Chapter 6
Part D
VOLUME 2

Operation of the Project

Overview

This chapter provides an outline of the design, construction and operation of the Project. The roading component of the Project has been designed to an expressway standard comprising four traffic lanes with continuous median separation. The NIMT realignment has been designed to ensure that the NIMT continues to operate to its current standard and provide freight and passenger services by rail along the length of the North Island.

6 Operation of the Project

6.1 Introduction

This Chapter provides a summary of the key aspects of design, construction and operation of the Project, in addition to the detail already provided in other Chapters within Volume 2.

The Expressway is generally parallel to SH1, which is also generally parallel to the NIMT. The Expressway will have two lanes of traffic in each direction, with connections with local roads provided at half-interchanges located to the north of the Ōtaki township and just south of the Ōtaki River. Local connections and the construction of new local roads and access roads are provided to and across the Expressway, so as to maintain local connectivity.

The Project includes the following principal design features:

- A four-lane median-divided expressway (two traffic lanes in each direction);
- Ensuring legible access into and out of Ōtaki from the Expressway to support vitality and the GOV, while limiting direct access elsewhere along the Expressway. This is sought to be achieved by:
  - A half-interchange north of Ōtaki; and
  - A half-interchange south of Ōtaki (southern side of Ōtaki River);
- Two two-lane bridges over the Ōtaki River;
- One two-lane bridge over the Waitohu Stream;
- Grade-separated overbridges to cross some local roads, watercourses, the NIMT and the Expressway;
- A new section of local arterial road near Mary Crest;
- A realignment of approximately 1.2 km of the NIMT through Ōtaki; and
- Stormwater treatment and attenuation facilities, including swales, along the majority of the length of the route.

Further technical information relating to the Project is provided within Part G of this AEE report, the relevant Technical Reports in Volume 3 and the Plan Set within Volume 5. These documents have been cross-referenced throughout this Chapter.

6.2 General Project Description

The Project and the operation of the Project are described in this Chapter with specific reference to:

- The Design Philosophy Statement;
- The ULDF;
- Road design;
- Traffic services;

- Interchanges and local connections;
- Pavements and surfacing;
- Bridges and other key structures;
- Noise attenuation;
- Surface drainage, stormwater treatment and flood management;
- Culverts;
- Cycleway and walkways; and
- Urban design and landscaping.

6.2.1 Design Philosophy Statement

A Design Philosophy Statement (DPS) was produced for the key elements, to capture standards and assumptions relating to the roading component of the Project. The DPS covers the design philosophy for the Expressway, as well as local connections and the creation of new local roads. It identifies the key standards, guidelines and criteria that have been used in the Project design through which the objectives of the Project are sought to be achieved. These objectives relate not only to the construction and operation of the Expressway, but also seek to provide integration of the structures with appropriate local road connectivity across the corridor, and ensure that the Expressway is designed in an environmentally and culturally sensitive way.

The DPS document is provided as Technical Report 1, Volume 3.

6.2.2 Urban and Landscape Design Framework

A ULDF has been used as a touchstone for designing the Project. Its purpose has been to:

- Set out urban and landscape design principles and objectives providing a framework for design of the Project; and
- Inform the finalisation of the design of the Project.

The ULDF was developed by specialists through urban design investigations of the Project area, Project team meetings, multidisciplinary workshops, Wellington Northern Corridor RoNS urban design workshops and liaison with stakeholders.

The ULDF is provided as Technical Report 23, Volume 3.

6.2.3 Road Design

The form of the Expressway, the associated local roads, and the NIMT realignment is shown in the scheme plans in Volume 5: Plan Set, which should be read in conjunction with this section. Bridges and crossings can also be viewed on the plans in Volume 5.

The Expressway has been designed to seek to ensure that the corridor is future-proofed to accommodate changes in population and traffic demands, based on current estimates.

