

WHAKATAUKI
PLACEHOLDER

to be confirmed with
mana whenua partners

**Me tangata te whenua
Kia māori te whenua
Kia māori te whakaaro
Me noho tangata whenua ngā mātāpono
Tū ai te tangata, Tū ai te whenua, Tū ai te Wai**

**Treat the land as a person
Let it be its natural self
Normalise māori values
Embed the principles in all things
Elevate the status of the people, land and water**

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1. Introduction



Chapter Overview

This chapter sets out the purpose, core principles and process used to develop the cultural environmental design framework (CEDF) for the Ōtaki to North of Levin Highway project (Ō2NL/Ō2NL Project). It provides an overview of the transport problem, objectives for the project and the design concept, along with references to national guidance, and background documents, as integrated throughout the CEDF.

Waka Kotahi, as a Crown entity, is committed to partnership-based approach with tangata whenua that reflects the principles of Te Tiriti o Waitangi. With our project partners, Muaūpoko and hapū of Ngāti Raukawa ki te Tonga, we have worked together on the development of the Ōtaki to North of Levin Highway Project. Waka Kotahi acknowledges the inalienable connection our iwi and hapū partners have to the waterways, whenua and each other within Horowhenua.

Waikawa Beach
[<https://www.flickr.com/photos/tomraven/2893539543>]

1.1 Overview.

Ōtaki to North of Levin Highway project (Ō2NL project/project) is the final 24km northern-most section of the Wellington Northern Corridor.¹ The alignment follows the toe of the Tararua foothills through Kāpiti and Horowhenua Districts, passing to the east of Levin and connecting north of the town centre on SH57—to Papaioea/Palmerston North- and the existing SH1—to Bulls.

The project incorporates a Cultural and Environmental Design Framework (CEDF) that has been developed in partnership with mana whenua and following discussions with councils and stakeholders, through a series of consultation workshops. The CEDF sets out the overarching (core) design principles and vision that will be applied to the final design of the project.

The CEDF is consistent with the form and content of the preliminary Urban and Landscape Design Guidelines and New Zealand Transport Agency (NZ Transport Agency) Landscape Guidelines.

Please Note: Place names used in this document are generally consistent with the NZ Geographic Board. Alternative names and spelling (for example Koputaroa) represent our current understanding of names that are also relevant to those placed. It is recognised that there may be other relevant place names and also that there are other areas where different and, or multiple place names are known and acknowledged by iwi. This will be an important matter to consider in following stages, as a legacy for the Project. Amongst other methods, the mahi toi strategy proposed can be used to bring the names together, in a joined up narrative.

In keeping with the project principles, every attempt has been made use te reo māori correctly and as a priority. Further, the maps and diagrams are set to a ki uta ki tai, maunga to moana alignment; as a deliberate expression, to normalise Te Ao Māori.

Purpose

This consenting stage CEDF will continue to be expanded and refined throughout the life of the project. This consenting stage, *CEDF* provides a framework within which the proposed project will be developed through detailed design. It identifies the core design principles, constraints and opportunities and how anticipated outcomes could be realised, to guide design development.

This consenting stage CEDF describes the design concepts of the project and complements the Design and Construct Report.

The overarching purpose of the Cultural and Environmental Design Framework² is to **integrate** the design elements of the Ō2NL project in response to **context** and agreed **principles** and design **outcomes** that flow from this. Te Ao Māori³, mātauranga māori⁴ and te mana o te wai⁵ are placed at the centre of the design framework. Therefore, the challenge for the project, in achieving its objectives⁶, is to look for all opportunities to ‘first do no harm’ and to let the whenua and the awa be its natural self.

The CEDF gives effect to NZ Transport Agency (Waka Kotahi) planning guideline requirements and the partnership of the project between Waka Kotahi and Muaūpoko and Ngāti Raukawa. It is a living document, that will be developed through the life of the project, as it is relevant to:

- **Consent Design and the Assessment of Environmental Effects, the AEE (2022) CEDF**
- **Detailed Design (2024) Final CEDF**



Sections 1-3 of this document- the Overview, Setting and Design Principles- set the foundations for the project. Section 4, Design Response, has been included for specific elements following partner and specialist input, to assist in the development of the design of the project. This explains how design issues might be resolved in accordance with the design principles; what needs to be considered to confirm the design and to finalise the CEDF prior to construction.



Core Principles

Through the partnership process, core (overarching) principles have been developed that flow from Te Ao Māori cultural values. These values define the foundation for interaction between those working on the project and for the relationship between the project team, the project itself, and the natural world.

The values endorsed within the partnership include:

- **Te Tiriti** (spirit of partnership)
- **Rangātiratanga** (leadership—professionalism—excellence)
- **Ūkaipotanga** (care—constructive behaviour towards each other)
- **Pukengatanga** (mutual respect)
- **Manaakitanga** (generosity – acknowledgement—hospitality)
- **Kaitiakitanga** (environmental stewardship)
- **Whanaungatanga** (belonging—teamwork)
- **Whakapapa** (connections)



Through the partnership process, the core (overarching) principles developed for the project and the CEDF are to:

- **Tread Lightly, with the Whenua***
 - Me tangata te whenua (treat the land as a person)
 - Kia māori te whenua (let it be its natural self)
- **Create an Enduring Legacy**
 - Kia māori te whakaaro (normalise māori values)
 - Me noho tangata whenua ngā mātāpono (embed the principles in all things)
 - Tū ai te tangata, Tū ai te whenua, Tū ai te Wai (elevate the status of the people, land and water)

Other principles that are aligned, and should be considered along with the core are:

Rongomau—'to make peace' also referencing healing - rongoā

Haumanutanga—referencing safety, recovery, restoration; the process to ensure these things.

Wairuatanga—relating to the need to consider the mauri of the whenua and the wai; the process to ensure this and bring this together in an holistic way.

Together, the values and core principles form the **vision** for the project. They bring a focus on a CEDF and design response (and assessment, procurement, construction and ongoing management) for positive, measurable outcomes; *to preserve, restore, enhance and create by treading lightly with the whenua and through enduring legacy.*

Waka Kotahi's policies, and specific design principles for landscape and urban design support these principles.

* tread lightly, with the whenua aligns with 'first do no harm'. It does not imply 'do minimum. For example, the opportunities and outcomes to restore the streams will mean a bold approach.

Process

The CEDF brings together the contextual aspects of the project's design and approvals phases and provides a strategy to achieve the project's intended built environmental and cultural outcomes through construction and ongoing management.

The CEDF includes and expands on those matters addressed in Waka Kotahi Urban and Landscape Design Frameworks ('ULDF')⁷ with overall outcomes set for the landscape and highway (land within the proposed designations or managed for the purpose of the project⁸) and specific elements or components of the project. This integrates matters from all other design disciplines such as ecology, archaeology, heritage, transport and engineering.

The title, **Cultural and Environmental Design Framework**, is significant. This places Te Ao and Mātauranga Māori and Te Mana o te Wai at the centre of the project, and the way in which the framework outcomes have been developed and then expressed in the design. It reflects the partnership role that Muaūpoko and Ngāti Raukawa play in this project and the cultural interests and values of those iwi and how they are expressed in the design, procurement, construction and ongoing management of the project.

This version of the CEDF is for the Resource Management Act consenting phase of Ō2NL and contains concepts sufficient to inform the specialists assessment of effects and the future detailed design stage of the project.

The CEDF is a "live" document (and so remains a draft), with the principles and partner feedback, including through a 'traffic light' Design Audit (attached as Appendix 1), being used to help develop and then evaluate each of the design iterations to date. It will develop beyond the consenting phase, becoming progressively more detailed in the procurement and final detailed design versions. It will be embedded, via consent conditions and procurement requirements, in construction, operation and ongoing maintenance through construction documentation, management plans and audit processes.

Overview.

