# PP2O
# Draft Ecological Management Plan

*Peka Peka to North Ōtaki*

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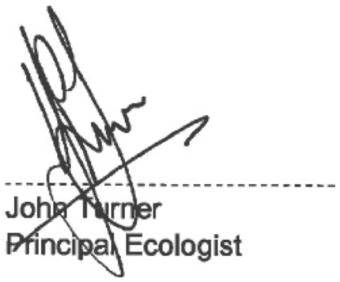

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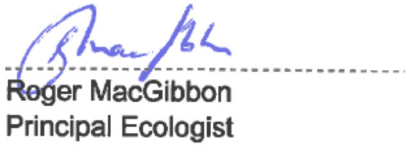

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# Contents

# 1 Introduction

## 1.1 Purpose

The purpose of this draft Ecological Management Plan (EMP) is to outline the approach to be adopted to ensure that the adverse effects of the Peka Peka to North Ōtaki Expressway Project (the Project) are avoided, remedied or mitigated and to fulfil the proposed resource consent conditions. It addresses all aspects of the Project's ecological management initiatives so consent agencies, design engineers and contractors know how the ecological effects of the Project will be mitigated and managed.

The proposed resource consent conditions for the Project stipulate the purpose of the EMP as being:

- to detail the ecological management programme that will be implemented to appropriately manage effects of the Project on the environment during the construction phase and once the Project is operational;
- to document the permanent mitigation measures, including the restoration, management and maintenance of ecological mitigation, as well as the mechanisms for developing relevant mitigation and restoration plans for terrestrial and freshwater habitat;
- to ensure that mitigation has been successful by establishing post-construction monitoring and response procedures; and
- to ensure that any long-term effects are appropriately managed through monitoring, adaptive management and implementation of appropriate responses.

This draft Ecological Management Plan (EMP) will form Appendix E of the Construction Environmental Management Plan (CEMP) for the Peka Peka to North Ōtaki Expressway (PP2O).

The EMP will be prepared by a suitably qualified ecologist. The EMP will be finalised in consultation with Ngā Hapū o Ōtaki.The final draft EMP will be lodged with Greater Wellington Regional Council (GWRC) for certification at least 15 working days before the commencement of work on the Expressway.

## 1.2 Scope

It is not intended that at this stage this draft EMP provide exhaustive and detailed coverage of all aspects of ecological management of the Project.

This EMP is a “working” document in the sense that it may be updated, even after it has been "finalised" and reviewed by the relevant Councils, so that it remains fit-for-purpose. Any such updates to the document would be limited solely to changes that preserve or enhance, from an environmental point of view, the measures used to address particular effects."

The proposed resource consent conditions for the Project require the EMP to:

- include information on how the following outcomes will be achieved:
    - minimise loss of valued vegetation and habitats (see sections 4.1 to 4.5 and 5);
    - minimise construction effects on freshwater bodies (see sections 4.4 to 4.8 and 5);
    - minimise effects on identified wetlands resulting from hydrological changes to water tables (see sections 4.4 and 5); and
    - minimise effects on fish and fish habitat during stream work (see sections 4.5 to 4.8 and 7);
- detail of habitat offset mitigation proposed (see section 6);
- include a Fish Rescue and Relocation Plan (see section 7);
- detail the ecological monitoring to be undertaken pre-construction, during construction, and post-construction (see section 8);
- detail the remedial/response and maintenance actions proposed (see sections 6 and 9);
- include a Revegetation and Mitigation Strategy (see section 10);
- detail the salvage of elements of any valued habitat of indigenous flora and fauna (including felled logs) that have been lost as a result of the Project where practicable, including provision for transfer of elements of the affected habitat to ecological mitigation sites (see section 11); and
- detail each new diversion channel. If full details are not available at t the time the EMP is submitted full details shall be provided in the relevant SSEMPs (see section 12).

This draft EMP has been compiled by John Turner of Opus International Consultants. John has also written the aspects of the EMP that relate to terrestrial and wetland ecology.

Aspects of the EMP that relate to freshwater ecology have been prepared by Scott Larned of NIWA.

# 2 Actual and potential adverse ecological effects of the Project

The key ecological sites referred to in this EMP are shown in Maps 1 to 9 which are in Appendix 1 of this report.

## 2.1 Potential adverse effects

There are a number of potential adverse ecological effects associated with the Project that will need to be avoided or minimised through suitable management and intervention, these are:

- damage to remaining areas of native bush habitat immediately adjacent to the Project footprint as a result of construction activities;
- edge effects due to the loss of bush from the edges of Hautere Bush F (Site C, Map 2, Appendix 1), Cottle's Bush (Site F, Map 2, Appendix 1) and bush to south of Te Hapua Road (Site I, Map 4, Appendix 1);
- potential loss of habitat and desiccation effect on peripatus (Site I, Map 4, Appendix 1);
- potential effects on the hydrology of the remaining part of the Ōtaki Railway Wetland (Site A, Map 1, Appendix 1);
- adverse effects on aquatic life due to sediment and contaminant discharges to watercourses during construction;
- adverse effects on fish passage during, and as a result of, construction activities; and
- impediment of fish passage by various new culverts installed along the Expressway.

## 2.2 Actual adverse effects where habitat rehabilitation will be required

Following construction of the Project c0.3ha of the c0.8ha Ōtaki Railway Wetland will remain (Site A, Map 1, Appendix 1). Habitat restoration is required post construction as set out in section 5.

## 2.3 Actual adverse effects where habitat offsets will be required

There are several locations along the alignment where loss of habitat could not be avoided or has been minimised to the extent possible, but there is a resulting residual loss of habitat. These are the:

- loss of c.0.5ha of habitat from the Ōtaki Railway Wetland (Site A, Map 1, Appendix 1);
- loss of habitat from the edges of three areas of native bush - Hautere Bush F (Site C, Map 2), Cottle's Bush (Site F, Map 2) and bush to south of Te Hapua Road (Site I, Map 4) - totalling c.0.5ha; and

- the loss of waterway habitat due to installation of culverts and stream diversions at various locations along the Project.

This loss of habitat will require the protection and enhancement of existing habitat or creation of new habitat to compensate for the loss as set out in section 6.

### 2.4 Direct Effects on Wildlife Resulting from Construction Activities and the Provisions of the Wildlife Act 1953

The nature of site clearance activities prior to construction (i.e. vegetation removal and soil stripping) means that there is a risk that some animals protected by the Act may be harmed in the process. The groups of animals at risk along the alignment are common non-threatened young native birds (in the nest during the breeding season) and non-threatened reptile species.

Given that effects on the populations of these species have been assessed as insignificant (Volume 3 of AEE, Technical Report No. 11) there is no necessity to avoid, remedy or mitigate effects under the provisions of the RMA. However, the provisions of the Wildlife Act 1953 apply to any killing of protected wildlife, even non-threatened species. A permit is therefore likely to be required from the Director-General of Conservation to undertake site clearance works in advance of construction which may kill individuals of a native bird or reptile species. The permit will be obtained in the normal manner before construction works commence.

## 3 Guiding Principles for Offsets

The Standard on Biodiversity Offsets published by the Business and Biodiversity Offsets Programme[1] (BBOP) in 2012 uses the following mitigation hierarchy as an approach to ecological mitigation (BBOP, 2012):

*"a. Avoidance: measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity.*

*b. Minimisation: measures taken to reduce the duration, intensity and / or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.*

*c. Rehabilitation/restoration: measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised.*

*d. Offset: measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored, in order to achieve no net loss or a net gain of biodiversity. Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation or averted risk, protecting areas where there is imminent or projected loss of biodiversity."*

[1] http://bbop.forest-trends.org/pages/mitigation_hierarchy

Depending on the nature of the works and the scale of effects some or all of the steps in the hierarchy may be applicable.

The Project has sought to avoid and minimise adverse effects during the design process such as realigning the highway to avoid significant sites and minimising the Project footprint when passing through significant ecological sites that could not be avoided. This draft EMP sets out how adverse effects of the Project can be further avoided or minimised by appropriate management during and after construction, and also the ecological offsets that are proposed where adverse effects cannot be avoided, minimised and/or rehabilitated or restored.

# 4 Avoiding and minimising potential adverse effects

## 4.1 Avoiding of Damage of Significant Ecological Sites Close to the Project Footprint

Where the Project passes through or close to areas of native bush it will be important to ensure that habitat loss is kept to a minimum and that any further unnecessary habitat damage is avoided (Sites C, D, F, G and I: Maps 2 to 4, Appendix 1).

A suitably experienced ecologist will be onsite during vegetation clearance at or close to these locations to ensure that native vegetation loss and damage is minimised. The ecologist will also be onsite during the fencing of the designation boundary again to ensure damage to habitat is minimised.

Effects on the remaining part of the Ōtaki Railway Wetland are dealt with in Section 5 below. Sites B (Map 2, Appendix 1), E (Map 2, Appendix 1) and Site J (Map 4, Appendix 1) will be totally lost to the footprint and further potential effects during construction are therefore not a matter of concern. Site H is of low ecological value and will be the location for wetland habitat creation.

## 4.2 Protection of Bush Edges from Wind-throw and Desiccation

The removal vegetation from the edges of areas of bush can result in indirect damage to the vegetation that remains: for example wind-throw of trees and desiccation leading to poor regeneration and stress on existing vegetation, as a result of greater exposure to the elements.

Where mature native trees are removed from the edges of Hautere Bush F (Site C, Map 2 , Appendix 1), Cottle's Bush (Site F, Map 2 , Appendix 1) and bush to south of Te Hapua Road (Site I, Map 4 , Appendix 1), wind breaks will be planted along the edge to provide protection. These will be dense plantings of early succession, wind tolerant species e.g. ngaio, kanuka, wineberry, *Pittosporum tenuifolium* and *Coprosma repens*. These will be locally sourced from the coastal zone to ensure that they are genetically adapted to salt and wind tolerance. Ideally the wind break should be at least 10m wide, where space allows. Where there is limited space within the designation to plant on flat ground the embankments of the road will be planted.