The following sections describe the road design, signage and road markings, lighting and other matters which are proposed to be used in the initial construction of the Expressway, local roads and NIMT realignment. However, over the operational life of the Expressway, local road and NIMT, the relevant road controlling authorities and KiwiRail are proposed to retain the ability to make any changes, including to road design, pavements, signage and road markings, medians, lighting and street furniture, required for the ongoing management, control and upgrading of the roads / rail infrastructure. Depending upon the extent and nature of any such future changes, Outline Plan of Works may need to be submitted, or Outline Plan Waivers may be required, under the RMA.

Expressway

The Expressway will be approximately 13km long and has generally been designed to the following specifications:

- Median width of up to 6m (edge line to edge line), which is reduced to 4m at Peka Peka to align with the M2PP Project and is reduced to 4m on the approach to north Ōtaki;
- A swale, services or planting strip of approximately 10m in width, varying slightly along the route;
- 1.5m verges;
- 2.5m sealed shoulders on each outer edge with widening up to 3m adjacent to structures and barriers;
- 1m median sealed shoulders; and
- Wire rope median barrier with a typically grassed, planted, or sealed median (with a concrete or other form of barrier on river bridges and approaches to structures).

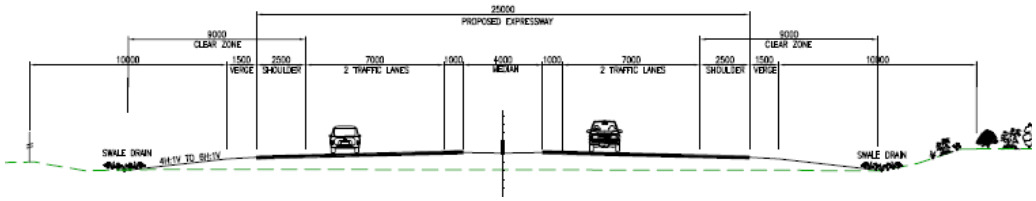

Figure 6-1: General Cross-Section of the Expressway

Local Roads

Sections of new local road or arterial road that are required to be constructed as part of the Project, and are to be located within the Project designation for construction, will have a cross-section and geometry that complies with relevant design standards for local roads, as agreed with KCDC. These standards are:

- New Local Arterial – approximate width of 16.6m with:
  - 3m wide swale, services or planting strip on each side;
  - 1.8m wide shoulder on each side; and
  - 3.5m wide lanes in each direction; and
- New section of local road which is to connect the sections of SH1 north of Mary Crest to Peka Peka:
  - Minimum 1.8m wide shoulder on both sides; and
  - 3.5m wide lanes in each direction.

6.2.4 NIMT

As a consequence of the Expressway project, an approximately 1.2km section of the existing NIMT in Ōtaki needs to be realigned in order to accommodate the preferred Expressway alignment. The 1.2km section of the NIMT that needs to be realigned begins approximately opposite Sue Avenue, runs through the Ōtaki township, and ends where the realigned railway connects with the existing NIMT approximately half way between SH1 and the Waitohu Stream (approximately 320m west of the intersection of Waitohu Valley Road and SH1). The remainder of the existing NIMT alignment is not altered.

The realigned NIMT will continue to run parallel to SH1 from Sue Ave until Waerenga Road although slightly east of the existing NIMT. The existing curve of the NIMT as it approaches County Road will be softened on the realignment, with the realigned NIMT crossing Rahui Road, approximately 120 metres from Rahui Road's intersection with SH1. The realigned NIMT will then curve back down towards SH1, crossing over the Mangapouri

Stream (approximately 120m downstream of where the existing NIMT intersects the stream), before crossing the existing SH1 alignment approximately 140 metres south west of the point at which County Road meets SH1 (and 80 metres south west of the point where the current NIMT crosses SH1). The realigned NIMT will then track north to link into the existing NIMT alignment around 540 metres before it crosses the Waitohu Stream.

It is intended that the realigned NIMT at Ōtaki will be constructed before work on the Expressway begins in that location. This will enable the relevant section of the existing NIMT that is being replaced by the realigned NIMT to be decommissioned and for the Expressway to be built in its place.

