.1 and 0.2mm/yr in the Pauatahanui Inlet. This minimal change is considered to be acceptable.

A final point of note regarding the long term effects on the Harbour is that the collection of field data, sediment yield modelling and the hydrodynamic and sediment transport modelling undertaken to assess the potential sedimentation effects of the Project on the Harbour has already greatly increased the level of knowledge around sediment behaviour in the Harbour. It is already well recognised that existing sediment runoff is a threat to the Harbour.

The Harbour modelling will be of considerable benefit in the long term collaborative management of the Harbour between a number of different stakeholders. Although not a direct form of mitigation, it is considered that the benefits of this detailed modelling of the Harbour will assist with the long term management of sediment entering the Harbour.

20.4.4 Discharge of stormwater from concrete batching plant

The discharge of stormwater from the concrete batching plant triggers Rule 2 of the Regional Discharges to Land Plan (discharges into or onto land not otherwise provided for by a rule in the Plan). Regard is had to the matters set out in Rule 2 for consideration of resource consents, in particular Clause 5.3 of the Plan. It is also noted that a concrete batching plant, specifically the potential for discharge of cement from the site, would meet the definition in Appendix 1 of the Plan for Hazardous Substances as "Ecotoxic: Substances or wastes, which if released, present or may present immediate or delayed adverse impacts on the environment by means of bioaccumulation and / or toxic effects upon biotic systems".

The main potential effect of discharge to land from the concrete batching plant relates to the ecotoxicity of cement and the potential effects on the natural environment in the streams and watercourses downstream of the site. The key aim is therefore to avoid cement discharge beyond the site.

As discussed in Chapter 8 of this report, the concrete batching plant includes the following key components:

- a temporary concrete batching plant unit comprising hoppers, aggregate storage bins, a cement silo, conveyors and a concrete mixing drum;
- aggregate storage bunkers; and
- a water tank or tanks.

In addition there will be a precast concrete construction yard, where concrete components are cast, stressed, cured and stored before loading and transporting onto the construction site proper.

The site will have a single designated 'dirty' area, comprising the concrete batching plant and the concrete truck access, delivery and loading area. The second area is the surrounding pre-cast construction yard which has its own stormwater controls. The concrete batching plants and the concrete truck access, delivery and loading areas will be located on concrete pads which will drain to the holding tanks described below. The perimeter of the concrete pad will be bunded with a mountable kerb to contain dirty water. The site may also operate a concrete truck wash-out area which will also drain to the tanks.

All runoff from the 'dirty' areas of the concrete batching plant will drain to holding tanks. The runoff and washdown water is expected to have high pH and high sediment loads. The tanks will have multiple stages to allow any sediment to settle out. The use of a multi-stage tank system allows for the large sediment to settle out for removal in the first stage

The remainder of the concrete batching plant activities comprise cast concrete and aggregate storage areas which will be located within the yard area. The water from the yard areas drain to stormwater treatment devices which will be designed to provide treatment before discharging to the receiving environment. The 'dirty' yard areas will have sediment control measures in place around the full extent of the works as shown in Figure 8.1.

A Concrete Batching Plant Management Plan (CBMP) will be developed prior to the commencement of construction of the Plant to manage the actual and potential effects of the Plant on the environment. The CBMP will include methods to manage discharges to air and methods to manage stormwater quality effects. The suite of management plans applicable to the Project also includes a number of other plans that are relevant to the operation of the concrete batching plant. For example, noise and vibration from the Plant will be managed through the CNVMP, and traffic will be managed through the CTMP. The CAQMP also sets out principles for the management of air quality effects including dust management.

The CBMP will set out a process for the provision of further information to GWRC prior to the commencement of construction including identification of the specific contaminants associated with the concrete batching plant including quantities of cement, and any other hazardous substances (as defined in Appendix 1 of the Discharges to Land Plan). The CBMP will have regard to the following principles:

Deliveries and storage

- Storage containers will be covered to prevent rainwater entry, and any storage of raw materials except for aggregate shall be stored in an appropriate enclosure. Environmentally hazardous substances (including cement) will be stored in a manner that prevents the entry of rainwater into the container and in a secondary containment device (such as a bund).
- An Emergency Spill Response Plan will be developed and will set out methods to manage all hazardous substances stored on site.
- The aggregate used for the concrete batching plants will include sand and quarried or recycled aggregate or other material such as glass. The aggregate will be delivered to the site by truck and will be stored in designated bunkers for each aggregate type (e.g. sand, pap7 type aggregate). Finer aggregates will be covered to prevent discharges to air.
- Cement will be delivered via tanker and transferred to the on-site cement silo pneumatically to ensure the transfer of cement is fully enclosed.

Rubbish

- Rubbish on-site is likely to include cement bags, and additive packaging. All storage bins will have, as a minimum, sealed bottoms and lids.
- Waste compactors and bins will be located and operated in such a manner as to prevent leachate / wastes leaking from the bins and entering the stormwater system.

Stormwater and wastewater

- Methods will be specified to ensure any contaminants including cement avoid contacting stormwater runoff from "clean" areas of the site. Clean stormwater shall be collected and directed around the perimeter of the site away from "dirty" areas.
- Where practicable, water for the concrete will be sourced from re-use of surface water collected from the site and washdown water. Additional water may be required which will be sourced from reticulated mains water supply.
- Process water shall be captured and reused on site.
- "Dirty" areas shall be clearly defined and contained as a separate system to "clean" stormwater areas. Water collected from the "dirty" areas including the concrete batching plant, cement unloading and driveway areas shall be collected and stored on site for reuse.
- The stormwater treatment devices required on this site shall be designed to in accordance with the standards set out in the Assessment of Water Quality Effects report (**Technical Report 15**).
- A continuous turbidity and pH meter will be located at the discharge point from the Concrete Batching Plant treatment system. Discharges from the concrete batching plant will be required to meet a turbidity and pH discharge standard. This level will initially be set at 50 NTU and pH between 6 and 9. Where the turbidity level is exceeded, or pH is greater than 9, further treatment will be required via chemical treatment and / or pH management prior to discharge. Alternatively this stormwater will be discharged to the reticulated sewer.

Conditions of consent are proposed requiring the preparation of the CBMP.

In summary, it is concluded that the actual and potential effects of discharges to land from the concrete batching plant will be minimal subject to careful on-site management methods.

20.5 Water quality effects during operation

Operation of the Project has the potential to adversely affect water quality in streams and coasts through stormwater runoff from road surfaces.

Contaminants in stormwater can have a number of adverse effects, including:

- damaging aquatic (freshwater and marine) habitat;

- making water unsuitable for contact recreation (e.g. swimming) and / or human fish consumption[116];
- contaminating drinking water supplies;
- reducing the aesthetic properties of water (e.g. visual clarity and odour).

The cultural effects of predicted changes to water quality are discussed in Chapter 24.

20.5.1 Stormwater design philosophy

The key tenet of the stormwater philosophy for the Project is that all stormwater that comes into contact with the road surface will pass through a treatment device. Treatment will either be by wetlands where possible, or by propriety treatment devices in all other areas.

20.5.1.1 Wetlands

Constructed wetlands are highly effective treatment systems designed to utilise the contaminant removal benefits of natural wetlands. They are capable of 77% removal of influent TSS as well as significant removal of dissolved heavy metals such as copper, zinc and phosphorous. Wetlands are also capable of providing flow attenuation, public amenity, and support for aquatic life and wildlife. For these reasons, wetlands are considered to be the best-practice treatment option wherever site criteria can be met. The most significant criterion is space, which has limited the use of wetlands in areas of steep topography.

Five specific areas of the Main Alignment met the site criteria and have been considered for constructed wetland treatment, as detailed in Table 20.7.

Table 20.7: Proposed wetland locations

Wetland	Location	Area treated	Description
W1	MacKays Crossing - Te Puka (SH1)	0m to 2,100m	Located between MacKays Crossing and Te Puka terrace at approximately 940m.
W2	Horokiri Valley	5,550 to 7,550m	Located in Horokiri Valley at approximately 7,550m. There is suitable flat and low-lying land available on the other side of the Horokiri Stream to the road alignment for a wetland. It is proposed that runoff is transported from the road across the stream into the wetland via an open-flow rectangular channel. There is potential for flooding at this site. The hydrology assessment shows that there is a risk of approximately 10-12mm of flooding in a Q10 event, which is considered acceptable for wetland use.

116. The ANZECC guideline for human fish consumption is referred to as: “Water quality guidelines for the protection of human consumers of aquatic foods”. For specific metals (e.g. zinc and copper) the guidelines detailed are for “chemical compounds in water found to cause tainting of fish flesh and other aquatic organisms”.

Wetland	Location	Area treated	Description
W3	Horokiri Valley (BHFFP)	8,600 to 10,200m	Located immediately after deep cut sections of the road in Horokiri Valley at approximately 10,200m where the road is at grade and the surrounding land is relatively flat. There is sufficient space between the road alignment and Horokiri Stream for a suitably sized wetland.
W4	Horokiri Valley south	10,200 to 11,800m	Located in the lowest-lying section of the Horokiri valley. There are steep hills to the west of the road alignment but a large, flat space suitable for wetland use lies to the east of the alignment. There is also proposed vegetation planting in the surrounding area so the use of a wetland would be complementary to this.
W5	SH58 / Pauatahanui	15,600 to 17,700m	Located at the intersection of the Main Alignment with SH58 at 17,500m. There is land within the proposed designation to the south-east of this intersection that is suitable and large enough for wetland use. There is also some spare capacity within the intersection itself that could be used creatively for wetland use. Although there is insufficient space for an entire wetland system within this area, a forebay area and sediment pond could be created in this space and connected to a larger banded bathymetric pond to the south-east of the intersection. Considering a design like this could create additional public amenity for the intersection and help visually tie the intersection to its rural surroundings. A constructed wetland at this location may also provide additional habitat and spawning areas for native fish These matters will be considered during detailed design.

20.5.1.2 Proprietary treatment devices

Where stormwater cannot be treated by a wetland, proprietary treatment devices will be used. They have few site constraints and will be effective for use as treatment on almost any section of the road alignment. They are highly effective in treating runoff with high sediment loads, however, they do not offer some of the potential benefits of well-maintained wetlands. The steep nature of the road precludes the use of wetlands in many locations and accordingly, proprietary devices are proposed for a significant proportion of the road alignment.

Proprietary treatment devices are capable of treating a wide range of catchment areas, depending on the size of the devices. Appropriate catchment areas for these devices have been based on economic and environmental factors. Beyond this catchment size, the additional cost of treating larger areas becomes relatively linear. Therefore treatable catchment areas should be a minimum of 15,000m^2 (1.5Ha) where possible to take advantage of cost savings.

In determining appropriate treatable catchment areas, the cost of forebay areas and piping was considered. Forebay areas to the side of the road are required for every proprietary treatment device to avoid lane closures during maintenance of the devices. Increasing the catchment area per device reduces the amount of devices and forebay areas required which is potentially more economic. However, the economic trade-off of having a larger catchment area is the increased piping diameter to convey runoff. Keeping catchment areas relatively small also reduces the risk of attenuation and better matches natural predevelopment stormwater flows. For these reasons, it was estimated that the maximum treatable area per device should be kept to 25,000m[2].

20.5.1.3 Treatment approach summary

Table 20.8 provides a summary of the stormwater treatment proposed for each of the catchments in the Project area.

Table 20.8: Proposed stormwater treatment by catchment

Catchment	Area treated (ha)	
	Wetland (% of total catchment)	Proprietary (% of total catchment)
Whareroa Stream	528,420 (**100%**)	-
Te Puka / Wainui Stream	320,587 (**20%**)	1,262,158 (**80%**)
Horokiri Stream	2,045,111 **(69%)**	903,292 **(31%)**
Ration Stream	64,115 (**5%**)	1,229,816 (**95%**)
Collins Stream	158,808 (**100%**)	-
Pauatahanui Stream	536,864 (**44%**)	689,994 (**56%**)
Duck Creek	-	1,599,919 (**100%**)
Kenepuru Stream	-	959,988 (**100%**)
Porirua Stream	-	906,871 (**100%**)

20.5.2 Stormwater effects on stream water quality

In almost all catchments the Project will make a very minimal (1% or less) change to the level of impervious cover in the catchment. In the Te Puka catchment impervious cover will increase by approximately 2% which is reflective of the fact that there is virtually no development in this catchment currently.

As discussed earlier, a contaminant load model (CLM) and motorway and catchment data was used to predict contaminants in stormwater runoff. The CLM modelled the concentration of TSS, zinc, copper and total petroleum hydrocarbons (TPH) for three scenarios:

- without the Project;
- with the Project, <u>without</u> stormwater treatment; and
- with the Project, with stormwater treatment.

The following figures show the predicted concentrations for TSS, zinc and copper using the motorway and catchment data method and for TPH from the CLM.

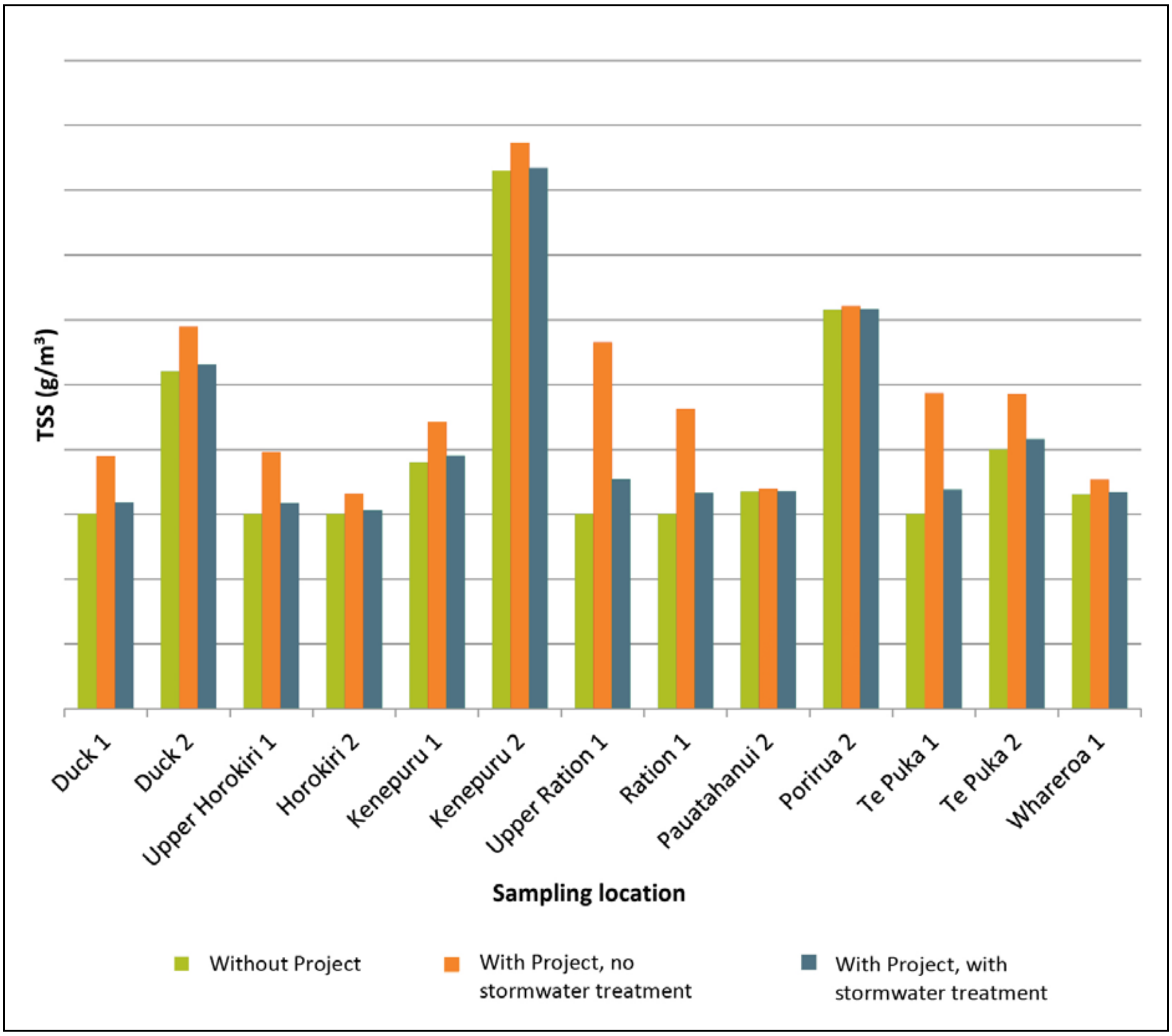

Figure 20.3: TSS concentration across representative sample locations

Predicted TSS concentrations reduce slightly (or are unchanged in the Whareroa catchment) for the 'with Project' scenario in all catchments. This is due to change in land use to paved road surface, which will generate less sediment than the existing pastoral land use.

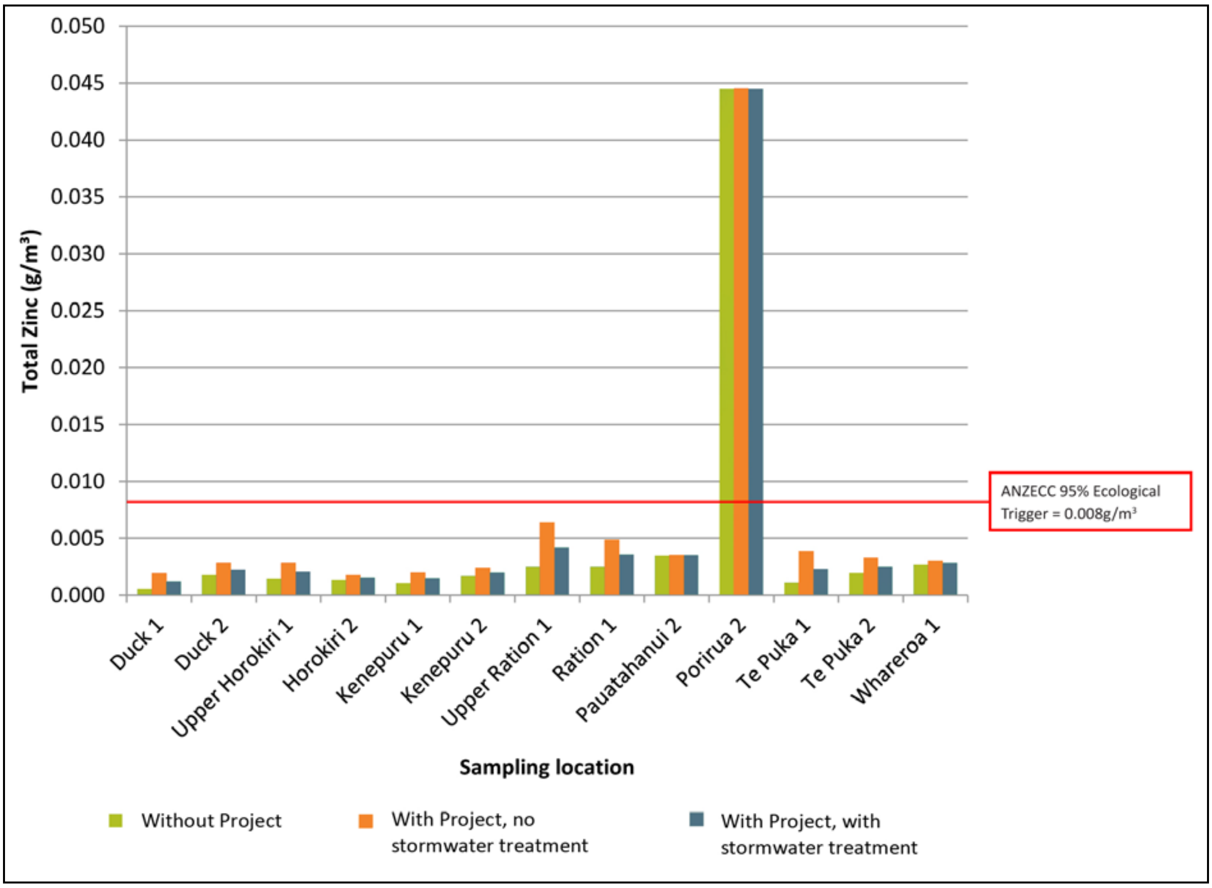

Figure 20.4: Zinc concentration across representative sample locations

The Project will cause relatively minimal changes to zinc concentrations in all the catchments, with some catchment showing slight increases and some catchment, slight decreases. The Project will not cause the ANZECC ecological threshold to be exceeded in any catchment where it currently is not. In all catchments, including those where ecological triggers are currently exceeded, the predicted zinc concentrations will be well within guidelines for stock drinking water, contact recreation and human consumption of fish species.

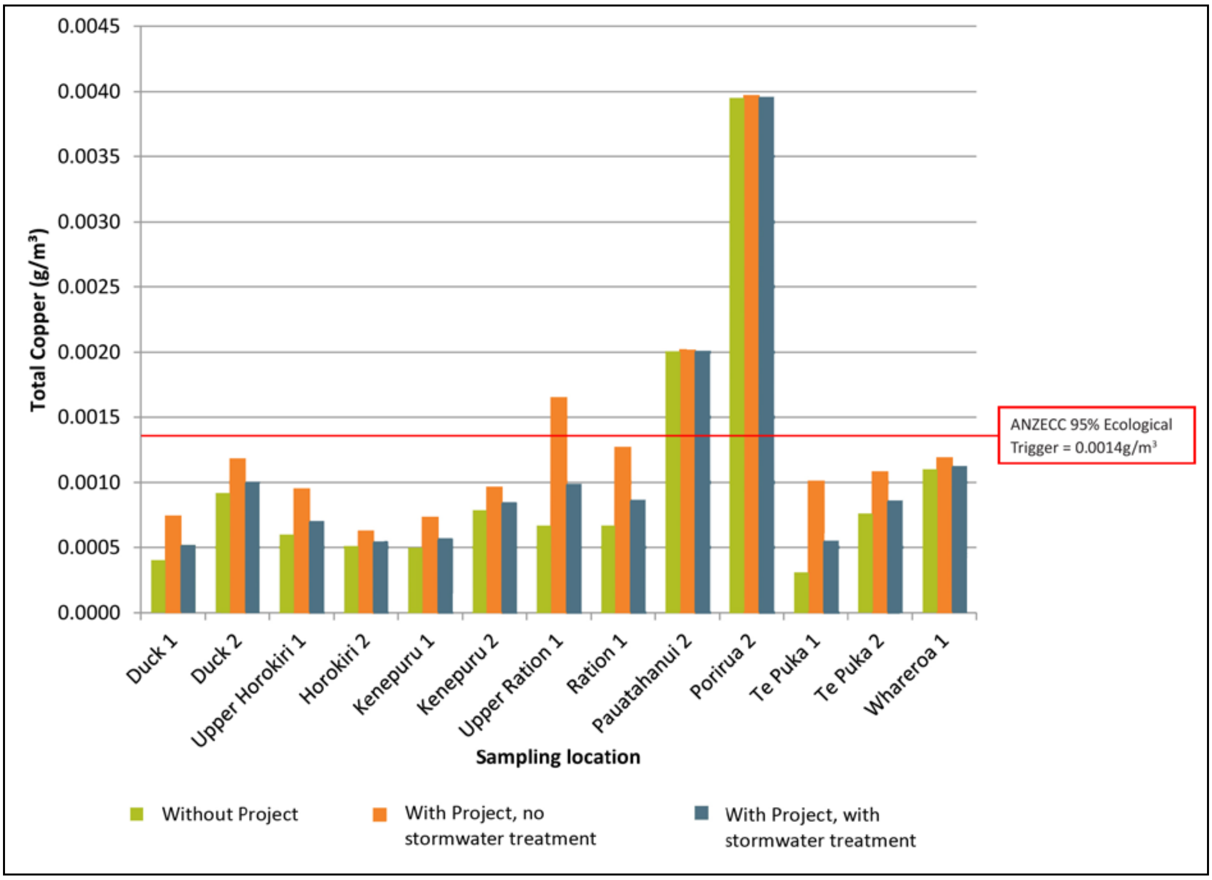

Figure 20.5: Copper concentration across representative sample locations

The Project will result in some changes to copper concentrations in all the catchments, with some catchments showing slight increases and some catchments slight decreases. In only one catchment (Ration) will the Project cause the ANZECC ecological threshold to be exceeded where it currently is not. The Project will not cause the copper guideline values for stock drinking water, contact recreation and human fish consumption to be exceeded in any of the affected catchments (including Ration).

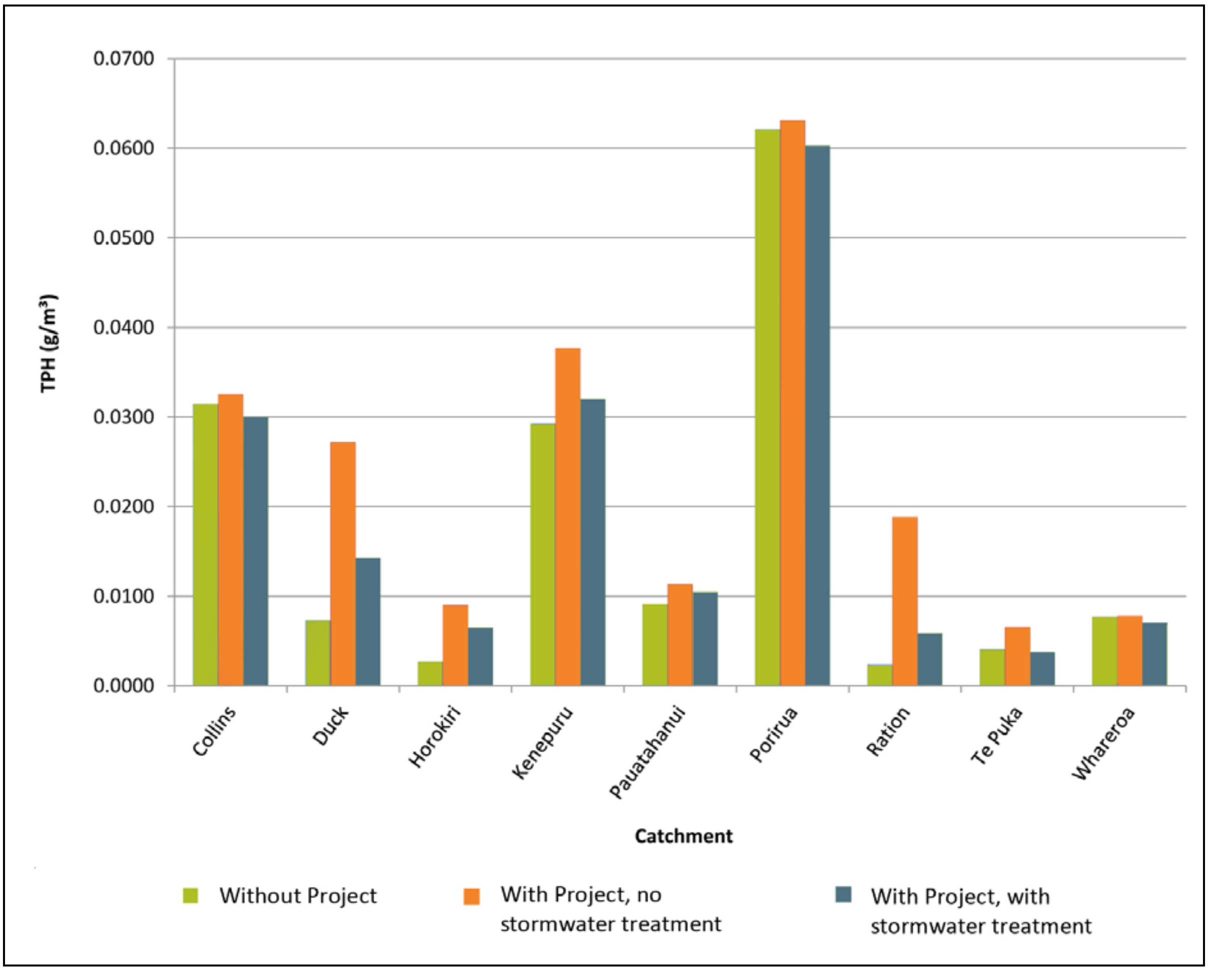

Figure 20.6: TPH concentration across representative sample locations (CLM)

The model predicted minimal increases of TPH in the Duck, Horokiri, Kenepuru, Pauatahanui and Ration streams. These catchments are currently mainly rural and the introduction of the predicted traffic volumes into these catchments would be expected to have this type of result.

While some streams are predicted to receive increased concentrations of TPH it is not expected that this would be at levels that would lead to any conspicuous oil or grease. Similarly, no objectionable odour associated with hydrocarbons was noted in any streams and this is not predicted to change as a result of the Project. Any change in visual clarity or odour associated with increased levels of hydrocarbons will be minimal and acceptable.

The potential effects on freshwater ecology from predicted changes to water quality in the streams are discussed in Chapter 22.

20.5.3 Effects on marine water quality

The CLM was also used to estimate contaminant loads in the marine receiving environments:

- the Kapiti Coast, being;
  - the Wainui Stream mouth; and
  - the Whareroa Stream mouth.
- the Pauatahanui Inlet; and
- the Onepoto Arm.

The contaminant loads entering the three marine receiving environments was predicted by adding the predicted contaminant loads for each of the streams draining into them. Table 20.9 shows the difference (in percentage terms) for the four contaminants entering the three marine receiving environments.

Table 20.9: Percentage change in contaminant loads (2031)

Receiving environment	TSS	Zn	Cu	TPH
Kapiti Coast	-1%	-4%	-9%	-14%
Pauatahanui Inlet	0%	2%	1%	20%
Onepoto Arm	-1%	-6%	-16%	-44%

The summary results show that for the Kapiti Coast and the Onepoto Arm, the Project will result in reductions in contaminant levels of all four modelled contaminants.

For the Pauatahanui Inlet, for all contaminants except TPH, the Project is to result in minimal (2% or less) changes in contaminant levels. THP entering the Pauatahanui Inlet is expected to increase by 20%. This increase is due to the introduction of significant traffic volumes into catchments (Horokiri, Ration, Pauatahanui, Collins and Duck) that drain into the Pauatahanui Inlet.

The predicted increase in TPH into the Pauatahanui is not significant from a water quality perspective in that it will not cause conspicuous oil or grease in the water or any change in odour. Similarly, it will not adversely affect recreational use (including contact recreation) of the Inlet.

The potential effects on marine ecology from predicted changes to water quality in the marine receiving environments are discussed in Chapter 23.

21. Terrestrial ecology

Overview

The Project traverses highly modified land, which has mainly been converted to pasture with relatively few areas of native vegetation remaining. Within this modified landscape populations of indigenous fauna are small and species of conservation interest are restricted to specific sites, typically associated with fragments of native vegetation. These habitats have been identified and described.

A conservative approach has been taken to quantifying the loss of vegetation and terrestrial habitats. The adverse effects on terrestrial ecology will arise during construction as a result of vegetation clearance and disturbance of habitats and / or species.

An extensive ecological mitigation package is proposed to remedy and mitigate the adverse effects of construction. This will include retirement from farming of approximately 400ha of marginal land and replanting of 271ha of this land. Mitigation sites have been identified (including the early retirement sites established in recent years by the NZTA), the sites chosen for the range of potential ecological and hydrological benefits they can provide the retirement and revegetation of land above the Project alignment will provide additional benefits such as reduced erosion, and improved water quality. There will be some minor potential effects on the habitat of terrestrial fauna during construction. This can be effectively managed by the translocation of habitats such as logs and bolder slopes, and by careful construction management methods.

In the long term, as the retired areas mature, the Project is expected to have a positive effect on terrestrial ecology.

21.1 Introduction

This chapter presents the findings of investigations undertaken to determine the actual and potential effects of the Project on terrestrial ecology. Terrestrial ecology includes terrestrial vegetation and terrestrial fauna such as birds, bats, lizards and terrestrial invertebrates. This chapter also describes potential effects on wetlands habitats for flora and birds.

Initially desktop study of ecological databases and previous relevant studies identified information about the existing terrestrial ecology which informed the methodology used for field surveys undertaken within and adjacent to the Project designation. Once a baseline of terrestrial ecology had been determined, the impacts of the construction and operation of the Project were assessed. This first assessment stage was undertaken without the application of any specific ecological mitigation for the Project. On the basis of this initial assessment the ecologists then worked closely with the design team to seek to avoid potential adverse ecological effects that had been identified, where possible. Where avoidance was not possible, ecological mitigation was then developed to mitigate any remaining adverse effects.

The final assessment stage considered the actual and potential environmental effects, following implementation of the proposed mitigation.

21.2 Existing terrestrial ecology

21.2.1 Ecological investigations

The identification of effects on terrestrial ecology required the assessment of the composition and values of the existing terrestrial ecology. This relied on two complementary methods:

- desktop studies of available relevant information such as ecological databases and existing datasets and previous ecological surveys; and
- field surveys.

The description of existing terrestrial ecology in this section includes a brief overview of the investigations undertaken. Further details on the methods used and findings of these investigations are contained in the relevant technical reports provided in Volume 3:

- Terrestrial vegetation and habitats: Description and values (**Technical Report 6**);
- Herpetofauna and terrestrial macro-invertebrates: Description and values (**Technical Report 7**); and
- Avifauna and bats: Description and values (**Technical Report 8**).

21.2.2 Terrestrial flora and habitats

21.2.2.1 Wellington Ecological District

The Project area is entirely within the Wellington Ecological District (ED)[117] which is characterised by steep, strongly faulted hills and ranges, and the Wellington and Porirua Harbours. The ED was originally forested with fringes of salt marsh vegetation around the harbours. Near the coast, rimu / rata / kohekohe forest would have dominated while podocarp forests (kahikatea, totara, matai) would have been prevalent on the river terraces and lower slopes with miro / rimu / tawa forest at higher altitudes.

Today, the Wellington ED is almost entirely modified by farming and urbanisation, with pasture, plantation pine, gorse and regenerating shrublands throughout, although some small forest remnants occur. The Main Alignment corridor has mostly been cleared of native vegetation and converted to exotic vegetation, including pasture and pine plantation. Areas of extensive grazing land are located on the steeper hill country in Te Puka Stream and Horokiri Stream areas and the Duck Creek Catchment. It also includes the lower lying valley occupied by Battle Hill Farm Forest Park (BHFFP).

117. Ecological districts are classified by the Department of Conservation. Although the Project is located entirely within the Wellington ED, in the Te Puka and Horokiri valleys it on the margins of the Tararua ED.

There are occasional remnant pockets of indigenous vegetation, including areas in Te Puka Stream and Duck Creek tributaries and within Porirua Park Bush. There are areas of regenerating second growth bush, notably in the Cannons Creek Catchment. There are also extensive areas of former pasture that are reverting to natural vegetation largely characterised by gorse, tauhinu and other small leafed species such as twiggy coprosma, manuka and kanuka.

There are extensive areas of commercial pine plantation on the hills east of Horokiri Stream (Akatarawa Forest), and smaller areas scattered through the remainder of the corridor. Within the BHFFP there are still small remnants of native vegetation which provide good representations of the types of indigenous flora which would have once been typical of the region. Vegetation includes a small coastal forest remnant (35ha) which can be found on the western side of the BHFFP, as well as areas of low producing grassland and indigenous forest within the plantation forest on the eastern side of the park. The bush is dominated by tawa and titoki, while the upper slopes are almost pure kohekohe. In swampy lower areas, kahikatea, pukatea and swamp maire are present.

The middle part of the Main Alignment corridor (Sections 3 to 7) has a more gently rolling topography and is characterised by a closer pattern settlement; a patchwork pattern of boundary shelter planting and differing land management; a wide variety of vegetation including exotic shelter trees, small plantations, amenity trees, and areas of native re-vegetation.

The area between Linden and Cannons Creek comprises rural fringe land. The hills form the backdrop to the Porirua East urban area, and comprise a mixture of former pasture that has reverted to gorse and mahoe shrubland; rough pasture on the ridgelines small pine plantations areas of remnant or regenerating indigenous forest and peri-urban activities.

21.2.2.2 Threatened plant species

Field surveys found only one species within the Project area that has a national threat classification (de Lange et al 2009)[118]. This species was, *Leptinella tenella*, (shown in Figure 21.1) and is classified as 'At Risk – Declining'.

118. De Lange, et al. 2009: Threatened and uncommon plants of New Zealand (2008 Revision). New Zealand Journal of Botany 47: 61-96.

Figure 21.1: *Leptinella tenella*

L. tenella is endemic to the North Island and northern South Island. It is a lowland species whose habitat is usually located on stream margins where they enter estuaries, on lake margins or on the margins of freshwater swamps and wetlands bordering saltmarsh. This species is sometimes found on cattle pugged swampy ground bordering saltmarshes. It is intolerant of shading and grass competition and favours sites that are kept open through periodic disturbance from high tides and flooding.

During this study *L. tenella* was present in an area of heavily grazed, sphagnum dominated wetland within the Horokiri Valley. This wetland is otherwise unremarkable, however, the presence of this species elevates its ecological significance slightly.

21.2.2.3 Ecologically significant sites

Within the Project area there are a number of areas of ecological significance. There are two types of area:

- **protected natural areas** (PNA) that are formally protected[119]; and
- **significant natural areas** (SNA) that are not formally protected[120]

These areas are listed in Table 21.1 (only PNAs and SNAs within the proposed designation are listed) and shown on plan **GM04**.

119. Protected means either: a scenic reserve or conservation land protected under the Reserves Act 1977 (including local purpose reserves and stewardship areas), a private or National Covenant (QEII) attached to the title of the land, or public land which has a management plan (e.g. regional parks).

120. Areas identified through district wide or regional surveys as having ecological value, but not necessarily formally protected.

Table 21.1: Relevant protected natural areas and significant natural areas within the Project area

Name	Total size (ha)	Significance	Description	In relation to Project
Protected natural areas				
MacKays Crossing Wetland and Wildlife Reserve	9.68	Regional	Moderately sized area of raupo reedland wetland which lies partly in the proposed designation. Considered to be regionally significant. DOC Wildlife Management Reserve. KCDC Ecosite 106.	Within proposed designation.
Rowans Bush	2.8	Regional	Partially protected by QEII covenant (QEII 5/07/363). Kohekohe and titoki forest on lowland hill country. Part of a series of fragments that provides links between Kapiti Island and the Tararua Ranges. Eastern half of their site is protected in part under QEII covenant. KCDC Ecosite K139.	Within proposed designation.
Akatarawa/Whakatikei Forest Park	15,439	-	GWRC water collection area and regional forest park. Identified in BRWR[121] as site 19b – Lowland to montane miro, rimu, rata, tawa, kamahi forest. Has a high diversity of native bird life and this area of vegetation has large corridor benefits and wider ecological habitat benefits.	Within proposed designation (very small area of park only)
Battle Hill Forest Farm Park	502	-	Much of this park is open space and farmland. There are a number of small wetland and bush fragments that lie within it that are considered to have ecological value. However there are no indigenous plant communities within the proposed designation.	Within proposed designation.
Horokiri Wildlife Management Reserve	6.25	-	Wildlife Management Reserve. Coastal wetlands and saltmarsh. Crown land reserve. PCC Ecosite 30.	Downstream of Project
Pauatahanui Inlet Wildlife Refuge	506	National	The eastern half of Pauatahanui Inlet. Estuary, open water & tidal flats. A Wildlife Refuge[122] and BRWR site 5a, nationally significant coastal estuary with intertidal sand flats and regionally rare salt marsh and saline herbfield, rushland and shrubland communities.	Downstream of Project.
Pauatahanui Wildlife Management Reserve	47.4	Regional	Wildlife Management Reserve[123]. Coastal wetlands and saltmarsh. Mixed private and public ownership. PCC Ecosite 65.	Downstream of Project.

121. Biological resources of the Wellington region, Wellington Regional Council, 1984

122. Under the Wildlife Act 1953 (DOC Conservation Unit R26053).

123. Under Reserves Act 1977 (DOC Conservation Unit R27056).

Name	Total size (ha)	Significance	Description	In relation to Project
Scoresby Grove Kanuka Forest	4.7	-	Private land with covenant. Small forest remnants within built up areas. PCC Ecosite 70a.	Within proposed designation.
Duck Creek Scenic Reserve	1.18	-	Coastal wetland and saltmarsh. Scenic reserve[124]. PCC Ecosite 22.	Downstream of Project.
Whitby West Bush	9.16	-	Small forest remnants within built-up area. Mixed private / public land. PCC Ecosite 155b.	Within proposed designation.
Belmont Regional Park	3,446	-	Much of this park is open space and farmland. There are a number of small wetland and bush fragments that lie within it that are considered to have ecological value including Wellington City Council Prime Bush Remnants.	Within proposed designation.
Cannons Creek Bush	41.66	-	Seral Forest with maturing tawa podocarp. Lowland tawa, kohekohe, mahoe forest remnant and gorse shrubland. Sizeable areas of forest. PCC Ecosite 12.	Within proposed designation.
Porirua Park Bush	16.4	-	Porirua Park Bush is well fenced and surrounded by a combination of farmland, residential areas and school facilities. BRWR site 13d – Regionally representative example of lowland tawa, kohekohe forest remnant. PCC Ecosite 76.	Within proposed designation.
Significant natural areas				
Paekakariki Bush B – I		-	KCDC Ecosite K222 – 229. Eight small fragments of kohekohe forest of varying sizes and conditions. All are unfenced and heavily grazed by stock.	Within proposed designation.
Transmission Gully / Wainui Saddle	0.287	-	Small forest remnant within farmland, PCC Ecosite 172.	Within proposed designation.
Transmission Gully Riparian Area	1.877	-	Riparian areas within farmland, PCC Ecosite 199.	Within proposed designation.
James Cook Drive Bush	12.84	-	Small forest remnants within built-up areas, PCC Ecosite 33.	Within proposed designation.
Exploration Drive Kanuka	5.67	-	Small forest remnants within built-up areas. PCC Ecosite 190.	Within proposed designation.

124. Under Reserves Act 1977 (DOC Conservation Unit R27001)

Name	Total size (ha)	Significance	Description	In relation to Project
Head of Cannons Creek	1.06	-	Tawa, mahoe, mapou, porokaiwhiri, mamaku and cabbage tree. WCC 0702.15.	Within proposed designation.
Head of Cannons Creek	1.28	-	Primary forest of tawa, nikau, porokaiwhiri, mamaku, wineberry, mapou and mahoe. Secondary forest of mahoe, porokaiwhiri, lancewood, mamaku and mapou intermixing with primary forest remnant. WCC 0702.16.	Within proposed designation.
Roberts Bush	3.68	-	Gullies of mahoe forest including small areas of maturing tawa forest within pines adjacent to SH1. PCC Ecosite 88.	Within proposed designation.

21.2.2.4 Early retirement areas

As a condition of the existing designations areas were retired from pasture and planted in native vegetation. This was to provide advanced ecological mitigation for a range of potential effects of the Project including protection of aquatic habitat, erosion and sediment management and mitigation for vegetation loss. In total, approximately 31 hectares were planted and these areas now provide some of the best areas of indigenous forest within the Designation area, in particular around the Ration Stream and the Duck Creek catchments.

Table 21.2 provides details of the planting that has been done in the Horokiri Stream, Pauatahanui Stream, Ration Stream and Duck Creek catchments.

Table 21.2: Advance ecological mitigation planting

Catchment	Terrestrial vegetation planting (ha)	Riparian vegetation planting (ha)
Horokiri Stream	22.2	5.1
Pauatahanui Stream	1.0	1.3
Ration Stream	3.4	2.4
Duck Creek	4.5	4.5
TOTAL	**31.1**	**13.3**

These early retirement areas have been included as part of the mitigation of effects on terrestrial, freshwater and marine ecology and are referred to subsequently.

21.2.3 Terrestrial fauna

Several areas of habitat for herpetofauna and terrestrial invertebrates are present within the designation. Herpetofauna refers to amphibians and reptiles, whereas a terrestrial invertebrate refers to species without a backbone that are visible with the naked eye. As part of the ecological field surveys, an assessment of the prevalence of herpetofauna and terrestrial invertebrates within the Project area was undertaken. This utilised existing information based on previous studies as well as field surveys.

21.2.3.1 Terrestrial invertebrates

Terrestrial invertebrates represent a diverse group of species. Within the highly modified habitats found along most of the route in the Project area range of common terrestrial invertebrates were detected within the Project area including bees and wasps, butterflies and moths, spiders, snails and slugs, centipedes and millipedes, Peripatus, beetles, wetas, cockroaches, silverfish, cicadas, hoppers, dragonflies, midges, earwigs, ants, worms and slaters. These species are expected in this type of environment. None of the species are considered to be threatened or at risk.

Desktop studies identified several species of invertebrate of conservation concern that may be present along the alignment. However, when the small areas of potential habitats of these species were searched none were found. The most notable species recorded was *Peripatus novaezealandiae* (commonly referred to as velvet worms, see Figure 6.14) which is one of five peripatus species in New Zealand. It is not threatened or at risk but is a species of local interest.

21.2.3.2 Lizards

Most of the Project area is in grazed pasture which provides relatively poor habitat for indigenous lizards (herpetofauna) due to the lack of potential refugia, habitat disturbance by stock, and the presence of introduced predators such as rodents, mustelids and cats. The exception to this is the larger scree slopes and stone fields towards the north of the Project area (through the Te Puka and upper Horokiri Valleys, and to a lesser extent Duck Creek) which provides good potential habitat.

Desktop studies identified several species of lizard of conservation concern that may be present along the alignment. However, only three herpetofauna species were detected during the field surveys: common geckos, common skinks and common copper skinks. These species were detected in relatively low numbers and are among the most common lizards found throughout the North Island. They are classified as not threatened[125]. The range and count of species found is considered to be representative of inland pasture throughout the region.

In total, field surveys found four lizards and nine skin sloughs. Two common skinks were located at the southern end of the Main Alignment corridor under an object in un-grazed pasture. In comparison, the two copper skinks were found under a cover object in stone fields within the northern section. Manual searches located a juvenile and two female common gecko. All were found beneath rocks within a stone field in grazed pasture near the northern end of the alignment in the Horokiri and Te Puka Catchments. Also in the Te Puka Catchment nine gecko (probably common gecko) skink sloughs were found in the scree.

21.2.3.3 Birds

Initially, the study determined the likely presence of birds (avifauna) within the ecological district from existing data for the Project area from the Ornithological Society of New Zealand's (OSNZ) data atlas. This was followed up with field surveys using point counts, incidental observations and nocturnal surveys. Information from the Guardians of the Pauatahanui Inlet (GOPI) was also used, specifically in relation to bird species around Pauatahanui Inlet.

While much of the Project area lies within largely rural landscapes, mobile avifauna will have ranges extending across the Project area. There are several ecologically significant sites and habitats within, or in close proximity to, the Main Alignment corridor that are utilised by avifauna.

The field surveys (involving point counts) recorded approximately half (48%) of the bird species listed in the OSNZ data atlas for the wider Project area. This is likely to be a function of the narrower sample area of the field survey and the time of year the survey was undertaken (January – March). Nonetheless, the 37 species observed during the survey are considered to provide an accurate representation of bird species in the area, together with the addition of a few more species which were not observed but

125. Although not threatened, they are still protected under the Wildlife Act 1953 and potential effects will need to be mitigated. This is discussed in Section 21.5.1.3 of this report.

which are known to be present in the area at various times of the year. Of the 37 species recorded, 20 are native and 17 are introduced. Although introduced species make up less than half of the number of species, approximately two-thirds (69%) of the point counts were introduced species, indicating their relative presence in greater numbers than native species within the area.

The 20 native species recorded have the following classifications:

- 15 are Not Threatened;
- Three (3) are Threatened (bush falcon, kaka and pied shag); and
- Two (2) are At Risk (black shag and New Zealand pipit).

Thus, Threatened and At Risk species were present within the Project area but were only recorded in very low numbers.

As noted, the majority of habitat along the Project area comprises pasture and farmland. The greatest number of species (16 out of the 37 species observed) were recorded in this habitat type, and 75% of these were introduced species. In comparison, the forest provides primary habitat for fewer species, but a greater proportion of these were native species and include the Threatened bush falcon and North Island kaka. The freshwater habitats are utilised by introduced, native, Threatened and At Risk species.

Specific habitats of importance for birds are:

- **Ration survey area**: the high mean bird abundances and species diversity per count recorded are likely to be due to the variety of land uses within this area (rural residential, hobby farms, exotic plantation) and its relatively close proximity to Pauatahanui Inlet and Pauatahanui Stream, rather than a reflection of high habitat quality.
- **Te Puka survey area**: the habitat with the highest ecological value was found here, notably the forest remnants within the Te Puka Catchment. The occurrence of large trees (including emergent podocarps) together with important fruiting species within these remnants provides suitable nesting and feeding habitat for a variety of native, Threatened and At Risk species.
- **Porirua Park Bush survey area**: while no Threatened or At Risk species were recorded within the area, a relatively high diversity of native species was recorded, most notably in the older growth forest which had a greater diversity in vegetation than found elsewhere.
- Streams constitute the main freshwater habitat in the Project area and are likely to provide some feeding opportunities for native bird species (especially shags and waterfowl), while generally lacking in nesting habitat.
- Petrel habitat: most breeding colonies are located on islands (e.g. Kapiti and Mana) with the few mainland populations largely confined to coastal forested hilltops, such as 15 found at the northern end of the Project. As such, petrels may be observed at the very northern section of the Main Alignment, but their habitat will not be directly or indirectly impacted upon by the Project.

21.2.3.4 Bats

There are three native bat species in New Zealand. The only part of the Project area where bats are likely to be present is around the Wainui Saddle and northwards down the Te Puka valley. Field surveys were undertaken during January 2010 around this area. The survey failed to positively identify any bat activity, with the one possible record unable to be positively identified by DOC staff.

Clarification of bat presence and relative abundance in this forest will be confirmed by additional monitoring this coming spring (i.e. 2011).

21.3 Assessment of effects on terrestrial ecology during construction

Construction of the Project will have two direct impacts on terrestrial ecology:

- the loss of terrestrial habitat and species through clearance and modification (i.e. earthworks and veneration clearance) as part of construction activities; and
- the disturbance and displacement of terrestrial fauna through construction activities.

21.3.1.1 Loss of terrestrial habitat

Within the 483ha proposed designation, 363ha is in pasture, pine or cropland. Of the 120ha of vegetation dominated by native species, a total of 40ha will be permanently lost beneath the road footprint, and a further 80ha will be potentially affected by associated construction activities. Within the study area catchments there are approximately 5,500ha of indigenous vegetation communities (340ha forest, 2,000ha regenerating broadleaf, 750ha manuka / kanuka, 800ha wetlands etc.). The 120ha of affected native vegetation in the proposed designation represents approximately 2% of the native vegetation within the total study area (i.e. the combined area of the catchments affected). Table 21.3 provides a summary of the magnitude of impact to this vegetation as a percentage of the total vegetation of this type found within the study area.

Table 21.3: Magnitude of terrestrial vegetation loss and modification (without mitigation)

Description (listed north to south)	Maximum area of habitat loss (ha)	Study area (ha)	Loss as % of study area	Ecological value	Assessment of impact magnitude	Assessment of impact significance
Freshwater wetlands						
Wetlands of low value - (Sphagnum bog)	0.8	34	2%	Low	Low	Very low
Wetland of high value - (K106)	1.2	34	4%	High	Low	Moderate
Shrublands and scrub						
Shrublands of low value	50.0	1,202	3%	Low	Low	Very low
Shrubland boulderfields of moderate value (found in Te Puka, Upper Horokiri, Duck)	-	-	-	Moderate	Low	Low
Regenerating indigenous forest (kanuka dominant)						
Sites of moderate value (incl PCC33, PCC155b, Part PCC190, PCC196)	10	590	2%	Moderate	Low	Low

Description (listed north to south)	Maximum area of habitat loss (ha)	Study area (ha)	Loss as % of study area	Ecological value	Assessment of impact magnitude	Assessment of impact significance
Regenerating broadleaf forest (mahoe dominant)						
Sites of low value (incl PCC199)	4.0	1,527	-	Low	Negligible	Very low
Sites of moderate value (incl PCC155b)	5.4		-	Moderate	Negligible	Very low
Sites of high value (incl Part PCC12, PCC76)	10.0		1%	High	Low	Moderate
Early Retirement Planting (No 1, 2, 3, 5, 6, 7)	17.7		1%	Moderate	Low	Low
Mature or maturing indigenous forest						
Sites of low value (incl K223-230, PCC88, PCC172)	16.6	225	7%	Low	Moderate	Very low
Sites of moderate value (incl K229, PCC33, Part PCC190)	1.7		1%	Moderate	Low	Low
Sites of high value (incl Akatarawa Forest, K139, PCC88, WCC0702.15, W0702.16)	1.7		1%	High	Low	Moderate
TOTAL (ha)	**120**					

21.3.1.2 Threatened plant species

As noted above, a locally uncommon endemic wetland plant, *Leptinella tenella* (At Risk – Declining), was found in a highly modified area of boggy pasture within the Project area. This area is likely to be used for the formation of a stormwater treatment pond. It is considered that careful design of this proposed stormwater treatment pond should adequately mitigate potential adverse effects on this species and good design may even create additional wetland habitat. This is included in the draft Ecological Management and Monitoring Plan (EMMP).

21.3.1.3 Terrestrial fauna

Indigenous insects of conservation interest (*Peripatus novaezealandiae*), and three common species of native lizard were found in low numbers, predominantly in scree and boulderfield habitat in the Te Puka Stream, Horokiri Stream and Duck Creek valleys. This habitat will be reduced by earthworks and any individuals of these species that have taken refuge in this habitat will potentially be lost.

21.3.1.4 Birds

One bush falcon (Threatened) was seen traversing the Horokiri Valley and one North Island kaka (Threatened) was seen over Wainui Saddle and traversing the upper Te Puka Valley. No breeding or foraging habitat for these species will be lost. It is considered unlikely that construction activity will displace these birds from their habitat.

One Pied Shag (Threatened) and one black shag (At Risk) were seen utilising habitat in the valley floors of the Horokiri and Pauatahanui catchments. These birds may be displaced from their streambed habitat by construction activity.

Several NZ Pipit (At Risk) were observed within the valley floor of the Te Puka and Horokiri Catchments. These birds may be displaced from their streambed habitat by construction activity.

In addition, the mature vegetation of Akatarawa Forest at the head of the Te Puka Valley, and Porirua Park Bush above Cannons Creek, contains good numbers of native birds including tui, kereru, kingfisher, fantail, tomtit and bellbird. Small sections of this vegetation will be affected by works, potentially causing disturbance and reducing habitat.

21.3.1.5 Bats

An unconfirmed recording of a native bat, probably the long tailed bat (Nationally Vulnerable) was recorded on the margins of Akatarawa forest at the head of Te Puka Valley. A minimal amount of potential bat habit will be lost and it is unlikely construction will disturb and displace them.

21.3.1.6 Potential indirect impacts

In addition to these direct impacts on terrestrial habitat and species of terrestrial fauna, construction of the Project has the potential to cause indirect adverse effects on terrestrial ecosystems, in terms of the effects of dust, fire and the potential for the introduction of weeds to the area.

Significant amounts of airborne dust may be created during the period of construction in each catchment where large areas of earthworks are exposed. There is a small risk of adverse effects on adjacent native vegetation. This cannot be quantified but can be monitored, with appropriate management responses put in place (as proposed in the draft EMMP).

There is a risk of fire during the construction period caused by hot works, smoking, and vehicle exhausts. A fire during summer drought could potentially destroy more vegetation than construction activities. This risk cannot be quantified but can and has been managed at other major projects through appropriate management systems (as proposed in the draft CEMP).

There is a risk during construction of the introduction of weed species not currently present on site, as a result of the importation of aggregates, topsoil, plant stock, or as seed on vehicles. This risk also cannot be quantified but can and has been managed at other major projects through appropriate management systems (as proposed in the draft EMMP).

21.4 Assessment of operational effects on terrestrial ecology

The on-going effects on terrestrial ecology resulting from the operation of the Project are relatively limited. The potential effects are limited to the direct impacts on terrestrial fauna from the road and vehicular traffic.

21.4.1 Falcon and kaka

Both falcon and kaka are present in low numbers. Minimal habitat required by these forest species for roosting, nesting, or feeding will be lost. There is no evidence that either species is at risk of collision with traffic. In the long term, retirement of pasture and revegetation of 115ha in the Te Puka and 247ha in the Horokiri Catchments, will expand forest habitat. Overall, it is considered the risk of adverse effects on these species from operation of the Project will be negligible and potentially positive.

21.4.2 Black and pied shag

Black and pied shag make use of the habitat provided by the main stem of the Horokiri Stream. Very little habitat required by black and pied shag for roosting and nesting, and feeding will be lost and in the long term the revegetation of the stream margins will provide additional roosting habitat. Overall it is considered the risk of adverse effects on these species from operation of the Project will be negligible, and potentially positive.

21.4.3 Bats

The presence of bats has not yet been confirmed around the Wainui Saddle. No habitat required by bats for roosting, nesting or feeding will be lost. There is no research in New Zealand on the effect of roads on bats, either in terms of disturbance or mortality. International research suggests that bats display clear avoidance behaviour of traffic. However, bat mortalities have been recorded near roads.

An accurate assessment of risk requires a better knowledge of bat distribution and abundance. However, assuming that bats are present in the forest above Wainui Saddle and actively forage along the bush margins of the Te Puka and Upper Horokiri Catchments there is a risk of mortality. This effect may, at least in part be mitigated by the retirement of pasture, and expansion of shrublands and scrub across the Project site.

Overall, and assuming bats are present around the Saddle, it is considered the risk of adverse effects from operation of the Project to be low to moderate. Regardless, monitoring of potential effects on any bats present is included as part of the draft EMMP. This includes the investigation of possible mitigation measures if operation of the Project is found to be causing bat mortalities.

21.4.4 Pipit

In the long term, the retirement and revegetation of pasture will reduce habitat for pipit in the Te Puka and Upper Horokiri Catchments, therefore it will impact on the local population. However, this revegetation is returning the landscape to its original forested habitat. Pipit are present today only as opportunistic species making use of a landscape that has been modified in such as way it provides habitat.

There is plenty of other habitat in the area available for pipit populations and there are not considered to be affected.

21.5 Measures to avoid, remedy or mitigate potential adverse effects on terrestrial ecology

21.5.1 Vegetation and terrestrial habitat loss

The Project will result in the permanent loss of 40ha of indigenous terrestrial vegetation and habitat. Potentially, an additional 80ha of indigenous vegetation will be temporarily lost due to construction activities, such as earthworks, but will be mitigated.

Considerable effort has been put into trying to limit the total vegetation loss associated with the Project. Some further avoidance of specific sites may be achievable through detailed design:

- Rowans Bush (KCDC Ecosite 139) in the Wainui Catchment;
- the various coastal kohekohe remnants in the Te Puka Catchment (KCDC Ecosites K223-229);
- the Akatarawa - Whakatikei Regional Forest Park;
- the Transmission Gully Riparian Area (PCC Ecosite 199);
- Tawa remnants within Cannons Creek Bush (PP12) in the vicinity of the Cannons Creek Bridge; and
- Porirua Park Bush (PCC Ecosite 76).

However, the loss of mature and maturing native forests and of advanced regenerating native bush and scrub, which is relatively uncommon with the highly modified landscape of the study area, requires mitigation. Further, these plant communities provide habitat for most of the species of indigenous fauna of conservation concern that have been located during this study, and the loss of this habitat also needs to be mitigated.

21.5.1.1 Approach to terrestrial habitat mitigation

When considering how effects on terrestrial habitats will be managed it should be recognised that some degree of terrestrial habitat loss cannot be avoided completely (although every effort has been undertaken to reduce the degree of loss). The philosophy for the mitigation of adverse effects on terrestrial habitat is that across the entire Project area there will be no net loss of terrestrial habitat.

There is no national standard or guidance for the calculation of mitigation required for vegetation loss. A commonly used method is to apply environmental compensation ratios (ECR) to provide new vegetation with an ecological value as close as possible to the vegetation removed.

It is considered that a total of 250ha of revegetation will be required to mitigate the vegetation loss. This is based on the ECRs shown in Table 21.4.

Table 21.4: Mitigation for vegetation loss

Habitat type	Potential loss of native vegetation (ha)	ECR	Required mitigation area (ha)
Wetlands	2	3	6
Shrublands in pasture dominated by tauhinu	50	1	50
Kanuka scrub and low forest	10	2	20
Regenerating native forest (Mahoe)	37	3	111
Mature native forest (tawa, kohekohe)	21	3	63
TOTAL	**120**		**250**

This figure of 250ha is very conservative in that it assumes that all vegetation within the proposed designation will be lost which is extremely unlikely. Based on the ECRs and the planting areas required for mitigation, four types of terrestrial restoration treatments are proposed:

- **Terrestrial revegetation**: standard mass planting, typically in pasture, and using native pioneer species (e.g. tauhinu, cottonwood, Coprosma, Hebe, kanuka, Pittosporum's, ngaio), with some future canopy species interspersed.
- **Riparian revegetation**: as above but using rapid growing and strongly rooted species suited to riparian environments (e.g. toetoe, flax, kowhai, cabbage tree, tutu, kohuhu, wineberry), with some future canopy species interspersed (e.g. kahikatea, pukatea, swamp maire). The objective is to restore a forest canopy to streams that are revegetated.
- **Enrichment planting**: typically where there is already regeneration of open shrublands that can provide a nursery. Planting will be of future canopy species (e.g. rewarewa, titoki, kohekohe, pigeonwood, tawa, and podocarps).
- **Retirement**: typically where natural regeneration has progressed to the point that additional planting is not required. The activities associated with this are fencing and pest control.

The evaluation of potential mitigation area is detailed in **Appendix 11.G**. The sites are listed in **Appendices 11.H and 11.I** and shown on the maps in **Appendix 11.J**. The total planting areas proposed are summarised in Table 21.5.

Table 21.5: Mitigation planting for terrestrial vegetation loss

Planting type	Area (ha)
Existing Benefit (early retirement planting)	31
Revegetation Area (proposed)	53
Enrichment Area (proposed)	187
Retirement and Protection (proposed)	155
TOTAL	**426**

It can be seen that the proposed 426ha of mitigation planting is well in excess of the 250ha required using the applied ECRs. This is largely because the proposed planting for the mitigation of terrestrial vegetation loss will also provide riparian mitigation in many instances. This is discussed in relation to potential effects on freshwater ecology in Chapter 22.

With the proposed planting mitigation areas the adverse effects on vegetation and terrestrial habitat will be adequately mitigated. In the long-term there will be a net gain (and hence positive effect) in terms of terrestrial habitat across the Project area.

21.5.1.2 Terrestrial invertebrates

Potential effects on peripatus can be mitigated by translocation of logs and debris in pasture along the route immediately prior to vegetation clearance / construction. These habitats are easily identified and can be moved by hand or small vehicle to the edge of suitable vegetation adjacent to the clearance line.

21.5.1.3 Lizards

Logs and debris will be relocated as part of pre-construction site inspections (combined with peripatus search). Logs will be moved to the edge of suitable vegetation or restoration plantings. Logs can be left whole or cut into slabs to be placed around the edge of planted areas – these can be incorporated into planting plans for restoration sites. The rotting timbers then provide shelter for lizards, as well as habitats for invertebrates on which they feed.

Boulderfields within the Te Puka and Horokiri can also be searched prior to earthworks and any animals trapped and translocated to nearby safe habitats.

21.5.1.4 Bats

While the presence of bats around the Wainui Saddle has not been confirmed, if they are found to be present there is a low risk that they could be adversely affected by the operation of the Project (being struck by road traffic). In part this potential effect will be mitigated by the additional terrestrial habitat being provided. Further investigations to seek to confirm the presence or absence of bats are proposed and if they are found to be present then monitoring of potential impacts on any population is also proposed. This is included as part of the proposed monitoring in the draft EMMP. If bat mortalities are observed during monitoring, mitigation options would be investigated.

22. Freshwater ecology

Overview

The Project involves works in nine separate catchments across three watersheds. The streams in these catchments provide varying qualities of habitat for freshwater species, although all are in heavily modified catchments and the habitat values and species composition are reflective of this.

During construction, sediment runoff from the large-scale earthworks has the potential to adversely affect freshwater habitats and species. A high level of erosion and sediment control is proposed and based on sediment modelling, levels of sediment entering streams during normal conditions are predicted to be low and the ecological impact of this is considered negligible. As currently occurs, during, and immediately after high rainfall events, sediment levels in streams will rise. During the construction period the additional earthworks area for the Project will increase sediment levels in streams between 1 and 30% (in a Q2 event). Given the current experience this is not considered to be ecologically significant because:

- freshwater species in these streams are currently able to tolerate temporary increases in sediment levels higher than this; and
- by definition, these events coincide with increased stream flows and the hydraulically active nature of the streams (e.g. they are in relatively steep terrain) means that sediment is rapidly transported downstream, rather than being deposited on stream beds (were greatest effect occurs).

The long term operation of the Project will require the modification of streams in eight of the nine catchments. Primarily this modification is the construction of culverts and bridges and the re-alignment of parts of streams as part of the hydraulic design of the Project. While considerable efforts have been made to reduce the degree of modification to streams (as discussed in Chapter 9), it cannot be avoided completely. The adverse effects on freshwater ecology resulting from stream works can be offset by restoring and protecting streams to ensure an overall remediation and mitigation of the loss of freshwater habitat. In total, approximately 10.5km of stream habitat will be affected (through stream realignment and / or armouring) and this will require the restoration and protection of approximately 26.5km of streams to mitigate for this. As part of the overall mitigation package of the Project, approximately 31km of streams will actually be restored and protected, meaning the Project will result in a net gain in freshwater habitat quality and a balance in freshwater habitat quantity, across the Project area. This positive effect will be on-going and expanding as the wider catchment areas retired from pasture (predominantly in the Te Puka and Horokiri catchment) are planted in native vegetation.

Stormwater runoff from the road surfaces will be treated to a high standard (as discussed in Chapter 20) and will have negligible, if any, impacts on freshwater ecology against the anticipated background contaminant loading.

22.1 Introduction

This chapter presents the findings of investigations undertaken to determine the likely effects of the Project on freshwater ecology.

Information about existing freshwater ecology was obtained from ecological databases and previous relevant studies. Ecological field investigations were also undertaken specifically for the Project. Once a baseline of freshwater ecology had been determined, the impacts of the construction and operation of the Project were assessed. This first assessment stage was undertaken without the application of any specific ecological mitigation. The Project ecologists worked closely with the design team to seek to avoid adverse ecological effects where possible. Where avoidance was not possible and effects were more than negligible, ecological mitigation was then developed to mitigate those adverse effects.

The final assessment stage considered the likely environmental effects with the application of the proposed mitigation.

22.2 Ecological investigations

The identification of effects on freshwater ecology required the assessment of the composition and values of the existing aquatic ecosystems. This relied on two complementary methods:

- desktop studies of available relevant information such as ecological databases, publications and previous ecological investigations; and
- field surveys.

The description of existing freshwater ecology given in this section includes a brief overview of the investigations undertaken. Further details on the methods used and findings of these investigations are contained in the report on freshwater habitats and species: Description and values (**Technical Report 9**).

22.3 Existing freshwater ecosystem

22.3.1 Freshwater habitat

Freshwater habitat is considered to be streams with permanent or intermittent flows which have the capacity to provide aquatic habitat. It did not in this case include ephemeral streams, seepages or overland flow paths. This section provides a description of the physical characteristics of the seven different freshwater habitats[126].

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126. An assessment of the physical habitat of the Whareroa Stream was not part of the field investigations due to fact that there are no stream works (i.e. stream crossing and/or realignments) proposed. However, the potential effects from construction (chemically treated sediment laden water) and operation (treated stormwater) have been considered and are covered later in this chapter. Collins Stream was assessed as part of the Pauatahanui Stream.

22.3.1.1 Te Puka / Wainui Stream

In its headwaters in the Wainui Saddle area, the Te Puka Stream is a poorly defined cobble and boulder base stream under a full forest canopy (the true right branch) or a narrow channelised, intermittent creek (true left branch). The larger perennial true right branch represents a very natural aquatic habitat type with sub-surface flows, appropriate organic matter and complex and simple habitat areas (Figure 22.1).

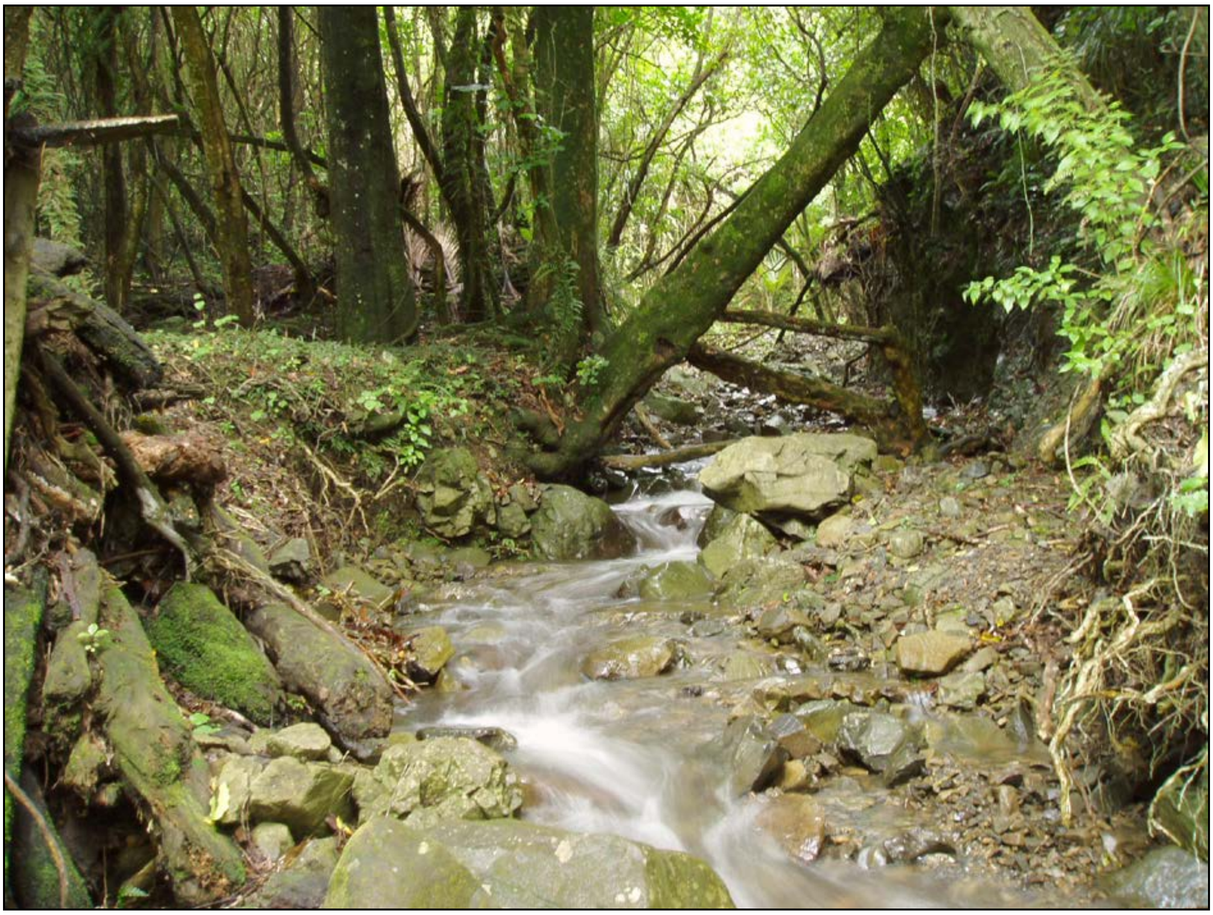

Figure 22.1: Upper Te Puka Stream

These are ideal habitat for koaro and banded kokopu but less so for shortjaw kokopu. Riffle habitat makes up around 40% of the aquatic habitat with cascades, stepped riffles, and stepped pools making up the remaining general aquatic habitat types. All represent relatively shallow “fast” water habitat.

The middle and lower reaches of the stream drop out of forest into pastoral farmland (Figure 22.2). These reaches are semi-braided with a relatively undefined channel set in wide banks.

Figure 22.2: Mid Te Puka Stream

22.3.1.2 Horokiri Stream

The upper western tributaries of the Horokiri are largely in rough pasture and many are ephemeral. The larger, eastern tributaries are perennial and lie in native regenerating shrublands and forest. While the water is clear and the substrate cobble relatively clean, the riparian areas of the main stem are largely in exotic pasture species and are unprotected from stock (Figure 22.3).

Figure 22.3: Upper Horokiri Stream

The middle and lower-middle reach is deeply incised with native herbs and grasses on the steep, high banks and pastoral grasses on the bank tops (Figure 22.4). The water generally runs clear in a wide deep set channel as a shallow run and riffle system.

Figure 22.4: Mid Horokiri Stream, with gorse covered riparian margins

The lowest reaches are much flatter and the stream is larger and deeper with frequent pools and long runs. Here, the water is often slightly coloured by sediment, and sands and sediment are common on the benthos. The banks are largely exotic and mixed weeds (willow), shrubs and grasses.

22.3.1.3 Ration Stream

This is a generally flatter catchment than the others in the Project area. The majority of the upper reaches are in beef and sheep pasture, the middle reach in plantation forestry and the lower reaches in life style farming.

Water in this system is not always flowing and often only found underneath long grass swards and wetland plants. An open channel with water flow is only obvious in the middle to lower reaches (Figure 22.5) under pine plantation or through the farmlands near the inlet.

Figure 22.5: Mid Ration Stream with low flows and bank modification, running though the Pauatahanui golf course

22.3.1.4 Pauatahanui Stream

The upper catchment area has pockets of bush and shrubland, the middle and lower catchment is largely in exotic shelter belts and pasture. The middle and upper reaches were not investigated by field work.