### 4.3 Minimising habitat loss and desiccation effects on peripatus

*Peripatus*, also known as velvet worm, inhabit damp, rotting timber, located in shady forests. Rotting timber in the Steven's bush (Site I, Map 4, Appendix 1), where peripatus was found, is close to the Project footprint and therefore could be directly affected by the Project. Even though the habitat is not directly affected the removal of vegetation cover in this location could expose the habitat to desiccation (drying out).

The site will be inspected and monitored *for Peripatus* by a suitably qualified ecologist prior to and during vegetation removal from the edge of this bush as set out in section 8.1.1. If *Peripatus* are identified within the area affected by the Project the response is set out in section 9.4.

### 4.4 Management of the hydrology of the remaining part of the Ōtaki Railway Wetland

The remaining part of wetland will continue to receive water from the catchment during rain events and ground water seepage from the north eastern corner of the wetland which will not be covered by the Project footprint. Low permeability soils will be used to create an impermeable zone between the wetland and the new Expressway embankment to prevent water from the wetland draining through the more permeable embankment materials. The remaining wetland area is therefore expected to continue to be permanently wet, although water levels may temporarily fluctuate during rain events. Water currently exits the wetland via a small surface channel at the southern end of the wetland. Once the Expressway is constructed water will exit the southern end of the remaining wetland via a culvert. The culvert will be positioned to ensure that the hydrological conditions of the remaining wetland area will be similar to those that exist in the wetland at the present time.

### 4.5 Sediment and contaminant management during construction

During construction, activities on and near stream banks and in channels (including the installation of culverts, bridges and fords) and stream-channel realignment, may increase fine-sediment and contaminant input through run-off, bank erosion and bank failure, as well as spills and leakage from stockpiles and vehicles (Chen et al. 2009). In addition to local sediments, potential contaminants include lubricants, engine oils, fuels, concrete, grout, detergent, paint, solvent, and metal, glass and wood debris (Eldin 2002). Liquid contaminants that reach streams may be rapidly transported downstream and/or into the underlying aquifers where removal or neutralisation is difficult or impossible. Construction vehicles in stream channels and the installation and use of temporary fords will alter natural substrate and mobilise fine sediment (Taylor et al. 1999). These potential adverse effects of construction on water quality and in-stream habitat will need to be prevented or minimised. The Draft Construction Environmental Management Plan (CEMP) addresses the potential effects of Expressway construction on waterways in the Project area.

The CEMP and the Erosion and Sediment Control Plan (ESCP) outline best management practices (BMPs) with respect to temporary construction activities. These standards and guidelines include the use of equipment such as sediment traps and silt barriers to minimise run-off and sediment from bare areas entering surface waters. In addition to BMPs for general construction activities, there are some specific actions required to protect the

waterways from the negative effects of construction. The following guidelines are proposed for inclusion in the CEMP:

- Areas of stream that are affected by culvert installation and temporary diversion to be block-netted upstream and downstream to keep fish out of the affected area;
- Discharge of construction materials and waste into storm drains or other pipes that discharge to stream channels to be prevented or minimised;
- Procedures to be put in place for preventing and cleaning-up contaminant spills before they reach waterways;
- BMPs for transport, storage and handling of petroleum products, paints, solvents, lubricants, cement, road aggregate and other construction materials and construction wastes to be applied;
- BMPs for sanitary waste facilities and collection to be applied;
- BMPs for construction vehicle fuelling, washing and maintenance to be applied;
- Contaminated soils (both pre-existing and construction related) to be removed or treated to prevent transport to streams;
- Work on stream banks and in channels to be minimised during periods of heavy rain;
- Paving and other operations that can produce contaminated run-off to be minimised during periods of heavy rain;
- Contaminated and/or sediment-laden water from dewatering operations to be treated before discharge to streams, or removed from the construction area; and
- Temporary channel-crossing structures (fords, culverts, bridges) to be designed to minimise erosion and impedance of flow. These structures are to be inspected after heavy rains and flow events for accumulations of debris, culvert blockage, channel scour, and bank erosion or failure. Maintenance of crossing structures will be undertaken by the contractor during construction. NZTA will have a global consent in place for on-going network maintenance as part of the operation of the SH network.

## 4.6 Protection of migrating fish during construction

In addition to potential effects on water quality and habitat, in-stream construction activities may impede migratory fish movements. There are two peak migration periods for fish species that occur in the Project area:

- Upstream migrations of juvenile shortfin and longfin eels, banded kokopu, short-jaw kokopu, torrentfish and koaro, and downstream migrations of redfin bullies peak in spring and summer; and
- Upstream migrations of redfin bullies and downstream migrations of adult eels, koaro, and torrentfish peak in autumn during freshes (short-duration, low-magnitude floods).

In addition to these peak periods, there are lower-intensity migrations occurring throughout the year.

In the intermittent streams, migration through the Project area is constrained to periods during which flow levels are high enough to allow fish passage. Temporary stream diversions, channel realignments and culvert and ford installation could create migration barriers, so construction schedules will consider peak migration periods. Where possible construction activities in intermittent waterways will be scheduled to be undertaken in dry and drying periods when fish passage is either not possible or is likely to be minimal. In perennial and near-perennial streams, in-stream construction activities that impede flow or fish movements will be concentrated into periods outside of the peak migration periods. Short-term in-stream works can be undertaken during migration periods, if few migratory native fish are present upstream and downstream of the construction site, and the fish present are collected and relocated, as specified in the Fish Rescue Plan (Section 7)..

Monitoring to identify effects of construction activities on aquatic ecosystems and to trigger remedial or mitigation responses if needed, is described in Section 8.2 below.

### 4.7 Treatment of road run-off

Road run-off has the potential to affect water and sediment quality with consequent adverse effects on aquatic life found in receiving waters below discharge points (Wong et al. 2000, Shaver and Suren 2011).

To address this issue the Project design includes vegetated attenuation swales and dry ponds to reduce or prevent the transport of contaminants from the road to waterways by physical and biological uptake and degradation. In all but the largest storms, all runoff from the Expressway will be treated in these attenuation systems. Details of the locations and designs of the attenuation systems are given in the stormwater report (Volume 3, Technical Report No. 10, Assessment of Stormwater Effects). Road runoff from the Expressway will be treated to meet the 2010 NZTA Stormwater Treatment Standard for State Highway Infrastructure[2].

### 4.8 Provision for fish passage in new culverts

It is assumed that each waterway that crosses the Expressway, and that drains a catchment extending from the coast to the Tararua foothills, is a migration route for one or more native fish species. The fact that most of the streams have intermittent reaches at SH1 does not preclude their use by native fish; migrations between upstream tributaries and the coastal plain must occur during flowing periods. These streams will require effective fish passage as part of Project mitigation (as identified in Table 1). In contrast, several waterways in the Project area are very short, and lack any connection to upstream tributaries or to the coast (either directly or via other waterways).

The schedule of culverts in Technical Report No. 10 (Volume 3) lists 31 new culverts, of which 23 will cross the Expressway or railway, and 21 of these will be in the waterways that occur within catchments that extend between the coast and the Tararua foothills. The 21 culverts in waterways are summarised in Table 1. The estimated total length of culverts in waterways is 1143 m. Some of the new culverts will replace existing culverts under SH1, so the net increase in waterway culverts will be less than 1143 m.

[2] http://www.nzta.govt.nz/resources/stormwater-management/stormwater-management.html

In addition, two new culverts are to be installed in the Railway and Kennedy wetlands; these have a combined length of 92 m. The wetland culverts and 15 of the culverts that will cross the Expressway or the railway will be designed for fish passage (Table 1).

The culverts that will not be designed for fish passage are in waterways lacking upstream and/or downstream connectivity as discussed above; these culverts are for flood conveyance. The Ōtaki River and Waitohu and Mangaone Streams will be crossed with bridges, which will not create migration barriers.

Fish passage will be designed to be suitable for the local suite of migratory fish, under a range of flows (e.g., the 10$^{th}$ to 90$^{th}$ percentile flow for each stream). At least five catchments in the Project area are inhabited by native fish with moderate to low climbing ability, and fish passage designed for non-climbers or poor climbers will be required at the Expressway crossing points. Culvert dimensions, grades, inverts, and improvements for fish passage (e.g., baffles, aprons, resting pools) will be in accordance with the guidelines developed for New Zealand fish species (Boubée et al. 1999, 2000, Stevenson and Baker 2009).

Details of appropriate culvert and fish passage designs are given in Technical Report No. 10 in Volume 3. Design features include embedding the culvert inverts, provision of low flow channels, and increasing the roughness of the low flow channel by using angular rock substrate. In the absence of complete knowledge of the migratory fish that pass through the Project area, fish passage will be designed to accommodate species with poor climbing ability and non-climbers.

Lengths of culverts, diversions and other works are from the culvert schedule in Technical Report No. 10 (Assessment of Stormwater Effects). The length of riprap and other works at each site was estimated as the difference between total disturbed length and the sum of the culvert and diversion lengths. Six culverts will function only for water conveyance and flood control, and no fish passage measures are planned due to the lack of upstream or downstream connectivity.

**Table 1: Culverts for waterways in the Peka Peka to North Ōtaki Project area, and lengths of channel alteration.**

| Culvert name | Culvert length (m) | Fish passage | Diversion length (m) | Riprap, other works (m) | Total disturbed (m) |
|---|---|---|---|---|---|
| Greenwood Culvert | 25 | Yes | 0 | 30 | 55 |
| Waitohu Tributary Culvert | 40 | Yes | 0 | 20 | 60 |
| Mangapouri Culvert at Expressway | 60 | Yes | 0 | 40 | 100 |
| Mangapouri Culvert at NIMT | 20 | Yes | 0 | 40 | 60 |
| Racecourse Culvert | 100 | No | 120 | 0 | 220 |
| Te Roto Culvert | 40 | No | 0 | 25 | 65 |
| Mangaone Culvert at link road east | 16 | Yes | 0 | 19 | 35 |
| Mangaone Culvert at Expressway | 50 | Yes | 0 | 30 | 80 |
| Mangaone Overflow Culvert | 50 | No | 0 | 0 | 50 |
| School Rd Culvert at link road (east) | 16 | No | 400 | 4 | 420 |
| Gear Culvert at Gear Road | 20 | Yes | 120 | 10 | 150 |
| Gear Culvert at Expressway | 40 | Yes | 40 | 10 | 90 |
| Settlement Heights Culvert | 40 | Yes | 110 | 20 | 170 |
| Coolen Culvert | 40 | Yes | 0 | 4 | 44 |
| Avatar Culvert | 60 | No | 0 | 4 | 64 |
| Edwin Culvert | 100 | Yes | 95 | 5 | 200 |
| Jewell Culvert | 120 | Yes | 0 | 20 | 140 |
| Cavallo Culvert | 80 | Yes | 230 | 10 | 320 |
| Cording Culvert | 70 | No | 0 | 5 | 75 |
| Awatea Culvert | 68 | Yes | 0 | 22 | 90 |
| Kumototo Culvert | 88 | Yes | 0 | 27 | 115 |
| **Total** | **1143** | | **1115** | **345** | **2603** |

Monitoring to ensure that fish passage through Expressway culverts is appropriately provided and maintained is described in Section 7.2 below.