The Ōtaki Railway Station

The realigned NIMT results in the Ōtaki Railway Station also needing to be moved slightly on its axis. This will not have an impact on access to the station or its operation. The station is not owned by KiwiRail, but the platform area is. The station needs to be moved slightly to the east to ensure that the realigned NIMT can be accessed safely from the station.

In order to mitigate any effects on heritage values associated with the station, realignment will include the deconstruction and rebuilding of all brick elements. Subject to the brickwork being reconstructed in total and all interior and exterior fabric being relocated with the building (e.g. the platform, verandah and toilet block) and relative to the building as it currently exists, there will be little loss of heritage fabric or significance of the station. The Ōtaki Railway Station has high historical, architectural and rarity values, however assuming the proposed realignment of the station and associated elements is undertaken, it is considered that the heritage effects on this building will be less than minor.

Realigned Design

The section of the realigned NIMT running through Ōtaki, from Waerenga Road will run roughly parallel to the Expressway on its eastern side and does not at any point intersect the Expressway. From just past Waerenga Road until just before connecting with the existing NIMT north of Ōtaki the realigned NIMT has been future proofed to allow double tracking. The other elements of design are recorded in Technical Report 2. In summary the required standards include:

- Provision of a passing loop past Ōtaki Railway Station (on a single line railway a passing loop is a section where trains travelling in opposite directions can pass each other);
- A 820m minimum radius for new sections of NIMT (the minimum radius defines the minimum curvature within the alignment, which affects the maximum safe speed of a curve - the realigned section is designed to enable 100 km/h, except for the curve north of the Ōtaki River, which is designed for 80 km/h);
- A minimum 5.5m vertical clearance (for example where a road bridge passes over the rail corridor) to future proof for electrification; and
- Future proofing for later double-tracking along the corridor.

Noise and Vibration Effects

The realigned NIMT will be closer to properties to the west of the realignment by up to approximately 100 metres at its greatest point (but generally the shift in alignment is much less). The effects of this shift have been considered by the experts in their assessment of this Project. In particular, Technical Report 15 concludes that only two properties will be adversely affected by the move, requiring mitigation measures to be implemented at those locations. Those properties are the Ōtaki Motel and the property at 230 Main Highway. The NZTA and KiwiRail are working with those affected property

owners to determine appropriate mitigation. This is further explained in Technical Report 15.

Stream Crossings and Stormwater

The realigned NIMT will continue to cross Mangapouri Stream and the Waitohu Stream. Culverts will be constructed in respect of both.

Swales are proposed on the eastern side of the realigned NIMT between Rahui Road and Mangapouri Stream. From where the realigned NIMT crosses SH1 until it reconnects with the existing NIMT alignment, swales are proposed on both sides of the railway line. A stormwater management pond is proposed between the realigned NIMT and the Expressway for the section between Rahui Road and SH1.

Bridges

The realigned NIMT will be crossed by two bridges. Bridge 6 will provide access over the realigned NIMT for the realigned Rahui Road. Bridge 8 will allow SH1 to cross over the realigned NIMT. Previously, Rahui Road was a level crossing so the safety of the crossing will improve considerably following completion of the Project.

Realigning the NIMT on this section prevents the need for the Expressway to cross the NIMT over extended periods of track (which it would have to do twice if the NIMT remained on its current alignment). As is shown in the Plan set in Volume 5 of this AEE report, this would be completely impractical.

Level Crossings

As a result of the Expressway, five of the eight existing level crossings within the Project area will be closed. The level crossings to be closed are the crossing at School Road, the crossing opposite Te Waka Road, the crossing enabling access to the Stevens property, and the crossings at Old Hautere Road and Rahui Road. Grade separation or alternative access will be provided at each of those locations.

These changes will significantly reduce the risk of crashes occurring between trains and road traffic, pedestrians or cyclists. The changes remove all the public level rail crossings in the Project area. The removal of the level crossings will result in the warning bells being removed, as well as the train horn not being used (as is generally the case when approaching a level crossing).

6.2.5 Traffic Services

Traffic services include features such as:

- Road markings and permanent road signs (including variable message signs);
- Road lighting; and
- Barrier protection.