Cultural and Environmental Indicators and Concepts

The cultural and environmental indicators for the project will where practicable seek to integrate RMA, Waka Kotahi policies and Te Ao Māori concepts, values and principles. Working in parallel, these indicators will where practicable seek to support the statutory requirements, and core principles for the project. As a starting point, with guidance to be developed in the next stage of the CEDF, the cultural and environmental indicators & concepts for the project will flow from mātauranga māori:

- **Hauora/Waiora**—is a Māori philosophy of health and wellbeing that extends to all aspects of life. It comprises taha tinana (physical wellbeing), taha hinengaro (emotional and mental), taha whanau (social well being), and taha wairua (spiritual wellbeing)
- **Mana whenua**—the concept of mana whenua is a key to understanding the environmental management philosophies of Māori. Mana whenua as defined by the Resource Management Act (1991) as the customary authority exercised by an iwi or hapū in an identified area. It is the authority to control and manage a traditional area or resource in relation to prescribed customary and cultural practices. The authority is obtained through the relationship of the people and their ancestral connection to the land
- **Manaakitanga**—is the way in which care, generosity, and respect is expressed towards manuhiri (guests), and towards the environment and atua. Mana of people and places is uplifted when people behave in a manner that aligns with their collective values
- **Mātauranga**—is the knowledge, comprehension and execution of actions guided by values and kawa. This knowledge is embedded within pūrākau, waiata, whānau korero and increasingly documented form. It requires tangata whenua to protect and enhance all aspects of the natural world
- **Mauri**—is the life force of all living and non-living things. Mauri is the essential quality and vitality of a being or entity which can be assessed using qualitative and quantitative tools to detect unsustainable practices causing damage to the environment
- **Ritenga**—are everyday rituals and practices that sustain the well-being of people, communities and natural resources. Everything is balanced between regulated and de-regulated states; tapu is to be restricted or sacred; rahui is temporary restriction; and noa is relaxed or unrestricted. Protocols such as karakia (prayer) and environmental monitoring can shift the regulation of states from being tapu to noa in appropriate situations. Tapu is an ancient concept that can be interpreted as holy or sacred. It can be defined as ‘spiritual restriction’- a supernatural condition. It involves rules and prohibitions that were central to traditional society, respect for people, natural resources and the environment

- **Tapu**—was used to control how people behaved towards each other and the environment placing restrictions to ensure that society flourished-relevant to establishing rahui; limiting or restricting access to a place for a period of time, often associated with water, other features of the environment, where a species has been depleted and sometimes where a death has taken place
- **Wāhi tapu**—are places that hapū and whānau have set aside because of the historical and cultural associations. For example, where the area is associated with atua, tupuna, burial sites and significant events. There are permanent restrictions that are relevant in these places. Wāhi tapu are often located near water and in places where food and other resources were gathered and rituals were performed, for example, to give the first fish back to the atua or where tohunga looked after those that had passed, in the process of hāhunga
- **Te Ao Māori**—is a worldview based on the holistic principle that all elements are interrelated. Every part of the environment is understood to have a common genealogy, descending from a common ancestor. The principle ancestors being lo matua te kore (lo the Parentless), Ranginui and Papatūānuku (Sky Father and Earth Mother) and their atua tamariki (142 known demigods/goddesses)
- **Taonga**—are tangible and intangible components of Te Ao Māori. Taonga are anything that is of value or treasured including places, people, language, objects, flora and fauna. Taonga are understood through mātauranga, they are to be cherished, protected and enhanced



Manakau Stream
[Wildlands Consultants Ltd 2019]

REVIEW & COMPLETE WITH MANA WHENUA

– this section is to be developed through wānanga in future stages of the project.

Key indicator concepts, values and principles are listed here as a starting point, as discussed by project partners. These relate to both baseline monitoring and evaluation of the project outcomes.

- **Tino Rangatiratanga**—is absolute sovereignty and self-determination; having ownership, rights, control over, and possession of original Māori lands, waters, and taonga. Article Two of Te Tiriti guarantees Māori tino rangatiratanga, which is fundamental to Maori wellbeing
- **Tikanga and kawa**—Te Reo Māori is the kawa. How Te Reo Māori is spoken (dialects) is the tikanga. Kawa is the policy and tikanga are the procedures on how the policy is realised. To put it simply, kawa is what we do, tikanga is how we do it
- **Tiakitanga**—is the act of guardianship and protection of mauri. The process and practices tangata whenua undertake to protect the environment for future generations include cultural monitoring, environmental education and restoration, participation in planning and RMA matters, partnership and co-governance agreements
- **Te Mana o te Wai**—prioritises the health and wellbeing of water first, the second priority is the health needs of people such as drinking water, and the third is the ability of people and communities to provide for their social, economic and cultural well-being⁹
- **Wairuatanga**—is the recognition of the interconnectedness of physical and spiritual dimensions. Wairua is the energy force that connects all aspects of life including the environment. Mana whenua support and uplift the essence of wairuatanga through karakia, rituals and cultural practices
- **Wahi tupuna**—is a type of place associated with an ancestor or group of ancestors. For example past marae, kainga, mahinga kai and pātaka kai sites

Structure

The CEDF grows from the overarching values and principles through to emerging outcomes (depending on final design and construction requirements) for the project elements that are then expressed in the design. It is structured into five parts.

Part 1: Overview—(this section) sets out the governance and broad, philosophical approach for the Ō2NL project, including the project partnership, values, and the high-level core principles for development of the CEDF (refer above). These set the tone for the project, defining a collaborative approach between partners, and an approach which seeks to leave the Horowhenua and Kāpiti landscape with environmental improvements, as a result of the project.

Part 2: Setting—provides the project context—the historical and existing natural, cultural and built (patterns of settlement and land use) landscapes of Horowhenua and Kāpiti from the start of the project, north of Ōtaki to the SH1 and SH57 connections north of Levin. This section provides an introduction to the known environmental and cultural values of the project area and its broader surrounds, identifying opportunities for Ō2NL to provide improvements to the existing environment. This section of the CEDF has been set out in schematic form and will be developed, through further feedback from the partner and their iwi and hapū groups.

Part 3: Design Principles—expands on the core principles, to drive specific design responses within the project context.

Part 4: Design Response—sets out the emerging Ō2NL response to context and defines high-level landscape and highway outcomes for the project relating to land, water and all communities/living things, ecological connections, and specific outcomes for the project elements in the landscape (beyond and under the construction footprint) and of the highway that will be used to complete the project.

Part 5: Planting Concept Plan—this sets out the concept Landscape Plan (planting) for the concept design of the project integrating rehabilitation and restoration planting for ecology, landscape, visual amenity and natural character restoration. The landscape plan will be developed along with the design of the Project in the next phases leading to construction.

Part 6: Next Steps—(relevant to each version of the CEDF) sets out work to complete beyond the CEDF, to progress Ō2NL from consenting to construction, as a 'Living Document' that is expanded and refined throughout the life of the project.

Partnership

This CEDF has been developed in a collaborative design (co-design) process between Waka Kotahi and its iwi partners for the project, Muaūpoko and various hapū of Ngāti Raukawa ki te Tonga. The goal of this partnership is to ensure cultural values, and the core principles that flow from this permeate the design process and all aspects of the CEDF. Integration of these values and principles should be inherent, embedded. They are relevant to all aspects of the design including the selected alignment of the highway and how it interacts with the land, water above and below ground, all flora and fauna, existing and likely future communities and other transport connections in the district.

The foundation of the partnership is Te Tiriti o Waitangi, as is supported by Waka Kotahi's Māori Strategy. Principles endorsed in the Ō2NL partnership include:

- Give effect to the Treaty (exercise partnership to mutual benefit)
- Develop a culture of care (constructive behaviour to each other)
- Bring your best (excellence, passion)

The values and core principles (as set out above) have been developed through the partnership that underpin the cultural and environmental strategy and framework for the project.

The partnership process to develop the CEDF included regular hui and workshops to develop and review each chapter. This included specific application of the principles to design investigations, for example, to determine the most appropriate locations for the material supply sites and outcomes that would tread lightly and create an enduring legacy. Page turn reviews and feedback of the CEDF drafts have been iterative and supported by presentations from various specialists along with hapū meetings, as requested by the iwi partners.

A CEDF Design Audit matrix (see Chapter 4 and 6) was developed with the partners, to evaluate and help refine the framework outcomes, preliminary design and RMA processes. This is a tool to be refined in the next stages, to further embed the principles in the project.

A central component of the project is the recognition that Iwi and Hapū have an inalienable connection with, and responsibility to Taiao, and its health and wellbeing. The partnership is committed to ensuring that because of this relationship the health and wellbeing of Te Taiao will be improved. This includes benefits for the wider ecosystem, the river and whānau, hapū, iwi and the wider Horowhenua community. The parties recognise that this requires systemic changes and rethinking of how hapū and Waka Kotahi work together to achieve this.

Waka Kotahi recognise that working in a collaborative and innovative way reduces huge organisational costs and maximises opportunities to achieve shared outcomes. Ō2NL will ensure that Iwi and Hapū-partners are recognised, resourced and supported to work within the project to uphold their responsibility, and play a leadership role in the delivery of activities within their rohe. The incorporation of the iwi and hapū voice in project decision making policy and procedure is a constant process, rather than a particular touch point in time.