Typically the riparian areas are in rough pasture, pasture weeds and mixed exotic trees (willow being common) and in general there is a strong vegetative riparian cover in the middle and upper reaches. Generally the banks are unprotected and stock has free access to most areas.

The lower reaches, prior to discharge into the Pauatahanui Inlet, are wide and relatively deep with sand, gravel and small cobble reaches typical of lowland streams. Over-hanging willows are associated with pools and deep runs (Figure 22.6).

Figure 22.6: Lower Pauatahanui Stream

22.3.1.5 Duck Creek

The upper catchment is generally in pasture, with the headwaters (four or five tributaries) lying in scattered riparian native shrubland and pasture. The catchment contributing to the middle-lower section is in plantation forest. Approximately half the catchment is in steep to very-steep pastoral land with the other half being in forestry.

In many lower and middle reach areas the stream has good in-stream habitat and varied riparian and wetland edge habitat. However, the upper stream is currently modified through three perched culverts which prevent continuous upstream fish passage (Figure 22.7).

Figure 22.7: One of the existing perched culverts (acting as barriers to fish passage) in Duck Creek

22.3.1.6 Kenepuru Stream

While the majority of the catchment is urbanised, the upper reaches contain some pastoral and scrub areas. Its headwaters (a tributary of Kenepuru Stream known as Cannons Creek) lie in Belmont Regional Park and the stream descends through farmland and regenerating bush for 3.6km until it joins Kenepuru Stream. For approximately 1.4km Cannons Creek flows in a concrete-lined channel before dropping steeply down a series of large stepped concrete structures to join Kenepuru Stream. Kenepuru Stream eventually enters Porirua Harbour approximately 3.0km from the Cannons Creek Lakes Reserve.

22.3.1.7 Porirua Stream

The proposed alignment traverses the top end (head water) of an un-named tributary of Porirua Stream. This short steep tributary is intermittent but has a good cover of indigenous secondary forest (dominated by mahoe) below the road alignment within the gully.

Figure 22.8: Un- named tributary of Porirua Stream

Downstream of the mahoe gorge, it is surrounded by the pine forest plantation that covers the majority of the sub-catchment of this tributary.

22.3.1.8 Water quality

As discussed in Chapter 20, the water quality data illustrates that several catchments have heavy metal issues and that most catchments currently have nutrient enrichment. The catchments with the highest levels of contamination (copper and / or zinc) are Porirua, Kenepuru, Duck, Pauatahanui, Ration and Horokiri. In terms of dissolved contaminants (which are of greater relevance to freshwater ecology), only the Kenepuru catchment has notable high dissolved copper contaminant levels. Again, it is the Kenepuru and Pauatahanui catchments that have the greatest nutrient enrichment.

The total suspended solids (TSS) data gathered suggests that all of the streams in the Project area experience a number of raised TSS conditions throughout each year. In the Horokiri Stream, TSS levels can be very elevated (greater than 1000 g/m^3) and elevated quite frequently, whereas in other catchments levels are more typically in the range of 50-100 g/m^3 during rain events.

22.3.2 Freshwater fish species

Freshwater fish species in six[127] catchments within the Project area were investigated. The Freshwater Fisheries Database (FFDB) recorded 17 species of fish. Four of these species (smelt, flounder, mullet and triple fin) are more frequently caught in tidal reaches and are typical of the lower reaches of streams.

Electric fish surveying (EFM) recorded nine of the remaining 13 species listed in the FFDB. Those not found were lamprey, torrent fish, shortjaw kokopu and giant bully. The freshwater fish species recorded in the study area catchments are shown in Table 22.1.

Table 22.1: Freshwater fish species in streams in the Project area

Fish	Recorded on FFDB						Threat status	Found in EFM sampling
	Te Puka	Horokiri	Ration	Pauatahanui	Duck	Kenepuru		
Lamprey		✓		✓			Declining	
Short fin eel	✓	✓		✓			Not threatened	✓
Long fin eel	✓	✓		✓			Declining	✓
Koaro	✓	✓		✓			Declining	✓
Inanga		✓		✓			Declining	✓
Giant kokopu		✓		✓			Declining	✓
Short jaw kokopu		✓					Declining	
Banded kokopu	✓	✓		✓			Not threatened	✓
Red-finned bully	✓	✓		✓			Declining	✓
Common bully		✓		✓			Not threatened	✓
Giant bully		✓					Not threatened	
Torrent fish		✓					Declining	
Brown trout[128]							Introduced	✓

Based on the FFDB and the EFM undertaken as part of the field investigations, the two species of eel and red fin bully are the most frequently encountered freshwater fish in streams in the Project area. Lamprey, torrent fish, shortjaw kokopu and giant bully are infrequently found (that is, in less than 1% of records) or may not now be present (only one shortjaw kokopu has been recorded, 1987).

127. Whareroa Stream was not included as there are no physical works in this stream. Collins Stream is very small with insufficient water to sample, and access to upper Ration Stream was not attained. Porirua Stream was investigated but had insufficient water to fish.

128. Brown trout were recorded on the FFBD, and reported in historic literature but not sampled in the field work of 2009-2011 sampling.

22.3.3 Aquatic macroinvertebrates

Aquatic macroinvertebrates encompass a wide range of species, including many insects, crayfish and clams. The diversity, or species richness, of aquatic macroinvertebrates provides an indication of the overall quality of aquatic habitats.

Two indicators of quality were used:

- EPT taxa richness; and
- Macroinvertebrate community indices (MCI & QMCI).

EPT provides information about the richness of Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa. This is recorded as a percentage of a community that is EPT as an indicator of overall quality of the community. A higher ratio typically indicates a higher quality of aquatic habitat.

MCI and QMCI consider the whole macroinvertebrate population structure and provide a score that indicates general water quality. Generally, an MCI score of less than 80 indicates poor water quality and a score of greater than 119 indicates excellent water quality, and an QMCI score of >6 indicates an excellent water habitat condition.

Table 22.2: MCI & QMCI score classification meanings[129]

Quality class	Stark (1998) description	MCI	QMCI
Excellent	Clean	>120	>6.0
Good	Possible mild pollution	100-120	5-6
Fair	Probable moderate pollution	80-100	4-5
Poor	Probable severe pollution	<80	<4

22.3.3.1 EPT results

In total, 81 different aquatic macroinvertebrate taxa[130] were sampled from the catchments in the Project area. All sample sites have over 10 EPT taxa and a typical range of between 15 and 20 taxa with five stream sites having over 25 EPT taxa. For most sites in the Project area, over 50% of the community's species belong to one of the three EPT groups, as shown in Figure 22.9.

129. Stark and Maxted. 2004. Macroinvertebrate Community Indices for Auckland Soft-bottomed Streams. ARC Technical publication 303

130. 'Taxa' (plural of taxon) refers to a group (i.e. one or more) of organisms.

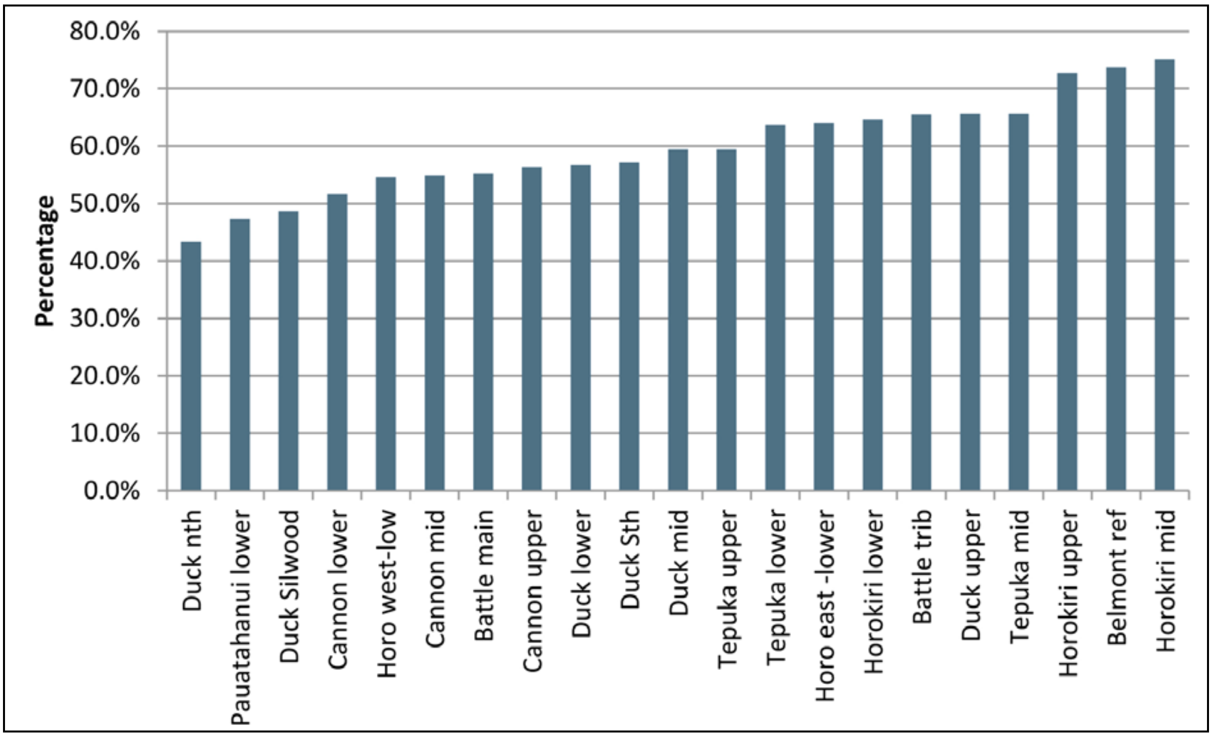

Figure 22.9: The proportion that the EPT taxa makeup of the total taxa present at each site

The lowland sites of Duck Creek and Pauatahanui were the only sampled sites that have less than 50% EPT representation. Two project sites (Horokiri middle and Horokiri upper) and one of the reference sites (Belmont Stream) have over 70% of the taxa present belonging to the EPT groups.

There is also a positive trend of increasing EPT representation in the fauna from lowland to upland reaches, indicating a higher species richness (and freshwater habitat) in upper reaches.

22.3.3.2 MCI and QMCI results

The MCI results are shown in Figure 22.10.

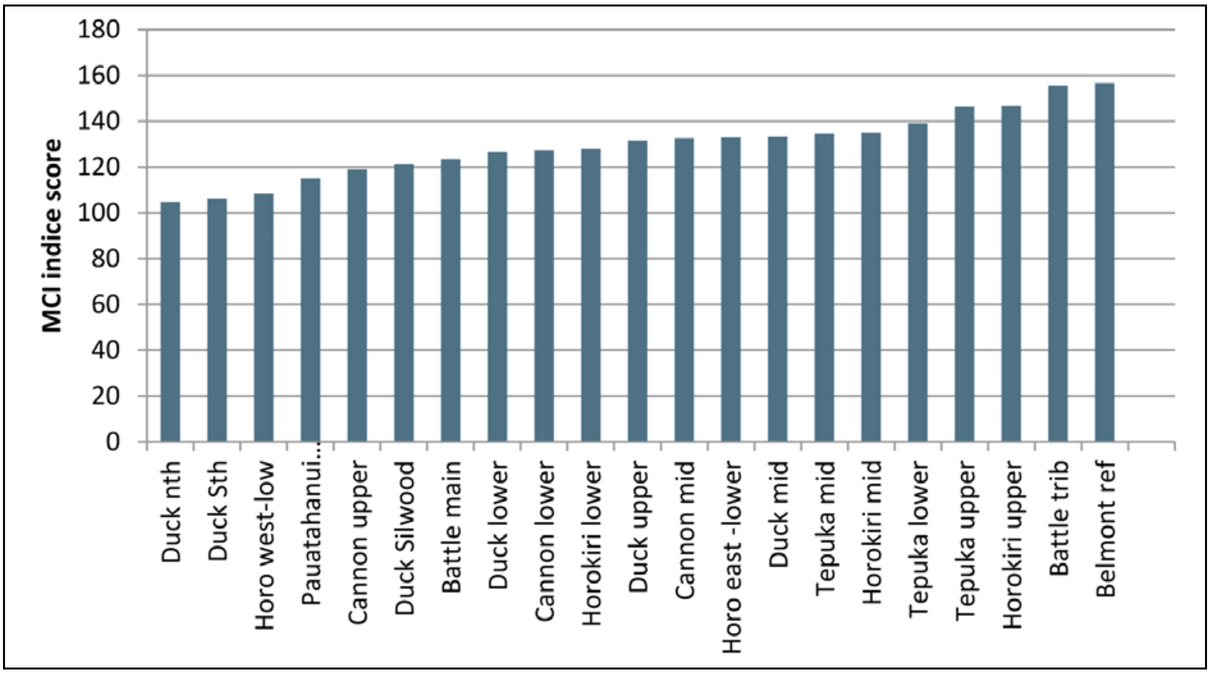

Figure 22.10: MCI results for streams in the Project area

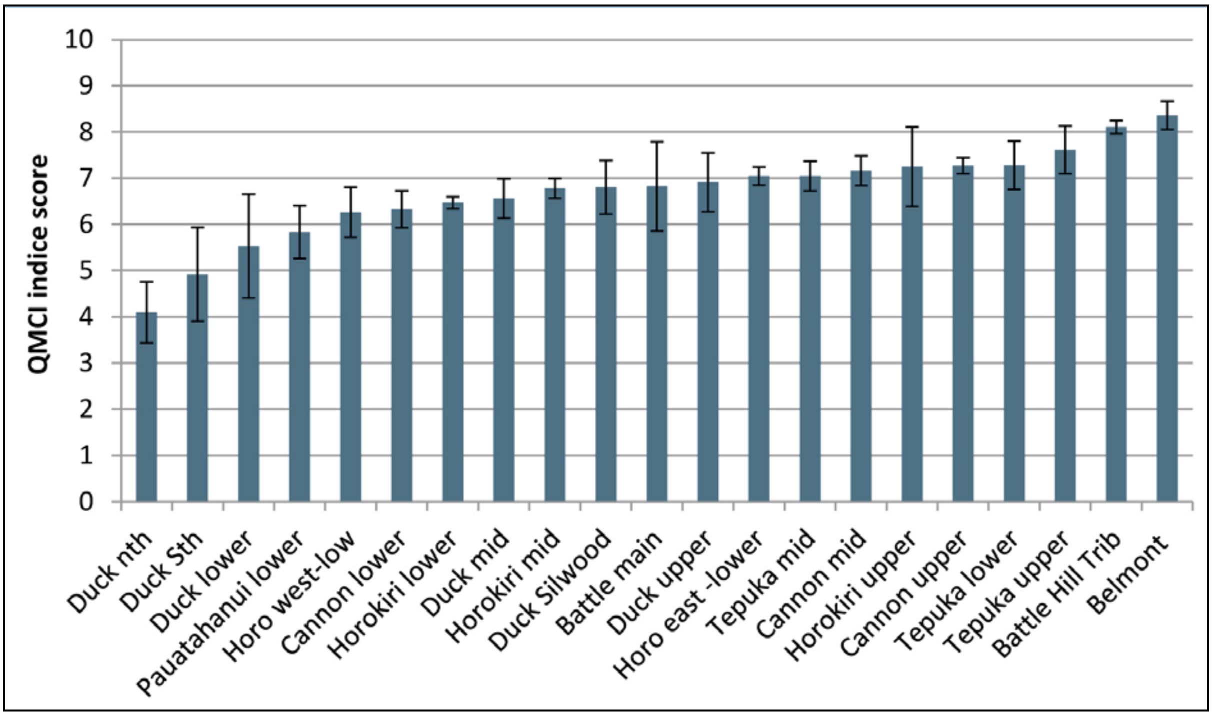

Figure 22.11: QMCI results for streams in the Project area

The results indicate that all the streams are 'good' or 'excellent' in terms of their MCI & QMCI scores. Other general conclusions are that Te Puka and the mid and upper Horokiri stand out as having some of the highest scores (discounting a tributary in Battle Hill Farm Forest Park).

The other main conclusion is that MCI and SQMCI scores for all streams tend to decrease in the lower reaches of the stream. This is consistent with the general trend of increased levels of contamination and softer substrate prominence in lower reaches.

22.3.4 Summary of freshwater habitat value

Based on the ecological investigations considering both freshwater habitat and species, the following overall conclusions can be made:

- The streams sampled generally have high fisheries values with Horokiri Stream identified as having very high regional values and Duck Creek having high regional values.
- The eastern tributaries of the Te Puka and Horokiri Streams have their headwaters in native forest and have high habitat values. The western tributaries lie predominantly in pasture and have lower habitat values.

Table 22.3 provides an overall summary of the ecological value of the relevant streams.

Table 22.3: Ecological value of streams in the Project area

Stream reach	Physical habitat (SEV)	Fish	Aquatic invertebrates	Compilation and result
High value stream habitat				
Upper Te Puka	High	Moderate	High	High
Lower-middle Te Puka	High	Low	High	High
Middle Horokiri (East)	Moderate	High	High	High
Lower Horokiri (East)	Moderate	High	High	High
Upper-middle Duck	High	Low	High	High
Middle Duck	Moderate	High	High	High
Moderate value stream habitat				
Upper Horokiri (East)	Moderate	Moderate	High	Moderate
Lower Pauatahanui	Low	High	Moderate	Moderate
Lower Duck	Moderate	High	Moderate	Moderate
Upper Kenepuru (Cannons)	Moderate	Moderate	High	Moderate
Low value stream habitat				
Middle Ration	Low	Low	Low	Low
Lower Ration	Low	Moderate	Low	Low
Porirua tributary (Linden)	Low	Low	Low	Low

22.4 Assessment of construction effects on freshwater ecology

22.4.1 Freshwater habitat degradation and loss

The main construction activities that have the potential to effect freshwater habitat and species are construction works in stream beds which could degrade habitat through physical disturbance and / or the increase of contaminants (mainly sediment) into the water column and eventually the stream bed. In addition permanent diversions cause the infilling and loss of habitat reaches (albeit with recreation of new habitat).

22.4.1.1 Physical habitat disturbance

Works in streams (such as the construction of bridges and culverts) have the potential to disturb freshwater species, both through direct physical disturbance and the disturbance of sediment on stream beds. This effect can be adequately managed to minimise habitat disturbance so that species are not significantly affected.

Streamworks will not be undertaken in wetted channels and temporary upstream diversions will be put in place prior to works starting in the natural channel. Where necessary, fish will be captured and transferred to alternative sites prior to the commencement of streamworks.

22.4.1.2 Temporary culverts for construction access

The construction of the access track will require the installation of approximately 61 temporary culverts which will be in place for up to two years. Many of these will only be in ephemeral water bodies. Due to the temporary nature and small scale of these culverts, any potential adverse effects on freshwater ecology are considered to be minor.

Any damage to streams bank or riparian vegetation will be remediated after the culverts have been removed.

22.4.1.3 Sediment from earthworks

The main potential effect during construction that could have significant adverse effects on freshwater ecosystems is increased levels of sediment entering waterways from the large scale earthworks required for the Project. While a level of sediment is required for the healthy function of freshwater ecosystems, too much sediment can adversely affect ecosystems.

The possible adverse effects of too much sediment on species could include:

- smothering of species living of the streambed;
- interference with the gills of fish and invertebrates;
- increased sediment in the water column can reduce periphyton growth levels which provide food for many freshwater species; and

- changes in the visual clarity of water can affect the ability of fish to see their prey.

The level of sediment in the water column is indicated by the turbidity of the water which is measured in units known as NTU[131]. There is no standard for trigger levels of NTU in relation to freshwater habitats as it can be very ecosystems and species specific. However, the Project ecologists have identified that figures of around 20 – 25 NTU can be considered as 'warning' (but not damaging) levels. Table 22.4 shows the recorded turbidity levels for some of the affected streams, with all of these streams having median turbidity levels well below the 20 – 25 NTU 'warning' level.

Table 22.4: Average turbidity levels of selected streams

Stream	Turbidity (NTU)	
	Mean	Median
Duck	8.9	7.3
Horokiri (Upper)	12.2	4.2
Horokiri (Lower)	13.6	5.7
Pauatahanui	24.3	2.8

The erosion and sediment control philosophy to reduce and manage sediment from the earthworks was discussed in Chapter 20. Based on the assumed performance of the proposed erosion and sediment and sediment control (*ESC*) measures, sediment yield increases for streams has been estimated and used as a basis for considering the potential effects on freshwater ecosystems.

Under regular conditions (i.e. not at Q2 or above rainfall event) erosions and sediment control measures are expected to control and minimise the volume of sediment entering streams to such an extent that negligible (if any) adverse effects on freshwater ecology are predicted.

Storm events have the potential to result in more significant increases of sediment to waterways and ESC measures have an upper limit of effectiveness in these events. In general terms, a high rainfall event is likely to generate more sediment that could enter streams and hence adversely affect freshwater species through streambed deposition. Table 22.5 shows predicted sediment increases in the various catchments for Q2 and Q10 events.

Table 22.5: Sediment yield estimates during construction for storm events (with mitigation)

Catchment	Increase in sediment (%) from base line	
	Q2 event	Q10 event
Kenepuru	10	10
Duck	27	27
Porirua	2	2
Ration	43	43
Horokiri	14	14
Pauatahanui	2	2
Whareroa	5	5
Wainui / Te Puka	29	29

131. Nephelometric turbidity units

Modelling of the potential increase as a result of construction (with mitigation) is between 2% and 43% in a Q10 event. This varies from catchment to catchment depending on the underlying geology, soil, slope, land use and vegetation cover and proximity to the waterway.

Baseline sediment deposition in stream has also been modelled and (due to gradient) virtually no deposition changes result. The exceptions to this are in the Ration and Whareroa, two low gradient streams.

For the following assessment it is considered that a Q50 event is beyond the scope of any sediment management tools, and will result in such severe erosion within the affected catchments that the contribution from the construction site will be only a small proportion of the overall adverse catchment effect.

For a Q2 or Q10 event it can be expected that up to a 29% increase in sediment in most of the streams would occur. In Ration Stream the predicted increase is higher than other streams because of its low gradient.

Around 29% increase is the highest expected increase other than in the Ration Stream and in many streams this will be less (<20%). In these catchments rain events of these sizes currently cause an increase in sediment into the streams due to much of the catchments being in farmland. Those increases currently can be considerably more than 20% on top of the background (i.e. hundreds to thousands of NTU[132]).

Currently, temporary increases in turbidity following these events appear to cause few negative effects on freshwater ecosystems. The likely reasons for this is that the species present have a relatively good tolerance of these types of events and are able to withstand short (less than three days) exposure to elevated sediment levels. Furthermore, by definition such events coincide with increases in stream flows and most of the affected streams are hydraulically active meaning sediment is kept in suspension and transported downstream relatively quickly rather than staying in the water column or being deposited in the stream bed.

As such, while the earthworks required for the Project will result in additional sediment entering streams and being deposited on streambeds, the ecological effects of this, both in regular conditions and immediately following high rainfall events, is considered to be limited and within acceptable levels.

22.4.2 Discharge of other contaminants to streams

Other than the sediment entering streams, other general construction activities could potentially result in other contaminants entering streams such as fuel and oil from machinery. The likelihood of these substances entering streams is very low as the CEMP has procedures to avoid this, such as requiring all refuelling to be done well away from streams. It also contains procedures for accidental spills.

132. There is roughly a linear relationship between NTU and TSS up to 500.

A limited number of contaminated land sites have been identified but the CLMP contains procedures for how potential adverse effects of contaminated material can be managed and these sites do not pose a threat to streams.

22.5 Assessment of operational effects on freshwater ecology

There are two main potential long-term effects from the on-going operation of the Project:

- freshwater habitat modification resulting from the required realignment of sections of some streams; and
- stormwater runoff from road surfaces entering streams,

22.5.1 Freshwater habitat modification

The Project will result in the permanent modification (to varying degrees) of streams (and their tributaries) in all catchments except the Whareroa.

The modification of streams will result from the following aspects Project:

- permanent culverts and bridges; and
- permanent channel realignment (as part of the hydraulic design).

As discussed previously (particularly in relation to the road alignment through the upper Horokiri Stream valley), a consideration in the design of the Project has been the minimisation of stream modification (and hence potential effects on freshwater habitats). However, while considerable efforts have been made to minimise the level of modifications required, the location and scale of the Project means that some stream modification is unavoidable.

From a hydraulic and ecological perspective, the function of modified streams must be undertaken on a catchment-wide basis. That is, individual culverts and diversions cannot be considered in isolation but as part of the wide package of streamworks within the catchment.

In general terms the types of effects that can result from the streamworks proposed could include:

- loss of stream length (i.e. physical habitat);
- changes to flow regimes (water volumes and velocities);
- loss of riparian vegetation which can influence habitat characteristics such as water temperature and the quality of spawning habitat;
- impediments to fish passage (e.g. by culverts);

Table 22.6 gives an indication of the total stream modification for the Project as a result of culverting and channel realignment.

Table 22.6: Magnitude of freshwater habitat loss and modification (without any mitigation)

Stream	Ecological value[133]	Total length of stream habitat in catchment (m)	Length of stream lost or modified (m)	Loss or modification as % of total	Impact magnitude
High value stream habitat					
Upper and mid Te Puka	High	9,786	2,496	26	Very high
Middle and Lower Horokiri East	High	5,083	1,109	22	Very high
Upper and middle Duck	High	14,154	832	6	Moderate
Moderate value stream habitat					
Lower Te Puka / Wainui	Moderate	3,333	651	20	Moderate
Upper Horokiri East	Moderate	17,335	828	5	Low
Lower Duck	Moderate	5,562	0	0	None
Lower Pauatahanui	Moderate	149,029	1,374	1	Low
Upper Kenepuru (Cannons)	Moderate	19,944	274	1	Low
Lower value stream habitat					
Ration Stream	Low	19,442	2,147	11	Very low
Porirua (tributaries in Ranui Heights)	Low	57,483	707	1	Very low
TOTAL	**10,418**	**301,151**	-	-	-

The magnitude of habitat loss and modification is greatest in the Te Puka and Horokiri Streams. Based on the ecological values of the stream and the degree of modification, the impact magnitude (without mitigation) is considered to be very high for upper and mid Te Puka and mid and lower Horokiri east Streams. It is considered to be moderate for the Upper and Middle Duck and the Lower Te Puka / Wainui. It is considered to be low, very low or negligible for all other streams.

22.5.1.1 Approach to freshwater habitat mitigation

When considering how effects on freshwater habitats will be managed it is useful to first acknowledge that the effects of permanent stream realignment cannot be avoided completely (although every effort has been undertaken to reduce the scale of modification) or remedied (as the re-alignment will be permanent). As such, management options have necessarily focused on how potential effects can best be mitigated.

133. The ecological values assigned to streams within the Project area have been derived from field observations and analysis by the Project ecologist specifically for the Project. These values do not entirely align with those values assigned to them in the Regional Freshwater Plan for the Wellington Region 2000. The key differences are that the Project ecologists consider that Te Puka Stream and Duck Creek have higher ecological values than they have been assigned in the RFWP, while Ration Stream has lower values than it has been assigned. This is discussed further in relation to the approach to freshwater habitat mitigation.

The philosophy for the mitigation of adverse effects on freshwater habitat is that across the entire Project area there will be no net loss of the quality (i.e. the life-supporting capacity) of freshwater habitat as a result of the Project. In some catchments there will be a small net loss in terms of quantity (i.e. stream length), but in other catchment these will be a substantial gain in quality. Overall, there will be a net gain in the quality freshwater habitat as a result of the Project.

The stream ecological valuation (SEV) method has been used in order to quantify and then to assist in balancing the effects of the project on the values of watercourses (in quality and quantity terms). One of the advantages of using the SEV method is that it takes into account the different ecological functional values of streams. For the Project, these values have been derived from ecological investigations, rather than just their significance in planning documents. This has meant that all the streams affected by the Project have been treated consistently. In order to mitigate for effects on watercourses only ecological mitigation has been offered (i.e. there is no consideration of amenity benefits etc.).

22.5.1.2 Development of mitigation using the stream ecological valuation method

The SEV method is a tool used to quantify the ecological value and performance of streams. It can also specifically be used to determine the mitigation required to compensate (or mitigate) adverse effects on streams. It is increasingly being used in New Zealand, including being adopted by the Auckland Regional Council in 2007 as a best practice method for providing environmental compensation for adverse effects on streams[134].

The methodology for using SEV is outlined in **Technical Report 11**, but broadly it involves:

- assessing the ecological value of the affected streams;
- determining the extent of effect (e.g. stream loss etc.) for each type of habitat (e.g. perennial, ephemeral etc.);
- determining the environmental compensation ratio (ECR) for each type of habitat;
- calculating the quantity of each habitat needed to compensate for the loss by multiplying the habitat loss by the ECR; and
- it does have a weakness in not weighting threatened species and in only using faunal presence / absence.

Seven types of habitat modification (with the following ECR in brackets) were identified:

- culvert steep (4.1);
- culvert flat (2.2);
- culvert armouring (1.7);
- culvert stream loss (6.0);

134. ARC, 2008: Stormwater and Sediment Field Day, Auckland Botanic Gardens 2008, Stream Ecological Valuation (SEV).

- diversion length (1.7);
- diversion armouring (1.7); and
- diversion stream loss (6.0).

The highest ECRs (i.e. 6.0) are for stream loss, whereas modification (e.g. armouring) has a lower ERC.

The ECR were derived by using Te Puka and Horokiri Streams and Duck Creek as templates as there will be a high degree of modification in those catchments. As such, the ECR derived (and applied across the entire Project area) are conservative (in that they will tend to require that the Project provides more habitat mitigation than may be strictly necessary under the SEV approach).

An ECR was also derived for the removal of existing barriers to fish passage (three perched culverts) on Duck Creek, which is work that the NZTA also proposes to undertake, not directly required by the Project. Removal of these barriers as part of the Project will improve the freshwater habitat in Duck Creek (by providing fish with access to additional habitat) and has therefore been assigned an ECR of -1.5 (the negative value indicating the improved habitat as a benefit which can be subtracted from the overall length required for compensation).

Based on the different types of freshwater habitat affected and the ECRs, the total compensation required is set out in Table 22.7.

Table 22.7: Calculation of freshwater habitat compensation required

Scenario effect	Affected length (linear m)	ECR Ratio	Calculated compensation required (linear m)
Culvert steep	409	4.1	1,677
Culvert flat	3,208	2.2	7,058
Culvert armouring	860	1.7	1,462
Culvert stream loss	809	6.0	4,854
Diversion length	4,039	1.7	7,029
Diversion armouring	500	1.7	870
Diversion stream loss	593	6.0	3,555
TOTAL	**10,418**		**26,504**

In essence, using the SEV method with the calculated ECRs, the loss and / or modification of approximately 10.5km of existing stream requires the restoration and protection of approximately 26.5km of stream to compensate for the loss of habitat value.

In this context, restoration and protection refers to:

- the retirement from pasture and planting of native vegetation on land in stream catchments;
- the exclusion of stock from streams and tributaries which currently have unrestricted stock access; and
- the removal of existing barriers to fish passage (i.e. the perched culverts in Duck Creek).

The majority of the offset mitigation for freshwater habitat involves pasture retirement and the planting of native vegetation. While some of this has already be done (as advanced mitigation planting as a condition of the existing designations for the Project), most of this planting will be new. This planting is similar to that required for the mitigation of terrestrial vegetation loss (described in Chapter 21) but focused in the riparian zone of the streams. The area associated with the riparian zone has not also been counted in terms of the terrestrial vegetation offsetting mitigation.

The total planting required to compensate for both the terrestrial and freshwater habitat loss will restore and protect approximately 30km of streams, 3.5km more than the 26.5km that is necessary to offset the adverse effects of freshwater habitat loss. As such, in the long term there will be a net gain in the quality of healthy freshwater habitat within the Project area. This additional 3.5km of restored and protected stream is also useful in that it provides a comfortable margin of flexibility (i.e. small changes in exact diversion and culvert lengths will not require additional stream length to be provided for offset mitigation).

Overall, in the long term the Project will result in the improvement of freshwater habitat within the Project area.

22.5.1.3 Fish movement

Fish passage can be provided to all streams affected by the Project where native fish are known to be present. This will typically be provided using modified (e.g. wooden block added as in Figure 22.12) buried culverts.

Figure 22.12: Wooden blocks bolted to culvert to improve fish passage

In steeper culverts, fish ladders are likely to be required. An example of a fish ladder is shown in Figure 22.13.

Figure 22.13: Example of a fish ladder

One issue during operation is the continued maintenance of culverts and, their intakes and outlets, to ensure that bank erosion, debris deposition, and structural deterioration, are managed to maintain the conditions necessary for passage past these structures.

With on-going programmed monitoring and maintenance of culverts, the risk of adverse effects on fish passage from operation is negligible. Further details around monitoring and the on-going maintenance of fish passage are contained in the draft EMMP.

22.5.2 Stormwater runoff

The discharge to streams of treated stormwater from road surfaces has the potential to adversely affect freshwater habitat and species.

As discussed in Chapter 20, changes to contaminants entering streams from the operation of the Project are predicted to be relatively minimal. There will be no change in TSS, while there will be reasonably small changes (some catchment experiencing increases and some experiencing decreases) in zinc, copper and TPH.

Changes to zinc and copper (relative to ANZECC 95% ecological triggers) are shown in Table 22.8.

Table 22.8: Comparison of zinc and copper discharge in 2031, without Project and with Project (no stormwater treatment) relative to ANZECC 95% ecological triggers

Catchment (taken at mouth)	2031 without Project				2031 with Project (No treatment)			
	Total Zinc (g/m^3)	Trigger	Total Copper (g/m^3)	Trigger	Total Zinc (g/m^3)	Trigger	Total Copper (g/m^3)	Trigger
Horokiri	0.009	Fail	0.002	Fail	0.010	Fail	0.002	Fail
Pauatahanui	0.012	Fail	0.003	Fail	0.013	Fail	0.003	Fail
Porirua	0.069	Fail	0.010	Fail	0.069	Fail	0.011	Fail
Duck	0.038	Fail	0.004	Fail	0.042	Fail	0.005	Fail
Ration	0.005	Pass	0.001	Fail	0.008	Fail	0.002	Fail
Kenepuru	0.084	Fail	0.006	Fail	0.086	Fail	0.006	Fail
Te Puka	0.004	Pass	0.001	Fail	0.005	Pass	0.001	Fail
Whareroa	0.004	Pass	0.001	Fail	0.004	Pass	0.001	Fail

The values show that even without any stormwater treatment, there is only one catchment (Ration) where zinc and copper levels will move from a pass to a fail in terms of the 95% ANZECC ecological triggers. When stormwater treatment is applied to the model the predicted zinc concentration is within the guidelines, meaning the only change with respect to the guideline triggers values is copper in the Ration Stream (the predicted value of 0.0015 g/m^3 only just exceeds to ecological trigger value of 0.0014 g/m^3). While this minor exceedance is acknowledged, the ecological effect of this is considered to be negligible and no further mitigation (i.e. in addition to the proposed Project-wide stormwater treatment) is required specifically to mitigate this minor exceedance.

The other contaminant modelled was TPH. The proposed proprietary treatment devices will remove 75% of TPH and it is considered that this will have negligible impacts on freshwater ecology.

23. Marine ecology

Overview

Although the Project does not involve works or the discharge of contaminants into the coastal marine area, the marine environment is the ultimate receiving environment for sediment laden water from construction of the Project and stormwater runoff from the road surfaces from the operation of the Project. There are two marine receiving environments of relevance:

- the Kapiti Coast, comprising the mouths of the Wainui and Whareroa Streams; and
- the Porirua Harbour, comprising the Pauatahanui Inlet and the Onepoto Arm.

The mouths of the Wainui and Whareroa Streams are dynamic environments on the open coast. In contrast, the Porirua Harbour is more enclosed, accessible to the open coastal by a narrow 100m channel. Due to this and the fact that the Harbour is the receiving environment for approximately 80% of the discharges associated with the Project, ecological investigations have focused more (but not exclusively) on effects on the Harbour ecosystem.

Construction of the Project will result in increased levels of sediment entering the Harbour. Increased levels of suspended sediment as a result of high rainfall events are expected to have negligible ecological effects. There are two Q10 events (with certain wind conditions) where deposited sediment on the seabed is predicted to have moderate (Onepoto Arm) and high (Pauatahanui Inlet) adverse ecological effects. While the potential ecological effects of sediment deposition resulting from these events is moderate and high respectively, the number of factors required to occur simultaneously means that their annual occurrence probability is relatively low.

Operation of the Project will involve the discharge of treated road runoff to the Porirua Harbour which will contribute to the long term accumulation of contaminants in central subtidal basins. Operational phase discharges to the marine environment adjacent to the Wainui and Whareroa Streams will be diluted and widely dispersed given the large, high energy receiving environment.

23.1 Introduction

This chapter presents the findings of investigations undertaken to determine the likely effects of the Project on marine ecology.

Information about existing marine ecology was obtained from ecological databases and previous relevant studies. Ecological field investigations were also undertaken specifically for the Project. Once a baseline of marine ecology had been determined, the impacts of the construction and operation of the Project were assessed. This first assessment stage was undertaken without the application of any specific ecological mitigation. The Project ecologists worked closely with the design team to seek to avoid adverse ecological effects where possible. Where avoidance was not possible, ecological mitigation was then developed to mitigate those adverse effects.

The final assessment stage considered the likely environmental effects with the application of the proposed mitigation.

23.2 Ecological investigations and modelling

The identification of effects on marine ecology required the assessment of the composition and values of the existing marine ecosystems. This relied on two complementary methods:

- desktop studies of available relevant information such as ecological databases and existing datasets and previous ecological investigations; and
- field surveys.

The description of existing marine ecology given in this chapter includes a brief overview of the investigations undertaken. Further details on the methods used and findings of these investigations are contained in **Technical Report 10** on marine habitats and species.

23.3 Existing marine ecosystems

The physical and biological characteristics of the two marine environments (i.e. the Wainui Stream mouth and the Porirua Harbour) are described in this section. Key aspects described are:

- morphology;
- sediment characteristics;
- water quality; and
- habitat and species.

More information is provided about the Porirua Harbour than the Wainui Stream mouth because:

- the majority of the works (approximately 80% of the Project by length) will occur in catchments which flow into the Porirua Harbour; and
- the Whareroa and Wainui Stream mouths are much higher energy dynamic environment (being on the open coast) and hence, in general, the potential for adverse effects on this ecosystem is significantly reduced.

23.3.1 Whareroa Stream mouth

The tidal river mouth estuary of the Whareroa Stream is a modified ecosystem that discharges through a sandy beach to the high energy marine environment. The stream mouth is occasionally blocked and as such the mouth is artificially managed and there is a significant amount of drift wood present on the beach and within the lower reaches of the stream. A small saltmarsh wetland is present in the upper estuary and to the north there are relatively unmodified dunes. A retaining wall has been constructed adjacent to the south bank. Upstream of the dunes, the stream has been channelised and is considered highly modified.

23.3.1.1 Sediment characteristics

The sediment at the mouth of Whareroa Stream is dominated by sand (approximately 99%) and contains low concentrations of copper (2.7mg/kg dw), lead (5.0mg/kg dw) and zinc (22.0mg/kg dw).

23.3.1.2 Water quality

The catchment of the Whareroa Stream is primarily coastal farmland, comprising approximately 80% pasture and 20% scrub. Water quality is reported to be adversely affected by agricultural and road runoff. Stream water is humic stained with moderate concentrations of nutrients and *E. coli*.

23.3.1.3 Habitat and species

The migratory freshwater and marine fish that have been recorded in this habitat include longfin eel, giant kokopu, redfin bully, inanga, shortfin eel, banded kokopu, common bully, koaro, lamprey, yelloweyed mullet, anchovy and smelt.

Birds known to use the Whareroa Stream mouth include banded dotterel, black-backed gull, mallard, pipit, pukeko, red-billed gull, royal spoonbill, shore plover, shovelers, spur wing plover, variable oystercatcher and white-faced heron.

23.3.2 Wainui Stream mouth

The mouth of the Wainui Stream is characterised as a high energy open sandy beach. The Wainui Stream forms a small tidal stream mouth estuary, which drains to Paekakariki Beach, which is a high energy, open sandy beach. A small lagoon is present behind the beach, which passes through coastal dunes. The stream mouth is occasionally blocked and there are large amounts of driftwood in the lower reaches of the stream mouth.

23.3.2.1 Sediment characteristics

The concentration of common stormwater contaminants in surface sediment is currently low i.e. as a percentage of the ex-Auckland Regional Council (ARC) Environmental Response Criteria (ERC) amber threshold concentration copper and zinc are detected at 19% of the amber threshold, lead 14% and high molecular weight (HMW) polycyclic aromatic hydrocarbons (PAHs) 2% of the amber threshold.

Surface sediment is characterised as comprising predominantly fine sand (86%) as would be expected in a high energy open beach environment.

23.3.2.2 Water quality

Water quality is typically high, but may be compromised by runoff from the township of Paekakariki, septic tank leachate from the motor camp located upstream of the estuary and agricultural runoff in the upper reaches of the stream.

23.3.2.3 Habitat and species

Only one invertebrate (polychaete worm) was detected in the infaunal cores collected, and no epifauna were detected. This finding is typical of high energy exposed sandy / cobbly beaches. Whilst the abundance and diversity is low at this site, the ecological values are high and the risks of degradation low due to the hydrodynamic environment of the ultimate receiving environment.

Migratory freshwater fish that use the estuary include longfin and shortfin eels, torrentfish, two species of bully, banded kokopu and giant kokopu.

Shore birds that have been observed at the stream mouth include black-backed gulls, variable oyster catchers, pied stilts, banded dotterels, spur wing plovers and other common species. It is likely that shore plovers, royal spoonbills, white-faced herons, black shags, mallards, pukeko and pipits also are occasionally present

23.3.3 Porirua Harbour

Porirua Harbour (867ha) contains two shallow tidal inlets: the Onepoto Inlet (283ha) and the Pauatahanui Inlet (524ha). Both inlets have common access to the sea via a narrow 0.1km wide entrance. Maximum water depth in both inlets is approximately 3.0m. Approximately 80% of the Onepoto Arm is subtidal, whereas 60% of the Pauatahanui Inlet is subtidal[135]. The ratio of subtidal to intertidal habitat is relatively high compared to other estuaries and tidal inlets and this has important implications for sedimentation and eutrophication patterns.

The primary driver for the movement of water into and out of Porirua Harbour is tidal exchange. Approximately 60% of the incoming tide flows to the Pauatahanui Inlet, with 40% to the Onepoto Arm. Winds, waves and freshwater inflows also influence the movement of water and sediment. The larger streams that enter into Porirua Harbour have complex flood tide deltas, with dynamic and often multiple channels at the stream mouths. Circulation eddies occur in both inlets, and these are likely to contribute to accumulation of fine sediment in the central basins. Within the Pauatahanui Inlet, most deposition occurs in the western and eastern parts of the central basin, where currents and circulation eddies are weakest.

23.3.3.1 Marine habitat

The Pauatahanui Inlet is an important wildlife site providing habitat for indigenous waterfowl and migratory wading birds, and is the only large area of saltmarsh and sea grass in the Wellington region. In addition to its importance as a wildlife and plant sanctuary, the Inlet and its biota provide for a range of functions vital for the continuing health of the ecosystems and associated communities. The shellfish of the Inlet are involved in the filtering of the Inlet's water; helping to maintain its clarity and purity. The saltmarsh vegetation acts as a natural trap for the sediment arriving in the Inlet.

135. 'Subtidal' refers to the area below water at low tide. 'Intertidal' (or littoral or foreshore) refers to the area between high and low tide.

The Onepoto Arm has less ecological value than Pauatahanui Inlet, but still contains large areas of mud flats, shell beds, populations of coastal fish and small areas of salt marsh of ecological value. Part of the Onepoto Arm was reclaimed for a causeway for the railway. The construction of this causeway created three shallow lagoons from the Harbour. When SH1 was re-aligned in the 1970s alongside the railway, these lagoons were partially filled in and Aotea Lagoon was developed into a recreational area.

23.3.3.2 Marine species

Around 43 species of fish are thought to live in the Porirua Harbour. Of these, long finned eel, lamprey and inanga (Galaxias species) are recognised as declining and pipefish are sparse, but secure populations do occur overseas. There are highly diverse shallow subtidal macro-invertebrate communities within both the Pauatahanui Inlet and the Onepoto Arm. The Pauatahanui Inlet has a high diversity and abundance of benthic[136] invertebrates. The Onepoto Arm is slightly less diverse and has a higher proportion of sediment and organic enrichment tolerant species.

In the intertidal zone infaunal invertebrate taxa were detected with a dominance of polychaete worms, bivalves, gastropods. Cockles were detected at all sites sampled in the most recent field survey at a variety of densities. However, cockle density is likely to be higher at sites lower on the intertidal sand and mudflats and also in shallow subtidal areas. Sediment grain size and sediment quality are likely to be factors that influence the density and distribution of cockles in the Harbour. A high diversity of molluscs (bivalves and gastropods) was detected, with the area around the Pauatahanui Stream mouth having the highest diversity. Typically this group of organisms is less diverse or absent when habitat quality is low.

Five main subtidal biological types were detected:

- cockle (*Austrovenus stutchburyi*) dominated;
- nut shall (*Nucula hartvigiana*) dominated;
- annelid worm (*polychaete*) dominated;
- eelgrass (*Zostera sp.*) habitat; and
- annelid worm (*Serpulidae*) habitat.

No subtidal rocky reef habitat was encountered at any of the survey sites, but does occur at the Harbour mouth and outer Harbour. Cockles in the Pauatahanui Inlet are an important biological component as they are a food source for a variety of organisms, affect the distribution of predator species, affect nitrogen and oxygen fluxes between water and sediment and are an important substrate for the attachment of algae and other molluscs. Eelgrass is present in the shallow subtidal areas. Eelgrass habitat is considered as being ecologically significant due to its contribution to primary productivity and detrital food webs and through its structural complexity, providing habitat for a range of species.

136. 'Benthic' refers to flora and fauna (benthos) living on the bottom of a body of water (stream or sea).

Seagrass meadows (which as noted above are present) have also been shown to enhance bottom stability, reduce sediment accumulation, and enhance nutrient cycling. Seagrass was found to be extensive in both Inlets, saltmarsh covers approximately 51ha in the Pauatahanui Inlet, but is largely absent in the Onepoto Arm. Some nuisance macroalgae has been found in both the Pauatahanui Inlet (around the Pauatahanui Stream) and the Onepoto Arm (around the Porirua Stream).

23.3.3.3 Sediment

The Harbour throat experiences a net average deposition rate of 27.1mm/year of fine sand[137]. Since 1980, much of this fine sand has been trapped against the breakwaters and Mana Marina entrance. The predominant source of sediment entering the Porirua Harbour is from both bed load and suspended load from the Porirua, Kakaho, Ration, Pauatahanui, Duck, and Brown streams. The land uses in these catchments are predominantly pastoral, urban or commercial forestry.

The mean sedimentation rate in Porirua Harbour is estimated to be 0.75-7mm in a 13 month period. The sediment rates are very low in the Pauatahanui Inlet and very low to moderate in the Onepoto Arm.

In terms of sediment contaminants, a survey of heavy metal concentrations in Porirua Harbour[138], determined that (in terms of ecological response criteria (ERC)[139]):

- the average concentration of copper and zinc in sediment samples exceeded the amber (and in some cases the red) threshold; and
- the average concentration of lead did not exceed any thresholds.

An intertidal sediment quality survey in Porirua Harbour[140] indicated elevated contaminant concentrations in surface sediment samples from Onepoto and Browns streams and Duck Creek. At all three stream mouths, total DDT levels exceeded effects thresholds[141]. At Browns Stream mouth, levels of lead, zinc and various polycyclic aromatic hydrocarbons (PAHs) were also exceeded. This is likely to be reflective of the urban development in the Browns Stream catchment. Onepoto Stream mouth has levels of lead in excess of thresholds.

137. Measured between 1974 and 2009

138. Glasby et al. (1990)

139. ERC were developed by the Auckland Regional Council to report on sediment and water quality. It uses a traffic light system where: green sites are low impact sites; amber sites are showing signs of degradation; red sites are higher impact sites where significant degradation has already occurred. Auckland Regional Council (ARC) (2004). Blueprint for monitoring urban receiving environments. Auckland Regional Council Technical Publication No. 168.

140. Sorenson & Milne (2009)

141. DDT is assumed to be from historical land use in these catchments.

23.3.3.4 Ecological value

Both inlets contain relatively diverse invertebrate assemblages and species that are known to be sensitive to organic enrichment and to silt and clay. Sediment grain varied amongst sites in each of the Inlets, with some sites in each Inlet having a high proportion of silt and clay and some having a high proportion of sand and gravel. These differences are largely due to different historic and current land use practices, in addition to having somewhat different hydrodynamic environments. Sediment contaminants were significantly higher in the Onepoto Arm as compared to the Pauatahanui Inlet and habitat modification is more extensive in the Onepoto Arm.

The Pauatahanui Inlet has the following ecological values:

- High ecological values in terms of:
    - Benthic invertebrate community typically highly diverse with high species richness.
    - Benthic invertebrate community contains many taxa that are sensitive to organic enrichment and mud.
    - Intertidal surficial sediments typically comprise approximately 50-70% very fine sand and silt / clay.
    - Depth of oxygenated surface sediment typically >1.0cm.
    - Contaminant concentrations in surface sediment rarely exceed low effects threshold concentrations.
- Moderate ecological values in terms of:
    - Subtidal surficial sediments typically comprise approximately 50-70% very fine sand and silt / clay (although central basin sites approaching 100%).
    - Habitat modification limited.

The Onepoto Arm has the following ecological values:

- High ecological values in terms of:
    - Marine sediments typically comprise <50% very fine sand and silt / clay.
- Moderate ecological values in terms of:
    - Benthic invertebrate community typically has moderate species richness and diversity.
    - Benthic invertebrate community contains many taxa that are sensitive to organic enrichment and mud.
    - Depth of oxygenated surface sediment typically >0.5cm.
- Low ecological values in terms of:
    - Elevated contaminant concentrations in surface sediment, above ISQG-High or ARC-red affects threshold concentrations.
    - Habitat highly modified.

Overall, it is considered that the Pauatahanui Inlet has high ecological values and the Onepoto Arm has moderate ecological values.

23.4 Construction effects on marine ecology

The potential effects on marine ecology from construction of the Project are from increased sediment entering the coast. The risk of other contaminants such as oil and fuel entering streams is considered very low and hence this has not been assessed as a potential effect on marine ecology. Protocols for managing contaminants and emergency procedures for accidental spills are contained in the draft CEMP.

Effects on marine ecology can occur from both suspended sediment and from sediment deposited on the seabed (benthos). Broadly, the magnitude of the effect on marine ecosystems is a function of:

- the sensitivity of the marine organism;
- the level of sedimentation (depth of sediment);
- the concentration of total suspended sediment; and
- the duration of exposure (length of time sediment remains on the seabed or in suspension).

It is considered, in terms of the effects of increased sediment on marine ecology, two particular types of effects require consideration:

- the effect during construction period during and immediately after an extreme weather event (up to a Q10 event);
- the long term residual (up to 20 years from the commencement of works) effect of increased sediment from construction of the Project.

Prior to a discussion on these two particular potential effects, the hydrodynamic sediment modelling undertaken to assess the sediment effects is briefly described.

23.4.1 Hydrodynamic sediment modelling

Construction of the Project will require large areas of open earthworks which have the potential to add to sediment loads entering the Porirua Harbour[142]. The potential changes in the sediment patterns in the Harbour associated with the Project construction are dependent on a variety of environmental conditions (primarily related to wind and rainfall). Event based and long term simulation modelling was undertaken to determine the effects on marine ecological values.

Event based modelling focuses on determining patterns of sediment deposition and total suspended sediment in 2 year and 10 year return period rainfall events, under calm, northerly and southerly wind environments, during the period of maximum earthworks. The event based modelling was further

142. The fate of sediment entering the open coast (i.e. the Whareroa and Wainui Stream mouths) was not modelled as this is a high energy environment and is rapidly transported offshore.

explored for higher risk events to determine the effect of the Project on various sediment deposition thresholds of ecological relevance. The modelling isolates areas of the Harbour which receive 5-10mm of sediment due to the Project (or pushed into this threshold due to the Project) from the area that does not currently receive this amount of sediment (i.e. without the Project). The scientific literature indicates that the most sensitive marine invertebrate species may be affected at this depth of sediment, if sustained for longer than three days. The modelling further isolates areas of the Harbour that receive >10mm of sediment due to the Project (or pushed into this threshold due to the Project) that, without the Project construction, do not received >10mm sediment. Invertebrate community composition is likely to be adversely affected at this depth of deposition, if sustained for longer than three days.

In addition, a long term simulation was undertaken (20 year period) to determine the cumulative effects of sediment deposition on the Harbour due to the Project.

23.4.1.1 Factors affecting sediment deposition

The deposition of sediment in the Harbour varies both spatially and temporally and is mainly a function of the location and volume of sediment discharged from stream mouths and the concurrent hydrodynamic conditions (which is itself influenced by a number of factors including wind speed and direction and tides).

23.4.1.2 Summary of modelling results

The modelling indicated that much of the terrestrial sediment entering the Harbour is deposited in the shallow intertidal zone near stream mouths. In these areas total suspended sediment (TSS) is also highest, exacerbated by wave induced suspension of bed material in shallow water. Fine sediment is transported further away from stream mouths.

Modelling of rainfall events indicates that maximum deposition bed depths and TSS concentrations are experienced during or shortly after the peak of the storm event. Over a 24 hour period following the peak of the storm, sediments are distributed throughout the Harbour by currents and tidal exchange. Minimal redistribution of sediment occurs three (3) and seven (7) days after storm events[143]. The primary areas where sediment deposits and TSS is elevated following storm events are around the mouth of Kakaho Stream, the shallow intertidal eastern end of the Pauatahanui Inlet and the sheltered shallow western side of the Onepoto Arm.

23.4.2 Sensitivity of marine species

With respect to the duration of deposited sediment remaining in place, most marine invertebrates can tolerate a deposition of sediment for up to three days by isolating themselves from environmental stressors (e.g. bivalves close their valves, other invertebrates cease feeding). If the sediment deposition persists for longer than three days, sublethal and lethal effects begin to occur in the most sensitive taxa. Less sensitive organisms may tolerate sediment deposition for a longer period before

143. Sediment redistribution refers to deposited sediment becoming entrained again and being transported and re-deposited in a new location.

adverse effects begin to occur. The assessment considered the depth of sediment deposition at three days following the peak of the rainfall events modelled, in order to capture effects on the most sensitive species from a sedimentation event.

Marine invertebrates are considered to be more susceptible to the discharge of sediment, as most taxa have limited mobility or are permanently attached, whereas fish can move to areas that are less affected. The marine invertebrates present in the Harbour include both sensitive and tolerant taxa. The intertidal and near shore shallow subtidal invertebrate community composition includes species that are sensitive to mud e.g. gastropods, bivalves and certain species of polychaete. Species that are tolerant of mud are also present e.g. mud crabs and oligochaete worms.

In the Porirua Harbour, sediments tend to be coarser within the intertidal areas, whereas fine sediment accumulates subtidally. Therefore, it is anticipated that adverse effects may be experienced by marine organisms inhabiting intertidal areas at shallow depths of sediment deposition compared to organisms inhabiting the subtidal fine sediment habitats. In the assessment those areas of Harbour that receive sediment during various rainfall events that pushes the total deposition in an event to 5-10mm and to >10mm were considered. Individual sensitive species may be adversely affected at 5-10mm deposition (both intertidally and subtidally), and a large number of species (and potentially communities) may be adversely affected at >10mm deposition. Organisms inhabiting the very fine sediment within subtidal basins may be able to tolerate greater depths of deposition. However, in order to be conservative, the same effects thresholds have been used across the entire Harbour.

23.4.3 Event based sediment effects

Both Q2 and Q10 events were modelled to consider what the ecological effects of the sediment associated with these events would be. Two aspects have the potential to adversely affect marine ecology:

- total suspended sediment (TSS); and
- deposited sediment.

23.4.3.1 Total suspended sediment

In order to assess the effects of suspended sediment on marine organisms an understanding of both concentration and duration of exposure is required. Marine taxa have differing sensitivities to suspended sediment concentration and duration. Organisms can be affected by suspended sediment primarily through clogging of gills and other filter structures, inability to visually detect prey, and reduced light.

The most sensitive species researched (pipi or *Paphies australis*) shows sublethal adverse effects at 75g/m³ when continuously exposed for periods in excess of 13 days. Under a variety of rainfall events and wind conditions, the results indicate that in the combined Q10 rainfall event situation, suspended sediment, at one day post the peak of the rainfall event, reaches concentrations that may cause adverse effects on marine organisms if exposure was sustained. However, by three days post the peak of the rainfall event, the concentration of suspended sediment derived from runoff throughout Porirua Harbour is below effects threshold concentrations.

As such, in all scenarios modelled within both arms of the Harbour the effect of suspended sediments is always negligible.

23.4.3.2 Deposited sediment

The approach to the assessment of effects of sedimentation has been to gain an understanding from the modelling outputs of the location and area affected by sediment deposition at biological effects threshold depths and duration and then determine from the deposition maps (refer to **Technical Report 15**) whether the areas receiving sediment were sensitive to deposition. Our assessment of ecological values indicated that within Porirua Harbour the central subtidal basins are not particularly sensitive to sediment deposition due to being characterised by a depauperate invertebrate community and deep fine anoxic sediment. In contrast, the shallow subtidal and intertidal areas have diverse invertebrate communities, comprising both sensitive and tolerant organisms, and a more coarse sediment grain size distribution.

For most of the Q10 events under the various wind conditions, the resultant increased area of Harbour that is predicted to receive sediment (three days following the rainfall event) at the thresholds considered (i.e. 5-10mm and >10mm) is considered to have minimal effects. This is due to the deposition occurring primarily within the subtidal basin areas that currently accumulate fine sediment during rainfall events and are characterised by a severely diminished invertebrate community with lower ecological values.

However, there are two rainfall and wind scenarios that have been assessed as potentially resulting in significant adverse effects on marine ecological values (Table 23.1).

Table 23.1: Potentially ecologically significant sediment generating events

Event	Sediment deposition predicted	Probability of occurrence over two year period[144]	Ecological significance of adverse effect
Q10 event in Kenepuru Catchment, with S-SE wind	2.7ha (Onepoto Arm) of primarily intertidal and shallow subtidal habitat receiving >10mm	7% (3 - 14%)	Moderate
Q10 event in Duck Catchment, with N-NW wind	3.0ha receiving 5-10mm deposition, and 3.2ha receiving >10mm deposition (both primarily in intertidal and shallow subtidal habitats within the Pauatahanui Inlet)	12% (4 - 23%)	High

While the likelihood of these events occurring is low, the consequences of the events on small areas of the Porirua Harbour are considered ecologically significant, particularly in the near shore habitats.

144. Probabilities provided relate to a 5m/s or stronger wind occurring at the same time as a Q10 rainfall event. The Harbour model run and ecological assessment is based on a 10m/s or stronger wind occurring at the same time as a Q10 rainfall event and consequently the probabilities are over estimates, i.e. conservative.

If the Project was being constructed and one of these two events was to occur the sediment that is deposited in the Harbour would increase by 5-6% compared to what would occur without the Project being under construction. However, the additional effects of the Project on sediment deposition in the Harbour, whilst comprising a small proportion of the total sediment deposition occurring, remain of medium-high significance.

23.4.4 Long term residual effects of sediment deposition

Sediment from construction of the Project that is deposited in the near shore (intertidal and shallow subtidal) areas of the Harbour will, over time, move to and accumulate in the subtidal basins. In the long term, the additional sediment discharged to the Harbour as a result of construction of the Project, adds to the cumulative effects of sedimentation of the central subtidal marine environment in both inlets of the Harbour. The modelling of sediment deposition patterns in the Harbour twenty years after the commencement of construction indicates a difference in bed deposition depth in the subtidal basin areas of up to 5cm that is attributable to the Project.

In the Pauatahanui Inlet, sediment is accumulated in the central subtidal basins, whereas in the Onepoto Arm accumulation is in the southern subtidal area. The maximum depth of deposition of sediment of 5cm amounts to a maximum deposition of 2.5mm per year on average.

The long term simulation without the Project constructed indicates that approximately 61ha of the marine habitat in the Onepoto Arm and 204ha in the Pauatahanui Inlet will accumulate >100mm of sediment in 20 years' time (Table 23.2).

Table 23.2: Harbour area affected by long term (20 year) sediment accumulation

	Area affected without the Project (ha)		Area affected with the Project (ha) and % increase	
Depth of sediment	Onepoto Arm	Pauatahanui Inlet	Onepoto Arm	Pauatahanui Inlet
>100mm	57.68	114.18	57.77 (0.15%)	115.27 (0.95%)
>200mm	3.76	57.80	4.15 (10.37%)	58.91 (1.92%)
>300mm	0	32.12	0	33.21 (3.39%)
TOTAL	**61.44**	**204.1**	**61.92 (0.79%)**	**207.39 (1.61%)**

With the Project, the area that will accumulate >100mm of sediment in 20 years' time increases to 62ha in the Onepoto Arm and 207ha in the Pauatahanui Inlet. These results clearly show that the majority of the sediment that is predicted to accumulate in the Porirua Harbour in the next 20 years is not from the Project. The long term simulation results without the road are likely to be an underestimate of sediment runoff and accumulation, as further urban development and felling of forestry blocks, which are associated with high sediment runoff, have not been included in the model assumptions, but are highly likely to be undertaken in the next twenty years.

The increase in total Harbour area that accumulates >100mm of sediment in 20 years is 0.79% in the Onepoto Arm and 1.6% in the Pauatahanui Inlet. While this additional sediment from the Project predicted to accumulate in the subtidal basin areas is a small proportion of the total sediment predicted to accumulate in these areas, it has some minor additive adverse effects on the ecological values and functioning of the estuary in the long term through habitat modification. A summary of the long term ecological effect of sediment redistribution in the Porirua Harbour is described in Table 23.3.

Table 23.3: Significance of long- term sediment re- deposition with the Porirua Harbour

Description (listed north to south)	Ecological value	Assessment of impact magnitude	Assessment of impact significance
Pauatahanui Inlet			
Intertidal and shallow subtidal	High	Negligible	Low
Shallow subtidal margins	Moderate	Negligible	Very low
Central subtidal basins	Low	Moderate	Very low
Onepoto ArmOnepoto Arm			
Intertidal zone	Moderate	Negligible	Very low
Central subtidal basins	Low	Moderate	Very low

This summary shows that in all marine environments the ecological significance of sediment redistribution as a result of the Project is low or very low in the long term.

23.5 Operational effects on marine ecology

Currently, common stormwater contaminants are detected at below biological effects thresholds in surface sediment from the Pauatahanui Inlet, whereas the Onepoto Arm surface sediment is commonly above biological effects thresholds. Higher concentrations of contaminants are present in the central subtidal basins within the Pauatahanui Inlet. It is in this part of the inlet, where ecological values are lower, that contaminant concentrations could further increase in the long term, regardless of whether the Project is constructed or not.

During the operational phase of the Project, treated runoff from the road will discharge to the Porirua Harbour via streams and to the open coast via Wainui and Whareroa Streams. As with any stormwater discharge into such an environment, there will be cumulative effects in the long term arising from the accumulation of contaminants contained in discharges.

The receiving environment of the Wainui and Whareroa Streams are high energy and afford large dilution. The discharge of treated stormwater will contribute in the long term to the accumulation of contaminants in marine sediments in sheltered low energy environments such as the Porirua Harbour. This is considered to have negligible, if any, effect on marine ecology in the Harbour.

In summary, the operational stormwater discharges to all marine receiving environments will have negligible effects.

24. Tangata whenua

Overview

The protection of stream habitats and resident native fish species is of paramount concern to Ngati Toa Rangatira both during the construction and operational phases of the Project. Ngati Toa undertake customary food gathering within the Project area and there are areas of historical and cultural significance that must be taken into account. Part 2 of the RMA provides a framework for assessing the actual and potential effects of the Project on tangata whenua. Section 7(a) is of particular importance, where particular regard is given to kaitiakitanga.

There will be direct and indirect effects of construction on waterbodies during construction, the most significant of which is the potential for increased levels of sediment entering waterways from the large scale earthworks required for the Project.

Once the Project is operational, there is potential for the discharge of contaminated stormwater from the road surface to local streams, with potential impacts on water and habitat quality, and effects on sensitive species; and a potential increase of stormwater and contaminant discharge to Porirua Harbour with potential impacts on habitats and sensitive species.

Appropriate mitigation and monitoring measures will be implemented to ensure that effects on habitat and fish species will be appropriately managed. The effects on these things, and the proposed mitigation, which are outlined in this Chapter, are also described in Chapter 19 (hydrology), Chapter 20 (water quality), Chapter 22 (freshwater ecology), and Chapter 23 (marine ecology) and the Ecological Impact Assessment (**Technical Report 11**).

In addition, measures will be put in place to ensure that in the event of accidental discovery of culturally significant material appropriate protocol is followed.

24.1 Introduction

Te Runanga o Toa Rangatira (Ngati Toa) is the predominant iwi in the area in which the Project is located. In order to assess the cultural effects of the Project, a cultural impact assessment was undertaken by Te Runanga o Toa Rangatira Inc on behalf of Ngati Toa Rangatira (**Technical Report 18**). That Report informs this Chapter. The Consultation Summary Report (Technical Report 22) also outlines another iwi group that was consulted in relation to the Project, the Port Nicholson Block Settlement Trust.

The Ecological Impact Assessment (**Technical Report 11**) has also informed this Chapter, as it outlines the bio-physical effects of the Project on the water bodies and habitats that are of paramount concern to Ngati Toa Rangatira.

24.2 Existing environment – tangata whenua

24.2.1 Ngati Toa Rangatira historical background

Ngati Toa Rangatira is a tribe belonging to the Tainui waka, whose traditional homeland was at Kawhia on the west coast of Tainui. However, as a consequence of the pressure from Waikato neighbours and the attractions of the Cook Strait as a place to settle and trade with Pakeha, Te Rauparaha led Ngati Toa Rangatira in a historic resettlement from the Kawhia Region to the Cook Strait in 1819. By 1840, Ngati Toa Rangatira was established as the pre-eminent Iwi dominating the Cook Strait, Kapiti, Porirua, Wellington and Te Tau Ihu (northern South Island) regions.

Ngati Toa Rangatira's rohe (tribal area) spans a large number of local authorities and includes both rural and urban areas. It is important to understand that Ngati Toa Rangatira's rohe is not solely focused on the land. The waters of the Cook Strait are at the heart of the rohe and are as integral to Ngati Toa Rangatira's association as the land.

In respect of the area comprising the Project, Ngati Toa Rangatira's ahi kaa[145] rights were applied mainly through the customary use of resources, rather than strictly through occupation. Ngati Toa Rangatira had settlements at either end of the Project route, at Whareroa in the north and Pauatahanui in the south. However, Ngati Toa Rangatira settled predominantly in coastal locations, such as Wainui (Paekakariki), Pukerua, Taupo (Plimmerton), Paremata and Porirua. The environs of the Pauatahanui Inlet and Porirua Harbour also provided attractive locations for settlement and facilitated access to the coast for fishing and gathering kaimoana.

Historically, importance of the Project area to Ngati Toa Rangatira was therefore primarily as an area of plentiful natural resources that were vital to the Iwi's health and cultural wellbeing, including large areas of forest that sustained important native plants for medicinal purposes as well as food sources, and the network of streams in the area that were highly valued as an important source of kaiawa (river food). The Inlet itself was a key attraction, given its close resemblance to the estuary at Kawhia.

24.2.2 Areas of cultural significance

24.2.2.1 Waahi tapu

Ngati Toa is not aware of any waahi tapu within the proposed designation boundaries. This may be because, as has been explained above, much of this area was not favoured for settlement, but was principally used for gathering resources.

However, there are a number of waahi tapu in the wider Project area, and given Ngati Toa Rangatira's frequent use of the area for gathering customary food and resources; there is the potential for

145. Ahi kaa literally means 'to keep the home fires burning' and recognises observable long- term use of the land; that it is not enough to simply conquer an area but that the conquerors must also retain a presence there.

discovery of waahi tapu along the Main Alignment and within the designation boundaries. A precautionary approach should therefore be taken, and accidental discovery protocol followed[146].

24.2.2.2 Streams

Traditionally, the Te Puka, Horokiri, Pauatahanui and Waiohata (Duck Creek) streams were highly valued by Ngati Toa Rangatira as important sites for gathering mahinga kai (food resources) and despite the general degradation of the catchments over the years the streams continue to provide important habitats for native fish species. The Horokiri and Pauatahanui Streams sustain a particularly important native fishery, including tuna (long and short finned eel), bully, inanga, kokopu and occasionally the rare kakahi (freshwater mussel). These species continue to be highly prized by Ngati Toa Rangatira, and they continue to exercise their customary fishing rights throughout these catchments.

24.2.2.3 Porirua Harbour

Ngati Toa Rangatira initially settled around the Harbour in the early 1820s and from that time maintained control over the Harbour until the mid-nineteenth century when its control was challenged by the Crown and settlers. A number of Ngati Toa Rangatira settlements were situated around the Harbour, including Onepoto, Takapuwahia and a fortified pa at Taupo (Plimmerton) and Paremata, situated at the mouth of the Harbour. At the northern entrance of Porirua Harbour lies Whitireia Peninsula, which is another area of importance containing numerous waahi tapu, burial places, kainga (villages), pa, middens, pits, terraces and tauranga waka (canoe landing sites).

The Harbour was an important source of food for all of the settlements located in its vicinity. Koura, paua and kina were in abundance around the coastal fringes outside the Harbour and cockles, mussels and finfish were extensively collected from within the Harbour. However, over the following decades the effects of intensified land use, contaminants and siltation resulted in poor water quality and an inability to harvest kaimoana. Ngati Toa Rangatira is involved in efforts to revitalise the Harbour[147], with a view to being able to harvest kaimoana in the future.

Although the proposed Main Alignment is not directly adjacent to the Porirua Harbour, the proposed Kenepuru Interchange and Link Road are located in the vicinity of Porirua Stream, which is one of the streams that feeds into the Harbour. Similarly, the Pauatahanui Inlet is fed by six major streams (namely, Pauatahanui, Horokiri, Browns, Ration, and Kakaho Streams and Duck Creek), which are in close proximity to the Main Alignment.

146. This protocol is discussed within this Chapter, and also within Chapter 26 (Archaeology and built heritage) and the Construction Environmental Management Plan (CEMP).

147. Te Runanga O Toa Rangatira, representing Ngati Toa Rangatira, is a leading party in the Memorandum of Understanding (MoU) (along with PCC, WCC and GWRC) regarding the Porirua Harbour and Catchment Strategy, signed in 2010. The MoU serves to formalise support for and participation in preparation of a Harbour and catchment strategy, aimed at cleaning up the Harbour. When complete and once it is adopted, the strategy will set the parameters for all community input into care for the Harbour and its catchment (including the Inlet). The NZTA are a co-signatory to this MoU.

The Pauatahanui Wildlife Reserve incorporates the northern side of the Pauatahanui Inlet, which is in close proximity to SH58 and the proposed Main Alignment. Traditionally, the Inlet sustained an abundance of fish and shellfish that was highly valued by Ngati Toa Rangatira for customary fishing. Pipi and cockles were a particularly important food resource, gathered from the mud flats of the Inlet at low tide. However, due to the effects of silt run-off and contamination from development in the area, the health of the Inlet and its ability to sustain kaimoana has become seriously compromised. Nevertheless, the Inlet is still regarded as mahinga mataitai (traditional seafood gathering place) by Ngati Toa Rangatira, who believe it has the capacity to regenerate if it is protected and nurtured into the future.

24.2.2.4 Battle Hill Farm Forest Park

Battle Hill Farm Forest Park (BHFFP) was the site of the last battle in the region between Ngati Toa Rangatira and the Crown in 1846, and the grave sites and site of the battle itself on the ridge leading up to the BHFFP summit are regarded as waahi tapu by Ngati Toa Rangatira.

The Project will pass through a section of BHFFP. However, the grave sites and the battle site proper are not located within the proposed boundaries of the Main Alignment.

24.2.2.5 Horokiri Wildlife Reserve

The Horokiri Wildlife Reserve is located in the vicinity of Motukaraka Point (accessed off Grays Road, Pauatahanui) which was an important settlement for the Ngati Ira iwi prior to Ngati Toa Rangatira's arrival in the 1820s[148]. A pa site was established on this site by Ngati Toa Rangatira, due to its strategic advantages in elevation and surrounding steep banks. The Wildlife Reserve is not located within the proposed designation boundaries, but is an area of cultural significance to Ngati Toa Rangatira, within the wider Project area.

24.2.2.6 QE Park

QE Park is located within a historic Ngati Toa Rangatira reserve, which was set aside by the Crown as part of the purchase of Porirua in 1847. It includes areas of early Ngati Toa Rangatira settlement and contains a number of important waahi tapu, including urupa and pa sites. There are two significant streams that pass through the Park, the Wainui and Whareroa Streams, which were traditionally used for fishing and still retain important cultural associations for Ngati Toa Rangatira.

The proposed Main Alignment does not pass directly through the Park, and it is located some distance from known waahi tapu, which are generally situated towards the coast.

148. With the arrival of Ngati Toa in the 1820s the Ngati Ira iwi was forced to move to the Wairarapa.

24.2.2.7 Whareroa Farm

Whareroa Farm is also located within the vicinity of the Project area, on the east of the existing SH1, opposite the entrance to QE Park. Whareroa Farm is located within an early area of Ngati Toa Rangatira settlement and contains a number of waahi tapu, including urupa. Whareroa Farm is in the vicinity of the Project; however, the waahi tapu sites are not located within the proposed boundaries of the Main Alignment.