# 5 Restoration of the remaining part of the Ōtaki Railway Wetland

Approximately 0.3ha of the existing Ōtaki Railway Wetland will remain once the Expressway has been constructed (see Map 5, Appendix 1). This residual area of wetland will continue to receive water from the catchment during rain events and ground water seepage in the north eastern corner of the wetland which will not be covered by the Project footprint. This remaining wetland is expected to be permanently wet, with water draining out via a culvert from its southern extremity.

The part of the wetland that will remain has been affected by human activity and is under pressure from weed invasion. It would benefit from full restoration following construction. A detailed plan for this restoration will be developed as part of the landscape detailed design and specification. The landscape plans are shown in Volume 5 and they identify the intent of the project landscape outcomes. An ecologist will provide input to the plan and provide advice on weed removal and post restoration weed control, re-contouring that may be beneficial and replanting requirements. The ecologist will also advise on species selection which is expected to focus on the main species already present in the wetland including:

- *Carex geminata*
- *Carex virgata*
- *Carex secta* Purei
- *Cordyline australis* Cabbage tree
- *Eleocharis acuta* Spike rush
- *Eleocharis gracilis* Slender spike-sedge
- *Isolepis prolifer*
- *Typha orientalis* Raupo

Kapungawha *Schoenoplectus tabernaemontani* has previously been recorded in the wetland, although was not recorded as part of the Project ecological assessment. This species may also be included as part of the mix of plants used.

A critical part of the restoration of this wetland will be management of the hydrological state of the remaining wetland as described in Section 4.4 above.

# 6 Habitat offsets

## 6.1 Wetland Habitat Creation

To offset the loss of wetland habitat from the Otaki Railway Wetland (c.0.5ha) it is proposed to create two new areas of wetland. It is proposed to aim for a compensation ratio of 2:1 with 2 areas creased for every 1 lost. The two new areas will be the Kennedy Wetland (c.0.4ha – see Map 5, Appendix 1) and a new area of wetland adjacent to the Mary Crest bush (c.0.7ha – see Map 6, Appendix 1). The cumulative area of these two wetlands is c.1.1ha. The Kennedy Wetland will receive water from outflow of the remnant of the Ōtaki Railway Wetland. This is expected to provide permanent flow through the Kennedy Wetland and keep this wetland permanently wet.

It is proposed to create the new area of wetland adjacent to the Mary Crest bush in an area that is currently damp pasture. The area is low lying and the plant species present indicate high water content in the soil or high water table. It is proposed to increase the wetness of the area by digging down into the water table. By doing this it is expected that conditions will be created where native wetland plant species can be introduced and wetland habitat

created. The area where it is proposed to create the wetland slopes gently from east to west. Consequently a low bund with impermeable lining may be required around the western edge of the wetland to assist in water retention. A weir is likely to be required to control water outflow from the wetland.

Exact replication of the existing vegetation communities of the Ōtaki Railway Wetland within the new wetlands is not a realistic objective due the high degree of variability of composition within the wetland. Nor is it necessarily a desirable objective given substantial influence of human activities in determining the present species and composition of the vegetation within the Ōtaki Railway Wetland. A more realistic objective is to create wetland conditions suitable for the key species present in the Ōtaki Railway Wetland. The species used in the creation of these new wetlands will be as per those specified for the remnant of the Otaki Railway Wetland in Section 5 above, with the addition of flax *Phormium tenax* to the species mix.

Over a period of time these species will find their own compositional equilibrium. Plant material will be salvaged from the Ōtaki Railway Wetland prior to construction or obtained from nursery plant stock grown from locally sourced seeds. Inclusion of shallow open water with deeper water zones (up to 1.5m) in the Kennedy Wetland and the wetland proposed at Mary Crest would also create habitat diversity in the wetland that would be attractive to waterfowl.

A suitably qualified ecologist will guide the design of the wetlands, supervise their construction and planting and develop the maintenance and monitoring programme. Management of water levels will be essential during the period of plant establishment to maximise survival.

## 6.2 Compensation for Native Bush Loss

There are two options by which the loss of native bush from Hautere Bush F (Site C, Map 2, Appendix 1), Cottle's Bush (Site F, Map 2, Appendix 1) and bush to south of Te Hapua Road (Site I, Map 4, Appendix 1) could be mitigated:

- Protection and enhancement of an existing area of native bush; and/or
- Planting new areas of bush.

### 6.2.1 Protection and enhancement of an existing area of native bush

There are a number of existing areas of native bush in the vicinity of the Expressway that are under threat from grazing and/or plant and animal pests. In some cases the remaining areas of bush are unlikely to survive in the long-term without intervention. This is especially true where regular grazing by domestic animals takes place. In these stands of bush, no natural regeneration takes place and as mature trees die they are not replaced. Over time, that bush disappears. By fencing and covenanting such areas to ensure long-term protection, the long-term viability of such areas can be significantly enhanced, particularly when supported by plant pest removal. However, protecting existing areas of bush will require agreements to be made with landowners and this cannot be guaranteed.

A compensation ratio of 2:1, as a minimum, has been chosen in this case to reflect the compromised condition of the bush and the likelihood of on-going degradation in the absence of intervention. An area of bush with potential for long-term protection has been identified close to the Project corridor that supports habitat very similar in character and condition to much of the area of bush that is being lost to the Project footprint. Negotiations are on-going to try to secure this area of bush for protection. If agreement is secured with the land owner it is proposed to covenant the bush to provide long-term protection. This will ensure that it remains fenced from stock. It is also proposed to undertake planting of suitable edge and sub-canopy tree and shrub species around the edge of the bush and in gaps in the canopy within the bush interior to provide a "kick-start" to the regeneration process. This will be supported by a 3 year weed control and maintenance programme.

A suitably qualified ecologist will advise on species selection for the edge and sub-canopy, planting method and oversee the planting. Timing will be an important consideration on this site with autumn rather than spring planting essential given the free draining, drought prone soil conditions. The ecologist will also develop the maintenance and monitoring programme.

### 6.2.2 Planting new areas of bush

If the protection of an existing area of bush cannot be achieved, an area has been identified adjacent to the existing Mary Crest bush, and within the designation, where new bush habitat can be established by planting (Map 6, Appendix 1). In this case a minimum compensation ratio of 3:1 has been chosen. This takes account of the extended timeframe which is required for the new bush habitat to develop significant ecological values (50 to 100 years), comparable to those being lost. However, the ratio also recognises the fact that areas of bush affected by the Project are not pristine habitat and much of that lost is severely threatened by on-going grazing. The new area of bush by contrast will be within the designation, which will provide long-term protection from adverse effects such as grazing.

Most of the bush lost (>80%) is from Hautere Bush F (Site C, Map 2, Appendix 1) and Cottle's Bush (Site F, Map 2, Appendix 1) which are located on lowland river terraces where the soils are free draining and prone to summer drought. Totara and titoki which tolerate dry summer conditions are dominant species in this zone. The bush to the south of Te Hapua Road (Site 1, Map 4, Appendix 1) is located seaward of the edge of the river terraces in the lee of the stable coastal dunes.

The Mary Crest site, where it is proposed to plant native bush if a suitable area of existing bush cannot be secured, is also located on the seaward edge of the river terraces with the stable dunes system that extends along most of the Kapiti Coast. Within the site are dunes characterised by free draining sand with thin soils and dune hollows where peats are present but which are also influenced by deposition from streams flowing through these low lying areas. The character of the forest that can be established in this location is more varied than that lost. The presence of both drier stable dunes and low lying wetter areas means that areas of forest dominated by totara and titoki can be created and also areas favoured by kahikatea and pukatea. Establishment of the forest would require a staged approach as certain species such as titoki and pukatea are vulnerable to frost in the absence of shelter. The drier areas, including lower slopes of the road embankment, would

be planted with totara, kanuka *Kunzea ericoides*, karamu *Coprosma robusta*, taupata *Coprosma repens* and mahoe *Melicyus ramiflorus*. Low lying damp areas will be planted with kahikatea, flax, cabbage tree, mingimingi *Coprosma propinqua* and manuka. These areas will need to be kept free from weeds for a period of five years, or until monitoring indicates that the area should be self-sustaining, usually indicated by a closed tree and shrub canopy. In year three frost sensitive species; titoki, pukatea and kohekohe will be planted into the appropriate zone.

A suitably qualified ecologist will develop the habitat creation plan and advise on species selection, planting method, vegetation zoning, weed control and develop the maintenance and monitoring programme.

## 6.3 Waterway habitat loss and alteration

This section outlines the proposal for offset mitigation for the loss and alteration of stream channel habitat. The goal of the proposal is to substantially improve the ecological condition of existing waterways that will cross the Expressway, through the enhancement of at least 2,601 metres of channel on both banks, as specified in Table 2. Mitigation actions consist of riparian retirement, planting riparian buffers, and fencing.