Iwi, Hapū and Marae will lead us to understanding the Rangatiratanga o te Taiao and the application of a hapū led framework towards the health and wellbeing of our community. This framework goes beyond being consigning hapū to the "consulted" category and promotes the centre, directing, and leading (co-design/co-decide) modus of operating between the Parties.

To ensure that the responsibility of Ō2NL is upheld, all parties will maintain a strong relationship with the iwi and hapū through the representative structures they nominate, and will ensure their voice is central to all significant decision-making processes. Steering Group Chair and Senior Leadership work closely with iwi and hapū to ensure that all Ō2NL led activities are contributing to improving the health and wellbeing of our community.

All parties will work in partnership to realise the objectives of this relationship. This will include developing a comprehensive co-design process to allow the wider community to have input into the Ō2NL workstreams. Partners will align their organisation to provide for these outcomes. This alignment and necessary organisational changes will ensure the project success indicators are in line with the community and iwi/hapū success and aspirations.

Consultation

The CEDF has been being prepared by **Waka Kotahi** and **iwi partners**, with input and feedback from the project **stakeholders**. Key stakeholders include Horowhenua District Council, Kāpiti Coast District Councils (KCDC), Horizons and Greater Wellington Regional Councils (HRC, GWRC), the Department of Conservation (DOC), Heritage New Zealand (HNZ) and KiwiRail. Community consultation has occurred in all phases of project from route selection, through option design development and refinement using varied interactive online forums and face to face opportunities including a series of community group meetings and neighbourhood drop-in sessions including that which has occurred over the past 6 years. Details can be found in the AEE provided in Volume II.

1.2 Waka Kotahi Design Principles.

Landscape Design Principles

Waka Kotahi **Landscape Design** Principles capture the key elements of landscape design for highway projects.

"These principles reflect the Transport Agency's expectations for the integration of highway landscaping through all project phases. The principles below are applicable to all highway projects from the large and complex to the small and simple."

The following principles should not be considered in isolation but be pursued in parallel as they are closely inter-related. A project which dismisses one or more principle entirely is unlikely to lead to satisfactory landscape outcomes for the Transport Agency.

1. A context sensitive and place based approach
2. Facilitate green infrastructure and landscape integration
3. Understand the physical conditions
4. The right plant in the right place
5. Promote biodiversity and build in resilience
6. Champion low impact design (LID)
7. Deliver a quality user experience
8. Low maintenance and whole of life value
9. Safety in design
10. Facilitate community engagement and a collaborative approach"

Urban Design Principles

The **Urban Design** Principles reflect Waka Kotahi's expectations for the integration of urban design in all phases of highway projects and the desired interdisciplinary approach to addressing urban design issues.

The principles are applicable to all Waka Kotahi projects from the large and complex to the small and simple.

"The principles should be used in the early stages of a project to assist with the design of route options. As the design evolves, these principles should be adapted and turned into context and project-specific design objectives and principles. The principles should not be considered in isolation but be pursued in parallel as they are closely inter-related. A project which dismisses one or more principles entirely is unlikely to lead to satisfactory urban design outcomes."

The 10 urban design principles are:

1. Designing for the context
2. Integrating transport and land use
3. Contributing to good urban form
4. Integrating all modes of movement
5. Supporting community cohesion
6. Maintaining local connectivity
7. Respecting cultural heritage values
8. Designing with nature
9. Creating a positive road user experience
10. Achieving a low maintenance design"

These landscape and urban design principles, as integrated within the project, are consistent with the New Zealand Urban Design Protocol; to which Waka Kotahi is a signatory.

Project site photograph
[Isthmus Group]



Toitū Te Taiao: Waka Kotahi – Preliminary Draft Principles

Waka Kotahi has recently developed a Sustainability Action Plan, Toitū Te Taiao, to ensure design of its land transport system reduces environmental harm. Under that strategy, a set of high-level environmental principles has been developed (in draft form), to achieve consistent and high-standard environmental outcomes across all Waka Kotahi projects. The draft principles address **water quality, ecological, Te Ao Māori and conservation values, integrated natural and community values and natural resources** and have been used as a reference to support the development of the CEDF. These will help inform the development of the cultural and environmental indicators for monitoring the Project, if and as required. These principles are drawn from Waka Kotahi Environmental and Social Policy, Plans and Standards including its partnership with Infrastructure Sustainability Council of Australia (ISCA) network to deliver sustainable outcomes across land transport infrastructure projects.



Environmental and Social Policy, Plans and Standards [Waka Kotahi]

MĀTĀPONO: OUR PRINCIPLES

KAITIAKITANGA²

We recognise the environment is a taonga that must be managed carefully. We also recognise that Māori have a responsibility and obligation of care over their communities and environments.

RECOGNITION OF CULTURAL VALUES

We recognise and provide for Māori perspectives, tikanga (customs) Te Reo Māori and kawa (protocols) in the work we do.

STEWARDSHIP

We take a long-term view to ensure a sustainable transport future and conservation of resources.

PRECAUTIONARY

When an activity raises threats of harm to human health or the environment, we take precautionary measures.

EQUITY

We consider broad equity impacts of land transport interventions, including intergenerational impacts.

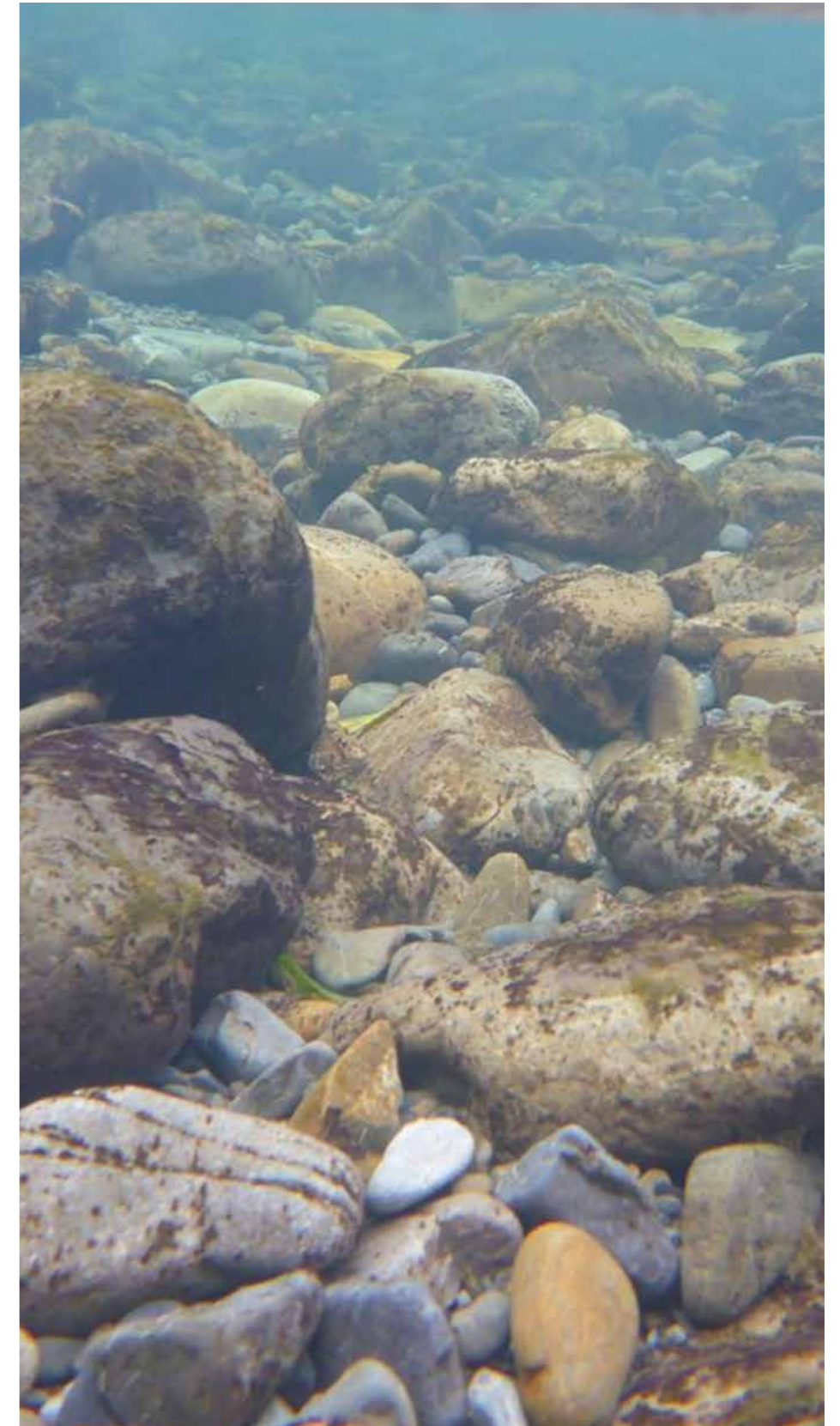
REMEDIATION

We put right elevated harm arising from the land transport system.