24.3 Assessment of effects on tangata whenua

Potential effects on tangata whenua values can arise from both the construction and the operation of the Project.

The streams and waterways in the Project area provide important habitat for a variety of native fish species. There are relatively few streams in the Wellington Region that support significant fish populations, therefore protection of these stream habitats is of particular importance to Ngati Toa Rangatira. Native fish species continue to be highly prized by Ngati Toa, and they continue to exercise their customary fishing rights throughout these catchments. As such, any adverse effects on water bodies will compromise their ability to exercise these customary fishing activities, as well as their cultural relationship with the water bodies.

24.3.1 Construction of the Project

24.3.1.1 Direct effects of construction on water bodies

As outlined in Chapter 22 (Freshwater ecology), the main construction activities that have the potential to affect freshwater habitat and species are construction works in stream beds which could degrade habitat through physical disturbance and / or the increase of contaminants (mainly sediment) into the water column.

Works in streams (such as the construction of bridges and culverts) have the potential to disturb freshwater species, both through direct physical disturbance and the disturbance of sediment in stream beds. This effect can be adequately managed to minimise habitat disturbance so that species are not significantly affected. Stream works will not be undertaken in wetted channels and temporary upstream diversions will be put in place prior to works starting in the natural channel. Where necessary, fish will be captured and transferred to alternative sites. Fish passage and natural debris flow are of importance to Ngati Toa Rangatira, given the high cultural significance of streams in the catchment, and the Porirua Harbour.

The establishment of the track for construction access will require the installation of approximately 60 temporary culverts, which will be in place for approximately two years. Many of these will only be in ephemeral water bodies. Due to the temporary and small scale of these culverts any potential adverse effects on freshwater ecology are considered to be minor. Any damage to streams banks or riparian vegetation will be remediated after the culverts have been removed.

The main potential effect during construction that could have significant adverse effects on freshwater ecosystems is increased levels of sediment entering waterways from the large scale earthworks required for the Project. While a level of sediment is required for the healthy function of freshwater ecosystems, too much sediment can adversely affect ecosystems, including smothering species that live on the streambed, interfering with the gills of fish and invertebrates, and changing the visual clarity of water, which can affect the ability of fish to see their prey.

The effects of sediment discharges during construction on Porirua Harbour depends on a number of variables, the size of the rainfall event, the direction and strength of winds and associated wave activity. Under regular conditions (i.e. not during a significant rainfall event[149]) erosion and sediment control measures are expected to control and minimise the volume of sediment entering streams to such an extent that negligible (if any) adverse effects on freshwater ecology are predicted. Current temporary increases in turbidity following rainfall events appear to cause few negative effects on freshwater ecosystems. The likely reasons for this is that the species present have a relatively good tolerance of these types of events and are able to withstand short (less than three days) exposure to elevated sediment levels.

24.3.1.2 Indirect impacts on water bodies

The key indirect impacts on freshwater quality, ecology and species are the discharge of sediment and the discharge of contaminants from construction machinery, such as oils and lubricants. The likelihood of these substances entering streams is very low as the CEMP has procedures to avoid this, such as requiring all refuelling to be done well away from streams. It also contains procedures for accidental spills.

24.3.1.3 Effects of construction on other areas of cultural significance

As outlined above, the construction of the Project will require large-scale earthworks, which will potentially have considerable effects on the surrounding environment.

Of all the culturally significant areas identified in the cultural impact assessment, BHFFP will be the most greatly impacted by the construction of the Project. The Main Alignment will travel through the Park, meaning there will be construction activity within and around the Park and several of the existing tracks will be used for construction access, limiting public access at these points, including walking and cycling connections. However, the grave sites and the battle site proper are not located within the area proposed for the Main Alignment and therefore Ngati Toa Rangatira do not consider that construction of the Project will undermine customary interests or Iwi’s relationship with BHFFP. The most important issue at the Park will be ensuring that construction effects (such as sediment and stormwater discharges) on water bodies in close proximity will be appropriately managed, as outlined above.

149. Further details regarding sediment yield increases in streams after storm events is included in Chapter 22 (Freshwater ecology).

The construction of the Project will also generate large quantities of excavated material requiring disposal, which has the potential to adversely affect the surrounding environment, especially at sites of cultural significance and high ecological value. Therefore, it is important to develop and implement appropriate measures to mitigate the potential adverse effects of disposal sites to an acceptable level, such as through SSEMPs.

24.3.1.4 Accidental discovery of artefacts

Although there are few sites of cultural significance and no waahi tapu have been identified within the area of the proposed Main Alignment, there is the potential that there are sites that have not yet been discovered, or identified. As such, it is important that a precautionary approach is taken, as there may be a possibility of unknown sites being present and adversely impacted on, especially during construction. Measures will be in place to ensure correct protocol is followed, in the event of an accidental discovery of culturally significant material.

24.3.2 Operation of the Project

The protection of stream habitats, the Pauatahanui Inlet, Porirua Harbour and resident native fish species is of paramount concern to Ngati Toa Rangatira both during the construction phase and once the Project is operational. Ngati Toa wish to ensure that fish passage is maintained within fords and culverts and runoff (e.g. stormwater into waterways) is managed during the Project's operation. This is to protect both Ngati Toa Rangatira's customary interests in the area and the environment of value to them.

The Ecological Impact Assessment (**Technical Report 11**) outlines the key effects on water bodies once the Project is operational[150]:

- Potential discharge of contaminated stormwater from the road surface to local streams, with potential impacts on water and habitat quality, and effects on sensitive species; and
- Potential increase of stormwater and contaminant discharge to Porirua Harbour with potential impacts on habitats and sensitive species.

In terms of the cumulative effects on Porirua Harbour, the Project will add to its long term accumulation of stormwater derived contaminants. However, the Project forms only a small proportion of the contributing discharges into the Harbour, as there is other land use and development derived contaminants.

As outlined above, BHFFP is a culturally significant area that will be affected by the Project. Once the road is operational; Ngati Toa Rangatira considers that while the development of a road in this location will affect the rural character and surrounds of BHFFP, the area is already modified by forestry activity, transmission lines and roading, including Paekakariki Hill Road. As such, Ngati Toa Rangatira does not consider the operation of the Project will undermine customary interests or Iwi's relationship with BHFFP.

150. The Ecological Impact Assessment (**Technical Report 11**) provides an assessment of operational impacts.

24.4 Measures to avoid, remedy, mitigate or offset potential adverse effects on tangata whenua

From the cultural impact assessment, potential adverse effects on tangata whenua were identified for both the construction and operation of the Project. The construction and operational effects on water bodies in the vicinity of the Project are of paramount concern to Ngati Toa Rangatira.

24.4.1 Construction

The Ecological Impact Assessment (**Technical Report 11**) outlines the measures for mitigation of the direct and indirect effects of construction on water bodies in the vicinity of the Project. For the avoidance of potential adverse effects during construction, efforts should be made to limit impacts to streams outside the construction footprint. This includes culverting temporary construction access tracks and reinstating the stream bed once works are complete. It also includes retention of as much riparian vegetation as possible, which is an important component of the stream habitat, reduces stream bank erosion, and assists with entrapment of overland sediment.

The complete list of mitigation measures (including site specific mitigation) for construction effects is included in **Technical Report 11**. Some of the proposed mitigation measures include:

- Staging of works and establishment of maximum open earth worked area to reduce risk of sediment discharge;
- Stream and marine water quality and aquatic habitat monitoring during construction, with a focus on adaptive management;
- Storm event disaster plan during construction;
- Temporary culverts, which will be in place for up to two years, will need to follow correct protocols to ensure fish passage is maintained; and
- SSEMP have also been developed for several sites, including Te Puka and Horokiri Streams, which describe how environmental management, including for fill deposit sites, should be identified and carried out.

The effects of sediment discharges during construction on Porirua Harbour depends on a number of variables, the size of the rainfall event, the direction and strength of winds and associated wave activity. Overall, the effects of the discharge of sediment generated by construction earthworks, assessed over a range of rainfall events scenarios, is likely to have between negligible and moderate effects on the ecological values of Porirua Harbour.

Deposition on stream beds does have the potential to have adverse ecological effects. A range of measures are proposed for the management of erosion, and the capture and treatment of sediment during construction. Treatment devices have been designed to exceed regional guidelines.

With regard to freshwater systems, the comprehensive erosion control and sediment treatment that is outlined in the Assessment of Hydrology and Stormwater Effects (**Technical Report 14**), estimates increases in sediment yield will vary between 7% and 20% from stream to stream. This is a significant reduction from calculations made with minimal treatment. These levels of increased sediment yield are predicted to lead to high effects in only one catchment, Upper Duck Creek. Moderate adverse effects are likely in Te Puka and Horokiri streams, with low to very low effects in all other streams.

24.4.2 Operation

The complete list of mitigation measures (including site specific mitigation) for effects once the Project is operational is included in **Technical Report 11**. Several of the mitigation measures are as follows:

- A scheduled and on-going programme of maintenance and monitoring is required for all culverts that take into account continued fish passage requirements;
- In the long term, retirement and revegetation of land in the Te Puka, Horokiri, Duck and Kenepuru catchments will create corridors of riparian communities and stream habitat of increased value; and
- There are also opportunities for additional offset mitigation through the repair of perched culverts in Duck Creek, which are limiting fish movement within these catchments. The replacement of these culverts would provide significant ecological benefits within these catchments.

Overall, it is believed that direct effects on aquatic habitat can be mitigated. In the long term it is considered that effects on water quality will be negligible and the quality and quantity of freshwater habitat may be improved. Therefore, Ngati Toa Rangatira's relationship with the network of streams is provided for and customary fishing activities can continue. Part 2 matters of the RMA are also provided for, particularly 6(a):

> *"the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development"*

24.4.3 Discovery of artefacts

Although no waahi tapu have been identified within the area of the proposed designations, there is always the potential that there are sites that have not yet been discovered. A number of measures will be in place to ensure correct protocol is followed, in the event of an accidental discovery of potential archaeological material. An accidental discovery procedures protocol for the Project has been developed and agreed with the NZHPT and Ngati Toa Rangatira. A copy of this is located in the draft CEMP.

25. Landscape and visual

Overview

The location of the proposed route and the significant engineering required to construct the Project means there are potential adverse effects on the natural character of wetlands and rivers and their margins, outstanding natural landscapes, visual amenity values, and physical landscape features. The scale of these effects varies as the road traverses through the landscape. Conversely, there is the potential for positive visual effects for users of the road who will travel through the bold natural landscapes that are largely inaccessible at present.

A number of general and specific measures are proposed which will avoid, remedy, mitigate or offset the adverse landscape and visual effects resulting from the construction and operation of the Project. These measures have been informed by the urban and landscape design principles developed for the Project and documented in the Urban Design and Landscape Framework.

The scale of the Project means that it will create a significant change to the environment. The landscape and visual effects of this change cannot be fully avoided. The Assessment of Landscape and Visual Effects (**Technical Report 5**) concludes that there will be some significant adverse landscape and visual effects, arising from both the construction and operation phases of the Project. A best practice approach has been taken to avoid effects as far as practicable and the proposed measures will adequately remedy and mitigate the remaining adverse effects.

The complete assessment of landscape and visual effects is contained in the Assessment of Landscape and Visual Effects Report (**Technical Report 5**).

25.1 Introduction

This chapter presents an assessment of the landscape and visual effects of the Project. Full details of the assessment of landscape and visual effects undertaken are contained in **Technical Report 5**.

25.2 Existing environment - Landscape and visual

To assess the landscape and visual effects of the Project, an understanding of the existing landscape and visual environment is required. The following subsections provide a description of the existing environment. There are two factors considered:

- Natural landscape factors: these include the existing landforms, streams, natural vegetation and land use patterns; and
- Perceptual and associative factors: these include description of the aesthetic and visual aspects, and the values associated with landscape such as recreational value, historical associations and value to Tangata Whenua.

The nature of the existing landscape environment is dynamic. As such, with regard to the environment as it exists now and the knowledge that the Project is several years from commencement, any future landscape changes (e.g. forestry clearance, planting and further subdivision) are unlikely to set a materially different context for the Project.

25.2.1 Natural landscapes

Wellington's regional landscapes are characterised by parallel ranges of hills oriented on a northeast – southwest alignment and separated by the region's main faults. There is a secondary pattern of splinter faults and folds on a north-south axis, which results in north-south valleys and basins. The proposed Main Alignment responds to the geomorphic landform pattern and follows a series of valleys paralleling steep fault escarpments.

Stream patterns in the area also respond to the tectonic influences on the landscape with the main streams (Te Puka Stream, Horokiri Stream and Duck Creek) generally following the alignments of faults and splinter faults. The tributary streams on the fault escarpments (such as the western tributaries of Te Puka Stream, Horokiri Stream and Duck Creek) are short and steep while the tributaries on the more gently sloping back slopes are longer, have larger catchments and tend to follow more meandering courses between inter-leaved spurs. Two-thirds of the route traverses catchments that drain to Pauatahanui Inlet and the majority of the remaining route is within catchments that flow into the Onepoto Arm of the Porirua Harbour. Only the northernmost 5km encompassing Te Puka / Wainui Stream catchment does not drain toward Pauatahanui Inlet or Porirua Harbour, but instead joins the Wainui Stream and flows across the narrow coastal plain to a mouth north of Paekakariki.

The Project lies within the Wellington Ecological District, as defined by the Department of Conservation[151]. The district is characterised by steep, strongly faulted hills and ranges, and the Wellington and Porirua Harbours. The area would naturally have been mostly forested and would likely have supported coastal kohekohe, rata, kahikatea, totara, tawa, miro, rimu forest in the warmer lower valleys and on higher slopes, matai forest on stream terraces and lower slopes; a mixture of riparian vegetation and native grasslands along streams; and salt marsh and swamp forest around Pauatahanui Inlet. However, the area surrounding the route now has mostly been cleared and converted to exotic pasture and pine plantation. There are occasional remnant pockets of indigenous vegetation (such as in the upper reaches of Te Puka Stream valley), areas of regenerating forest (such as at Cannons Creek and Porirua Reserve) and areas of former pasture that are in the early stages of regeneration with gorse, tauhinu and some more advanced areas of kanuka and mahoe evident.

25.2.2 Land use patterns

The area surrounding the Project route is characterised by eight land use patterns which can be summarised as:

i) **Pasture:** areas of extensive grazing land are located on the steeper hill country in the Te Puka Stream and Horokiri Stream areas and in the Duck Creek Catchment, south of SH58.

151. A small area of the Tararua ED (the Tararua Foot Hills) provides a backdrop to the Main Alignment corridor and is therefore relevant to the consideration of the wider existing landscape. The proposed designation does not extend into the Tararua ED.

ii) **Indigenous bush and scrub:** remnant patches of indigenous bush and vegetation exist in the Te Puka Stream and Duck Creek tributaries, as well as the wetland area (wildlife refuge) at the head of Pauatahanui Inlet adjacent to Pauatahanui Village. Areas of regenerating second growth bush exist in the Cannons Creek catchment and Porirua Park Reserve.

iii) **Exotic plantation:** there is an extensive area of commercial pine plantation on the hills east of Horokiri Stream (Akatarawa Forest), areas on the hills east of the lower Te Puka Stream and west of Ration Stream, and smaller plantations scattered throughout the remainder of the route.

iv) **Rural lifestyle:** this is predominantly located in the middle part of the route with gently rolling topography and lots typically ranging between 10 to 100 hectares.

v) **Rural village:** Pauatahanui is located along Paekakariki Hill Road near the head of the Pauatahanui Inlet. There are a number of historic buildings and sites and lot sizes range from below 2000 square metres to 10 hectares. The alignment of the proposed road avoids the rural village.

vi) **Urban periphery:** the area in the vicinity of Cannons Creek and Porirua East comprises an urban basin back-dropped by rural hills, which comprise a mosaic of former pasture that has reverted to gorse and mahoe shrubland, rough pasture on the ridgelines, small pine plantations and areas of remnant or regenerating indigenous forest. Other than at the tie-in to the existing SH1 and the points where the link roads connect with the Kenepuru area, Whitby and Waitangirua, the alignments of the proposed roads avoid all urban areas.

vii) **Urban areas:** the southernmost connections of the Main Alignment to the existing SH1 at Linden and the Kenepuru Link Road traverse urban areas with lot sizes below 2000 square metres.

viii) **Peri- urban activities:** these include Pauatahanui Golf Course, Battle Hill and Belmont regional parks, Porirua Gun Club, a regional electricity substation at Takapu Road and a smaller substation at Pauatahanui and other commercial activities.

25.2.3 Landscapes of significance to tangata whenua

It is understood that the route falls within the rohe of Ngati Toa Rangatira. The coast and Porirua Harbour (including Pauatahanui Inlet) was a focus of pre European settlement. In light of the Cultural Impact Assessment (**Technical Report 18**), a number of landscape features in the vicinity of the route have been identified as having cultural significance, including:

- Whareroa Farm (Queen Elizabeth Park area and the prominent terrace east of MacKays Crossing), which was an area of settlement and contains Whareroa Pa, urupa and other waahi tapu.
- Battle Hill, which was the location of Te Rangihaeata's last battle, with several casualties of the battle buried on the site.
- Pauatahanui Inlet, which was settled and provided an important food resource and because it was seen as a memory of Kawhia Harbour which was the iwi's traditional homeland.

- Onepoto Arm of the Porirua Harbour, which was settled and provided an important food resource.

25.2.4 Historical associations

Historical associations with the landscape have been informed by the Archaeology (**Technical Report 20**), Cultural (**Technical Report 18**) and Built Heritage (**Technical Report 19**) Assessments. The following historical associations contribute to the route's landscape values:

- A U.S Marines Corp military camp was located at MacKays Crossing during World War II. There is little physical evidence remaining of the camp although a brick fuel tank associated with the camp is located in the terrace at the foot of Te Puka Stream valley.
- Battle Hill within the current BHFFP is the site of the last engagement fought in the Wellington region during 1846 as part of the New Zealand Wars. The site is on a ridge approximately 1km west of the proposed Main Alignment.
- Pauatahanui was established as a garrison settlement on the site of Te Rangihaeata's pa immediately following the last battle in 1846. There are a number of historic buildings and sites, most of which are within the village precinct west of the proposed alignment. St Joseph's Catholic Church and historic cemetery is on a hill immediately east of the proposed SH58 interchange, approximately 1km east of the village.
- The suburb has a high level of amenity, extensive walkways, bush and open space reserves. A feature of its identity is the street naming, which is derived from a nautical theme associated with Cook's voyages.
- Porirua City was a planned post World War II urban development. The proposed route alignment encircles part of the Porirua basin (i.e. south of Ranui Heights, Porirua East, Cannons Creek and Waitangirua), which was subsequently developed as a state housing area.
- 'Transmission Gully' can be recognised as a landscape feature itself, characterised by its transmission lines, and including the BHFFP.

25.2.5 Perceptual landscape factors

For the purposes of assessing how people perceive changes in the environment, the existing landscape of the Project area has been categorised into ten landscape character areas which are described in detail in **Technical Report 5**. The landscape character areas cover the Kapiti Coastal Plains, Te Puka Stream-Wainui Saddle-Upper Horokiri Stream, Battle Hill Farm Forest Park, Pauatahanui Rolling Hill Country, Lanes Flat, Bradey Road Lifestyle Area, Eastern Whitby, Duck Creek Valley, Porirua East Basin and Linden.

In summary, the strongest aesthetic characteristics of the area traversed by the Project route are the hills that provide a noticeable backdrop to the surrounding landscape, steep escarpments, straight valleys and areas of relatively natural landscape. These features characterise Wellington's landscape and are most evident in the Te Puka Stream, Horokiri Stream and Duck Creek sections of the route. There are key landmarks in the wider Project area including Kapiti Island, Wainui Saddle (long distance views only), Lanes Flat, Pauatahanui Inlet, Belmont Hills and Cannons Creek.

Transient (changeable) factors that contribute to landscape value along the route include the mist / cloud often hanging over the Wainui Saddle and high ridges, and the extent to which the low sunlight sometimes accentuates the ridges of the hills. The changing weather in the Pauatahanui Inlet also changes the landscape values, when viewing the hills from the south to north. For example, on calm days the water provides a mirror reflection of the hills, compared to most other days when there can be high winds and storms. The Pauatahanui Inlet is also recognised as an important bird habitat which contributes to the transient aspects of the wider landscape.

25.2.6 Features recognised in statutory planning documents

The presence of the existing designations in the applicable district plans means that the Transmission Gully alignment has been legally recognised since 1996 as being a potential future transport corridor. As has been explained elsewhere, the current proposed alignment has built on previous assessments and has been refined for a number of reasons – including for visual and landscape reasons – into the proposal that is the subject of these applications.

Important landscape features in the Project area that are recognised in statutory planning documents are outlined below:

- The Tararua Foot Hills, which are identified in the KCDP as an outstanding natural landscape.
- There are areas included in the PCDP classified as 'Landscape Protection Areas', such as the Whitby Landscape Protection Area (including Duck Creek and Resolution Ridge). The Whitby Landscape Protection Area is an area of land that has been identified as having significant landscape qualities, which are important elements in defining the landscape character of Whitby and Porirua City, i.e. this area provides a landscape connection between the Belmont area and the Pauatahanui Inlet and provides a logical landscape delineation of the eastern extent of urban Whitby.
- In the Judgeford Hills Zone of the PCDP, Policy 4A.3.5.2 states that lifestyle development in the Judgeford Hills area is "to have regard to the effects of the Transmission Gully Motorway on landscape and natural character".

25.3 Actual and potential visual and landscape effects

25.3.1 Methodology for assessing landscape and visual effects

The main actual and potential landscape and visual effects have been assessed using Part 2 of the Act as a framework. In particular, sections 6(a), 6(b), 7(c) and 7(f) are considered particularly relevant. These provide as follows (paraphrased):

> *"Section 6*
>
> *…shall recognise and provide for matters of national importance:*
>
> *(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use and development.*

(b) the protection of outstanding natural features and landscapes from inappropriate subdivision, use and development.

Section 7

…other matters…shall have particular regard to:

(c) the maintenance and enhancement of amenity values

(f) maintenance and enhancement of the quality of the environment"

25.3.2 Construction effects

Overall, there is the potential for temporary adverse landscape and visual effects during the construction period. For example, in terms of visual factors:

- The works will involve setting up site offices in some locations for the full duration of the construction programme, and for shorter durations in other areas;
- There will be construction equipment, vehicles, people, lighting and other associated materials clearly visible on the site for the duration of construction;
- Visual outlook will be affected both for local residents and from some public places, simply because the landscape will be visually different, and will be constantly changing. In some locations, this will be a very noticeable change from the existing "green" semi-rural areas;
- The main site compound at Lanes Flat will retain a high visual footprint throughout the construction period due to its location adjacent to SH58 and high public visibility because of the openness of Lanes Flat, the presence of lifestyle and suburban properties overlooking the valley, and the intersection with SH58. The works would be prominent and discordant because of the Main Alignment's elevation on an embankment crossing the valley and because of Lanes Flat's openness and simple form.

In terms of natural landscape factors:

- Removal of vegetation (including harvesting of pine plantations), exposed earthworks and the construction activity itself will all affect the landscape.

Construction effects will be temporary and visibility from public places will be limited to some extent by the topography and rural environment traversed by the route. The main locations where you will be able to see the works are at Lanes Flat and Linden. There will also be a number of rural-residential lifestyle block properties that will overlook construction sites. The impact of construction activities on the landscape will be progressive as different construction fronts are opened over time as earthworks are implemented and rehabilitation and planting occurs in each area.

Changes in views of the landscape from private properties and public viewpoints will typically be most intensive during construction. This will arise from the presence of areas of exposed earthworks, and general construction activities such as temporary buildings, construction vehicles moving around, noise and temporary lighting.

25.3.3 Operational effects

25.3.3.1 Natural character of the coastal environment, wetlands and rivers (section 6(a))

Section 6(a) requires that parties exercising powers under the RMA recognise and provide for the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use and development.

There are two aspects to natural character; being the landscape aspects of natural character and the ecological aspects of natural character. This chapter is only concerned with the landscape aspects of natural character, with the ecological aspects being addressed in Chapters 21, 22 and 23 of this report.

Within the Project area, the six main landscape features in the Project area to which section 6(a) applies:

- Te Puka Stream;
- Horokiri Stream;
- Ration Stream;
- Pauatahanui Stream and Pauatahanui Inlet;
- Duck Creek; and
- Cannons Creek.

The Project would directly affect the natural character of the streams through such works as culverts and stream diversions and would indirectly affect the perceptual aspects of natural character by construction of the road within the valleys parallel to the streams.

Potential adverse effects on the natural character of the streams are considered to be very high[152] for Te Puka Stream due to its relatively high existing natural character and the currently low degree of modification to the stream and valley. Potential adverse effects on the other streams are considered to be moderate to high taking into account the lower degrees of existing natural character and the landscape context at these streams which have already been modified due to past developments.

25.3.3.2 Outstanding natural features and outstanding natural landscapes (section 6 (b))

Section 6(b) requires that parties exercising powers under the Act recognise and provide for the protection of outstanding natural features and landscapes from inappropriate subdivision, use and

152. High refers to the criteria identified in **Technical Report 5** of the landscape and visual assessment methodology. The five point scale developed to identify the level of effect ranges goes from 1 (very low) through to 5 (very high).

development. As stated above, there is one outstanding natural feature and landscape within the Project area, which is recognised in the statutory planning documents. This is the foothills of the Tararua Ranges, which is identified in the KCDP.

While there is some potential for the Project to have adverse effects on the outstanding natural landscape (ONL), it is considered that these effects would be modest. This is because:

- the hills have a "robust character", meaning that they are rough, steep and rugged, with differing types of vegetation present, including forest and pasture;
- there is only a small proportion of the whole ONL that will be affected by the Project,
- the Main Alignment traverses the hills at a low elevation meaning its impact on the appearance of the landscape is minimised and is not clearly visible from wider public spaces throughout the District; and
- there is existing modification in the vicinity of where the Project crosses the ONL including other infrastructure such as transport and power lines.

The other district plans and the Wellington RPS (both operative and proposed) do not identify any ONF / ONLs. Notwithstanding this, a further assessment was undertaken of the Project area to determine whether any other ONF / ONLs are affected by the Project. Four additional potential ONF / ONLs were identified and analysed, and are outlined below:

- The valleys of Horokiri Stream and Duck Creek have relatively high landscape values, but were not considered to hold the requisite values, such as to be classified as ONF / ONLs; and
- The Paekakariki Coastal Hills and Pauatahanui Inlet / Backdrop Hills do have sufficient landscape values to be considered ONF / ONLs. While the proposed alignment route is relatively close to the Paekakariki Hills (approximately 250m) at the MacKays Crossing end, it is located inland of the escarpment so that there will be no adverse effects. The proposed Transmission Gully route is inland of the Pauatahanui Inlet and is unlikely to have any visual effect on the Inlet itself.

For the reasons discussed above, the proposed Project can therefore considered 'appropriate' with regards to section 6(b) of the RMA.

25.3.3.3 Maintenance and enhancement of amenity values (section 7(c))

Section 7(c) requires particular regard to be had to the maintenance and enhancement of amenity values. Six landscape and visual aspects of amenity have been identified and assessed. These are:

- landscape character and aesthetics;
- effects on historical landscape associations;
- effects on recreation;
- visual effects from nearby properties;
- night-time amenity effects; and

- amenity for users of the road

Landscape character

The Project will introduce a significant change to the existing landscape character along the whole alignment. This is simply because there will be a road traversing through an environment where there is currently no road, and which presently appears "green" for most of its length. However, the significance of the actual and potential effects on amenity values varies at different parts of the route. The route can be divided into two main parts in this regard – the more natural parts of the route, and the more modified parts.

- The greatest degree of change would be in the more natural parts such as Te Puka Stream, Horokiri Stream (including BHFFP) and Duck Creek (including Belmont Regional Park), where there would be moderate to high levels of adverse effects on the landscape character values and natural rural qualities. However, at the same time, the natural landscape would also provide positive amenity effects for users of the road, because of the dramatic juxtaposition of the highway with the natural landscape.
- In the more modified parts of the route, such as the lifestyle areas (Paekakariki Hill Road, Flightys Road and Bradey Road) and backdrops to the urban basin, the change in the intrinsic landscape character would be less significant and the landscape more readily able to absorb the Project.

Historical associations

Historical associations form part of a landscape character context. Potential effects on historical associations were identified at MacKays Crossing, Battle Hill and Pauatahanui. In each case the effects of the Project on such associations are assessed as being low[153]. The only exception to this is at St Joseph's Church at Pauatahanui where the Project will have moderate effects on the visual amenity experienced from the church grounds and will accentuate an existing separation between the church and Pauatahanui.

Recreational landscapes

The main recreational landscapes affected, in terms of amenity, are the BHFFP and the Belmont Regional Park. At the BHFFP, there will be 'low' overall landscape effects on the most heavily used parts of the Park. The main adverse landscape effects will be experienced within the Horokiri Stream Valley. At present this valley has a remote and quiet character which will be affected by the proposed road. However the 'Transmission Gully' road has been anticipated for some time and the park development appears to have taken it into account by avoiding trails and facilities in the Horokiri Stream valley. The connection to the 'Transmission Gully – Puketiro Loop' trail will be maintained by means of underpass. Views of the Project will be largely screened from trails within the pine plantation, although users will still be aware of its presence, if only from traffic noise. It is worth noting that the refined alignment will have less adverse effects on the park compared to the existing designation. The latter is elevated on the hill slopes on the eastern side of Horokiri Stream where a

153. This assessment is provided within **Technical Report 5**.

road would be more visible from western parts of the park, would have greater impact on the plantation trails, and greater impacts on the tributary streams on the east side of the Horokiri Valley.

At Belmont Regional Park the trail network comprises a 'spine' along the main Belmont Hills ridge with connections down spurs and valleys on both sides of the range. Physical access will be maintained along the current trails by passing beneath bridges on the Main Alignment. The main adverse landscape effect of the Project on the Park will be the effects on the naturalness and quiet rural character of Duck Creek valley. There will be a 'high' degree of effect within the vicinity of the road. However the sense of naturalness will remain from the upper parts of the Belmont Hills from where the Project will appear relatively low in the landscape and viewed in the context of the Porirua urban backdrop. Effects from the hill top area will be 'low'.

Visual effects from nearby properties

The most significant visual amenity effects experienced from properties will be from those within the urban areas. These occupy a relatively small proportion of the Project route. The greatest degree of effects will be on properties in the Linden area in the vicinity of the proposed connection with existing SH1, and particularly those on properties immediately adjacent to the Main Alignment. The effects on these properties are generally high, although in most instances they will be incremental or cumulative effects given their current close proximity to the existing SH1.

Properties closest to the Main Alignment (i.e. within two properties to the Alignment) will typically provide a buffer to other properties so that the degree of visual effect will diminish quickly with increasing distance from the Alignment. The effects are typically 'low' to 'moderate' within two properties of the Alignment, although there can be 'moderate' effects from greater distances where properties have elevated views or there are 'viewshafts' along streets.

Measures to mitigate effects include boundary planting parallel to the alignment through urban areas to soften or screen views of the alignment. Noise mitigation barriers are also proposed for some properties nearest the alignment. These barriers will typically reduce adverse visual effects from those properties, although the barriers can have adverse visual effects in some instances by reducing outlook and creating shading. Where noise walls are proposed, amenity planting is proposed to soften both sides of all the proposed mitigation walls (where space allows for this), including for the Waitangirua Link Road.

Some rural lifestyle properties will also be affected at Flightys Road, Paekakariki Hill Road and Bradey Road. Effects on these properties will only be moderate in most cases because:

- The rolling topography and extent to which the Main Alignment is within cuttings will help to restrict visibility;
- Substantial existing vegetation including shelter belts, plantations and some areas of regenerating scrub will reduce visibility;
- Lifestyle areas have largely been subdivided and developed in anticipation of the Project so that dwellings constructed in recent years are generally set back from the existing designation boundaries (and hence will also be set back from the new proposed designation boundaries).

There are longer distance views from some urban areas, such as from parts of Tawa and Porirua, For instance, from parts of Tawa there will be elevated views of the Kenepuru Interchange and a proposed large cutting. While the Project will detract from the amenity from these areas, it will typically be part of the middle-ground viewed beyond an intervening foreground urban landscape.

Despite the above, some properties will also experience a very high visual impact from the Project. Where there is a moderate to very high impact on a property, mitigation measures have been proposed to mitigate amenity effects to an acceptable level, e.g. planting within the proposed designation boundaries at strategic locations to intercept views from houses or to soften particular elements of the Project, such as the profile of cut batters.

Night- time amenity effects

Lighting within the Project is proposed to be limited to each of the interchanges, the short section of the Main Alignment between the SH58 and James Cook Interchanges, the short section between the Kenepuru Interchange and the tie in at SH1 and the connections between the Main Alignment and the existing SH1 at each end of the Project route:

- The SH58 and James Cook Interchanges, and the short section of Main Alignment between them, are on rural fringes with the potential to detract from the darkness characteristic of rural areas. However both interchanges will be seen against a backdrop of urban development, reducing the potential effect on landscape character. The extent of box cut on this section of the route and the proposed kanuka revegetation along both sides of the corridor between the two interchanges will further reduce and mitigate landscape effects of the lights.
- Lighting of the Kenepuru Interchange and connection with the existing SH1 will be in keeping with the surrounding urban context at that location.
- There is existing lighting at the MacKays Crossing interchange. Additional lighting will result in a relatively minor change in landscape effects at this location.

In each instance the lighting effects are expected to be moderate or low in landscape terms. There is also the potential for light spill / glare that is outside the scope of the Landscape and Visual assessment, but is the type of effect managed effectively through lighting design during the detailed design phase of the Project (Phase 4).

Amenity for users of the road

The experience of travelling along the new road will be characterised by:

- large constructed earthworks traversing steep topography;
- natural landmarks including the steep Te Puka Stream and the Wainui Saddle summit, BHFFP, Lanes Flat, Duck Creek, Cannons Creek; and
- a sequence of enclosure within box cuts, narrow valleys and areas of vegetation (both existing and proposed as part of mitigation measures), interspersed with open views from embankments and wider valleys and areas of pasture.

Transmission Gully will also become a gateway to Wellington. Existing SH1 traverses coastal plains and open landscapes through the Manawatu, Horowhenua and Kapiti Coasts, gradually converging with the Taraura Ranges escarpment as the highway travels south. At Transmission Gully, the road will pass between the hills and the experience will dramatically change from a flat, open and settled landscape to a steep enclosed and natural landscape. Wainui Saddle will be a landmark where views open to the south toward the Porirua Basin. The gateway experience will continue further south through the Duck Creek area, and particularly south of Cannons Creek where there will be elevated views over urban Porirua. For vehicles travelling north, there will be some similarity in experience between Ngauranga Gorge and Transmission Gully and a distinct departure / gateway experience where motorists emerge from Transmission Gully to the Kapiti Coast plains.

Overall, the experience along the new route will be largely positive, traversing rural and natural landscapes typifying Wellington's bold fault line landforms. The Main Alignment has also been designed to fit within the landscape. This has been achieved by softening the effects of cut and fill batters, vegetating slopes where possible and reducing the visual clutter of the road furniture proposed for the highway.

25.3.3.4 The effects on natural components (biophysical aspects) of the landscape (section 7 (f))

Section 7(f) requires particular regard to be given to the maintenance and enhancement of the quality of the environment[154]. The large scale earthworks required for the Project could cause biophysical effects on the landforms, streams and natural vegetation, which can affect the maintenance and enhancement of the natural components of the landscape. Specialist assessments that address ecology, hydrology and sedimentation are contained within each of the technical reports (and associated chapters), and are also referred to in the landscape assessment.

The most significant actual and potential biophysical landscape effects are expected to occur in the Te Puka and upper Horokiri valleys and at Lanes Flat.

Te Puka Stream

The effects on the Te Puka Stream will be as a result of the reconstruction of the stream and the associated loss of riparian vegetation and clearance of areas of bush in the upper Te Puka Stream valley. These potential effects are considered to be largely unavoidable due to the constraints of the narrow and steep-sided valley.

Horokiri Stream

The alluvial river terraces on Horokiri Stream in BHFFP have some significance and are listed as a noteworthy feature in the BHFFP Management Plan. The Main Alignment avoids or limits the effects on

154. 'Environment' is defined in the RMA, and includes 'people and communities' and section 7(f) is therefore concerned with more than just the biophysical environment, but these aspects (including amenity) are discussed within Chapter 27 this report.

these features by tending to follow the 'inland' margins of the terraces, following the toe of adjacent hills and swapping sides of the valley in a way that mirrors the pattern of the Horokiri Stream.

Lanes Flat

At Pauatahanui Stream and Lanes Flat there will be natural landscape effects that occur with the construction of the Main Alignment embankment across the valley, occupation of part of the flood plain by the SH58 Interchange, and raising the level of part of the flood plain for the main construction yard. The Pauatahanui Stream itself will be bridged, although it will require realignment of the stream bed beneath the bridge. As Lanes Flat is a relatively rare landform type within the study area and is sensitive to modification, the Project is likely to have a high effect due to further encroachment on the floodplain and visually dominating the head of Lanes Flat. Such potential effects can be offset by the proposed remediation measures, including restoration of riparian vegetation along Pauatahanui Stream, restoration of natural vegetation on both sides of the valley and restoration of Lanes Flat itself to a wetland.

In terms of vegetation cover, almost all the route is modified, comprising mostly pasture and regenerating scrubland. The main areas in which there will be some clearance of native vegetation are in the upper Te Puka Stream where the Main Alignment encroaches into remnant patches of bush, and parts of the regenerating kanuka forest south of Pauatahanui Stream. Clearance of small areas of regenerating scrubland will be offset by the proposed planting, which is intended to mitigate visual effects of the Project, to integrate the road into the broader landscape, and have ecological benefit. As discussed, a detailed list of landscape mitigation measures is tabulated in **Appendix 5.E** of **Technical Report 5**.

Surplus fill sites

There will also be surplus fill sites that will potentially have adverse visual effects. Demand for fill sites will likely be concentrated near the south end of the route near the Kenepuru Interchange, as a result of the most likely construction sequencing. The six potential surplus fill disposal sites are therefore located between Cannons Creek and the Kenepuru Interchange and are shown in the plans **GM18** and **GM20**.

Potential effects of filling include encroachment into natural waterways and natural vegetation. Effects on waterways and vegetation have been largely avoided or minimised through the initial selection of fill sites (with those that would have a greater potential effect being discarded). In summary:

- all sites are located in areas of pasture or pine plantation;
- two sites near Cannons Creek are located on broad ridges or hilltop areas to maximise the separation from watercourses;
- two sites near Ranui Heights at the south end of the route are located in gullies behind the Main Alignment. While these works would have some adverse effects on natural landform and watercourses, the watercourses are short, the catchments small, the gullies would already be compromised by the adjacent embankments, and the land is already modified by the existing forestry;

- the fifth site is on the valley side above the existing SH1 at Linden. The natural drainage is modified, and the land cover comprises pine plantation; and
- Effects on natural landform would be mitigated by contouring the sites.

25.3.4 Construction mitigation measures

As previously described, actual and potential adverse landscape and visual effects arising during the construction period will be temporary. While the overall construction period spans six-seven years, the likely construction programme would be undertaken by work ‘fronts’, starting from separate locations and working over sections of a few kilometres at a time, so that activities such as vegetation clearance and bulk earthworks will be limited to a much shorter period from any one viewpoint. Earthworks will also typically be stabilised with grass as soon as possible following completion of bulk earthworks (or each stage of bulk earthworks) in any particular location. Timely revegetation (for soil stabilisation) is included in conditions addressing erosion and sediment control.

The Project site compound at Lanes Flat will be present for the full duration of works, and will be a visual presence in the local landscape. Actual and potential effects arising from its presence can be addressed by planting around the southern perimeter and east and west ends of the site. Screen planting will be carried out at the commencement of the Project and would comprise a ‘kahikatea mix’ incorporating fast growing screening species such as karamu and flax in order to screen views from the adjacent road (in particular of the ground surface within the yard). This planting will be permanent and will form part of the long term rehabilitation and enhancement of Lanes Flat which will also be undertaken as part of the Project.

Other screening of properties during the construction phase will be required in specific locations along the road alignment on a case by case basis. Individual landowners whose properties are likely to be significantly adversely affected by the construction works (as identified in **Technical Report 5**) will be approached and given the option of visual screening being installed.

25.3.5 Operational mitigation measures

A best practice approach was taken to landscape measures as follows:

- The priorities were avoidance, remediation and mitigation (and offset), in that order.
- Landscape design was completed in conjunction with other technical experts to maximise cross-over benefits and to facilitate an integrated approach to the overall Project design.
- While measures were designed to address specific adverse landscape effects, opportunities were sought to achieve multiple benefits from each landscape measure.
- Attention was focussed on improving each element of the Project to cumulatively enhance the design and avoid or reduce potential effects.
- Alternative measures to avoid, remedy or mitigate effects were investigated in those locations with potentially significant effects.

Measures to avoid, remedy or mitigate adverse effects are set out in the recommended conditions, and in Landscape Plans (**LA01-21**). The full assessment of effects from private properties is provided in the section by section analysis of **Appendix 5.D** of **Technical Report 5**. Landscape mitigation measures have also been tabulated in **Appendix 5.E** of **Technical Report 5**, where they are correlated with specific effects. As discussed, there is cross-over between landscape mitigation measures and those carried out for other reasons, particularly those to be carried out for ecological purposes.

A summary of landscape planting and revegetation mitigation measures proposed at the key landscape locations are contained in Table 25.1.

Table 25.1: Summary of key measures to avoid, remedy or mitigate effects

Landscape location	Actual or potential environmental effect identified	Measures to avoid, remedy or mitigate effects
Te Puka Stream	• Potential adverse biophysical effects on landform, streams and vegetation as a result of earthworks (construction). In particular, modification of natural landforms (in particular truncating of spurs, removal of vegetation in some locations and encroachment into watercourses and streams). • The road will be a defining feature of the valley. It will affect the valley's existing remote character.	• Restore vegetative cover to reduce prominence of earth-works, in particular to soften the un-natural appearance of benching. • Following construction, re-construct a naturalistic stream bed adjacent to the alignment in a manner that replicates as much as possible the existing stream bed conditions. • Retiring the western slope from grazing to enable natural regeneration, and restoring riparian vegetation in some tributary watercourses.
Horokiri Stream	• Potential adverse biophysical effects on landform, streams and vegetation as a result of earthworks (construction). In particular, modification of natural landforms (in particular truncating of spurs, removal of vegetation in some locations and encroachment into watercourses and streams).	• Retiring the eastern slope of the valleys from grazing to allow for natural regeneration of vegetation. • Restore riparian vegetation along sections of the stream parallel to the road.
Ration Stream	• Potential adverse biophysical effects on landform, streams and vegetation as a result of earthworks (construction). In particular, modification of natural landforms (in particular truncating of spurs, removal of vegetation in some locations and encroachment into watercourses and streams).	• Extend planting along the stream to the north-east to connect with an area of existing native vegetation.

Landscape location	Actual or potential environmental effect identified	Measures to avoid, remedy or mitigate effects
Pauatahanui Stream, Pauatahanui Inlet and Lanes Flat	• Potential adverse biophysical effects on landform, streams and vegetation as a result of earthworks (construction). Modification will include construction of the Main Alignment embankment across the valley, and occupation of part of the flood plain by the interchange and the main Construction Compound Site. Pauatahanui Stream itself will be bridged, although a diversion of the stream bed will still be required beneath the bridge. • The highway interchange and construction yard will encroach onto the Lanes Flat flood plain and significantly impact on the visual character of the valley.	• Restore the balance of Lanes Flat to a continuous wetland between the proposed SH58 Interchange / Main Alignment and Pauatahanui. Existing drains are to be removed and sedge / reed wetland re-established, interspersed with areas of open water. Stormwater ponds to be integrated within Lanes Flat. • Restore native riparian and margin vegetation along the Pauatahanui Stream, and to plant the existing gaps between the stream and existing hillside kanuka on the south side of the valley, so that the stream would form the boundary between the Lanes Flat wetland and the regenerating bush backdrop. The kanuka could also continue on either side of the Main Alignment to the north of SH58 and between Pauatahanui Stream and the Duck Creek catchment in the vicinity of the James Cook Interchange. • Plant kahikatea-mix vegetation along the north side of the valley to frame the opposite side of Lanes Flat. Kahikatea would also be planted around the perimeter of the construction yard compound (and other fast growing screening species such as karamu and flax), within the SH58 Interchange roundabout and between the SH58 Interchange and Bradey Road.
Cannons Creek – Linden	• Adverse effects on the outlook from residential properties - the alignment has potential high visibility because of its location on the hill face behind the urban area.	• The sequence of box cuts (predominantly) and embankments mean the alignment will appear embedded in the terrain. For instance, it will be visible as a series of short embankments / bridges between cuttings rather than a continuous carriageway. • Native planting adjacent to the Main Alignment corridor is proposed to mitigate visual effects from the eastern Porirua urban area.

Landscape location	Actual or potential environmental effect identified	Measures to avoid, remedy or mitigate effects
Duck Creek (Waiohata Stream)	• The main adverse landscape amenity effects will be for recreational users of Belmont Regional Park. The proposed alignment will have a 'high' effect on the natural rural qualities of the immediate valley.	• Restoration of native riparian vegetation along major tributary streams of Duck Creek to reinforce natural landscape patterns and soften views from within the valley.
Porirua Basin	• Adverse effects on the outlook from residential properties - the alignment has potential high visibility because of its location on the hill face behind the urban area.	• Planting within the corridor would help reduce visibility of the carriageway and soften the edges of cut batters, and create a natural connection between Porirua Park Bush and Cannons Creek Bush.
Urban areas	• Adverse effects on the outlook from residential properties due to the proposed alignment, fill sites, site compounds and enabling works. • Potential for adverse visual effects of noise barriers on surrounding communities.	• Comprehensive boundary planting parallel to the Main Alignment through urban areas is proposed to soften or screen views of the Project, where sites have been identified as being adversely affected. • Noise management barriers (walls or bunds) are proposed for some properties nearest the alignment. Amenity planting is proposed where there is sufficient space to soften both sides of the noise mitigation treatments. This would also reduce the potential for graffiti (in the case of walls).

26. Archaeology and built heritage

Overview

There are no known archaeological or built heritage sites within the area proposed to be designated for the Main Alignment. However, there are two sites of heritage significance in close proximity to the Main Alignment, which have the potential to be adversely affected by aspects of the Project's construction and / or operation.

At both locations, appropriate mitigation, monitoring and remedial action will be implemented (if required) to ensure that effects will be appropriately managed. Mitigation for noise and vibration, dust, and visual effects, which are outlined in this chapter, are also described in Chapters 16 (Noise and vibration), 17 (Air quality), and 25 (Landscape and visual). One site of heritage significance is not easily viewed or accessible in its current location on private land. To increase public appreciation of the structure, the NZTA will facilitate the use of an existing off-road access to allow it to be viewed, which would be a positive effect of the Project.

In addition, measures will be put in place to ensure that in the event of accidental discovery of potential archaeological material appropriate protocols are followed.

26.1 Introduction

Assessments have been undertaken that profile the existing environment in relation to archaeology, culture and heritage and assess the Project's impacts on these sites.

The reports that contribute to this overall assessment are:

- the Assessment of Built Heritage Values (**Technical Report 19**); and
- the Assessment of Archaeological Values (**Technical Report 20**).

26.2 Existing environment – Archaeology and built heritage

There are no recorded archaeological or built heritage sites within the boundaries of the proposed notices of requirement. However, there are archaeological and built heritage sites in the wider vicinity of the proposed designation boundaries.

Technical Report 20 presents an archaeological assessment of the proposed footprint. This assessment includes identifying sites that may be of Maori origin. However, this does not constitute an assessment of Maori cultural values, as there are sites of significance to Maori for their spiritual and traditional values that have no physical remains, and so cannot be assessed in terms of archaeological value. Information on these sites of cultural value has been obtained from Ngati Toa Rangatira, and is contained in the Cultural Impact Report (**Technical Report 18**), and discussed in Chapter 24.

26.2.1 Maori occupation and subsistence

Battle Hill Farm Forest Park (BHFFP) was the site of the last battle in the region between Ngati Toa Rangatira and the Crown in 1846, and the grave sites and site of the battle itself on the ridge leading up to BHFFP summit are regarded as waahi tapu by Ngati Toa Rangatira.

The Pauatahanui area is recognised as an environment that was rich in resources for early Maori. As a result there are numerous midden sites and pits located around the edge of the Pauatahanui Inlet, reflecting the richness of the sea-based resources. This area is still regarded as a mahinga mataitai, meaning a traditional seafood gathering place, by Ngati Toa Rangatira. Several of the streams in the area (including Te Puka Stream, Horokiri Stream, Pauatahanui Stream and Duck Creek) also continue to be highly valued by Ngati Toa Rangatira as important mahinga kai or food resources and many continue to provide an important habitat for native fish species. The coast has always been important for Maori, as a route for travelling and settlement, as a source of kaimoana, and as a cultural and spiritual reference point. The Cultural Impact Assessment described in Chapter 24, further outlines the importance of these resources to Ngati Toa Rangatira.

QE Park is located within a historic Ngati Toa Rangatira reserve, which was set aside by the Crown as part of the purchase of Porirua in 1847. It includes areas of early Ngati Toa Rangatira settlement and contains a number of important waahi tapu, including urupa, and pa sites. Two significant streams also pass through the Park, the Wainui and Whareroa Streams, which were traditionally used for fishing and still retain important cultural associations for Ngati Toa Rangatira. Whareroa Farm is also located within the vicinity of the wider Project area, on the east of the existing SH1, opposite the entrance to QE Park. Whareroa Farm is within an early area of Ngati Toa Rangatira settlement and contains a number of waahi tapu, including urupa.

26.2.2 European settlement

There is evidence of the beginnings of European settlement in the wider study area. Several early European buildings remain at Pauatahanui. The Taylor-Stace Cottage has historical significance, as it is the oldest existing residence in the Pauatahanui area and possibly in the whole Wellington District. In the Pauatahanui area there are two historic churches. St Joseph's Church is located on SH58, opposite Bradey Road, and St Alban's Church is located near SH58. These Churches are both listed on the PCC Heritage Register[155], and are registered by the New Zealand Historic Places Trust as Category 1 (St Josephs) and Category 2 (St Albans) Historic Places. St Alban's is located in the Pauatahanui Village, and there will be no effects on this Church as a result of the Project.

St Joseph's is of particular relevance, as it is in close proximity to the Project, with direct access off SH58 (approximately 1km east of Pauatahanui Village). St Joseph's is the oldest Catholic Church building still in use in Wellington and was the first Catholic Church building in the Porirua basin. The building has a historical connection with the Pauatahanui Village as many of the original settlers are buried in the Churchyard. The Church grounds are situated next to SH58, but on land that is higher (vertically) than the SH58 carriageway. The Church is also set back from the road. The Church is regularly used and the Churchyard is visited by families of those buried there. Of particular interest are

155. The Heritage Register forms Part J of the PCDP. The heritage features identified on the Register are protected by rules in the Heritage section of the PCDP.

the "glacier windows", on the side of the building closest to SH58. These are original windows featuring paper 'transfers' on the glass, which are in a delicate state and are suffering deterioration. St Joseph's is located approximately 170m from the Main Alignment. The location of St Joseph's Church is identified on plan **GM02.**

26.2.3 Past military presence

Evidence of past military presence exists in the area, including the historic battle fought at BHFFP, outlined above. There was also a military presence at Paekakariki during World War II. The 1st and 2nd divisions of the United States Marine Corps were camped in or near QE Park between June 1942 and October 1943. Three camps were built: Camp Russell was located in the Park beside the present day entrance at MacKays Crossing, Camp Mackay was located on the other side of SH1, on land now occupied by Whareroa Farm Reserve and Camp Paekakariki was located at the southern end of the Park. The combined capacity of the camps was approximately 15,000 men. The three camps are outside the area proposed for the Main Alignment, and there is no surface physical evidence of these camps.

One feature associated with the camps that still remains is a brick World War II splinter proof blast containment structure (the 'brick fuel tank'), which is located adjacent to the Te Puka Stream (identified on plan **GM02**). The structure is listed in the KCDP as a significant site and it is identified within the Assessment of Built Heritage Values as a heritage feature. No other heritage assessment or a conservation plan is known to have been written about the structure and it is not registered under the HPA. The Main Alignment will be located approximately 22m from the brick fuel tank.

The tank is a circular splinter proof brick wall protecting a now-removed metal petrol storage tank. It was designed and built by the Public Works Department in 1942 as a petrol storage depot to be used by US Defence Force vehicles. The structure is one of 15 similar such structures built throughout New Zealand, of which six now remain, but is the only remaining land transport fuel storage tank, as the others were used to store aviation fuel. The brick fuel tank has some architectural value as a rare building type, and for its large scale, circular form and use of materials, and also for its association with the New Zealand Public Works Department and the American Defence Force. The structure is listed in the KCDP as a significant site.

26.3 Assessment of effects on archaeology and built heritage

Potential effects on archaeology, culture and heritage could arise from both the construction and the operation of the Project.

26.3.1 Construction of the Project

Although there are no archaeological or built heritage sites that have been identified within the proposed designation boundaries, there are several aspects of construction that have the potential to adversely affect sites that are in close proximity to the Main Alignment designations. These aspects are:

- dust generated from construction activities;

- noise and vibration effects arising from construction activities on artefacts; and
- discovery of artefacts during construction.

26.3.1.1 Dust

Construction of the Project will entail large scale earthworks and other activities, such as contractor's yards, and mobile rock crushing, all of which generate dust. This dust effect may be more significant in the vicinity of SH58, which is the location of the main construction yard.

As recorded above, St Joseph's Church is located on SH58, approximately 170m from the Main Alignment. The construction yard, which is in close proximity to the Church (at a distance of approximately 300m), will contain a concrete batching plant. Dust that may result from construction activities could adversely affect the glacier windows at the Church (which are located on the SH58 side of the building), by causing abrasion. Dust may also increase maintenance requirements for the building exterior. Without the proposed management measures in place, dust could have a potentially adverse effect on St Joseph's Church.

26.3.1.2 Noise and vibration

Noise and vibration may have adverse effects on heritage and archaeological sites that are in close proximity to the Main Alignment. The Main Alignment will be approximately 22m from the brick fuel tank and therefore, earthworks will be undertaken in close proximity to the structure. Vibration effects from earthworks and construction could have the potential to adversely impact on the stability of the brick fuel tank.

During construction, vibration may also have an adverse effect on the St Joseph's Church building and particularly the glacier windows. Construction noise may also affect the amenity of the Church, especially during scheduled service times.

Measures will be put in place to ensure that the potential adverse effect arising from vibration on the brick fuel tank and on St Joseph's Church are largely avoided. Good noise management is also essential to reduce the construction noise effects on the Church to the extent practicable.

26.3.1.3 Accidental discovery of artefacts

Although there are no sites of archaeological significance that have been identified within the area of the proposed Main Alignment, there is the possibility that such sites have not yet been discovered, or identified. As such, it is important that a precautionary approach is taken, as there may be a possibility of unknown sites being present and adversely impacted on, especially during construction. Measures will be in place to ensure correct protocol is followed, in the event of an accidental discovery of potential archaeological material.

26.3.2 Operation of the Project

The operation of the Project has the potential to adversely affect archaeological, cultural and historic sites.

The Main Alignment has been designed to ensure that there will be adequate separation distance between the road and the brick fuel tank, to avoid any vibration effect on the tank, associated with traffic movement from the operation of the Project. The brick fuel tank is not easily viewed or accessible in its current location on private land. To increase public appreciation of the structure, NZTA is able to facilitate an off-road access to allow the tank to be viewed, and work with HPT and / or the Whareroa Farm Guardians to incorporate the structure as part of a US Marine Corps experience trail.

The amenity of St Joseph's Church will be adversely affected as a result of the new road. St Joseph's Church is already situated next to a large road (SH58), however, there will be a new Interchange in view of the Church, once the Project is operational. This has the potential to adversely impact on the ambience and general amenity of the church grounds, although any increase in traffic noise is expected to be negligible in this location, once the Project is operational. Although the Project will realign SH58 so that it is five metres further away from the Church, mitigation measures will be implemented to reduce the potential adverse visual effects of the Project on the amenity of St Joseph's Church.

26.4 Measures to avoid, remedy, mitigate or offset potential adverse effects on archaeology and built heritage

From the archaeology and heritage assessments, the following potential adverse effects were identified:

- dust generated from construction activities;
- vibration effects on structures from construction activities;
- discovery of artefacts during construction; and
- effects on amenity at archaeological sites (e.g. from noise effects) once the Project is operational.

26.4.1 Dust from construction

Dust from construction activities (including rock crushing) will be managed through the CAQMP. The primary management approach will be the suppression of dust at its source, which will ensure that potential adverse effects on archaeological, cultural and heritage sites are largely avoided. In addition, a CBPMP will also be prepared, which will outline operating procedures for the suppression of dust at the concrete batching plant. This will be especially pertinent for St Joseph's Church, given its location in the vicinity of the concrete batching plant. As well as dust suppression using water, the CBPMP will also set out protocols for covering materials, rock crushing plant operation, and regular inspections of plant and equipment to ensure it is functioning properly.

Monitoring will be required during construction works to determine the effects of dust on the Church. If monitoring indicates a problem, management measures will be implemented, which could include protective covers being fitted for the glacier windows or removing the windows from the Church and putting them back once construction is complete.

26.4.2 Vibration effects on structures

Vibration effects from earthworks and construction could have an adverse impact on the brick fuel tank and on St Joseph's Church. At the brick fuel tank, likely effects of different types of construction activity on the tank will need to be determined by structural engineers and acoustics specialists at the detailed design stage. Monitoring will then be required during construction works, and then for a further period following construction, to ensure that any adverse effects from vibration are identified and managed appropriately.

Monitoring will also be required during construction works to determine the effects of vibration on St Joseph's Church. As noted above, if monitoring indicates a problem, management measures will be implemented, which could include removing the glacier windows from the Church, and replacing them once construction is complete.

26.4.3 Discovery of artefacts

Although there are no sites of archaeological significance that have been identified within the area of the proposed designations, there is always the potential that there are sites that have not yet been discovered. A number of measures will be in place to ensure correct protocol[156] is followed, in the event of an accidental discovery of potential archaeological material. These measures include the following[157]:

- If any suspected archaeological material is uncovered, all work within 100m of the discovery shall stop immediately. The NZTA Project Manager will be advised, who will immediately inform the nominated iwi representative and the Project's archaeologist;
- If the discovery contains Koiwi (human remains), all work within 200m shall cease immediately, and in addition to the above parties the Project Manager shall also inform the NZ Police, and the NZHPT; and
- The NZTA Project Manager, in consultation with the Archaeologist, Stakeholder Relationship Manager and the iwi representative, shall coordinate the response.

26.4.4 Effects on amenity at historic sites

The amenity of the grounds of St Joseph's Church will be affected as a result of its close proximity to the Main Alignment. To mitigate for the adverse effects on amenity, planting on the western boundary of the Church property has been offered, to screen the SH58 Interchange from view from within the Church grounds.

156. An accidental discovery procedures protocol for the Project has been developed and agreed with the NZHPT and Iwi (Ngati Toa Rangatira).

157. The full list of proposed procedures is located in the CEMP.

Construction noise may adversely affect the Church, especially during scheduled service times. Therefore good noise management at the Church is essential to reduce construction noise effects as far as practicable. The CEMP and its subsidiary plan for noise / vibration will form part of the suite of consent and designation conditions. The noise effects from traffic on the Church are expected to be negligible, so no noise mitigation is recommended once the Project is operational.

The NZTA require their contractors to perform to a high level in relation to managing stakeholder and community expectations. Communication will be the key tool to manage effects, allowing the NZTA and contractors to understand community concerns and ascertain the most appropriate way to respond to these concerns. For the Church, this may mean restricting construction activity during scheduled service times, to ensure that the adverse noise effect is appropriately mitigated for Church users.

The brick fuel tank is not easily viewed or accessible in its current location on private land. To increase public appreciation of the structure, the NZTA will allow for an existing off-road access track to be used, to allow the tank to be viewed. This would result in a positive effect on heritage, which would arise as a result of the Project.

27. Social effects

Overview

Construction and operation of the Project has the potential to generate adverse social effects as a result of noise and vibration, air quality, and traffic and access, affecting amenity, connectivity and movement, local character and recreation values. Measures outlined within the CEMP and its subsidiary plans for traffic, noise / vibration and air quality will be used to ensure that any adverse effect on the social environment arising from construction will be appropriately mitigated. Once the Project is operational, it is anticipated that the proposed mitigation measures will also ensure that any adverse social effects will be appropriately managed.

27.1 Introduction

This chapter provides an assessment of the Project in relation to social impacts. An assessment of social impacts focuses on the experiences (actual or anticipated, direct or indirect) of individuals, families / households, or communities in response to changes induced by a project.

By their very nature, social impacts are often the 'human' experiences of other effects. For example, people may be concerned about the effects of dust on their property, but effects of the Project on Air Quality are discussed in the Air Quality Assessment, where appropriate mitigation for these effects is given. As such, it is important to avoid the "double counting" of effects where there are such overlaps. Thus, effects that are dealt with in the other specialist reports are also acknowledged within this social impact assessment chapter, where relevant, but an overlapping of discussion has been restricted. Perceptions of amenity values are, however, fully acknowledged in this social assessment.

Therefore, this chapter has been informed by the Social Impact Assessment (**Technical Report 17**) as well as a number of relevant technical assessments and the preceding assessment chapters.

27.2 Existing social environment

The SIA has established a local study area for the purposes of profiling the existing environment and for assessing local social impacts associated with the Project. The SIA identifies six main community areas within the Project Area:

- Paekakariki: This community area includes MacKays Crossing Interchange on SH1 and the coastal community of Paekakariki. The surrounding areas are predominantly horticultural and pastoral and contain a number of rural residential properties. This community area is within the Kapiti Coast District.

- Rural communities (Maungakotukutuku and Paekakariki Hill): This community area contains predominantly rural land, comprising of forest and areas of steep pasture land. There are several rural residential dwellings within this community area. However, there is limited community infrastructure and resources. These are within Porirua City.
- Pauatahanui and Whitby: This community area extends through rolling rural and rural residential land north of SH58, crosses SH58 and a low-lying marine plain associated with the Pauatahanui Inlet, then climbs the moderately-steep terrain to the south. The community area includes the communities of Pauatahanui and Whitby and is within Porirua City.
- Eastern Porirua: This community area includes the communities of Ascot Park, Waitangirua, Cannons Creek and Ranui Heights, with residential being the predominant land use. This community area is in Porirua City.
- Linden and Tawa: This community area traverses a number of steep gullies, and ends in the gentle slopes of the Porirua Stream Valley at Linden. It includes the communities of Linden, Tawa and Greenacres, which are within Wellington City; and Porirua Central, within Porirua City. Residential activity is the predominant land use.
- Coastal communities: The coastal communities which fall within the wider study area (i.e. Pukerua Bay, Plimmerton, Mana-Camborne, Paremata, and Papakowhai), but are not directly adjacent to the Project route, form this community area. These communities may be indirectly affected as a result of the Project. Residential activity is the predominant land use, but with high landscape, recreational and cultural values. SH1 currently severs a number of these coastal communities.

These community areas are shown in Figure 27.1.

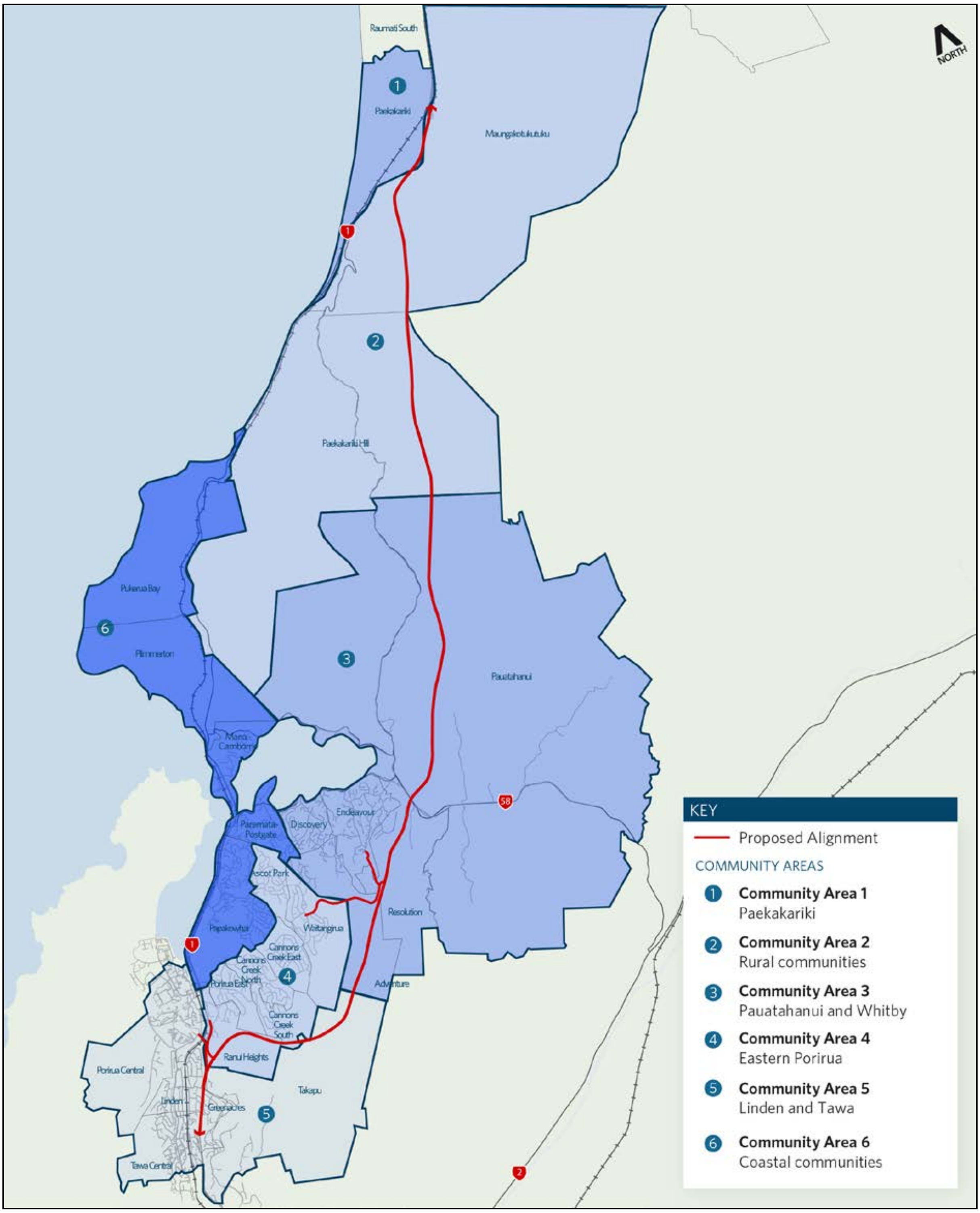

Figure 27.1: Community areas identified within the SIA

Potential social effects can be created from both the construction and the operation of the Project. The potential effects from each phase are different and have therefore been considered separately. The social impacts associated with planning for the Project have also been considered, and are discussed in the SIA. However, they are not discussed in this chapter because they have already occurred, and are not relevant for the purposes of deciding whether or not the requirements for designations should be confirmed or the applications for resource consents should be granted.

27.3 Assessment of social effects during construction

The main potential social impacts arising from construction activities are considered to relate to:

- construction noise and vibration effects;
- air quality effects;
- traffic and access effects;
- effects on recreational activity; and
- landscape and visual impacts.

As outlined above, these social impacts are the 'human' experiences of other impacts, the effects of which are explained in the preceding assessment chapters and within the technical reports. As such, it is important to avoid the "double counting" of effects where there are such overlaps. Therefore, the following sections will outline the social impact, and cross reference to the relevant chapter and technical report for more specific information on the actual or potential effect.

The Project is considered to be a major construction project, both in terms of the timeframes and scale of works involved. As such, the following are described as potential adverse social effects arising from the Project's construction, and are discussed in the sections below:

- anxiety about construction effects; and
- disruption to the community.

27.3.1 Noise and vibration

Day time construction noise will generally not affect residents beyond some nuisance / disturbance during particularly noisy works, although people who stay at home during the day (including people who work from home, are sick, or who work night shifts) could be disproportionally affected by long periods of noisy works. A large proportion of the construction works, including a concrete batching plant, will be in the vicinity of the SH58 Interchange. Residents in close proximity to this area may be subjected to long periods of noisy works. Effective noise management is therefore essential to reducing these noise effects as far as practicable.

Noise and vibration effects are discussed in Chapter 16 and in **Technical Report 12**.

27.3.2 Air quality

Construction of the Project will entail large scale earthworks and other activities, such as contractor's yards, concrete batching, and mobile rock crushing, all of which generate dust.

Dust can affect human health and be a nuisance to the surrounding public by causing dust deposits on and in houses, cars and washing. Dust may also impact on people's enjoyment of outdoor areas and cause perceived or actual health impacts.

The air quality assessment, described in Chapter 17 and in **Technical Report 13**, assesses the potential effects associated with construction (dust and vehicle emissions) along key routes – and focuses on sensitive receptors in the community, such as residential areas, schools, preschools and healthcare facilities. Management measures to be put in place will ensure the adverse effects of dust will not be significant at these locations.

27.3.3 Traffic and access

During the construction phase some suburban and rural roads will be used for construction-related traffic. Some temporary disruption to access for community facilities, schools, health centres and regional parks, or on cycleways and pedestrian linkages may occur. However, the development of a Construction Traffic Management Plan (CTMP) and the availability of alternative public access points elsewhere will ensure impacts on people's way of life will be appropriately managed.

Traffic effects are discussed in Chapter 13 and in **Technical Report 4**.

27.3.4 Recreation

Overall, access to Belmont and Battle Hill Regional Parks (and pedestrian and cycle linkages through the Parks) will be maintained in the long term (post-construction), but there will be some minor changes to the Parks during construction in order to manage phasing of construction activities. For example, several of the existing tracks will be used for construction access, limiting public access at these points, including walking and cycling connections.

Horse riding on Paekakariki Hill Road has been identified in the SIA and during consultation, as a popular recreational activity within Regional Parks, on private land and on local roads. There may be some disruption to this activity during construction of the Project resulting from additional construction traffic on roads causing safety concerns, and from occupation of publicly owned land (i.e. Regional Parks). Similarly, construction of the Project has the potential to affect well-used regional cycle routes, including Kenepuru Drive, SH58 and SH1 at MacKays Crossing.

There will be other effects on recreation as a result of the construction of the Project. Water based recreation may be affected, as people are less likely to swim, fish or participate in water sports if the water quality of streams and / or the Harbour is affected, for example by any sedimentation resulting from the Project. Management measures are to be put in place to ensure that the adverse effects on water quality will not be significant, during the construction of the Project, so that recreational opportunities will not be affected. Chapter 20 contains a discussion on the measures that will need to be implemented to reduce the adverse effects on water quality.

27.3.5 Landscape and visual

The main visual effects during the construction phase will arise from construction yards, partially completed road elements, and concentrations of vehicles and machinery at the construction sites. These elements will represent a significant change in the amenity and the 'look and feel' of neighbourhoods (including recreation areas such as Lanes Flat and at the Regional Parks) for local residents (particularly for those who will have a view over construction sites), over a reasonably long duration. This may affect people's pride in their neighbourhood, but as the visual effects of construction are temporary, it is not considered to have a significant impact on wellbeing or way of life. Some people, including children, will have a genuine interest in the construction work and activity in their neighbourhood and these people may consider that the visual impact of construction is not an adverse effect.

Landscape and visual effects are discussed in Chapter 25 and in **Technical Report 5**.

27.3.6 Anxiety

While it is expected that there will be a sense of relief amongst some people once construction of the Project finally starts (given the long duration of the designations and speculation and uncertainty about the Project for many years), this will be tempered by the fairly lengthy construction period overall.

Construction works, especially those with long timeframes, can be socially disruptive and can represent an annoyance to surrounding residents and road users, depending on how well they are managed.

27.3.7 Disruption to the community

There will be disruption to the community during the construction phase of the Project as a result of such matters as construction traffic, noise and perception arising from large crews of workers present in the area. There are a number of community facilities in close proximity to the Project, and there may be some inconvenience during construction, particularly in relation to access for these facilities. This may be particularly the case at the Tokelau Church in Waitangirua, St Joseph’s Church on SH58, Belmont and Battle Hill Regional Parks (discussed in 26.3.4, above), and at the Maraeroa Marae.

The Maraeroa Marae is an important community facility in Waitangirua, which will be affected by the Project. The Link Road that enters Waitangirua will share a boundary with the Marae, creating noise and access inconvenience during construction. Members of the Marae also have concerns over parts of their land which may be affected by the Project, for example by noise walls on the property, including an area of land of particular significance to some Marae members.

Potential benefits to the community can also arise during the construction period, arising from increased activity brought about by construction and new workers in an area. There will be a daily influx of temporary construction workers during peak construction time. This may bring significant benefits, particularly in terms of increased spending at local businesses (especially food outlets), and passive surveillance that large groups of people can provide. However, small communities may struggle to accommodate the demand that is placed on its local facilities, as a result of the influx of construction workers.

27.4 Assessment of social effects from operation

There are a number of operational consequences of the Project (including unintended consequences) outlined in the SIA, which may impact on people’s wellbeing and way of life. As in the construction effects section above, the following sections will outline the social impact, and cross reference to the relevant chapter and technical report for more specific information on the effect.

27.4.1 Noise and vibration

All properties near the Main Alignment and those which are considered to be sensitive receptors– including schools, residential properties, care centres and churches – have been assessed against the New Zealand Standard 6806:2010 Acoustics: Road Traffic Noise. At the interchanges there will be an increase in road-traffic noise levels, but these remain within the criteria set by NZ Standard 6806.