**Table 2: Linear mitigation requirements for disturbed waterway lengths in the Project area.**

| Waterway | Ecological value | Compensation ratio | Total disturbed (m) | Mitigation required (m) |
|---|---|---|---|---|
| Mangaone Stream | High | 2 | 115 | 230 |
| Mangapouri Stream at Expressway | Moderate | 1.5 | 160 | 240 |
| Settlement Heights Stream | Moderate | 1.5 | 170 | 255 |
| Jewell Stream | Moderate | 1.5 | 140 | 210 |
| Kumototo Stream | Moderate | 1.5 | 115 | 172.5 |
| Greenwood Stream | Low | 0.7 | 55 | 38.5 |
| Waitohu Tributary Stream | Low | 0.7 | 60 | 42 |
| Racecourse Stream | Low | 0.7 | 220 | 154 |
| Te Roto Stream | Low | 0.7 | 65 | 45.5 |
| Railway Wetland | Low | 0.7 | 95 | 66.5 |
| Kennedy Wetland | Low | 0.7 | 20 | 14 |
| Mangaone Overflow | Low | 0.7 | 66 | 46.2 |
| School Stream at Link road | Low | 0.7 | 520 | 364 |
| Gear Stream at Gear Road | Low | 0.7 | 240 | 168 |
| Coolen Stream | Low | 0.7 | 44 | 30.8 |

| | | | | |
|---|---|---|---|---|
| Avatar Stream | Low | 0.7 | 64 | 44.8 |
| Edwin Stream | Low | 0.7 | 200 | 140 |
| Cavallo Stream | Low | 0.7 | 320 | 224 |
| Cording Stream | Low | 0.7 | 75 | 52.5 |
| Awatea Stream | Low | 0.7 | 90 | 63 |
| **Total** | | | **2834** | **2601** |

In order to maximise the ecological benefits, it is proposed that mitigation activities focus on creating relatively large, long riparian buffers on a small number of waterways that currently have moderate to high ecological values. The emphasis on a few large projects in lieu of many small projects is consistent with mitigation strategies for the MacKays to Peka Peka and Transmission Gulley sections of the RoNS Wellington Northern Corridor. Based on this approach four waterways have been targeted for riparian restoration planting (Table 3):

- Mangaone Stream – east and west of the expressway (Map 7 , Appendix 1);
- Settlement Heights – one section of stream (Map 8 , Appendix 1);
- Jewell Stream – 1 section and (Map 9, Appendix 1) and
- Mary Crest – three sections of stream (Map 9 , Appendix 1)

**Table 3: Locations and sizes of proposed riparian buffers. Buffer widths refer to each bank.**

| Location | Buffer length (m) | Buffer width (m) |
|---|---|---|
| Mangaone Stream (east of Expressway) | 600 | 20 |
| Mangaone Stream (west of Expressway) | 1100 | 5-20 |
| Settlement Heights Stream (east of Expressway) | 520 | 20 |
| Jewell Stream (east of Expressway) | 160 | 20 |
| Mary Crest Stream (west of Expressway) | 340 | 20 |
| **Total** | **2720** | |

The total proposed length of riparian planting exceeds the total mitigation required in Table 2. This is because, as shown in Table 3, the proposed buffer distance along the southern bank of the Mangaone Stream west of the Expressway is 5m (due to the presence of Te Horo Beach Road near to the south bank of Mangaone Stream). Therefore extra length of riparian planting has been added to compensate for this reduced buffer width.

The plant species selection will be based on species listed in Technical Report No. 8 in Volume 3 (Landscape and Visual Assessment) and in the GWRC Wellington Regional Native Plant Guide[3]. The final selection of species will be undertaken by an ecologist with riparian restoration expertise. The ecologist will also advise on planting method, vegetation zoning, weed control and develop the maintenance and monitoring programme. The riparian planting will also be overseen by the ecologist.

# 7 Fish Rescue and Relocation

A Fish Rescue and Relocation Plan will be developed by a suitably qualified fish biologist to guide all work in any permanent or intermittent water body (including the Ōtaki Railway Wetland) that is to be diverted or reclaimed (including temporary diversion for culvert placement).

The Fish Rescue and Relocation Plan shall include details of fish and crayfish rescue and relocation techniques to be used, including (but not limited to):

- the species to be captured and transferred;
- placement of appropriate screens to stop fish migrating back into the reach to be diverted while the rescue operation is being carried out;
- the use of fish capture methods and period of capture effort;
- the methods of transfer proposed for the species captured;
- the location and use of holding (refuge) pools within the stream reach to be diverted prior to undertaking the stream diversion works;
- the method of draining the water body to ensure maximum fish rescue;
- the methods of rescue (and transfer) from the pool refuges for any fish or crayfish remaining following fish capture; and
- the methods to record, count, and measure all fish and crayfish species caught and transferred.

The Fish Rescue and Relocation Plan shall be Appended to this EMP and provided to the GWRC as part of this EMP.

[3] http://www.gw.govt.nz/native-plant-guide

# 8 Monitoring

## 8.1 Native bush and wetlands

### 8.1.1 Monitoring of *Peripatus*

As set out in section 4.3, the Steven's bush (Site I, Map 4, Appendix 1) will be inspected and monitored for *Peripatus* by a suitably qualified ecologist prior to and during vegetation removal from the edge of this bush. Prior to this EMP being submitted to the Environmental Manager at GWRC (Manager) the EMP shall be updated to set out methodologies and practices for this monitoring. If *Peripatus* are found in the area to be disturbed by the Project the response is set out in section 9.4.

### 8.1.2 Monitoring of mitigation and offsets

Monitoring of native bush and wetlands will primarily focus on ensuring that mitigation and offsets are successful. In this respect the sites will include:

- planted exposed edges of Hautere Bush F, Cottle's Bush and bush to south of Te Hapua Road;
- the restored remnant of the Ōtaki Railway Wetland;
- the two new wetland areas – the Kennedy Wetland and the wetland at Mary Crest;
- the area of bush identified for protection and enhancement, if this offset option is adopted; and
- the area identified for bush habitat creation at Mary Crest, if this option is adopted.

The monitoring of these areas will be undertaken by an ecologist on at least a bi-annual basis and will focus on the following:

- the success of plant establishment, identifying specimen failures requiring replacement;
- surveillance for invasive weeds and reporting on necessary weed control;
- hydrological conditions within the wetland areas;
- Determining the point where late successional species can be introduced to the bush areas at Mary Crest; and
- Attainment of a state where the planted bush at Mary Crest will be self-sustaining.

Monitoring of these sites will be for 3 years, except for the area of bush created at Mary Crest, which will be for a period of five years.

### 8.1.3 Surveillance of weeds within the Project footprint

Two significant conduits for weed species already exist close to the Project: the existing road corridor and the railway corridor. The Project is therefore not expected to present any greater risk as a conduit for weeds than the existing infrastructure corridors. However,

during construction and also before and during the establishment of landscape planting and treatments, there is a significantly higher risk of weed establishment. Weed control will be part of the landscape specification and on-going maintenance plan for the road corridor to be developed during the later stages of the Project i.e. detailed design phase and thereafter.

## 8.2 Freshwater environments

### 8.2.1 Pre-construction monitoring

Pre-construction monitoring will be required for 6 months within the Project area to develop turbidity trigger levels against which construction effects can be evaluated as set out in the conditions and the EMP. Turbidity is a useful variable for indicating episodes of elevated suspended sediment associated with earthworks and waterway diversions. The focus on turbidity is consistent with the Transmission Gully and McKays to Peka Peka Projects. The reason for compiling pre-construction turbidity data is to determine the natural range of variation, and to develop statistical correlations between turbidity at sites upstream of the Project area and corresponding sites within the construction areas. By knowing these correlations prior to construction, trigger levels can be defined in terms of turbidity in the construction areas relative to “background” turbidity upstream.

Six-month turbidity logger deployments are proposed for the each of the four major waterways in the Project area, Ōtaki River and Waitohu, Mangapouri and Mangaone Streams. The locations of these sites will be included within the EMP prior to it being submitted to the Manager. Comparable turbidity measurements for the remaining, highly intermittent waterways in the Project area are not proposed for two reasons. First, the low frequency of flowing periods means that it would take far longer to compile enough data for robust correlations for the intermittent waterways than for the perennial and near-perennial streams. Second, turbidity in intermittent waterways is strongly affected by the duration of flowing periods and the flow magnitude, which confounds relationships between sites.

### 8.2.2 Construction-phase monitoring

Water quality and biota need to be monitored in waterways during the construction phase to ensure that construction activities are not having adverse effects on aquatic ecosystems. This monitoring should take place in phase with construction activities, i.e., when construction is underway near a major waterway, the waterway should be monitored until the construction is complete.

Construction monitoring should be carried out at the Ōtaki River and Waitohu, Mangapouri and Mangaone Streams, and at one of the intermittent waterways in the moderate ecological-value class (i.e., Jewell, Kumototo or Settlement Heights Streams) during periods when flowing water is present. The intermittent waterway selected for construction monitoring should be the one with the greatest frequency of flow, to facilitate monitoring schedules. The frequencies of flow at these three waterways should be determined by visual assessment during the pre-construction phase.

*Turbidity monitoring*

Turbidity will be used as the sentinel for monitoring construction effects on waterways, and trigger levels for construction effects will be based on turbidity. The proposed trigger level is a 50% or greater increase in turbidity (as nephelometric turbidity units (NTU)) between upstream and downstream monitoring sites, when the downstream turbidity exceeds 5 NTU (see section 9.1 below).

At the Ōtaki River and Waitohu, Mangapouri and Mangaone Stream sites, turbidity will be continuously monitored (as it is during the pre-construction period). At the chosen intermittent waterway (one of Jewell, Kumototo or Settlement Heights Streams) this monitoring will not have occurred in the pre-construction period. This monitoring will involve telemetered turbidity sensors and loggers installed, operated and maintained upstream and downstream of the proposed discharge points to the waterways. The proposed locations of the loggers will be included in the EMP prior to it being provided to the Environment Manager at GWRC (Manager). The locations of these sites shall be chosen to avoid other potential sources of sediment interfering with the results of monitoring.

The purpose of the turbidity monitoring is to continuously monitor sediment discharges from works areas into the 5 waterways until the relevant earthworks areas are stabilised.