COMPREHENSIVE

We consider social, cultural, environmental and economic costs and benefits, including those that are indirect, long-term and not monetized.

Ohau River
[Image: EOS Ecology]



1.3 Overview of Design.

Extracts from Ōtaki to North of Levin
Detailed Business Case, Waka Kotahi

The Transport Problem

The current section of State Highway 1 between Ōtaki and Levin has extremely serious safety and resilience problems. These problems are being exacerbated due to exceptionally high growth currently occurring in the Horowhenua after a generation of little activity. Local and regional plans predict that this will continue for some time and large plan changes are underway (for example Tara-Ika entailing approximately 3,500 houses) to enable new developments which accommodate the growth.

Between Ōtaki and Levin there is only one north to south route, SH1. It is all things to all people. It is the transport route shared by road freight, bus public transport, active modes and private motor vehicles (as presented in the System Schematic diagram on this page). It is a lifeline for all of these modes and movements. The only detour increases journeys by over two hours (more in peak times), via SH2 and the Remutaka Ranges.

The strategic case for Ō2NL, based on the significant growth trends, poor safety records and meeting increasing resilience needs has not changed since 2018, in fact performance has deteriorated. The problems are current and to a scale which makes them nationally significant, especially when considering that all of these issues are compounded by the growing region and associated demand for travel along the highway.

In the last five years to 2021, there were 72 deaths and serious injuries (DSI) along SH1 and SH57 within the project area, making it one of the country's most dangerous sections of road. The highways are classified as High-Risk Rural Roads and have a Star Rating of 2 out of 5. Although Waka Kotahi is investing approximately \$60m over the next 3 years to improve safety on these two highways in this area, what can feasibly be achieved in the existing SH1 is limited and there will remain a significant and unacceptable safety risk within this strategic national corridor.

The lack of resilience in the existing transport system means that journeys, particularly inter-regional, are regularly disrupted—most often by crashes. There is no alternate route to SH1 between Manakau and Ohau—this section also has ageing structures and is at high risk of closure due to regular flooding.

Many strategic alternatives, options and sub-option refinements have been considered over the last 10 or more years to address the problems on this corridor. The relative economic performance of strategic alternatives and corridor options were examined fully during the IBC (in 2018), which informed the decision by the Waka Kotahi Board to proceed with a preferred corridor option to the east of the existing state highways.

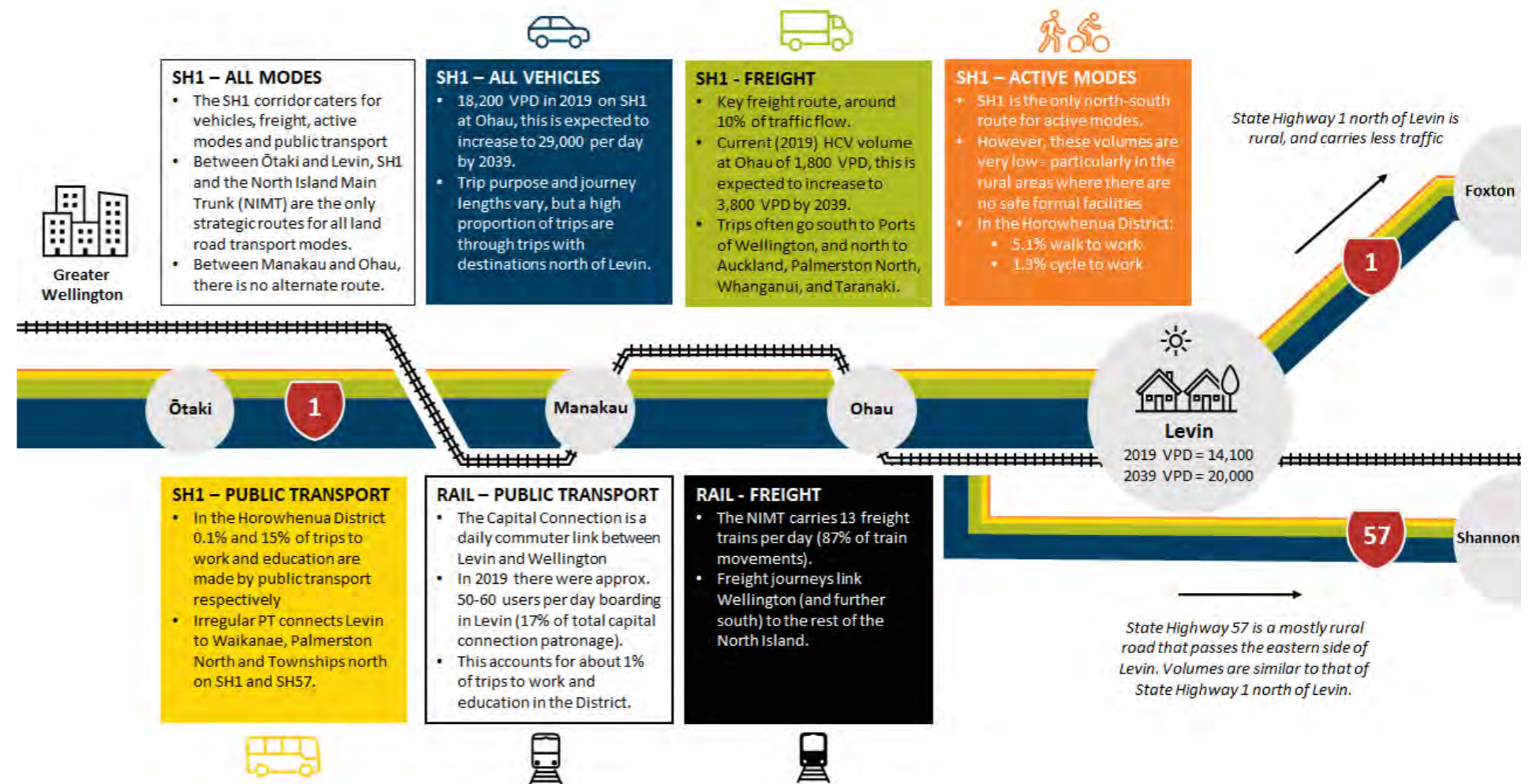
Assessment has shown that the recommended new, offline 4-lane highway and Shared Use Path (SUP) from north of Ōtaki to north of Levin delivers the best results against the problems and objectives whilst not creating impacts or risks that are unable to be mitigated.

The project RMA objectives for the Ō2NL project are to:

- Enhance safety of travel on the state highway network
- Enhance the resilience of the state highway network

- Provide appropriate connections that integrate the state highway and local road network to serve urban areas
- Enable mode choice for journeys between local communities by providing a walking and cycling facility, and
- Support inter and intra-regional growth and productivity through improved movement of people and freight on the state highway network.

Transport System Schematic
[Image from Ōtaki to North of Levin Detailed Business Case, Waka Kotahi]



The Ō2NL project will also help support wider regional strategic transport projects as shown in figure below, including the Kāpiti Expressway project and Te Ara Nui o Te Rangihaeata, Transmission Gully; as the northern most section of the Wellington Northern Corridor. The project will also help support the outcomes of the SH3 Te Ahu a Turanga Manawatū Tararua highway (between Ashhurst and Woodville) which will improve access to Palmerston North, Taupō, the Hawke's Bay and Gisborne.



Locations

- Major Settlements**
- 1 Te Whanganui a Tara/Wellington
 - 2 Lower Hutt
 - 3 Upper Hutt
 - 4 Porirua
 - 5 Paraparaumu
 - 6 Ōtaki
 - 7 Levin
 - 8 Featherston
 - 9 Carterton
 - 10 Masterton
 - 11 Martinborough

- Ōtaki to North Levin
- Peka Peka to Ōtaki
- Mackays to Peka Peka
- Te Ara Nui o Te Rangihaeata, Transmission Gully

Ō2NL and wider programme
[Image from Ōtaki to North of Levin Detailed Business Case, Waka Kotahi]



Overview of the Design.