Permanent Road Signs and Markings

Design of all road signs and markings will be in accordance with the NZTA's manual of traffic signs and markings (MOTSAM) or any equivalent document which replaces that manual. It will also be in accordance with the Land Transport Rule: Traffic Control Devices.

The Project includes two gantries for signage along the Expressway to identify the entry to Ōtaki, as well as other directional and distance signage on the Expressway, at interchanges and on the local roads. The Expressway also features variable message signs adjacent to the half interchanges and where the Expressway begins at Taylors Road in the north.

Road Lighting

Lighting is to be provided around interchange locations (north and south of Ōtaki) and intersections; lighting is not proposed along the remainder of the Expressway. Local road lighting will be reinstated where it currently exists and new lighting will be required at new intersections on the local road network, e.g. at the junction of Ōtaki Gorge Road and the new local arterial.

All road lighting will be designed to comply with Australian/New Zealand Standard – AS/NZS 1158.0:1997: Road Lighting.

Barrier Protection

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;
- AS/NZS 3845:1999 Road Safety Barrier Systems;
- The National Cooperative Highway Research Program (NCHRP) Report 350 - Recommended Procedures for the Safety and Performance Evaluation of Highway Features; and
- The Transit NZ Bridge Manual, September 2004 Revision.

The Expressway will have barriers installed as appropriate for each section of the Expressway. Local roads formed as part of the Project will have wire rope or guardrail type barriers installed where required, with a more substantial concrete and/or steel barrier installed on bridges over the Expressway. The Expressway itself will have wire rope or guardrail type barriers, where these are required, along its length. Across the Ōtaki River Bridge a rigid or semi-rigid bridge barrier will be used to protect vehicles. The remaining bridges that are part of the Expressway will have concrete and/or steel barriers on them.

At locations identified on the scheme plan set, areas of the median will be sealed to enable emergency services to drop the wire rope barrier and access the other carriageway in emergency situations. This will also include an emergency access to Gear Road at Te Horo.

Side barriers have been included in areas where the fill batters are steeper than 2(H):1(V). Where embankments are above 2m they have generally been steepened from 4(H):1(V) to 2(H):1(V) with side protection barriers also included.

A median width of up to 6m has been allowed for along most of the Expressway, except for the northern and southern ends. Generally this includes a grassed or sealed strip between the opposing lanes of the Expressway, and a 1m sealed shoulder either side of the median strip.

6.2.6 Interchanges and Local Connections

The layout of merges, diverges, on-ramps and off-ramps to the Expressway has been developed in accordance with the RoNS Design Standards and Guidelines (October 2009), as well as (in the case of merge and diverge design requirements) the following additional design standards:

- Manual of Traffic Signs and markings (MOTSAM), Part 3, Motorways and Expressways;
- State Highway Geometric Design Manual (SHGDM) (Draft);
- Austroads Guide to Traffic Management – Part 6: Intersections, Interchanges and Crossings; and
- Austroads Guide to Road Design – Part 4c: Interchanges.

There are two half-interchanges incorporated into the Project, north and south of Ōtaki Township. These provide access on and off the Expressway. To the south of Ōtaki access

will be provided for traffic driving to or from the south, and to the north of Ōtaki access will be provided for traffic driving to or from the north. At south Ōtaki, the interchange connects with Ōtaki Gorge Road bridge over the Expressway and NIMT, and leads to a new roundabout on the existing SH1 that enables access north and south along the existing SH1 alignment.

The new connection at Rahui Road is a bridge for vehicles and pedestrians over the Expressway and NIMT, which follows a similar alignment to the current road, and connects with the existing SH1 in Ōtaki.

The overbridge at Te Horo does not provide access on or off the Expressway, however it links School Road with Te Horo Beach Road to facilitate access between the two areas of Te Horo that are bisected by the transport corridor.

6.2.7 Pavements and Surfacing

The pavement design for the Project takes into account the following:

- Subgrade differential settlement issues;
- Rehabilitation of existing pavements;
- Construction methodology and impact on existing traffic;
- Use of locally available materials and recycling of existing pavement materials; and
- Surfacing considerations, including noise mitigation and high vehicle stress areas.