Heavy vehicles on roads can generate vibration that travels through the ground to nearby houses. Typically this is well below limits set to avoid structural damage to houses or cosmetic damage such as cracking plaster and paintwork. Vibration levels reduce as vibration travels further away from a road. A detailed assessment of road-traffic vibration has been conducted (refer to Chapter 16 and **Technical Report 12**), which includes measurements of vibration from the existing SH1 in Linden, and has been found that beyond approximately seven metres from the road any vibration noticed would be at an acceptable level. It is noted that there are no houses within seven metres of the proposed Main Alignment.

Without any management measures it is likely that there would be adverse effects to surrounding communities, facilities and schools (e.g. Linden School), arising from noise.

It should be noted that a large proportion of the Main Alignment will traverse areas in which there are no residential areas, such as the 'Rural Communities' in the vicinity of Maungakotukutuku and Paekakariki Hill Road, and therefore people's wellbeing is not expected to be impacted in these areas.

27.4.2 Air quality

Vehicle emissions and the potential adverse health impacts associated with these emissions are a potential impact relating to the operational phase of the Project, especially in relation to people's wellbeing. Air Quality effects are outlined in Chapter 17 and in **Technical Report 13**. Traffic volumes are predicted to increase at several locations, including Kenepuru Drive and SH58 east of the Main Alignment, and in areas surrounding the Porirua Link Roads, once the Project is operational.

A key benefit of the Project is the removal of traffic from local roads and the existing SH1 route, which is prone to congestion at commuter and holiday peak periods, to the alternative Project route. The result is a more efficient movement of traffic, and hence less congestion. Therefore, whilst there will be increased traffic volumes at several locations, the traffic will be generally moving un-impeded, thereby reducing the rate of vehicle emissions.

27.4.3 Amenity

The completed Project will represent a significant change in the amenity[158] of the area for local residents, with potential adverse noise and visual effects, particularly for those with a view of the Main Alignment and the Link Roads.

There will be an effect on amenity at Belmont Regional Park due to the introduction of the Main Alignment. There will also be an adverse effect on amenity at Battle Hill within the Horokiri Stream Valley, where at present this Valley has a remote and quiet character, which will be fundamentally changed by the proposed road. The Main Alignment will also separate the most heavily used part of the Battle Hill Farm Forest Park from the trails in the pine forest on the opposite side of Horokiri Stream. There will be an effect on amenity at Mahoe Park and Arthur Carman Park, in Linden, once the Project is operational. However these are both currently affected by the existing Wellington-Johnsonville motorway. These landscape and visual effects are further discussed in Chapter 25 and in **Technical Report 5.**

Mitigation measures, including planting for affected visual outlooks and noise barriers for increased noise effects, will need to be implemented to reduce the potential adverse effects from this change in amenity.

27.4.4 Connectivity and movement

Effects on connectivity and movement resulting from operation of the Project have been identified within the SIA as a social impact. Generally, the Project will reduce travel distances and generate accessibility and connectivity improvements in the community areas within the Project Area, which is considered to result in positive social impacts on people's patterns of daily living.

Improved accessibility along the new State highway network will benefit people's patterns of daily living by improving connectivity and reducing travel times to other areas in Wellington, including places of work, community facilities and facilities of regional importance, such as Wellington International Airport. The Project may have the potential to provide further opportunities for redevelopment of businesses in areas where they may not have previously been so viable, as a result of increased traffic flow (e.g. at Waitangirua).

While there has been some comment from residents in Paekakariki who feel they may be disadvantaged by limited access points on to the Main Alignment, there will be an overall net benefit to people's access to the State highway network. For example, Paekakariki residents will have to travel north to enter the State highway network once the Project is operational; however the reduced traffic along the existing SH1, particularly at the entry point into Paekakariki, is a positive operational effect of the Project, in terms of road safety and ease of accessibility.

158. The RMA definition of amenity values is "natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes".

Without the proposed mitigation measures there would be a loss of pedestrian connectivity, and reduced safety of regional cycle network around SH58 Interchange, and also on Warspite Avenue in Waitangirua. However, there will be reinstated or alternative cycling and walking tracks in some areas and a signalised junction with pedestrian phase at Warspite Avenue junction with the Porirua Link Road. These measures are outlined in the Urban and Landscape Design Framework (**Technical Report 23**) and the Assessment of Traffic and Transportation Effects (**Technical Report 4**).

A significant impact for the coastal communities is the overall reduction in traffic as well as reduced severance. In this instance, 'severance' is used to describe the effects of roads and traffic that physically separate a community. Roads and traffic can affect social interaction and accessibility, particularly when the roads are wide and there is a high volume of traffic. Significant roads, such as SH1 in this instance, also have few crossing points for pedestrians and cyclists, and it is also difficult for local traffic to enter the road network. Communities may feel cut-off by the physical presence of the road and there may be perceptions of danger associated with living near a busy arterial.

Currently, several of the communities along SH1, particularly at Mana and at Pukerua Bay, experience east-west severance as a result of the State Highway. The Project will provide an alternative route to the existing SH1 and, as a result, the existing SH1 is expected to have reduced traffic volumes. A less busy road, with fewer vehicles, reduces its severance effects.

The reduced severance of the existing SH1 will increase access opportunities to private residences that are accessed off SH1, as well as to community facilities including retail and medical centres, and to churches. This is especially pertinent in the Mana area, which has a number of retail stores and takeaway outlets accessed directly off SH1. Pukerua Bay will also benefit from a reduction of traffic, as residents have stated that crossing SH1 presents a number of safety and mobility issues for residents and is the major contributing factor to community severance, posing both a real and perceived barrier. Reduced severance is also expected to improve the amenity of those communities and provide opportunities for the potential enhancement of the urban environment.

27.4.5 Safety

Improvements to the overall transportation network will bring about significant improvements to road safety, particularly along the existing SH1 route, which will have a positive impact in relation to the health / wellbeing of local residents (as well as road users from elsewhere in the Region). Some sections of the existing SH1 between Linden and MacKays Crossing have unusually high crash rate severity. The Project is expected to significantly improve road safety performance, by providing improved modern design standards. The Project will feature safety improvements, such as a continuous median barrier separation for northbound and southbound traffic and grade separated intersections. The overall effect will be improved road safety for road users, as well as for the communities along the existing SH1.

The Porirua Link Roads will introduce increased traffic volumes into Whitby and into Waitangirua. This has the potential to decrease road safety for people within these areas. Recommendations for traffic calming have been made in the Urban Design and Landscape Framework report, which will be taken into consideration by PCC, for the design of the Link Road, where it connects into Waitangirua, to include measures for reducing driver speed on entry into the local road network. This will reduce the adverse effects of increased traffic for road users and for pedestrians in these areas.

The incidence of crime is often reduced when areas are well lit at night time and have increased traffic volumes. As such, this is a positive effect resulting from the operational phase of the Project, especially in areas that did not previously have high traffic numbers, such as in Waitangirua.

27.4.6 Route security

SH1 between Linden and MacKays Crossing is vulnerable to several threats which collectively reduce the security of the route, including large earthquakes, tsunami, and high rainfall events, which cause flooding, and road traffic crashes. The Project will improve the security of SH1 and the security of the Region's road network, by providing an alternative route to the current SH1. The modern design standards will also provide increased resilience to natural hazards.

The result of this is a reduced road closure period in the event that the Main Alignment is affected by any of these threats, providing a positive effect for people's wellbeing, as reduced road closure periods allow for more rapid response by emergency vehicles and improved access to regional hospital facilities following a major natural disaster. The Project will also provide improved access to key electricity transmission, gas and water infrastructure following such an event. The availability of alternative routes will also allow traffic to be diverted, rather than stopped, in the event of a road closure on one of the routes. These measures will positively impact on people's confidence in the transport network and general wellbeing.

27.4.7 Local character

Impacts in relation to people's expectations of local character vary between community areas, and according to people's individual expectations. For example, at MacKays Crossing and Linden (these being the connection points at each end of the Main Alignment), the operational 'reality' of the road is not expected to differ greatly from the existing environment. However, it should also be acknowledged that in other areas impacts on people's actual living environment will be permanently changed. For the rural section of the Project (i.e. in the vicinity of Paekakariki Hill) there will be a significant change to the local character and landscape caused by the new road structures and associated traffic, although given the rural nature and lack of community infrastructure in the area, significant impacts on services and facilities are not anticipated in this area.

Varying in extent between community areas, the Project will result in a permanent alteration to local character, including:

- for the MacKays segment of the Project and for the Linden community area, this change in character will generally be a minor increase to existing effects experienced by residents who are already in an environment dominated by a busy arterial State highway;
- in Eastern Porirua and Tawa / Linden, the main arterial roading structures will generally be located at the extremity of communities and will form an edge effect. The Link Roads will introduce a change of character to these community areas particularly in terms of new structures and increased volumes of traffic and consequential increased sense of activity. Some residential areas will experience a change in local character because they will overlook the new road.

As previously discussed in relation to connectivity and movement, there will also be a reduction in severance on the existing SH1, which increases accessibility and safety. Reduced severance can also improve the amenity and local character of communities, providing opportunities for the potential enhancement of the urban environment.

While attention is needed with respect to specific design of intersections, pedestrian facilities, walkways and cycleway connections, in general, it is expected there will not be significant adverse impacts resulting from the Project on local communities.

27.4.8 Recreation opportunities

Overall, access to Belmont and Battle Hill Regional Parks (and pedestrian and cycle linkages through the Parks) will be maintained or improved. Whilst the route necessarily removes parts of these parks, the key points are:

- pedestrian and cycle linkages will be maintained across the Project;
- in Belmont Regional Park there are two spur trails from the main ridge to Duck Creek, from where there are two connecting trails to Cannons Creek Lake Reserve in Waitangirua. Physical access will be maintained along the existing trail alignments by making use of bridges in order to pass under the Main Alignment;
- construction of a new track as part of the Project, to be made available for recreational users, linking QE Park and BHFFP; and
- at BHFFP, the Project has been anticipated for some time and the park development appears to have taken it into account by avoiding trails and facilities in this area. The connection to the pine forest trails will be maintained by means of underpasses. From within the pine plantation the road will be screened, although users will still be aware of its presence, if only from traffic noise.

There will be opportunities for some Crown-owned blocks of land in the area to be made available to the Wellington Regional Council, under the Public Works Act 1981. This land could then be used as Regional Park, in place of any land lost as a result of the Project.

There will be other effects on recreation as a result of the operation of the Project. Water based recreation may be affected, as discussed previously. People are less likely to use waterbodies for recreational purposes (e.g. swimming, fishing etc.) if the water quality of streams and / or the Harbour is affected. There may be some disruption to this activity during construction of the Project, however, it is not anticipated that these effects on water based recreation will continue to be adversely affected once the Project is operational. The assessment of water quality effects (Chapter 20) outlines the measures that will need to be implemented to reduce the adverse effects on water quality.

There will be provision made for the relocation of the Porirua Gun Club (which is impacted by the Main Alignment) to a new location in consultation with various parties. Parts of the Pauatahanui Golf course will need to be rearranged, but will be able to continue to operate once the Project is operational.

Horse riding on Paekakariki Hill Road has been identified in the SIA as a popular recreational activity. There may be some disruption to this activity during construction of the Project, but it is not considered that this activity will be adversely affected once the Project is operational.

27.5 Measures to avoid, remedy or mitigate potential adverse social effects

From the SIA, the following potential adverse social effects were identified:

- noise and vibration (construction and operational phases);
- air quality (construction phase);
- traffic and access (construction phase);
- amenity (operational phase); and
- recreation (construction and operational phase).

For the construction phase of the Project, the Construction Environmental Management Plan (CEMP) and its subsidiary plans for noise / vibration, air quality and traffic are used and will form part of the suite of consent and designation conditions. The NZTA and PCC will require their contractors to perform to a high level in relation to managing stakeholder and community expectations. Communication will be the key tool to manage effects, allowing the NZTA, PCC and the contractors to understand how the community feels and ascertain the most appropriate way to manage community concerns.

Once the Project is operational, adverse effects will be mitigated through a variety of methods:

- To mitigate the adverse effects arising from noise and vibration, noise barriers and bunds will be installed as appropriate near private residences, as well as near schools (e.g. Linden School) and other community facilities (e.g. Maraeroa Marae);
- To mitigate the adverse effects on visual amenity, planting will be incorporated. For example, central areas and road margins will be planted with low growing species and taller trees and shrubs will be introduced as a view shaft for the existing houses and to frame views along the road corridor. Proposed planting measures are outlined in the Landscape and Visual Assessment (**Technical Report 5)**. Noise barriers will also be provided to mitigate adverse effects on amenity, as outlined above. At Maraeroa Marae, the mitigation for effects on amenity (e.g. noise walls) may impact on culturally sensitive land in the Marae grounds. It is important that if this land is disturbed, provision will be made for these locations to be marked for remembrance;
- To mitigate the adverse effects on recreation:

- A short section of cycleway will be constructed parallel to the north-bound onramp near MacKays Crossing as part of a long distance cycleway that follows the coastal route from Paekakariki through Pukerua Bay and the Taupo Swamp[159]. The landscape amenity of the coastal route is likely to improve for cyclists as a result of the substantial reduction in traffic.
- A new track will be constructed for recreational users, linking BHFFP through to QE Park.
- A cycleway and footpath underpass will be constructed adjacent to the Pauatahanui Stream. The proposed restoration of Lanes Flat involves the construction of a new wetland habitat in the Lanes Flat area. This area will be constructed for stormwater management, ecological enhancement and visual amenity reasons. This area will also incorporate walking trails and a recreational cycle track leading alongside the stream and underneath the alignment. The underpass will be constructed both to allow pedestrian and cycle access, and to allow passage of the stream underneath. This will add to recreational amenity. The design of underpasses and bridges apply CPTED principles to encourage safe and useable facilities.
- Detailed design at Kenepuru Drive tie-in to accommodate the regional cycle route.
- A Traffic Management Plan to be prepared recognising that horse riders are present on local roads such as Paekakariki Hill Road, and a focus on making linkages clear.
- Effects on water quality will be managed through methods for erosion and sediment control as outlined within Chapter 20 and **Technical Report 15**.

159. Taupo Swamp is a lowland freshwater swamp, located three kilometres north of Plimmerton, adjacent to SH1.

PART H: MANAGEMENT OF ENVIRONMENTAL EFFECTS

28. Environmental management and monitoring

Overview

Where practicable, potential adverse effects have been avoided or reduced through the integrated design process. Potential adverse effects that are not able to be fully avoided will require careful management throughout the construction and operation of the Project. The Project delivery framework sets out the overall framework in which the Project will be delivered through to commissioning. This identifies where management plans and other key processes (such as the submission of outline plans to territorial authorities) will occur. The overall management plan framework is also set out, with three tiers of management plan being proposed:

- an overarching Construction Environmental Management Plan (CEMP);
- a series of topic specific management plans (e.g. noise, air quality etc); and
- a series of site specific environmental management plans (SSEMPs).

A draft CEMP and drafts of many of the topic specific management plan have been prepared and are contained in Volume 5. These provide indicative details about how potential environmental effects will be managed. SSEMPs will eventually be developed for all areas of Project in sequence with the staging of construction. At this stage indicative SSEMPs have only been developed for six key focus areas, which are some of the more complex areas throughout the Project. The initial consideration of how environmental effects are to be managed in these areas was therefore useful for environmental assessment and consenting purposes. The management plans also cover proposed environmental monitoring which will be undertaken prior to, during and following construction to monitor potential effects, and provide a mechanism through which additional measures can be implemented during construction and operation if necessary.

As a result of the mitigation proposed, which can be delivered as conditions of the designations and resource consents, it is concluded that the potential adverse effects of the Project will be adequately and appropriately avoided, remedied or mitigated.

28.1 Introduction

The assessment of environmental effects in Part G (summarised in Chapter 11) identified a wide range of positive and adverse actual and potential environmental effects predicted to result from the construction and operation of the Project.

While many potential adverse effects have been able to be avoided completely or at least significantly reduced, the effects assessment identified a range of adverse effects that will require remediation and/or mitigation to ensure that they are appropriately managed. This chapter provides a discussion of the environmental management measures proposed to be implemented before, during and after construction, in order to manage potential environmental effects of the Project.

The remainder of this chapter provides the following information:

- the Project delivery framework identifying how conditions and management plans will be implemented through the further (detailed) design and construction phases of the Project (Section 28.2)
- the proposed management plan framework (Section 28.3); and
- a summary of the measures proposed to adequately manage potential adverse effects (Section 28.4).

It is suggested that the suite of proposed mitigation, remediation and monitoring measures summarised in Section 28.4 be formalised through the placement of conditions on the designations and resource consents. The summary of measures provides a reference to the relevant proposed condition(s).

Proposed conditions are set out subsequently:

- proposed conditions of the designations (Chapter 29)
- proposed conditions of the resource consents (Chapter 30).

28.2 Project delivery framework

Key to the future management of effects is the development and implementation of a suite of measures that include conditions, management plans and monitoring and maintenance. This is referred to as the Project delivery framework. This includes the need to manage areas of environmental sensitivity, to recognise environmental risk issues, and to identify the mechanisms to avoid, remedy or mitigate these actual and potential effects.

This chapter identifies the methods and plans that will be developed by the NZTA and/or PCC (or its nominated contractors/consultants) at the time detailed design and construction occurs, associated monitoring and processes for verification. This overall process for delivery of the Project is shown in Figure 28.1.

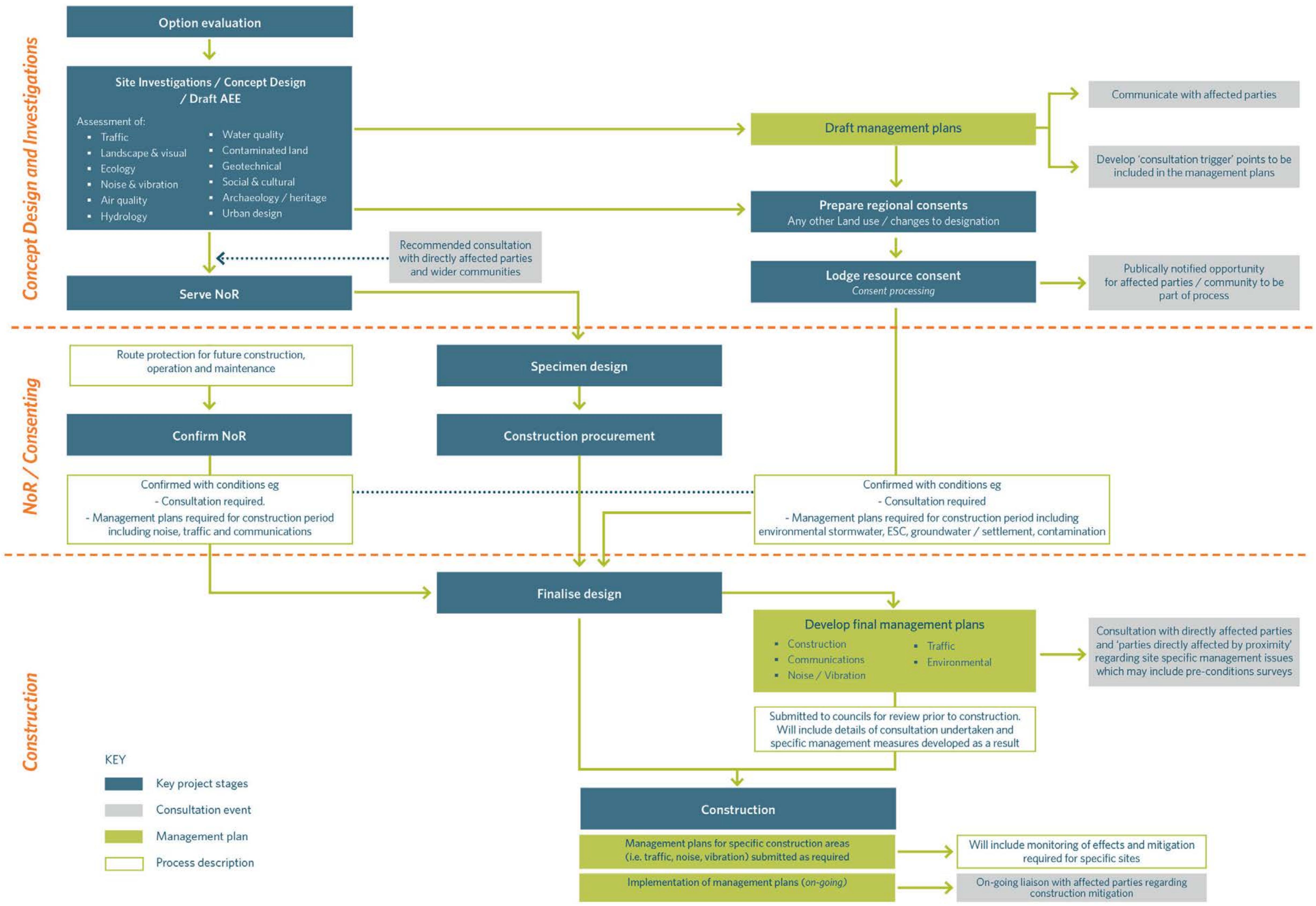

Figure 28.1: Overall Project delivery process

28.2.1 Principles for Project delivery

The following principles form the basis for the development of the plans and conditions that will dictate the delivery of the Project, its operation and maintenance:

- All works are to be undertaken in compliance with current New Zealand standards and legislation;
- The construction and operation of the Project will use the best practicable options to avoid, remedy or mitigate adverse effects;
- An integrated team approach to development of the design and the methods to avoid, remedy or mitigate actual and potential effects means that no one particular discipline is more important than another;
- Each technical specialist, consultant, or contractor involved in the Project has equal responsibility to strive to avoid, remedy or mitigate adverse effects.

In addition to these principles, the methods used will seek to:

- Maintain on-going communication with the local authorities who will be responsible for monitoring and enforcing conditions placed on the designation and resource consents sought;
- Maintain strong communication links with the directly affected landowners, Tangata Whenua, key stakeholders and the community;
- Mitigate adverse effects during design and construction of the Project through which the above environmental principles will be implemented.

28.2.2 Methods to avoid, remedy or mitigate

The following methods to avoid, remedy and mitigate actual and potential adverse effects are proposed:

- designation conditions
- consent conditions
- management plans

Mitigation measures are set out in this chapter. This section sets out actual and potential adverse environmental effects, and methods that should be used to manage them. Following that, management plans and conditions are discussed and described.

In addition, the assessment of alternatives (Chapter 9) discussed how the integrated approach to design has already led to the avoidance of effects and significant improvements in the design, which will result in a better environmental outcome than both the existing designated route and the design option that was preferred at the end of the Scheme Assessment Phase.

28.3 Management plan framework

This section sets out the framework of management plans required to avoid, remedy and mitigate effects. The proposed framework is shown in Figure 28.2.

Figure 28.2: Proposed management plan framework

28.3.1 Construction environmental management plan

A draft Construction Environmental Management Plan (CEMP) has been prepared for the Project (Refer Volume 5). The final CEMP will be prepared by the Project contractor prior to construction of the Project, and will be required to be generally in accordance with the draft prepared. The final CEMP will be provided to KCDC, PCC, UHCC and WCC prior to construction, to allow those councils to request changes (under section 176A of the RMA).

The CEMP is an overarching strategy document. The other plans generally fall under this main plan. The CEMP provides the strategy for how the Project is going to be physically constructed. It sets out the methods and tools to be implemented by the construction contractors to manage, remedy and mitigate potential adverse environmental effects in order to meet the proposed resource consents and designation conditions, relevant legislation and the NZTA's environmental objectives.

The CEMP includes the principles and general approach to managing the environmental effects, along with setting out a methodology for delivering more detailed site specific management plans once construction contracts have been awarded. The delivery of detailed site specific environmental management plans is a critical part of the Project Delivery Framework during construction.

The CEMP covers all anticipated construction elements and presents a framework of principles, environmental policy, objectives and performance standards. It establishes the relationship with the related environmental management plans that address specific topic areas, for example construction noise, traffic, and air quality, which are included as appendices to the CEMP.

Implementing the CEMP (including its second tier management plan appendices) will, as far as is practicable, serve to appropriately avoid, remedy or mitigate any potential adverse environmental effects of the Project's construction. A range of proactive and reactive communication tools will be employed that require a constructor to clearly demonstrate that the community is engaged and informed. The proposed designation and consent conditions that require preparation of a CEMP also provide flexibility to review and modify practices according to changing circumstances. Making sure the CEMP is current and relevant is critical to its successful implementation. The CEMP details the tools for the implementation of good environmental management including monitoring and review requirements of the CEMP, auditing procedures, corrective actions and management reviews of the CEMP.

The contractor(s) will be required to undertake all construction activities on site in accordance with the provisions of the relevant management plans as part of their contractual arrangements.

28.3.2 Topic specific environmental management plans

The CEMP and the various environmental sub-plans may require review and amendment during the life of the Project to reflect changes to activities, risks, mitigation measures, responsibilities and management processes. The ability to make changes to the CEMP is an important aspect of continually improving the effectiveness of the CEMP.

Changes to further develop and finalise the Draft CEMP will be required once the consents and designations are obtained, by the selected contractors as part of the process of undertaking and finalising detailed design and construction methods. The process for modifications is set out in the CEMP and includes a process involving inputs from Councils and key stakeholders.

This CEMP and its second tier plans are to be consistent with and complement the Project's AEE. The many technical assessment reports contained in the AEE inform the specific environmental management, monitoring and mitigation measures described within the sub-plans. The contractor will implement these to manage actual and potential environmental effects during construction.

28.3.3 Site specific environmental management plans

A set of six draft Site Specific Environmental Management Plans (SSEMPs) have been prepared as part of this suite of application documents. The opening text of the SSEMPs states:

> *"This document, that is in the form of an SSEMP, is one of a number that have been developed for key focus areas along the TG Alignment. The focus areas were chosen to be representative of the range of sites along the route and to have between them the full range of environmental management issues likely to be encountered during construction of the route.*
>
> *The aims in producing these documents are to:*
>
> - *Provide confidence in design;*
> - *Assist in assessing effects;*
> - *Assist in developing mitigation strategies; and*
> - *Assist in consultation with stakeholders regarding construction management issues."*

The purpose of the SSEMPs is to:

- Provide more detailed design information about specific key areas along the route where there are a number of interacting discipline areas, technical challenges or particularly sensitive receiving environments;
- Prepare targeted environmental management measures to demonstrate how generic performance based construction management techniques could be applied to a tangible example across the route;
- Demonstrate a method for developing the design further at a later date in other areas along the Project route; and
- To better inform the development of performance based consent and designation conditions using the technical inputs of all the relevant technical specialists. The SSEMPs provide a more integrated consideration of the key performance standards relevant to controlling actual and potential effects on the environment.

28.3.3.1 Developing the SSEMPs

The following four step approach was used to develop the SSEMPs:

Identify key environmental issues for the Project

↓

Identify the SSEMP focus areas

↓

Targeted workshops

↓

Integrated design approach

Steps 1 – Identify key environmental issues

The six SSEMP areas have been specifically chosen for a number of reasons which started with a process of identifying the key environmental issues associated with the Project. The areas were selected in a workshop by technical specialists through a process using the following criteria:

- **High profile (public)**. Sites that are clearly visible from public areas and that are known to be of particular interest to the public.
- **Visual and landscape**. Areas that are within close proximity to a regionally significant landscape, which have particularly significant natural landscape values in the context of the RMA, or which are clearly visible from public areas.
- **Social and community and urban design**. Areas where there is a significant amount of interaction with the public and where appropriate design is critical to achieve a better and more liveable outcome for people and communities.
- **Demonstrative of the Porirua City Council Link Roads**. An area that was specific to the PCC applications (as requiring authority for the Link Roads) was required in order to demonstrate the issues that are particular to the construction of local roads under the jurisdiction of a territorial authority.

  Noise. Areas where there are noise mitigation requirements recommended both for construction and operational noise management.
- **Traffic management**. Challenging traffic management issues arise at tie-ins with the existing state highways where construction will need to occur, whilst still providing for the through movement of traffic.
- **Constructability**. Some parts of the route will pose very challenging design and construction phasing requirements in order to adequately manage effects on the environment.
- **Water quality and potential for effects on Pauatahanui Inlet**. The Pauatahanui Inlet attracts significant public interest and any potential for effects on it – particularly from sediment associated with construction – needs to be very carefully managed.

- **Hydrology and flood risk**. The construction of the Project has the potential to cause damming and/or flooding.
- **Erosion downstream and culverts**. There will be approximately 115 culverts required for the Project of varying sizes, lengths and shapes.
- **Ecology**. Ecological effects on streams, vegetation, other terrestrial flora and fauna and aquatic ecology are identified as potential adverse effects of the Project.

Step 2 – Identify the SSEMP Focus Areas

In light of the above criteria, areas with a good geographical spread throughout focus areas the Project and with a high level of relatively complex issues were chosen:

SSEMP area	Reason for selection
Te Puka Stream	• Complex construction methodology likely entailing stream diversions and fish translocation requirements. • High ecological values (notably freshwater).
Upper Horokiri Stream	• "Appendix B" stream[160] in good condition ecologically. • Number of diversions, reclamation and crossings. • Visually important landscape.
State Highway 58 Interchange	• High profile and publicly visible. • Close to residential areas and the Pauatahanui Substation. • Proposed location of main site compound and concrete batching plant. • Presence of low level contamination. • Potential for downstream flooding issues.
Waitangirua	• PCC is the requiring authority. • Construction noise management and visual mitigation is likely to be required in order to minimise construction efforts on the Maraeroa Marae, Tokelau Church and associated buildings. • Community traffic safety issues at the tie-in, including pedestrian and cycling movements.
Duck Creek	• Complex bridge construction and ecological issues. • Affected by both the NZTA and PCC projects.
Kenepuru Interchange	• Complex traffic management including raising of State Highway 1, interaction with existing through traffic and railway. • Traffic management including regional cycling route, and keeping SH1 traffic moving. • Close to residential properties and schools – close interface with the community. • Noise barriers required to be constructed early for construction noise management.

160. Horokiri Stream is listed in Appendix 2, Part B of the Regional Freshwater Plan for Wellington.

Step 3 - Targeted workshops

Two facilitated workshops were held in order to discuss, firstly, the purpose and selection of the SSEMPs. Then key construction issues for each SSEMP were discussed in order to develop principles for managing construction activities given known environmental and construction issues. Ideas were captured on large flip charts and maps. The following invited parties attended:

- local authority regulatory planning officers[161];
- the Department of Conservation;
- Ngati Toa;
- specialist staff from GWRC;
- consultant technical advisors to the local authorities (appointed as advisors to all the Councils through the RATAG group) in ecology, water, visual and landscape disciplines;
- NZTA personnel and the NZTA's consultant experts.

Step 4 – Integrated approach to development

The outputs from the workshops were worked into the reports and plans through further integrated design sessions involving key technical experts.

28.3.4 SSEMP relationship to the AEE and conditions

The draft SSEMPs form part of the application documentation and demonstrate a higher level of detail for key areas, along with environmental management principles that have been developed specifically for the unique issues present at the chosen sites.

28.3.5 Summary of environmental effects and corresponding management plans

The following table provides a summary matrix relating relevant actual and potential effects on the environment to the "second tier" construction management plans.

161. All five local authorities were represented.

Table 28.1: Proposed management of environmental effects via management plans

Environmental effect (Construction)		Management of effect	Relevant management plan
Designations			
Noise	Noise	• Implementation of construction in accordance with Construction Noise & Vibration Management Plan. • Maintenance of complaints register.	CNVMP
Vibration	Vibration effects on heritage structures	• Implementation of construction in accordance with Construction Noise & Vibration Management Plan. • Maintenance of complaints register.	CNVMP
Social responsibility	Social effects	• Minimise disturbance with appropriate timing/sequencing of construction. • Careful management of construction, including selection of techniques. • Accurate and regular communications with potentially affected parties to manage understanding and expectations.	CEMP and communications plan CNVMP CTMP
Culture and heritage	Archaeological, built heritage, tangata whenua	• Archaeologist to be identified as part of the construction team. • Works to be in accordance with NoR and any HPT approvals.	CEMP Archaeological protocols ArchMP CNVMP LMP
Site operation	Site facilities	• To be managed in accordance with the CEMP. • Landscape and visual effects management applies.	CEMP
Traffic	Construction traffic	• Construction traffic to be managed as per the CTMP and site specific management plans	CTMP CEMP
Visual and landscape effects	Construction site facilities, yards and buildings	• Landscape mitigation planting applies where practicable. Lanes Flat compound planting becomes permanent upon completion.	LMP CEMP
	Visual mitigation	• Landscape mitigation plan sets out staged planting plans for management of effects during construction, as well as mitigation for permanent works.	LMP

Environmental effect (Construction)		Management of effect	Relevant management plan
Resource consents			
Land	Stability Erosion and sediment control Stormwater management	• Development and implementation of erosion and sediment management procedures. • Sediment ponds. • Stabilisation of inactive worked areas. • Diversion of clean water. • Proactive weather forecasting, monitoring and risk management.	ESCP and SSEMPs
Water resources			
Ecology	Planting and habitat management / replacement	• Species / habitat translocation. • Enrichment planting. • Freshwater habitat restoration. • Landscaping.	EMMP LMP
Spill response and contamination	Contamination	• Development and implementation of CLMP.	CEMP Asbestos management Plan CLMP
	Hazardous substances	• Storage and use in accordance with Dangerous Goods regulations; relevant licences and approvals obtained in CEMP; incident form to be filled in and recorded if hazardous spill occurs.	
	Refuelling / maintenance areas	• Spill management procedure to be developed as part of CEMP and implemented by construction team; use and maintenance of spill kit; spills to be cleaned up and recorded as per CEMP.	
Site operation	Site facilities	• To be managed in accordance with the CEMP. • Contingency measures.	CEMP

28.4 Summary of mitigation, monitoring and other measures to manage adverse effects

A range of mitigation, remediation, management and monitoring measures has therefore been developed for the Project, in order to avoid, remedy or mitigate potential adverse effects. These measures are summarised in Table 28.2. Where relevant, a reference is provided to proposed condition(s).

Table 28.2: Proposed mitigation and monitoring

Construction effects
Operational effects

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Traffic and transport				
Increased construction traffic movements of both light vehicles and heavy vehicles are likely to have adverse amenity and safety effects on local roads.	Use CTMP to control construction vehicle movements and routes; Special controls for traffic movements around shift start/finish to avoid intensive traffic movement periods; Minor safety improvements/upgrades to local roads in key locations (in consultation with territorial authorities).	Yes – as set out in the CTMP	Designation: • Subject to requirements of the CTMP • Future SSTMPs required to set out detailed requirements	• Assessment of Traffic & Transportation Effects • CTMP
Construction traffic may cause damage to local roads.	Condition survey of the local roads which are proposed to be used as access roads during and after construction activity and make any necessary repairs. Condition survey and hand over on completion.	Yes – review road condition at regular intervals during construction	Designation: • condition survey requirement	• Assessment of Traffic & Transportation Effects

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Dirt (silt & sediment etc) tracked onto roads from construction vehicles	Managed under provisions of CEMP	Regular visual inspections by site personnel	Designation and resource consent: • CEMP	• CEMP
Disruption to regional cycle and pedestrian networks during construction, including at MacKays Crossing, SH58 and Kenepuru Drive.	CTMP to include requirement to provide temporary, safe and convenient alternatives for cyclists and pedestrians.	N/A	Designation: • CTMP	• CTMP • NZTA requirement (COPTTM)
Potential for disruption to pedestrian movements along Warspite Avenue	Requirement to provide temporary, safe and convenient alternative route for Warspite Avenue pedestrians.	N/A	Designation: • CTMP	• CTMP • NZTA & PCC requirement (COPTTM)
Significant increase in traffic volumes using Kenepuru Drive (between Kenepuru Link Rd and Raiha St) which may result in adverse safety and access effects and potential effects on travel times.	Specialist detailed design for this location to address safety and access issues. This may include modifications to the intersection and road layout to better accommodate pedestrians and cyclists, improve access and visibility.	N/A	Designation: • Process for designing and agreeing an appropriate solution with PCC (as Road Controlling Authority)	• Assessment of Traffic & Transportation Effects
Reduced safety and amenity of the regional cycle network and for pedestrians around the tie-ins/intersections at SH 58, James Cook Drive, Waitangirua and Kenepuru Drive.	Further design prior to commencement of construction including methods for providing safe pedestrian and cycle movements at SH58, James Cook Drive, Waitangirua and at Kenepuru Drive.	N/A	Designation: • Process for achieving appropriate solutions	• Assessment of Traffic & Transportation Effects
The ability to cycle on SH1 at MacKays Crossing is disrupted by the new route	Further design prior to commencement of construction including methods for providing a safe and clearly signed posted alternative for cyclists to get back onto another route	N/A	Designation: • Requirement to provide an appropriate design solution	• Assessment of Social Effects

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Reduced pedestrian connectivity and safety along Warspite Avenue	Provide signalised junction with pedestrian phase at Warspite Avenue junction with Porirua Link Road.	N/A	Designation: • Develop a solution in consultation with PCC (as Road Controlling Authority)	• Urban Design and Landscape Framework
Land use and property				
Some properties will be temporarily occupied because they are required for temporary construction purposes.	Condition to require uplifting of the old designation as soon as it is no longer required; Requirement to consider uplift of parts of (i.e. surplus) designation upon completion. Note: acquisition and compensation is arranged through the Public Works Act	N/A	Designation: • Require uplift of old designation. • Consider uplift of parts of new designation.	• Consultation Summary Report • Assessment of Social Effects
Access to water supply for some parties / properties will be adversely affected by the construction of the new route.	Where water access arrangements are not otherwise protected through an existing legal mechanism, NZTA will undertake to make alternative arrangements on a case by case basis.	N/A	Designation: • Alternative access arrangements to be determined on a case by case basis through consultation	• NZTA requirements
Access to some properties will be adversely affected by the new route.	• Provision of alternative access	N/A	No condition (NZTA is required under Government Roading Powers Act to provide an alternative access)	• Assessment of Environmental Effects

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Porirua Gun Club will not be able to continue to operate from its current site and is required to be relocated and accommodated elsewhere.	• Find alternative location	N/A	No condition Addressed through an existing agreement between NZTA and Porirua Gun Club	• Assessment of Environmental Effects
Network utilities				
Dust from construction activities has the potential to adversely affect Transpower assets	Some assets may need to be cleaned during construction.	Yes – in communication with Transpower, dust effects on assets will be monitored during construction	Designation: • NUMP	• Agreement between NZTA and Transpower • Consultation Summary Report
Permanent relocation of some utilities, and their maintenance access routes, is required to make way for construction of the road	Close liaison with utility provider to manage continuity of supply.	No	Designation: • NUMP • Separate agreements have been made in some cases	• Consultation Summary Report
Potential for physical damage to network utility assets.	Careful on-site management processes to accurately locate and protect assets prior to the commencement of construction.	Yes – ongoing as required during construction	Designation • CEMP • NUMP	• Consultation Summary Report • CEMP
The Project has the potential to change maintenance regime(s) for network utility operators.	N/A	N/A	No condition: • Separate agreements to maintain appropriate access for maintenance	• Consultation Summary Report

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Noise and vibration				
Construction noise and vibration has potential to cause disturbance to close neighbours.	Comply with construction noise standard – e.g.: Restricted use of local roads by construction traffic; Restricted night working; Restricted use of pile driving; Noise barriers installed early.	• No monitoring except as required by standards or CNVMP	Designation: • CNVMP	• Acoustics Assessment Report (Section 5.4) • CNVMP
Construction vibration has potential to cause damage to brick fuel tank.	Detailed assessment of vibration sources within 20 m of brick fuel tank;	Building condition survey pre-construction Visual inspection Vibration monitoring of works within 20 m Set appropriate standards in CNVMP.	KCDP Designation: • Condition survey • CNVMP • Provision to alter work practices if damage is detected through monitoring	• Acoustics Assessment Report (Section 5.4.4) • CNVMP • Assessment of Built Heritage Effects
Construction vibration may cause damage to St Joseph’s Church.	Nil – the site is too far away for construction-related vibration to have an effect.	Building condition survey pre-construction	PCDP Designation: • Condition survey	• Acoustics Assessment Report (Section 5.4.4) • CNVMP • Assessment of Built Heritage Effects

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Road-traffic noise may cause disturbance to neighbours.	Noise barriers (e.g. bunds and walls); Building-modification if necessary (determined at commencement of construction).	N/A	Designation: • Noise barriers to be constructed in specified locations • Requirement for low noise surfaces in specified locations	• Assessment of Acoustics Effects (Tables 5-1, 5-2 & 5-3)
There will be adverse operational noise effects from Waitangirua Link Road on Maraeroa Marae.	Requirement to for permanent noise barrier adjacent to Maraeroa Marae as early as possible (prior to commencement of construction), with the design developed in consultation with the Marae committee.	N/A	Designation: • Early construction of noise barrier	• Assessment of Acoustic Effects • Waitangirua SSEMP
Air quality				
Potential for dust nuisance effects at nearby sensitive receptors. Those most likely to be affected include residents near the Kenepuru and Waitangirua Link Roads, and Linden interchange.	Dust management during construction; Responsiveness to complaints.	Visual monitoring; Instrumental TSP monitoring near potentially affected residents in the Linden area.	Designation: • CAQMP • Complaints register (part of CEMP)	• Assessment of Air Quality Effects • CAQMP
Rural residents who are reliant on rain water may be affected by dust (in water supply).	Dust management during construction or alternative water supply; Responsiveness to complaints.	N/A	Designation: • CAQMP • Provision for alternative water supply	• CAQMP
Potential for adverse effects arising from dust settling on Transpower lines and other assets.	Refer above under “Network Utilities”			

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Changes in vehicle related emission levels at locations where higher vehicle volumes are predicted.	No – meets NZ guidelines	No (Background pollutant levels are currently being monitored in Tawa by GWRC, near where peak contribution from the Project is predicted.)	No	• Assessment of Air Quality Effects • Assessment of Traffic and Transportation Effects
Contaminated land[162]				
Presence of contaminants above human health risk-based guideline values may have adverse effects on human health; or above ecological risk-based guideline values may have adverse effects on terrestrial/aquatic life.	Remedial action plan to be approved by GWRC; Proper on-site soil management, with impacted soil placed under clean soil cover or structures. This soil will not be used to construct stormwater management devices.	Health and safety, dust, and sediment and erosion control monitoring; Track and record where soil is placed to verify appropriate location and prevent spread of contamination during future operations (e.g., highway maintenance).	Designation: • CLMP • Recording and verification • Resource Consent (Land Use Consent for Earthworks): • Remedial Action Plan	• Assessment of Contaminated Land Effects (Section 8, Summary recommendation s • CSMP
Potential for presence of hazardous materials including asbestos and unexploded ordnance.	Specialist management process for management of hazardous materials.	N/A	KCDP Designation • CLMP	• Assessment of Contaminated Land Effects
Hydrology				
Use of Lanes Flat for construction activities has the potential to adversely affect storage capacity of flood plain resulting in slightly increased flood levels.	• Consultation with property owners to identify concerns and options • Potential for provision of flood level management measures on a case by case basis in consultation with property owners	N/A	Designation: • Consultation with affected property owners	• Assessment of Hydrology and Stormwater Effects • Consultation Summary Report
Also refer to mitigation, monitoring and conditions below under "water quality"				

162. The Contaminated Land Management Plan (CLMP) is also referred to as the Contaminated Soil Management Plan (CSMP).

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Occupation of Lanes Flat for construction activities has the potential to adversely affect storage capacity of flood plain and affect water levels on three properties in an extreme rain event.	Consultation with property owners to identify concerns and options Potential for provision of flood level management measures on a case by case basis in consultation with property owners	N/A	Designation: • Consultation with affected property owners	
Stormwater networks in Waitangirua are under capacity to accept additional flows from surface of PCC link roads.	Upgrade stormwater systems before or during construction	N/A	PCC Designation: • Detailed design condition	• Assessment of Hydrology and Stormwater Effects
Stormwater flows at Linden need to be carefully managed in order to avoid adverse capacity effects on existing WCC network	Detailed design to be required to build in storage capacity or alternative method to manage effects on existing network	N/A	Resource Consent (Land Use Consent for Earthworks): • Detailed design condition	• Assessment of stormwater & hydrology effects
TG Main Alignment increases rate of run off to Duck Creek resulting in downstream inundation / increase in flood flow levels	Detailed design to incorporate upstream storage capacity	N/A	Resource Consent (Land Use Consent for Earthworks): • Detailed design condition	• Assessment of stormwater & hydrology effects
Encroachment into Porirua Stream floodplain results in loss of flood flow capacity	Design incorporates measures to provide floodplain capacity to an existing or greater level than existing	N/A	Resource Consent (Land Use Consent for Earthworks): • Detailed design condition	• Assessment of stormwater & hydrology effects

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Water quality[163]				
Construction works will result in sediment discharge to streams.	Treatment using erosion and sediment control measures; Construction staging to minimise risk during a storm event; Agreed maximum area of open (unstabilised) earthworks within catchments leading to each arm of the Porirua Harbour to minimise risk during a storm event; Early warning system for potential storm events.	Adaptive management of erosion and sediment control measures; Continuous water quality monitoring; Continuous sediment control measure monitoring; Event based aquatic habitat monitoring.	Resource Consent (Land Use Consent for Earthworks): • Performance standards for sediment management • Monitoring conditions	• Assessment of Water Quality Effects • Ecological Impact Assessment • various SSEMPs
Contaminants (other than sediment) from worksite(s) have an adverse effect on, or are transported to, either streams or the Porirua Harbour.	Incident response; Cement works management in close proximity to streams. Truck washes bunded and dirty water captured; Dedicated vehicle service sites and fuel storage areas bunded; Rules regarding concrete truck wash down; Risk management plan and on site pollution kits and training.	N/A	Designation and Resource Consent (Land Use Consent for Earthworks): • CEMP	• CEMP
Contaminants in stormwater from road surfaces are transported to streams and Porirua Harbour.	Treatment of all road run off prior to discharge.	N/A	Part of the design and required by to be in accordance with documents submitted. Required to meet permitted activity standards.	• Assessment of Water Quality Effects

163. Some of the mitigation and monitoring that relates to water quality is also related to marine ecology.

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Terrestrial ecology				
Terrestrial vegetation will be lost as a result of enabling works and construction works.	Use BPO to avoid identified sites within designation during detailed design; 250ha of revegetation as mitigation for loss of 120 ha of native vegetation (sites identified & include existing and total 426ha of which 270 ha of revegetation – includes overlap w. freshwater stream mitigation); Mitigation sites to be legally protected through covenants or similar mechanism. Note: mitigation may not be in the same catchment	Specialist ecological advice during detailed design; Landscape and restoration plan for each mitigation site; Monitoring of planting for 3 years with quarterly report year 1, annually thereafter.	Resource Consent (Land Use Consent for Earthworks & Discharge permit): • Condition to specify amount of land to be covenanted (or similar mechanism) based on a ratio that corresponds to the amount lost	• Ecological Impact Assessment • SSEMP (identify issue & locations)
Wetland construction within Upper Horokiri Stream catchment may result in rare plant species loss.	Requirement for stormwater treatment pond development to provide habitat for rare plants	Additional rare plant monitoring and pest management for 3 years with quarterly report year 1, annually thereafter.	Resource Consent (Land Use Consent for Earthworks): • Detailed design to achieve habitat specification • Monitoring plan to be prepared	• EIA • SSEMP (identify issue & locations), Detailed Design for Stormwater Ponds provide detail.
Potential for loss of individual bugs and lizards particularly in scree slope habitats and stonefield habitats of Horokiri and Te Puka catchments.	Capture and translocation prior to earthworks where habitat found; Re-create scree / stonefield habitat at toe of fill batters for lizards.	Monitoring of populations for a fixed period; Monitoring of formed scree for a fixed period to confirm it is able to be used by target species; Specialist ecological advice during detailed design and construction in key locations.	Resource Consent (Land Use Consent for Earthworks): • Capture and translocation • Monitoring plan to be prepared • SSEMP	• Ecological Impact Assessment

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Construction may cause disturbance to avifauna – falcon / kaka / pied shag / black shag.	N/A	N/A	No	Nil
Construction may cause disturbance to bats.	N/A	Additional study required to confirm presence, species and population characteristics.	Designation: • Requirement to carry out bat study	• Ecological Impact Assessment • EMMP
Potential for bat mortality (hit by vehicles).	Adaptive management	Monitoring is required (on the assumption that bats are present).	Designation: • Requirement to carry out bat study	• Ecological Impact Assessment • EMMP
Freshwater ecology				
Construction will result in freshwater habitat loss and modification.	Use BPO to avoid streams not directly affected by stream works; Temporary culverts or fords installed, where practicable, on temporary construction access tracks to minimise effects on stream beds; Protection and restoration of 26km of stream as mitigation for loss or modification of 10.5 km of stream bed; Replacement of perched culverts in Duck creek will provide additional benefit (8.5 km that is currently cut off will be accessible to fish); Capture and release fish before and during construction.	Specialist ecological advice during detailed design and installation of culverts; Monitoring of diversions to achieve acceptable velocities and appropriate habitat mix; Monitoring to maintain fish passage in culverts; Monitoring of ecological enhancement, revegetation, land retirement to confirm benefits achieved are as expected; Monitoring of upper Duck Creek fish passage to confirm benefits achieved are as required.	Resource Consent (Land Use Consent for Earthworks & Discharge permit): • Methodology for temporary works in streams to be submitted to GWRC • Monitoring plan to be prepared • condition to specify amount of land to be covenanted (or similar mechanism) based on a ratio that corresponds to the amount lost • Detailed	• Ecological Impact Assessment • Diversion Design Guide including ecological design principles • Culvert Design Guide including ecological design principles • SSEMPs

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
			construction and staging plan for each diversion to be submitted to GWRC	
Construction activities may result in species loss within streams as a result of creating diversions, reclamations and culverting.	Capture and translocation of fish prior to diversion or culverting Note: DOC Permit required. Timing of works in the bed of streams to avoid peak fish migrations (1 Oct to 30 Dec, & 1 Apr to 30 May);	Monitoring of diversions for at least two spring migrations following completion of works for re-establishment of communities of fish and macro-invertebrates.	Resource Consent (Land Use Consent for Earthworks & Discharge permit): • Methodology and design for permanent structures in streams to be submitted to GWRC • Monitoring plan to be prepared	• Ecological Impact Assessment • SSEMPs
Marine ecology				
In an extreme weather event there is potential for sediment transport from construction areas to the Porirua Harbour resulting in loss of marine ecology.	Limitations on earthworks open areas; Performance based operation for erosion and sediment control; Wet weather shutdown procedures; Weather forecasting daily; Funding for a community project in the event of a notable event occurring.	Yes, key performance indicators; Essential component for controlling effects and managing the ESC devices.	Resource Consent (Land Use Consent for Earthworks & Discharge permit): • CEMP • Monitoring plan to be prepared • Off-set mitigation of specialist funding in the case of a significant event	• CEMP • Assessment of Water Quality Effects • SSEMP's

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Tangata whenua				
Potential for reduction/loss of fishery for eels, shellfish, freshwater mussels etc as a result of construction effects (sediment discharge from earthworks).	Performance based operation for erosion and sediment control. Note: Controls as set out above under ecology and water quality	Key performance indicators as specified by Ngati Toa	Resource Consent (Land Use Consent for Earthworks & Discharge permit): • Monitoring plan to be developed in consultation with Ngati Toa	• Assessment of Water Quality Effects • Assessment of Cultural Effects • CEMP
Landscape and visual				
Adverse effects on the outlook from rural-lifestyle properties during construction including associated bulk earthworks fill sites and enabling works – including the effects of a continually changing visual environment.	Where visual mitigation planting is proposed to mitigate permanent effects, consider early implementation to manage visual effects from construction; Early planting of fill batters and stream margins where practicable; Locally sourced plants where available and consistent with general Ecological Region principles.	Monitor planting and replacement of dead plants where necessary	Designation: • Addressed by a LMP as part of Outline Plan or CEMP. • Private property planting by agreement on a case by case basis.	• Landscape and Visual Assessment • Urban Design and Landscape Framework • Assessment of Social Effects.
Construction yards and compounds will have effects on visual amenity during construction.	Planting around Lanes Flat compound for screening purposes and/or fencing Localised planting in and around other site compounds to screen buildings and industrial plant where practicable; Construction lighting should seek to reduce effects of night time glare/ vertical spill; Manage sites in a tidy manner.	N/A	Designation: • Addressed by a LMP as part of Outline Plan or CEMP.	• Landscape and Visual Assessment • CEMP • Assessment of Social Effects.

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Adverse visual effects arising from the presence of the road	Location of signs (gantries in particular) should be considered in terms of proximity to adjacent dwellings and key views from properties and the road; Visual mitigation planting within the proposed designations and on private property is required where effects cannot be avoided through design refinement; Planting on private property to be subject to individual agreement and implemented as soon as possible to ensure adequate mitigation; Development and planting of Lanes Flat as a 'wetland' area to mitigate visual effects on Lanes Flat arising from the construction of the road.	Monitoring of planting, and maintenance for a specified period	Designation: • Addressed by a LMP as part of outline plan or CEMP.	• Landscape and Visual Assessment • Urban and Landscape Design Framework • Assessment of Social Effects.
Adverse landscape effects arising from the construction of the road – in particular effects on the landforms of the northern part of the route which are considered to be a ONL	Detailed design process to demonstrate consideration of further minimising: Size and scale of cut batters Overall road footprint Demonstrate that form, location and design of road furniture has given consideration to the landscape in which it sits Engagement of an appropriately qualified landscape professional to inform the detailed design process.		Designation: • Detailed design process to demonstrate consideration has been given to minimising landscape effects • LMP as part of Outline Plan or CEMP. • Engagement of a suitably qualified professional	• Landscape and Visual Assessment • Urban Design and Landscape Framework • Assessment of Social Effects.

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Potential for adverse visual effects of noise barriers and bunds on surrounding communities.	Requirement for noise barriers to have high levels of visual quality and /or have associated landscape planting.	N/A	Designation: • LMP as part of Outline Plan or CEMP.	• Landscape and Visual Assessment • Urban Design and Landscape Framework
At Flightys Road, the proposed noise bunds have the potential to dominate outlooks from private properties.	Requirement to design landscape bunds to be consistent with adjoining earthworks and landscape treatments.	N/A	Designation: • LMP as part of outline plan or CEMP.	• Landscape and Visual Assessment • Urban Design and Landscape Framework
Archaeology and built heritage				
Construction vibration may cause damage to St Joseph's Church or brick fuel tank.	Refer above under "Noise and Vibration"			
Potential for adverse dust effects on glacier windows at St Joseph's Church.	Dust management during construction; Protective cover to be offered if monitoring indicates a problem; or Remove and store glacier windows off-site during construction.	Monitoring during works to confirm effects (or otherwise) on glacier windows.	PCDP Designation: • Consideration of options to protect windows from construction effects • ArchMP	• Assessment of Built Heritage Effects • CAQMP

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Potential for discovery of artefacts during construction.	N/A	All site personnel to be given an induction; Archaeologist to be involved with monitoring site works.	Designation and Resource Consents (Land use consent for Earthworks & Discharge permit): • Accidental discovery protocol • Nominated archaeologist • ArchMP	• Assessment of Archaeological Effects • Cultural Heritage Assessment • CEMP
Effects on ambience and pleasantness within the grounds of St Joseph's Church as a result of the new interchange.	Landscaping to be offered to the Church to screen the new SH58 interchange from view from within Church grounds.	N/A	PCDP Designation: • Landscaping to be offered to church owners • ArchMP	• Assessment of Built Heritage Effects • Landscape and Visual Assessment
Social effects				
Potential for noise effects on surrounding communities during construction.	Refer to "Noise and Vibration" above			
Disruption to local communities will occur during construction, as a result of traffic, noise, and large crews of construction workers.	Refer to "Traffic and Transport" and "Noise and Vibration" above			
Potential for dust nuisance effects at nearby sensitive receptors – most likely to include residents near the Kenepuru and Waitangirua Link Roads, and Linden Interchange.	Refer to "Air Quality" above			

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Potential adverse effects on connectivity (pedestrian, cycle, horse riders and vehicles) through regional parks during construction – for public safety reasons.	Provide safe and convenient access across the alignment for all park users during the construction period.	N/A	Designation: • CEMP • CTMP	• Assessment of Social Effects • CEMP • CTMP
Potential for reduction/loss of fishery for coastal species as a result of construction effects.	Refer to “Marine Ecology” above			
Potential for amenity effects for contact recreation (e.g. water becomes cloudy and less desirable for swimming) in streams and/or Porirua Harbour.	Refer to “Water Quality” above			
Change in amenity for community facilities at the tie-in with the Whitby and Waitangirua Link Roads.	Involvement of relevant community facility personnel in development of design treatments.	N/A	Designation: • Urban design condition to require working party in relation to specific design elements	• Assessment of Social Effects • Urban Design and Landscape Framework • Waitangirua SSEMP
Change in amenity for local residents, particularly those with a view of the Main Alignment.	Refer to “Visual and Landscape”, “Noise and Vibration”, “Air Quality” and “Traffic and Transport” above			

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Loss of amenity and tranquillity, and land area, in BHFFP and Belmont Regional Park; Loss of public recreational land as a result of designating parts of regional parks.	Development and planting of Lanes Flat as 'wetland' recreational area; Construction of a new track to be made available for recreational users, linking QE Park to BHFFP; Flightys Road extension underpass to provide reasonable amenity and safety for pedestrians and horse riders; Redirect or reconnect severed paths in Belmont Regional Park; Provision of alternative recreational facility/ies where appropriate and in consultation with the relevant Council.	N/A	Designation: • Development of a public access plan in consultation with GWRC Note: Public Works Act process also applies	• Landscape and Visual Assessment • Urban Design and Landscape Framework • Assessment of Social Effects
Loss of pedestrian connectivity, and reduced safety and amenity of regional cycle network around SH58 Interchange.	Also refer to "Traffic and Transport" above Requirement to provide a shared pedestrian and cycle path under the Main Alignment and along Pauatahanui Stream; Pauatahanui Stream underpass to have high levels of amenity and Crime Prevention Through Environmental Design (CPTED) principles applied.	N/A	Designation: • Detailed design to incorporate safe pedestrian and cycle path	• Assessment of Social Effects • Assessment of Traffic and Transport Effects • Urban Design and Landscape Framework
Potential for adverse noise, visual, amenity effects on Linden Primary school.	Widening of SH1 near school to be fully on the eastern side; Noise barrier to be designed, in consultation with the school.	N/A	Designation: • Consultation to be undertaken with school to inform detailed design	• Assessment of Social Effects • Urban Design and Landscape Framework

Actual or potential environmental effect identified	Mitigation recommended	Monitoring recommended	Condition proposed	Report name(s)/ reference(s)
Specialist or site specific construction management measures				
Potential to introduce new weeds to the site that are not already there for example with topsoil, aggregate and freshwater in a currently relatively weed free environment.	Part of Construction Environmental Management Plan; Vehicle washing; Controls on sourcing of aggregate and topsoil.	Weed monitoring during works and at the completion of construction	Designation and Resource Consent (Land Use consent for Earthworks): • CEMP	• CEMP
There is potential for fires to be caused as a result of construction works such as hot works, exhaust sparks, cigarettes etc.	Comprehensive fire plan – which will include (for example) special controls during high risk seasons, no smoking work sites, exhaust controls; No smoking work site; Controls or halt on hot works during high risk periods, monitoring of vehicle / equipment exhausts; Relationship with Rural Fire including on-site training.	Monitoring of fire risk as part of fire plan	Designation and Resource Consent (Land Use consent for Earthworks): • CEMP	• CEMP

28.5 Proposed conditions

Based on the mitigation and monitoring measures summarised in Table 28.2, a suite of conditions is proposed to manage the effects of construction. These can be broken up into two broad categories:

- conditions dealing with human health and nuisance effects; and
- conditions dealing with other environmental, ecological, and water effects.

Some conditions will appear in both the designation and regional resource consent conditions, but for the most part the human health and nuisance effects are dealt with under the designation conditions, and the other environmental, ecological, and water effects are dealt with in the regional consent conditions.

A suite of conditions is also proposed to manage the effects of operation. These mainly relate to maintenance, including maintenance of the road and associated structures, surface runoff and maintenance of vegetation planting. The NZTA has an existing network maintenance contract and has a number of measures in place for the ongoing operation and maintenance of its assets. Porirua City Council has similar measures in place. Maintenance measures include, for example:

- landscape maintenance;
- road surface maintenance;
- stormwater management; and
- graffiti removal.

29. Proposed designation conditions

29.1 Guide to reading the conditions

The proposed suite of conditions to manage effects of the Project has been numbered in order to eliminate confusion, specifically to avoid multiple 'Condition 1' and so forth. The numbering format is as follows:

Set of proposed conditions	Numbering format
NZTA designation conditions	**NZTA.1., NZTA.2.** and so on
PCC designation conditions	**PCC.1., PCC.2.** and so on

29.2 Proposed NZTA designation conditions

29.2.1 Definitions

AEE	Transmission Gully Project Assessment of Effects on the Environment Volumes 1 to 5 dated August 2011
CEMP	Construction Environmental Management Plan
Commencement of Works	means the time when the works that are the subject of these consents commence
Council	means the **[insert relevant Council]**
Existing network utilities	all network utilities existing at the date of lodgement of this Notice of Requirement (network utility has the same meaning as in Section 166 RMA)
GWRC	Wellington Regional Council
KCDC	Kapiti Coast District Council
Manager	means the **[insert relevant position title]** of the Council
OP	means an Outline Plan prepared in accordance with Section 176A of the RMA
PCC	Porirua City Council
Project	means the construction, maintenance and operation of the Transmission Gully Main Alignment and/or the Kenepuru Link Road
Requiring Authority	means the NZ Transport Agency

RMA	means the Resource Management Act 1991.
Road Asset Manager	means the **[insert relevant Council]** Council's road asset manager
SSEMP	means a Site Specific Environmental Management Plan required under the provisions of regional consent conditions
Stage	means a stage of the Project as nominated by the contractor and agreed with the GWRC
UHCC	Upper Hutt City Council
WCC	Wellington City Council

29.2.2 Advice Notes

A. These conditions apply to all jurisdictions unless otherwise stated.

B. These conditions are related to the proposed regional consent conditions, and the proposed designation conditions for each of the relevant districts. Where management plans are required, a single management plan could be prepared to address the relevant condition for each NoR and any similar regional consent condition.

C. Where possible, the designation and regional consent conditions use the same or similar wording.

Reference	Proposed condition
	General conditions and administration
NZTA.1.	Except as modified by the conditions below, and subject to final design, the Project shall be undertaken in general accordance with the information provided by the Requiring Authority in the Notice of Requirement dated **[insert date]** and supporting documents being: **a. [insert final dates and revision numbers here]** For the avoidance of doubt, none of these conditions prevent or apply to works required for the ongoing operation or maintenance of the Project following construction such as changes to street furniture or signage over time. Depending upon the nature of such works, OPs or OP waivers may be required for any such works.
NZTA.2.	As soon as practicable following completion of construction of the Project, the Requiring Authority shall: a. Review the width of the area designated for the Project; b. Identify any areas of designated land that are no longer necessary for the ongoing operation, or maintenance of the Project or for ongoing mitigation measures; and c. Give notice to the Council in accordance with Section 182 of the RMA for the removal of those parts of the designation identified in NZTA.2(b) above.
NZTA.3.	The designation shall lapse if not given effect to within 15 years from the date on which it is included in the District Plan under Section 175 of the RMA.
	Outline plans
NZTA.4.	Subject to Condition NZTA.5 below, the Requiring Authority shall submit an Outline Plan (OP) to the Council for the part of the Project located within the District or for each Project stage within the District, in accordance with Section 176A of the RMA.
NZTA.5.	An OP need not be submitted if the Council has waived the requirement for an OP for the Project or for the relevant Project stage located within the District in accordance with Section 176A(2)(c) of the RMA.

Reference	Proposed condition
NZTA.6.	The OP(s) shall include the following Management Plans for the relevant stage(s) of the Project: a. Archaeological Management Plan (ArchMP); b. Construction Environmental Management Plan (CEMP); c. Construction Traffic Management Plan (CTMP); and d. Landscape Management Plan (LMP).
	Management plans
NZTA.7.	All works shall be carried out in general accordance with any of the management plans required by these conditions.
NZTA.8.	The consent holder may request amendments to any of the management plans required by these conditions by submitting the amendments in writing to the Manager for approval prior to any changes taking effect.
	Archaeology and heritage
NZTA.9.	The Requiring Authority shall, prior to the commencement of construction of the part of the Project located within the District, or prior to the commencement of construction of any Project stage within the District, prepare an **Archaeological Management Plan** (ArchMP) in consultation with Te Runanga o Toa Rangatira Inc and the New Zealand Historic Places Trust. The ArchMP shall include: a. Methods to avoid noise, vibration and dust effects on St Josephs Church building; b. Methods to avoid adverse vibration and other construction effects on the brick fuel containment structure at approximate chainage 2500 and shall be consistent with any conditions imposed on any relevant New Zealand Historic Places Trust authority. **Note:** Condition NZTA.9(a) applies to the Porirua District Plan designation only. **Note:** Condition NZTA.9(b) applies to the Kapiti Coast District Plan designation only. **Explanatory note**: An authority under Section 12 of the Historic Places Act will be sought prior to the commencement of construction and is also likely to require the preparation of an ArchMP.
NZTA.10.	The Requiring Authority, in consultation with, Te Runanga o Toa Rangatira Inc and the New Zealand Historic Places Trust, shall prepare an accidental discovery protocol to be implemented in the event of accidental discovery of cultural or archaeological artefacts or features during the construction of the Project. This protocol shall be submitted to the Manager at least 20 working days prior to any construction or enabling Work commencing under this consent on any part of the Project within the District. The protocol shall include, but not be limited to: a) Training procedures for all contractors regarding the possible presence of cultural or archaeological sites or material, what these sites or material may look like, and the relevant provisions of the Historic Places Act 1993 if any sites or material are discovered; b) Parties to be notified in the event of an accidental discovery shall include, but need not be limited to Te Runanga o Toa Rangatira Inc, the New Zealand Historic Places Trust, the GWRC, the relevant District or City Council and the New Zealand Police (if koiwi are discovered); c) Procedures to be undertaken in the event of an accidental discovery (these shall include immediate ceasing of all physical works in the vicinity of the discovery); and d) Procedures to be undertaken before Work under this consent may recommence in the vicinity of the discovery. These shall include allowance for appropriate tikanga (protocols), recording of sites and material, recovery of any artefacts, and consulting with Te Runanga o Toa Rangatira Inc and the New Zealand Historic Places Trust prior to recommencing works in the vicinity of the discovery.
	Construction Environmental Management Plan
NZTA.11.	An OP for the part of the Project located within the District or for any Project stage located within the District shall include a Construction Environmental Management Plan or Plans (CEMP) for the relevant part of the Project. Among other things, a CEMP is to confirm that the proposed construction methodology for the relevant part of the Project complies with General Condition 1 of this designation and to demonstrate how other

Reference	Proposed condition
	conditions of this designation have been or will be complied with during the construction of the relevant part of the Project.
NZTA.12.	The purpose of the CEMP is to confirm final project details, staging of Work, and detailed engineering design to seek to ensure that the Project remains within the limits and standards approved under this consent and that the construction and operation activities avoid, remedy or mitigate adverse effects on the environment in accordance with the conditions of this consent. The CEMP shall provide details of the responsibilities, reporting frameworks, coordination and management required for project quality assurance; final detailed design; construction methodologies; timeframes and monitoring processes and procedures. Works shall not commence on a Stage until the consent holder has received the Manager's written approval for the CEMP(s) for that Stage. A CEMP shall include but need not be limited to: (1) Quality Assurance A Quality Assurance section which shall include management frameworks, systems and procedures for quality management of all on-site activities and compliance with the conditions of this designation. Among other matters this section shall provide details of the following: a. Name, qualifications, relevant experience and contact details of an appropriately qualified and experienced project manager, who shall be responsible for overseeing compliance with the CEMP; b. Names, qualifications, relevant experience, and methods for contacting principal staff employed on the relevant part of the Project, along with details of their roles and responsibilities; c. Methods and systems to inform and train all persons working on site of potential environmental issues and how to comply with conditions of the consent; d. Systems and processes whereby the public are informed of contact details of the project manager and principal staff identified above; e. Liaison procedures with the Council; and f. Communication protocols. (2) Site Management The Site Management section of the CEMP shall detail procedures to manage the relevant part of the Project throughout the entire construction process in a safe manner. This section shall provide details of the following (and may include other matters): a. Details of the site access for all Work associated with construction of the part of the Project; b. Measures to be adopted to maintain the site in a tidy condition in terms of disposal/storage of rubbish, storage and unloading of building materials and similar construction activities; c. Location of workers' conveniences (e.g. portaloos); d. Procedures for controlling sediment run-off into the watercourses/streams, dust and the removal of soil, debris and construction materials from the watercourses/streams and riparian margins, and onto public roads or places (including identifying the location of wheel wash facilities); e. A contingency plan in the event that there is any unconsented discharge to watercourses/streams; f. Details of the storage of fuels and lubricants (which shall require that storage be bunded or contained in such a manner so as to prevent the discharge of contaminants from spillages); g. Details of the proposed maintenance of machinery and plant to minimise the potential for leakage of fuels and lubricants; h. Location of vehicle and construction machinery access and storage during the period of site works;

Reference	Proposed condition
	i. Procedures for thoroughly cleaning all machinery of unwanted vegetation (e.g. weeds), seeds or contaminants prior to entering the site; j. Methods for the clear identification and marking of the construction zones including those which extend into watercourses; k. A methodology that prescribes the extent to which machinery can operate in the vicinity of watercourses so as to minimise disruption and damage to the watercourses and associated vegetation; l. Methods to manage public health and safety during the construction works, and notification to the public of temporary access restrictions to the immediate works area during the staged construction; m. Confirmation that no equipment or machinery will be cleaned, or refuelled in any part of any watercourses/streams, except as otherwise specifically provided for in the CEMP or an SSEMP; n. Procedures for removing all contaminants (e.g. fuel, hydraulic oils, lubricants etc) from the site at the end of the construction period, except for those required for ongoing maintenance of the road and operational activities; and o. Procedures for making any repairs to the adjacent road network required where any damage occurs as a direct result of the Project. <u>(3) Construction Programme and Methodology</u> A Construction Programme which shall include a programme of works that seeks to enable the relevant part of the Project to be constructed in a manner that is timely, adequately co-ordinated and manages the adverse effects of construction on the environment. This section shall, among other matters, provide details on the following: a. A detailed staging programme and anticipated timetable for construction works during the relevant part of the Project; and b. A methodology to identify how earthworks will be staged during the relevant part of the Project to manage the effects of the Project on the Pauatahanui Inlet. <u>(4) Environmental Management Plans</u> The following environmental management plans shall be included in the appendices to any CEMP: a. **Construction Noise and Vibration Management Plan** (CNVMP); b. **Contaminated Land Management Plan** (CLMP); and c. **Construction Air Quality Management Plan** (CAQMP). A. The CNVMP shall: a. Be prepared by a suitably qualified acoustics specialist; b. Include specific details relating to methods for the control of noise associated with all relevant Project works, which shall be formulated to, as far as practicable, comply with the following criteria in accordance with NZS 6803:1999:

Day	Time	$L_{Aeq(15\ min)}$	L_{AFmax}
Weekdays	0630h - 0730h	55 dB	75 dB
	0730h - 1800h	70 dB	85 dB

Reference	Proposed condition

	1800h - 2000h	65 dB	80 dB
	2000h - 0630h	45 dB	75 dB
Saturday	0630h - 0730h	45 dB	75 dB
	0730h - 1800h	70 dB	85 dB
	1800h - 2000h	45 dB	75 dB
	2000h - 0630h	45 dB	75 dB
Sundays and public holidays	0630h - 0730h	45 dB	75 dB
	0730h - 1800h	55 dB	85 dB
	1800h - 2000h	45 dB	75 dB
	2000h - 0630h	45 dB	75 dB

c. Address the following aspects with regard to construction noise:
   i. Noise sources, including machinery, equipment and construction techniques to be used;
   ii. Predicted construction noise levels;
   iii. Hours of operation, including times and days when noisy construction work and blasting would occur;
   iv. The identification of activities and locations where structural noise mitigation measures such as temporary barriers or enclosures may be used;
   v. Details of which road-traffic noise mitigation options will be implemented early to also mitigate construction noise;
   vi. The measures that will be undertaken by the Requiring Authority to communicate noise management measures to affected stakeholders;
   vii. Mitigation options, including alternative strategies where full compliance with the noise criteria cannot practicably be achieved;
   viii. Schedules containing site specific information;
   ix. Methods for monitoring and reporting on construction noise; and

d. Include specific details relating to methods for the control of vibration and airblast associated with all relevant Project works, which shall be

Reference	Proposed condition

formulated to, as far as practicable, comply with the Category A criteria in the following table, measured in accordance with ISO 4866:2010 and AS 2187-2:2006:

Receiver	Details	Category A	Category B
Occupied dwellings	Night-time 2000h - 0630h (transient vibration)	0.3 mm/s ppv	1 mm/s ppv
	Daytime 0630h - 2000h	1 mm/s ppv	5 mm/s ppv
All occupied buildings	Daytime blasting – vibration	5 mm/s ppv	10 mm/s ppv
	– airblast	120 dB L_{Zpeak}	-
All buildings	Vibration - transient (including blasting)	5 mm/s ppv	BS 5228-2 Table B.2
	Vibration - continuous		BS 5228-2 50% of Table B.2 values
	Airblast	-	133 dB L_{Zpeak}

e. Describe the measures to be adopted in relation to construction vibration including:

i. Vibration sources, including machinery, equipment and construction techniques to be used;

ii. Procedures for building condition surveys at locations close to activities generating significant vibration, prior to and after completion of the works (including all buildings predicted to experience vibration which exceeds the Category A vibration criteria);

iii. Procedures for management of vibration by a suitably qualified expert, if measured or predicted vibration and airblast levels exceed the Category A criteria;

iv. Procedures for approval by the Council and continuous monitoring of vibration levels and effects by suitably qualified experts if measured or predicted vibration and airblast levels exceed the Category B criteria; and

v. The measures that will be undertaken by the Requiring Authority to communicate vibration management measures to affected stakeholders.