Preliminary Design Concept

The plan to the right provides a summary of the spatial design and indicative alignment of the highway and associated infrastructure in response to the objectives and design framework vision for the project.

Large scale project intervention and features include:

- 24.8km in length
- 4 lane highway
- 14 large structures (+ minor structures)
- 1 grade separated interchange at Tararua Road and a grade separated half interchange north of Ōtaki
- 4 roundabouts
- 4 main watercourse crossings
- Shared Use Path

Highway features include:

- High standard of geometrics
- Smooth horizontal / vertical alignment (indicative shown)
- Consistent with highways to the south
- 110km/h design speed
- Limited entry/exits / no direct private access
- Noise reducing asphalt surfacing on highway

Shared Use Path features include:

- SUP for full extent of project
- Alignment (indicative shown) serves existing and future population
- Adjacent to proposed highway north of Pukehou area existing SH1-rail bridge
- Connects to local roads
- Shares larger watercourse bridges
- Complements existing and planned HDC and Tara-Ika masterplan connections including a HDC planned connection to Arapaepae Road South (SH57) that is aligned with Liverpool St (East-West Arterial, consent application being progressed in parallel with Ō2NL)



SH57 Roundabout



Queen Street East Bridge



Tararua Road Bridge

Legend.

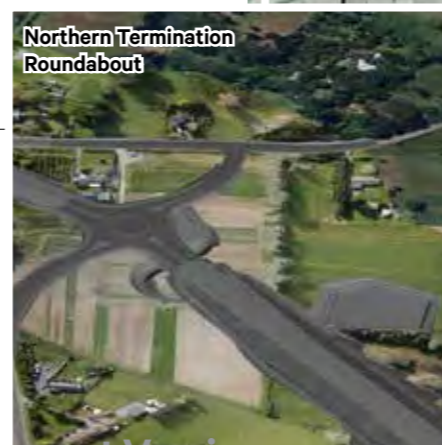
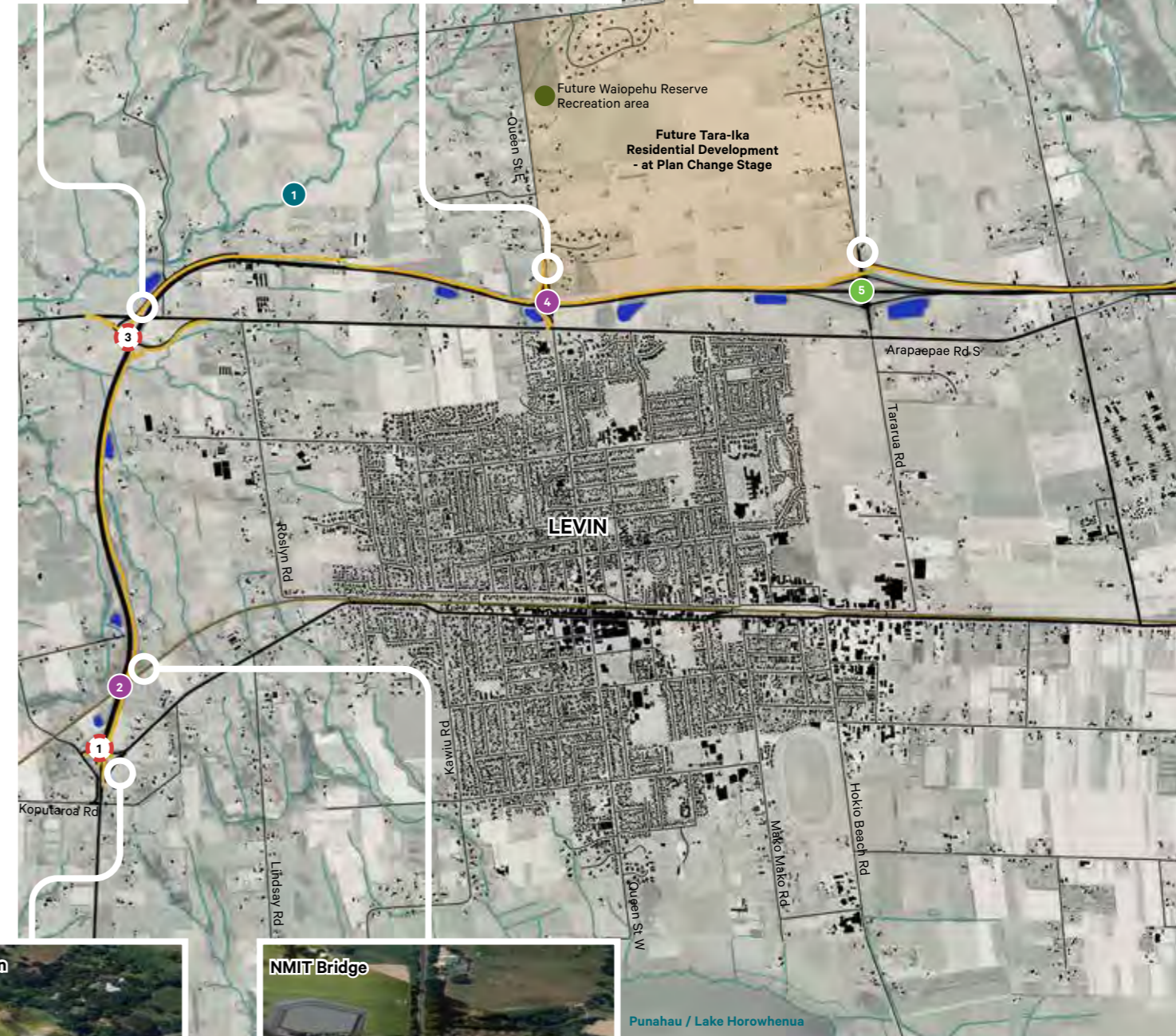
	Existing State Highway 1
	Local roads
	Railway line
	Awa, river
	Indicative highway alignment
	Proposed Shared Use Path (SUP)
	Stormwater wetlands
	Awa bridge - multispan
	Awa bridge - singlespan
	Roundabout
	Interchange with local road over highway
	Local road connection - over highway
	Local road connection - under highway

Crossings, Roundabouts & Interchanges

- Northern Termination Roundabout
- NMIT Bridge
- SH57 Roundabout
- Queen Street East Bridge
- Tararua Road Bridge
- Muhunoa East Rd Bridge
- Ohau Bridge
- Kuku Bridge
- Kuku East Rd Bridge
- Waikawa Bridge
- North Manakau Road Bridge
- Manakau Heights Drive Bridge
- South Manakau Road Bridge
- Waiauti Bridge
- SH1 Bridge

Awa - Named Rivers & Streams

- Koputaroa Stream
- Ohau River
- Makorokio Stream
- Kuku Stream
- Waikōkopu Stream
- Waikawa River
- Manakau Stream
- Waiauti Stream
- Waitohu Stream
- Greenwood Stream
- Ōtaki River