Expressway Pavement

The general pavement design for the Expressway is an unbound granular construction with a stabilised base course. The use of cement modification has been considered as a means of stabilising the pavement, and has currently been recommended by the NZTA's consultants on a "whole of life" risk basis. However, other forms of pavement stabilisation may also be considered to improve the strength and durability of the pavement.

Expressway Surfacing

The Expressway passes through the built up areas of Ōtaki Township and Te Horo settlement. In the Ōtaki urban areas (between the railway station and Waitohu Valley Road) the noise mitigation measures provided as part of the Project will incorporate the use of low traffic noise surfacing such as OGPA.

The use of OGPA as a noise mitigation measure is based on assessments undertaken by specialists using New Zealand Standard (NZS) 6806:2010 Acoustics – Road-traffic Noise – New and Altered Roads. Where OGPA (or similary) is used it will be necessary for the OGPA to be laid up to 12 months after the road is initially opened to ensure that the pavement has cured sufficiently and the OGPA is retained on the surface once vehicles start travelling over it.

The balance of the Expressway will have a chip seal surfacing.

Local Road Surfacing

Local roads will be surfaced with chip seal.

The Project also provides for development of property accesses, typically involving reshaping of entranceways, some additional drainage items and sealing from the road edge to the property boundary.

6.2.8 Bridges and Other Key Structures

The bridges and other key structures proposed for the Project are described below.

Bridges

The Project will involve the construction of a number of bridges. Three of the bridges will form part of the interchanges located north and south of the Ōtaki Township. The remaining bridges are required to take all or part of the carriageway across one or more of the following features:

- Existing SH1;
- Access roads and local roads;
- Rivers, streams and other waterways; or
- The NIMT.

Overall there are 10 key bridges incorporated into the Project, two of which run in parallel across the Ōtaki River (and are numbered as one structure). These are outlined in Table 6-1.

Urban design guidelines for bridge structures have been incorporated in the ULDF. The proposed bridge structures comply with these guidelines.

Table 6-1: PP2O Bridges

Bridge No.	Name	Description	Approx Length (m)	Approx Width (m)
9	Mary Crest	Expressway over NIMT & local access road	152	19.3
8	Te Horo	Local road over Expressway and NIMT	102	11.9
7	South Ōtaki	Local road over Expressway	58	15.4
6	South Ōtaki rail	Local road over NIMT	17.1	15.4
5	Ōtaki River Bridge (two parallel 2-lane bridges)	Expressway over Ōtaki River	332	23 (total)
4	Rahui Road	Rahui Road over Expressway and NIMT	115	13.9
3	Ōtaki North	Local Road over Expressway	36.2	16.9
2	Ōtaki North rail	Local road over NIMT	18.4	16.9
1	Waitohu	Expressway over Waitohu River	82	17

Five different types of bridges are proposed to be used for the Project. Indicative designs of each bridge, the effects of which have been assessed by relevant specialists, are incorporated in the Project design. The types of bridges proposed are:

- Architecturally designed super 'T' bridge;
- Hollow core bridge;
- Concrete Box bridge;
- Precast beam and slab bridge; and
- Super 'T' on circular columns.

Design of Bridges

The length, width and span arrangements of the bridges are generally governed by the roading geometry. Sloped abutment walls have generally been adopted (apart from in limited cases where they are not technically feasible) as these are considered visually superior to vertical abutment walls.

Bridge solutions with specific architectural treatment have been design at the more visible "local road over Expressway" crossings, and this is reflected in the bridge forms being proposed for the Ōtaki North (No. 7), Rahui (No. 6), Ōtaki South (No. 3) and Te Horo (No. 2) crossings.

Retaining Walls and Bridge Abutments

Mechanically Stabilised Earth walls (MSE walls) will generally be used in the areas of fill at bridge abutments. The walls will be formed as either vertical walls (in areas where space is constricted) or as 'spill through' abutments where additional space is available and a more open atmosphere is appropriate.