The turbidity data shall be monitored by the consent holder on a daily basis (including weekends and holidays). The continuous telemetered turbidity loggers shall have a rainfall induced alert (alerting a cell phone number) of 7mm/hr so as to ensure the logs are checked where rain events occur. The 7mm/hr alert may be revised as more specific information becomes available, in consultation with the Manager.

As noted above, continuous turbidity monitoring will not take place at the fifth, intermittent waterway.

*Other variables to be monitored*

Fine sediment deposits and oil-and-grease will be monitored monthly, and aquatic macroinvertebrates and fish will be monitored quarterly. In addition, spot monitoring will be triggered by unscheduled events such as spills and construction accidents. Details of monitoring variables and their purposes are set out below.

- Fine sediment deposits. Fine sediment deposition resulting from construction activities poses a risk to aquatic ecosystems. Fine sediment deposition can be measured rapidly in the field. Procedures for monitoring fine sediment deposition and guidelines for interpreting the measurement data have been developed for New Zealand streams (Clapcott et al. 2011). These procedures and guidelines are for “hard-bottomed” streams with gravel, cobble, and boulder-dominated beds such as the Ōtaki River and Waitohu Stream. The same procedures and guidelines will be updated for soft-bottomed streams such as Mangapouri Stream and set out in the EMP before it is submitted to the Manager.

- Oil and grease. Oil and grease from construction equipment can harm aquatic organisms, but they are not detected by turbidity loggers. Therefore, regular grab sampling and analysis is required. Standard procedures will be used for oil-and-

grease sample collection (ASTM 1980), and the samples will be analysed by a certified analytical laboratory.

- Aquatic macroinvertebrates. Invertebrate monitoring should consist of replicate samples collected using the Ministry for the Environment standard protocols for semi-quantitative sampling in hard and soft-bottomed streams (Protocol C1 and C2; Stark et al. 2001). Invertebrate samples will be processed using the standard protocols for fixed counts (Protocol P2; Stark et al. 2001). The data from these samples will be suitable for calculating QMCI and other invertebrate metrics.

- Fish. Fish monitoring will follow the standardised electric fishing protocol that has been developed for estimating the diversity and relative abundance of fish species in New Zealand waterways (David et al. 2010).

Construction effects on the above ecological variables are to be identified on the basis of comparisons between sites upstream of and within or immediately downstream of the construction sites on the 5 waterways (4 stipulated and one chosen as set out above). The upstream and downstream sites used for ecological monitoring on the Ōtaki River and Waitohu, Mangapouri and Mangaone Streams should be the same areas used for pre-construction turbidity monitoring. A fifth pair of upstream and downstream sites will need to be established at the selected intermittent waterway.

The data from the monthly measurements of fine sediment deposits and oil and grease should be provided to NZTA within 1-2 weeks of collection to enable remedial or mitigation measures in cases of water quality degradation.

Further details about construction monitoring for these other variables will be set out in the EMP prior to it being submitted to the Manager.

### 8.2.3 Post-construction monitoring

Post-construction monitoring is recommended for a two-year period to ensure that water quality, biotic communities, fish passage are not adversely affected by Expressway operation. Monitoring of the constructed wetlands for three years after they are completed is recommended to confirm that the wetlands achieve a level of aquatic ecological value equal to that of established wetlands. Finally, monitoring of the planted riparian buffers for three years after planting is recommended to ensure that plants have established and are not being replaced by non-native plant species. The individual monitoring variables and monitoring aims are set out below.

*Waterway monitoring*

The post-construction monitoring should take place at the same five waterways listed above for construction monitoring, using the same paired sites. The site-pairs will continue to serve as control-impact sites for identifying Expressway effects. Quarterly monitoring of fine sediment deposits, aquatic macroinvertebrates and fish should be sufficient for detecting Expressway effects, if any occur. The two-year period should be followed by a review to determine whether remedial measures are needed, or continued monitoring is necessary.

Such details will be set out in the EMP before it is submitted to the Manager. Monitoring methods should be identical to the methods listed above for construction monitoring.

Inspection of the 15 fish-passage culverts by an ecologist one and four years after installation is required. Inadequate culvert maintenance is considered a major cause of fish passage problems. Regular culvert inspection and maintenance is recommended in virtually all fish passage guidelines (e.g., Boubée et al. 1999, Stevenson and Baker 2009). These visual inspections are set out in the conditions. The inspections will focus on aspects such as debris and sediment blockage and erosion and scouring.

After the four-year inspection, on-going visual inspections of the 15 fish passage culverts should be linked to the maintenance programme and aimed at removing obstructions, preventing scour and bank erosion, and repairing structures as necessary. This will be set out in the EMP prior to it being submitted to the Manager. Culvert inspection and maintenance will be included in the NZTA global consent for ongoing network maintenance as part of the operation of the State highway network.

*Wetland monitoring*

Aquatic ecological conditions need to be monitored at the constructed Kennedy and Mary Crest wetlands for three years after their completion to ensure that the wetlands achieve a level of aquatic ecological value equal to that of established wetlands. Aquatic invertebrates are the most practical component of these ecosystems for monitoring, as invertebrate communities reflect the integrated effects of hydrological conditions, water quality and habitat suitability. It should be noted that precise relationships linking wetland invertebrate communities to specific environmental factors are lacking, but invertebrate data from the new wetlands can be used for comparisons with established wetlands in the region (Suren and Sorrell 2010). Wetland invertebrate monitoring should consist of quarterly replicate samples collected using a standardised method, such as the timed kick-net sampling method in Suren et al. (2011b).

Further details about wetland monitoring will be set out in the EMP prior to it being submitted to the Manager.

*Planted riparian buffer monitoring*

The planted riparian buffers used for offset mitigation require biannual maintenance and inspection for three years after planting. The buffers will be checked for dead or diseased plants, proliferations of weeds and insect pests and broken fences. Maintenance will consist of plant replacement, weed cutting, fence repair and insect control. A three-year period of weed control is often needed before planted riparian buffers consisting of New Zealand native plants are self-sustaining (Porteous 1993).

Further details about riparian buffer monitoring and maintenance will be set out in the EMP prior to it being submitted to the Manager.

# 9 Remedial/response actions

## 9.1 Turbidity levels

Turbidity trigger levels will be established on the 4 major waterways (Ōtaki River and the Waitohu, Mangapouri and Mangaone streams) following the 6 month pre-construction monitoring set out in section 8 above. The pre-construction monitoring will establish baseline turbidity levels. Turbidity monitoring will continue during construction of the Project in all waterways within which works are occurring or ongoing. The proposed trigger level is a 50% or greater increase in turbidity (as nephelometric turbidity units (NTU)) between upstream and downstream monitoring sites, when the downstream turbidity exceeds 5 NTU.

Should the turbidity monitoring trigger be exceeded the following responses will be implemented:

- within 24hrs of the 50% threshold breach, carry out and record in writing a full audit of the condition of all erosion and sediment control measures within the earthworks area discharging to the monitored waterway;
- remedy any causes on site that may have contributed to the 50% threshold breach as soon as practicable, and record what remedial measures were undertaken;
- notify the Manager by email within 1 working day of the 50% threshold breach, including providing details of the percentage change in turbidity and any remedial measures taken;
- if the NTU threshold remains generally elevated above 50% for more than 48hrs, then macro-invertebrate sampling shall be undertaken following Protocols C1 or C2, as set out in Protocols for Sampling Macro-invertebrates in Wadeable Streams, MfE 2001(for hard and soft-bottomed streams, respectively) within 2 working days at upstream and downstream sites agreed to by the Manager. For known discharge points, these shall be specified in the EMP prior to it being submitted to the Manager. All laboratory analysis of these samples shall include a full macro-invertebrate count;
- within 10 working days of the collection of the macro-invertebrate samples, a report shall be provided to the Manager which has been prepared by a suitably qualified and experienced aquatic ecologist, and which includes the following:
    - the results of the macro-invertebrate sampling;
    - the causes of the discharge, the response to remedy the cause and measures proposed to avoid a recurrence of this cause;
    - an assessment undertaken by a suitably qualified and experienced aquatic ecologist which details whether the following thresholds have been exceeded:

- a decline in the Quantitative Macro-invertebrate Community Index (QMCI) score of 1.5 or greater from the corresponding upstream monitoring site or baseline monitoring scores; or
- a decline of greater than 20% in sensitive invertebrate taxa (in this case taxa with a QMCI score of ≥ 5) compared to the upstream monitoring site or baseline monitoring scores; and

- mitigation works will be undertaken, which may include raking or other sediment clearance procedure. As part of the report required above the consent holder shall, in consultation with the Manager, detail what mitigation measures are proposed and the timeframes for implementing these. The consent holder shall implement the mitigation measures approved by the Manager. These measures shall be implemented to the Manager's satisfaction and within the timeframe specified by the Manager.

### 9.2 Exceedances of other monitored aquatic ecology variables

If the limits established for monitoring in section 8 above for the following matters are exceeded:

- fine sediment deposits;
- oil and grease;
- aquatic macroinvertebrates; and
- fish,

then the response set out in section 9.4 shall be implemented.

### 9.3 Triggered event monitoring – oil spills and construction accidents

In the event of oil spills and/or construction accidents in which contaminants are discharged to water, or to land in a manner that may enter water, sampling of potentially affected waterways, both immediately upstream and downstream, shall be undertaken as soon as reasonably practicable and the response set out in section 9.4 shall be implemented. Sampling methodology for the most likely contaminants will be included within the EMP prior to it being submitted to the Manager.

### 9.4 *Peripatus* mitigation

As set out in sections 4.3 and 8.1.1, if monitoring the affected part of the Steven's bush (Site I, Map 4, Appendix 1) identifies the presence of *Peripatus* then:

- If the footprint is likely to directly affect logs inhabited by peripatus or if the logs are likely to be exposed to desiccation due to the removal of tree cover, these will, with the land owner's permission, be moved further into the bush. In addition, a few sections of tree trunk from trees felled along the Project will be placed, again with the land owner's permission, within the remaining bush adjacent and to existing rotting timber currently

inhabited by *Peripatus*. This will provide future habitat for the species as they start to decay.