B. The CLMP shall include information regarding:

a. The measures to be undertaken in the handling, storage and disposal of all contaminated material excavated during the construction works

Reference	Proposed condition
	including the appointment of a suitably qualified contractor to supervise the removal of any contaminated soil; b. The soil validation testing that will be undertaken; c. The soil verification testing that will be undertaken to determine the nature of any contamination in excavated spoil and the potential reuse or disposal options for contaminated spoil; d. Measures to be undertaken in the event of unexpected contamination being identified during construction activities, including measures to: i. Assist with identification of unknown contaminated material; ii. Stop work or isolate the area (as necessary) once any such material is identified; e. The measures to be undertaken to: i. Protect the health and safety of workers and the public from the potential effects of contaminated soil; ii. Control stormwater runon and runoff to and from areas of contaminated soil; iii. Remove or manage any contaminated soil; and f. The measures to be undertaken to: i. Identify any suspected asbestos; ii. Identify the type of asbestos and confirm the appropriate means by which it shall be removed; iii. Handle material containing asbestos, particularly in buildings built prior to 1980; iv. Implement appropriate health and safety measures to ensure the safety of workers and the public from the potential effects of asbestos; and v. Remove the asbestos and dispose of it to an appropriately licensed facility. The Requiring Authority shall ensure a suitably qualified contaminated land specialist is available to: a. supervise excavation works for the Project which are in the vicinity of any contaminated soils; b. supervise any removal of contaminated soil required for the Project c. ensure that an appropriately qualified contractor identifies and handles asbestos in accordance with the CLMP when demolishing any buildings built prior to 1980; and d. advise the Manager in writing of this contractor, prior to such demolition occurring. These measures shall include appointment of a suitably qualified contractor to implement the asbestos identification and handling measures identified in the CLMP; and the appointment of a suitably qualified contaminated land specialist to supervise excavation works for the Project which are in the vicinity of any contaminated soils, and notification of these appointments to the Manager prior to any relevant demolition works or soil removal being undertaken. C. The CAQMP shall provide a methodology for managing the effects of dust from the site, and shall, as a minimum include: a. Identification and implementation of dust suppression measures appropriate to the environment in which the works are located, and the sensitivity of nearby receptors; and b. Identification of contingency measures to address identified and verified adverse effects on sensitive receptors. Contingency measures may

Reference	Proposed condition
	include options such as: i. Cleaning of water tanks and replenishment of water supplies; ii. Cleaning of houses; and iii. Cleaning of other buildings and infrastructure. (5) Layout Drawings Drawings showing the proposed layout of the construction yards, including associated buildings, fencing and site accesses. The layout drawings shall, as far as practicable, incorporate the following: a. The main access to the construction yards to be located as far as practicable from residential dwellings; b. Noisy construction activities to be located as far as practicable from residential dwellings; c. Temporary acoustic fences and visual barriers.
NZTA.13.	The Requiring Authority shall provide the Manager with an updated schedule of construction activities at monthly intervals during the construction of any part of the Project or any Project Stage within the District.
	Communications and public liaison
NZTA.14.	A liaison person shall be appointed by the Requiring Authority for the duration of the construction phase of the Project to be the main and readily accessible point of contact for persons affected by the construction work. The Requiring Authority shall take appropriate steps to seek to advise all affected parties of the liaison person's name and contact details. This person must be reasonably available for on-going consultation on all matters of concern to affected persons arising from the construction of the Project. If the liaison person will not be available for any reason, an alternative contact person shall be nominated, to seek to ensure that a project contact person is available by telephone 24 hours per day/seven days per week during the construction phase of the Project.
NZTA.15.	Prior to the commencement of construction and/or enabling works, the requiring authority shall prepare and implement, a **Communications Plan** that sets out procedures detailing how the public will be communicated with throughout the construction period. As a minimum, the Communications Plan shall include: a. Details of a contact person available on site at all times during works. Contact details shall be prominently displayed at the entrance to the site(s) so that they are clearly visible to the public at all times. b. Methods to consult on and to communicate the proposed hours of construction activities outside of normal working hours and on weekends and public holidays, to surrounding residential communities, and methods to deal with concerns raised about such hours. c. Methods to record concerns raised about hours of construction activities and, where practicable, methods to so far as is practicable, avoid particular times of day which have been identified as being particularly sensitive for neighbours. d. Details of communications activities proposed including: i. Publication of a newsletter, or similar, and its proposed delivery area. ii. Newspaper advertising iii. Notification and consultation with individual property owners and occupiers with dwellings within 20 metres of construction activities. The Communications Plan shall also include linkages and cross-references to methods set out in other management plans where relevant.
	Complaints
NZTA.16.	During construction Work, the consent holder shall maintain a permanent record of any complaints received alleging adverse effects from, or related to, the exercise of this consent. The record shall include: a) the name and address (as far as practicable) of the complainant; b) identification of the nature of the complaint; c) location, date and time of the complaint and of the alleged event;

Reference	Proposed condition
	d) weather conditions at the time of the complaint (as far as practicable), and including wind direction and approximate wind speed if the complaint relates to air quality. e) the outcome of the consent holders investigation into the complaint; f) measures taken to seek to ensure that such a complaint does not occur again; and g) Any other activities in the area, unrelated to the project that may have contributed to the compliant, such as non-project construction, fires, traffic accidents or unusually dusty conditions generally. The consent holder shall also keep a record of any remedial actions undertaken. This record shall be maintained on site and shall be made available to the Manager, upon request. The consent holder shall notify the Manager in writing of any such complaint within 5 working days of the complaint being brought to the attention of the consent holder.
	Existing network utilities
NZTA.17.	The Requiring Authority shall prepare and implement a **Network Utilities Management Plan** (NUMP) so that enabling works, design and construction of the Project adequately take account of, and include measures to address, the safety, integrity, protection or, where necessary, relocation of, existing network utilities.
NZTA.18.	A copy of the NUMP shall be provided to the Manager at least 10 working days prior to the commencement of any enabling or construction works on any part of the Project located within the District.
NZTA.19.	The NUMP shall include, but need not be limited to, the following matters: a. The methods the Requiring Authority will use to liaise with all infrastructure providers who have existing network utilities that are directly affected by, or located in close proximity to, the part of the Project in the District. b. The methods the Requiring Authority will use to enable infrastructure providers to access existing network utilities for maintenance at all reasonable times, and to access existing network utilities for emergency works at all times, whilst construction activities associated with the Project are occurring. c. The methods the Requiring Authority will use to seek to ensure that all construction personnel, including contractors, are aware of the presence and location of the various existing network utilities which traverse, or are in close proximity to, the part of the Project in the District, and the restrictions in place in relation to those existing network utilities. This shall include plans identifying the locations of the existing network utilities and appropriate physical indicators on the ground showing specific surveyed locations.
NZTA.20.	The NUMP shall be prepared in consultation with the relevant infrastructure providers who have existing network utilities that are directly affected by the Project and, in addition to the matters listed in Condition NZTA.19, shall include: a. Measures to be used to accurately identify the location of existing network utilities, b. Measures for the protection, relocation and/or reinstatement of existing network utilities; c. Measures to provide for the safe operation of plant and equipment, and the safety of workers, in proximity to live existing network utilities; d. Measures to manage potential induction hazards to existing network utilities; e. Earthworks management (including depth and extent of earthworks), for earthworks in close proximity to existing network utility; f. Vibration management for works in close proximity to existing network utility; and Emergency management procedures in the event of any emergency involving existing network utilities.
	Operational noise
NZTA.21.	For the purposes of Conditions NZTA.21- NZTA.31 the following terms will have the following meanings: a. Acoustics Assessment – means the Acoustics Assessment report submitted as part of the AEE for this designation. b. BPO – means Best Practicable Option.

Reference	Proposed condition
	c. Building-Modification Mitigation – has the same meaning as in NZS 6806:2010. d. Habitable space – has the same meaning as in NZS 6806:2010. e. Noise Criteria Categories – means the groups of preference for time-averaged sound levels established in accordance with NZS 6806:2010 when determining the BPO mitigation option, ie Category A – primary noise criterion, Category B - secondary noise criterion and Category C – internal noise criterion. f. NZS 6806:2010 – means NZS 6806:2010 Acoustics – Road-traffic noise – New and altered roads. g. PPFs – means only the premises and facilities identified in green, yellow or red in the Acoustics Assessment. Structural Mitigation – has the same meaning as in NZS 6806:2010.
NZTA.22.	The Requiring Authority shall implement the road-traffic noise mitigation measures identified as the "Selected Options" in the Acoustics Assessment as part of the Project, in order to achieve the Noise Criteria Categories indicated in the Acoustics Assessment ("Identified Categories"), where practicable, subject to Conditions NZTA.23- NZTA.31 below.
NZTA.23.	The detailed design of the Structural Mitigation measures in the "Selected Options" (the "Detailed Mitigation Options") shall be undertaken by a suitably qualified acoustics specialist prior to commencement of construction of the Project, and, subject to Condition NZTA.24, shall include, as a minimum, the following: a. Noise barriers with the location, length and height in general accordance with Table 5-2 of the Acoustics Assessment; and b. Open graded porous asphalt or equivalent low-noise road surfaces in general accordance with Table 5-1 of the Acoustics Assessment.
NZTA.24.	Where the design of the Detailed Mitigation Options identifies that it is not practicable to implement a particular Structural Mitigation measure in the location or of the length or height included in the "Selected Options" either: a. if the design of the Structural Mitigation measure could be changed and the measure would still achieve the same Identified Category or Category B at all relevant PPFs, and a suitably qualified or experienced planner approved by the Council certifies to the Council that the changed Structural Mitigation would be consistent with adopting the BPO in accordance with NZS 6806:2010, the Detailed Mitigation Options may include the changed mitigation measure; or b. if the changed design of the Structural Mitigation measure would change the Noise Criteria Category at any relevant PPF from Category A or B to Category C, but the Council confirms that the changed Structural Mitigation measure would be consistent with adopting BPO in accordance with NZS 6806:2010, the Detailed Mitigation Options may include the changed mitigation measure.
NZTA.25.	The Detailed Mitigation Options shall be implemented prior to completion of construction of the Project, with the exception of any low-noise road surfaces, which shall be implemented within 12 months of completion of construction of the Project.
NZTA.26.	Prior to construction of the Project, a suitably qualified acoustics specialist shall identify those PPFs which following implementation of all the Structural Mitigation measures included in the Detailed Mitigation Options are not in Noise Criteria Categories A or B and where Building-Modification Mitigation may be required to achieve 40 dB LAeq(24h) inside habitable spaces ("Category C Buildings"). a. Prior to commencement of construction of the Project in the vicinity of a Category C Building, the Requiring Authority shall write to the owner of each Category C Building seeking access to such building for the purpose of measuring internal noise levels and assessing the existing building envelope in relation to noise reduction performance. b. If the owner of the Category C Building consents to the Requiring Authority request for access to the property within 12 months of the date of the Requiring Authority's letter (sent pursuant to Condition NZTA.26(a)), then no more than six months prior to commencement of construction of the Project, the Requiring Authority shall instruct a suitably qualified acoustics specialist to visit the building to measure internal noise levels and assess the existing building envelope in relation to noise reduction performance.

Reference	Proposed condition
NZTA.27.	Where a Category C Building is identified, the Requiring Authority shall be deemed to have complied with Condition NZTA.26 above where: a. The Requiring Authority (through its acoustics specialist) has visited the building; or b. The owner of the Category C Building consented to the Requiring Authority's request for access, but the Requiring Authority could not gain entry for some reason (such as entry being denied by a tenant); or c. The owner of the Category C Building did not approve the Requiring Authority's access to the property within the time period set out in Condition NZTA.27(b) (including where the owner(s) did not respond to the Requiring Authority's letter (sent pursuant to Condition NZTA.26(a) within that period)); or d. The owner of the Category C Building cannot, after reasonable enquiry, be found prior to completion of construction of the Project. If any of (b) to (d) above apply to a particular Category C Building, the Requiring Authority shall not be required to implement any Building-Modification Mitigation at that Category C Building.
NZTA.28.	Subject to Condition NZTA.27, no more than six months after the assessment required under Condition NZTA.26(b), the Requiring Authority shall give written notice to the owner of each Category C Building: a. Advising of the options available for Building-Modification Mitigation to the building; and b. Advising that the owner has three months within which to decide and advise the Requiring Authority whether to accept Building-Modification Mitigation for the building, and if the Requiring Authority has advised the owner that more than one option for Building-Modification Mitigation is available, to advise the Requiring Authority which of those options the owner prefers.
NZTA.29.	Once an agreement on Building-Modification Mitigation is reached between the Requiring Authority and the owner of an affected building, the mitigation shall be implemented in a reasonable and practical timeframe agreed between the Requiring Authority and the owner.
NZTA.30.	Subject to Condition NZTA.27, where Building-Modification Mitigation is required, the Requiring Authority shall be deemed to have complied with Condition NZTA.29 above where: a. The Requiring Authority has completed Building-Modification Mitigation to the Category C Building; or b. The owner of the Category C Building did not accept the Requiring Authority's offer to implement Building-Modification Mitigation prior to the expiry of the timeframe stated in Condition NZTA.28(b) above (including where the owner did not respond to the Requiring Authority within that period); or c. The owner of the Category C Building cannot, after reasonable enquiry, be found prior to completion of construction of the Project.
NZTA.31.	The Requiring Authority shall manage and maintain the Detailed Mitigation Options to ensure that, to the extent practicable, those mitigation works retain their noise reduction performance.
	Roading and traffic management
NZTA.32.	A general Construction Traffic Management Plan (CTMP) shall be prepared for the Project. This CTMP shall address the following: a. The staging of the works, including details of any proposals to work on multiple sections of the Project route concurrently; b. A general methodology for selecting detour routes; and c. The potential effects on the detour routes selected and how these will be managed to seek to ensure safety for all road users.
NZTA.33.	The CTMP shall be provided to the Road Asset Manager at least one month prior to commencement of construction of any part of the Project within the District.
NZTA.34.	The CTMP shall contain a section setting out methods to manage the construction traffic effects of the harvesting of plantation forestry as part of the enabling works for the Project. These methods shall include but not be limited to:

Reference	Proposed condition
	a. Traffic and access considerations; b. Methods to manage effects on the amenity of surrounding residential neighbourhoods including hours of operation, and number of heavy vehicle movements per day; c. The areas to be cleared at any one time; and d. Methods to maintain the quality of local roads used as access routes.
NZTA.35.	Site Specific Traffic Management Plans (SSTMPs) shall be provided to the road controlling authority at least 3 working days prior to the commencement of work in that area, and shall describe the measures that will be taken to manage the traffic effects associated with the construction of specific parts of the Project prior to construction of the relevant part(s) of the project commencing. In particular SSTMP(s) shall describe: a. Temporary traffic management measures required to manage impacts on road users during proposed working hours; b. Delay calculations associated with the proposed closure/s and detour routes; c. The capacity of any proposed detour route(s) and their ability to carry the additional traffic volumes and any known safety issues associated with the detour route, including any mitigation measures the Requiring Authority proposes to put in place to address any identified safety issues; d. Individual traffic management plans for intersections of the proposed Project with arterial roads; e. Measures to maintain, where practicable, existing vehicle access to adjacent properties and businesses; f. Measures to maintain, where practicable, safe and clearly identified pedestrian and cyclist access on roads and footpaths adjacent to the construction works. Where detours are necessary to provide such access the Requiring Authority shall provide for the shortest and most convenient detours, which it is reasonably practicable to provide, having regard to safety; g. Any proposed temporary changes in speed limit; h. Provision for safe and efficient access of construction vehicles to and from construction site(s); and i. The measures that will be undertaken by the Requiring Authority to communicate traffic management measures to affected road users and stakeholders.
NZTA.36.	SSTMP(s) shall be prepared following consultation with the following key stakeholders: a. The Council; b. Emergency services (police, fire and ambulance). c. Schools and childcare centres with frontage or access to roads within which works in relation to the relevant part of the Project will take place.
NZTA.37.	The CTMP and SSTMP(s) shall be consistent with the version of the NZ Transport Agency Code of Practice for Temporary Traffic Management (COPTTM) which applies at the time the CTMP or the relevant SSTMP is prepared.
NZTA.38.	The CTMP and SSTMP(s) shall undergo an independent safety and traffic operational review, by a suitably qualified independent party, prior to being submitted to the Council.
NZTA.39.	The Requiring Authority shall carry out random auditing of temporary road closure/s in accordance with COPTTM at regular intervals throughout the construction of the Project. The intervals shall be stated in the generic CTMP.
NZTA.40.	Prior to the commencement of any part of the Project, or any enabling works within the District, the Requiring Authority shall undertake a pre-construction condition survey of the carriageway/s along those local roads affected by the Project for which the Council is the road controlling authority and submit it to the Manager and the Roading Asset Manager. The condition survey shall consist of a photographic or video record of the carriageway.
NZTA.41.	The Requiring Authority shall, at carry out regular inspections of the road networks affected by the Project during construction, to seek to ensure that all potholes and other damage resulting from the construction of the Project are repaired as soon as practicable.

Reference	Proposed condition
NZTA.42.	As soon as practicable following completion of construction of the Project the Requiring Authority shall, at its expense, conduct a post-construction condition survey of the road network affected by the Project. The results of the pre and post construction surveys will be compared and where necessary, the Requiring Authority shall arrange for the Council's road maintenance contractor to repair any damage to the carriageways and footpaths (and associated road components), for which the Council is the road controlling authority, where that damage has resulted from the impacts of construction of the Project.
	Site specific contamination matters
NZTA.43.	The Requiring Authority shall, in consultation with the New Zealand Police and New Zealand Defence Force update the protocol that has been prepared detailing the procedures to manage the risk of unexpectedly discovering an unexploded ordnance (UXO). The protocol shall include: a. Arrangements for intrusive investigation of any potential UXO in the MacKays Crossing area where the potential UXO could be disturbed by construction activities prior to commencement of any enabling or construction works in the MacKays Crossing area; and b. Measures to seek to ensure the safety of workers and the public from the potential effects of the UXO. **Note**: This condition applies to the Kapiti Coast District Plan designation only.
NZTA.44.	The Requiring Authority shall prepare a specific remedial action plan (RAP) for the Porirua Gun Club site and provide this to the Manager at least 20 working days prior to undertaking either remedial action or earthworks at the Porirua Gun Club site. The RAP shall include: a. A soil excavation plan; b. A soil disposal plan; c. A validation sampling plan; and d. Reporting requirements. The Requiring Authority shall implement the RAP. **Note:** This condition applies to the Porirua District Plan designation only
	Lighting
NZTA.45.	Lighting shall be designed and screened to minimise the amount of lighting overspill and illumination of residential areas, and shall demonstrate that: a. All motorway lighting shall be designed in accordance with "Road lighting Standard AS/NZS1158"; and b. All other lighting shall be designed in accordance with the rules of the relevant District Plan (if any).
	Landscape management and urban design
NZTA.46.	An OP for the construction of any part of the Project located within the District or for the construction of any Project stage within the District shall include a Landscape Management Plan (LMP) for the relevant part of the Project. The LMP shall be prepared by a suitably qualified landscape architect (or similar appropriate personnel), and shall be prepared in accordance with: a. Transit New Zealand's Guidelines for Highway Landscaping (dated September 2002); b. Transit New Zealand's "Urban Design Implementation Principles (2006)"; and shall be consistent with: a. the Transmission Gully Urban and Landscape Design Framework (Beca et al, 2011); and b. the Ecological Management and Monitoring Plan (Boffa Miskell, August 2011).
NZTA.47.	All LMP(s) shall provide for: a. Input to earthworks contouring; b. The integration of the Project's permanent works into the surrounding landscape; c. Landscape works within land acquired for the Project which mitigate the effects of the Project on properties in the vicinity of the alignment;

Reference	Proposed condition
	d. Retention or relocation of significant existing trees, where practicable; and e. Replacement planting for loss of existing trees, where appropriate and practicable.
NZTA.48.	The LMP(s) shall be prepared in consultation with Te Runanga o Toa Rangatira Inc, and the **[insert relevant Council here]** and shall include the following: a. A Concept Plan/Report – this shall depict the overall landscape and urban design concept, and provide a framework for the design intent, layout and mitigation proposals. b. Landscape Design Details – these shall include the following details: i. Identification of vegetation to be retained; ii. Proposed planting, including plant species, mixes, spacing/densities, sizes (at the time of planting) and layout; iii. Planting programme – the staging of planting in relation to the construction programme; iv. Detailed specifications relating to (but not limited to) the following: • Vegetation protection (for desirable vegetation to be retained); • Weed control and clearance; • Ground preparation (topsoiling and decompaction to provide for rapid plant establishment and ongoing vigour); • Mulching; and • Plant supply and planting - which shall require: 1. Any planting to reflect the natural plant associations of the area; 2. Where practicable, the use of mixes of plant which are of a suitable richness and diversity to encourage self-sustainability once established; and 3. Any native plants to, so far as practicable, be genetically sourced from the relevant Ecological District; v. A maintenance regime including monitoring and reporting requirements, which is to apply for the three years following that planting being undertaken; vi. Landscape treatment for noise barriers; vii. Landscape treatment for any pedestrian and cycle facilities; viii. Consideration of: • The landscape character of the area; • The relationship of the works to the natural environment, including streams; • The potential for a joint pedestrian and cycle path under the SH58 interchange; and • Crime Prevention Through Environmental Design (CPTED) principles in urban areas.
NZTA.49.	Prior to the Requiring Authority undertaking any planting provided for in the LMP and throughout the ensuing landscaping maintenance period, all weed species declared as plant pests in the Wellington region by the Wellington Regional Pest Management Strategy shall be controlled and removed from the site of any planting undertaken pursuant to the LMP which is located on: a. Land declared to be motorway or limited access road; b. Any Crown land held for roading or motorway purposes for the Project and which the NZTA administers; or c. Any other land, e.g. private land and local authority owned land, in relation to which the NZTA has appropriate property rights which allow it to lawfully undertake such weed removal.
NZTA.50.	The planting identified in a LMP shall be implemented in accordance with the LMP within the first planting season following the completion of the construction works to which the LMP relates, or where an LMP relates to a number of Project stages, within the first planting season following completion of construction of the Project stage to which the planting relates, providing climatic conditions are suitable; otherwise at the first practicable opportunity thereafter.

29.3 Proposed PCC designation conditions

29.3.1 Definitions

AEE	Transmission Gully Project Assessment of Effects on the Environment Volumes 1 to 5 dated August 2011
CEMP	Construction Environmental Management Plan
Commencement of Works	means the time when the works that are the subject of these consents commence
Council	means the Porirua City Council
Existing network utilities	all network utilities existing at the date of lodgement of this Notice of Requirement (network utility has the same meaning as in Section 166 RMA)
GWRC	Wellington Regional Council
Manager	means the **[insert relevant position title]** of the Council
OP	means an Outline Plan prepared in accordance with Section 176A of the RMA
PCC	Porirua City Council
Project	means the construction, maintenance and operation of the Waitangirua and Whitby Link Roads
Requiring Authority	means the Porirua City Council
RMA	means the Resource Management Act 1991.
Road Asset Manager	means the Council's road asset manager
SSEMP	means a Site Specific Environmental Management Plan required under the provisions of regional consent conditions
Stage	means a stage of the Project as nominated by the contractor and agreed with the GWRC

29.3.2 Advice Notes

A. These conditions apply to both the Whitby Link Road and the Waitangirua Link Road Notices of Requirement unless otherwise stated.

B. These conditions are related to the proposed regional consent conditions, and the proposed designation conditions for each of the relevant districts. Where management plans are required, a single management plan could be prepared to address the relevant condition for each NoR and any similar regional consent condition.

C. Where possible, the designation and regional consent conditions use the same or similar wording.

Reference	Proposed condition
	General conditions and administration
PCC.1.	Except as modified by the conditions below, and subject to final design, the Project shall be undertaken in general accordance with the information provided by the Requiring Authority in the Notice of Requirement and supporting documents being: a. **[list final dates and revision numbers here]** For the avoidance of doubt, none of these conditions prevent or apply to works required for the ongoing operation or maintenance of the Project following construction such as changes to street furniture or signage over time. Depending upon the nature of such works, OPs or OP waivers may be required for any such works.
PCC.2.	As soon as practicable following completion of construction of the Project, the Requiring Authority shall: a. Review the width of the area designated for the Project; b. Identify any areas of designated land that are no longer necessary for the ongoing operation and maintenance of the Project or for ongoing mitigation measures; and c. Give notice to the Council in accordance with Section 182 of the RMA for the removal of those parts of the designation identified in PCC.2b above.
PCC.3.	The designation shall lapse if not given effect to within 15 years from the date on which it is included in the District Plan under Section 175 of the RMA.
	Outline plan
PCC.4.	Subject to Condition PCC.5 below, the Requiring Authority shall submit an Outline Plan (OP) to the Council for the part of the Project located within the District or for each Project stage within the District, in accordance with Section 176A of the RMA.
PCC.5.	An OP need not be submitted if the Council has waived the requirement for an OP for the Project or for the relevant Project stage in accordance with Section 176A (2) (c) of the RMA.
PCC.6.	The OP(s) shall include the following Management Plans for the relevant stage(s) of the Project: a. Construction Environmental Management Plan (CEMP); b. Construction Traffic Management Plan (CTMP); and c. Landscape Management Plan (LMP).
	Management plans
PCC.7.	All works shall be carried out in general accordance with any of the management plans required by these conditions.
PCC.8.	The consent holder may request amendments to any of the management plans required by these conditions by submitting the amendments in writing to the Manager for approval prior to any changes taking effect.
	Archaeology and heritage
PCC.9.	The Requiring Authority, in consultation with, Te Runanga o Toa Rangatira Inc and the New Zealand Historic Places Trust, shall prepare an accidental discovery protocol to be implemented in the event of accidental discovery of cultural or archaeological artefacts or features during the construction of the Project. This protocol shall be submitted to the Manager at least 20 working days prior to any construction or enabling Work commencing under this consent on any part of the Project within the District. The protocol shall include, but not be limited to: a. Training procedures for all contractors regarding the possible presence of cultural or archaeological sites or material, what these sites or material may look like, and the

Reference	Proposed condition
	relevant provisions of the Historic Places Act 1993 if any sites or material are discovered; b. Parties to be notified in the event of an accidental discovery shall include, but need not be limited to Te Runanga o Toa Rangatira Inc, the New Zealand Historic Places Trust, the GWRC, the relevant District or City Council and the New Zealand Police (if koiwi are discovered); c. Procedures to be undertaken in the event of an accidental discovery (these shall include immediate ceasing of all physical works in the vicinity of the discovery); and d. Procedures to be undertaken before Work under this consent may recommence in the vicinity of the discovery. These shall include allowance for appropriate tikanga (protocols), recording of sites and material, recovery of any artefacts, and consulting with Te Runanga o Toa Rangatira Inc and the New Zealand Historic Places Trust prior to recommencing works in the vicinity of the discovery.
	Construction Environmental Management Plan
PCC.10.	An OP for the part of the Project located within the District or for any Project stage located within the District shall include a Construction Environmental Management Plan or Plans (CEMP) for the relevant part of the Project. Among other things, a CEMP is to confirm that the proposed construction methodology for the relevant part of the Project complies with General Condition 1 of this designation and to demonstrate how other conditions of this designation have been or will be complied with during the construction of the relevant part of the Project.
PCC.11.	The purpose of a CEMP is to confirm, for the relevant part of the Project, the staging of works, detailed engineering design to seek to ensure that the construction of that part of the Project remains within the limits and standards approved under this designation and that the construction activities avoid, remedy or mitigate adverse effects on the environment. A CEMP shall provide details of the responsibilities, reporting frameworks, coordination and management required for Project quality assurance, final detailed design, construction methodologies, anticipated timeframes and monitoring processes and procedures. A CEMP shall include but need not be limited to: <u>(A) Quality Assurance</u> A Quality Assurance section which shall include management frameworks, systems and procedures for quality management of all on-site activities and compliance with the conditions of this designation. Among other matters this section shall provide details of the following: a. Name, qualifications, relevant experience and contact details of an appropriately qualified and experienced project manager, who shall be responsible for overseeing compliance with the CEMP; b. Names, qualifications, relevant experience, and methods for contacting principal staff employed on the relevant part of the Project, along with details of their roles and responsibilities; c. Methods and systems to inform and train all persons working on site of potential environmental issues and how to avoid, remedy or mitigate any potential adverse construction effects; d. Systems and processes whereby the public are informed of contact details of the project manager and person or persons identified above; e. Liaison procedures with the Council; and f. Communication protocols. <u>(B) Site Management</u> The Site Management section of the CEMP shall detail procedures to manage the relevant part of the Project throughout the entire construction process in a safe manner. This section shall provide details of the following (and may include other matters): a. Details of the site access for all works associated with construction of the part of the Project;

Reference	Proposed condition
	b. Measures to be adopted to maintain the site in a tidy condition in terms of disposal/storage of rubbish, storage and unloading of building materials and similar construction activities; c. Location of workers' conveniences (e.g. portaloos); d. Procedures for controlling sediment run-off into the watercourses/streams, dust and the removal of soil, debris and construction materials from the watercourses/streams and riparian margins, and onto public roads or places (including identifying the location of wheel wash facilities); e. A contingency plan in the event that there is any unconsented discharge to watercourses/streams; f. Details of the storage of fuels and lubricants (which shall require that storage be bunded or contained in such a manner so as to prevent the discharge of contaminants from spillages); g. Details of the proposed maintenance of machinery and plant to minimise the potential for leakage of fuels and lubricants; h. Location of vehicle and construction machinery access and storage during the period of site works; i. Procedures for thoroughly cleaning all machinery of unwanted vegetation (e.g. weeds), seeds or contaminants prior to entering the site; j. Methods for the clear identification and marking of the construction zones including those which extend into watercourses; k. A methodology that prescribes the extent to which machinery can operate in the vicinity of watercourses so as to minimise disruption and damage to the watercourses and associated vegetation; l. Methods to ensure public health and safety during the construction works, and notification to the public of temporary access restrictions to the immediate works area during the staged construction; m. Confirmation that no equipment or machinery will be cleaned, or refuelled in any part of any watercourses/streams, except as otherwise specifically provided for in the CEMP or an SSEMP; n. Procedures for removing all contaminants (e.g. fuel, hydraulic oils, lubricants etc) from the site at the end of the construction period, except for those required for ongoing maintenance of the road and operational activities; and o. Procedures for making any repairs to the adjacent road network required where any damage occurs as a direct result of the Project. <u>(C) Construction Programme and Methodology</u> A Construction Programme which shall include a programme of works that seeks to enable the relevant part of the Project to be constructed in a manner that is timely, adequately co-ordinated and manages the adverse effects of construction on the environment. This section shall, among other matters, provide details on the following: a. A detailed staging programme and anticipated timetable for construction works during the relevant part of the Project; and b. A methodology to identify how earthworks will be staged during the relevant part of the Project to manage the effects of the Project on the Pauatahanui Inlet. <u>(D) Environmental Management Plans</u> The following environmental management plans shall be included in the appendices to any CEMP: a. **Construction Noise and Vibration Management Plan** (CNVMP); and b. **Construction Air Quality Management Plan** (CAQMP). A. The CNVMP shall: a. Be prepared by a suitably qualified acoustics specialist;

Reference	Proposed condition
	b. Include specific details relating to methods for the control of noise associated with all relevant Project works, which shall be formulated to, as far as practicable, comply with the following criteria in accordance with NZS 6803:1999:

Day	Time	$L_{Aeq(15\ min)}$	L_{AFmax}
Weekdays	0630h - 0730h	55 dB	75 dB
	0730h - 1800h	70 dB	85 dB
	1800h - 2000h	65 dB	80 dB
	2000h - 0630h	45 dB	75 dB
Saturday	0630h - 0730h	45 dB	75 dB
	0730h - 1800h	70 dB	85 dB
	1800h - 2000h	45 dB	75 dB
	2000h - 0630h	45 dB	75 dB
Sundays and public holidays	0630h - 0730h	45 dB	75 dB
	0730h - 1800h	55 dB	85 dB
	1800h - 2000h	45 dB	75 dB
	2000h - 0630h	45 dB	75 dB

c. Address the following aspects with regard to construction noise:
   i. Noise sources, including machinery, equipment and construction techniques to be used;
   ii. Predicted construction noise levels;
   iii. Hours of operation, including times and days when noisy

Reference	Proposed condition
	construction work and blasting would occur; iv. The identification of activities and locations where structural noise mitigation measures such as temporary barriers or enclosures may be used; v. Details of which road-traffic noise mitigation options will be implemented early to also mitigate construction noise; vi. The measures that will be undertaken by the Requiring Authority to communicate noise management measures to affected stakeholders; vii. Mitigation options, including alternative strategies where full compliance with the noise criteria cannot practicably be achieved; viii. Schedules containing site specific information; ix. Methods for monitoring and reporting on construction noise; and d. Include specific details relating to methods for the control of vibration and airblast associated with all relevant Project works, which shall be formulated to, as far as practicable, comply with the Category A criteria in the following table, measured in accordance with ISO 4866:2010 and AS 2187-2:2006:

Receiver	Details	Category A	Category B
Occupied dwellings	Night-time 2000h - 0630h (transient vibration)	0.3 mm/s ppv	1 mm/s ppv
	Daytime 0630h - 2000h	1 mm/s ppv	5 mm/s ppv
All occupied buildings	Daytime blasting – vibration	5 mm/s ppv	10 mm/s ppv
	– airblast	120 dB L_{Zpeak}	-
All buildings	Vibration - transient (including blasting)	5 mm/s ppv	BS 5228-2 Table B.2
	Vibration - continuous		BS 5228-2 50% of Table B.2 values
	Airblast	-	133 dB L_{Zpeak}

Reference	Proposed condition
	e. Describe the measures to be adopted in relation to construction vibration including: i. Vibration sources, including machinery, equipment and construction techniques to be used; ii. Procedures for building condition surveys at locations close to

Reference	Proposed condition
	activities generating significant vibration, prior to and after completion of the works (including all buildings predicted to experience vibration which exceeds the Category A vibration criteria); iii. Procedures for management of vibration by a suitably qualified expert, if measured or predicted vibration and airblast levels exceed the Category A criteria; iv. Procedures for approval by the Council and continuous monitoring of vibration levels and effects by suitably qualified experts if measured or predicted vibration and airblast levels exceed the Category B criteria; and v. The measures that will be undertaken by the Requiring Authority to communicate vibration management measures to affected stakeholders. B. The CAQMP shall provide a methodology for managing the effects of dust from the site, and shall, as a minimum include: a. Identification and implementation of dust suppression measures appropriate to the environment in which the works are located, and the sensitivity of nearby receptors; and b. Identification of contingency measures to address identified and verified adverse effects on sensitive receptors. Contingency measures may include options such as cleaning houses and buildings. (E) Layout Drawings Drawings showing the proposed layout of the construction yards, including associated buildings, fencing and site access. The layout drawings shall, as far as practicable, incorporate the following: a. The main access to the construction yards to be located as far as practicable from residential dwellings; b. Noisy construction activities shall be located as far as practicable from residential dwellings; c. Temporary acoustic fences and visual barriers.
PCC.12.	The Requiring Authority shall provide the Manager with an updated schedule of construction activities at monthly intervals during the construction of any part of the Project.
	Communications and public liaison
PCC.13.	A liaison person shall be appointed by the Requiring Authority for the duration of the construction phase of the Project to be the main and readily accessible point of contact for persons affected by the construction work. The Requiring Authority shall take appropriate steps to seek to advise all affected parties of the liaison person's name and contact details. This person must be reasonably available for on-going consultation on all matters of concern to affected persons arising from the construction of the Project. If the liaison person will not be available for any reason, an alternative contact person shall be nominated, to seek to ensure that a project contact person is available by telephone 24 hours per day/seven days per week during the construction phase of the Project.
PCC.14.	Prior to the commencement of construction and/or enabling works, the requiring authority shall prepare and implement, a **Communications Plan** that sets out procedures detailing how the public will be communicated with throughout the construction period. As a minimum, the Communications Plan shall include: a. Details of a contact person available on site at all times during works. Contact details shall be prominently displayed at the entrance to the site(s) so that they are clearly visible to the public at all times. b. Methods to consult on and to communicate the proposed hours of construction activities outside of normal working hours and on weekends and public holidays, to surrounding residential communities, and methods to deal with concerns raised

Reference	Proposed condition
	about such hours. c. Methods to record concerns raised about hours of construction activities and, where practicable, methods to so far as is practicable, avoid particular times of day which have been identified as being particularly sensitive for neighbours. d. Details of communications activities proposed including: i. Publication of a newsletter, or similar, and its proposed delivery area. ii. Newspaper advertising iii. Notification and consultation with individual property owners and occupiers with dwellings within 20 metres of construction activities. The Communications Plan shall also include linkages and cross-references to methods set out in other management plans where relevant.
	Incidents / public complaints
PCC.15.	During construction Work, the consent holder shall maintain a permanent record of any complaints received alleging adverse effects from, or related to, the exercise of this consent. The record shall include: a. the name and address (as far as practicable) of the complainant; b. identification of the nature of the complaint; c. location, date and time of the complaint and of the alleged event; d. weather conditions at the time of the complaint (as far as practicable), and including wind direction and approximate wind speed if the complaint relates to air quality. e. the outcome of the consent holders investigation into the complaint; f. measures taken to seek to ensure that such a complaint does not occur again; and g. Any other activities in the area, unrelated to the project that may have contributed to the compliant, such as non-project construction, fires, traffic accidents or unusually dusty conditions generally. The consent holder shall also keep a record of any remedial actions undertaken. This record shall be maintained on site and shall be made available to the Manager, upon request. The consent holder shall notify the Manager in writing of any such complaint within 5 working days of the complaint being brought to the attention of the consent holder.
	Existing network utilities
PCC.16.	The Requiring Authority shall prepare and implement a **Network Utilities Management** Plan (NUMP) so that enabling works, design and construction of the Project adequately take account of, and include measures to address, the safety, integrity, protection or, where necessary, relocation of, existing network utilities.
PCC.17.	A copy of the NUMP shall be provided to the Manager at least 10 working days prior to the commencement of any enabling or construction works on any part of the Project located within the District.
PCC.18.	The NUMP shall include, but need not be limited to, the following matters: a. The methods the Requiring Authority will use to liaise with all infrastructure providers who have existing network utilities that are directly affected by, or located in close proximity to, the Project. b. The methods the Requiring Authority will use to enable infrastructure providers to access existing network utilities for maintenance and all reasonable times, and to access existing network utilities for emergency works at all times, whilst construction activities associated with the Project are occurring. The methods the Requiring Authority will use to seek to ensure that all construction personnel, including contractors, are aware of the presence and location of the various existing network utilities which traverse, or are in close proximity to the Project, and the restrictions in place in relation to those existing network utilities. This shall include plans identifying the locations of the existing network utilities and appropriate physical indicators on the ground showing specific surveyed locations.
PCC.19.	The NUMP shall be prepared in consultation with the relevant infrastructure providers who have existing network utilities that are directly affected by the Project and, in addition to the matters listed in Condition PCC.18 shall include:

Reference	Proposed condition
	a. Measures to be used to accurately identify the location of existing network utilities, b. Measures for the protection, relocation and/or reinstatement of existing network utilities; c. Measures to provide for the safe operation of plant and equipment, and the safety of workers, in proximity to live existing network utilities; d. Measures to manage potential induction hazards to existing network utilities; e. Earthworks management (including depth and extent of earthworks), for earthworks in close proximity to existing network utility; f. Vibration management for works in close proximity to existing network utility; and g. Emergency management procedures in the event of any emergency involving existing network utilities.
	Roading and traffic management
PCC.20.	A general Construction Traffic Management Plan (CTMP) shall be prepared for the Project. This CTMP shall address the following: a. The staging of the works, including details of any proposals to work on multiple sections of the Project route concurrently; b. A general methodology for selecting detour routes; and c. The potential effects on the detour routes selected and how these will be managed to seek to ensure safety for all road users.
PCC.21.	The CTMP shall be provided to the Road Asset Manager at least one month prior to commencement of construction of any part of the Project within the District.
PCC.22.	Site Specific Traffic Management Plans (SSTMPs) shall be provided to the road controlling authority at least 3 working days prior to the commencement of work in that area, and shall describe the measures that will be taken to manage the traffic effects associated with the construction of specific parts of the Project prior to construction of the relevant part(s) of the project commencing. In particular SSTMP(s) shall describe: a. Temporary traffic management measures required to manage impacts on road users during proposed working hours; b. Delay calculations associated with the proposed closure/s and detour routes; c. The capacity of any proposed detour route(s) and their ability to carry the additional traffic volumes and any known safety issues associated with the detour route, including any mitigation measures the Requiring Authority proposes to put in place to address any identified safety issues; d. Individual traffic management plans for intersections of the proposed Project with arterial roads; e. Measures to maintain, where practicable, existing vehicle access to adjacent properties and businesses; f. Measures to maintain, where practicable, safe and clearly identified pedestrian and cyclist access on roads and footpaths adjacent to the construction works. Where detours are necessary to provide such access the Requiring Authority shall provide for the shortest and most convenient detours, which it is reasonably practicable to provide, having regard to safety; g. Any proposed temporary changes in speed limit; h. Provision for safe and efficient access of construction vehicles to and from construction site(s); and i. The measures that will be undertaken by the Requiring Authority to communicate traffic management measures to affected road users and stakeholders.
PCC.23.	SSTMP(s) shall be prepared following consultation with the following key stakeholders: a. The Council; b. Emergency services (police, fire and ambulance). c. Schools and childcare centres with frontage or access to roads within which works in relation to the relevant part of the Project will take place.
PCC.24.	The CTMP and SSTMP(s) shall be consistent with the version of the NZ Transport Agency Code of Practice for Temporary Traffic Management (COPTTM) which applies at the time

Reference	Proposed condition
	the CTMP or the relevant SSTMP is prepared.
PCC.25.	The Requiring Authority shall, at carry out regular inspections of the road networks affected by the Project during construction, to ensure all potholes and other damage resulting from the construction of the Project are repaired as soon as practicable.
PCC.26.	As soon as practicable following completion of construction of the Project the Requiring Authority shall, at its expense, conduct a post-construction condition survey of the road network affected by the Project. The results of the pre and post construction surveys will be compared and where necessary, the Requiring Authority shall arrange for the Council's road maintenance contractor to repair any damage to the carriageways and footpaths (and associated road components), for which the Council is the road controlling authority, where that damage has resulted from the impacts of construction of the Project.
	Lighting
PCC.27.	Any lighting used during construction shall be designed and screened to minimise the amount of lighting overspill and illumination of residential areas.
	Landscape management and urban design
PCC.28.	An OP for the construction of any part of the Project located within the District or for the construction of any Project stage within the District shall include a Landscape Management Plan (LMP) for the relevant part of the Project. The LMP shall be prepared by a suitably qualified landscape architect (or similar appropriate personnel), and shall be prepared in accordance with: a. Transit New Zealand's Guidelines for Highway Landscaping (dated September 2002); b. Transit New Zealand's "Urban Design Implementation Principles (2006)"; and shall be consistent with: c. the Transmission Gully Urban and Landscape Design Framework (Beca et al, 2011); and d. the Ecological Management and Monitoring Plan (Boffa Miskell, August 2011).
PCC.29.	All LMP(s) shall provide for: a. Input to earthworks contouring; b. The integration of the Project's permanent works into the surrounding landscape; c. Landscape works within land acquired for the Project which mitigate the effects of the Project on properties in the vicinity of the alignment; d. Retention or relocation of significant existing trees, where practicable; and e. Replacement planting for loss of existing trees, where appropriate and practicable.
PCC.30.	The LMP(s) shall be prepared in consultation with Te Runanga o Toa Rangatira Inc, PCC (as asset owner), Whitby Residents Association, Maraeroa Marae Executive, and Tokelauan Christian Church and shall include the following: a. A Concept Plan/Report – this shall depict the overall landscape and urban design concept, and provide a framework for the design intent, layout and mitigation proposals. b. Landscape Design Details – these shall include the following details: i. Identification of vegetation to be retained; ii. Proposed planting including – plant species, mixes, spacing/densities, sizes (at the time of planting) and layout; iii. Planting programme – the staging of planting in relation to the construction programme; iv. Detailed specifications relating to (but not limited to) the following: • Vegetation protection (for desirable vegetation to be retained); • Weed control and clearance; • Ground preparation (topsoiling and decompaction to provide for rapid plant establishment and ongoing vigour); • Mulching; and • Plant supply and planting - which shall require: 1. Any planting to reflect the natural plant associations of the area;

Reference	Proposed condition
	2. Where practicable, the use of mixes of plant which are of a suitable richness and diversity to encourage self-sustainability once established; and 3. Any native plants to, so far as practicable, be genetically sourced from the relevant Ecological District; v. A maintenance regime for any planting which is to apply for the three years following that planting being undertaken (requirements and programme) vi. Waitangirua entrance feature; vii. Landscape treatment for noise barriers (Waitangirua Link Road); viii. Pedestrian and cycle facilities; ix. Consideration of: • The landscape character of the area; and • The relationship of the works to the natural environment, including streams • Crime Prevention Through Environmental Design (CPTED) principles in urban areas.
PCC.31.	Prior to the Requiring Authority undertaking any planting provided for in the LMP and throughout the ensuing maintenance period, all weed species declared as plant pests in the Wellington region shall be controlled and removed from the site of any planting undertaken pursuant to the LMP.
PCC.32.	The planting identified in a LMP shall be implemented in accordance with the LMP within the first planting season following the completion of the construction works to which the LMP relates, or where an LMP relates to a number of Project stages, within the first planting season following completion of construction of the Project stage to which the planting relates, providing climatic conditions are suitable otherwise at the first practicable opportunity thereafter.

30. Proposed resource consent conditions

30.1 Guide to reading the conditions

The proposed suite of conditions to manage effects of the Project has been numbered in order to eliminate confusion, specifically to avoid multiple 'Condition 1' and so forth. The numbering format is as follows:

Set of proposed conditions	Numbering format
NZTA resource consent conditions	**G.1., G.2.** and so on - General conditions which are proposed to apply to all the regional consents
	E.1., E.2. and so on - Earthworks conditions
	S.1., S.2. and so on - global streamworks for construction
	WS.1., WS.2. and so on - works in streams
	Duck.1., Duck.2. and so on - permit for removal and replacement of perched culverts in Duck Creek
	CBP.1., CBP.1. and so on - discharge permits for concrete batching plant
PCC resource consent conditions	**PCC.G.1., PCC.G.2.** and so on - General conditions which are proposed to apply to all the regional consents
	PCC.E.1., PCC.E.2. and so on - Earthworks conditions
	PCC.WS.1., PCC.WS.2. and so on - works in streams (Duck Creek)

30.2 Proposed NZTA resource consent conditions

30.2.1 Abbreviations for all consents

AEE	Transmission Gully Project Assessment of Effects on the Environment Volumes 1 to 5 dated August 2011
CEMP	Construction Environmental Management Plan
Commencement of Works	means the time when the works that are the subject of these consents commence
AEE	Transmission Gully Project Assessment of Effects on the Environment
CEMP	Construction Environmental Management Plan

Commencement of Works	means the time when the works that are the subject of these consents commence
GWRC	Wellington Regional Council
Heavy rainfall event	15mm of rain per hour at any of the rain gauges monitored for the Project
KCDC	Kapiti Coast District Council
The Manager	means the Manager, Consents Management, Wellington Regional Council or nominated GWRC staff or contractor appointed to act on the Manager's behalf
PCC	Porirua City Council
Project	means the construction, maintenance and operation of the Transmission Gully Main Alignment and/or the Kenepuru Link Road
RMA	Resource Management Act 1991
Stabilised	means inherently resistant to erosion or rendered resistant, such as by using indurated rock or by the application of basecourse, grassing, mulch, or another method to the reasonable satisfaction of the Manager. Where seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by the Manager 80% vegetative ground cover has been established.
Stage	means a stage of the Project as nominated by the contractor and agreed with the Greater Wellington Regional Council
UHCC	Upper Hutt City Council
WCC	Wellington City Council
Work	means any activity or activities undertaken in relation to the Project

30.2.2 Advice Notes

A. Where there may be contradiction or inconsistencies between the application and further information provided by the applicant, the most recent information applies. In addition, where there may be inconsistencies between information provided by the applicant and conditions of the consent, the conditions apply.

B. Any change from the location, design concepts and parameters, implementation and/or operation may require a new resource consent or a change of consent conditions pursuant to Section 127 of the Resource Management Act 1991.

The following "G" conditions are General Conditions that are applicable to all consents and permits sought. Additional specific conditions follow for each consent/permit sought.

Reference	Proposed condition
G.1	The Project shall be undertaken in general accordance with the plans and information submitted with the application as documented as consent numbers [**INSERT GWRC REFERENCE NUMBERS HERE],** subject to such amendments as may be required by the following conditions of consent. The plans and information include: (i) Consent applications dated **[INSERT DATES HERE]** (ii) Documents **[INSERT DATES HERE]** (iii) Plans **[INSERT FINAL PLAN REFERENCES HERE]**
G.2	Subject to the consent holder holding or obtaining appropriate property rights to enable it to do so, the consent holder shall permit the servants or agents of the GWRC to have access to relevant parts of the respective properties at all reasonable times for the purpose of carrying out inspections, surveys, investigations, tests, measurements and/or to take samples.
	Pre- construction administration conditions
G.3	At least 20 working days prior to commencement of any Stage the consent holder shall arrange a pre-construction site meeting between the GWRC and any other relevant party nominated by the GWRC, including the primary contractor. In the case that any of the invited parties, other than the representative of the consent holder, does not attend this meeting, the consent holder will have complied with this condition, provided the invitation requirement is met.
G.4	Prior to the commencement of construction Work, the consent holder and the GWRC (and or their agreed representative(s) who have authority to make decisions regarding consent compliance), shall meet and decide upon a suitably qualified or experienced person or persons who shall fulfil the role of compliance officer for the Project. The agreed person's responsibilities shall include: a) Pre-commencement site meeting(s) with contractors; b) Regular scheduled compliance inspections to meet the requirements of regional consents [**INSERT GWRC REFERENCE NUMBERS HERE]**; c) Spot compliance checks before and/or after forecast extreme weather events; d) Collection, collation and filing of any required monitoring and compliance reports; and e) Enforcement action under the provisions of the RMA in the event of a non-compliance. This person may be a Council employee, or may be an independent person agreed between the consent holder and the GWRC as an **Independent Professional Advisor**. The actual and reasonable costs of this person exercising these responsibilities shall be recoverable from the consent holder (refer to Condition G.5).
G.5	The GWRC shall be entitled to recover from the consent holder the actual and reasonable costs of the conduct of any review, calculated in accordance with and limited to the Council's scale of charges in-force and applicable at that time pursuant to Section 36 of the Resource Management Act 1991
G.6	The consent holder shall ensure that a copy of this consent and all documents and plans referred to in this consent, are kept on site at all times and presented to any GWRC officer on request.
	Review condition
G.7	The Manager may review any or all conditions of this consent by giving notice of their intention to do so pursuant to Section 128 of the Resource Management Act 1991, at any time within six months of the first, third and fifth anniversaries of the date of commencement of this consent for any of the following purposes: a) To deal with any adverse effects on the environment, which may arise from the exercise of this consent, and which it is appropriate to deal with at a later stage; and

Reference	Proposed condition
	b) To review the adequacy of any monitoring plans proposed and/or monitoring requirements so as to incorporate into the consent any monitoring or other requirements which may become necessary to deal with any adverse effects on the environment arising from the exercise of this consent.
	Staging and programme conditions
G.8	If the Work is to be staged, the consent holder shall prepare a staging plan prior to the commencement of that Work, and shall provide written notification of the commencement of the Work in each Stage to the GWRC, at least ten working days prior to that Work commencing in each area.
G.9	The consent holder shall provide the Manager with an updated schedule of construction activities for the Project at monthly intervals throughout the construction phase of the Project.
	Management plans
G.10	All works shall be carried out in general accordance with the management plans required by these conditions.
G.11	The consent holder may request amendments to any of the management plans required by these conditions by submitting the amendments in writing to the Manager for approval prior to any changes taking effect.
	Construction Environmental Management Plan
G.12	Prior to the commencement of any Stage which involves activities authorised by this consent, the consent holder shall submit a Construction Environmental Management Plan or Plans ("CEMP") to the Manager for review and certification. Among other things, the CEMP(s) is to confirm that the proposed construction methodology for the Stage complies with Condition G.1 of this consent and to demonstrate how other conditions of this consent have been or will be complied with. The CEMP(s) shall be prepared in relation to the relevant Stage. The purpose of the CEMP is to confirm final project details, staging of Work, and detailed engineering design to seek to ensure that the Project remains within the limits and standards approved under this consent and that the construction and operation activities avoid, remedy or mitigate adverse effects on the environment in accordance with the conditions of this consent. The CEMP shall provide details of the responsibilities, reporting frameworks, coordination and management required for project quality assurance; final detailed design; construction methodologies; timeframes and monitoring processes and procedures. Works shall not commence on a Stage until the consent holder has received the Manager's written approval for the CEMP(s) for that Stage. A CEMP shall include but need not be limited to: (1) Quality Assurance A Quality Assurance section which shall include management frameworks, systems and procedures for quality management of all on-site activities and compliance with the conditions of this designation. Among other matters this section shall provide details of the following: a) Name, qualifications, relevant experience and contact details of an appropriately qualified and experienced project manager, who shall be responsible for overseeing compliance with the CEMP; b) Names, qualifications, relevant experience, and methods for contacting principal staff employed on the relevant part of the Project, along with details of their roles and responsibilities; c) Methods and systems to inform and train all persons working on site of potential environmental issues and how to comply with conditions of the consent; d) Systems and processes whereby the public are informed of contact details of the project manager and principal staff identified above; e) Liaison procedures with the Council; and f) Communication protocols. (2) Site Management

Reference	Proposed condition
	The Site Management section of the CEMP shall detail procedures to manage the relevant part of the Project throughout the entire construction process in a safe manner. This section shall provide details of the following (and may include other matters): a) Details of the site access for all Work associated with construction of the part of the Project; b) Measures to be adopted to maintain the site in a tidy condition in terms of disposal/storage of rubbish, storage and unloading of building materials and similar construction activities; c) Location of workers' conveniences (e.g. portaloos); d) Procedures for controlling sediment run-off into the watercourses/streams, dust and the removal of soil, debris and construction materials from the watercourses/streams and riparian margins, and onto public roads or places (including identifying the location of wheel wash facilities); e) A contingency plan in the event that there is any unconsented discharge to watercourses/streams; f) Details of the storage of fuels and lubricants (which shall require that storage be bunded or contained in such a manner so as to prevent the discharge of contaminants from spillages); g) Details of the proposed maintenance of machinery and plant to minimise the potential for leakage of fuels and lubricants; h) Location of vehicle and construction machinery access and storage during the period of site works; i) Procedures for thoroughly cleaning all machinery of unwanted vegetation (e.g. weeds), seeds or contaminants prior to entering the site; j) Methods for the clear identification and marking of the construction zones including those which extend into watercourses; k) A methodology that prescribes the extent to which machinery can operate in the vicinity of watercourses so as to minimise disruption and damage to the watercourses and associated vegetation; l) Methods to manage public health and safety during the construction works, and notification to the public of temporary access restrictions to the immediate works area during the staged construction; m) Confirmation that no equipment or machinery will be cleaned, or refuelled in any part of any watercourses/streams, except as otherwise specifically provided for in the CEMP or an SSEMP; n) Procedures for removing all contaminants (e.g. fuel, hydraulic oils, lubricants etc) from the site at the end of the construction period, except for those required for ongoing maintenance of the road and operational activities; and o) Procedures for making any repairs to the adjacent road network required where any damage occurs as a direct result of the Project. <u>(3) Construction Programme and Methodology</u> Notwithstanding Conditions G.8 and G.9 above, a Construction Programme which shall include a programme of works that seeks to enable the relevant part of the Project to be constructed in a manner that is timely, adequately co-ordinated and manages the adverse effects of construction on the environment in accordance with the conditions of this consent. This section shall, among other matters, provide details on the following: a) A detailed staging programme and anticipated timetable for construction works during the relevant part of the Project; and b) A methodology to identify how earthworks will be staged during the relevant part of the Project to manage the effects of the Project on the Pauatahanui Inlet in accordance with this consent

Reference	Proposed condition
	Environmental management plans
G.13	The management of key environmental effects associated with the construction phase of the Project shall be detailed within environmental management plans that are included in the appendices to the CEMP. This suite of management plans shall include: a) Construction Air Quality Management Plan (CAQMP) – Condition G.14; b) Contaminated Land Management Plan (CLMP) – Condition G.15; c) Erosion and Sediment Control Plan (ESCP) – Condition E.4 and E.5; d) Chemical Treatment Plan (CTP) (i.e. flocculation) – Condition E.19; e) Ecological Management and Monitoring Plan (EMMP) – Condition E.24; f) Concrete Batching Plant Management Plan (CBMP) – Condition CBP.2.
G.14	The CEMP shall include an updated version of the **Construction Air Quality Management Plan** which shall provide a methodology for managing the effects of dust generated by activities on site, and shall, as a minimum include: a) Identification and implementation of dust suppression measures appropriate to the environment in which the Work is located, and the sensitivity of nearby receptors; and b) Identification of contingency measures to address identified and verified adverse effects on sensitive receptors. Contingency measures may include options such as: • Cleaning of water tanks and replenishment of water supplies; • Cleaning of houses • Cleaning of other buildings and infrastructure.
G.15	The CEMP shall include a **Contaminated Land Management Plan** which shall include information regarding: a) The measures to be undertaken in the handling, storage and disposal of all contaminated material excavated during the construction works; b) The soil validation testing that will be undertaken; c) The soil verification testing that will be undertaken to determine the nature of any contamination in excavated spoil and the potential reuse or disposal options for that spoil; d) Measures to be undertaken in the event of unexpected contamination being identified during construction activities, including measures to: • Assist with identification of unknown contaminated material; • Stop work or isolate the area once any such material is identified; e) The measures to be undertaken to: • Protect the health and safety of workers and the public; • Control stormwater runon and runoff; • Remove or manage any contaminated soil; and f) The measures to be undertaken to: • Identify any suspected asbestos; • Identify the type of asbestos and confirm the appropriate means by which it shall be removed; • Handle asbestos containing material. • Implement appropriate health and safety measures to maintain the safety of workers and the public; and • Remove the asbestos and dispose of it to an appropriately licensed facility. These measures shall include appointment of a suitably qualified contractor to implement the asbestos identification and handling measures identified in the CLMP.
G.16	Should a heavy rainfall event occur or advance notice of an impending event be received the consent holder may undertake contingency measures not set out in any management plan, but only subject to the following conditions: a) The measures must be for the express purposes of managing non-stabilised areas of earthworks or improving erosion and sediment controls in the catchments that drain to the Porirua Harbour,

Reference	Proposed condition
	b) Unless impracticable to do so, the consent holder must secure prior (oral or written) approval from the Manager for undertaking the measures, c) As soon as practicable following the undertaking of the measures, the consent holder must provide to the Manager written notice of the measures undertaken and amend the relevant Management plan(s) as may be appropriate to take account of the measures undertaken and submit the amended Management plan to the Manager for approval under Condition G.11.
	Archaeology
G.17	The Requiring Authority, in consultation with, Te Runanga o Toa Rangatira Inc and the New Zealand Historic Places Trust, shall prepare an accidental discovery protocol to be implemented in the event of accidental discovery of cultural or archaeological artefacts or features during the construction of the Project. This protocol shall be submitted to the Manager at least 20 working days prior to any construction or enabling Work commencing under this consent on any part of the Project within the District. The protocol shall include, but not be limited to: a) Training procedures for all contractors regarding the possible presence of cultural or archaeological sites or material, what these sites or material may look like, and the relevant provisions of the Historic Places Act 1993 if any sites or material are discovered; b) Parties to be notified in the event of an accidental discovery shall include, but need not be limited to Te Runanga o Toa Rangatira Inc, the New Zealand Historic Places Trust, the GWRC, the relevant District or City Council and the New Zealand Police (if koiwi are discovered); c) Procedures to be undertaken in the event of an accidental discovery (these shall include immediate ceasing of all physical works in the vicinity of the discovery); and d) Procedures to be undertaken before Work under this consent may recommence in the vicinity of the discovery. These shall include allowance for appropriate tikanga (protocols), recording of sites and material, recovery of any artefacts, and consulting with Te Runanga o Toa Rangatira Inc and the New Zealand Historic Places Trust prior to recommencing works in the vicinity of the discovery.
	Complaints
G.18	During construction Work, the consent holder shall maintain a permanent record of any complaints received alleging adverse effects from, or related to, the exercise of this consent. The record shall include: a) the name and address (as far as practicable) of the complainant; b) identification of the nature of the complaint; c) location, date and time of the complaint and of the alleged event; d) weather conditions at the time of the complaint (as far as practicable), and including wind direction and approximate wind speed if the complaint relates to air quality. e) the outcome of the consent holders investigation into the complaint; f) measures taken to seek to ensure that such a complaint does not occur again; and g) Any other activities in the area, unrelated to the project that may have contributed to the compliant, such as non-project construction, fires, traffic accidents or unusually dusty conditions generally. The consent holder shall also keep a record of any remedial actions undertaken. This record shall be maintained on site and shall be made available to the Manager, upon request. The consent holder shall notify the Manager in writing of any such complaint within 5 working days of the complaint being brought to the attention of the consent holder.
G.19	The consent holder shall immediately notify the Manager if any contaminants (including sediment) or material are released in the undertaking of the Work and enters any watercourse due to any of the following: a) discharges from non-stabilised areas that are not treated by erosion and sediment control measures required under this consent; and/or b) failure of any erosion and sediment control measures; and/or c) any other incident which either directly or indirectly causes, or is likely to cause,

Reference	Proposed condition
	adverse ecological effects in any watercourse that is not authorised by a resource consent held by the consent holder. If any of these events occur, the consent holder shall: a) establish control measures where these have failed or have not been implemented in accordance with the CEMP as soon as practicable; b) liaise with the Manager to establish what remediation or rehabilitation is required and whether such remediation or rehabilitation is practical to implement; c) carry out any remedial action as required by and to the satisfaction of the Manager; and d) maintain a permanent record of the incident at the site, which shall include the date and time of the incident, the nature, manner and cause of the release of the contaminants, weather conditions at the time of the incident and the steps taken to contain any further release and to remedy any adverse ecological effects on the watercourse. A copy of this record shall be provided to the Manager within 5 working days of the incident being brought to the attention of the consent holder.
	Consent lapse and expiry
G.20	Pursuant to section 125(1) of the Act, the consents referenced [**INSERT GWRC REFERENCE NUMBERS HERE]** shall lapse 15 years from the date of their commencement (pursuant to Section 116(5) of the Act) unless it has been given effect, surrendered or been cancelled at an earlier date.
G.21	Pursuant to section 123(c) of the Act, the consents referenced [**INSERT GWRC REFERENCE DISCHARGE PERMIT AND WATER PERMIT NUMBERS HERE]** shall expire 35 years from the date of their commencement (pursuant to Section 116(5) of the Act).

RC1 Land Use Consent – Earthworks

For approximately 6 million cubic metres of earthworks for the purpose of road construction over an area of approximately 170 hectares between Linden and MacKays Crossing including five fill sites, construction laydown areas and site compounds, and erosion and sediment control devices; and the associated removal of vegetation including plantation forestry.

RC2 Discharge Permit

To authorise the discharge of chemically treated sediment laden water to land that may enter water

RC3 Discharge Permit

To authorise the discharge of chemically treated sediment laden water to water

Reference	Proposed condition
	Earthworks limit conditions
E.1	Non-stabilised areas of earthworks authorised by this consent (whether of themselves or in combination with non-stabilised areas of earthworks authorised or by the consent granted to the PCC for earthworks **[insert consent reference]**) within the Pauatahanui Inlet watershed, shall be limited to not more than 40ha in total at any one time, and shall be further limited within the Duck Creek catchment, to not more than 14.25ha at any one time, unless otherwise agreed in writing with the Manager.
E.2	Non-stabilised areas of earthworks within the Onepoto Arm watershed shall be limited to not more than 17.25ha in total at any one time, unless otherwise agreed in writing with the Manager.
	Erosion and sediment control objectives
E.3	During construction of the Project, the consent holder must achieve the following objectives as far as reasonably practicable: (a) Minimise the overall non-stabilised earthworks footprint; (b) Use BPO to minimise non-stabilised earthworks in the areas where highly erodible colluvium is found in the Duck Creek, Upper Horokiri and Te Puka Stream catchments; (c) Use a staged construction programme to minimise areas of earthworks that are non-stabilised at any one time; (d) Stabilise completed areas of earthworks as soon as practicable and within one month of completion or ceasing Work in that area; (e) Divert clean run off away from non-stabilised earthworks areas; (f) Use BPO to design and install a variety of perimeter controls for the management of flows of water and sediment and sediment retention; (g) Achieve TSS removal efficiencies of at least 70% for all storm events with a less than 10 year ARI, as demonstrated by an agreed monitoring programme; (h) Design all emergency spillways to accommodate at least a 50 year ARI storm event peak flow; (i) Design all emergency spillways that are programmed to be in operation for more than one year to accommodate a 100 year ARI storm event peak flow; (j) Use dry and wet weather forecasting, monitoring and reporting, to ensure all

Reference	Proposed condition
	practicable erosion and sediment control measures are put in place if a heavy rainfall event is forecast and manage the effects of weather on the erosion and sediment control measures; (k) Prepare for and manage environmental risks from heavy rainfall events; and (l) Use adaptive management principles to review and refine the erosion and sediment control and treatment measures used.
	Erosion and Sediment Control Plan and measures
E.4	For each Stage of Work, an **Erosion and Sediment Control Plan** (ESCP) shall be prepared and submitted a minimum of 20 working days prior to earthworks of the Stage commencing, for the certification of the Manager. Certification, shall be obtained prior to earthworks of the stage commencing.
E.5	The ESCPs shall as far as practicable meet the objectives in Condition E.3 and include, but not be limited to: (a) Contour information at suitable intervals; (b) Erosion and sediment control measures including specific pond design (including calculations supporting pond sizing) (c) Catchment boundaries for the erosion and sediment control measures; (d) Location of the Work, and cut and fill operations; (e) Details of construction methods to be employed, including timing and duration; (f) Design details including: i. Contributing catchment area; ii. Retention volume of structure (dead storage and live storage measured to the top of the primary spillway); iii. Shape of structure (dimensions of structure); iv. Location of flood waters v. Safety and access vi. Position of inlets/outlets vii. Stabilisation of the structure; and viii. Maintenance. (g) A programme for managing non-stabilised areas of earthworks, including progressive stabilisation considerations; (h) The identification of appropriately qualified and experienced staff to manage the environmental issues onsite; (i) The identification of staff who have clearly defined roles and responsibilities to monitor compliance with the Consent Conditions and ESCP; (j) Provision of details of a chain of responsibility for managing environmental issues and details of responsible personnel; (k) The establishment of a sediment control team (including representatives from the contractor, GWRC and the Consent Holder) to meet and review erosion and sediment control measures on a weekly basis, or at intervals as otherwise agreed; (l) Approach and procedures for ensuring advance warning of a heavy rainfall event and for the management of such an event including systems of advance warning, arrangements for communications with the GWRC and other relevant authorities, and for the monitoring and treatment of non-stabilised areas of earthworks and erosion and sediment control measures, and for reporting to GWRC following any

Reference	Proposed condition
	such event; and (m) Methods and procedures to be undertaken for decommissioning of erosion and sediment control measures.
E.6	Erosion and sediment control measures shall be constructed and maintained in accordance with the NZTA's *Draft Erosion and Sediment Control Standard for State Highway Infrastructure* and *Draft Field Guide for Contractors*; (and any amendments to that document), except where a higher standard is detailed in the ESCP referred to in Condition E.5 above, in which case the higher standard shall apply.
E.7	Prior to any earthworks commencing, a certificate signed by an appropriately qualified and chartered professional engineer shall be submitted to GWRC to certify that the erosion and sediment control measures have been constructed in accordance with the ESCP as specified in Condition E.5 of this consent.
E.8	A copy of the "as-built(s)" and the certified ESCPs shall be kept on site, and all erosion and sediment control measures (including staging boundaries and particularly the extent of exposed areas) shall be updated as soon as practicable as changes are made. As-built plans shall be accompanied by text detailing the relevant earthworks methodology, constraints and likely progressions, and shall (in general accordance with the ESCPs) be revised as required to enable clear interpretation as to the day to day operation and management of erosion and sediment control measures.
E.9	All necessary perimeter controls shall be operational before earthworks (or relevant stage of earthworks) begin.
E.10	The consent holder shall seek to ensure that procedures are adopted to prevent the deposition of slurry, clay or other materials on the roads by vehicles leaving the site where such material is liable to cause a nuisance or hazard. Should the exercise of this Consent result in material being deposited on the road that causes or is liable to cause a nuisance or hazard, that material shall be removed immediately to the satisfaction of the Manager.
E.11	No sediment retention ponds, chemical treatment systems or perimeter controls shall be removed or decommissioned before the entire area is stabilised**,** unless such removal and decommissioning is in accordance with the CEMP or a SSEMP.
E.12	All 'cleanwater' runoff from stabilised surfaces, including catchment areas above the site, shall be diverted away from earthwork areas via a stabilised system, so as to prevent surface erosion.
	Incidents
E.13	During construction Work, the consent holder shall maintain a permanent record of any incidents alleging adverse effects from, or related to, the exercise of this consent. The record shall include: (a) identification of the nature of the incident; (b) location, date and time of the incident; (c) weather conditions at the time of the incident (as far as practicable). (d) the outcome of the consent holders investigation into the incident; (e) measures taken to seek to ensure that such an incident does not occur again; and (f) Any other activities occurring in the area that are unrelated to the project and that may have contributed to the incident. This record shall be maintained on site and shall be made available to the Manager, upon request. The consent holder shall notify the Manager in writing of any such complaint within 5 working days of the complaint being brought to the attention of the consent holder.
	Erosion and sediment control monitoring
E.14	The Consent Holder shall carry out monitoring in accordance with the approved ESCP and shall maintain records detailing: (a) The location of the monitoring undertaken; (b) The time and date the monitoring was undertaken;

Reference	Proposed condition
	(c) The weather conditions at the time of monitoring; (d) The performance criteria measured (e) The erosion and sediment controls that required maintenance; (f) The maintenance actions which were completed; and (g) The time when the maintenance was completed; and (h) Areas of non-compliance with the ESCP and the Chemical Treatment performance monitoring plan (if any), the reasons for the non-compliance and any action taken to remedy the non-compliance (if any). This information shall be made available to the GWRC upon request.
E.15	The Consent Holder shall carry out Sediment Retention Device monitoring during heavy rainfall trigger events in accordance with the approved ESCP and agreed performance criteria, shall maintain records detailing: (a) The location of the Sediment Retention Device; (b) The time and date the monitoring was undertaken; (c) The weather conditions at the time of monitoring; (d) The event based performance criteria measured; including but not limited to; i. Inlet turbidity; flow; particle size, pH ii. Outlet turbidity; flow; particle size, pH iii. pH of pond iv. Free Aluminium ($Al3+$) (e) The performance of the sediment retention devices with agreed event based performance criteria; (f) The maintenance actions which were completed; and (g) The time when the maintenance was completed; and (h) Areas of non-compliance with the ESCP and the Chemical Treatment Plan (as relevant) and the reasons for the non-compliance. This information shall be made available to the GWRC upon request.
E.16	The Consent Holder shall carry out Erosion Control Device monitoring in accordance with the approved ESCP and agreed performance criteria, shall maintain records detailing: (a) The location of the Erosion Control Device; (b) The time and date the monitoring was undertaken; (c) The weather conditions at the time of monitoring; (d) The performance criteria measured; including but not limited to; i. Loss of cover material ii. Erosion across protected slopes (e) The performance of the Erosion Control Devices with agreed performance criteria; (f) The maintenance actions which were completed; and (g) The time when the maintenance was completed; and (h) Areas of non-compliance with the ESCP and the Chemical Treatment Plan (as relevant) and the reasons for the non-compliance. This information shall be made available to the GWRC upon request.
	Construction Environmental Management Plan – additional requirements
E.17	In addition to the requirements in the General Conditions, the CEMP shall have regard to

Reference	Proposed condition
	the following rehabilitation principles: (a) To identify and give particular attention to high cuts that will be visible from dwellings and public open space in order to quickly reduce any visual effects. (b) For the engineer, ecologist and landscape architect to work together to design the final shape of, and re-vegetation proposals for, earthworks and rock cuts as part of the detailed design process. (c) To shape the finished cuts to emulate natural rock features and reduce where appropriate the creation of uniform linear features. This may include rolling back the top, ripping sections to create shaped corners, creating gully like features and scree-like slopes, etc. (d) To shape the finished cuts to provide areas of fractured rock that will provide microhabitats for native grasses, ferns and shrubs. (e) To shape the finished cuts to allow the deposition of soil in key areas so that tall shrubs can rapidly establish helping to break up the face. This can include benching, and bunding the toe of the cut when access track construction has been completed. (f) To vegetate cuts with plants equivalent to the slopes above and below the cut. **Explanatory Note:** The CEMP provides an umbrella document that identifies the management processes and techniques to seek to ensure appropriate environmental management of the site. The preparation of and approval processes for the SSEMP's are undertaken in general accordance with the procedures outlined in the CEMP.
	Chemical treatment (Flocculation)
E.18	All sediment retention ponds and devices shall be chemically treated in accordance with the CTP required under Condition E.19 of this consent.
E.19	Prior to the commissioning of chemical treatments for sediment management purposes, the Consent Holder shall provide GWRC with a **Chemical Treatment Plan** (CTP) for each stage of the works, or in association with a SSEMP, for confirmation by the Manager that it will achieve the standards set out in the ESCP required under Condition E.5. Each CTP shall be submitted to the Manager, for approval at least 20 working days prior to any flocculation works commencing within the relevant SSEMP. Each CTP shall include, but need not be limited to: (a) Specific design details of the chemical treatment system; (b) Monitoring, maintenance (including post-storm) and contingency programme (including a Record Sheet); (c) Details of optimum dosage (including catchment specific soil analysis and assumptions); (d) Procedures for carrying out an initial treatment trial; (e) A spill contingency plan; (f) A performance monitoring plan for device performance for sediment treatment; and (g) Details of the person or bodies that will hold responsibility for long-term maintenance of the chemical treatment system and the organisational structure which will support the system.
	Site Specific Environmental Management Plans (SSEMPs)
E.20	The consent holder shall prepare, submit and implement a Site Specific Environmental Management Plan (SSEMP) for each stage or sub stage area set out in the staging plan required under the CEMP. The SSEMP shall be submitted to the Manager, for certification at least 20 working days prior to works commencing in each plan area. Suitably qualified environmental specialist(s) shall assist in the preparation of the SSEMPs.