Retaining walls will generally be used in the following situations:

- At the abutments of some bridges; and
- Around the ramps of some interchanges.

All retaining walls will be designed in accordance with the Transit New Zealand Bridge Manual.

Further design detail on retaining walls can be found within Technical Report 4, Volume 3.

6.2.9 Noise Attenuation

The guiding approach for acoustic design is to address appropriately the adverse effects of road-traffic noise.

Noise attenuation design has been carried out in accordance with:

- NZS 6806:2010 Acoustics – Road Traffic Noise – New and Altered Roads.

Noise attenuation through design is achieved through a variety of measures, some of which are proposed in combination with others:

- Low-noise generating road surfacing (e.g. OGPA);
- Noise barriers (including noise walls), although none are required for the Project;
- Property boundary noise fences; and
- Where it has not proven practicable to reduce external noise to the levels set out in NZS 6806 through other means, acoustic insulation for the internal habitable spaces of buildings where noise sensitive activities (such as sleep) will be affected.

Consideration of noise and vibration from road and rail traffic has included both the Expressway and local road changes and connections, and the realigned section of the NIMT. It is noted that even though the Expressway generally follows or is near to the existing SH1 corridor, in some locations such as through Ōtaki, there will be an increase in road traffic noise experienced at dwellings as a result of a road being closer to that dwelling than the SH1 currently is.

A detailed Acoustics Assessment has been competed for the Project. The assessment of noise effects and the proposed mitigation measures are summarised in Part G, Chapter 22 of this AEE report and detailed within Technical Reports 14 and 15.

6.2.10 Surface Drainage, Stormwater Treatment and Flood Management

Flood Management

Parts of the Project traverse low-lying areas. As highlighted in previous chapters, several of the watercourses that will be crossed by the Project flood from time to time, predominantly the Ōtaki River, and Waitohu, Mangapouri and Mangaone Streams. A key aspect of the Project's design has been to ensure that it will not increase the flood risk for the community from these waterways. In achieving this outcome, the Project has recognised and worked in with existing KCDC/GWRC flood management strategies.

The Project has been designed to accommodate the passing of floodwater. The Expressway has been designed around the 'lifeline' concept where the Expressway is constructed as a raised embankment across the several floodplain areas and is elevated sufficiently so that it can act as a lifeline and remain open in flood conditions. This

concept does, however, counter the philosophy of allowing a flood to break out of its primary watercourse and follow a natural flow path to the sea. The existing NIMT and SH1 already traverse several flood plains which provides good comparable information on the affects of flooding. Currently culvert systems, such as the culvert systems on the Mangapouri Stream associated with the NIMT and County Road crossings, are designed to restrict flood flows to protect downstream properties, and the Project's design would maintain this function.

In some places it has been necessary to provide areas of additional flood water storage. To mitigate against increased peak run-off associated with the Expressway surface, attenuation will be provided to hold back stormwater, avoiding downstream flooding. This will be provided through the construction of swales alongside the Expressway and will require the establishment of stormwater ponds in the form of wetlands or basins. The incorporation of culverts at both wet and dry flow points in the embankments throughout the Expressway allows for drainage of floodwaters over their natural flow paths.

Culverts and Bridges

Existing watercourses will pass under the Expressway either by way of a culvert or beneath a bridge, depending on the size of the watercourse. The locations of the bridges have been described in Table 6-1, and culverts are described more in Chapters 17 and 18. Provision for fish passage is proposed in accordance with GWRC guidelines.

Surface Drainage

The majority of the Expressway is to be drained using a swale system. As such, there are few physical drainage devices such as sumps and manholes proposed. Where these are required, they are generally restricted to local roads and interchanges.

Run-off from the Expressway will generally be allowed to flow down the grassed/planted slopes adjoining the carriageway and collected in a swale at the toe of the slope. In some locations space will be constrained, or barriers/walls will be positioned along the edge of the Expressway. In these locations sumps would collect the run-off and drain it to either pipes or swales.

Bridge deck drainage will generally be achieved by collecting run-off from the bridge deck and discharging into the adjacent drainage system at the ends of the bridge.