- If it is not possible to move the logs further into the bush in this location then they will be moved into the nearest area of available bush inhabited by *Peripatus*, where access can be gained for this purpose. While in transit measures will be taken to ensure that the habitat does not dry out. Additional sections of trees removed from the Project footprint will also be undertaken at this new location to provide future habitat for the species.

Prior to this EMP being submitted to the Manager the EMP shall be updated to set out methodologies and practices for this mitigation.

## 9.5 Remedial/mitigation actions

In the event that any ecological or management trigger level within this EMP, or associated water quality site monitoring limits within the ESCP, is exceeded during or post-construction, and the provisions of section 9.1 do not apply, then the following actions shall be implemented, in consultation with the Manager:

- notify the Manager of the exceedance within 1 working day of the exceedance being identified.
- investigate a plausible cause-effect association with the Project. If the adaptive management trigger level exceedance is not assessed (by a suitably qualified and experienced ecologist) to be attributable either partially or fully to the Project, the consent holder shall not be held liable for any remediation or mitigation measures.
- should the exceedance be linked either partially or fully to the Project, the following steps shall be undertaken by the consent holder:
    - notify the Manager of the causes of the exceedance within 5 working days of identifying the exceedance;
    - within a timeframe approved by the Manager, identify the on-site practice that is generating the effect;
    - implement measures necessary to prevent future exceedances and to alter the operational measure in consultation with the Manager;
    - remedy or mitigate the effects of the exceedance which have been approved by the Manager;
    - obtain certification of any necessary amendments to management plans or other documents and obtaining any necessary resource consents;
    - undertake further monitoring approved by the Manager to assess the effectiveness of the measures implemented to avoid, remedy or mitigate the exceedance and cause of the exceedance; and

- In the event that the measures implemented to avoid, remedy or mitigate the effects of the exceedance or cause of the exceedance actions are unsuccessful, in the opinion of the Manager, the consent holder will implement appropriate remedial actions and further monitoring within a timeframe and which have been approved by the Manager and obtain necessary resource consents for those measures; and

- provide a written report to the Manager within 10 working days of each exceedance which includes details of the exceedance, reasons for the exceedance and measures implemented in responses to the exceedance.

### 9.6 Revegetation remedial actions

At the completion of the maintenance period for each revegetation and mitigation area as set out in the Revegetation and Mitigation Strategy (see section 10) a suitably qualified ecologist shall carry out a full review of the success of the revegetation in that area. The results of the review shall be provided to the Manager for certification:

- that the revegetation has met the requirements of the EMP; and/or

- to identify any remedial actions that need to be carried out.

Where any remedial actions are required, a programme and description of remedial actions shall be provided to the Manager for certification. These actions shall be carried out as soon as practicable having regard to weather and appropriate planting seasons.

## 10 Revegetation and Mitigation Strategy

Prior to the EMP being submitted to the Manager the EMP will be updated to include, as an appendix, a Revegetation and Mitigation Strategy will be prepared to cover each of the following areas:

- the exposed edges of Hautere Bush F, Cottle's Bush and bush to south of Te Hapua Road;

- the restored remnant of the Ōtaki Railway Wetland;

- the two new wetland areas – the Kennedy Wetland and the wetland at Mary Crest;

- the area of bush identified for protection and enhancement if this offset option is adopted;

- the area identified for bush habitat creation at Mary Crest if this option is adopted; and

- riparian planting along the Mangaone, Settlement Heights, Jewell and Mary Crest streams,

The Revegetation and Mitigation Strategy shall include, for each area:

- plans and locations of the area(s) to be protected, fenced, revegetation, and maintained;
- full details of the proposed revegetation and mitigation including: fencing requirements; planting plans; timing of planting; spacing of planting; species schedules and eco-sourcing of plants; planting preparation procedures;
- the maintenance requirements, including ongoing pest/weed control; and
- the monitoring requirements (as set out in sections 6 and 8 above).

The maintenance period for each area shall be a minimum of 3 years (except for the area of bush created at Mary Crest (if that option is chosen) which shall be maintained for a period of 5 years) which shall commence from the time planting (or fencing if the offset protection and enhancement option is chosen) is undertaken in each area.

# 11 Salvage of flora and fauna

As mentioned in sections 4 and 6 above, there is the potential to salvage and relocate flora and fauna affected by the Project. The rescue of fish during stream diversions and/or reclamations is set out in section 7.

Salvage and relocation of flora and fauna will be identified in this section in detail prior to submission to the GWRC. However, such salvage and relocation could include:

- the salvage and use of felled timber trees by Ngā Hapū o Ōtaki;
- the relocation of logs from areas to be cleared for the Project to [Site I, Map4) to enhance the habitat for *Peripatus* (velvet worm);
- the relocation of suitable wetland flora from the Ōtaki Railway Wetland to the newly created wetlands (and the Ōtaki Railway Wetland remnant) if material is suitable for salvage and replanting;
- the relocation of suitable flora from areas to be cleared for the Project to the proposed riparian planting area and/or landscape planting areas if suitable material is found and relocation deemed to be worthwhile.

The EMP will be updated prior to submission to the GWRC to detail the salvage and relocation processes to be implemented if any salvage and/or relocation is used during constructing the Project and mitigating its effects.

# 12 Details of each new diversion channel

## 12.1 Diversion channel details

Full details of each new diversion channel will be added to this section of the EMP. If full details are not available at the time the EMP is submitted full details shall be provided in the relevant SSEMPs.

## 12.2 Mudfish surveys

Prior to the commencement of any stream diversion work in affected waterways, surveys of brown mudfish will be carried out by a suitably qualified ecologist (who has prior experience with mudfish surveys).

These surveys will include (subject to the length of affected waterway being long enough to contain the stated number of traps), at a minimum, the setting in appropriate mudfish habitat of 20 fine meshed (4mm) gee-minnow traps and six fine meshed (4 mm) fyke nets over 2 consecutive nights at each stream site to be surveyed. Fyke nets will contain a "large fish exclusion" compartment. Where site conditions preclude carrying out the method detailed above, suitable alternatives will be discussed with the Manager. Full details of the proposed mudfish survey methodology shall be submitted to the Manager for certification prior to undertaking the survey. The survey shall be carried out in accordance with the certified methodology. Mudfish that are located in the surveys will be transferred to safe locations in the same waterway prior to commencement of work. Transfer procedures will be set out in the Fish Rescue and Relocation

Results of the mudfish survey will be provided to the Manager within 10 working days following completion of the data collection and will inform the fish transfer requirements (as set out in the Fish Rescue and Relocation Plan) for the diversion.

Results of mudfish surveys will be included in the EMP prior to the EMP being supplied to the Manager for certification.