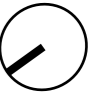
Northern Termination Roundabout



NMIT Bridge



Punahau / Lake Horowhenua



Scale: 1:40,000
July '22



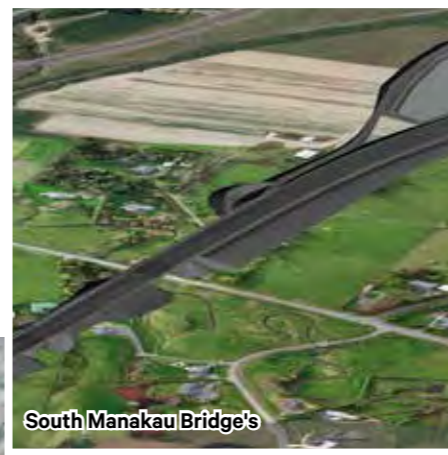
Muhunua East Rd Bridge



Kuku East Rd Bridge



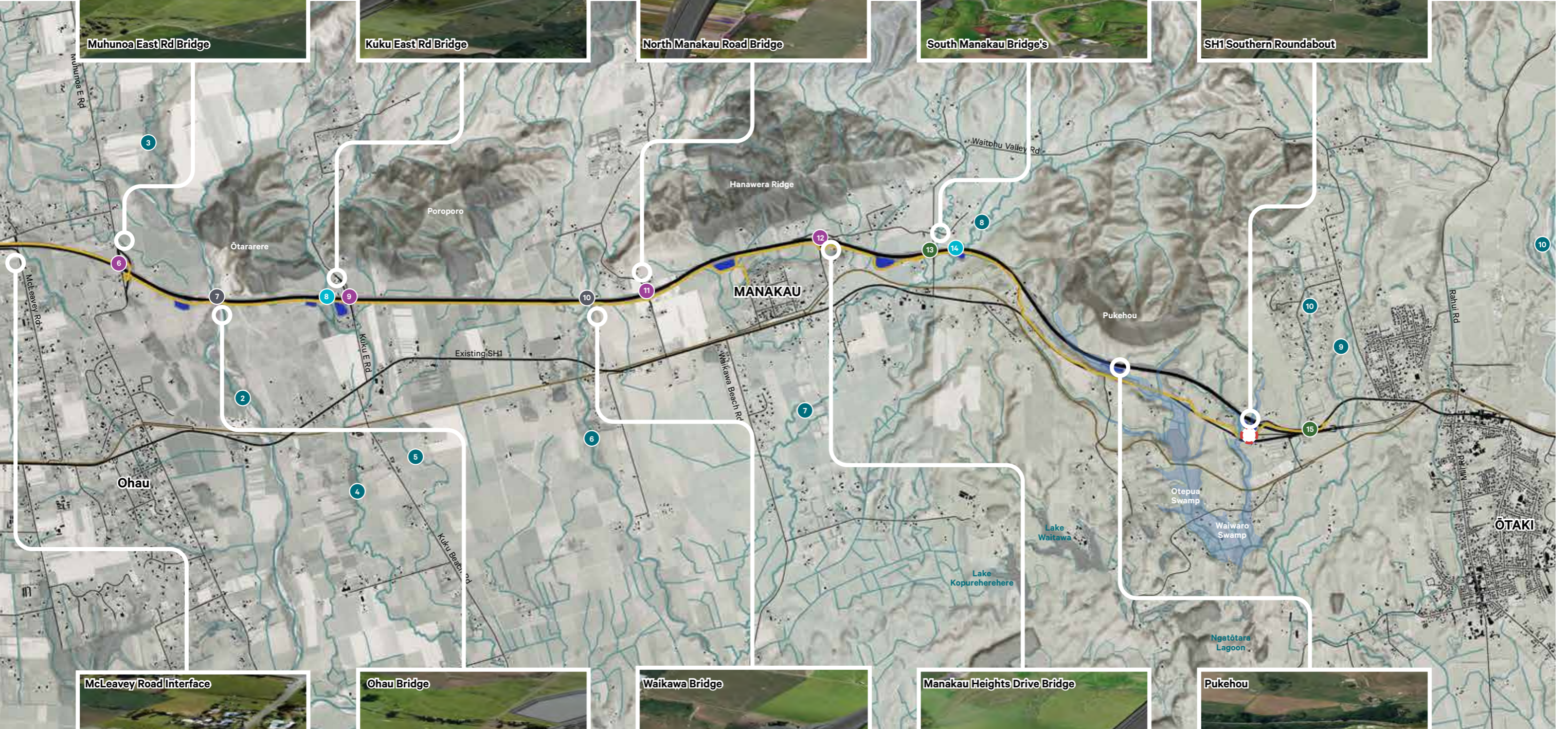
North Manakau Road Bridge



South Manakau Bridge's



SH1 Southern Roundabout



McLeavey Road Interface



Ohau Bridge



Waikawa Bridge



Manakau Heights Drive Bridge



Pukehou

PLACEHOLDER Ō2NL PROJECT NAME AND LOGO
November 2022.

1.4 Background Documents.

The following documents have informed the CEDF. The title of each document is followed by a very short high level summary that is provided to indicate content of the documents and does not provide a full understanding of those documents and their relevance to the Project. A fuller summary is provided in Volume II.

Iwi Kaitiaki Strategy (to be confirmed by project partners)

Iwi Management Plans (to be confirmed by project partners)

Horowhenua District Council District Plan (Operative Plan 2015)

The District Plan sets out how land and resources in the Horowhenua District can be used. Relevant objectives and policies are contained in Part B, including in relation to matters of importance to tangata whenua, natural features and values, water, urban and residential environments, heritage, and land transport.

Horizons One Plan

Notified in 2007, the One Plan is the “one stop shop” resource management planning document for the Horizons Region. It combines the Regional Policy Statement, Regional Plan and Coastal Plan. The One Plan defines how the natural and physical resources of the Region, including fresh water, air, productive land and natural ecosystems, will be cared for and managed by the Regional Council in partnership with Territorial Authorities and the community.

The focus of the One Plan is four keystone environmental issues, two of which have particular relevance for the project: surface water quality degradation, and threatened indigenous biodiversity.

Objectives and policies addressing surface water quality are contained in chapters 5 and 14 of the One Plan; objectives and policies on indigenous biodiversity are contained in chapters 6 and 13.

(Note: the other key issues are Increasing Water Demand, and Unsustainable Hill Country Land Use).

Kāpiti Coast District Council District Plan (Operative Plan 2021)

The District Plan sets out how land and resources in the Kāpiti Coast District can be used. Relevant objectives and policies are contained in Part 1 in relation to matters of importance to tangata whenua- mana whenua and all Part 2 sections including urban and natural environment matters.

Greater Wellington Regional Council RPS and NRP

The start of the project area just north of Ōtaki lies inside the boundary of the Wellington Regional Council.

The Wellington Regional Policy Statement (RPS) and the Natural Resources Plan (NRP, decision version) sets out the framework and priorities for resource management in the Wellington region. Relevant objectives and policies in the NRP (decisions version) are contained in chapters 3 and 4 and relate to Māori relationships with their ancestral lands, water, sites, wāhi tapu, and other taonga; natural character, form and function; biodiversity; sites with significant values; and natural features and landscapes. Schedules and maps associated with these policies are also relevant.

Resource Management Act (1991)

Matters of national importance particularly relevant to landscape and urban design matters for the project include sections 6(a), 6(c), 6(d) and 6(e). These relate to the natural character of wetlands, lakes and rivers and their margins; areas of significant indigenous vegetation and habitats; public access to and along rivers and lakes; and the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga.

Other relevant sections include 7 (a), 7(aa), 7(c) and 7(f), which relate to kaitiakitanga, the ethic of stewardship, amenity values, and the quality of the environment. Section 8, addressing Te Tiriti o Waitangi (the Treaty of Waitangi) requires the principles of partnership, participation and protection to be taken into account in all RMA processes.

Land Transport Management Act (2003)

Requires Waka Kotahi to ‘exhibit a sense of social and environmental responsibility’ in meeting the statutory objective of operating a transport network.

The National Policy for Freshwater Management (2020)

Requires Te Mana o te Wai as the fundamental concept for all freshwater decision-making.

Waka Kotahi Toitū Te Taiao Sustainability Action Plan (2020)

Waka Kotahi has recently developed a Sustainability Action Plan, Toitū Te Taiao, to ensure design of its land transport system reduces environmental harm, and cares more for the people, places and planet. Under that strategy, a set of high-level environmental principles has been developed, to achieve consistent and high-standard environmental outcomes across all Waka Kotahi projects; as are relevant to the outcomes for this project.

Waka Kotahi Tiakina Te Taiao - Sustainability Monitoring Report

Tiakina Te Taiao, first released as a baseline report in 2018, is a companion document to Toitū Te Taiao - the Sustainability Action Plan, which was released in April 2020 and supports Arataki, the ten-year plan.

Waka Kotahi Environmental Plan

First published in 2008, the Environmental plan, specifies how Waka Kotahi staff and suppliers are expected to address key social and environmental effects. Relevant objectives include:

- Social responsibility: To enhance and contribute to community cohesion
- Culture and heritage: To pro-actively limit the disturbance of significant cultural and heritage features along state highways. To show respect for historic buildings we own to maintain their integrity
- Visual quality: To incorporate multi-purpose landscaping as an integral part of all new state highway construction projects. To improve the visual quality of the existing state highway network.

Waka Kotahi Environmental and Social Management

Standard (Z/19) (2010) requires consultants engaged on transport projects to consider social and environmental factors identified in legislation and policies and guidelines (including 2021 updates relevant to this project to the Environmental and Social Policy).

Waka Kotahi Bridging the Gap: Waka Kotahi Urban Design Guidelines (2013)

The Guidelines set out 10 over-arching urban design principles, guidance for Urban and Landscape Design Frameworks (ULDF) and Urban and Landscape Management Plans (ULMP) and on specific highway components and walking and cycling including pedestrian paths, pedestrian crossings, cycle lanes and paths, pedestrian and cycle bridges, underpass design, lighting and crime prevention.