Reference	Proposed condition
	(a) Each SSEMP as far as practicable meet the objectives in Condition E.3 and shall be in general accordance with the CEMP and shall include, but need not be limited to: i. a detailed design and construction methodology for all works within the area covered by the SSEMP; ii. details of any contractor appointed to carry out the works authorised by this consent, including the contractor's company, address, named representative and their contact details; iii. a detailed schedule of construction activities including the expected commencement date and duration of works in each location within the area covered by the SSEMP; iv. a staging of works to demonstrate that the area of disturbance will be kept to the minimum practicable; and v. evidence that a suitably qualified engineer has been appointed to carry out the overall design, supervision and certification of earthworks (including cut/fill batter stability and construction of all erosion and sediment controls). (b) In respect of erosion and sediment control, the SSEMP shall be prepared in general accordance with the NZTA's *Draft Erosion and Sediment Control Standard for State Highway Infrastructure* and *Draft Field Guide for Contractors* and shall include, but not be limited to: i. detailed design specifications of all earthworks within the SSEMP area, including disposal sites, and all erosion and sediment control measures to be implemented, including supporting calculations where appropriate; ii. the expected commencement dates for the implementation of erosion and sediment controls measures in the SSEMP area; iii. information regarding chemical treatment of the proposed sediment retention ponds and devices; iv. identification of innovative treatments for erosion control that are to be used; v. monitoring and maintenance schedules for all erosion and sediment control measures on a set frequency (at least weekly), or within 24 hours of each trigger rain event that is likely to impair the function or performance of the control measures; vi. a site plan showing contours at suitable intervals, cut and fill operations, the specific location of all sediment and erosion control measures, and catchment boundaries for the sediment controls; and vii. locating temporary stockpiles of excavated material at least 50m away from any ephemeral stream or permanent watercourse unless there is appropriate treatment of stormwater (which may include discharging to vegetated land). (c) In respect of revegetation and rehabilitation activities, the SSEMP shall include, but not be limited to: i. identification of soil resource to be used for rehabilitation within the SSEMP area; ii. identification of the vegetation types to be used on a plan or schedule; iii. a programme for revegetation and maintenance activities for a period of up to the 3 years (maintenance activities may include the exclusion of pest browsers and stock and the removal of weeds, and fencing that might be required for the exclusion of stock); iv. the desired percentage of surface cover to be achieved to reduce the adverse effects from sediment-laden stormwater run-off; v. identification of any innovative treatments of exposed rock cuttings that are to be used; and vi. information demonstrating that as far as practicable the objectives in Condition E.3 are met.
E.21	The consent holder may request amendments to any SSEMP by submitting the amendments in writing to the Manager for approval, prior to any changes taking effect.
	Ecological management objectives

Reference	Proposed condition
E.22	During construction of the Project, the consent holder must achieve the following objectives as far as reasonably practicable: (a) Re-establish affected lizard habitat and minimise lizard mortality resulting from construction of the Project; (b) Re-establish affected peripatus habitat and minimise peripatus mortality resulting from construction of the Project; (c) Minimise disturbance of breeding kaka and falcon; (d) Minimise effects on fish during streamworks; (e) Mitigate stream loss and modification by: i. Enriching riparian habitat; and ii. Enhancing fish passage; (f) Reduce construction effects on the aquatic and Porirua Harbour marine environments; and (g) Avoid the destruction of valued vegetation, where practicable.
E.23	During the operational life of the Project, the consent holder must achieve the following objectives as far as reasonably practicable: (a) Minimise bat mortality (if any) resulting from operation of the Project; (b) Maintain habitat for *leptinella tenella*, and ensure the long term retention of that habitat; (c) Protect against future land uses which could adversely effect stream ecology, through ensuring the long term retirement of regenerating land; (d) Mitigate the loss of indigenous forest, by revegetating indigenous forest, and ensuring the long term retention of that forest; and (e) Reduce sediment generation and discharge, by ensuring the long term retention of riparian habitat enriched during construction.
	Ecological management and monitoring
E.24	The consent holder shall, in consultation with the Director-General of Conservation, (a) update and finalise the Draft Ecological Management and Monitoring Plan dated July 2011 to: i. include performance measures, actions, methods, trigger levels and monitoring programmes designed to achieve the objectives specified in Conditions E.22 and E.23 above; ii. provide for the continual review and monitoring of the effects of construction activities, including the inspection of all erosion and sediment control devices after all heavy rainfall trigger events, and the upgrading of devices where necessary to achieve the most efficient and effective treatment; and (b) submit this to the Manager, for approval at least 20 working days prior to works commencing on any part of the Project.
E.25	The consent shall implement the actions, methods, and monitoring programmes specified in the Ecological Management and Monitoring Plan.
E.26	The consent holder shall seek to ensure that: (a) all ecological monitoring is undertaken or supervised by a suitably qualified person; (b) the results of all monitoring carried out pursuant to the Ecological Management and Monitoring Plan are: i. recorded in a log on-site; ii. available for inspection during normal office hours; iii. submitted to the Manager and to the Director-General of Conservation at

Reference	Proposed condition
	quarterly intervals; (c) records are kept to show where monitoring is not possible due to dry conditions or where no sediment retention pond inflow or outflow exists.
E.27	The consent holder shall engage a suitably qualified person to confirm the extent of any valued Natural Areas as specified in the Wellington Conservation Management Strategy 1996, RPS, Regional or District Plans prior to the commencement of works and shall develop the detailed design to avoid these areas as far as practicable. Any protection mechanisms for these areas shall be set out in the CEMP.
E.28	The replacement of the eight identified perched culverts within Duck Creek shall be completed within two years of the commencement of construction of any part of the new road. Replacement culverts shall be designed so as to provide fish passage for native migratory fish species, and shall be of a similar size and capacity to the existing culverts unless otherwise agreed with the Manager.
E.29	As far as practicable, measures shall be employed to minimise adverse effects on fish during construction of stream diversions and culvert installation.
	Fill standards
E.30	All fill material used on site shall: (a) Be restricted to natural material, such as clay, soil and rock and other inert materials as detailed in the definition of cleanfill material in section 2.2 of the Ministry for the Environment publication 'A guide to the Management of Cleanfills, 2002', and (b) Be restricted to those materials listed as acceptable in table 4.1 of the Ministry for the Environment publication 'A guide to the Management of Cleanfills, 2002'.
	Progressive stabilisation and staging of earthworks
E.31	The consent holder shall commence trials to assess the suitability of revegetation techniques and treatments of exposed rock cuttings within at least one year prior to the commencement of construction.
E.32	A report of the results of the revegetation trials, and rock treatments shall identify: (a) which techniques and treatments are generally suitable for different areas and works within the project site; and (b) how each suitable technique or treatment (if any) will be incorporated into the completed Project. This report shall be submitted to the Manager at least one month prior to the commencement of construction.
E.33	The consent holder shall progressively stabilise exposed areas on completion of an area of cut or fill. Areas where future buildings or paved areas are proposed shall be temporarily stabilised with basecourse, grass, or other such material to the satisfaction of the Manager.
	Forestry removal/logging conditions
E.34	The GWRC's Regional Soil Conservator shall be notified in writing at least 20 working days prior to the commencement of forestry removal. This notification shall include: (a) details of the site location; and (b) timing and staging.
E.35	Prior to the commencement of forestry/logging and any associated vegetation removal, construction of access tracks or other related enabling works, the consent holder shall ensure that an approved CEMP and ESCP containing measures specific to this activity, are in place and have been given effect to in accordance with Conditions G.12 and E.5.
E.36	As soon as practicable, following logging in any area, all parts of the area affected by forestry logging shall be re-established in vegetation in accordance with an approved landscape plan.
E.37	Best management practices as described in the New Zealand Forest Code of Practice (LIRO 1990, revised 1993) shall be adopted.
E.38	No vegetation or slash with a diameter of greater than 100 mm shall be allowed to remain

Reference	Proposed condition
	in any watercourse and, when removed, shall be placed in a position where that material cannot enter any watercourse.

RC4 Land use consents and water permits for Wainui Stream

RC5 Land use consents and water permits for Te Puka Stream

RC6 Land use consents and water permits for Horokiri Stream

RC7 Land use consents and water permits for Ration Stream

RC8 Land use consents and water permits for Collins Stream

RC9 Land use consents and water permits for Pauatahanui Stream

RC10 Land use consents and water permits for Duck Creek

RC11 Land use consents and water permits for Kenepuru Stream

RC12 Land use consents and water permits for Porirua Stream

For each Stream the following consents and permits are sought:

- Land Use Consent and Water Permit – to permanently realign (divert and reclaim) the beds of steams, being pipe culverts, bridges and associated erosion protection control structures and stormwater outlet structures (refer to Schedule 1); and
- Land use consent to undertake permanent works in the beds streams and associated tributaries, including the construction, use and maintenance of culverts and fords; the construction and maintenance of gabion baskets and rock rip-rap erosion protection structures; and associated channel realignment and disturbance of the beds of those streams (refer to Schedules A-C).
- Water permit to divert water as part of the reclamation of the bed of a stream and associated tributaries *(Note: does not apply to Collins Stream)*.

Explanatory Notes: refer to Schedules A-C – table of reclamations and diversions – which sets out the length of stream affected and the numbers and length of structures, reclamations and diversions.

Reference	Proposed condition
WS.1	The consent holder shall use natural rock and soil material, where practicable, to reclaim the stream bed. All fill material shall be placed and compacted so as to minimise any erosion and/or instability so far as is practicable.
WS.2	The consent holder shall seek to ensure that all works authorised by this permit to be undertaken in the dry bed of the stream, are completed before the flow of the stream is diverted back into the stream bed.
WS.3	The consent holder shall, as far as practicable, design all diversions in a manner than seeks to maintain stream flows (both volume and velocity) in a similar state to its natural state at the time of commencement of Work.
WS.4	The works shall remain the responsibility of the consent holder and shall be regularly inspected and maintained by the consent holder so that: (a) the waterway within or over the culverts and fords remains substantively clear of debris; (b) any erosion of the stream banks or bed that is attributable to, and is within 20m up

Reference	Proposed condition
	or downstream of, the stream works authorised by this consent are remedied as soon as practicable by the consent holder; and (c) fish passage through the culverts and fords is not impeded. **Explanatory Note**: Maintenance does not include any works outside of the scope of the application. Any additional works (including structures, reshaping or disturbance to the stream bed) following completion of the construction works as proposed in the application, may require further resource consents.

RC13 Land Use Consent – To undertake works in, on, over or under the beds of Duck Creek for the purpose of removing existing perched culverts in eight locations, and replacing them with culverts that allow fish passage

Reference	Proposed condition
Duck.1	The consent holder shall prepare and submit **detailed design plans and construction methodology**, including proposed duration and timing for the removal and replacement of existing culverts authorised by this consent, to the Manager for approval at least 20 working days prior to works commencing. The detailed design plans and construction methodology shall include: (a) measures/methods to seek to ensure that fish passage is maintained on completion of construction of the replacement culverts; (b) details of culvert inlet/outlet protection structures e.g. pre-cast wing walls or rock rip-rap; and (c) appropriate sizing of culverts and allowances for secondary flow paths during high flows.
Duck.2	The replacement of all eight culverts shall be completed within two years of the commencement of construction of any part of the Project.

RC14 Land Use Consent for use, placement and erection of structures (refer to Schedule C:Temporary Culverts) – To undertake works in, on, over or under the beds of streams and associated tributaries including the construction, use and maintenance of bridges, culverts and fords, and water permit for any associated temporary diversion and disturbance of the beds of those streams

Explanatory note: this is a global consent for construction works in streams along the entire route.

Reference	Proposed condition
S.1	Unless any modifications are required to comply with any of the conditions of this consent, the location, design, implementation and operation of the works shall be in general accordance with the: (a) consent application and its associated plans and documents lodged with the GWRC **[INSERT DATES AND NUMBERS HERE]**; and (b) information to be prepared and submitted to the GWRC in accordance within the CEMP conditions of this consent.
	Pre- construction conditions
S.2	The consent holder shall prepare and submit **detailed design plans and construction methodology**, including proposed duration and timing for all required structures and stream works authorised by this consent, to the Manager for approval at least 20 working days prior to works commencing. The detailed design plans and construction methodology shall include: (a) measures/methods to seek to ensure that fish passage is maintained during and on completion of construction works along the stretches of stream affected by the exercise of this consent; (b) details of culvert inlet/outlet protection structures e.g. pre-cast wing walls or rock rip-rap; (c) appropriate sizing of culverts and allowances for secondary flow paths during high flows; and (d) any other measures or details as appropriate to achieve compliance with all conditions of this consent.
S.3	Works shall not commence until the detailed design plans and construction methodology required by Condition S2. of this consent have been certified by the Manager GWRC as being in general accordance with consent application plans.
S.4	The Manager, shall be given a minimum of 20 working days notice in writing, prior to Work commencing in each location (including any maintenance Work). **Explanatory Note:** This condition excludes Work permitted by the Regional Freshwater Plan for the Wellington Region.
S.5	The consent holder shall prepare and implement a **revegetation and mitigation strategy** for the stream modifications and structures authorised by this consent. The strategy shall be submitted to the Manager, at least 20 working days prior to any Work commencing. The revegetation and mitigation strategy shall include, but not be limited to: (a) details, methods, timing and responsibilities for revegetation of all exposed areas of stream bank or dewatered channel or culvert fill slopes as a result of this consent, including the methods for the protection of such areas; (b) planting plan and schedules; (c) monitoring and maintenance processes and procedures, including for replacement of dead plants, for a period of three years from completion of construction. **Explanatory Note:** the plant species used to revegetate areas shall be consistent with the

Reference	Proposed condition
	species in the immediate vicinity of the exposed areas ("like-with-like"), with native species suitable for stream side and spawning habitats preferred at all times.
S.6	At least 20 working days prior to the commencement of construction of any temporary stream crossing, the consent holder shall submit detailed design plans of the crossing to the Manager for certification, and construct the crossing in accordance with the certified plans.
	During construction conditions
S.7	All work involving construction of new structures within streams, including post-construction clean up and reinstatement, shall be completed within 20 working days of completion of Work, to the satisfaction of the Manager.
S.8	The consent holder shall take all practicable steps to minimise sedimentation and disturbance of streams during the construction and implementation of the Work, including: (a) completing all Work in the minimum time practicable; (b) minimising the area of disturbance at all times; (c) avoiding placement of excavated material in the wetted channel; (d) separating construction activities from the wetted channel; (e) minimising time spent by machinery in the wetted channel, including the number of vehicle crossings; (f) immediately removing any excess material from the bed and banks of the stream on completion of the Work; and (g) where practicable, using material from the old dry channel for subsequent new channels.
S.9	Except for construction Work in the Te Puka Stream catchment, the consent holder shall maintain fish passage at all times during and on completion of the construction Work along the stretches of stream affected by the exercise of this consent. Any fish stranded or trapped by the construction works as authorised by this consent shall as soon as practicable be relocated upstream or downstream (as relevant) to clear water.
S.10	For Work within the Te Puka Stream catchment, the consent holder shall capture any fish stranded or trapped by the construction Work as authorised by this consent and relocate upstream or downstream (as relevant) to clear water.
S.11	During whitebait migration season (between 1 September to 30 November inclusive) and/or the adult fish spawning season (between 1 April to 31 July inclusive), Work within the wetted channel of the stream is only permitted: (a) with the prior approval of the Manager; and (b) in any case, will be limited to 1 day out of 7 and no more than 2 days in any 30 days. **Explanatory Note:** This condition excludes works as permitted by Rule 22 of the Regional Freshwater Plan for the Wellington Region.
	Post- construction and maintenance conditions
S.12	Unless otherwise agreed in writing with the Manager, all temporary stream crossings shall be removed within not more than two years of their installation.
S.13	Upon removal of any temporary crossing, the consent holder shall either: (a) replace the crossing with a permanent ford crossing; or (b) reinstate the stream bed to, as far as practicable, a natural state to closely match the upstream and downstream riparian and instream habitats and visual appearance. At least 20 working days prior to the commencement of construction of any fords, the consent holder shall submit detailed design plans to the Manager for certification.
S.14	The structures erected as part of the Work shall remain the responsibility of the consent holder and shall be regularly inspected and maintained by the consent holder so that:

Reference	Proposed condition
	(a) the waterway within or over the culverts and fords remains substantively clear of debris; (b) any erosion of the stream banks or bed that is attributable to the stream works authorised by this consent are remedied as soon as practicable by the consent holder; and (c) fish passage through the culverts and fords is not impeded. **Explanatory Note**: Maintenance does not include any works outside of the scope of the application. Any additional works (including structures, reshaping or disturbance to the stream bed) following completion of the construction works as proposed in the application, may require further resource consents.

RC 15 Discharge Permit for Concrete Batching Plant: Discharge contaminants to air after bag filtration resulting from the mixing of cement powder with other materials to manufacture concrete or concrete products; and

RC16 Discharge Permit for Concrete Batching Plant: Discharge contaminants to stormwater from an industrial or trade process.

Reference	Proposed condition
	Pre- construction administration
CBP.1	The location, design and operation of the concrete batching plant shall be in general accordance with: **[Insert reference to plans, date and legal description(s)]**
CBP.2	The consent holder shall prepare a **Concrete Batching Plant Management Plan (CBMP)**. The Consent Holder shall provide the CBMP to the Manager for certification prior to the commencement of operation of the batching plant.
CBP.3	The CBMP shall include, but not be limited to, details of: General (a) The final site layout including buildings and storage yard(s) and other storage facilities; (b) An operation and maintenance manual detailing regular monitoring to be undertaken, including visual checks and maintenance of all plant machinery and equipment to mitigate against accidental discharges; (c) A contingency plan for discharges to the environment from the plant; (d) Complaints investigation, monitoring and reporting; (e) The identification of staff and contractors' responsibilities. Air Quality Management Measures (a) Procedures for responding to process malfunctions and accidental dust discharges; (b) Procedures to seek to ensure that sand and aggregate (and other potentially dusty materials) are handled and stored so as to minimise dust emissions; (c) Mitigation measures to be implemented during the operation of the plant, including the installation of a water sprinkler system to minimise dust emissions; (d) Criteria, including consideration of weather conditions and procedures for use of water sprays on stockpiles and operational areas of the site; (e) Daily visual monitoring of dust emissions. Stormwater Quality Management Measures (a) Methods to separate clean stormwater and divert it away from dirty areas of the site; (b) Methods to capture and treat stormwater from dirty areas of the site; (c) Collection and storage of rubbish in appropriate receptacles to avoid contamination with rainwater; and (d) Methods for collection and re-use of water onsite.
CBP.4	Operation of the plant shall not commence until the CBMP, detailed design plans and methodology required by Conditions CBP.1, CBP.2 and CBP.3 of this permit have been

Reference	Proposed condition
	certified by the Manager.
CBP.5	The consent holder shall review and (if necessary) update the CBMP within two months of the date of commencement of operation of the concrete batching plant, and at least once every year thereafter and also in the event that potential and actual adverse emissions to air are identified by an enforcement officer; or for the purpose of reviewing the stormwater management systems on-site. In any such event, the Best Practicable Option shall be used to prevent such emissions. Any proposed changes to the CBMP shall be submitted to the Manager for review within one month of the consent holder's review.
CBP.6	The Manager, shall be given a minimum of 48 hours notice prior to the operation of the concrete batching plant commencing.
	Limit conditions
CBP.7	The Consent Holder shall at all times operate, maintain, supervise, monitor and control all processes on site so that air emissions authorised by this consent are maintained at the minimum practicable level.
CBP.8	There shall be no discharges to air resulting from the exercise of this permit which are, in the opinion of an enforcement officer, noxious, dangerous, offensive, or objectionable at or beyond a 20 metre wide buffer zone around the physical boundary of the plant.
CBP.9	No discharges from any activity on site shall give rise to visible emissions to an extent which, in the opinion of an enforcement officer, is noxious, dangerous, offensive or objectionable.
CBP.10	Beyond the boundary of the site there shall be no hazardous air pollutants caused by discharges from the site, which are present at a concentration that causes, or is likely to cause adverse effects to human health, the environment or property.
	Operation and process conditions
CBP.11	As far as practicable, all process water shall be captured and reused on site.
CBP.12	The site shall be kept clean and tidy and appropriate measures taken to minimise dust emissions from wind and vehicle movements, including ensuring that within site boundaries all vehicle speeds are be kept below 10 kilometres per hour, in accordance with the CBMP required by Condition CBP.2.
CBP.13	If a significant discharge of dust into air occurs from any part of either a cement silo or associated equipment during the delivery of cement into that silo, all deliveries into that silo shall cease immediately and shall not be resumed until the dust source has been located and remedied.
CBP.14	Each silo on site shall be fitted with a pulse-jet type bagfilter unit that shall be adequately maintained and be operating whenever bulk cement is being transferred into that silo and that air displaced from cement silos during silo filling shall be vented to atmosphere via the bagfilter unit fitted to that silo.
CBP.15	Each silo on site shall be fitted with a high level fill alarm that shall be adequately maintained and be operating whenever bulk cement is being transferred into that silo, and that in the event of the alarm operating, filling into the silo shall cease immediately and shall not be resumed until the cause has been located and remedied.
CBP.16	Air displaced from the cement weigh hopper during weighing shall be vented to atmosphere via a bagfilter.
CBP.17	Air extracted from the mixer drum during batching of concrete shall be vented to atmosphere via a pulse-jet type bagfilter unit that shall be operating whenever the batching of concrete is being undertaken.
CBP.18	That all ducting and emission control equipment shall be maintained in good condition and as far as practicable be free from leaks to prevent fugitive emissions.
CBP.19	Aggregate shall be handled in such a way as to minimise dust emissions, including appropriate storage and the minimisation of drop heights when unloading. Appropriate storage means storage only in the enclosed high-level bins or in ground-level storage bays. Minimisation of drop heights is specified in the CBMP required by Condition CBP.2.
CBP.20	The maximum height of any stockpiles of sand, aggregate or any other potentially dusty material in ground-level storage bays shall not exceed the height of the side and rear walls of that bay.

Reference	Proposed condition
CBP.21	Water sprays shall be available on each ground-level storage bay used for sand, aggregate or any other potentially dusty material, and shall be used when necessary for dust suppression.
CBP.22	The aggregate conveyors shall be enclosed at least on one side and above or fitted with close fitting covers and fitted with return scrapers to adequately minimise dust emissions.
	Monitoring and site management conditions
CBP.23	Regular maintenance of the concrete batching process, including weekly visual inspections of the equipment prior to use, shall be carried out by an appropriately trained operator. Records of maintenance and visual inspections shall be kept and made available to the Manager on request.
CBP.24	The consent holder shall keep a record of all deliveries of bulk materials to, and dispatches of concrete from, the plant. These records shall be made available to the GWRC on request.
CBP.25	Regular maintenance of the concrete batching process, including weekly visual inspections of the equipment prior to use, shall be carried out by an appropriately trained operator. Records of maintenance and visual inspections shall be kept and made available to the Manager on request.
CBP.26	The consent holder shall undertake regular visual monitoring of dust emissions from each delivery of bulk cement to the site, as specified in the CBMP required by Condition CBP.2.
CBP.27	The consent holder shall require bulk tanker drivers to remain in the immediate vicinity of the tanker delivery controls throughout each delivery of bulk cement to the site, and to continuously monitor each such delivery for spills and/or discharges to air.
CBP.28	The filter units, high level alarms and pressure relief valves fitted to each silo shall be inspected for correct operation and damage at least once each month.
CBP.29	The filter unit fitted to the concrete mixer unit shall be inspected for correct operation and damage at least once every six months.
CBP.30	A continuous turbidity and pH meter shall be located at the discharge point from the Concrete Batching Plant dirty water treatment system. Discharges from the concrete batching plant shall meet a turbidity and pH discharge standard – initially set at: • Turbidity 50 NTU; and • pH between 6-9. Where the turbidity level is exceeded, or pH is greater than 9, further treatment shall be required via chemical treatment and/or pH management prior to discharge. Alternatively this stormwater shall be discharged to the reticulated sewer.
CBP.31	The stormwater treatment devices used on this site shall be designed in accordance with the standards set out in the NZTA's *Draft Erosion and Sediment Control Standard for State Highway Infrastructure* and *Draft Field Guide for Contractors*.
	Logging and reporting conditions
CBP.32	The consent holder shall keep a record of all deliveries of bulk materials to, and dispatches of concrete from, the plant. These records shall be made available to the GWRC on request.
CBP.33	A log shall be maintained of the results of all daily, weekly and monthly inspections and visual assessments of all emissions control equipment and of any dust emissions from the site or processes.
CBP.34	All records, logs, monitoring and test results that are required by the conditions of this consent shall be made available on request, during operating hours, to an enforcement officer and shall be kept for a minimum period of 12 months from the date of each entry.
CBP.35	The consent holder shall notify an enforcement officer as soon as practicable in the event of any significant discharge of contaminants into air, which may result in adverse effects on the environment.
CBP.36	Details of any complaint received shall be provided to the Manager within 7 days of receipt of the complaint/s.
	Review condition
CBP.37	The conditions of this consent may be reviewed by the Manager pursuant to section 128 of the RMA, by the giving of notice pursuant to section 129 of the Act, in within two

Reference	Proposed condition
	months of commencement of operation of the concrete batching plant, and annually thereafter in order: (a) To deal with any significant adverse effect on the environment arising from the exercise of the consent which was not foreseen at the time the application was considered and which is appropriate to deal with at the time of the review. (b) To consider the adequacy of conditions which prevent nuisance beyond the boundary of the site, particularly if regular or frequent complaints have been received and validated by an enforcement officer. (c) To consider developments in control technology and management practices that would enable practical reductions in the discharge of contaminants to air. (d) Alter the monitoring requirements, including requiring further monitoring, or increasing or reducing the frequency of monitoring.
	Expiry
CBP.38	This consent relating to the discharge of contaminants to air from a concrete batching plant shall expire 15 years from the date of its commencement unless it has lapsed, been surrendered or been cancelled at an earlier date.

30.3 Proposed PCC resource consent conditions

30.3.1 Abbreviations for all consents

AEE	Transmission Gully Project Assessment of Effects on the Environment
CEMP	Construction Environmental Management Plan
Commencement of Works	means the time when the works that are the subject of these consents commence
GWRC	Wellington Regional Council
Heavy rainfall event	15mm of rain per hour at any of the rain gauges monitored for the Project
The Manager	means the Manager, Consents Management, Wellington Regional Council or nominated GWRC staff or contractor appointed to act on the Manager's behalf
PCC	Porirua City Council
Project	means the construction, maintenance and operation of the Waitangirua and Whitby Link Roads
RMA	Resource Management Act 1991
Stabilised	means inherently resistant to erosion or rendered resistant, such as by using indurated rock or by the application of basecourse, grassing, mulch, or another method to the reasonable satisfaction of the Manager. Where

	seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by the Manager 80% vegetative ground cover has been established.
Stage	means a stage of the Project as nominated by the contractor and agreed with the Greater Wellington Regional Council
UHCC	Upper Hutt City Council
WCC	Wellington City Council
Work	means any activity or activities undertaken in relation to the Project

Note: text that appears in italics forms either an explanatory note or advice note prepared to assist with interpretation of the condition, but does not form part of the condition for compliance purposes.

30.3.2 Advice Notes

A. Where there may be contradiction or inconsistencies between the application and further information provided by the applicant, the most recent information applies. In addition, where there may be inconsistencies between information provided by the applicant and conditions of the consent, the conditions apply.

B. Any change from the location, design concepts and parameters, implementation and/or operation may require a new resource consent or a change of consent conditions pursuant to Section 127 of the Resource Management Act 1991.

The following "PCC.G" conditions are General Conditions that are applicable to all consents and permits sought by PCC. Additional specific conditions follow for each consent/permit sought.

Reference	Proposed condition
G.22	The Project shall be undertaken in general accordance with the plans and information submitted with the application as documented as consent numbers [**INSERT GWRC REFERENCE NUMBERS HERE],** subject to such amendments as may be required by the following conditions of consent. The plans and information include: (i) Consent applications dated **[INSERT DATES HERE]** (ii) Documents **[INSERT DATES HERE]** (iii) Plans **[INSERT FINAL PLAN REFERENCES HERE]**
G.23	Subject to the consent holder holding or obtaining appropriate property rights to enable it to do so, the consent holder shall permit the servants or agents of the GWRC to have access to relevant parts of the respective properties at all reasonable times for the purpose of carrying out inspections, surveys, investigations, tests, measurements and/or to take samples.
	Pre- construction administration conditions
G.24	At least 20 working days prior to commencement of any Stage the consent holder shall arrange a pre-construction site meeting between the GWRC and any other relevant party nominated by the GWRC, including the primary contractor. In the case that any of the invited parties, other than the representative of the consent holder, does not attend this meeting, the consent holder will have complied with this condition, provided the invitation requirement is met.
G.25	Prior to the commencement of construction Work, the consent holder and the GWRC (and or their agreed representative(s) who have authority to make decisions regarding consent compliance), shall meet and decide upon a suitably qualified or experienced person or persons who shall fulfil the role of compliance officer for the Project. The agreed person's responsibilities shall include: (a) Pre-commencement site meeting(s) with contractors; (b) Regular scheduled compliance inspections to meet the requirements of regional consents [**INSERT GWRC REFERENCE NUMBERS HERE**]; (c) Spot compliance checks before and/or after forecast extreme weather events; (d) Collection, collation and filing of any required monitoring and compliance reports; and (e) Enforcement action under the provisions of the RMA in the event of a non-compliance. This person may be a Council employee, or may be an independent person agreed between the consent holder and the GWRC as an **Independent Professional Advisor**. The actual and reasonable costs of this person exercising these responsibilities shall be recoverable from the consent holder (refer to Condition PCC.G.5).
G.26	The GWRC shall be entitled to recover from the consent holder the actual and reasonable costs of the conduct of any review, calculated in accordance with and limited to the Council's scale of charges in-force and applicable at that time pursuant to Section 36 of the Resource Management Act 1991
G.27	The consent holder shall ensure that a copy of this consent and all documents and plans referred to in this consent, are kept on site at all times and presented to any GWRC officer on request.
	Review condition
G.28	The Manager may review any or all conditions of this consent by giving notice of their intention to do so pursuant to Section 128 of the Resource Management Act 1991, at any time within six months of the first, third and fifth anniversaries of the date of commencement of this consent for any of the following purposes:

Reference	Proposed condition
	(a) To deal with any adverse effects on the environment, which may arise from the exercise of this consent, and which it is appropriate to deal with at a later stage; and (b) To review the adequacy of any monitoring plans proposed and/or monitoring requirements so as to incorporate into the consent any monitoring or other requirements which may become necessary to deal with any adverse effects on the environment arising from the exercise of this consent.
	Staging and programme conditions
G.29	If the work is to be staged, the consent holder shall prepare a staging plan prior to the commencement of any works, and shall provide written notification of the works commencing in each Stage to the GWRC, at least ten working days prior to works commencing in each area.
G.30	The consent holder shall provide the Manager with an updated schedule of construction activities for the Project at monthly intervals throughout the construction phase of the Project.
	Management plans
G.31	All works shall be carried out in general accordance with the management plans required by these conditions.
G.32	The consent holder may request amendments to any of the management plans required by these conditions by submitting the amendments in writing to the Manager for approval prior to any changes taking effect.
	Construction Environmental Management Plan
G.33	Prior to the commencement of any Stage which involves activities authorised by this consent, the consent holder shall submit a Construction Environmental Management Plan or Plans ("CEMP") to the Manager for review and certification. Among other things, the CEMP(s) is to confirm that the proposed construction methodology for the Stage complies with Condition PCC.G.1 of this consent and to demonstrate how other conditions of this consent have been or will be complied with. The CEMP(s) shall be prepared in relation to the relevant Stage. The purpose of the CEMP is to confirm final project details, staging of Work, and detailed engineering design to seek to ensure that the Project remains within the limits and standards approved under this consent and that the construction and operation activities avoid, remedy or mitigate adverse effects on the environment in accordance with the conditions of this consent. The CEMP shall provide details of the responsibilities, reporting frameworks, coordination and management required for project quality assurance; final detailed design; construction methodologies; timeframes and monitoring processes and procedures. Works shall not commence on a Stage until the consent holder has received the Manager's written approval for the CEMP(s) for that Stage. A CEMP shall include but need not be limited to: (1) Quality Assurance A Quality Assurance section which shall include management frameworks, systems and procedures for quality management of all on-site activities and compliance with the conditions of this designation. Among other matters this section shall provide details of the following: a. Name, qualifications, relevant experience and contact details of an appropriately qualified and experienced project manager, who shall be responsible for overseeing compliance with the CEMP; b. Names, qualifications, relevant experience, and methods for contacting principal staff employed on the relevant part of the Project, along with details of their roles and responsibilities; c. Methods and systems to inform and train all persons working on site of potential environmental issues and how to comply with conditions of the consent; d. Systems and processes whereby the public are informed of contact details of the project manager and principal staff identified above;

Reference	Proposed condition
	e. Liaison procedures with the Council; and f. Communication protocols. (2) Site Management The Site Management section of the CEMP shall detail procedures to manage the relevant part of the Project throughout the entire construction process in a safe manner. This section shall provide details of the following (and may include other matters): a. Details of the site access for all Work associated with construction of the part of the Project; b. Measures to be adopted to maintain the site in a tidy condition in terms of disposal/storage of rubbish, storage and unloading of building materials and similar construction activities; c. Location of workers' conveniences (e.g. portaloos); d. Procedures for controlling sediment run-off into the watercourses/streams, dust and the removal of soil, debris and construction materials from the watercourses/streams and riparian margins, and onto public roads or places (including identifying the location of wheel wash facilities); e. A contingency plan in the event that there is any unconsented discharge to watercourses/streams; f. Details of the storage of fuels and lubricants (which shall require that storage be bunded or contained in such a manner so as to prevent the discharge of contaminants from spillages); g. Details of the proposed maintenance of machinery and plant to minimise the potential for leakage of fuels and lubricants; h. Location of vehicle and construction machinery access and storage during the period of site works; i. Procedures for thoroughly cleaning all machinery of unwanted vegetation (e.g. weeds), seeds or contaminants prior to entering the site; j. Methods for the clear identification and marking of the construction zones including those which extend into watercourses; k. A methodology that prescribes the extent to which machinery can operate in the vicinity of watercourses so as to minimise disruption and damage to the watercourses and associated vegetation; l. Methods to manage public health and safety during the construction works, and notification to the public of temporary access restrictions to the immediate works area during the staged construction; m. Confirmation that no equipment or machinery will be cleaned, or refuelled in any part of any watercourses/streams, except as otherwise specifically provided for in the CEMP or an SSEMP; n. Procedures for removing all contaminants (e.g. fuel, hydraulic oils, lubricants etc) from the site at the end of the construction period, except for those required for ongoing maintenance of the road and operational activities; and o. Procedures for making any repairs to the adjacent road network required where any damage occurs as a direct result of the Project. (3) Construction Programme and Methodology Notwithstanding Conditions PCC.G.8 and PCC.G.9 above, a Construction Programme which shall include a programme of works that seeks to enable the relevant part of the Project to be constructed in a manner that is timely, adequately co-ordinated and manages the adverse effects of construction on the environment in accordance with the conditions of this consent. This section shall, among other matters, provide details on the following: a. A detailed staging programme and anticipated timetable for construction works during the relevant part of the Project; and b. A methodology to identify how earthworks will be staged during the relevant part

Reference	Proposed condition
	of the Project to manage the effects of the Project on the Pauatahanui Inlet in accordance with this consent.
	Environmental management plans
G.34	The management of key environmental effects associated with the construction phase of the Project shall be detailed within environmental management plans that are included in the appendices to the CEMP. This suite of management plans shall include: (a) Construction Air Quality Management Plan (CAQMP) – Condition PCC.G.14; (b) Erosion and Sediment Control Plan (ESCP) – Condition PCC.E.2; and (c) Chemical Treatment Plan (CTP) (i.e. flocculation) – Condition PCC.E.16.
G.35	The CEMP shall include an updated version of the **Construction Air Quality Management Plan** (CAQMP) which shall provide a methodology for managing the effects of dust from the site, and shall, as a minimum include: (a) Identification and implementation of dust suppression measures appropriate to the environment in which the works are located, and the sensitivity of nearby receptors; and (b) Identification of contingency measures to address identified and verified adverse effects on sensitive receptors. Contingency measures may include options such as: • Cleaning of water tanks and replenishment of water supplies; • Cleaning of houses • Cleaning of other buildings and infrastructure.
G.36	Should a heavy rainfall event occur or advance notice of an impending event be received the consent holder may undertake contingency measures not set out in any management plan, but only subject to the following conditions: (a) The measures must be for the express purposes of managing non-stabilised areas of earthworks or improving erosion and sediment controls in the catchments that drain to the Porirua Harbour, (b) Unless impracticable to do so, the consent holder must secure prior (oral or written) approval from the Manager for undertaking the measures, (c) As soon as practicable following the undertaking of the measures, the consent holder must provide to the Manager written notice of the measures undertaken and amend the relevant Management plan(s) as may be appropriate to take account of the measures undertaken and submit the amended Management plan to the Manager for approval under Condition G.11.
	Archaeology
G.37	The Requiring Authority, in consultation with, Te Runanga o Toa Rangatira Inc and the New Zealand Historic Places Trust, shall prepare an accidental discovery protocol to be implemented in the event of accidental discovery of cultural or archaeological artefacts or features during the construction of the Project. This protocol shall be submitted to the Manager at least 20 working days prior to any construction or enabling Work commencing under this consent on any part of the Project within the District. The protocol shall include, but not be limited to: (a) Training procedures for all contractors regarding the possible presence of cultural or archaeological sites or material, what these sites or material may look like, and the relevant provisions of the Historic Places Act 1993 if any sites or material are discovered; (b) Parties to be notified in the event of an accidental discovery shall include, but need not be limited to Te Runanga o Toa Rangatira Inc, the New Zealand Historic Places Trust, the GWRC, the relevant District or City Council and the New Zealand Police (if koiwi are discovered);

Reference	Proposed condition
	(c) Procedures to be undertaken in the event of an accidental discovery (these shall include immediate ceasing of all physical works in the vicinity of the discovery); and Procedures to be undertaken before Work under this consent may recommence in the vicinity of the discovery. These shall include allowance for appropriate tikanga (protocols), recording of sites and material, recovery of any artefacts, and consulting with Te Runanga o Toa Rangatira Inc and the New Zealand Historic Places Trust prior to recommencing works in the vicinity of the discovery.
	Incidents and complaints
G.38	During construction Work, the consent holder shall maintain a permanent record of any complaints received alleging adverse effects from, or related to, the exercise of this consent. The record shall include: (a) the name and address (as far as practicable) of the complainant; (b) identification of the nature of the complaint; (c) location, date and time of the complaint and of the alleged event; (d) weather conditions at the time of the complaint (as far as practicable), and including wind direction and approximate wind speed if the complaint relates to air quality. (e) the outcome of the consent holders investigation into the complaint; (f) measures taken to seek to ensure that such a complaint does not occur again; and (g) Any other activities in the area, unrelated to the project that may have contributed to the compliant, such as non-project construction, fires, traffic accidents or unusually dusty conditions generally. The consent holder shall also keep a record of any remedial actions undertaken. This record shall be maintained on site and shall be made available to the Manager, upon request. The consent holder shall notify the Manager in writing of any such complaint within 5 working days of the complaint being brought to the attention of the consent holder.
G.39	The consent holder shall immediately notify the Manager if any contaminants (including sediment) or material are released in the undertaking of the Work and enters any watercourse due to any of the following: (a) discharges from non-stabilised areas that are not treated by erosion and sediment control measures required under this consent; and/or (b) failure of any erosion and sediment control measures; and/or (c) any other incident which either directly or indirectly causes, or is likely to cause, adverse ecological effects in any watercourse that is not authorised by a resource consent held by the consent holder. If any of these events occur, the consent holder shall: (a) establish control measures where these have failed or have not been implemented in accordance with the CEMP as soon as practicable; (b) liaise with the Manager to establish what remediation or rehabilitation is required and whether such remediation or rehabilitation is practical to implement; (c) carry out any remedial action as required by and to the satisfaction of the Manager; and (d) maintain a permanent record of the incident at the site, which shall include the date and time of the incident, the nature, manner and cause of the release of the contaminants, weather conditions at the time of the incident and the steps taken to contain any further release and to remedy any adverse ecological effects on the watercourse.

Reference	Proposed condition
	A copy of this record shall be provided to the Manager within 5 working days of the incident being brought to the attention of the consent holder.
	Consent lapse and expiry
G.40	Pursuant to section 125(1) of the Act, the consents referenced [**INSERT GWRC REFERENCE NUMBERS HERE]** shall lapse 15 years from the date of their commencement (pursuant to Section 116(5) of the Act) unless it has been given effect, surrendered or been cancelled at an earlier date.
G.41	Pursuant to section 123(c) of the Act, the consents referenced [**INSERT GWRC REFERENCE DISCHARGE PERMIT AND WATER PERMIT NUMBERS HERE]** shall expire 35 years from the date of their commencement (pursuant to Section 116(5) of the Act).

RC17 Land Use Consent – Earthworks

For bulk earthworks for the purpose of construction of the Porirua Link Roads including erosion and sediment control devices, and the associated removal of vegetation.

RC18 Discharge Permit

To authorise the discharge of chemically treated sediment laden water to land that may enter water.

RC19 Discharge Permit

To authorise the discharge of chemically treated sediment laden water to water.

Reference	Proposed condition
	Earthworks limit conditions
E.39	Non-stabilised areas of earthworks authorised by this consent (whether of themselves or in combination with non-stabilised areas of earthworks authorised or by the consent granted to the NZTA for earthworks **[insert consent reference]**) within the Pauatahanui watershed, shall be limited to not more than 40ha in total at any one time, and shall be further limited within the Duck Creek catchment, to not more than 14.25ha at any one time, unless otherwise agreed in writing with the Manager.
	Erosion and sediment control objectives
E.40	During construction of the Project, the consent holder must achieve the following objectives as far as reasonably practicable: (a) Minimise the overall non-stabilised earthworks footprint; (b) Use BPO to minimise non-stabilised earthworks in the areas where highly erodible colluvium is found in the Duck Creek, Upper Horokiri and Te Puka Stream catchments; (c) Use a staged construction programme to minimise areas of earthworks that are non-stabilised at any one time; (d) Stabilise completed areas of earthworks as soon as practicable and within one month of completion or ceasing Work in that area; (e) Divert clean run off away from non-stabilised earthworks areas; (f) Use BPO to design and install a variety of perimeter controls for the management of flows of water and sediment and sediment retention; (g) Achieve TSS removal efficiencies of at least 70% for all storm events with a less than 10 year ARI, as demonstrated by an agreed monitoring programme; (h) Design all emergency spillways to accommodate at least a 50 year ARI storm event peak flow; (i) Design all emergency spillways that are programmed to be in operation for more than one year to accommodate a 100 year ARI storm event peak flow; (j) Use dry and wet weather forecasting, monitoring and reporting, to ensure all practicable erosion and sediment control measures are put in place if a heavy rainfall event is forecast and manage the effects of weather on the erosion and sediment control measures; (k) Prepare for and manage environmental risks from heavy rainfall events; and

Reference	Proposed condition
	(l) Use adaptive management principles to review and refine the erosion and sediment control and treatment measures used.
	Erosion and Sediment Control Plan and measures
E.41	For each Stage of Work, an **Erosion and Sediment Control Plan** (ESCP) shall be prepared and submitted a minimum of 20 working days prior to earthworks of the Stage commencing, for the certification of the Manager. Certification, shall be obtained prior to earthworks of the stage commencing.
E.42	The ESCPs shall as far as practicable meet the objectives in Condition PCC.E.2 and include, but not be limited to: (a) Contour information at suitable intervals; (b) Erosion and sediment control measures including specific pond design (including calculations supporting pond sizing) (c) Catchment boundaries for the erosion and sediment control measures; (d) Location of the Work, and cut and fill operations; (e) Details of construction methods to be employed, including timing and duration; (f) Design details including: i. Contributing catchment area; ii. Retention volume of structure (dead storage and live storage measured to the top of the primary spillway); iii. Shape of structure (dimensions of structure); iv. Location of flood waters v. Safety and access vi. Position of inlets/outlets vii. Stabilisation of the structure; and viii. Maintenance. (g) A programme for managing non-stabilised areas of earthworks, including progressive stabilisation considerations; (h) The identification of appropriately qualified and experienced staff to manage the environmental issues onsite; (i) The identification of staff who have clearly defined roles and responsibilities to monitor compliance with the Consent Conditions and ESCP; (j) Provision of details of a chain of responsibility for managing environmental issues and details of responsible personnel; (k) The establishment of a sediment control team (including representatives from the contractor, GWRC and the Consent Holder) to meet and review erosion and sediment control measures on a weekly basis, or at intervals as otherwise agreed; (l) Approach and procedures for ensuring advance warning of a heavy rainfall event and for the management of such an event including systems of advance warning, arrangements for communications with the GWRC and other relevant authorities, and for the monitoring and treatment of non-stabilised areas of earthworks and erosion and sediment control measures, and for reporting to GWRC following any such event; and (m) Methods and procedures to be undertaken for decommissioning of erosion and sediment control measures.
E.43	Erosion and sediment control measures shall be constructed and maintained in

Reference	Proposed condition
	accordance with the GWRC's *Erosion and Sediment Control Guidelines for the Wellington Region dated September 2002*; (and any amendments to that document), except where a higher standard is detailed in the documents referred to in Condition PCC.E.4 above, in which case the higher standard shall apply.
E.44	Prior to any earthworks commencing, a certificate signed by an appropriately qualified and chartered professional engineer shall be submitted to GWRC to certify that the erosion and sediment control measures have been constructed in accordance with the ESCP as specified in Condition PCC.E.4 of this consent.
E.45	A copy of the "as-built(s)" and the certified ESCPs shall be kept on site, and all erosion and sediment control measures (including staging boundaries and particularly the extent of exposed areas) shall be updated as soon as practicable as changes are made. As-built plans shall be accompanied by text detailing the relevant earthworks methodology, constraints and likely progressions, and shall (in general accordance with the ESCPs) be revised as required to enable clear interpretation as to the day to day operation and management of erosion and sediment control measures.
E.46	All necessary perimeter controls shall be operational before earthworks (or relevant stage of earthworks) begin.
E.47	The consent holder shall seek to ensure that procedures are adopted to prevent the deposition of slurry, clay or other materials on the roads by vehicles leaving the site where such material is liable to cause a nuisance or hazard. Should the exercise of this Consent result in material being deposited on the road that causes or is liable to cause a nuisance or hazard, that material shall be removed immediately to the satisfaction of the Manager.
E.48	No sediment retention ponds, chemical treatment systems or perimeter controls shall be removed or decommissioned before the entire area is stabilised**,** unless such removal and decommissioning is in accordance with the CEMP or a SSEMP.
E.49	All 'cleanwater' runoff from stabilised surfaces, including catchment areas above the site, shall be diverted away from earthwork areas via a stabilised system, so as to prevent surface erosion.
	Incidents
E.50	During construction Work, the consent holder shall maintain a permanent record of any incidents alleging adverse effects from, or related to, the exercise of this consent. The record shall include: (a) identification of the nature of the incident; (b) location, date and time of the incident; (c) weather conditions at the time of the incident (as far as practicable). (d) the outcome of the consent holders investigation into the incident; (e) measures taken to seek to ensure that such an incident does not occur again; and (f) Any other activities occurring in the area that are unrelated to the project and that may have contributed to the incident. This record shall be maintained on site and shall be made available to the Manager, upon request. The consent holder shall notify the Manager in writing of any such complaint within 5 working days of the complaint being brought to the attention of the consent holder.
	Erosion and sediment control monitoring
E.51	The Consent Holder shall carry out monitoring in accordance with the approved ESCP and shall maintain records detailing: (a) The location of the monitoring undertaken; (b) The time and date the monitoring was undertaken; (c) The weather conditions at the time of monitoring; (d) The performance criteria measured (e) The erosion and sediment controls that required maintenance;

Reference	Proposed condition
	(f) The maintenance actions which were completed; and (g) The time when the maintenance was completed; and (h) Areas of non-compliance with the ESCP and the Chemical Treatment performance monitoring plan (if any), the reasons for the non-compliance and any action taken to remedy the non-compliance (if any). This information shall be made available to the GWRC upon request.
E.52	The Consent Holder shall carry out Sediment Retention Device monitoring during heavy rainfall trigger events in accordance with the approved ESCP and agreed performance criteria, shall maintain records detailing: (a) The location of the Sediment Retention Device; (b) The time and date the monitoring was undertaken; (c) The weather conditions at the time of monitoring; (d) The event based performance criteria measured; including but not limited to; i. Inlet turbidity; flow; particle size, pH ii. Outlet turbidity; flow; particle size, pH iii. pH of pond iv. Free Aluminium (Al3+) (e) The performance of the sediment retention devices with agreed event based performance criteria; (f) The maintenance actions which were completed; and (g) The time when the maintenance was completed; and (h) Areas of non-compliance with the ESCP and the Chemical Treatment Plan (as relevant) and the reasons for the non-compliance. This information shall be made available to the GWRC upon request.
E.53	The Consent Holder shall carry out Erosion Control Device monitoring in accordance with the approved ESCP and agreed performance criteria, shall maintain records detailing: (a) The location of the Erosion Control Device; (b) The time and date the monitoring was undertaken; (c) The weather conditions at the time of monitoring; (d) The performance criteria measured; including but not limited to; i. Loss of cover material ii. Erosion across protected slopes (e) The performance of the Erosion Control Devices with agreed performance criteria; (f) The maintenance actions which were completed; and (g) The time when the maintenance was completed; and (h) Areas of non-compliance with the ESCP and the Chemical Treatment Plan (as relevant) and the reasons for the non-compliance. This information shall be made available to the GWRC upon request.
	Construction Environmental Management Plan – additional requirements
E.54	In addition to the requirements in the General Conditions, the CEMP shall have regard to the following rehabilitation principles: (a) To identify and give particular attention to high cuts that will be visible from dwellings and public open space in order to quickly reduce any visual effects. (b) For the engineer, ecologist and landscape architect to work together to design the

Reference	Proposed condition
	final shape of, and re-vegetation proposals for, earthworks and rock cuts as part of the detailed design process. (c) To shape the finished cuts to emulate natural rock features and reduce where appropriate the creation of uniform linear features. This may include rolling back the top, ripping sections to create shaped corners, creating gully like features and scree-like slopes, etc. (d) To shape the finished cuts to provide areas of fractured rock that will provide microhabitats for native grasses, ferns and shrubs. (e) To shape the finished cuts to allow the deposition of soil in key areas so that tall shrubs can rapidly establish helping to break up the face. This can include benching, and bunding the toe of the cut when access track construction has been completed. (f) To vegetate cuts with plants equivalent to the slopes above and below the cut. **Explanatory Note:** The CEMP provides an umbrella document that identifies the management processes and techniques to seek to ensure appropriate environmental management of the site. The preparation of and approval processes for the SSEMP's are undertaken in general accordance with the procedures outlined in the CEMP.
	Chemical treatment (Flocculation)
E.55	All sediment retention ponds shall be chemically treated in accordance with the CTP required under Condition PCC.E.18 of this consent.
E.56	Prior to the commissioning of chemical treatments for sediment management purposes, the Consent Holder shall provide GWRC with a **Chemical Treatment Plan** (CTP) for each stage of the works, or in association with a SSEMP, for confirmation by the Manager that it will achieve the standards set out in the ESCP required under Condition PCC.E.4. Each CTP shall be submitted to the Manager, for approval at least 20 working days prior to any flocculation works commencing within the relevant SSEMP. Each CTP shall include, but need not be limited to: (a) Specific design details of the chemical treatment system; (b) Monitoring, maintenance (including post-storm) and contingency programme (including a Record Sheet); (c) Details of optimum dosage (including catchment specific soil analysis and assumptions); (d) Procedures for carrying out an initial treatment trial; (e) A spill contingency plan; (f) A performance monitoring plan for device performance for sediment treatment; and (g) Details of the person or bodies that will hold responsibility for long-term maintenance of the chemical treatment system and the organisational structure which will support the system.
	Site Specific Environmental Management Plans (SSEMPs)
E.57	The consent holder shall prepare, submit and implement a Site Specific Environmental Management Plan (SSEMP) for the Waitangirua Link Road. The SSEMP shall be submitted to the Manager, for certification at least 20 working days prior to works commencing in each plan area. Suitably qualified environmental specialist(s) shall assist in the preparation of the SSEMP. (a) Each SSEMP as far as practicable meet the objectives in Condition PCC.E.2 and shall be in general accordance with the CEMP and shall include, but need not be limited to: i. a detailed design and construction methodology for all works within the area

Reference	Proposed condition
	covered by the SSEMP; ii. details of any contractor appointed to carry out the works authorised by this consent, including the contractor's company, address, named representative and their contact details; iii. a detailed schedule of construction activities including the expected commencement date and duration of works in each location within the area covered by the SSEMP; iv. a staging of works to demonstrate that the area of disturbance will be kept to the minimum practicable; and v. evidence that a suitably qualified engineer has been appointed to carry out the overall design, supervision and certification of earthworks (including cut/fill batter stability and construction of all erosion and sediment controls). (b) In respect of erosion and sediment control, the SSEMP shall be prepared in general accordance with the GWRC's *Erosion and Sediment Control Guidelines for the Wellington Region dated September 2002* and shall include, but not be limited to: i. detailed design specifications of all earthworks within the SSEMP area, including disposal sites, and all erosion and sediment control measures to be implemented, including supporting calculations where appropriate; ii. the expected commencement dates for the implementation of erosion and sediment controls measures in the SSEMP area; iii. information regarding chemical treatment of the proposed sediment retention ponds and devices; iv. identification of innovative treatments for erosion control that are to be used; v. monitoring and maintenance schedules for all erosion and sediment control measures on a set frequency (at least weekly), or within 24 hours of each trigger rain event that is likely to impair the function or performance of the control measures; vi. a site plan showing contours at suitable intervals, cut and fill operations, the specific location of all sediment and erosion control measures, and catchment boundaries for the sediment controls; and vii. locating temporary stockpiles of excavated material at least 50m away from any ephemeral stream or permanent watercourse unless there is appropriate treatment of stormwater (which may include discharging to vegetated land). (c) In respect of revegetation and rehabilitation activities, the SSEMP shall include, but not be limited to: i. identification of soil resource to be used for rehabilitation within the SSEMP area; ii. identification of the vegetation types to be used on a plan or schedule; iii. a programme for revegetation and maintenance activities for a period of up to the 3 years; iv. the desired percentage of surface cover to be achieved to reduce the adverse effects from sediment-laden stormwater run-off; v. identification of any innovative treatments of exposed rock cuttings that are to be used; and vi. information demonstrating that as far as practicable the objectives in Condition PCC.E.2 are met.
E.58	The consent holder may request amendments to any SSEMP by submitting the amendments in writing to the Manager for approval, prior to any changes taking effect.
	Ecological monitoring
E.59	The consent holder shall, in consultation with the Director-General of Conservation, (a) update and finalise the Draft Ecological Management and Monitoring Plan dated July 2011 to: i. include performance measures, actions, methods, trigger levels and monitoring programmes;

Reference	Proposed condition
	ii. provide for the continual review and monitoring of the effects of construction activities, including the inspection of all erosion and sediment control devices after all heavy rainfall events (i.e. where more than 15mm of rain falls in a 24 hour period), and the upgrading of devices where necessary to achieve the most efficient and effective treatment; and submit this to the Manager, for approval at least 20 working days prior to works commencing on any part of the Project.
E.60	The consent holder shall engage a suitably qualified person to confirm the extent of any valued Natural Areas as specified in the Wellington Conservation Management Strategy 1996, RPS, Regional or District Plans prior to the commencement of works and shall develop the detailed design to avoid these areas as far as practicable. Any protection mechanisms for these areas shall be set out in the CEMP.
E.61	As far as practicable, measures shall be employed to minimise adverse effects on fish during construction of stream diversions and culvert installation.
	Fill standards
E.62	All fill material used on site shall: (a) Be restricted to natural material, such as clay, soil and rock and other inert materials as detailed in the definition of cleanfill material in section 2.2 of the Ministry for the Environment publication 'A guide to the Management of Cleanfills, 2002', and (b) Be restricted to those materials listed as acceptable in table 4.1 of the Ministry for the Environment publication 'A guide to the Management of Cleanfills, 2002'.
	Progressive stabilisation and staging of earthworks
E.63	The consent holder shall progressively stabilise exposed areas on completion of an area of cut or fill. Areas where future buildings or paved areas are proposed shall be temporarily stabilised with basecourse, grass, or other such material to the satisfaction of the Manager.

RC20 Land use consent for works in Duck Creek

Land use consent to undertake permanent works in the bed of Duck Creek, for the purpose of placing structures related to the construction of a road.

Reference	Proposed condition
PCC.WS.1	The consent holder shall prepare and submit **detailed design plans and construction methodology**, including proposed duration and timing for all required structures and stream works authorised by this consent, to the Manager for approval at least 20 working days prior to works commencing. The detailed design plans and construction methodology shall include: (a) measures/methods to ensure that fish passage is maintained during and on completion of construction works along the stretches of stream affected by the exercise of this consent; (b) details of culvert inlet/outlet protection structures e.g. pre-cast wing walls or rock rip-rap; (c) appropriate sizing of culverts and allowances for secondary flow paths during high flows; and (d) any other measures or details as appropriate to achieve compliance with all conditions of this consent.
PCC.WS.2	The consent holder shall use natural rock and soil material, where practicable, to reclaim the stream bed. All fill material shall be placed and compacted so as to minimise any erosion and/or instability so far as is practicable.
PCC.WS.3	The consent holder shall ensure that all works authorised by this permit to be undertaken in the dry bed of the stream, are completed before the flow of the stream is diverted back into the stream bed.
PCC.WS.4	Works shall not commence until the detailed design plans and construction methodology required by Condition PCC.WS.1 of this consent have been certified by the Manager GWRC as being in general accordance with consent application plans.
PCC.WS.5	The Manager, shall be given a minimum of 20 working days notice in writing, prior to works commencing in each location (including any maintenance works). **Explanatory Note:** This condition excludes works/activities permitted by the Regional Freshwater Plan for the Wellington Region.
PCC.WS.6	The works shall remain the responsibility of the consent holder and shall be regularly inspected and maintained by the consent holder so that: (a) the waterway within or over the culverts and fords remains substantively clear of debris; (b) any erosion of the stream banks or bed that is attributable to, and is within 20m up or downstream of, the stream works authorised by this consent are remedied as soon as practicable by the consent holder; and (c) fish passage through the culverts and fords is not impeded. **Explanatory Note**: Maintenance does not include any works outside of the scope of the application. Any additional works (including structures, reshaping or disturbance to the stream bed) following completion of the construction works as proposed in the application, may require further resource consents.

PART I: STATUTORY ASSESSMENT

31. Approach to the assessment

Overview

The purpose of this statutory planning assessment is to provide analysis of the Project against the relevant policy framework within which the designations and resource consents are sought. This assessment has been prepared for both:

- the NZTA Project (the Main Alignment and the Kenepuru Link Road); and
- the PCC Project (the Porirua Link Roads).

As a result of the 'bundling' of resource consents (which themselves have different activity statuses, the most restrictive activity status for the resource consents sought is applied to all of the resource consent applications. In this case, the NZTA resource consent applications that relate to all streamworks and bulk earthworks are bundled together as they cannot occur separately. Those activities of the NZTA Project are rendered non-complying activities (with the exception of the concrete batching plant – which is a discretionary activity) and the equivalent PCC Project activities which are discretionary activities.

The NZTA also seeks designations through six (6) NoRs, and the PCC seeks designations through two (2) NoRs.

31.1 Introduction

This chapter sets out the structure and scope of the statutory assessment of the Project against the relevant policy framework. Chapter 3 contained a list of the resource consents that are required and the status of the activities to which the consents relate. However, as a result of 'bundling' the consents, the most restricted activity classification is applied. On this basis, the NZTA component of the Project is a non-complying activity in terms of the resource consent applications that are to be lodged (within the administrative jurisdiction of GWRC). The PCC component of the Project is discretionary (GWRC). Part B also identifies the designations being sought through eight NoRs – six by the NZTA and two by PCC.

Part B of the AEE identifies the relevant provisions of the RMA in relation to the Project. In particular, under section 104 of the RMA (consideration of resource consents) and under section 171 of the RMA (consideration of NORs for designations), the BoI must have regard to the relevant provisions of any national policy statement, national environmental standard, and regional and district planning documents when considering the applications.

The remainder of this chapter considers the applicable objectives, policies and regulations within these documents and provides an assessment of the Project against these provisions. A separate document entitled "Statutory Provisions Report" (refer to Volume 2) compiles all the relevant objectives and policies that have been considered as part of the preparation of this assessment.

This chapter concludes with an assessment of the Project under Part 2 of the RMA and in particular against the purpose of the RMA in section 5 as the overriding consideration for the Project.

31.2 Approach to statutory planning assessment

As outlined in Chapter 3, the following consents and approvals are sought:

- Six Notices of Requirement by the NZTA and two Notices of Requirement by the PCC.
- Land use consents for bulk earthworks – both NZTA and PCC
- Land use consents, discharge permits and water permits to carry out works in streams including realignment of streams (divert, discharge and reclaim) – NZTA
- Land use consents, discharge permits and water permits to carry out works in Duck Creek including realignment of streams (divert, discharge and reclaim) – PCC
- Land use consent and discharge permits to operate a concrete batching plant – NZTA
- Discharge sediment laden water to land and water – NZTA and PCC

31.2.1 Bundling of activities

According to the "bundling" principle, where there is a group of activities belonging to a class making it appropriate for them to be considered holistically as a single bundle, they should be assessed according to the most stringent class of their group. Some of the activities of the Project are more closely associated with each other than others. Nevertheless, a conservative approach has been taken such that all activities of the Project for which resource consents are sought in this application are treated as a single bundle:

- For the NZTA Project, the reclamation activities that are proposed to be located within the Appendix 2 listed streams under the RFWP mean that the resource consent applications are treated as a non-complying activity bundle overall.
- For the PCC Project, the most stringent activity category for the resource consents is discretionary activity, and as such these activities have been treated as a discretionary activity bundle to which Section 104B applies.

31.2.2 Approach to assessment under section 104D(1)(b)

The bundling approach has a flow on implication for how section 104D has been applied for the non-complying activity bundle.

Section 104D is specific to the consideration of non-complying activities and requires an additional test to be applied to an application before further consideration can be made of the relevant activities under section 104. Section 104D requires the activities to pass one of the two "gateway" tests of the RMA:

"(a) the adverse effects of the activity on the environment (other than any effect to which section 104(3)(a)(ii) applies) will be minor; or

(b) the application is for an activity that will not be contrary to the objectives and policies of -

(i) the relevant plan, if there is a plan but no proposed plan in respect of the activity; or

(ii) the relevant proposed plan, if there is a proposed plan but no relevant plan in respect of the activity; or

(iii) both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity."

The assessments of the applications indicate that aspects of the Project will not be able to meet the test of Section 104D(1)(a) as some of the activities will generate a more than a minor adverse effect – refer to **Technical Report 11** Assessment of Ecological Effects in particular. Given this, the test in section 104D(1)(b) must be considered.

There are several regional plans applicable to the bundled activities, as follows:

- the RFWP applies to bulk earthworks, works in watercourses and, in particular, to reclamations; and
- The RDLP applies to discharge of contaminants.

The approach to the section 104D(1)(b) test involves a properly balanced and weighted consideration of objectives and policies of relevant plan(s). Depending on the activities, environment and effects in issue, some objectives and policies may have more particular relevance than others. For instance, those objectives and policies focussed on the topic of a particular activity in issue have been given relatively more weight than general objectives and policies of the plan.

The approach applied to this assessment below has been, for each specific activity within the bundle, to start with consideration of the objectives and policies of the plan of most relevance to that activity to determine whether or not the activity " ... will not be contrary to the objectives and policies of ... [that] ... relevant plan". This is on the basis that a basic pre-requisite of section 104D(1)(b) would be that the activity is not contrary to the objectives and policies of that plan.

The assessment also goes on to consider whether there are any other relevant objectives and policies pertaining to the activity in other plans, and the assessment under section 104D(1)(b) is also made on that broader basis.

Having considered each of the activities within the bundle on that basis, the assessment also considers them as a whole, against the relevant plans which are applicable to the bundle.

In each case, the phrase "not contrary to" has been considered in light of established case law to the effect that this phrase contemplates "being opposed to in nature, different to, opposite to".

31.2.3 Approach to assessments for section 104(1)(b) and section 171(1)(a)

Section 104(1)(b) requires that when considering an application for resource consent and submissions, 'regard' must be had, subject to Part 2, to any relevant provisions of various listed RMA documents, namely:

- a national environmental standard;
- other regulations;
- a national policy statement;
- a New Zealand coastal policy statement;
- a regional policy statement or proposed regional policy statement; and
- a plan or proposed plan.

In addition, section 104(1)(c) refers to "any other matter the consent authority considers relevant and reasonably necessary".

Section 171 requires that when considering a requirement (for a designation) and any submissions received, "particular regard" must be had to "any relevant provisions of" the same listed RMA documents, with the exception of national environmental standards and regulations. Section 171(1)(d) is expressed in similar terms to section 104(1)(c).

Neither provision identifies which of any policy statement and plan are of specific relevance or otherwise, leaving matters of relevance to be judged in the circumstances. The phrases "have regard to" and "have particular regard to" also in effect leave to judgement the weight that should be given to any particular RMA document or provision of it. It is not a requirement of section 104 or 171 that an activity upholds or gives effect to or is not contrary to any particular RMA document or its objectives, policies or other provisions. On the other hand, it is recognised that matters of conflict or discordance with provisions of certain national, regional or local level RMA documents may have weight or significance in the mix of matters to be considered.

31.2.4 Consideration of Notices of Requirement

The matters outlined in section 171(1)(a-c) are considered in this report as follows:

- Section 171(1)(a) – the Statutory Provisions Report and Chapter 32 assesses the NZTA and the PCC Projects (respectively) against the relevant statutory and non-statutory planning legislation.
- Section 171(1)(b) – refer to Chapter 9 – Consideration of Alternatives. This chapter outlines the long history of the Transmission Gully Project, and firstly, the reasons for choosing route, and then the integrated design process within which the design has been further refined and developed with inputs from a comprehensive range of technical specialists.
- Section 171(1)(c) – refer to Chapters 7 and 8 - Description of the Project and Chapter 6 Description of the environment. These chapters set out the works required for the Project. Chapter 2 provides the background to the Project Objectives and the reasons for the Project.

- Section 171(1)(d) – refer to Part G Assessment of Environmental Effects and Chapter 32 Statutory Assessment. These chapters set out those matters considered in specialist reports contained in technical reports.

The documents relevant to consideration of the Project under section 171(1) (a) are as follows:

- the National Policy Statement for Freshwater Management 2011;
- the National Policy Statement for Electricity Transmission 2008;
- the New Zealand Coastal Policy Statement 2010;
- the Proposed Wellington Regional Policy Statement;
- the Wellington Regional Policy Statement 1995;
- the Wellington Regional Freshwater Plan 1999;
- the Wellington Regional Air Quality Management Plan 2000;
- the Wellington Regional Soil Plan 2000;
- the Wellington Regional Coastal Plan 2000;
- the Wellington Regional Discharges to Land Plan;
- the Kapiti Coast District Plan 1999;
- the Upper Hutt City District Plan 2004;
- the Porirua City District Plan 1999; and
- the Wellington City District Plan 2000.

The relevant provisions of these documents and an analysis of the Project against them are set out in the following sections.

31.2.5 Resource consent applications – Sections 104, 104D, 105 and 107

The matters outlined in Section 104(1)(a) - (c) are considered in this report as follows:

- Section 104(1)(a) – any actual or potential effects of allowing the activity (refer to Part G of this report and to the Technical Reports)
- Section 104(1)(b) – any relevant provisions … of statutory documents
- Section 104(1)(c) – any other matter considered relevant and reasonably necessary to determine the application.

The documents relevant to consideration of the Project under section 104(1)(b) are as follows:

- all those listed above as being relevant under section 171(1) (a);
- the National Environmental Standard for Air Quality 2004; and
- the National Environmental Standard for Sources of Human Drinking Water 2008.

Cross-references, further comments and considerations in relation to section 104 are set out in Table 31.1

Table 31.1: Relevant assessment matters under section 104 of the RMA

Section 104	Comment	Cross-reference
Section 104(1)(a) Any actual and potential effects on the environment of allowing the activity	Considered in depth in Part G of the AEE and in the associated Technical Reports.	Part G and Technical reports
Section 104(1)(b) Any relevant provisions of statutory documents	Each of the relevant statutory documents has been assessed and a conclusion drawn about the Project's consistency with those documents.	Chapter 32
Section 104(1)(c) Any other matters	There are a number of other statutory and non-statutory documents that have been publicly notified, been through a public process, or are widely available in the public arena. Those considered to be relevant have been assessed in this report.	Chapter 32
Section 104(2) May disregard an adverse effect of an activity on the environment if a NES or Plan permits an activity with that effect	There are no logical or sensible comparisons to the Project that could be constructed as a permitted activity, such as to make a permitted baseline comparison useful.	Not relevant
Section 104(3) A consent authority must not...*etc*	No written approvals from potentially affected parties have been sought in relation to Section 104(3), and trade competition has not been considered to be a factor in relation to an application by the NZTA. This will be reviewed again on receipt of submissions.	Chapter 32
Section 104(5)	The NZTA has discussed the resource consent applications with the relevant Councils in a pre-lodgement process, and the approach to consenting has been confirmed through this process.	Chapter 10
Section 104(6) and (7) Provision of information	There has been an extensive pre-lodgement process in which the applicants have engaged with the relevant regulatory authorities – including the EPA – to review and consider adequacy of information and technical reports intended to be provided.	N/A

31.2.6 Integrated approach to assessment of the two projects

The NZTA and the PCC have been working together to prepare this suite of documents and applications. Whilst the applications have been prepared in an integrated manner and are integrally linked to each other, they are considered to be two separate Projects for the purpose of determining consent status and the structure of Notices of Requirements. There are a number of reasons why each agency's applications should be considered separately in this statutory assessment:

- The PCC and the NZTA are separate requiring authorities who will be responsible for their own designations – a requirement under Section 168(1) of the Act;
- The PCC's regional consent applications are a discretionary activity under the Regional Freshwater Plan whilst the NZTA's regional consent applications are a non-complying activity – requiring the additional tests of Section 104D to be applied; and

- The Proposed Plan Change to the Regional Freshwater Plan does not apply to the PCC's applications.

32. Statutory assessment

Overview

There is a large number of objectives and policies relevant to the Project (from national, regional and district planning documents). An analysis of the relevant objectives and policies is provided in this chapter and it is concluded that the Project is generally consistent with these.

The conclusions of this assessment include the following:

- Overall, the Project is not inconsistent with the relevant objectives and policies of the national and regional statutory planning documents;
- The Project is a key part of the Wellington RoNS which will, as a whole, bring significant travel time savings between Wellington Airport and Levin, and ease freight movements into and out of Wellington;
- The Project is entirely consistent with the transport related policies in the Regional Policy Statement, the Regional Land Transport Strategy and the four district plans;
- The Project will sustain the potential of natural and physical resources for future generations. It is intended to meet the growing transportation needs of the Region and does not preclude future opportunities for other land transport development, such as public transport;
- The Project safe-guards the life supporting capacity of air, soils, water and ecosystems;
- The Project's adverse effects on the environment will be avoided, remedied, mitigated (including by offsetting) (as set out in Part H of this AEE) sufficient to satisfy the requirements of section 5 of the RMA;
- The Project recognises and provides for the matters in section 6 of the RMA;
- The Project has also appropriately responded to those matters in Sections 7 and 8 of the RMA.

It is concluded that the proposals will meet the statutory tests of the RMA.

In light of the matters considered and assessed, it is considered that the benefits of this Project alongside the proposed measures to avoid, remedy and mitigate the adverse effects, leads to the conclusion that the Project is consistent with the purpose and principles of the Act. To this end, it is considered that the sustainable management purpose of the RMA will be achieved by confirming the designations and granting the resource consents sought.