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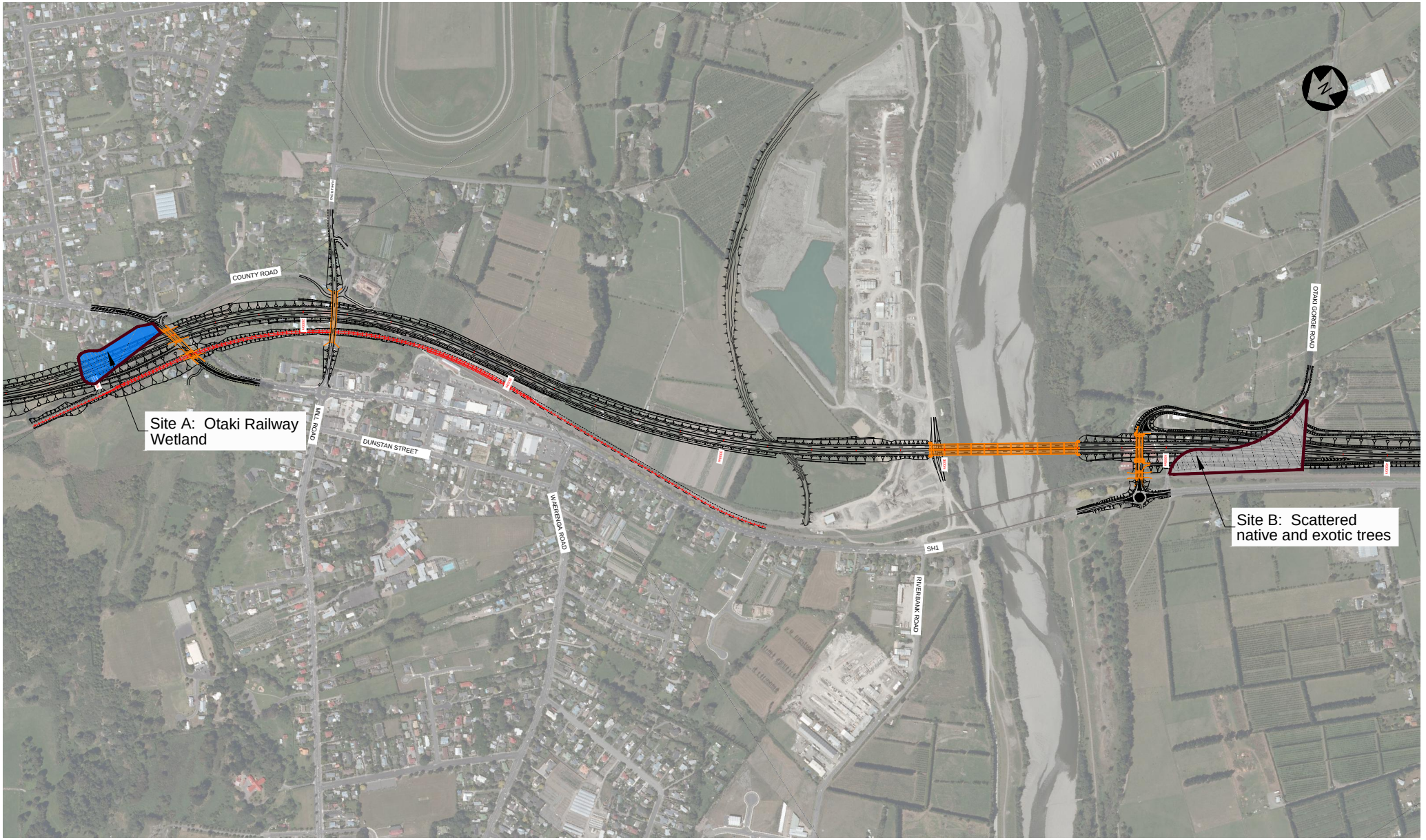
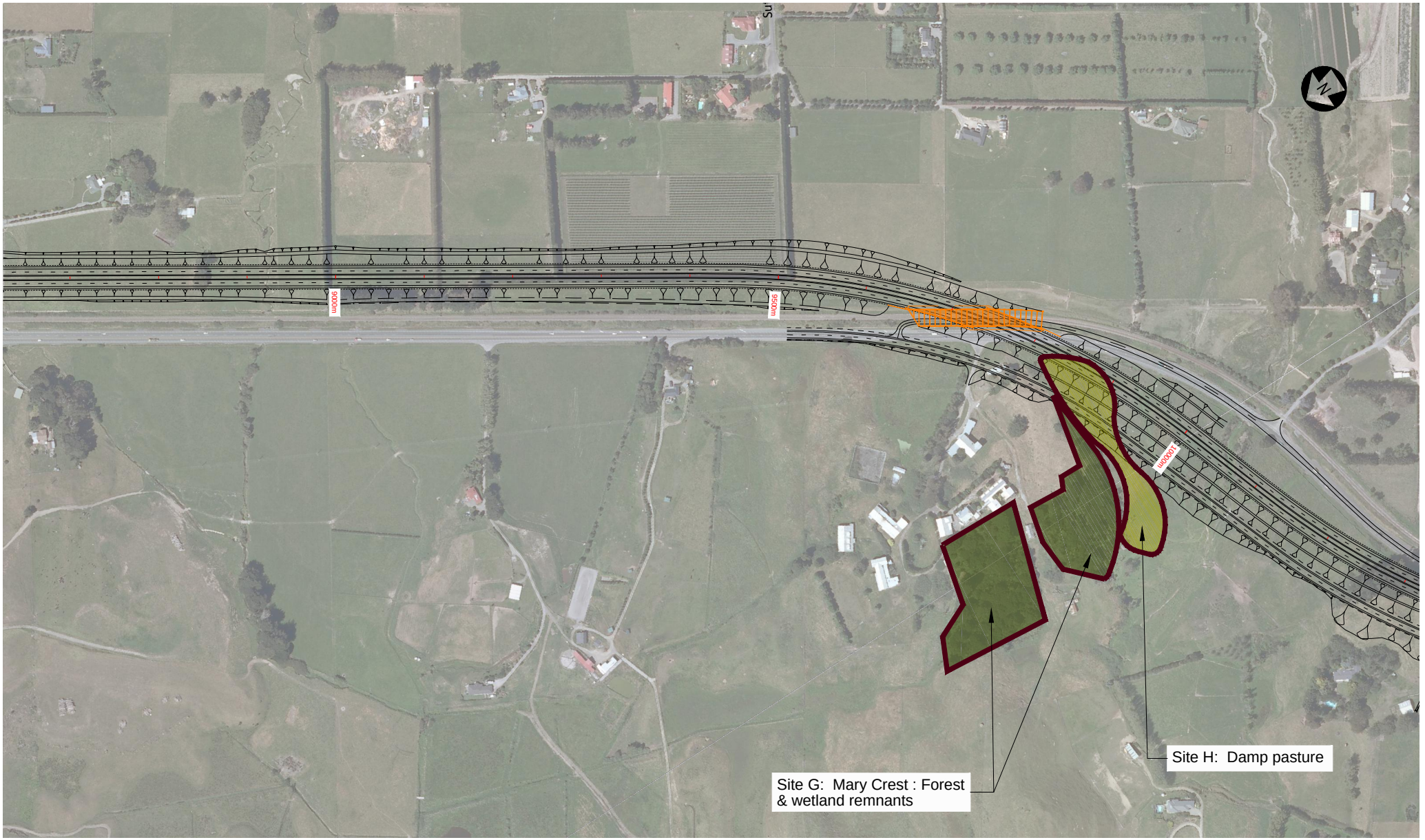
# Appendix 1: Maps



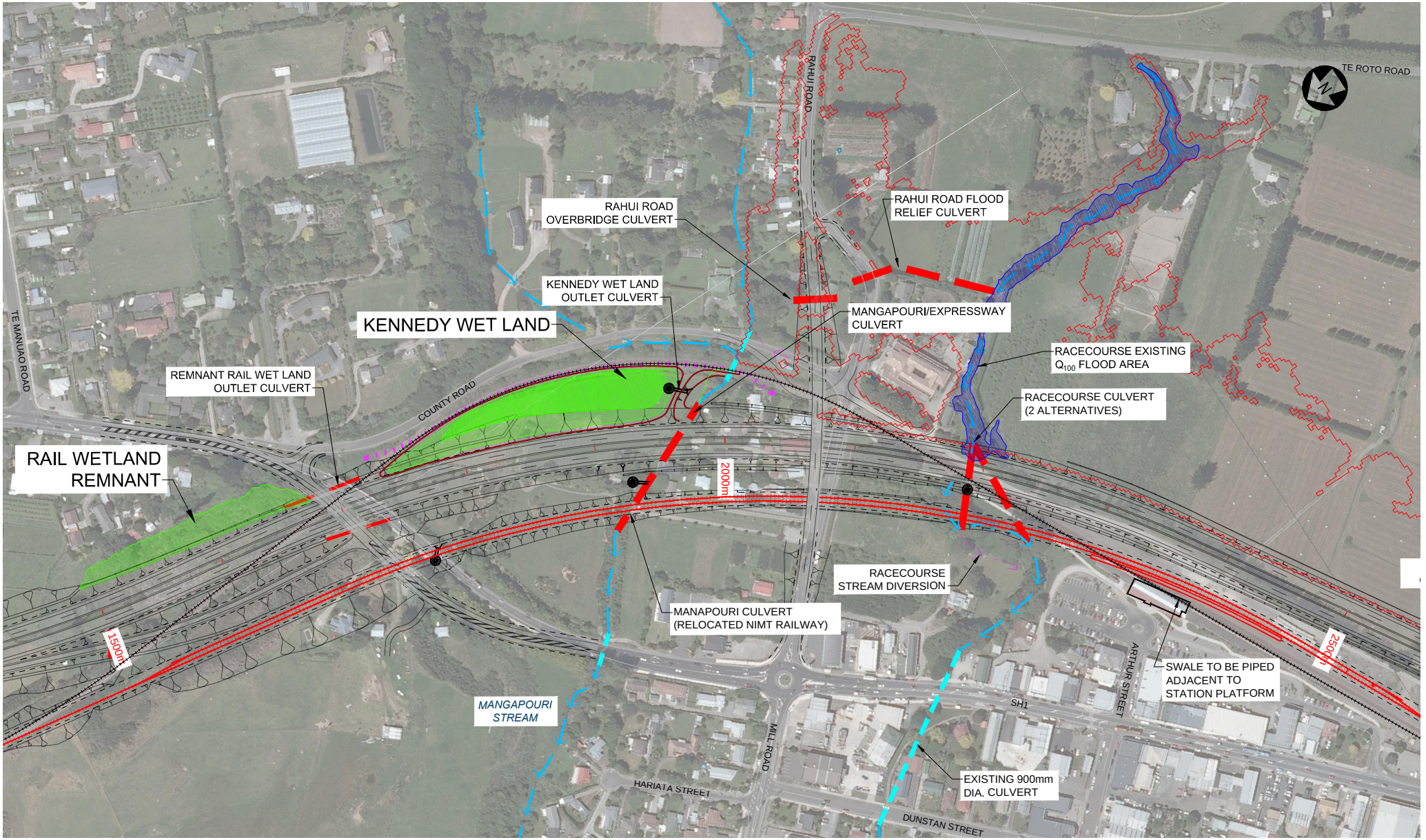

MAP 1 PP2O Peka Peka to North Otaki - Terrestrial Ecology Assessment : Key ecological features along the alignment


MAP 2 PP2O Peka Peka to North Otaki - Terrestrial Ecology Assessment : Key ecological features along the alignment