Waka Kotahi Landscape Guidelines (Final Draft) (2014)

The Guidelines similarly set out 10 over-arching principles, and guidance on (1) design considerations (including safety and extent of landscaping), (2) landscape treatments (including topsoil, planting, and stormwater) and (3) maintenance requirements.

Waka Kotahi Guide to Traffic Engineering Practice - Bicycles

This sets out minimum standards, covering such matters as path width, gradients and provision at structures referencing Austroads standards AGRD06A-09: Guide to Road Design Part 6A: Pedestrian and cyclist Paths (replacing Guide to Traffic Engineering Practice: Part 14).

Waka Kotahi Pedestrian Planning and Design Guidance

Sets out ways to improve New Zealand's walking environment. It outlines a process for deciding on the type of provision that should be made for pedestrians and provides design advice and standards.

Waka Kotahi Multi-modal Planning and Design Guidance

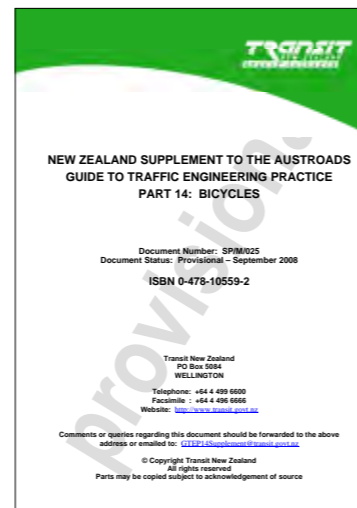
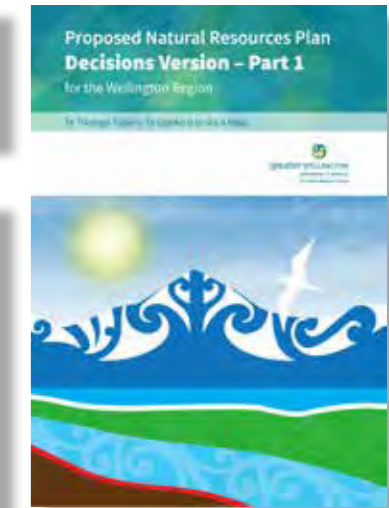
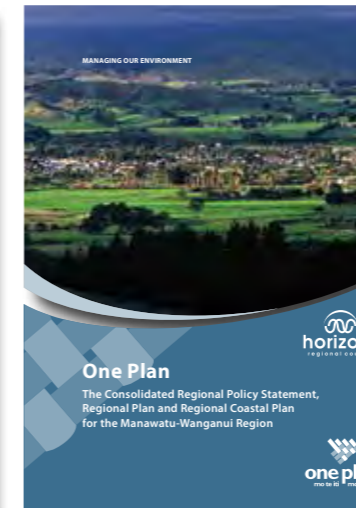
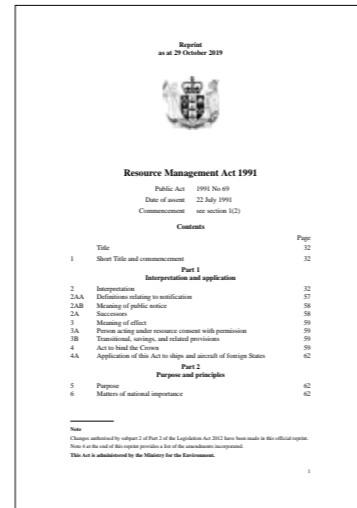
Guides focused on walking, cycling and public transport. <https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/multi-modal-transport/>

Waka Kotahi - Cycling Network Guidance

Promotes a consistent, best-practice approach to cycling network and route planning throughout New Zealand. It sets out a principles-based process for deciding what cycling provision is desirable, and provides best practice guidance for the design of cycleways. <https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance>

Ngā Haerenga - The New Zealand Cycle Trail

The New Zealand Cycle Trail Design Guide was first published in February 2010 to assist people involved in planning, designing or building cycle trails that would make up the New Zealand Cycle Trail (NZCT).



Various background documents used to underpin and interpret the CEDF

1.5 Endnotes.

¹ Ō2NL mostly traverses Horowhenua District and Horizons Region with a section at the southern end (from a short distance south of South Manakau Road) falling in Kāpiti Coast District and Greater Wellington Region)

² A CEDF is equivalent to, and includes the requirements of, the Urban & Landscape Design Framework (ref Bridging the Gap: Waka Kotahi Urban Design Guidelines)

³ Te Ao Māori, in very simple terms, is the world view of tangata whenua, of the interconnectedness and interrelationships of all living things including wairua, the spiritual realm.

⁴ Mātauranga māori, in very simple terms, is the knowledge that underpins Te Ao Māori. It is knowledge built through observation, investigation and use overtime. It is how Te Ao Māori is understood.

⁵ Te mana o te wai refers to the intrinsic properties of water, its mana. It speaks to the vital importance of water to Māori and to the application of Mātauranga Māori in how we behave towards water; to enhance, uphold or diminish its mana.

⁶ The Waka Kotahi RMA objectives for the project are to:

- Enhance safety of travel on the state highway network
- Enhance the resilience of the state highway network
- Provide appropriate connections that integrate the state highway and local road network to serve urban areas
- Enable mode choice for journeys between local communities by providing a north-south cycling and walking facility
- Support inter and intra-regional growth and productivity through improved movement of people and freight on the state highway network.

The investment objectives for the project, as included in the DBC are:

- Reduce deaths and serious injuries from 50-55% per annum by 2035
- Reduce duration of journeys affected by closures and delays by 60% by 2035
- Provide appropriate connections that integrate the state highway and local road network to serve urban areas by 2030
- Enable mode choice for journeys between local communities by providing north-south walking and cycling facility by 2030
- Support inter and intra-regional growth and productivity through improved movement of people and freight by 2030.

⁷ Bridging the Gap: NZTA urban design guidelines. <https://www.nzta.govt.nz/resources/bridging-the-gap/>

⁸ For example where there are other areas outside of the proposed designations that are included in the restoration planting plan for the project.

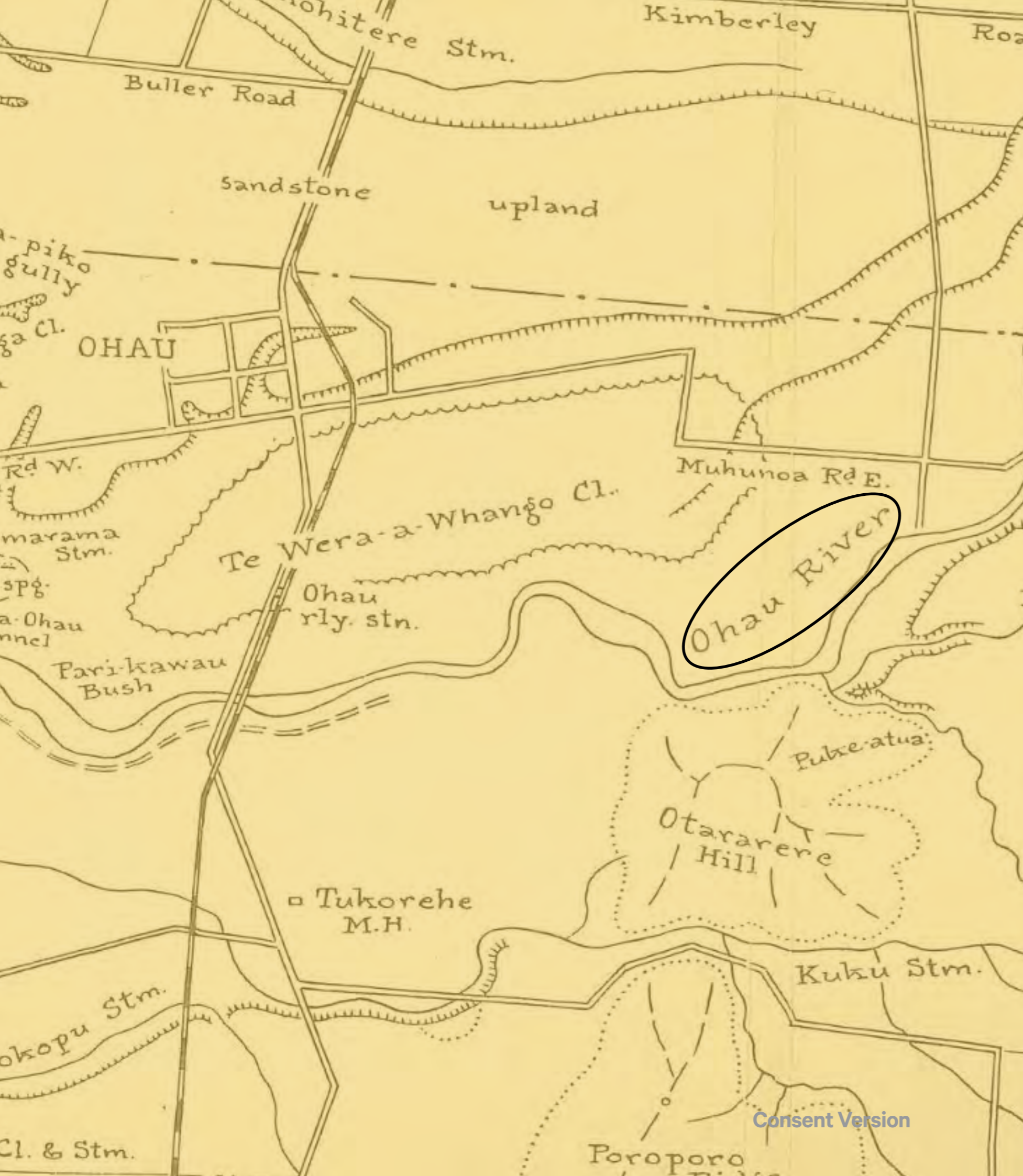
⁹ <https://environment.govt.nz/publications/essential-freshwater-te-mana-o-te-wai-factsheet/>