32.1 Introduction

The assessment generally follows the hierarchy of applicable planning documents shown in Figure 32.1 and concludes with an assessment against Part 2 of the RMA.

National

National policy statements

- New Zealand Coastal Policy Statement 2010
- National Policy Statement for Freshwater Management 2011
- National Policy Statement for Electricity Transmission 2008

National environmental standards

- National Environmental Standard for Air Quality 2004
- National Environmental Standard for Sources of Human Drinking Water 2008

Greater Wellington Regional Council

Regional policy statements

- Wellington Regional Policy Statement 1995
- Proposed Wellington Regional Policy Statement

Regional plans

- Wellington Regional Freshwater Plan 1999
- Wellington Regional Air Quality Management Plan 2000
- Wellington Regional Coastal Plan 2000
- Wellington Regional Plan for Discharges to Land 1999
- Wellington Regional Soil Plan 2000

Territorial authorities

- Kapiti Coast District Plan 1999
- Upper Hutt City District Plan 2004
- Porirua City District Plan 1999
- Wellington City District Plan 2000

Figure 32.1: Hierarchy of relevant planning documents

32.2 National Policy Statement for Freshwater Management 2011

The NPS FW is relevant to the Project. The NPS FW contains a Preamble and then five sections containing Objectives and Policies which are grouped into the following topics:

- Water quality
- Water quantity
- Integrated management
- Tangata whenua roles and interests
- Progressive implementation programme

32.2.1 Water quality

Of particular relevance to the Project are the provisions related to water quality which are aimed at:

1. *Managing the use and development of land and discharges of contaminants to safeguard the life-supporting capacity, ecosystem processes and indigenous species of freshwater (Objective A1); and*
2. *Maintaining or improving the overall quality of fresh water within each region, while protecting the quality of outstanding freshwater bodies and the significant values of wetlands and improving the quality of water that is degraded by human activities (overallocated) (Objective A2).*

The NPS FW sets out a staged implementation programme over which time Councils are required to include objectives and policies in their plans to reflect the stated Objectives (including those above). The NPS FW also requires immediate inclusion of stated objectives and policies into regional plans (no further RMA Schedule 1 process is required, they are deemed to be automatically included from 1st July 2011). These are:

"1. When considering any application for a discharge the consent authority must have regard to the following matters:

a) the extent to which the discharge would avoid contamination that will have an adverse effect on the life-supporting capacity of fresh water including on any ecosystem associated with fresh water; and

b) the extent to which it is feasible and dependable that any more than minor adverse effect on fresh water, and on any ecosystem associated with fresh water, resulting from the discharge would be avoided.

2. This policy applies to the following discharges (including a diffuse discharge by any person or animal):

a) a new discharge or

> b) *a change or increase in any discharge – of any contaminant into fresh water, or onto or into land in circumstances that may result in that contaminant (or, as a result of any natural process from the discharge of that contaminant, any other contaminant) entering fresh water.*
>
> 3. *This policy does not apply to any application for consent first lodged before the National Policy Statement for Freshwater Management takes effect on 1 July 2011."*

- For the most part, discharge of contaminants arises from construction activities (silt and sediment) and many methods are proposed to avoid discharges of sediment as far as practicable, or to mitigate as far as practicable. Actual and potential adverse effects arising from sediment are concluded to be minor (Ecological Impact Assessment - **Technical Report 11**) although it is acknowledged that there could be some short term effects on water quality albeit with a minor effect on ecosystems which are already well adapted to high sediment loads (Policy 1(a)).
- Options to avoid discharges to freshwater that will have a more than minor effect have been extensively considered, along with a wider package of measures to avoid, remedy and mitigate adverse effects of the Project as a whole (Policy 1(b)). Methods to avoid adverse effects, and consider alternative options, are discussed in Chapter 9 of this AEE report, and include an integrated approach between specialists.

Overall, it is concluded that the Project will be generally consistent with the intent of the NPS FW in relation to water quality.

32.2.2 Water quantity

The NPS FW sets out objectives for water quality aimed at:

- Sustainably managing the taking, using, damming, or diverting of fresh water to safeguard the life-supporting capacity, ecosystem processes and indigenous species (B1);
- Avoiding any further over-allocation and phasing out existing over-allocation (B2).
- Improving and maximising the efficient allocation and efficient use of water (B3); and
- Protecting significant values of wetlands (B4).

Because the Project will requires diverting of freshwater, this chapter is relevant. Similar to the water quality chapter the NPS FW inserts new provisions in regional plans that take effect immediately as of 1 July 2011:

> *"1. When considering any application the consent authority must have regard to the following matters:*
>
> *a) the extent to which the change would adversely affect safeguarding the life-supporting capacity of fresh water and of any associated ecosystem and*

b) the extent to which it is feasible and dependable that any adverse effect on the life-supporting capacity of fresh water and of any associated ecosystem resulting from the change would be avoided.

2. This policy applies to:

a) any new activity and

b) any change in the character, intensity or scale of any established activity – that involves any taking, using, damming or diverting of fresh water or draining of any wetland which is likely to result in any more than minor adverse change in the natural variability of flows or level of any fresh water, compared to that which immediately preceded the commencement of the new activity or the change in the established activity (or in the case of a change in an intermittent or seasonal activity, compared to that on the last occasion on which the activity was carried out).

3. *This policy does not apply to any application for consent first lodged before the National Policy Statement for Freshwater Management takes effect on 1 July 2011.*

As discussed further below (in consideration against the Regional Freshwater Plan), the following points are relevant in relation to stream diversion:

- There will be notable adverse effects on streams as a result of the Project – from removal of habitats, construction of structures, reclamation and realignment (Policy (1)(a)). Reestablishment and reconstruction of habitats is a key part of this Project and the management of actual and potential adverse effects on streams. It has been a main focus of the technical studies and this statutory planning assessment due to the emphasis under the RFWP Policy 4.2.10 on avoiding effects on waterbodies identified as having Natural Character Value, and because of the non-complying activity status. The Ecological Impact Assessment concludes that the extent of the change is more than minor in the context of the Act, but that there are opportunities to manage adverse effects to an appropriate level by avoidance, remediation, or mitigation.
- Avoidance of effects (Policy (1)(b)) is considered in Chapter 9 of this AEE. Methods to avoid more than minor adverse effects on streams have been extensively considered throughout the development of the design. In short, it was not possible to have a feasible Project and eliminate more than minor effects – so a balanced approach to assessing effects over the whole alignment and gamut of effects has been taken – i.e. considering all options to manage effects and balancing those effects with the environmental benefits the Project will bring.

32.2.3 Tangata whenua roles and interests

Part D of the NPS FW seeks "*To provide for the involvement of iwi and hapu, and to ensure that tangata whenua values and interests are identified and reflected in the management of fresh water including associated ecosystems, and decision-making regarding freshwater planning, including on how all other objectives of this national policy statement are given effect to.*" (Objective D1).

Part D requires local authorities to take reasonable steps to work with iwi and hapu and to reflect tangata whenua interests (Policy D1).

Whilst the NPS requires actions to be taken by regional council to develop policies (rather requiring actions by an applicant for consents and approvals), it is relevant to mention that this Project has been developed in consultation with tangata whenua and the ongoing construction, maintenance and operation phases will continue in this manner.

32.3 National Policy Statement for Electricity Transmission 2008

The National Policy Statement on Electricity Transmission (NPS ET) sets out the objective and policies for managing the electricity transmission network under the Act. Local Authorities are required to, within 4 years of approval of the NPS ET, process a Plan Change to give effects to its provisions. The NPS ET gives guidance to the drafting of plan rules and decision-making on resource consents. There is one objective in the NPS ET:

> *"To recognise the national significance of the electricity transmission network by facilitating the operation, maintenance and upgrade of the existing transmission network and the establishment of new transmission resources to meet the needs of present and future generations, while:*
>
> - *managing the adverse environmental effects of the network; and*
> - *managing the adverse effects of other activities on the network."*

The following policies relate to recognising the national benefits of transmission and managing effects, both on and of transmission infrastructure. Bullet point 2 of this objective is particularly relevant to the Project and Policies 10 and 11 are also relevant to "managing the adverse effects of third parties on the transmission network". In this regard, the NZTA and Transpower (as owner of the transmission lines), have been working closely together to develop a solution for relocation of transmission lines and towers as enabling works for the construction of the Project. Many alternative options have been considered for both the road and the lines in order to achieve a workable outcome. The NZTA and Transpower have also chosen to lodge RMA consent applications together in order to achieve an aligned consenting outcome. It is considered that this approach meets the intent of the NPS ET.

32.4 NZ Coastal Policy Statement 2010

The New Zealand Coastal Policy Statement 2010 (NZCPS) provides policy guidance and direction on management of the coastal environment. Whilst the Project is not located within the Coastal Marine Area, it affects streams and catchments within the vicinity of the coastal environment of the Porirua Harbour. The Assessment of Landscape and Visual Effects and Ecological Impact Assessment both consider the surrounding landscapes which rise up from the Harbour as being part of the wider coastal environment. Policy statements and plans produced by the regional and territorial authorities must give effect to the NZCPS.[164] Matters addressed in the NZCPS include:

164. Sections 62(3), 67(3)(b) and 75(3)(b).

- Preservation of the natural character of the coastal environment;
- Protection of those characteristics of the coastal environment of special value to tangata whenua;
- Provision of appropriate subdivision, use and development of the coastal environment; and
- The Crown's interest in the Coastal Marine Area.

These matters are addressed (on the basis of the superceded NZCPS 1994) at a regional level within the objectives, policies, rules and other provisions of the Wellington Regional Policy (RPS) Statement and the Wellington Regional Coastal Plan (which are discussed separately below). It is acknowledged that the statutory planning documents will be out of date with respect to the new NZCPS which came into effect in December 2010. In summary the following planning assessment is provided for relevant objectives and policies of the NZCPS.

32.4.1 NZCPS Objectives

There are seven overarching objectives of the NZCPS of which Objectives 1, 2, 3, and 6 are most relevant to this Project. These set out the high level direction for management of the Coastal Marine Area, and the policies follow this direction. The following assessment considers both the relevant objectives and policies together.

32.4.2 The extent and characteristics of the coastal environment (Objectives 1 and 2, and Policy 1 and 4)

The NZCPS which came into effect in December 2010 introduced a new focus on the extent and characteristics of the coastal environment (Policy 1). In the case of the Project, whilst the Project does not extend into the Coastal Marine Area, and the Project does not require resource consents under section 12 of the Act, or under the Regional Coastal Plan, the Project has the potential to have adverse effects on the coastal environment – in particular, the Porirua Harbour – arising from land-based construction activities (Policy 4). Having regard to the extent and, in particular, the characteristics of the coastal environment, assessments have been undertaken to consider the effects of the Project on the coastal environment and coastal processes. In particular, this is reflected in **Technical reports 5, 6, 10, 11, 14 and 15**. It has also been part of the consideration of alternatives sites, routes and methods and has resulted in refinements to the design that is the subject of this consenting process (Chapter 9 of this AEE).

In summary, the preparation of the application documentation has had detailed regard to the coastal environment by assessing its significance, the actual and potential effects on it, and methods to avoid, remedy and mitigate adverse effects. The application documents conclude that the ecological values of the coastal environment will be maintained in the long term, although there is a very low potential for a moderate adverse effect arising from an extreme weather event. Further discussion about the regionally specific objectives and policies in the PRPS and the Coastal Plan follow below and discuss regionally specific features and effects.

32.4.3 Treaty of Waitangi, tangata whenua and Maori (Objective 3 and Policy 2)

By engaging tangata whenua in the preparation of the application documents, and by making key design decisions in consultation with tangata whenua, matauranga Maori (Maori customary knowledge, traditional knowledge or intergenerational knowledge) has been incorporated. The Porirua Harbour is an area of historical interest to Ngati Toa as mahinga kai (places of food gathering) and the associated quality of freshwater streams, watercourses and their habitats that flow to the coast is of particular interest in the context of this Project. This policy direction, along with the advice of Ngati Toa, has helped inform the technical assessments in relation to Objective 3 and Policy 2, in particular by focusing the assessments of effects on the coastal environment on recognizing the key areas and issues of importance to allowing tangata whenua to continue to exercise their role as Kaitiaki of the coastal environment.

32.4.4 Activities in the coastal environment (Objectives 4 and 6, and Policy 6)

Policy 6 of the NZCPS recognises that there are activities that affect the coastal environment such as the provision of infrastructure that are important to social, economic and cultural well-being (Policy 6-1(a)). As discussed in **Technical Report 5** (Assessment of Landscape and Visual effects), the Project is considered to be located within the wider coastal environment from a landscape perspective. That report concludes that the Project will hardly be visible from the coastal environment.

32.4.5 Natural character (Objective 2 and Policies 13 and 14)

Policy 13 relates to preserving the natural character of the coastal environment and recognises that natural character is different to natural features, landscapes and amenity values. Policy 14 promotes the restoration or rehabilitation of the natural character of the coastal environment. These policies as a group discuss the overall, natural character of the coastal environment and have informed the assessments of the Project insofar as how it will affect natural character, and how effects can be managed.

The Porirua Harbour has been modified in the past, in particular at its entrance (Onepoto arm at Porirua Stream) with the construction of the railway causeway and associated reclamations. Further changes were made in relation to substantial reclamations to create the marina and development land, and then second bridge road crossing at Mana. The latter respects have affected the ability of the Harbour to flush properly, meaning the original tidal flows are heavily modified and do not penetrate into the upper reaches with as much force as they would have historically. With increased sediment runoff from urbanised land and rural pastoral land and farming, this combination of land use change and modification has contributed to the build up of sediment in the Harbour.

As a matter of national importance under Part 2 of the Act, natural character is a key consideration. Having regard to Policies 13 and 14, the following assessment is made:

- Regarding natural character, the Project does not require the construction of any structures or features in the coastal environment that would have an effect on natural character.

- As demonstrated in Part G of this AEE and in **Technical Assessment 11** (Ecological Impact Assessment), not all adverse construction effects on the coastal environment can be avoided as there will be some effects on the coastal and ecosystems from the deposition of sediment from the streams in the catchments surrounding the Porirua Harbour. There is the potential, albeit of a very low probability, for moderate adverse effects as a result of sediment deposition in the event of extreme weather conditions coinciding with major earthworks periods. For the most part, effects from construction are temporary, short term and are unlikely to have any lasting adverse effect on the coastal environment. Further discussion about this against the regionally specific provisions of the PRPS follows below.
- Once construction is completed, there will be an enhancement of stream, and therefore, of coastal water quality resulting from land retirement, revegetation and planting in stream catchments. Parts of the stream system will be better than they currently are, providing to moderate good natural habitats for native species where it currently does not exist (notably in the Horokiri/eastern branch) and opening up Duck Creek to native species.
- The assessment and design for the Project has considered the natural character of the coastal environment, both in terms of the visual/landform, cultural and historical values, recreational values, and in terms of the dynamic processes of the natural environment – refer to **Technical Report 14** (Assessment of Hydrology and Stormwater Effects). Recognising that there is a degree of physical modification to the coastal environment arising from both modification to the Harbour entrance, and from changes to land uses in the surrounding environment resulting in increased sediment runoff over time, the specific elements which contribute to the natural character of the area will not be adversely affected by this Project.

32.4.6 Water quality (Objectives 1and 6, and Policy 21, 22 and 23)

Policy 21 requires that where water quality in the coastal environment has deteriorated such that it is having a significant adverse effect, that priority be given to enhancing it. Policy 22 requires consideration of controls to manage the effects of sedimentation on the coastal environment, including through managing land uses, forestry and vegetation removal. Policy 23 seeks to manage the discharge (of contaminants) to the coastal environment.

Water quality is a primary issue for the coastal environment in the consideration of the Transmission Gully Project, particularly during construction, because it is essentially a very large earthworks project which is being undertaken within a number of catchments that drain to the Porirua Harbour (from south of Wainui Saddle). The extent of effects on the coastal environment are largely related to construction and then, arising from the effects of an increase in sediment generating activities in the surrounding catchments.

Having regard to Policies 21, 22 and 23, the following assessment is made:

- The streams in the catchments affected by the Project are affected by high sediment levels currently, as a result of modification for urban and rural land uses. Functioning of streams has been affected by a number of land use activities including urban development, farming and forestry. **Technical Report 11** (Ecological Impact Assessment), demonstrates that the existing habitats have, as a result, adapted to a high sediment environment and are therefore reasonably resilient to sediment. Regardless of this, the Policy direction acknowledges that some coastal environments are already degraded, and that existing effects experienced could be enhanced by an improved approach to sediment management.
- A substantial body of information has been gathered as part of the background studies for this Project, about the hydraulic behaviour of the Porirua Harbour – including both the Onepoto Arm and the Pauatahanui Inlet. This will assist not only the NZTA, but also other agencies including the PCC, to better understand the effects of land use, subdivision and development on the Harbour. This improved understanding allows both the NZTA, and other parties to make better informed decisions about managing the effects on water quality in the Harbour.
- In the long term, **Technical Report 11** (Ecological Impact Assessment), demonstrates that the Project will not make any significant contribution to the continued degradation of streams – and consequently the quality of water discharging to the coastal environment. In fact, the Project will make some important enhancements and have a positive effect in many instances.
- The proposed covenanting and retirement of land – particularly in the Upper Horokiri catchment – is consistent with the Policy direction which promotes better management of land uses, including forestry and farming, where they are likely to contribute to sediment and other potential contaminants runoff to the coast.

Overall, it is concluded that the Project will be entirely consistent with these objectives and policies.

32.5 Proposed National Policy Statement on Biodiversity

The proposed NPS: Biodiversity is intended to provide clearer direction to local authorities on their responsibilities for managing indigenous biodiversity under the Act. The proposed NPS contains a list of criteria for identifying areas of indigenous vegetation and habitats of indigenous animals that have been recognised as being rare and/or threatened at a national level, and applies outside the conservation estate. Local authorities will be required to identify significant areas of biodiversity within five years after the NPS takes effect and will require a "no net loss" approach to applications for resource consents.

Whilst the NPS has yet to be gazetted and has not yet taken effect, public consultation has been completed as of May 2011, and it may come into effect during the process of considering this suite of applications. The Ecological Impact Assessment report has had regard to indigenous biodiversity in both field studies, development of the engineering design, and development of methods to avoid, remedy and mitigate adverse ecological effects arising from the Project. An example of where indigenous biodiversity has been recognised and provided for in this Project is in the design of the Upper Horokiri Wetland which will provide habitat for leptinella tenella – a native wetland groundcover species.

32.6 Proposed Regional Policy Statement

The PRPS sits above the Wellington Regional Plans in that under section 67(3) of the RMA, the Regional Plans must give effect to the provisions of the RPS. The PRPS is still subject to appeal, but is a relatively new document compared to the regional plans, and therefore provides an up to date position on the policy direction proposed for the Region. The PRPS is considered to hold greater weighting than the Operative RPS given the stage it has reached in the process towards becoming operative. Hearings have been held, decisions made, and appeals received.

A full assessment of the Project has been undertaken against the objectives and policies of the PRPS and is provided below. The PRPS is intended to provide a robust, integrated approach to promoting the sustainable management of natural and physical resources. Under section 59 of the RMA, “The purpose of a regional policy statement is to achieve the purpose of the Act by providing an overview of the resource management issues of the region and policies and methods to achieve integrated management of the natural and physical resources of the whole region.”

32.6.1 Assessment

32.6.1.1 Air quality

The PRPS separates air quality issues into two categories: Amenity (Objective 1) and Health Effects (Objective 2) – and each Objective has corresponding policies and methods. The PRPS seeks to maintain and enhance air quality in the Region. The RPS states that overall regional air quality in Wellington is generally good. In consideration of the relevant objectives and policies, the following conclusions are reached in respect of the Project:

Amenity effects (Objective 1)

Amenity effects will arise primarily through dust emissions from the earthworks associated with construction. There will be negligible air quality amenity effects arising from the operation of the road.

Policy 1 considers reverse sensitivity effects that may arise from operating one land use close to another, more sensitive land use. Land uses are generally controlled through District Plans, and the NoR process will result in a clear demarcation of the Project within the relevant District Plans. This will allow any future property owner or occupant to clearly identify the proposed location of the new road, and be aware of its presence. The existing TG designation also fulfils this purpose insofar as it signals the potential future land use (i.e. of a road transport corridor). In this regard, the NoR process is useful for a Project that has a longer timeframe for implementation as it protects the route and clearly demonstrates the presence of a proposed future transport corridor on District Plan maps which are easily accessible to the public.

Policy 2 requires consideration of reducing the effects of odour, smoke, dust and fine particulate matter. Dust arising from construction activities such as earthworks will be the most noticeable amenity effect, along with localised dust associated with specific point source activities such as concrete batching. Appropriate conditions are proposed to manage these specific short term effects. In addition to this consideration has been given to the location of the concrete batching plant to minimise effects on people and physical resources such as houses and buildings.

Health effects (Objective 2)

In relation to Policy 2, the potential for health effects in relation to roading infrastructure relate primarily to fine particulate emissions from vehicles and, to a lesser extent, from concrete batching. **Technical Report 13** (Assessment of Air Quality Effects) concludes that local air quality in close proximity to the road will be slightly lower simply due to the presence of the road (i.e in those "greener" areas of the route), though this will be barely noticeable and unlikely to have any adverse health effects. Air quality for urban areas will slightly improve because vehicle travel will be more efficient (less CO2 per km as compared to without the Project), and local air quality for coastal communities will substantially improve by virtue of there being substantially fewer vehicles using this route.

Overall, it is concluded that the proposal will be entirely consistent with the relevant objectives and policies that relate to air quality.

32.6.1.2 Coastal environment (including public access)

The regionally significant resource management issues for the coastal environment and corresponding objectives and policies are categorised into four areas: Adverse effects on natural character, and Restoring natural character (Objective 4 and Objective 5 respectively); Natural habitats and features, Coastal water quality and ecosystems (Objectives 3, 6 and 7); and Public Access (Objective 8). In relation to this Chapter of the PRPS the following conclusions are made:

Natural character (Objectives 4 and 5)

The Project does not entail the construction of any structures or features in the coastal environment that would have an adverse effect on natural character (refer to **Technical Report 5**). The Project is considered to be located within the wider coastal environment (Policy 37), though its visually distant proximity to the coast means it is unlikely to have an adverse effect on natural character (Policy 34 and 35).

Natural habitats and features (Objective 3), Coastal Water Quality (Objective 6) and Ecosystems (Objective 7)

As demonstrated in Part G of this AEE and in Technical Assessment 11: Assessment of Ecological effects there may be some potential effects on the quality of coastal ecosystems. Effects may arise from the distribution of sediment from the streams in the catchments surrounding the Porirua Harbour.

- In the catchments that run into the Porirua Harbour and in the environment surrounding the Harbour, human activities have had a significant effect over time on the visual appearance, character and natural coastal processes. There is already a significant contribution of sediment to the Harbour arising naturally from land runoff and as a result of existing land uses in the catchment such as farming and forestry. The Project will contribute to this sediment load during the construction phase.

- Historically, works at the Harbour mouth such as the construction of the railway line, and reclamations, have affected natural flushing processes meaning sediment is not washed away as quickly as it would have been in an unmodified environment. However, this has also meant that benthic communities are hardier and accustomed to high levels of sediment.
- For the most part, effects from construction are temporary, short term and unlikely to have any lasting adverse effect on the coastal environment because natural tidal processes will flush sediment away. There is the potential, albeit of a low probability, for moderate adverse effects on small parts of the Harbour as a result of sediment deposition in the event of extreme weather conditions coinciding with major earthworks periods.
- Once construction is completed, there will be an enhancement of coastal water quality resulting from land retirement, revegetation and planting in upstream catchments. This is entirely consistent with the aim in Policy 5 of maintaining and, where possible, enhancing water quality.
- The approach to mitigating actual and potential effects on the environment (particularly in relation to effects on streams and habitats) is entirely consistent with Policy 64 which makes reference to supporting environmental enhancement initiatives – albeit non-regulatory.

Public access (Objective 8)

- The Project will not adversely affect public access to the coastal environment because there are no works proposed close to or within the coastal marine area. Maintaining and enhancing public access is an important tenet of all the statutory documents, and this Project will not adversely affect access.

Overall, it is concluded that the proposal is consistent with the relevant objectives and policies that relate to the costal environment.

32.6.1.3 Energy, infrastructure and waste

The "Infrastructure" objective (Objective 10) and policies (Policies 6, 7 and 38) of this section are particularly relevant to the Project. The PRPS also defines 'regionally significant infrastructure' under the explanation for Policy 6, and it includes "*the Strategic Transport Network, as defined in the Wellington Regional Land Transport Strategy 2007-2016*", and addresses the provision of regionally significant infrastructure in the proposed objectives by recognising that it is a necessary and important part of the environment. This includes the State Highway network, of which the TG Project will be a part. It is relevant that central government has nominated the Project as a key part of the Wellington RoNS, in the GPS. This is therefore consistent with the policy direction in the PRPS and related documents such as the Regional Land Transport Strategy.

Objective 10 is that the "*social, economic, cultural and environmental benefits of regionally significant infrastructure are recognised and protected*".

It is also relevant in the context of RMA Section 30(1)(gb) which states that a function of a regional council is:

"Every regional council shall have the following functions for the purpose of giving effect to this Act in its region:…(gb) the strategic integration of infrastructure with land use through objectives, policies, and methods"

This section was added in the RMA Amendment Act 2005. The GWRC has included these policies which are directly relevant to the requirement to have regard to the strategic integration of infrastructure.

The Project will be entirely consistent with, and in fact will further Objective 10 insofar as the Project provides for a more efficient road transport network that will allow people to travel quicker and more reliably around the Region.

As discussed in Part G and in the Assessment of Traffic and Transport Effects report, the Project will:

- improve travel time reliability;
- reduce traffic travelling through local coastal communities;
- reduce travel times around the Region; and
- improve safety (through crash reduction).

Therefore, the Project will provide social and economic benefits in particular, to people and communities by:

- improving the amenity local coastal communities through a reduction of traffic travelling through them. It will be easier for people to cross the road, stop and park on the road, and potentially make it safer to get out of vehicles on the road and visit local shops and businesses;
- enhanced safety for pedestrians and cyclists using the old SH1 benefitting from less through traffic;
- enhance safety for people travelling both short and longer distances through the Region by using the new route which has been designed to meet modern safety standards and will result in reduced crashes in comparison to the existing route;
- more reliable travel times meaning that people will be better able to predict how long it will take to travel, providing greater certainty and less stressful/uncertain travel experiences;
- reduced travel times around the Region will have benefits both for commuters, as well as for tourism and freight movements – which are key aims of the GPS. This will both improve productivity with faster freight movements, along with enhancing trip enjoyment for both tourists and commuters.

Recognising the benefits from regionally significant infrastructure (under Policy 6) is an important consideration for this Project, and it is concluded that the Project will be entirely consistent with this Policy – and this clearly links back to the direction set out in Section 30(1)(gb) of the Act.

32.6.1.4 Fresh water (including public access)

The PRPS states that fresh water is integral to our health, wellbeing, livelihood and culture and that it is a matter of national importance to protect wetlands, lakes, rivers and streams from inappropriate use and development (Objectives 12 and 13). The PRPS also acknowledges fresh water as a significant taonga to tangata whenua, and this is confirmed in the cultural assessment prepared by Ngati Toa (refer to **Technical Report 18**).

Water Quantity and Quality (Objective 12 and Policies 11, 12, 13, 14, 15, 39, 40 and 41) and Ecosystems (Objective 13 and Polices 16, 17, 42 and 64)

- The PRPS acknowledges that many streams in the Region are of a poor quality due to urban development, farming and forestry, and encourages maintaining and where possible enhancing degraded habitats (Policies 11 and 39).
- Some streams in the catchments that will be affected by the Project are already affected by high suspended sediment levels, as a result of natural runoff from the land, and from modification for urban and rural land uses. Functioning of streams has been affected by a number of the activities including, filling and piping, vegetation removal, works in watercourses, pests and weeds, stock access, structures and culverts without fish passage and abstraction. In the long term, **Technical Report 11** (Ecological Impact Assessment) demonstrates that the Project will not make any significant contribution to the continued degradation of streams. In fact, the Project will make some important enhancements and have a positive effect in many instances. In this regard, although the Project will generate sediment during construction and this will affect water quality, there will be some enhancements to water quality in the long term resulting from land retirement, revegetation and planting in upstream catchments. This is consistent with the approach of Policies 11 and 39.
- The proposed landscaping has been specifically designed by both ecology and landscape specialists in order to provide a coordinated approach to addressing effects, including effects on riparian margins and in the upper catchments of streams. This will, in some instances, result in positive environmental benefits in the long term including improved water quality from run off, which is also consistent with the approach in Policy 64 which seeks environmental enhancement where appropriate.
- The approach to managing adverse ecological effects, either through avoiding, remedying, mitigating or offsetting, has been adopted to consider the effects of the Project as a whole – i.e. one Project affecting lots of catchments – with the development of measures to manage effects considered across the Project length. This approach allows a much wider geographical consideration of opportunities to manage effects. In some instances different catchments will realise a much greater overall benefit from mitigation of effects than the catchment in which the actual effects are felt. Whilst the priority for reinstatement or mitigation measures is always as close to the source of the effects as possible, in some instances a better outcome can be achieved elsewhere. In the context of the overall Project, it is considered that there will be an overall gain in ecological values – an overall enhancement of ecological values in the long term. This approach is explained in more detail in the Ecological Impact Assessment.

- The Project design has sought to minimise impacts on streams and fresh water habitats through continued design refinements as part of the integrated engineering and environmental assessments completed for this the consenting phase. In addition, opportunities to enhance water quality and stream habitats have been identified through the assessment process, and this is consistent with the regional policy direction in relation to water quality – in particular the focus of Policy 11 in relation to maintaining and enhancing habitat.
- The approach of using management plans to allow a contractor to develop a construction methodology on site – whilst still being required to achieve a prescribed performance standards is consistent with the policy direction in the Plan. In particular, and whilst it is acknowledge that there will be a large amount of earthworks and vegetation removal required for the Project, this is mitigated through the requirement to firstly minimise vegetation removal where practicable, minimise open areas of earthworks and to progressively stabilise land as works are completed. This is consistent with Policy 40 which aims to minimise earthworks and vegetation removal in order to manage effects on water quality and habitats.

Public access (Objective 8)

- The Project will enhance public access to some parts of watercourses along the route. The Project provides for replacement access to publicly owned land – BHFFP and Belmont Regional Park, for example – where the route severs existing accesses. Objective 8 and Policy 52 of the RPS both seek to enhance access to the coastal marine area and to lakes and rivers, and it is considered that this Project will be entirely consistent with this aim.

32.6.1.5 Historic heritage

The PRPS seeks to avoid the inappropriate modification and use and development of historic heritage (Objective 15). There is one historic heritage site of note within the Project area (brick fuel tank) and one just outside of the project area (St Joseph's Church at Pauatahanui), both of which have been recognised and provided for in the process of designing the Project:

- Early identification of these features (Policy 20 and 21) allowed for the modification of the project route to accommodate them.
- The 1940s brick fuel tank is located near MacKays Crossing. The Main Alignment has been redesigned to avoid this feature which is considered to be significant in that there are very few of these types of structures left in New Zealand. The tank will be retained, and a designation condition will require regular observation to identify any effects on it during construction. As discussed in the Urban Design and Landscape Framework (**Technical Report 23**), The NZTA is also interested in working together with other public bodies to facilitate public access to the site.

- St Josephs Church is located at the SH58 interchange. Effects on this building will be monitored during construction, and it is already recognised through conditions that the Church's unusual glacier glass windows will need to be protected during construction. The overall setting of the building and the sense of place of surrounds/grounds has also been considered and in the context of Policy 21, this is a key consideration. Again, consideration of the potential for effects on the heritage values of this building, even though it is well outside the alignment, is consistent with the policy direction.

After a detailed site walkover and archaeological review, no other known heritage sites have been identified that will be affected by the Project. Accordingly, the Project is entirely consistent with Objective 15 and Policies 20, 21 and 45.

32.6.1.6 Indigenous ecosystems

The PRPS acknowledges that ecosystems are constantly changing, and that all parts of an ecosystem are important to support each other. Objective 16 and Policies 22 and 23 have a particular focus on identifying and protecting indigenous ecosystems with significant biodiversity values. The PRPS also acknowledges the importance of healthy ecosystems is central to Maori cultural values. With respect to indigenous ecosystems, the following assessment summary is provided:

- The Project protects ecosystems where practicable, and also seeks to replant and restore habitats that have been lost either through the construction of the Project or through previous activities, in particular:
    - **Technical Report 15** (Assessment of Water Quality Effects) demonstrates that the re-establishment of terrestrial vegetation will (once construction has been completed) improve the quality of freshwater habitats – which is consistent with the Policy 46 direction; and
    - Whilst the Project will contribute to the loss of some areas of terrestrial vegetation, **Technical Report 11** (Ecological Impact Assessment) demonstrates that the Project will also contribute an overall net gain in protected, vegetated areas (which will be revegetated and maintained), and riparian habitats – consistent with the overall Objective 16 of maintaining and restoring ecosystems. These will contribute to a significant improvement in the long term, to terrestrial habitats and freshwater habitats by providing protected areas within which native species will be able to develop.
- Consistent with Policy 22, the field studies were carried out with a consideration of biodiversity values. In one instance (Upper Horokiri), wetland habitats for rare vegetation are provided by the Project in the anticipation of locally sourced examples becoming established. A focus on local sourcing and a diverse range of species for replanting and revegetation areas along the route is consistent with this Policy. The plans in Volume 4 (Plan Set), provide landscaping proposals that maximise the opportunity for use of indigenous plants and where appropriate eco-sourcing of stock (e.g. particularly for wetland and riparian vegetation).

- It is concluded that there is the potential for moderate effects on ecosystems in the short term during construction. In the longer term, however, there will be some minor ongoing adverse effects, and some notable positive effects arising from reinstatement of habitats and replacement with larger areas of habitat to offset effects.

32.6.1.7 Landscape

Chapter 3.7 of the PRPS sets out a framework of objectives and policies for recognising and protecting natural landscapes – with Objective 17 setting the overarching direction of recognising and protecting the values of outstanding natural features landscapes and significant amenity landscapes, along with Policies 24, 25, 26, 27 and 49. **Technical Report 5** (Assessment of Landscape and Visual Effects) provides a detailed assessment of the visual and landscape effects of the Project, and this assessment is summarised in Part G of this AEE. With respect to Landscape considerations, the following assessment summary is provided:

- Policy 24 requires identification of outstanding natural landscapes – which is done through the District plans (in this case, the Kapiti Coast District Plan). **Technical Report 5** identifies one outstanding natural landscape (the foothills of the Tararuas at the northern end of the route), and other amenity landscapes around the Wainui Saddle area and Battle Hill.
- Policy 25 promotes protection of outstanding natural features. It is acknowledged that there will be works within the one feature identified at the northern end of the route. However, **Technical Report 5** concludes that the features and qualities that contribute to this landscape being deemed “outstanding” will be maintained in the long term because the Project traverses the foothills, rather than the steep, rugged countryside that they are notable for. Visual impacts in the more remote parts of the route such as around the Wainui Saddle and the Upper Horokiri and Te Puka Stream valleys are significant (**Technical Report 5**), but are less visible from the public domain. The planting and mitigation proposed will mitigate these effects in the long term, although the Project remains a significant change to that which currently exists.

It is acknowledged that there are visual and landscape impacts of the Project, and this is particularly visible in the environments which are dominated by rural-residential blocks where residential dwellings currently enjoy a “green” outlook. These areas are not outstanding natural landscape areas, but do represent a significant impact (in the short and medium term) – particularly because they will be visible to people. While the planting and mitigation proposed will mitigate these effects in the long term, it is acknowledged (in **Technical Report 5**) that the Project represents a permanent and considerable change to this visual catchment. Managing effects on landscapes is an accepted approach under Policy 49.

In conclusion, whilst it is acknowledged that the Project will have an undeniable effect on the landscape, the policy direction (Policy 49) acknowledges that managing effects is an appropriate response. It is concluded that the proposal will not be inconsistent with the overall policy direction.

32.6.1.8 Natural hazards

One of the NZTA's key objectives for the Project is to improve regional network security by "providing an alternative strategic link" for Wellington. The origin of this objective is the Western Corridor Plan of the RLTS, which pre-dated the PRPS.

This objective is partially to maximize protection from natural hazards (particularly a seismic event), given the location of the current State Highway along an exposed coastline. A significant amount of investigation has been done to identify and plot natural hazards along and/or affected by the Project route. These hazards (identified in the introduction to Chapter 3.8 of HPRPS) include flooding, earthquake and tsunami along with other more localised hazards. **Technical Report 1** (Design Philosophy Statement: Roading Design), **Technical Report 2** (Design Philosophy Statement: Bridges and retaining walls) and **Technical Report 3** (Geotechnical Engineering report) – all detail how these important considerations have influenced and informed the Project's design. The approach of clear identification of hazards, and developing strategies to minimise risk is consistent with the approach of Objectives 18, 19 and 20, which relate to reduction of risks from natural hazards to people and communities, business and property and infrastructure. Having regard to these, the following conclusions are reached:

- Consistent with Policy 50, the Project will reduce the risks and consequences from natural hazards by improving network resilience through providing an alternative transport route into and out of Wellington, thus reducing the risks and consequences to people, communities, businesses, property and infrastructure from natural hazards (Objective 18 and Policies 50 and 51) and the consequences of natural hazards will be reduced (Objective 19); and
- Therefore, the communities of the Wellington Region will be more resilient and resistant to hazards (Objective 20).

It is concluded that this proposal will be entirely consistent with these objectives and policies because it is a forward thinking project that seeks to minimise a key risk to people and communities (i.e. accessibility to Wellington in the event of a seismic event) in advance of it occurring.

32.6.1.9 Regional form, design and function

The PRPS states that this chapter (Chapter 3.9) is about *"the physical arrangement within and between urban and rural communities"*. This chapter acknowledges that the Wellington Region has a strong "corridor" pattern which reinforces local centres, supports passenger transport, reduces energy use and makes services more accessible. It recognises that there are issues with this form, and that freight and commuter movements are focussed along the north-south corridors, increasing congestion on major routes (refer to page 57 and Objective 21). Objective 21 sets out a range of objectives stemming from "*A compact, well designed and sustainable regional form that has an integrated, safe and responsive transport network"*. Having regard to these objectives, the following points are noted:

- In relation to the integrated approach to land use and transportation promoted by Objective 21, the NZTA has, in development of the Project, prepared an Urban Design and Landscape Framework (**Technical Report 23**). This Framework sets out an overall urban design vision and principles, for the Project and the wider surrounding area in which the Project sits, and incorporates aspirations from the Council and community – including objectives around maintaining the viability of local centres (Policy 29) – in particular there will be benefits to coastal communities who will experience less through traffic. Where practicable, the urban design and landscaping proposed for the Project has drawn from the relevant concepts of the Framework to maintain and enhance urban landscape and to contribute to a pleasant environment for users and those resident around the Project area (Policy 32 and 53).
- The Project will improve north-south and east-west linkages for the Wellington Region (Objective 21(i)).
- The Project has been taken into account in the development of some key non-statutory planning studies prepared by the PCC – which have land use and growth policies that respond to the presence of the Project. In the Porirua area in particular, this represents an integrated approach to land use and transport planning (Objective 21(h)) which has anticipated the construction of the Transmission Gully Project as part of its aspirations set out in its future development framework.
- The Project will reduce traffic congestion on the existing SH1, and accommodate significantly improved traffic flows for through traffic including tourism and freight movement on the new route. This is consistent both with the RLTS and the PRPS – and matches the aims of Central Government in the GPS (Policy 57).
- The Project assists in accommodating the Region's growth in a manner consistent with the RPS and its strategic objectives, by improving accessibility and efficiency of the transport network between centres of economic development and growth. This gives effect to the principles of the RMA (Policy 29, 30, 31,55, 56 and 57);
- The Project promotes an integrated approach to land use and transport development (Objective 21(h) and Policy 57) insofar as the Project is recognised in a number of the strategy documents for the Region, and will assist the relevant authorities to fulfil their objectives – as demonstrated in the assessment in Chapter 15. The Project promotes transport efficiency in a way that does not compromise the intrinsic values of the Region's natural resources or the quality of the immediate environment by taking an integrated approach to development of the design and the methods to manage actual and potential adverse effects – particularly those on the natural environment.

In conclusion, consistent with the regional objectives around an integrated approach to development of the transport network, the Project will improve the overall functionality of the network (as demonstrated in **Technical Report 4**) and will not be inconsistent with the overall policy direction in this chapter.

32.6.1.10 Resource management with tangata whenua

Chapter 3.10 focuses on tangata whenua aims of achieving an integrated and holistic approach to managing the Regions' natural and physical resources.

Consistent with Objective 22 which promotes working together and Policy 66 which seeks to enhance involvement of iwi in decision making processes, Ngati Toa has been engaged to prepare a cultural impact assessment for the Project (**Technical Report 18**). In early discussions and meetings held about the project both before and during preparation of technical studies, Ngati Toa indicated particular interest in the effects of the Project on streams and waterways and the coastal environment. The proposal is therefore entirely consistent with Objective 22 and Policy 66. This early engagement also respects the principles of the Treaty (Objective 23 and Policy 47).

This is discussed further in relation to the assessment of the more Region-specific objectives and policies under the RFWP, and concludes that Ngati Toa is supportive of the approach to avoiding, remedying and mitigating actual and potential effects on the natural environment (including by offsetting). In particular, the approach allows for Ngati Toa to continue to act as kaitiaki of these resources (Objective 24 and Policy 48), and promote an improved approach to management (by all parties) of these resources in future. The potential for offsetting mitigation to improve habitat in upstream catchments that drain to the Porirua Harbour has been indicated as being of particular interest to Ngati Toa. Retiring and revegetating large areas of upstream catchments is seen a key opportunity arising from this Project to restore and enhance the mauri of streams and habitats (Objective 25 and Policy 48). Opportunities to enhance access to waterways is also seen by Ngati Toa as an important benefit of the Project (Objective 27 and Policy 48).

The effect of the Project on the Porirua Harbour is of particular interest to Ngati Toa, with one key reason being the identification of mahinga kai (historic food gathering areas) in the area (Objective 26 and Policy 48), along with the effects on overall mauri. A significant amount of work has been done in the preparation of this application documentation, to better understand the behaviour of the hydrological processes within the Harbour, and therefore the effect of any sediment from the Project on habitats. This body of work not only contributes to a better understanding of the effects of the Project, but also to better enabling iwi, the applicants and other parties to contribute to managing the future of the Harbour.

32.6.1.11 Soil and minerals

The PRPS acknowledges (in Issue 3) that highly productive agricultural land is under threat from development, including the construction of roads. Further, accelerated soil erosion is another key issue (Issue 1) that is relevant to the Project. Objective 28 promotes land management practices that do not accelerate soil erosion and Objective 29 promotes maintaining the desirable characteristics of soils that enable them to have an ecosystem function. Having regard to these objectives, the following points are noted:

- As discussed above, the streams in the catchments affected by the Project are affected by high sediment levels currently, as a result of natural land runoff and more recently from modification for urban and rural land uses. In the long term, the Ecological Impact Assessment, demonstrates that the Project will not make any significant contribution to the continued degradation of streams (Policy 40). In fact, the Project will make some important enhancements and have a positive effect in many instances by assisting to reduce soil erosion (Policy 14 and 68). Although the Project will generate sediment during construction, there will be improvements to erosion problems in the long term resulting from land retirement, revegetation and planting in upstream catchments.
- It is acknowledged that the Project will affect the usability of some pastoral farming areas (i.e. productive agricultural land) within the alignment (Policy 59) and use (i.e. occupy) some areas of current farmland. The Project also promotes the retirement of some areas formerly used for pastoral farmland as offset mitigation for the effects of the Project (particularly in relation to effects on watercourses). However, it is considered that the Project will not be inconsistent with the overall approach to soils management given that the overarching objective is to minimise soils loss.

32.7 Wellington Regional Policy Statement 1995

As stated above, the Proposed Regional Policy Statement is considered to carry greater weight than the RPS. This is because the PRPS has been through the public notification and submissions process, hearings have been held and decisions released. The PRPS is currently in the final stage where appeals are being decided. Regardless, the RPS contains similar themes and topic areas, and the above assessment is considered to cover these issues well.

32.8 Regional Freshwater Plan for the Wellington Region 1999

Chapter 4 of this AEE provides further commentary on the status of this Plan and various matters contained within this Plan. The RFWP contains objectives and policies that apply to those activities requiring regional consents under sections 13, 14 and 15 of the RMA. A number of consents are required under this Plan for the Project, relating to uses of the beds of waterways, the taking, use and diversion of water (including surface water, and reclamation) (as set out in Chapter 3 of this AEE).

This Section includes an assessment of the proposed works against all the relevant objectives and policies. Matters from the RFWP which are, of relevance to the Project are also summarised in Chapter 4 of this AEE and set out in **Technical Report 21** (Statutory Provisions Report). Whilst the following assessment makes specific reference to some provisions of the Plan by name/number, regard has been had to all the relevant provisions of the Plan.

Key Issues for the Region are set out in Chapter 2 of the RFWP as: The relationship of tangata whenua with fresh water; natural and amenity values and access; flood mitigation; use and development; water quality and discharges to fresh water; water quantity and the taking, use, damming or diversion of fresh water; use of the beds of rivers and lakes and development on the floodplain.

The objectives and policies are then set out in chapters according to their accompanying rules: Chapter 4 - General Objectives & Policies; Chapter 5 - water quality and discharges to fresh water; Chapter 6 - water quantity and Chapter 7 - use of the beds of rivers and lakes and development on the floodplain. Chapters 5, 6 and 7 contain the objectives, policies and rules that address specific uses and development of water bodies and river and lake beds.

It is noted that many of the objective and policy matters identified in the RFWP are consistent with and reflect those identified in the NZCPS and Regional Policy Statements. In such cases, the assessment of objectives and policies has also been discussed and responded to in the relevant sections above.

32.8.1 Request by the NZTA for a change to the Regional Freshwater Plan

The NZTA has instigated a Plan Change to the RFWP:

> *The NZTA's objective for the Plan Change is to allow greater flexibility for implementation of the Transmission Gully Project in a manner that is environmentally appropriate in the circumstances. The Plan Change does not propose a fundamental review of the Objectives, Policies and Rules of the Freshwater Plan. The proposed Plan Change would not alter the objectives or rules of the Freshwater Plan, but rather would modify the policy framework to give the NZTA more options for implementing the Transmission Gully Project in a way which is consistent with the objectives of the Freshwater Plan and the purposes and principles of the RMA* (taken from clause 1.2 of the Plan Change request).

The Plan Change seeks to provide better clarity in relation to the process for avoiding, remedying, mitigating effects (including by offsetting) as they relate to the streams potentially affected by the Project and makes particular reference to Clause 4.2.10 and proposes a new Clause 4.2.33A. Policy 4.2.10 of the RFWP is referred to throughout the Plan rules for non-complying activities and is therefore particularly relevant to any assessment against the provisions of the Plan. Policy 4.2.10 uses the term “avoid” rather than also recognising scope to remedy or mitigate. The explanation to the Policy provides further guidance as to why this approach has been used.

The Plan Change is a tool to manage consenting risks for the NZTA and has been initiated as a Private Plan Change by the NZTA. The Plan Change is designed so that it will apply to the Project only; it will apply to the eight catchments affected by the Project only; NZTA will be supported in its approach of designing effects avoidance, remediation, mitigation (including offsetting) in a way which responds to the actual values being affected (rather than being constrained by the wording of provisions in planning documents). In short, the Plan Change will enable the decision making on methods to manage environmental effects to be driven by the “actual and potential effects” of the activities.

Because the regional consents for the NZTA proposal are bundled as a non-complying activity overall, the tests of Section 104D must be applied (refer to the discussion about bundling above). The nature of some of the actual and potential effects on the environment are likely to be more than minor, and therefore the assessment of the proposal against the relevant objectives and policies of the Plan is critical to the applications. A key tenet of the Project is the ability to avoid, remedy, mitigate actual and potential adverse effects on the environment (including through offsetting). The Plan Change seeks to better clarify the ability to use this approach.

If the BoI accept the Plan Change, it will not become operative until the BoI has released its final decision on the Request and the decision has been implemented by GWRC (in accordance with section 149W). While the Plan Change is technically relevant now as a proposed plan change under Sections 104 and 171 arguably, it should not be given much weight as it is at an early stage of the process and is a privately promoted initiative by the NZTA[165].

It would be very unusual for a major roading project to have less than minor adverse effects on the environment. Whilst this is balanced with significant positive social, economic and environmental effects, the challenge is always to minimise the adverse effects as much as possible, whilst acknowledging that some mitigation will likely be needed. Thus, the policy framework is important for large projects which often incorporate non-complying components which need to pass the section 104D threshold.

The NZTA Project is a non-complying activity (using the bundling principles set out above) and therefore needs consideration under Section 104D.

32.8.2 General objectives and policies

Chapter 4 of the RFWP sets out general objectives and policies which the consent authority will have regard to when assessing applications for resource consents for Projects that involve works that affect freshwater resources. In summary, objectives and policies considered to be particularly relevant to this Project include:

- Objectives 4.1.1-4.1.3 and Policies 4.2.1-4.2.8 (the relationship of tangata whenua with fresh water),
- Objectives 4.1.4-4.1.6 and policies 4.2.9-4.2.14 (Natural values),
- Objectives 4.1.7 and 4.1.8 and policies 4.2.15-4.2.17 (Amenity values and access),
- Objectives 4.1.9 and 4.1.10 and policies 4.2.18-4.2.22 (Flood mitigation),
- Objectives 4.1.11-4.1.17 and policies 4.2.23-4.3.38 (Use and development).

These topic areas are assessed as follows.

165. At the time of writing, being 3 August 2011.

32.8.3 The relationship of tangata whenua with fresh water

Objectives 4.1.1- 4.1.3 and Policies 4.2.1- 4.2.8

- Having regard to the relevant objectives and policies, it is concluded that the kaitiakitanga of tangata whenua has been recognised in seeking specific a cultural heritage statement from iwi who have mana whenua in the Project area. This process has recognised the principles of the Treaty of Waitangi (the partnership between Iwi and the NZTA as a Crown agency, and the retention by Maori of rangatiratanga over their resources and taonga in particular). Ngati Toa, in the preparation of their cultural heritage assessment, has confirmed that their iwi's key driver is maintaining and enhancing the quality of the environment, particularly in relation to the quality of terrestrial flora and fauna, streams and watercourses and the marine environment (Objective 4.1.1. and 4.1.3; Policy 4.2.1, 4.2.2 and 4.2.6).
- The mauri of water in a number of streams has been adversely affected over time through changing land use patterns and modifications to water courses. The Project, through mitigation and offsetting when considered as a package of measures applied across the whole Project route, allows for the improvement of freshwater habitats overall. This is entirely consistent with the objective of protecting the mauri of waterbodies (Objective 4.1.2 and Policy 4.2.3).
- The ethic of stewardship and the principles of the Treaty have been recognised in engagement with and participation of both tangata whenua and the wider community with respect to environmental and natural heritage issue, including groups associated with the maintenance and enhancement of the Porirua Harbour and residents who have specific interest in and expressed stewardship of these natural resources. Consistent with the aim of taking into account the principles of the Treaty in the management of freshwater resources, the Project technical studies have enhanced understanding (both for tangata whenua and others) of the natural processes associated with freshwater resources, and the wider effects of land uses on both freshwater and ultimately, the Porirua Harbour. This has allowed for a cooperative approach to developing measures to manage effects and is consistent with the aims of the Treaty (Objective 4.1.3; Policy 4.2.4 and 4.2.5).
- Ongoing involvement with tangata whenua will be a part of the implementation, maintenance and operation of the Project (Policy 4.2.7) – along with providing opportunities for improved access (including general public access) to waterways as part of the construction of the Project.

Overall, it is concluded that the project will allow tangata whenua to maintain and enhance their relationship with freshwater.

32.8.4 Natural values

Objectives 4.1.4- 4.1.6 and policies 4.2.9- 4.2.14

Given the national priority of protection of natural character (RMA Section 6(a)), there is a consistent direction in the objectives and policies of the RPS and PRPS which flows through into the Regional Coastal Plan and the Regional Freshwater Plan both in relation to the coastal environment and freshwater features.

Policy 4.2.10 is one of many policies that are relevant to the Project. It has been specifically identified through the Plan Change process as being particularly relevant because it relates to avoiding adverse effects on listed streams (primarily from reclamations) as set out in Appendix 2 of the Plan. Policy 4.2.10 cross-references to Rule 50 of the Regional Plan which classes reclamation of those streams listed as a non-complying activity. This is the rule that gives the overall non-complying activity status of the NZTA bundle of applications. Policy 4.2.10 also cross references to other rules in the Plan, and these all relate to natural values of watercourses (including wetlands). Policy 4.2.10 is also accompanied by an explanation which is useful to enhance understanding of the intended direction of the Policy. As discussed above (introduction to this section) Policy 4.2.10 seeks to avoid more than minor adverse effects, and does not make reference to remedy, mitigate (including offsetting) effects in relation to protection of the natural character of wetlands, lakes and rivers.

As discussed above, the Proposed Plan Change seeks to provide more certainty around the approach to assessing applications for non-complying activities allowing for and clarifying the approach to avoiding first then remedying, mitigating (including offsetting) in the context of applications for non-complying activities associated with the Transmission Gully Project.

Policy 4.2.10 is specifically about protection of natural character from the adverse effects of subdivision, use and development. There is no specific definition in the Act of “natural character”. For the purposes of this assessment, it is considered that natural features, physical and biological processes, and the more intangible natural values that we appreciate about the natural environment, should be included in a consideration of protection of natural character.

Because of the policy direction set out by Policy 4.2.10, particular regard has been had to the natural character and natural values of the streams affected by the Project. Detailed assessments have been made about water quality, habitat quality, flora and fauna present, and the visual quality of all streams affected by the alignment. Of note in this context, is that there are other streams that are not listed in Appendix 2 that also exhibit a high degree of natural character when considered from an ecological, hydrological and visual perspectives. The policy direction appears to promote a higher level of consideration being given to protecting the natural character of the listed streams. However, this would not necessarily achieve the best environmental outcome, with some streams being effectively treated differently to others regardless of their quality.

Whilst this policy direction promotes avoiding effects on the listed Appendix 2 streams over and above all the others, the same regime has been applied across the whole alignment. This approach was decided upon early in the process of developing the environmental and engineering assessments for the Project.

The RFWP has objectives and policies with more specific regional direction, and the following assessment summary is provided:

- A key driver in developing the design has been to avoid adverse effects on streams wherever possible. After that, the aim is to minimise effects and then to either remedy or mitigate (including by offsetting). The Ecological Impact Assessment concludes that modification of freshwater resources (such as streams and wetlands) and offsetting the effects of modification does not necessarily result in an ongoing adverse effect on natural character (Objective 4.1.4). Conversely, the reinstatement of freshwater features through reconstruction elsewhere, revegetation, riparian planting and other measures to manage effects, can in fact lead to a positive overall effect and an improvement of the life supporting capacity of water and aquatic ecosystems (Objective 4.1.5 and 4.1.7).
- Consideration of effects on a case by case basis along the route allows for identification of important or significant natural features and protection of these where practicable (Objective 4.1.6). Early site work has allowed for identification of significant ecological features, and consideration of alternative designs has achieved a better ecological outcome overall (in comparison to the existing designated routes) – refer to the Ecological Impact Assessment. Refinements have resulted in a substantial decrease in the length of stream that is affected and the scale and intensity of effects. Further refinements have also been made with the development of indicative construction methodology for some of the more difficult parts of the alignment (refer to the SSEMPs in Volume 5).
- There will still be some adverse effects on the Appendix 2 streams in the short term during construction, and immediately post-construction whilst the streams are settling into the new environment (Policy 4.2.10). **Technical Report 11** (Ecological Impact Assessment) assesses the magnitude and significance of these impacts and then determines the measures required to manage these effects to an acceptable level (Objective 4.1.4 and 4.1.7). The report concludes that there will be an overall improvement in stream water quality resulting from upstream retirement, revegetation and native planting, particularly in the upper catchments of the Hororkiri and Pauatahanui Streams, and through riparian planting and restoration of stream margins, thus improving instream habitat (Objective 4.1.4).
- The use of an integrated engineering and environmental team comprising a wide range of technical specialists has enabled a continuing refinement of the Project design and the approach to avoiding adverse effects on the environment. As set out in Chapter 9 (Assessment of Alternatives) the option of avoiding undertaking any physical works within any of the Appendix 2 streams altogether has been considered, but discarded as an option. It would be very difficult to design a route that did not require any works in these streams, and such a design would not be the best practicable option and would be unlikely to achieve the best environmental outcome in any case.

The interpretation that the Project may be contrary to Policy 4.2.10 is acknowledged. This is a key reason for the NZTA pursuing the Plan Change. The intent of Policy 4.2.10 is considered to be met for the following reasons:

- In the short term at the conclusion of the construction of the Project, mitigation for the loss of riparian and instream habitat will be provided using the approach of considering the overall length of stream affected along the full alignment of the Project, with an aim to firstly replace like with like where possible within the same catchment, and secondly as close as possible to the source of the effect.
- The Project design and technical assessments have taken the approach of assessing the quality of all streams along the alignment with equal care and attention, rather than applying a special approach to the Appendix 2 streams. As concluded in the Ecological Impact Assessment, some of the streams within the Project alignment are not listed, yet still have natural features that are considered significant, and in some cases similar to or better than listed streams.
- Whilst there will be some adverse effects on these streams, including loss of overall stream length, in the long term there will be an improvement in water quality, and in the quality of instream and riparian habitats.

In short, **Technical Report 11** concludes that the Project and its associated works in relation to waterways and freshwater aquatic ecology can be achieved without long term loss to values and quantity. Further, the mitigation proposed will cause a net gain in those values post construction which will secure a long term environmental enhancement of these habitats for the Region (Policy 4.2.9 and 4.2.11).

- The research and assessments carried out for this Project also make a significant contribution to regional knowledge enabling better maintenance and enhancement of freshwater resources both by the applicant and by others (Policy 4.2.9 and 4.2.12). This knowledge and science can be fed directly into and assist in the management of adjoining areas managed by other agencies:
    - In addition to these environmental outcomes, this Project has also involved a range of ecological investigations that will add a significant body of new information to the public arena in relation to these important streams and watercourses, and to knowledge about how they affect the Porirua Harbour. This is considered (with reference to **Technical Report 11** (Ecological Impact Assessment) to be an important public resource in terms of increasing local and regional conservation knowledge.
    - There is also the potential to introduce new and innovative methods around stream diversions and rehabilitation.
    - There is now a substantially better understanding of the actual and potential effects of sediment (in particular) on the Porirua Harbour, and how it behaves in that marine environment.

Overall, it is concluded that the Project will have some adverse effects on streams that cannot be avoided, but that will be remedied and mitigated across the full alignment resulting in a benefit overall.

32.8.5 Amenity values and access

Objectives 4.1.7 and 4.1.8 and Policies 4.2.15- 4.2.17

Along with natural character, maintaining and enhancing access to lakes and rivers (and the coast) is a matter of national importance under Section 6(d) of the Act and is consequently given a high status in the relevant planning documents including the RFWP. Section 7(c) of the Act requires particular regard to maintaining and enhancing amenity values and this is also discussed to be of importance in the context of assessment against Part 2.

Having regard to these objectives and policies the following assessment is made:

- The Project will provide for more direct public access to key streams and waterways by opening up opportunities for walking, cycling and horse riding. This includes through the two Regional Parks – BHFFP and Belmont – where existing tracks will be enhanced, and opportunities to pass under the alignment through underpasses, will be available at convenient locations. The NZTA proposal will significantly enhance the amount of access available, and this will be entirely consistent with the policy direction of maintaining and enhancing access (Objective 4.1.7 and 4.1.8). In addition, the NZTA is likely to provide more land within the wider stream catchments available for public access in connection with revegetation and protection of land as part of mitigation of effects.
- Whilst there will be some limitations on public access to the margins of streams during construction for public safety reasons, alternative routes for recreational users will be made available and well signposted. Regardless of this, the overall end result will be a substantial improvement in access to streams and their margins in the long term (Objective 4.1.7 and 4.1.8).
- The existing overgrown wetland area at the top (eastern side) of Lanes Flat will be visually and ecologically improved with new wetland planting and extension of the wetland into the whole of Lanes Flat. New native wetland vegetation planting will provide amenity benefits, ecological mitigation, and water quality benefits (Objective 4.1.7 and Policy 4.2.16).
- New accesses through the regional parks and through new land acquired by the NZTA will also be made available. Whilst there will be some land severance caused by the Project, there are alternative access routes proposed for the public. It is considered that this will be consistent with the objectives of the Plan (Objective 4.1.8;Policy 4.2.16 and 4.2.17) which include maintaining, and where possible enhancing, public access.

Overall, it is concluded that the proposal will be consistent with these objectives and policies, and that whilst there will be modification to existing accesses, that amenity values and overall accessibility to watercourses will be substantially enhanced by the Project.

32.8.6 Flood mitigation

Objectives 4.1.9 and 4.1.10 and Policies 4.2.18- 4.2.22

The objectives and policies are concerned with health and safety of the public and the effects of flooding both on natural and physical resources including people's property. Having regard to these policies the following assessment is made:

- There are some instances where the Project will alter flood levels on privately owned properties, and will increase the potential for flood inundation in an extreme weather event. The owners of all these properties have been consulted, and options to manage flooding have been discussed. However, whilst there will be minor increases in flood levels in an extreme event, the overland flow paths that will be provided by the Project design means that the flood flows perform better, draining more efficiently. Consistent with Policy 4.2.18 and 4.2.20, studies have improved understanding of the behaviour of flood flows and the potential for adverse effects from flood events.
- Overall, this is considered to be an improvement and will be consistent with the policy direction which is to manage effects on both natural and physical resources and this is consistent with Objective 4.1.9 and 4.1.10 which promote management of flood effects to an acceptable level.

32.8.7 Use and development

Objectives 4.1.11- 4.1.17 and policies 4.2.23- 4.3.38

The fresh water use and development objectives and policies are focused on managing access to fresh water, including recognizing the rights of lawful users, and encourage activities that enhance fresh water resources. Having regard to these objectives and policies, the following assessment is made:

- With respect to lawful water users (Objective 4.1.14 and Policy 4.2.29):
    - The NZTA has worked with the GWRC to understand their water use needs in relation to the Regional water supply, and during construction will continue to manage the continuity of quality and supply.
    - The water bore at MacKays Crossing will be relocated as part of the enabling works for the Project as its current location is within the road alignment. Again, continuity of quality and supply will be managed.
- Objectives 4.1.12 and 4.1.13, and Policy 4.2.23 are particularly relevant insofar as it encourages activities that enhance freshwater resources. As discussed in **Technical Report 11** (Ecological Impact Assessment), the Project will have some adverse effects on water quality during construction, but post-construction there will be some notable benefits resulting from better upstream land management practices. Further, and consistent with Policy 4.2.27, there have been opportunities identified along the route to enable the restoration and rehabilitation of degraded water resources along the alignment – through riparian planting, removal of perched culverts, and revegetation and protection of land within the catchments surrounding key streams.

- Water access of land owners will be provided as appropriate by the NZTA, and this is consistent with the relevant objectives and policies (Objective 4.1.14).
- Consistent with Objective 4.1.7, conditions are proposed as the best means by which to manage adverse effects during construction. Policy 4.2.34 seeks to avoid, remedy or mitigate effects by using conditions, and the Policy explanation cross-references to Section 108 of the Act. Policy 4.2.35 and 4.2.36 set out the matters to have regard to when determining the nature and extent of any conditions that may be imposed on a resource consent. The approach to developing conditions and the methods to be used – particularly for controlling the effects of earthworks – are set out in Part H of this AEE. It is concluded that the suite of conditions proposed by both the PCC and the NZTA are entirely consistent with these objectives and policies. The guidance of the GWRC has also been sought insofar as their database of conditions is useful as a starting point for developing a robust set of conditions that are easy to implement, monitor and check for compliance later (Policy 4.2.37).
- Policy 4.2.33 seeks to provide for those activities which will have no more than minor adverse effects on the environment and sets out specific Criteria (1) to (7) to assess an activity against. The explanation states that this policy is to set guidelines for those activities that have no more than minor adverse effects. It is acknowledged that this Project will have some more than minor adverse effects, and therefore this Policy is not strictly relevant.

The Plan Change also seeks to add a new provision – Policy 4.2.33A – which will be the primary provision in relation to the statutory planning assessment for the Transmission Gully Project if the Plan Change is successful. This Policy includes avoidance, remediation, mitigation (including by offsetting) of adverse effects. Because this Policy has been written specifically for the Project, the Project will be consistent in its approach to providing a suite of measures to manage effects.

32.8.8 Water quality and discharges to fresh water

Objectives 5.1.1., 5.1.2 and 5.1.3 and the related policies relate directly to water quality and are consistent with the higher level themes in the PRPS and RMA. Having regard to these policies the following assessment is made:

- The Project design has sought to maintain and, in some cases, enhance water quality discharged to the coastal receiving waters of the Porirua Harbour. In particular, and whilst there will be some adverse effects on water quality during construction, there will be a long term neutral effect on water quality discharged to the Harbour as a result of upstream land retirement, revegetation and native planting – particularly in the Horokiri and Pauatahanui stream upper reaches (using the SEV methodology). This is an important benefit of the Project in the long term and is demonstrated in **Technical Report 11** (Ecological Impact Assessment) (Objective 5.1.1 and 5.1.2; Policy 5.2.1).
- The Project design for stormwater treatment and stormwater management includes a level of stormwater treatment that will result in no notable adverse effects on water quality in the long term. In some instances, and as demonstrated in **Technical Report 15** (Assessment of Water Quality Effects), water quality will improve because existing levels of sediment runoff from land will be better managed (Objective 5.1.2 and Policy 5.2.6).

- The proposed restoration and rehabilitation of the upper reaches of Duck Creek through the removal and replacement of perched culverts as offsetting mitigation will have a significant positive impact on the ecological quality of Duck Creek as new areas of habitat will be opened to fish species (Objective 5.1.2 and Policy 5.2.6) enabling better management of this freshwater resource for future generations.
- The discharge of water from the permanent operation of the road – through general surface run off, washing and maintenance – will be carried out in a way that appropriately manages the quality of the discharges (Objective 5.1.2). This is demonstrated in **Technical Report 15** (Assessment of Water Quality Effects) which has regard to the standards set out in the RFWP for stormwater discharges (Policy 5.2.14).
- As discussed above, Ngati Toa has advised that better management (i.e. improvement) of water quality is a key issue for tangata whenua and maintenance and in some cases enhancement of water quality, is consistent with this (Objective 5.1.3).
- Given that there will be some adverse construction effects on water quality, Policy 5.2.10 is relevant. Policy 5.2.10 allows for consideration of applications to discharge contaminants where they do not satisfy Policies 5.2.1 to 5.2.9 subject to Criteria (1) to (5). It is considered that this Project would meet these because the construction works will be temporary in nature, and because the Project is unusual and exceptional, being part of a proposal of national significance and being a RoNs.

32.8.9 Water quantity

The water quantity objectives and policies in Chapter 6 of the RFWP relate to taking, use, damming or diversion of fresh water and managing water abstraction and water takes, along with protecting lawful water users. As discussed above (under Chapter 4 General objectives and policies):

- The Project involves the diversion of water courses, as discussed extensively throughout this report and above in relation to Part 4 of the RFWP (in particular). As discussed above, it is considered that the natural and amenity values of streams can be managed in the short to medium term, and improved in the longer term (Objective 6.1.1 and Policy 6.2.2).
- Policy 6.2.15 provides specifically for the concept of offsetting which is promoted by the NZTA's Plan Change (Clause (2)). This Policy provides for the damming or diversion of water in any river, lake or wetland provided that adverse effects are avoided, remedied or mitigated. As discussed above, there has been extensive consideration throughout this report of methods to avoid, remedy and mitigate (including by offsetting) the adverse effects arising from the diversion of the streams along the alignment. Unlike Policy 4.2.10, this Policy does not differentiate between listed streams and other streams, and therefore the balanced approach to seeking effects management opportunities along the whole alignment is entirely consistent with this Policy.
- The NZTA has worked with the GWRC and the owners of the Paekakariki water supply bore to manage the continuity of supply and the relocation of the bore will be undertaken by the NZTA. Alternative options for other lawful water supplies affected by the Project (though none have been identified at this stage) will be managed on a case by case basis with each lawful user (Objective 6.1.2).

- Consistent with Policy 6.2.16, actively diverting water between catchments is not proposed as part of this Project in consideration of tikanga Maori.
- The effects of the Project on groundwater are considered to be negligible as demonstrated in **Technical Report 3** (Geotechnical Report).

Overall, it is considered that the Project will be consistent with the Water Quantity objectives and policies.

32.8.10 Use of the beds of rivers and lakes and development on the floodplain

Chapter 7 of the RFWP is particularly concerned with appropriate uses of the beds of lakes and rivers while avoiding, remedying or mitigating any adverse effects and being consistent with the values of tangata whenua. Maintaining flood mitigation works is also recognized, and this Project will not affect any flood mitigation works. Policy 7.2.1 is particularly relevant because it seeks to allow for particular uses within river and lake beds when adverse effects can be avoided, remedied or mitigated (with reference to Policy 7.2.2), and those listed particular uses include[166]:

- structures for transportation and network utility purposes
- structures for activities which need to be located in, on, under, or over the beds of rivers and lakes
- the enhancement of the natural character of any wetland, lake or river and its margins.

Having regard to these objectives and policies the following assessment is made:

- The use of an integrated engineering and environmental team comprising a wide range of technical specialists has enabled a continuing refinement of the project design and the approach to avoiding adverse effects on the environment (Objective 7.1.1).
- Policy 7.2.1 seeks to provide for particular uses within river and lake beds provided that any adverse effects are avoided, remedied or mitigated and that the significant adverse effects identified in Policy 7.2.2 are avoided. Having regard to Policy 7.2.1, "*structures for transportation and network utility purposes*" (bullet point 2) are specifically anticipated. Taking a broad view of the definition of structures to include reclamations (which are not specifically defined either in the Plan or in the Act), it is considered that the activities that form part of the Project all fall broadly within this category. In addition, "*the enhancement of the natural character of any wetland, lake or river and its margins*" is also provided for (bullet point 9) – and in this case, it is considered that the Project will achieve this in some instances.

166. It is noted that there may be a change in emphasis – with Proposed Plan Change Policy 4.2.33A being the dominant provision if the Plan Change is confirmed.

- Policy 7.2.2 seeks to not allow the use of rivers and lake beds that have significant adverse effects on eight listed matters. The Ecological Impact Assessment concludes that there will be more than minor short term adverse effects on natural and amenity values (bullet point 2) and water quality (bullet point 6) in the short term, turning to neutral or positive effects in the long term, and the report does not conclude that adverse effects are significant in the longer term, and/or unable to be appropriately managed. It is therefore considered that the proposal will be consistent with Policies 7.2.1 and 7.2.2 2 (but the possibility of an alternative interpretation is acknowledged).
- Overall, whilst there will be some adverse effects on the beds of streams, including loss of overall stream length, in the long term there will be an improvement in water quality, and in the quality of instream habitats. This meets the intent of the high level policy direction set in the Act which requires recognising and providing for the preservation of natural character, and maintenance and enhancement of amenity values (Part 2, Section 6(a) and 7(c) and (f)).)).
- There are instances where works are carried out affecting known floodplains – Horokiri Stream and SH58 at Lanes Flat (Objective 7.1.2). Policy 7.2.3 promotes no new uses within floodplains that would significantly increase risk to human life, health and safety. The Project is consistent with this Policy for the reasons outlined in the Hydrology chapter of Part G and in the Assessment of Hydrological and Stormwater Effects (**Technical Report 14**).

32.9 Regional Air Quality Management Plan for the Wellington Region 2000

The RAQMP sets out objectives and policies for managing discharges to air. While transport is recognised as a source of contaminant discharge to air, there are no rules in the RAQMP that relate to this. However, the Project does seek resource consents for discharge to air for construction activities – specifically from a concrete batching plant and from mobile rock crushing activities.

Relevant objectives and policies include Objective 4.1.1 and 4.1.2 and Policies 4.2.1, 4.2.2, 4.2.3 4.2.4, 4.2.5, 4.2.6, 4.2.7,4.2.8. 4.2.9, 4.2.10. 4.2.11, 4.2.12, 4.2.13, 4.2.15, 4.2.22, 4.2.23, and 4.2.25.

The RAQMP also provides further specific management direction and the relevant objectives and policies for the Project, discussed below.

32.9.1 Assessment

Consent is required for the concrete batching plant and rock crushing as a discretionary activity, and therefore requires consideration under Section 104. In addition to this, it is also relevant to consider wider air quality effects in the context of the Project. In this assessment, the following matters have been considered, consistent with the planning direction in the objectives and policies:

- Overall, the air quality in the Wellington Region is considered to be good. Existing air quality is a key consideration under Objective 4.1.1 with a focus on maintaining and protecting high air quality and no significant deterioration in overall air quality. The Assessment of Air Quality Effects (**Technical Report 13**) has regard to the ambient air quality guidelines (Policy 4.2.1 and 4.2.2) considering how the Project will affect regional air quality.