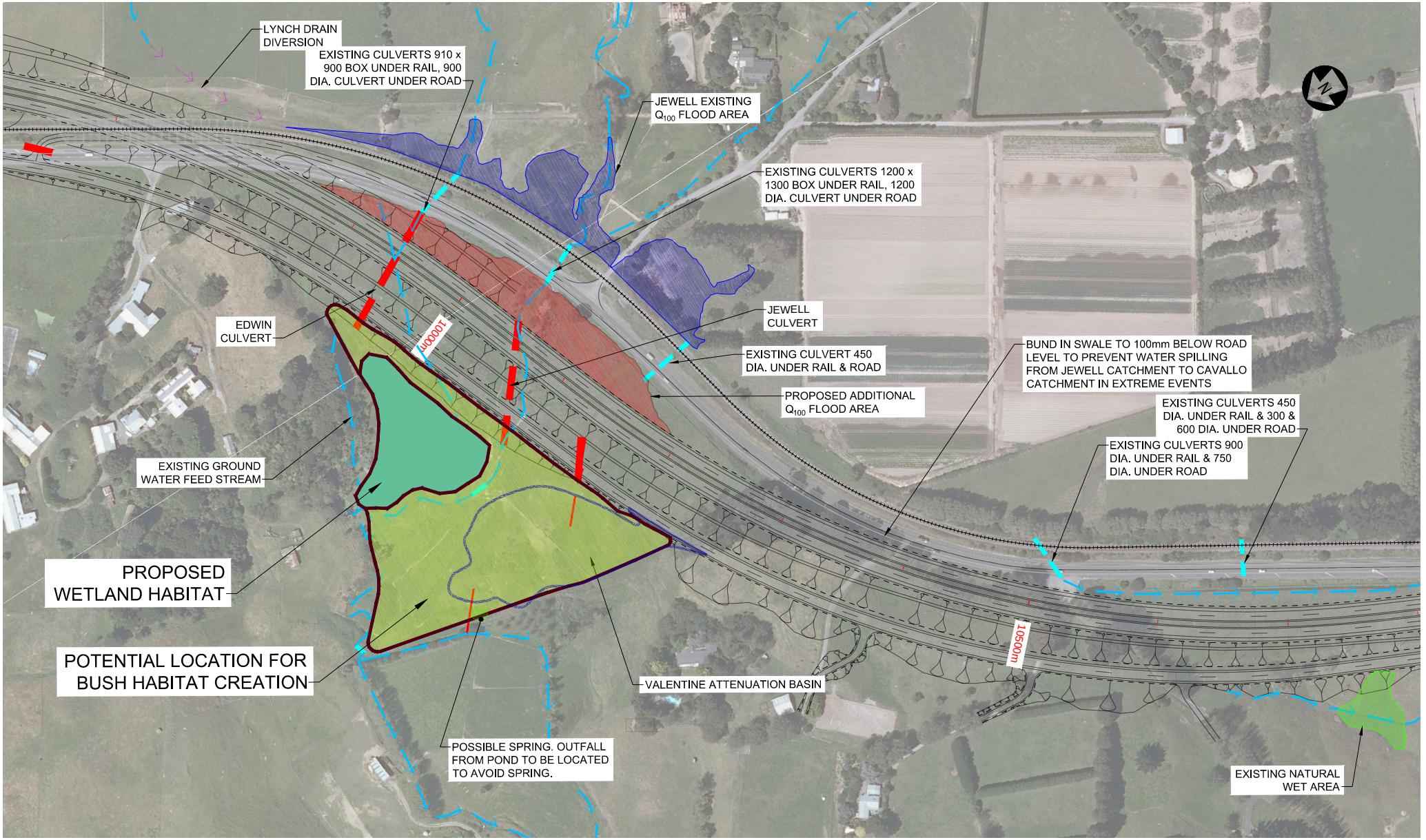



MAP 3 PP2O Peka Peka to North Otaki - Terrestrial Ecology Assessment : Key ecological features along the alignment

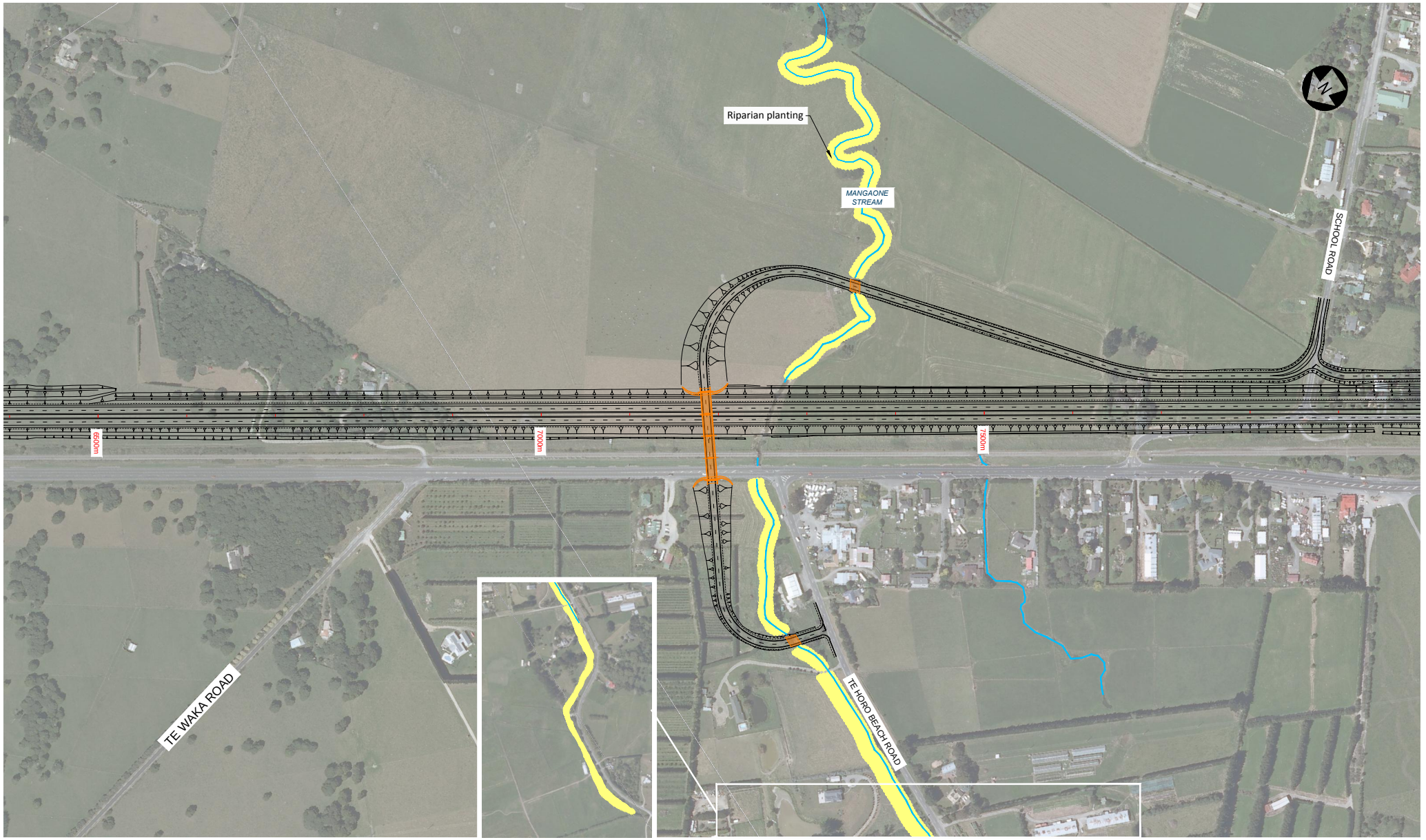

MAP 4 PP2O Peka Peka to North Otaki - Terrestrial Ecology Assessment : Key ecological features along the alignment




MAP 5 PP2O Ecological Mitigation - Locations of Rail Wetland Remnant and Kennedy Wetland

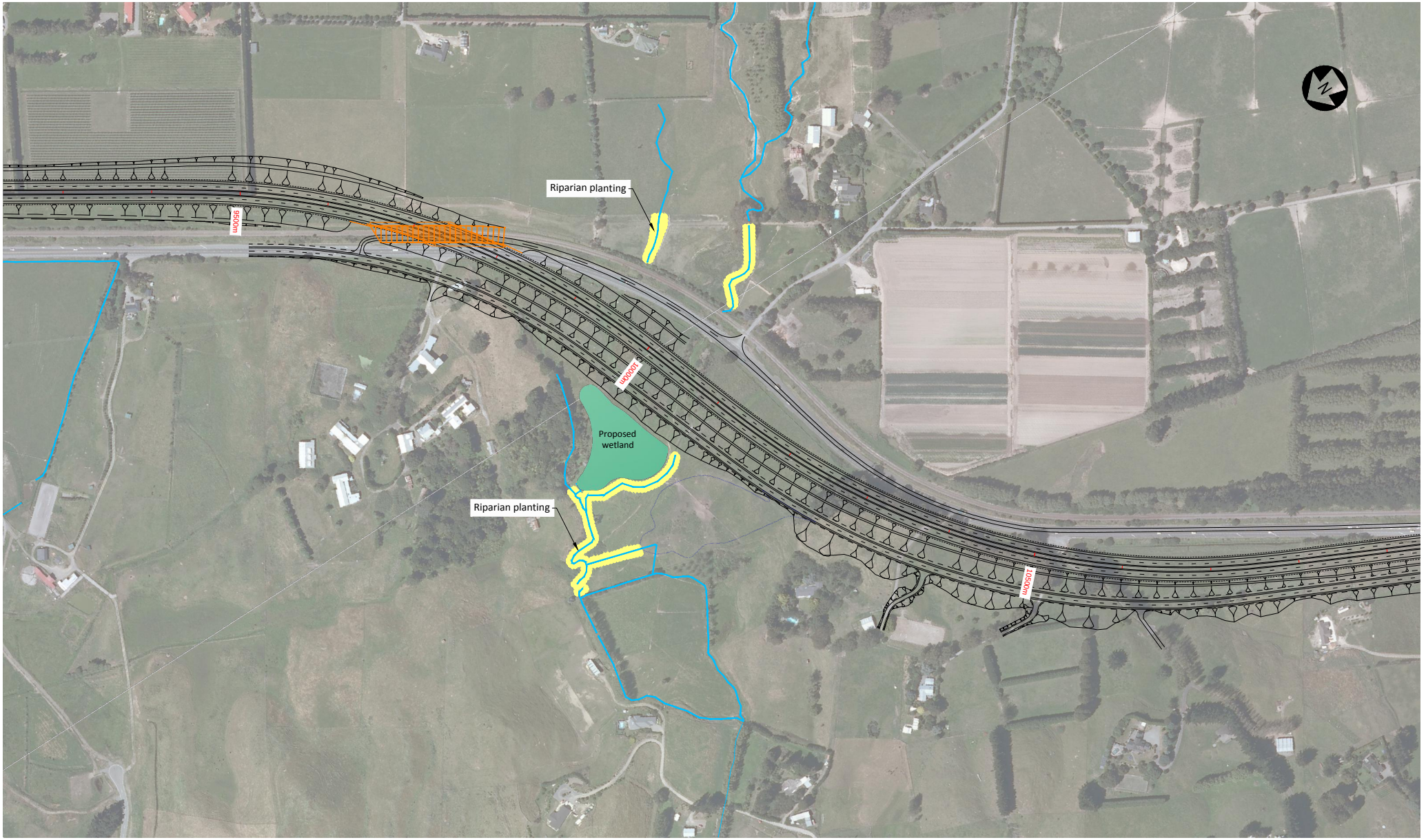



MAP 6 PP2O Ecological Mitigation -Wetland habitat to be created and potential bush offset habitat




MAP 7 PP2O Peka Peka to North Otaki - Terrestrial Ecology Assessment : Riparian Enhancement Zone - Mangaone Stream


MAP 8 PP2O Peka Peka to North Otaki - Terrestrial Ecology Assessment : Riparian Enhancement Zone - Settlement Heights




MAP 9 PP2O Peka Peka to North Otaki - Terrestrial Ecology Assessment : Riparian Enhancement Zone - Jewell & Mary Crest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