For further details on the drainage methodology refer to Technical Report 10.

Stormwater Treatment

Treatment of run-off from the Expressway has been designed in accordance with NZTA's Stormwater Treatment Standard for State Highway Infrastructure.

The scheme design makes significant use of swales and a limited number of ponds for dealing with stormwater and, as such, there is no need for many permanent erosion and sediment control measures. The swale system provides a significant amount of treatment.

A large portion of the permanent stormwater devices will be able to be used for stormwater control as they are constructed, reducing the need for temporary erosion and sediment control measures.

Treatment of stormwater will occur through a combination of swales along the edge of the Expressway and/or wetlands or basins. The swales will either be planted with native wet tolerant species in areas of peat, or grassed in areas of sand. Where it is more topographically or ecologically appropriate, wetlands are proposed to be used. These will treat the run-off for gross debris, suspended sediment, heavy metals and hydrocarbons. All stormwater treatment systems will include safe access for maintenance. Typically, a 5m maintenance margin is provided around wetlands or basins, with excavator access ramps also provided for cleaning out of the sediment.

Wetlands

As stated above, wetlands provide an important measure through which stormwater treatment and attenuation can be created for drainage systems. The Project incorporates the construction of a small number of stormwater wetlands for this purpose.

Some existing wet depressions close to the Expressway which will have once been wetlands would be restored to assist with stormwater management. Natural wetlands with high ecological value that are not affected by the Expressway will not be utilised for stormwater treatment purposes. Where additional wetlands are required, they have been designed to replicate, as far as possible, the hydrological function/regime of a natural wetland.

6.2.11 Culverts

Culverts are considered to be most appropriate for crossing all waterways, with the exception of the Ōtaki River and the Waitohu Stream. Culverts are provided for the smaller streams that are both wet and dry. Culverts are also incorporated into the Expressway embankment where natural flow paths would otherwise have been interrupted.

Fish passage is to be provided for all culverts that will contain surface water flows. Culverts that are installed for stormwater drainage are not required to provide fish passage as these are not in watercourses or environments where fish species are likely to be present.

A schedule of the culverts, including location, approximate length and approximate size, is included within Technical Report 10, Volume 3.

6.2.12 Cycleway and Walkways

Walking and cycling provision on local road bridges crossing the Expressway will vary. On local road bridge connections the kerb side traffic lanes will be 4.2m wide to provide adequate space for cycling in the traffic lane. In conjunction with this, a 2.5m shared use path will be provided on one side of the bridge. In certain locations a 1.5m pedestrian path has been provided on the other side of the bridge. Details of these facilities are indicated on the bridge plan set in Volume 5 of this AEE report.

Based on discussions with KCDC, equestrian use across bridge structures assumes that horse riders will either utilise the road shoulders, or dismount and walk horses along the footpaths.

It is anticipated that once the Project has been constructed the existing SH1 alignment will provide a more attractive route for pedestrians, cyclists and equestrians.

6.2.13 Urban Design and Landscaping

Urban design considerations for the Project include:

- Road alignment;
- Interchange location, type and design;
- Retaining walls;
- Bridges/underpasses placement and design;
- Noise barriers type (bund/wall), height and design;
- Pedestrian/cycle and bridleway links;
- Stormwater wetlands and basins, ponds and swales;
- Culverts;
- "Road furniture" (side and median barriers, lighting, signage); and

- Landscape treatment and planting.

Further details on urban design considerations for the Expressway are provided within the ULDF, Technical Report 23.

Landscaping and visual design objectives for the Project include:

- Enhancing and retaining views of significant landscape features;
- Incorporating ecological mitigation measures;
- Providing for mitigation associated with earthworks;
- Integration of Expressway with surrounding landform;
- Maintaining visual buffers;
- Assisting with stormwater treatments; and
- Reinforcing safety requirements.

Planting constitutes a key aspect of the urban design and landscape aspects of the Expressway.

Further details on landscaping and visual design are provided within Technical Reports 7 and 8, as well as within the plan set in Volume 5 of the AEE report.