- While the RAQMP does not control the effects of vehicle emissions, Policy 4.2.23 "*aims to deal with the effects of motor vehicle emissions through transport planning mechanisms*" (explanation to Policy). Alternatives to roads are promoted, as are measures that reduce congestion. **Technical Report 13** demonstrates that the Project will have an overall beneficial impact on air quality by reducing congestion particularly for coastal communities, and for the Region as a whole, which is entirely consistent with both Objective 4.1.1 and 4.1.2.
- The amenity levels of areas based on the nature of surrounding land uses have been considered in the evaluation of air quality impacts and in the development of mitigation planning (for addressing construction effects) which is consistent with Policy 4.2.5. In particular, while it is acknowledged that the proposed concrete batching plant has potential to generate adverse air quality impacts, it is considered that these effects can be managed through mitigation and that the benefits of undertaking the activity within the construction site (particularly for the safe and efficient construction of the major bridges and interchanges) warrants its inclusion in the construction designation footprint (as the best practicable option for overall effects on the environment);
- In determining the location and extent of the construction yards, and the location of particular construction activities (e.g. sediment generating activities and the concrete batching plant) consideration has been given to appropriate separation distances between these activities and adjoining land uses (e.g. such as residential dwellings and Transpower assets, substation and lines) in line with Policy 4.2.6 and 4.2.7.
- Construction activities can be managed to avoid noxious, dangerous, offensive or objectionable emissions and mitigation measures proposed reflect this (the mitigation measures proposed are set out in Part G of this AEE). This overall approach is consistent with Policy 4.2.5 which seeks to minimise emissions at their source – a key approach to managing air quality amenity effects from construction (dust for example).

In conclusion, an improvement in local air quality in particular locations will allow for people and communities to provide for their social, economic and cultural well-being and for their health and safety (Objective 4.1.2), while there will be negligible adverse effects on air quality in the Region as a whole.

32.10 Regional Coastal Plan for the Wellington Region 2000

There are no activities proposed to be undertaken within the Coastal Marine Area, and no resource consents are required for works in the Coastal Marine Area. As such, it is only in the sense that the Project , may result in adverse effects on the coastal environment of the Pauatahanui Inlet, as a result of run off from the land that flows to the coast, that the RCP's objectives and policies have any particular relevance.

For the most part the objectives and policies are directed at managing activities within the Coastal Marine Area, and in particular those that require approvals under Section 12 of the RMA. As a result, many are not directly relevant to this Project. The most relevant are considered to be the general objectives and policies in Clause 4.1 and 4.2, and Discharges to Land and Water in Clause 10.1 and 10.2. Section 4 of the Plan follows similar themes to the RFWP and reference is made to the detail in those assessments. In this regard, the proposal is considered to be consistent with the objectives and policies in Section 4.

Section 10 of the Plan relates to the discharge of contaminants to coastal water, water in the lower reaches of rivers within the coastal marine area, and land in the coastal marine area. It is not technically relevant to the Project, but regard has been had to the relevant objectives and policies. These are concerned with managing and enhancing coastal water quality with particular regard given in the policies which relate to shellfish gathering (Policy 10.2.1), contact recreation (Policy 10.2.2), improving the adverse effects from land-based discharges (Policies 10.2.10, 10.2.12), and tangata whenua interests (Policy 10.2.11). The assessments in this AEE confirm that the Project will meet the relevant objectives and policies because:

- There will be no notable adverse effects on water quality discharged to the Coastal Marine Area in the long term as a result of retirement of land, revegetation and native planting in the upper catchments of, primarily, the Pauatahanui and Horokiri Streams.
- There is only a low probability of an adverse effect on shellfish in the Porirua Harbour as a result of sediment deposition. This requires an unusual combination of factors to occur at once which is unlikely. Given this low probability, it is concluded that the proposal will not be inconsistent with this Policy.

Further detail is provided in the assessments against provisions in the RFWP which are more directly relevant to water quality issues.

32.11 Wellington Regional Plan for Discharges to Land 1999

The Discharges to Land Plan is relevant as the Project proposes to discharge contaminants (sediment) into water or onto land. The proposal has been assessed against all the objectives and policies in the Plan, and Policies 4.2.21, 4.2.22, 4.2.24, 4.2.41 and 4.2.48 are particularly relevant.

32.11.1 Assessment

The Plan focuses both on contamination from land uses such as landfills, hazardous substances, agriculture and horticulture, as well as contamination from, for example, the ongoing operation and maintenance of stormwater management devices. The latter is most relevant to this Project, although there are some known contaminated sites affected by this Project. Given this, Objectives 4.1.5 (in relation to discharge of sediment), 4.1.7 and 4.1.8 (both in relation to known contaminated sites) are of most relevance. Having regard to these objectives and the related relevant policies the following assessment is made:

- A thorough review of the potential for contamination to be found on the site has been undertaken, and this is consistent with the approach promoted in Policy 4.2.43. In the discrete and limited areas that have been identified as having potential for contamination, further intrusive ground investigations will be undertaken prior to the commencement of construction in those areas in order to accurately address and determine actual and potential contamination effects. This flexible approach, which allows tailoring the solution to the specifics of the situation, is entirely consistent with the approach in the Plan (Policy 4.2.25, 4.2.26 and 4.2.28).
- Further to this, the concept of the use of management plans as a method to manage effects, is specifically acknowledged in Policy 4.2.34 – and

- The only sites where special measures (in relation to contamination – with reference to Objectives 4.1.7 and 4.1.8) will need to be undertaken are in relation to:
    - The Porirua Gun Club where there are high levels of contamination. Specialist measures will be used in this case for management of earthworks and disposal of contamination; and
    - MacKays Crossing where there is the potential for discovery of unexploded ordinances (UXO).
- Standard measures to handle these 'higher' risk areas are available.
- The maintenance and operation of stormwater ponds is a permitted activity as demonstrated in the Assessment of Water Quality Effects (**Technical Report 15**). However it is relevant to have regard to Policy 4.2.21 which is to give particular consideration to the effects of discharges to land. Overall, it is concluded that there will be no more than minor effects on the environment as a result of ongoing discharges to land – so long as stormwater management devices are well maintained.

32.12 Regional Soil Plan for the Wellington Region 2000

The RSP manages land disturbing activities in the Region to maintain the quality of receiving water. Consents are sought for the Project under this Plan, relating to earthworks and land disturbance (as set out in Chapter 1 of this AEE). This Section includes an assessment of these proposed works against the relevant objectives and policies for these consents. It is noted that many of the objective and policy matters identified in the RSP are consistent with, overlap with, and reflect those identified in the NZCPS, Regional Policy Statements and RFWP.

The assessment of the Project against the RFWP is particularly relevant because the Project is essentially a large scale earthworks site and the consideration of effects is directly related to the in-stream health of the freshwater habitats in the Region. The themes in the objectives and policies of the RFWP and the RSP are very similar, and the assessment of the proposal against the Plans is therefore similar. The objectives and policies are contained in Section 4 and are all considered to be directly relevant to assessment of this Project.

The following assessments are made.

32.12.1 Assessment

The Project has prepared Sediment and Erosion Control guidelines (see **Technical Report 15** - Assessment of Water Quality Effects; and the Site Specific Environmental Management Plans), which identify specific management measures proposed to reduce the risk of surface erosion during construction (which could result in sediment generation). Objectives 4.1.8, 4.1.9, 4.1.10 and 4.1.11 promote avoiding, remedying and mitigating the effects of vegetation removal and earthworks. The Project is entirely consistent with this approach, and a flexible conditions framework involving use of management plans and performance standards to promote this approach during construction. For example:

- Minimising the footprint of works overall;
- Stabilisation or covering of sediment stock piles and use of geotextiles to stabilise exposed surfaces of the Project;
- Management of vegetation removal and early revegetation of areas to stabilise as construction progresses;
- Construction activities will be managed so that the proportion of the overall construction area, and that open in particular catchments at any one time, is minimized; and
- All water run-off from within construction areas is treated prior to discharge.

Objective 4.1.4 and Policy 4.2.6 of the Plan seek to ensure that information is provided so that effects can be accurately assessed. As discussed above, the background research and technical studies conducted for the Project have made a significant contribution to the body of information available in relation to the streams, vegetation, and the Porirua Harbour in particular. This is both useful for the assessment of the Project, and also as a resource for wider use – which is consistent with the aim of encouraging agencies to work together (Policy 4.2.8).

32.13 District plans

The NoRs relate to land within four district plans (refer to Figure 1.2).

The “relevant provisions” of the District Plans are matters to which particular regard is to be given when considering the NoRs and the regional consent applications. In relative terms, however, the provisions have more relevance to the NoRs, albeit on the basis that designations override district plan rules.

The District Plans provide a framework to promote sustainable management of a district’s land resources with specific methods and solutions developed to address issues for each of the four districts. The District Plans contain objectives and policies that apply to land use within the districts.

This section includes an assessment of those provisions of the District Plans relevant to a consideration of the NoRs – although they are also relevant matters for consideration of resource consent applications because the District Plans must not be inconsistent with the provisions of the Regional Policy Statement and Regional Plans. Chapter 4 of this AEE sets out the high level statutory framework and the relevant objectives and policies are provided in the Statutory Provisions Report (**Technical Report 21**).

It is noted that many of the objectives and policies in the District Plans are consistent with and reflect those identified in the NZCPS, PRPS/RPS and regional plans discussed previously. The following assessments will highlight the additional considerations from the objectives and policies of the District Plans, with respect to the Project.

It is noted that because the NZTA and the PCC are seeking to designate land, the rules in the District Plan do not apply in the sense that designations override rules, but they are relevant to consider. No resource consents are required under District Plans.

32.13.1 Kapiti Coast District Plan 1999

The Kapiti Coast District Plan (KCDP) became operative on 30 July 1999, and the proposed route involves land within the Rural Zone, and within the existing SH1. In addition to the underlying Rural zoning, there are a number of other KCDP notations on or close to the land required for the designation:

- Water Collection Area;
- Faultline;
- Ecological sites K111 (Wainui Stream Bush – DOC 711), K139 (Rowans Bush) and E17 (Tararua Ranges - DOC 281) – located outside the designation (shown on the application drawings);
- Outstanding Landscape; and
- Noise Contour.

There are a number of operative and proposed plan changes to the KCDP. None of these are considered relevant to the Project.

The KCDP contains an existing designation that relates to a Transmission Gully route:

- Designation D0103 relates to the main route from the previous alignment and NZTA is the requiring authority responsible for this designation. It is noted that the proposed designation route is different from the existing one, and this is demonstrated in the Plan Set.

The brick fuel tank near the MacKays Crossing end of the Project route is also annotated on the District Plan maps as a notable heritage item – albeit in the wrong location (the correct location is shown in the Assessment of Built Heritage Effects (**Technical Report 19**) and the existing designation would probably have resulted in the destruction of this feature (though its correct location has only recently been ascertained by a surveyor meaning the true effect may not have been realised) and the proposed new designation and associated road alignment skirts around it. The correct location is described in **Technical Report 19** (Assessment of Built Heritage Effects) and shown on plan **GM02**.

Relevant objectives and policies are found throughout the Plan and these have been considered with the following objectives (and associated policies) being considered to be particularly relevant: Rural Zone C2.1, Tangata Whenua C6.1, Earthworks C7.3.1, Heritage C8.1, Landscape C10.1, Ecology C11.1, Noise C14.1, Natural Hazards C15.1, Network Utilities C16.1, and Transport C18.1. Key points in relation to this suite of provisions are:

- Regarding the Rural Zone, reference can be made in particular to Objective C2.1/1.0 which seeks (in short) to ensure that the adverse effects of rural based activities are avoided, remedied or mitigated with particular regard to life supporting capacity of resources and providing for future generations. Associated relevant policies focus on identifying and protecting vegetation and fauna and natural landscapes and features (Policies 1A and 1B) and outstanding landscapes (Policy 2). Similarly, the Subdivision and Development Objective C7.3/2.0 and Policies 1-3 are particularly relevant because they relate to the management of earthworks and related effects on natural landscapes and ecosystems; and the Landscape Objectives C10.1/1.0 (outstanding natural landscapes) and Policies 1-14 are directly relevant for the same reasons, and because the route skirts the edge of an outstanding natural landscape.
- Both the Assessment of Landscape and Visual Effects (**Technical Report 5**) and the Ecological Impact Assessment (**Technical Report 11**) recognise the importance of the listed natural landscape of the Tararua Foothills (referred to above), the wider rural landscapes beyond this recognised feature, and the terrestrial vegetation and fauna that are a part of this. Subject to revegetation, replanting and protection of areas of existing "green" space, the Project is consistent with the direction of these objectives. Overall, for the reasons stated above (rural zone assessment – and assessment under the RPS and RFWP), the Project is considered to be consistent with these relevant objectives and policies.
- Regarding Tangata Whenua, Objective C6.1/1.0 takes a similar approach to the regional planning documents and uses similar wording to that in Part 2 of the Act insofar as it refers to taking into account the principles of the Treaty, having particular regard to kaitiakitanga and ensuring that the relationship of tangata whenua with the natural environment is recognised and provided for. Objective C11.1/2 (Landscape) also seeks to recognise and provide for the relationship of tangata whenua with the natural environment. As set out in the Cultural Impact Report (**Technical Report 18**), and in consultation records (refer to the Consultation Summary Report), there has been ongoing engagement with and recognition of Ngati Toa (Policy 1) throughout the development of the Project, and the preparation of the technical reports and AEE for this consenting phase. Opportunities have been available at a number of stages throughout the Project for involvement and influencing key design elements. An early awareness (Policy 2 and 4) of the issues that were of primary interest to Ngati Toa, and that influence their role as kaitiaki of the natural resources of the area (Policy 3 and 5), was an important early step, and which demonstrates consistency with the relevant objectives and policies. The importance of the water resources of the Region, and the coastal environment, were identified early as being of key interest to Ngati Toa (Policy 6 and 7), and ongoing sharing of ideas and findings from hydrological and ecological investigations. Opportunity to feed into the process of carrying out investigations and to influence mitigation decisions demonstrates consistency with Policy 6.
- Regarding Heritage, Objective C8.1/1.0 is relevant because it relates to identifying and protecting heritage features of significance. Fairly late in the process of developing the design for the designation and consenting phase, it was realised that the brick fuel tank located at the edge of the Te Puka Stream was not accurately located on the KCDC planning maps. This meant that the actual location could have resulted in the destruction of the feature. The alternative, to redesign the road around the tank, was investigated and the tank will now be retained – demonstrating consistency with this provision.

- Regarding Noise, Objective C14.1/1.0 (and Policies 1, 2 and 3) requires consideration of noise from non-residential activities on the amenity of residential and rural environments, and requires that noise effects are avoided, remedied or mitigated. Objective C14.1/2.0 is specific to the effects of traffic noise on residential amenity values, and Policy 2 and 4 are specific to new roads. A detailed assessment of all sensitive receptors (houses) close to the route has been carried out and consideration made as to potential effects on these. Where a higher than acceptable noise level is measured, consideration has been given to methods to manage the effects (Policy 5). It is acknowledged that the new road will bring new noise into the environment, simply by the presence of the new road, and that this will affect ambience. However, assessments have demonstrated that noise levels will be reasonable in terms of the relevant noise standards (Objective 14.2).
- Natural Hazards and the presence of a number of faultlines in the vicinity of the route are recognised in the Plan – including on the Planning Maps. Objective C15.1/1.0 and Policies 1 to 12 are all relevant. The objectives and policies focus on avoiding, remedying and mitigating actual and potential adverse effects arising from development within the vicinity of a natural hazard. The design of the Project, particularly within the Te Puka stream valley, is particularly cognisant of the natural hazards present, and the earth embankment design is a direct result of concerns about managing risks associated with the faultline. The Project is considered to be entirely consistent with this aim, and with the NZTA's objective of providing an alternative route into and out of Wellington to enhance route security.
- The aim of the objectives and policies that relate to Network Utilities (Objective C16.1/1.0 and Policies 1-5) is to provide for the efficient operation of these essential services. The applicants have been working closely with all potentially affected utility providers, and thus the Project will be entirely consistent with the aim of these provisions.
- There is potential for accidental discovery of hazardous substances from historical land uses. Objective C17.1/1.0 and Policies 1-4 promote the appropriate management of hazardous substances so that they do not have adverse effects on human health or the environment. Consistent with this approach, the Project sets out methods to identify and then manage identification and management of hazardous substances.
- With regard to Transport Objective C18.1/1.0 is particularly relevant to the Project and states: *To achieve a transport infrastructure that provides for efficient and safe movement of people and goods throughout the district and which avoids, remedies or mitigates adverse effects of existing and new traffic routes*. Policies 6 to 14 are relevant, and Policy 12 is particularly relevant because it relates to protecting the existing and proposed state highway network. This Project is entirely consistent with this objective insofar as it will result in more efficient movement of people and goods throughout the District (and Region), providing a more reliable route, shorter travel times, an alternative route to the existing state highway, and a safer modern designed road. In addition to this and with reference to the policies that have regard to other modes of transport (particularly Policies 7, 8, 9 and 13), the Project will not preclude the use of other modes of transport.
- In addition the Kapiti Coast District Council outlines "significant resource management issues" within Chapter B. Future roads links and connections (B.19.4.1(ii)(e)) is an issue raised as being of particular significance. Specific mention is made of an "*alternative to State Highway No. 1 south of Mackay's Crossing, known as the "Transmission Gully" route"*.

The key themes in the relevant objectives and policies are similar to those considered in the PRPS and other planning documents – particularly the provisions addressing natural landscapes, inappropriate subdivision and development and earthworks management – and the Project is considered to be consistent with these.

32.13.2 Upper Hutt City District Plan 2004

The Upper Hutt City District Plan (UHCDP) became operative on 1 September 2004. The proposed route involves land in the Rural Hill Zone only – an overall area of less than 1ha. There are no other notations for the land shown in the UHCDP. There are no proposed plan changes to the UHCDP considered of relevance to the proposed Project.

The UHCDP contains an existing designation that relates to a Transmission Gully route:

- Designation TNZ4 (Rural map 8) relates to the main route from the previous alignment and NZTA is the requiring authority responsible for this designation. On Rural Map 8 of the UHCDP the designation is labelled as 'State Highway 2'. This is slightly different to, and smaller than, the existing designated area within the jurisdiction of UHCC.
- Designation TNZ4 is bounded to the east by a GWRC designation (WRC6) for the Akatarawa and Whakatiki Water Catchment.

Relevant objectives and policies are found throughout the Plan with the following sections being particularly relevant to the activities being undertaken within the Upper Hutt District: 5.3.2, 5.4.1, 5.4.5, 5.4.7, 5.4.8, 9.4.1, 9.4.2, 13.3.1, 13.4.1, 15.3.1, 16.3.1 and 16.4.1. The area of Upper Hutt District directly affected by the Project is small (less than one hectare). However, it is recognised that there will be effects on the District arising from improved regional connectivity (for example). The key themes in the relevant objectives and policies are similar to those considered in the PRPS and other planning documents and the Project is therefore considered to be consistent with these as discussed in earlier sections.

32.13.3 Porirua City District Plan 1999

The Porirua City District Plan (PCDP) became operative on 1 November 1999. The proposed route (including the Porirua Link Roads) involves land in the following PCDP zones:

- Industrial Zone [Kenepuru link road only]
- Suburban Zone
- Rural Zone
- Whitby Landscape Protection Area
- Judgeford Hills Zone (intention when approving this plan change (aka EQM) was for its boundary to be contiguous with TG designation. Some drafting inconsistency has occurred)
- Recreation Zone
- Public Open Space Zone

There are three proposed plan changes to the PCDP which have little relevance to the Project.

The PCDP contains four designations that relate to a Transmission Gully route:

- Designation K0405 relates to the main route for a previous alignment and NZTA is the requiring authority responsible for this designation.
- Designation K0406 relates to the Kenepuru Link Road. NZTA is also the requiring authority responsible for this designation.
- Designation for the North Island Main Trunk Railway Line
- Designation for Battle Hill.

The two Porirua Link Roads are located wholly within the jurisdiction of the PCDP and cover land zoned for future residential purposes.

Relevant objectives and policies are found throughout Chapter C of the Plan though the following sections are considered particularly relevant: C1-4 zoning provisions, C5 Treaty, C7 Transport, C8 Heritage, C9 Landscape and ecology, C11 Noise, C12 Natural Hazards and C14 Network Utilities.

Rural Zone

The Rural Zone is by far the largest zone within which the Project is located. With regard to the Rural Zone objectives, the District Plan seeks "to identify a rural zone and continue its management so as to avoid remedy or mitigate the effects of the activities within it." (Objective C4.1). As discussed throughout this AEE, the effects on the environment of the Project have been considered holistically along the whole route.

The explanation for this Objective states that the Council sees the rural environment remaining non-urban for the foreseeable future. The Project will not jeopardise this goal and, along with the District Plan zoning provisions, may act almost like an urban limit boundary because it provides a clear contrast between urban and rural – particularly in the vicinity of the James Cook Interchange (Policy C4.1.1).

Consideration of the ongoing long-term productive potential of rural landholdings (Policy C4.1.8) is made in negotiations for land acquisition (through the Public Works Act) insofar as landowners will be compensated based on the remaining viability of lots (e.g. for primary production or subdivision purposes) if they are part purchased. It is acknowledged that the alignment will adversely affect the productive potential of some landholdings along the alignment, and there are a wide range of drivers (other than just viability of lot sizes) that have driven the choice of the proposed alignment – which are set out in Chapter 10 of this AEE.

Objective C4.2 seeks "to avoid or reduce the adverse effects of activities on ecosystems and the character of the Rural Zone". This NoR is accompanied by applications for regional resource consents, and therefore there has been a robust consideration of the wider effects of the Project on ecosystems and natural character of the Rural Zone (Policies 4.2.1, 4.2.2, 4.2.3 and 4.2.4). As discussed above, a significant part of the Project involves the revegetation and retirement of land as mitigation for the effects of the Project. There will be a notable positive outcome ecologically with improved stream environments arising from the Project, and it is considered that the Project will be consistent with these objectives and policies.

The Treaty

With regard to the Treaty, the District Plan takes a similar approach to the regional planning documents and uses similar wording to that in Part 2 of the Act (as stated in the explanation for Objective C 5.1) insofar as it refers to taking into account the principles of the Treaty, having particular regard to kaitiakitanga and ensuring that the relationship of tangata whenua with the natural environment is recognised and provided for (Policy 5.1.3).

Policy C5.1.1 is particularly relevant to the Project route and states: "*To recognise Te Runanga O Toa Rangatira as the voice of the tangata whenua*". Representatives of Ngati Toa have been involved throughout many phases of the Project's development, and have highlighted their key areas of interest as being in relation to natural resources, ecology water, and the coastal environment. They have been engaged to prepare a Cultural Impact Report (**Technical Report 18**) about the Project, drawing heavily on the conclusions of the Ecological Impact Assessment (**Technical Report 11**), and working with the relevant technical experts as required to better understand the effects of the Project (directly consistent with Policies C5.1.2 and C5.1.5).

Further, Policy C5.1.4 which states: "*To recognise the desire of Ngati Toa to maintain and enhance their traditional relationship with the natural world*." also promotes seeking opportunities to recognise the aims of Ngati Toa. Consistent with this policy direction, the NZTA and PCC have been working with Ngati Toa to review options for making already compromised natural resources more accessible, and to enhance environments where practicable.

Consistent with Policy C5.1.6, whilst no specific taonga or waahi tapu have been identified as being affected by the route, it is recognised that the natural environment as a whole is an important taonga in itself. This theme is also picked up in Policy C9.1.12 (Landscape and ecology) and Objective C10.1 (Coastal). This approach underpins the overall approach to assessing and addressing effects on the environment arising from the Project. Further to this, work has been undertaken with Ngati Toa to develop appropriate discovery protocols and designation/consent conditions to set out processes for discovery of archaeological remains.

Transport

Regarding Transport, Objective C7.1 aims to achieve a safe and efficient transportation network that enables the people of the City and the wider community to provide for their social and economic wellbeing without creating significant environmental effects. The Plan acknowledges that transport infrastructure is a significant resource in its own right, and maintaining this resource – and an integrated approach to planning - is an important focus of the objectives and policies.

The PCC has an integrated approach to managing land use and transportation (Policy 7.1.2), and the Plan has already anticipated the construction of the Project, having taken it into account when considering growth and development in the District. Policy 7.1.5 makes specific mention of the Project in its explanation:

"The most significant roading issue for the City is the Transmission Gully highway scheme"…"Council has a strong preference for the Transmission Gully route as a high priority. It is seen as having long term strategic benefit for the City and Region. However, it is acknowledged that the enhancement of the capacity of State Highway One is also necessary."

Clearly, the Project (both the link roads and the main alignment) are both entirely consistent with this Policy. Further to this, the Project will not preclude further works being carried out on the existing SH1 route, and it is acknowledged in the Urban Design and Landscape Framework (**Technical Report 23**), and in the Assessment of Traffic and Transportation Effects (**Technical Report 4**), that works on the existing coastal route could be desirable too.

The objectives and policies broadly promote avoiding, remedying and mitigating adverse effects of the transport network on the environment (Policy 7.1.2 and 7.1.3). This is addressed further in the assessment of effects in Part G of this AEE, and in the management of effects and conditions sections of Part H. Whilst it is generally accepted that a large infrastructure project such as this will have noticeable adverse effects on the environment that may in some cases be more than minor, the approach to avoiding, remedying and mitigating effects on the environment has been carried out using a balancing approach (as per Part 2 of the Act) considering both adverse and positive effects overall.

The Project is entirely consistent with Policy 7.1.4 which seeks to protect major transport corridors. The Transmission Gully route has been well recognised through previous designation processes as an intended transport corridor, and this is already acknowledged by its presence in the District Plan. This current proposal has identified a different route (although in the same general arrangement and optimised) that will result in a much better environmental outcome from an ecological perspective, and that will be more secure from a natural hazard perspective.

The applications are accompanied by extensive social and environmental assessments (this report and its associated technical reports) (Policy 7.1.5), and consideration of potential economic effects. The Project does not preclude the development of other transport modes such as walking, cycling and public transport and, in fact, promotes and provides many improved cycling and walking facilities as part of its design and mitigation measures. Maintaining regional cycle networks is a key consideration for the Project.

Landscape and ecology

Regarding landscape and ecology, Chapter C9 sets out the issue, objectives, policies and methods relating to Landscape and Ecology. The policy direction of this Chapter is considered consistent with the RPS and the RFWP, and the planning assessment above is considered relevant for this Chapter. Objective C9.1 seeks to manage the landscape and ecological systems in the City in a sustainable manner. The Project has been assessed to identify potential adverse effects on local and regional amenity values including visual and landscape impacts (**Technical Report 5**: Assessment of landscape and visual effects) and effects on ecology (**Technical Reports 6- 11**). An holistic approach – considering the effects of the Project as a whole along the entire route and across all the affected catchments – has been taken to assessing effects and then determining methods to avoid, remedy and mitigate effects. For example, the identification of an adverse effect within one catchment may be addressed through works in another catchment in some instances, and could result in a better environmental outcome and an overall improvement in the ecological and landscape values of a more important or significant environment.

Policy C9.1.5 seeks to protect the landscape and ecological character of the Rural Zone – which comprises the majority of the land along the route, and Policy C9.1.6 encourages the preservation and protection areas of significant native vegetation. The overall approach to managing effects of the Project is entirely consistent with this approach. Whilst there are no outstanding natural landscapes within the jurisdiction of the PCC, there are other important landscapes, including significant areas of regional park– with Battle Hill considered an important cultural landscape by some. Large areas of revegetation and protection of existing vegetation, are methods proposed to manage the landscape and ecological effects of the Project, and whilst the presence of the road will be an undeniably significant change, there will also be some notable landscape and ecological benefits felt as a result of methods (e.g. revegetation and protection) of the Project. Protection and enhancement of ecological integrity (Policy C9.1.14) is implicit in this.

Policy C9.1.15 is specific to the Whitby area and is directly relevant to the link roads. Whilst it relates to future subdivision of the area, the Policy seeks to recognise, protect and enhance existing ecological and landscape features, and the design of the link roads has had regard to minimising landscape effects in the choice of location and design.

Other parts of the route that will be particularly visible from urban areas include the Ranui Heights residential area near the southern end of the route. Whilst the route cannot be completely hidden, the approach has been to carry out extensive planting and revegetation in order to minimise its visual appearance on the landscape.

Coastal

With regard to coastal issues, Objective 10.1 seeks to protect and enhance the spiritual, cultural, ecological and amenity values of the coast. The wording of this Objective demonstrates that the coastal environment is very important to the PCC – and that the landward jurisdiction of the Council has an effect on the coastal environment.

The proposal will not adversely affect public access to the coastal environment (Policy C10.1.1). Many of the policies relate to the provision of esplanade reserves around the coast, so are not directly relevant to the Project.

Policy C10.1.5 is directly relevant because it seeks: "*To manage the effects of activities likely to result in increased levels of contaminants and silt run-off so as to avoid and/or mitigate these effects on the coastal environment and coastal marine area.*" As discussed above, (assessment of the RFWP, RCP and RPS) there is already substantial sediment runoff to the Porirua Harbour from existing natural land runoff and from a variety of past and existing land uses. There will be some increase in sediment transport to the Harbour during construction of the Project. For the most part the effect of this sediment will be less than minor, but there is a very small chance of a moderate adverse effect on the coastal environment if a combination of factors (including construction stage, specific wind and rain weather conditions, tide conditions) all coincide. There is a lot of public interest in the Porirua Harbour (evidenced through the consultation with key stakeholders and the public – refer to the Consultation

Summary Report), and further, given the policy direction in the RFWP, there is a strong emphasis on avoiding adverse effects completely. This is consistent with the approach taken for the Project.

Objective C11.1 is simple in its objective, which is to minimise the effect of noise on the environment. A detailed assessment of all sensitive receptors (houses) close to the route has been carried out and consideration made as to potential effects on these. This is consistent with Objective C11.1 because effects of noise are mainly felt by people, in the places where they regularly spend time. Where a higher than acceptable noise level is measured, consideration has been given to methods to manage the effects. It is acknowledged that the new road will bring new noise into the environment, simply by the presence of the road, and that this will affect local ambience (Policy C11.1.1). Particularly in relation to the more rural environments (such as Bradey Road and Flightys Road) it is recognised that those environments will experience traffic noise where, at present, there is none. However, the acoustic assessments indicates that noise levels at all properties can be managed in order to meet the NZ Standards for Road Traffic Noise (NZS 6806:4)(Policy C11.1.2).

Natural hazards

Regarding Natural Hazards, Objective C12.1 is particularly relevant to the Project as it seeks “to minimise the risk from earthquakes to the wellbeing and safety of the community”. A key objective of the NZTA for this Project is route security (as discussed a number of times elsewhere in this report). Providing an alternative route into and out of Wellington, including access to and from Porirua, is a key way in which to provide for the wellbeing and safety of the community.

Technical Report 1 (Design Philosophy Statement: Roading Design), **Technical Report 2** (Design Philosophy Statement: Bridges and retaining walls) and **Technical Report 3** (Geotechnical Engineering factual report) all detail how consideration of natural hazards have influenced and informed the Project’s design (Policy C12.1.2 specifically mentions the Ohariu fault). This natural hazards Chapter is considered to be consistent with the PRPS and the corresponding planning assessment is also applicable to the provisions of the PCDP. There has been specific consideration of natural hazards in the design of the Project with particular consideration of the key strategic objective of route security. As discussed in Chapter 1, the security of access into and out of Wellington has been a key driver in making some of the main design decisions. In particular the use of reinforced earth walls through the Te Puka stream valley instead of a bridge is an important design solution to better manage earthquake risk (Policy C12.1.5).

Objective 12.2 seeks to avoid or mitigate flood hazard on the wellbeing and safety of the community. This Project has been carefully designed so as to manage flood flows taking into account the potential effects on people and properties (Policy 12.2.1). Overall, and aside from one exception which has been discussed with the landowners and mitigated, it is considered that flood hazard has been adequately managed.

Network utilities

Regarding network utilities, of all the objective and policies, Policy C14.1.4(a) seeks to avoid or mitigate potential adverse effects on above ground lines. In consultation with Transpower and other utility providers, designation conditions have been developed (using a Network Utilities Management Plan) to manage effects on these assets. Ongoing liaison during construction will be required.

Objective C14.2 seeks to promote the efficient use and development of network utilities. The Project has been designed taking into account the presence of a number of existing network utilities, and effects will be managed and consistent with the existing networks (Policy C14.2.1).

Hazardous substances

Objective C15.1 seeks to prevent or mitigate any adverse environmental effects of accidental discharges of hazardous substances. All known contaminated sites have been mapped for this Project, and management of contamination is proposed through a remedial action plan and verification processes (Policy C15.1.4). Storage and handling of hazardous substances as part of the construction process will be subject to appropriate management practices set out in the CEMP (Policy C15.1.1).

Overall, it is concluded that the proposal will be consistent with all the relevant objectives and policies, and forms a key part of the infrastructure for PCC that is already recognised as essential in planning policy.

32.13.4 Wellington City District Plan 2000

The Wellington City District Plan (WCDP) became operative on 27 July 2000. The Project requires land in the Outer Residential Zone and the Rural Zone. There are a number of proposed plan changes and variations to the WCDP. One is relevant to the Project – Plan Change 70 which relates to earthworks. The WCDP contains two existing designations that relate to the Project:

- Designation H5 (Planning maps 29 and 31) relates to the main route from the previous alignment and the NZTA is the requiring authority responsible for this designation.
- Designation X1 (Planning map 29) relates to the Warspite Link Road and Interchange from the previous alignment (which is still shown on the planning maps, though it is understood that PCC as the requiring authority responsible for this designation has sought to have it uplifted).

Applicable objectives and policies are found throughout the Plan with the following sections being particularly relevant: General Provisions, Issues for Tangata Whenua, Suburban Areas, Rural Area, Natural Environment, Utilities, Designations and Earthworks.

32.13.4.1 Assessment

Having regard to the relevant objectives and policies, the following points are noted:

- The Project is located on the edge of established residential areas and the residential objectives (Objective 4.2.1) and associated policies are relevant – although they are largely focussed on the effects of urban development. Effects in this area are largely construction related and include noise and construction management issues. The NZTA has met with immediate neighbours in relation to operational noise issues, and measures are in place to address construction effects through the CEMP. There are no long term noise effects that cannot be adequately mitigated. Overall, whilst the objectives and policies are of limited relevance, the proposal is consistent with these.

- The Project will occupy land in the rural environment, and Policy 14.2.1 promotes the efficient use and development of the natural and physical resources of the rural environment. The Project is located on the outskirts of the urban area and the integrity of the rural environment will not be adversely affected – it is therefore consistent with this policy direction. Policy 14.2.3.1 seeks to control the effects of non-rural activities. Part G of this report discusses actual and potential effects, and Part H sets out methods of manage effects.
- Existing network utilities are present in a number of locations along the Project route, and within the Wellington jurisdiction include Transpower towers, Takapu Substation, a Vodafone cellsite and underground services. Objective 22.2.1 promotes the efficient development and maintenance of utilities. The development of this Project has involved extensive discussions and consultation with utility providers (refer to the Consultation Summary Report), and a management plan is proposed by designation conditions to address effects on utilities. Consequently it is considered that the Project is consistent with Objective 22.2.1.
- Regarding designations, Objective 24.2.1 states "To provide for designations, only where they are necessary, to ensure the efficient functioning and operation of public works." This Project is considered necessary in order to ensure the efficient functioning of the State Highway network, and is therefore consistent with this direction. Policy 24.2.1.2 is also relevant insofar as it encourages the removal of unnecessary designations. In this regard it is noted that the NZTA has undertaken to review the necessity of the existing designation once the outcome of this current NoR is known.
- Regarding earthworks, Objective 29.2.1. seeks to avoid, remedy or mitigate the adverse effects of earthworks on the environment. Policy 29.2.1.3 and 29.2.1.4 are the most relevant policies and promote consideration of instability, and management of erosion and offsite effects respectively. As discussed above, managing offsite effects of earthworks is a key consideration for this Project because it is essentially a large earthworks site. Extensive consent conditions are proposed (i.e. for the regional consent for earthworks) and related designation conditions are proposed, to manage the effects of earthworks consistent with this policy direction.
- Plan Change 72 is a full review of the residential chapters of the Plan, and amends a number of objectives, policies and rules. Efficient use of infrastructure is a consideration of the Plan Change and new medium density residential provisions are applicable to nearby areas. Overall, the Project will not be contrary to the Plan Change.

32.14 National environmental standards

There are two applicable national environmental standards (NES):

- NES for Air Quality – This NES sets the boundaries of Regional air-sheds and requirements for management of air quality within those air sheds. It is the responsibility of Regional Councils to manage air quality and to comply with the Regional Air Quality targets for their air-shed(s). Vehicle emissions are not specifically controlled under the AQNES, though emissions do make a noticeable contribution to overall air quality;

- NES for Sources of Drinking Water – The Project is located on the periphery of (downstream of) the Wellington Regional Council's drinking water collection areas. The only known extraction point affected by the project is at Paekakariki and this water source will be relocated as part of Project – as discussed in Chapter 15.

No consents are required under these standards as part of this Project and they are therefore considered to be of little relevance.

The "Proposed National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health" (NES CS) is not currently operative, but is expected to be gazetted by the Minister later in 2011. It may then become of relevance to the consideration of this Project. The purpose of the NES CS is to provide for a consistent approach to identifying, assessing and managing contaminants in soil across New Zealand. Currently different Councils have differing approaches to managing contaminants, with varying degrees of efficacy.

The NES CS proposes a mix of permitted activities and requiring resource consents for certain activities on land affected or potentially affected by contaminants in soil. The NES would require all territorial authorities (district and city councils) to give effect to and enforce its requirements.

The Assessment of Contaminated Land Effects (**Techncial Report 18**) has had regard to the relevant standards set out in the Proposed NES and proposes methods to clean up, manage and/or dispose of contaminated soils in accordance with the NES standards. Relevant conditions are proposed setting out the methods for the future contractors to follow on site.

32.15 Other relevant documents

Other relevant documents in terms of section 104(1)(c) and 171(1)(d)) include both statutory (including documents required to be prepared under other legislation such as the Land Transport Management Act 2003 or Conservation Act 1987 for example) and those non-statutory documents that, whilst not having a regulatory function under the RMA, have been through a public process and/or are well-recognised publicly as being important policy documents that set the direction for either the Region or the city. The following documents are considered relevant:

- the Government Policy Statement on Land Transport Funding 2009/10 – 2018-19;
- the National Infrastructure Plan 2011;
- the New Zealand Transport Strategy 2008;
- the Western Corridor Plan 2006:
- the Wellington Regional Land Transport Strategy 2010 – 2040;
- the Wellington Regional Strategy 2007;
- the Porirua Development Framework 2009;
- the Porirua City Community Outcomes Action Plan 2009 – 2015;
- the Draft Porirua Transportation Strategy;

- the Kapiti Coast Sustainable Transport Strategy 2008;
- the Wellington Conservation Management Strategy 1996;
- the Greater Wellington Parks Network Plan 2011; and
- the Pauatahanui Inlet Action Plan 2000.

32.15.1 Government Policy Statement on Land Transport Funding 2009/10 – 2018- 19

The Government Policy Statement on Land Transport Funding (GPS2) was updated and re-released in May 2009 and subsequently amended in November 2010. Its introductory statement says that "*The government's priority for its investment in land transport is to increase economic productivity and growth in New Zealand*".

The GPS introduced seven roads of national significance (RoNS) and covers the financial period 2009/10 to 2014/15. The GPS is issued under the LTMA and directs the NZTA to deliver on its objectives and outcomes. The GPS acknowledges that a combination of methods will be used to achieve the outcomes of the GPS including the RoNS, and other improvements including to local roads and public transport.

The Project is a part of the Wellington RoNS, and the Porirua Link Roads are an important local roading initiative to improve the efficiency of the main Project and, therefore, both the Main Alignment and the Link Roads are consistent with the GPS2.

32.15.2 National Infrastructure Plan 2011

The National Infrastructure Plan 2011 is the second to be released. The first Plan in March 2010 set out key infrastructure priorities including the Roads of National Significance, and this second Plan builds on those priorities, but takes into account the earthquakes in Christchurch and prioritises rebuilding work there. The Plan has five aims of which No.4 is directly relevant to this Project:

- *Working with Canterbury infrastructure providers to rebuild infrastructure to get the economy working again as well as considering how to build greater resilience.*
- *Providing a comprehensive approach to investment in Auckland which is fair to all New Zealanders, and which helps implement government responsibilities through the Auckland Spatial Plan.*
- *Achieving significant improvement in the management of government owned social infrastructure assets to deliver better services to the public and explore alternative procurement methods.*
- *Focusing land transport investment on supporting exporters (e.g. completing RoNS and improved rail services to ports).*
- *Improving the ability to monitor performance across all infrastructure sectors.*

32.15.3 New Zealand Transport Strategy 2008

The NZ Transport Strategy seeks to provide direction for the transport sector over 30 years. The strategy relates to all parts of the transport sector. Key relevant aims include:

- Environmental sustainability including: reducing vehicle emissions, renewable fuels, fuel efficient technology and electric vehicles, increasing the area of Crown transport land covered with indigenous vegetation;
- Assisting economic development: improving journey times and journey time reliability;
- Assisting safety and personal security: reducing road deaths and serious injuries;
- Improving access and mobility: increasing public transport, walking and cycling; and
- Protecting and promoting public health; reducing people exposed to transport noise and reducing people exposed to dangerous concentrations of air pollution.

The Project will be generally consistent with all these aims for the following reasons:

- The Project involves extensive areas of revegetation, retirement and planting of native, locally sourced vegetation. This land will remain within the control of either the NZTA, or another agency (e.g. the GWRC) and will be maintained in perpetuity as mitigation for the effects of the Project;
- The Project will significantly improve journey times around the Region and improve journey time reliability;
- There will be a reduction in road crashes and a significant improvement in overall traffic safety both through reduction in through traffic on some local roads – including the coastal route – and through a modern designed new route;
- The Project will not preclude opportunities for improved development of public transport, and provides some new opportunities for recreational walking and cycling; and
- Transport noise effects and air quality effects have been modelled. Properties that were likely to be exposed to higher levels of noise than allowed under the relevant standard will be protected by noise mitigation measures, including noise barriers.

32.15.4 Regional Land Transport Strategy 2010 - 2040

The Wellington Regional Land Transport Strategy (RLTS) 2010-2040 was adopted by GWRC in September 2010. It is a statutory document prepared under the LTMA and contains explicit support for the Transmission Gully Project. It is the strategic transport document that guides the development of the Region's transport system. It sets the framework and vision for the provision and management of movement and transport throughout the Region.

The vision of the Wellington RLTS 2010-40 is:

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

The RLTS objectives are to:

- assist economic and regional development;
- assist safety and personal security;

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

This Strategy also includes particular policy recognition that the Project is a critical transportation improvement for the Wellington Region. There is specific policy support for the Project contained in the following RLTS policies:

> *"8.1r - Ensure the proposed Transmission Gully Project is developed as the long term solution to address access reliability for State Highway 1 between MacKays and Linden.*
>
> *8.1s - Ensure the existing State Highway 1, between MacKays Crossing in the north and Mungavin Interchange in the south, is managed in a way that is consistent with its long term purpose of a scenic access route once the Transmission Gully project is operational."*

The Project will be consistent with all these relevant objectives because:

- Regional connectivity is improved and travel times are reduced;
- Reduction of traffic on the existing state highway will improve the liveability of coastal communities;
- Route security is enhanced, safety is improved, travel times will be shorter and more reliable, and this all provides for better accessibility to and from Wellington, with two major options being available; and
- The Project delivers the policy vision of Transmission Gully as the long term solution to address access reliability between MacKays and Linden.

32.15.5 Western Corridor Plan 2006

The 'Western Corridor Plan: Otaki to Ngauranga Merge' was adopted by GWRC in 2006 as part of the RLTS. It recognises that there are serious reliability and safety issues along this corridor both for public and private transport, and that there is a need to create a long-term strategic solution to respond to growing demand. This Plan seek to respond to these issues by planning and providing for a safer, more reliable road and rail corridor that meets user expectations of a consistent regional corridor. The Project is included as part of the Plan.

The Wellington Corridor Plan lists a number of policies relating to Land use Integration, Travel Demand Management, roading, passenger transport, and walking and cycling. The Project is entirely consistent with the Western Corridor Plan as the Transmission Gully Project is a critical component of delivering on these outcomes.

32.15.6 Wellington Regional Strategy 2007

In 2007, the nine local authorities of the Greater Wellington Region collaboratively finalised the production of the WRS. The Strategy has a principal aim of making the Greater Wellington area internationally competitive, in terms of being a Region with great lifestyle and job opportunities, supported by a strong economy. The focus areas for the Region are set out in Chapter 4 of this AEE.

The WRS initiatives for the promotion of an efficient regional form include:

- **Strong regional centres and land for business growth** – The WRS recognises that the Porirua City CBD and existing industrial areas have a particular role in terms of growing the Region's economy, ensuring that there is an adequate and adaptable supply of land for commercial and industrial use.
- **Integrating transport with urban and rural needs** – The WRS identifies that it is desirable to create more employment close to where people live. The efficient operation and use of our transport system and consideration of the development 'fit' with the transport network are fundamental to creating a good regional form.
- **More homes close to city centres and transport links** – The WRS acknowledges that one of the Region's strengths is its wide range of housing and lifestyle options. There is a need to enable medium and higher density development close to centres and transport links, while protecting the character of the traditional low-density family-focused suburbs.
- **Rural lifestyles** – The WRS has identified that the Region offers excellent opportunities for rural residential living. It recognizes the benefits in making lifestyle options available in certain areas including making better use of poor productivity areas, strengthening smaller communities, unlocking economic development opportunities, and enhanced management of special environmental features. This is counter balanced with caution regarding removing high quality soils from primary production, threatening sensitive ecosystems or significant landscapes, and land fragmentation creating urban expansion difficulties.
- **Regional Focus Area/Change Areas** –The WRS identifies a number of areas of change where there are likely to be development pressure or where opportunities are likely to emerge. The WRS does not suggest that all of these areas are promoted for development and notably at Pauatahanui suggests that, less development rather than more, is likely to be appropriate. The focus areas include Pauatahanui, Porirua to Linden, Paraparaumu town centre to Paraparaumu beach.

The Project will be entirely consistent with the WRS's initiatives because:

- It strengthens cross-region linkages and improves connectivity and it is part of the regional strategy to improve access to public transport opportunities for those who do not live close by (for example, through park and ride facilities);
- It will enhance the liveability of communities, providing for a much more pleasant urban environment in coastal communities as there will be a significant reduction in traffic volumes and traffic speed thus improving local amenity; and

- Will not preclude future development of rail and other public transport modes. Those corridors remain unaffected by the Project, and special provision has been made to future-proof the rail crossing (by Kenepuru Link Road) to allow for future tracks and electrification.

32.15.7 Porirua Development Framework 2009

The Porirua Development Framework (PDF) is a guiding document that is intended to influence how and where the city will physically develop over time. It provides a picture of what the City may eventually look like, identifying areas where people may live, work and play. It is also intended to guide change within the City.

An assessment against the provisions of the PDF was undertaken; refer to Appendix to **Technical Report 4** (Assessment of Traffic and Transport effects). Those assessments conclude that the Project is entirely consistent with the PDF because it anticipates the construction of the Project and has focussed future development aspirations for the District accordingly.

32.15.8 Porirua City Community Outcomes Action Plan 2009 – 2015

The Community Outcomes Action Plan was prepared by PCC in conjunction with the community to work towards achieving the community outcomes identified through the Local Government Act 2002 process. The Action Plan identifies nine community outcomes. One of these, 'Well Connected & On The Move', is of relevance to the Project because it promotes improved traffic and transport networks and connectivity in the district – the others are of less relevance to land use and transportation matters.

32.15.9 Draft Porirua Transport Strategy

The DPTS was open for consultation until 31 May 2011 and sets goals and aspirations for all types of transport in the Porirua District. The strategy is predicated on the construction of the Transmission Gully Project – consistent with the Western Corridor Plan, the Regional Land Transport Strategy and the policy position of the Council itself. Other local roading projects are being developed and given priority on the basis of the TG Project going ahead.

The Project is therefore consistent with the policy direction of the strategy.

32.15.10 Kapiti Coast Sustainable Transport Strategy 2008

The Strategy sets out a framework for decisions about transport development in the wider Region that will affect Kapiti in relation to the east/west corridors (the existing corridor at SH58 and the potential east/west link near Ngauranga Gorge).

The Project will substantially improve accessibility of the Kapiti Coast communities around the rest of the Wellington Region and this is consistent with the strategy.

32.15.11 Wellington Conservation Management Strategy 1996

The CMS is dated 1996 with a ten year term being from 1996 to 2005. Whilst it is out of date, it is relevant to have some regard to it. The Pauatahanui Inlet is listed in Chapter 6 of the CMS – Clause 6.4.

There is a useful description of the Inlet in on Page 61, which accords reasonably well with that in the Estuarine Ecology report (**Technical Report 10**). The Project alignment is located outside of the Inlet, and there is no specific reference to the streams that are affected by the Project.

Objectives are set out on Page 63 and Objective 1 is particularly relevant as it relates to "Conservation of the marine wetlands, indigenous species, historic resources and scenic qualities…" (etc…). The Inlet has been a key focus of the marine ecology studies and studies into the hydrology of the Porirua Harbour, and is clearly of great interest to the wider community as demonstrated in the level of interest identified through consultation (refer to the Consultation Summary Report, **Technical Report 22**) with a wide range of community groups, individuals and key stakeholders focusing on the Inlet. As discussed above, there is now a significantly improved body of research in place providing information about the hydrology of the Harbour so that effects of the Project (and other activities in catchment surrounding) can be better understood.

Overall, a significant amount of consideration has been given to the effects of the Project on the Inlet – and the values that are set out in the CMS. As discussed above, the expectation is that there will be no more than minor effects, although there is a very low probability of a combination of weather and construction events coinciding such that there is a moderate effect arising.

32.15.12 Greater Wellington Parks Network Plan 2011

The Greater Wellington Parks Network Plan (GWPNP) came into effect on 1 January 2011. It is a statutory document prepared under section 41 of the Reserves Act 1977. It combines and supersedes previous separate management plans for each of the Regional parks in the Region. The Landscape and Visual Assessment (**Technical Report 5**) has incorporated the principles from this Plan into design recommendations to maintain usability of BHFFP and Belmont Regional Park (refer to the Assessment of Social Effects – **Technical Report 17**).

32.15.13 Pauatahanui Inlet Action Plan 2000

The Pauatahanui Inlet Action Plan (PIAP) was released in August 2000 by the Pauatahanui Inlet Action Group. The PIAP was prepared by the group with input from a number of stakeholders, including the then Transit NZ. The PIAP's vision for the Inlet involves the protection and restoration of the ecosystem and its use for recreational opportunities. The PIAP contains a set of management actions to achieve this vision. These management actions are grouped into eight themes.

Theme 5 (Roading) is relevant to the Project:

"• *Issue 5.3: The construction of the Transmission Gully and/or the upgrading of the existing SH1 corridor, with a new bridge at the entrance of the Inlet are likely to have significant impacts on the Inlet.*

- *Actions 5.2 and 5.3: Ensure that the roading agencies develop and adopt a Memorandum of Understanding based on best practice which includes:*
    - *Management systems for on-going maintenance activities which identify and mitigate adverse environmental effects on the Pauatahanui Inlet; and*

- *New applications for roading activities under the RMA must recognise that the protection of the Inlet from adverse environmental effects is a critical issue to be addressed."*

The NZTA has undertaken a significant amount of work and investigation into better understanding of how the Porirua Harbour works. This has involved hydrological modelling, ecological investigations and studies of weather patterns. This has added substantially to the body of knowledge of about the Inlet and therefore to the ability to accurately understand the potential for adverse effects from land uses within the catchments surrounding it. The protection of the Inlet has been a significant consideration and focus of the engineering and environmental studies, and as such, has resulted in a good understanding of the actual and potential effects of the Project. This better understanding will allow not only the NZTA, but also other parties and agencies to better manage the effects of wider land use on the Harbour.

32.16 Assessment of section 105 matters

Some of the applications are for discharge permits, involving discharges to air, and discharges of contaminants into water and onto land. Therefore, section 105 is relevant.

Section 105(1)	Comments	Cross-references
Nature of the discharge and sensitivity of the receiving environment to adverse effects	During construction discharge will contain levels of sediment than would normally occur, particularly during storm events. The receiving environments in freshwater streams and, eventually, the Porirua Harbour, are already adapted to a high sediment environment from run off from native bush, pasture and forestry land in the catchments. Therefore, the environments are considered to be resilient to sediment. Adverse effects are considered to be minor for the most part with one low probability exception in relation to deposition in the Harbour in an extreme weather event. These effects are all discussed further in the technical reports, Part G and, in relation to the statutory provisions, above.	AEE Chapter 6 **Technical Report 11** (Ecological Impact Assessment)
The applicants reasons for the proposed choice	In simple terms, the Project is essentially a large earthworks site. There are a number of different alternatives that have been considered (Chapter 10) and methods for managing discharges. The best practicable option has been chosen or no other alternatives to that which the applicants have chosen. The design process to date has avoided effects as much as practicable given the Project objectives. Where effects cannot be avoided, and there are good opportunities to remedy, mitigate and offset actual and potential effects.	AEE Part A
Any possible alternative methods of discharge, including discharge into any other receiving environment		**Technical Report 15** (Water Quality Assessment)

32.17 Assessment of section 107 matters

Section 107 relates to discharge permits. This section is relevant because the Project involves the discharge of contaminants or water into water – i.e. it involves the potential discharge of silt laden water into streams (the Project is likely to increase sediment levels above current levels). The BoI cannot grant a discharge permit if the discharge is likely to result in certain effects. The relevant effects under section 107(1)(c) that may occur as a result of discharge of contaminants from the Project are:

- A conspicuous change in the colour or visual clarity (section 107(1)(d)) – earthworks and construction works will cause a change in colour or visual clarity of affected streams running through the worksites and the Pauatahanui Inlet at times.
- Any significant adverse effects on aquatic life (section 107(1)(g)) – in an extreme weather event, it is expected that there will be some noticeable adverse effects on shellfish and other organisms within the Pauatahanui Inlet arising as a result of sediment discharge travelling to the Inlet from streams, due to upstream earthworks and construction activities – with moderate effects potentially arising in extreme weather conditions that coincide with high levels of construction activity (i.e. a coincidence of events that is of extremely low probability of happening).

A consent authority may grant a discharge permit which gives rise to these effects if it is satisfied—

(a) that exceptional circumstances justify the granting of the permit; or

(b) that the discharge is of a temporary nature; or

(c) that the discharge is associated with necessary maintenance work—

and that it is consistent with the purpose of this Act to do so.

The assessments in this AEE and in the technical reports demonstrate that the Project will meet the tests within section 107(2)(b) for the following reasons:

- The discharges will be short term;
    - The effects will be felt at times, but not consistently, during the construction period of the Project – expected to be in the order of six years;
    - Any effects on the coastal environment will be those associated with sediment transport firstly from construction areas, then from streams that discharge into the Inlet, and lastly into the Inlet;
    - The resultant effects are related to the effect of sediment on the Inlet and include effects on marine communities including marine worms and shellfish (and marine vegetation such as grasses);
    - The assessment of effects on the marine environment (**Technical Report 10**) demonstrates that there will be moderate adverse effects arising in some instances when a combination of a number of factors coincide, and that the probability of this happening is small. This is considered to be an exceptional circumstance in terms of the tests of Section 107;
    - Effects on stream water quality are not representative of a "typical" day of work on the site, but instead represent the result of an unlikely or extreme weather event (1 in 10 year storm or worse);
    - Measures can be taken to minimise the likelihood of adverse effects resulting from an extreme weather event - and these are described in Part H of this report; and

  - Moderate adverse effects are only likely to arise when a combination of exceptional events all coincide at once, and there are a range of measures that can be used to further reduce the chances of all these factors coinciding – as discussed in the Ecological Impact Assessment report.
- There will be no ongoing adverse effects once the Project's construction has been completed, and there will be some positive effects arising from the implementation of the Project. In fact, the retirement, revegetation and replanting of large areas of land in the upper catchments of Horokiri and Pauatahanui streams will have a significant positive effect on water quality in the longer term. This work is also likely to result in less sediment runoff from the land surrounding the route, and will be consistent with Section 107.
- It will be consistent with the purpose of the Act to grant the discharge permit because the effects will be as a result of an unusual combination of weather and construction conditions, and have a very low probability of occurring all at once and generating a more than minor effect. This is discussed in the assessment of the Project against Part 2 (below) and in Part G of this AEE.

In summary, it is considered that this Proposal will meet the tests outlined in section 107 of the Act.

32.18 Assessment of Part 2 matters

Section 104(1)(b) of the RMA sets out the planning documents which the BoI shall have regard to when considering an application for resource consent and any submissions received. Similarly section 171(1)(a) of the RMA sets out the matters which a BoI must have particular regard to when considering a notice of requirement and any submissions received. This chapter has provided an assessment against those planning matters. In both cases, the considerations of sections 104 and 171 are subject to Part 2 of the RMA, which sets out the purpose and principles of the Act and which are central to determining the appropriateness of the NoRs and resource consent applications being sought for this Project.

The consideration of matters in sections 104 and 171 in relation to consideration of the resource consent applications and notices of requirement are "subject to Part 2", and the section 5 purpose of the RMA is to promote the sustainable management of natural and physical resources as defined by section 5(2). That definition of "sustainable management" is as follows:

> *"In this Act, **sustainable management** means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while—*
>
> *(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
>
> *(b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
>
> *(c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment."*

Part 2 provides further direction on the matters of national importance (section 6), other matters (section 7) and the principles of the Treaty of Waitangi (section 8) which should be responded to.

In promoting sustainable management, there is often the requirement to balance consideration of competing resource values and the benefits and adverse effects of a Project. In particular, for the designation of a public work, this balance involves considering the scale of often regional or national benefits for the wider community with the more localised adverse effects of the Project (and its activities) on the environment, including on people, communities, and [natural resources and values].

In terms of section 5 of the RMA, the construction of this part of the Wellington RoNS will enable people and communities to provide for their social, economic and cultural wellbeing and for their health and safety, by:

- Providing for the economic growth of the Region, particularly in the Porirua area, by improving accessibility and connectivity, particularly between economic centres and through new connections across the Region – consistent with the NZTA's project objectives;
- Providing significant community, social and transport benefits including:
  - resilience in the transport network;
  - health and safety benefits through reduced incidence of crashes both on the new route, and on the existing routes through reduced traffic flows;
  - reducing traffic flows on the existing SH1 making the local environments more pleasant – for example, through making it easier to get into and out of side streets, and walk along the road and cross the road with less traffic passing;
  - social and economic benefits through improved travel time reliability and quicker trips;
  - improved reliability for freight movements and resulting economic benefits;
  - completing a portion of the Wellington Northern Corridor - an alternative strategic transport corridor to the existing SH1 coastal route.

The completion of the Project is consistent with the Region's Land Transport Strategy, and is therefore one component of the strategic land transport solution for the Region's economic prosperity and sustainable growth.

In balancing these considerations with the matters in section 5(2) (a) through to (c) of the RMA, the following conclusions from the above planning assessment are made:

- In terms of sustaining the potential of natural and physical resources for future generations, the Project is intended to meet the growing transportation needs of the Region and does not preclude future opportunities for other land transport development, such as improvements to public transport, particularly rail, and improvements to walking and cycling routes;
- The Project safeguards the life supporting capacity:
  - of air – by reducing congestion and improving air quality both regionally and at a local level for the coastal communities where the existing SH1 passes through them;

- of water – because whilst there will be a short term adverse effect on water quality from sediment deposition, there will be important long terms benefits arising from the retirement of land, revegetation and planting under the upper catchments of streams;
- of soils – by the management of construction works (to control erosion and land disturbance) and remediation of sites of land contamination. In the long term there will be noticeable benefit overall as land alongside the route and other rural areas (240ha) will be retired.
- of ecosystems – by avoiding, remedying and mitigating the adverse effects on ecological values of the Project, including freshwater, herpetofauna, avian and vegetation ecology and through avoidance of and off-set mitigation for the permanent loss of streams retirement of land including riparian areas, there will, in the long term, be a noticeable ecological benefit overall.
- of people and communities – by managing actual and potential adverse effects both during construction and operation, and by having significant positive effects on the transport network.

- The Project avoids, remedies and mitigates adverse effects on the environment, including through identification of mitigation and offsetting measures and conditions for the consent applications and designations (Part H of this AEE).

The Project recognises and provides for the matters within section 6 of the RMA, particularly:

- The Project will, for the most part, have no more than a minor adverse effect on the natural character of the Coastal Marine Area. There is a very low probability of an extreme weather event coinciding with construction activities and wind and wave patterns that may cause some loss of marine communities in the Porirua Harbour. However, the probability of this happening is very low, and in the longer term, as a direct result of the Project, water quality will be improved;
- The Te Puka Stream will be permanently realigned in some parts as part of the construction of the road. Whilst this is a permanent effect, the effects will be remedied, mitigated and offset over the entire Project route;
- The Project protects and in some cases will enhance areas of natural character, particularly the margins of wetlands and rivers, and the upper reaches of the Horokiri and Pauatahanui Streams. In some cases the long term water quality of streams will be enhanced, and the quality of instream habitats will be improved. Overall, the Project will result in an improvement in the freshwater habitat;
- The Project is not expected to adversely affect any outstanding natural features of landscapes;
- Assessment has been undertaken of the ecology of the Project area and areas of significant indigenous vegetation will be re-established (and the effects are therefore mitigated) and through enrichment, retirement and new planting, the Project overall does not result in any significant effects on habitats of indigenous fauna; Some improvement overall can be expected;
- The maintenance and enhancement of public access to and along the Coastal Marine Area and streams is provided for by the construction of new and replacement walking, cycling and horse riding paths;

- The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wahi tapu, and other taonga has been provided for through the implementation of protocols for engagement with tangata whenua;
- The protection of historic heritage has been provided for, particularly through redesigning of the route to avoid one notable heritage structure (brick fuel tank) and providing an access to view that structure (where non is currently provided) and by the careful management of construction activities to avoid adverse effects on St Josephs Church. The Project will have a positive benefit for the church insofar as its access will be realigned for improved safety and visibility for visitors; and
- The Project does not impact on any recognised customary activities.

The Project has also had particular regard to and has appropriately responded to the matters in sections 7 and 8 of the RMA. While not exhaustive, the following are considered particularly relevant:

- The kaitiakitanga of tangata whenua has been recognised in seeking specific cultural impact statements from mana whenua in the Project area (**Technical Report 18**). This process has recognised the principles of the Treaty of Waitangi (the partnership between Iwi and the NZTA as a Crown agency, and the retention by Maori of rangatiratanga over their resources and taonga in particular);
- The ethic of stewardship has been recognised through:
  - engagement with and participation of tangata whenua in workshops and working groups early in the Project's development process; and
  - engagement with community groups who have specific interest in and who have exercised stewardship over particular resources. This includes the Maraeroa community marae at Waitangirua, and the Pauatahanui Inlet (including Pauatahanui Inlet Community Trust – PICT - and Guardians of Pauatahanui Inlet - GOPI);
- The efficient use and development of the rest of the existing State highway network and the potential to improve the use of the network, has also been recognised in providing for better connections to SH58 and existing SH1, along with local roads, which will improve the functioning and use of the wider network;
- Recognition has been given to the maintenance and enhancement of amenity values, particularly for residential communities through the assessment of noise emissions (and resulting noise mitigation), air quality, CEMP, the landscape and visual assessment (and the resulting planning for landscape and urban design mitigation) and in the assessment of alternatives for the Project;
- It is acknowledged that there are amenity impacts of the Project, particularly for rural communities who currently enjoy a "green" outlook where they will in future look out onto a road. While these are not outstanding landscape areas, the works do represent a significant impact (in the short and medium term), on these visual catchments. There will also be amenity effects associated with noise and emissions for residents. While the planting and other mitigation proposed will mitigate these effects in the long term, the Project represents a permanent and considerable change to the amenity for these communities.

It is considered that the benefits of this Project alongside the proposed measures to avoid, remedy and mitigate the adverse effects of the Project, leads to the conclusion that the Project achieves sustainable management of natural and physical resources and is consistent with the purpose and principles of the Act. It is considered that the purpose of the RMA will be achieved by confirming the NoRs and granting the resource consents sought.

Appendix A

Resource Management (Approval of Transit New Zealand as Requiring Authority) Notice 1994

Departmental Notices

Agriculture and Fisheries

Animals Protection Act 1960

Approval of Code of Ethical Conduct Notice No. 5330 (100-A1-07)

Pursuant to section 19A of the Animals Protection Act 1960 and on the advice of the National Animal Ethics Advisory Committee, I hereby approve the code of ethical conduct submitted to me by Elanco Animal Health, which is the same as the approved code of ethical conduct of Massey University.

Dated at Wellington this 22nd day of February 1994.

JOHN FALLOON, Minister of Agriculture.

go1646

Revocation of Approval of Code of Ethical Conduct Notice No. 5329 (100-A1-07)

Pursuant to section 19A of the Animals Protection Act 1960 and on the advice of the National Animal Ethics Advisory Committee, I hereby revoke the approval of Tauhara Furs Partnership to use the code of ethical conduct of the Ministry of Agriculture and Fisheries.

Notice No. 4421 appearing in the *New Zealand Gazette* on the 30th day of June 1988, at page 2628 is hereby revoked.

Dated at Wellington this 22nd day of February 1994.

JOHN FALLOON, Minister of Agriculture.

go1647

Approval of Code of Ethical Conduct Notice No. 5328 (100-A1-07)

Pursuant to section 19A of the Animals Protection Act 1960 and on the advice of the National Animal Ethics Advisory Committee, I hereby approve the code of ethical conduct submitted to me by Lowe Walker Hawera Limited, which is the same as the approved code of ethical conduct of NZ Pastoral Agriculture Research Institute Limited.

Dated at Wellington this 22nd day of February 1994.

JOHN FALLOON, Minister of Agriculture.

go1648

Conservation

Resource Management Act 1991

Notice of Approval of Bylaws Amendment

The Minister of Transport and the Minister of Conservation, pursuant to section 424 (6) of the Resource Management Act 1991, hereby give approval to The Northland Regional Council Maritime Bylaw Amendment No. 5 (Bylaw Charges 1992/93) resolved by way of Special Order and confirmed by a meeting of the said Council on 19 May 1993.

Dated at Wellington this 14th day of February 1994.

DENIS MARSHALL, Minister of Conservation (in relation to section 232 (37) of the Harbours Act).

B. A. MARTIN, for Russell Kilvington, Director of Maritime Safety in exercise of powers delegated by the Minister of Transport.

go1499

Crown Law Office

Judicature Act 1908

Appointment of Temporary Judge Made Permanent

Pursuant to section 4 of the Judicature Act 1908, Her Excellency the Governor-General, in the name and on behalf of Her Majesty the Queen, has been pleased to appoint

The Honourable Dame Silvia Rose Cartwright

to be a Judge of the High Court.

Dated at Wellington this 17th day of February 1994.

PAUL EAST, Attorney-General.

go1498

Environment

Resource Management Act 1991

The Resource Management (Approval of Transit New Zealand as Requiring Authority) Notice 1994

Pursuant to sections 167 and 420 (6) of the Resource Management Act 1991, the Minister for the Environment, hereby gives the following notice:

N o t i c e

1. Title and commencement—(1) This notice may be cited as the Resource Management (Approval of Transit New Zealand as Requiring Authority) Notice 1994.

(2) This notice shall come into force on the 7th day after the date of its publication in the *New Zealand Gazette*.

2. Interpretation—In this notice "State highway" and "motorway" have the same meaning as in section 2 (1) of the Transit New Zealand Act 1989.

3. Application of notice—This notice shall apply in addition to and not in substitution for the Resource Management (Approval of Transit New Zealand as Requiring Authority) Order 1992.

4. Approval as requiring authority—Transit New Zealand is hereby approved as a requiring authority under section 167 of the Resource Management Act 1991, for its particular network utility operation being the construction and operation (including the maintenance, improvement, enhancement, expansion, realignment and alteration) of any State highway or motorway pursuant to the Transit New Zealand Act 1989.

5. Approval in respect of existing designation—Transit New Zealand is hereby approved as a requiring authority under section 167 of the Resource Management Act 1991 for the Christchurch Northern Arterial (State Highway 74) in the district of Christchurch City Council.

Dated at Wellington this 17th day of February 1994.

SIMON UPTON, Minister for the Environment.

go1500

29 New Agency replaces Transit New Zealand as requiring authority

(1) This clause applies to any Order in Council, notice, or other instrument that approves of Transit New Zealand as a requiring authority and that was in effect immediately before 1 August 2008, including (without limitation)—

(a) the Resource Management (Approval of Transit New Zealand as Requiring Authority) Order 1992; and

(b) the Resource Management (Approval of Transit as Requiring Authority) Notice 1994.

(2) Without limiting clauses 26 and 28, on 1 August 2008,—

(a) the new Agency replaces Transit New Zealand as a requiring authority under any Order in Council, notice, or other instrument to which this clause applies; and

(b) every reference to Transit New Zealand in any Order in Council, notice, or other instrument to which this clause applies, is, unless the context otherwise requires, to be read as a reference to the new Agency; and

(c) anything done, or omitted to be done, or that is to be or may be done (under or in relation to an Order in Council, notice, or other instrument to which this clause applies) by Transit New Zealand is to be treated as having been done, or having been omitted to be done, or to be or may be done, by the new Agency; and

(d) every notice of requirement and designation of Transit New Zealand is transferred to and held by the new Agency, with the same status and priority as if Transit New Zealand and the new Agency were the same entity.

30 First members of new Agency

In appointing the first members of the new Agency, the Minister may, but need not, consult in accordance with section 98(2) of the Land Transport Management Act 2003.

Compare: 2004 No 97 Schedule 2 cl 4

31 Transferred employees

(1) The terms and conditions of employment of a transferred employee immediately before 1 August 2008 continue to apply in relation to that employee until—

Appendix B

Proposed conditions agreed between the NZ Transport Agency and Transpower NZ Limited

Reference	Proposed condition
NZTA.20A.	NZTA shall give reasonable notice and make reasonable endeavours to: (i) Liaise with Transpower in relation to any part of the works within the designation where their infrastructure may be affected; and (ii) Make reasonable and relevant changes requested by Transpower to the relevant design plans and methodologies, to ensure that access to, maintenance and the operation of Transpower infrastructure within the designated area is not adversely affected.
NZTA.20B.	To avoid interruptions to supply, or adverse effects on Transpower assets, NZTA shall, subject only to reasonable planned interruption: (i) Protect the Transpower asset from any activity which may interfere with the proper functioning of the services; and (ii) Seek to relocate it to the same or a similar standard (including property rights) as the operator currently has.
NZTA.20C.	All works or activities associated with the Transmission Gully Project and ancillary roads and activities shall be designed and undertaken to comply with the Code of Practice for Electrical Safety Distances 2001 (NZECP 34:2001). In this regard, NZTA shall liaise with Transpower New Zealand Limited during the design of the Project. All works shall to be designed to ensure the adequate protection of existing transmission lines from any potential adverse effects associated with the construction and operation of the roads within the designation (eg the provision of vehicle collision barriers where necessary). For completeness, NZEC 34:2001 includes the following requirements: (i) All machinery and mobile plant operated within the designated area shall maintain a minimum clearance distance of 4 metres from all transmission lines located within that area. (ii) With reference to NZECP 34:2001 Figure 1, in the case of any pole supporting any conductor, no person shall excavate or otherwise interfere with any land: a) at a depth greater than 300mm within 2.2 metres of the outer edge of the visible foundations of the tower; or b) at a depth greater than 750mm, between 2.2 metres and 5 metres of the outer edge of the visible foundation of the tower; or c) in such a way as to create an unstable batter. (iii) With reference to NZECP 34:2001 Figure 2, in the case of any tower (pylon) supporting any conductor, no person shall excavate or otherwise interfere with any land: a) at a depth greater than 300mm within 6 metres of the outer edge of the visible foundations of the tower; or b) at a depth greater than 3 metres, between 6 metres and 12 metres of the outer edge of the visible foundation of the tower; or c) in such a way as to create an unstable batter. (iv) In accordance with Section 4 of the NZECP 34:2001 no material shall be deposited (either permanent or temporarily) under or near any National Grid transmission line without the prior approval of Transpower. This is to ensure the safe NZECP 34:2001 (Table 4) separation distances from the lines are always maintained. All the above requirements shall apply unless prior written approval is given by Transpower.

Reference	Proposed condition
NZTA.20D.	If compliance with the Code of Practice for Electrical Safety Distances NZECP (34:2001) cannot be achieved, NZTA shall consult with Transpower New Zealand Limited who will identify acceptable alternative options, including and if necessary relocate or alter the existing transmission structures to achieve compliance.
NZTA.20E.	NZTA shall ensure that existing access arrangements to Transpower's existing works are retained where practicable. Where NZTA requires or causes a change in access arrangements, alternative arrangements shall be provided, in consultation with Transpower New Zealand Limited that provides safe four wheel drive 24 hour access to the tower base during the construction period or other options that will enable Transpower to undertake necessary works. Once construction has been completed, the maintenance of access tracks shall be the responsibility of Transpower.
NZTA.20F.	All trees and vegetation planted shall be selected and located to ensure that no part of any tree (when mature) will encroach within a (4) metre clearance from transmission line conductors. The 4 metre clearance relates to vertical, horizontal and felling distance clearances and shall take account of the maximum conductor swing and sag.
NZTA.20G.	NZTA shall ensure that the discharge of contaminants to air from the site during construction of the Transmission Gully Project does not create any dust hazard or nuisance to the transmission lines managed by Transpower New Zealand Limited. NZTA shall produce, in consultation with Transpower, as part of the Construction Environmental Management Plan, measures to identify how those potential dust effects will be managed around the transmission network.
	Explanatory Note: Proposed conditions NZTA.20A. to NZTA.20G. (inclusive) would apply to NoR 1, NoR 2, NoR 3 and NoR 4 only.