¹⁰ Including how the role and function of the current state highway will change once Ō2NL is open. This is subject to a separate investigation process that is underway with HDC, KCDC, iwi partners and other stakeholders.



2. Horowhenua





Chapter Overview

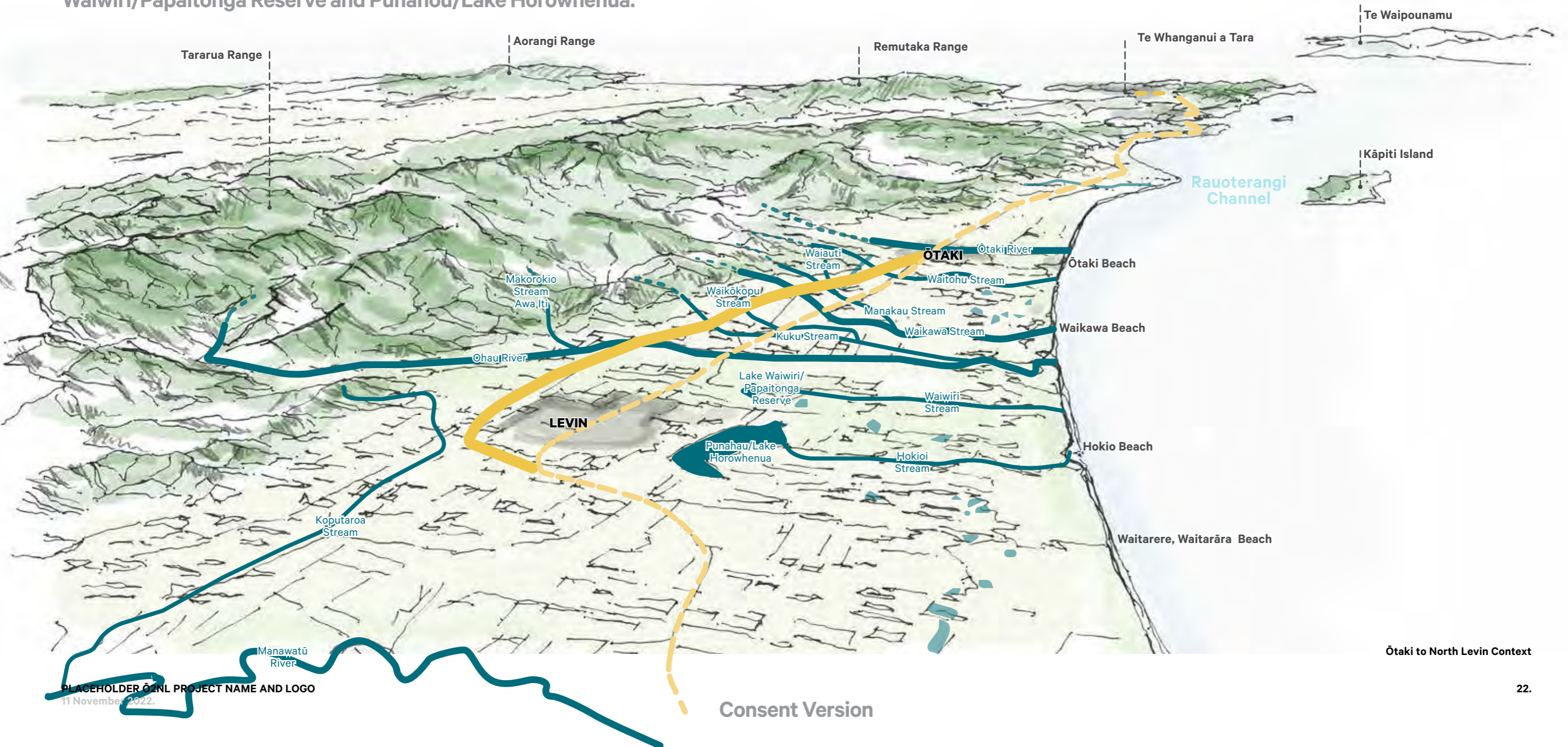
This chapter sets out relevant contextual matters to inform the design response for the project. Discussion with the iwi partners and evaluation of the design have provided integration of the districts cultural context within this process. Placeholder sections in the CEDF provide for agreed documentation. This will follow completion of cultural impact reporting for the project.

In summary, this section of the CEDF provides an analysis of the natural, cultural and urban systems as necessary to inform the vision and outcomes sought for the project. This analysis supports the statutory context outlined in the previous chapter and is consistent/inclusive of the matters addressed in the Waka Kotahi's ISCA - IS assessment processes.

Map XI by Adkin
Adkin, G. L. (1948) Horowhenua: Its Maori place-names and their topographic and historical background, Department of Internal Affairs, Wellington

2.1 Horowhenua

Horowhenua¹¹ is characterised by its mountains, river plains, dune lands and coast: the Tararua Range faces the sea across the fertile outwash plains and coastal dunes with remaining lakes and wetlands once part of a much larger surface water system. This broader landscape type is reflected in the name ‘Horowhenua’¹² which imagines the land sliding or flowing from the toe of the mountains and the unique hydrology creating Lake Waiwiri/Papaitonga Reserve and Punahou/Lake Horowhenua.



SECTION TO BE
REVIEWED &
COMPLETED WITH
MANA WHENUA

Ki uta ki tai

A journey through the district features unique catchments and varied microclimates, associated with a sequence of stony bed rivers, streams and tributaries that flow out of the ranges across the plains. This pattern speaks to the concept of ki uta ki tai (from the mountains to the sea), of a whole systems approach to the management of land and water. Ki uta ki tai acknowledges the connections between the atmosphere, the ranges, surface water, groundwater, land use, water quality, water quantity, and the coast. It also acknowledges the connections between people and communities, people and the land, and people and water.

Muaūpoko and Ngāti Raukawa are mana whenua of the area and partners with Waka Kotahi in the project. Muaūpoko and Ngāti Raukawa have an inalienable connection with the waterways and water bodies, whenua, and wider taiao (environment across Horowhenua. Each iwi and hapū has its own relationships with the area, which are acknowledged, respected and celebrated. In some cases there are multiple assessments separately provided by Muaūpoko and Raukawa hapū.

2.2 Taiao/Natural Landscape.

In the early years of settlement by Māori, the landscapes of Kāpiti and Horowhenua supported a wide range of indigenous habitats and vegetation patterns, from the snow-clad ranges and forested foothills to the dynamic outwash plains and parabolic sand dunes. The origins of these diverse patterns relate to successive tectonic activity, including volcanic deposits from the central plateau. Over time, these landforms were further shaped by water, including the large braided Ohau awa (river), which has ranged widely across the plains. Shifting patterns of natural interdunal roto (lakes and lakelets) and repo (wetlands), feature where hydrological patterns were slowed by landform changes and can be fed by springs linked to a network of aquifers and unique patterns of ground and overland flow.

In the environmental history of Lake Waiwiri/Papaitonga Reserve, Geoff Parks¹⁹ recalls the lushness of the Horowhenua low country:

"Not long ago the plain was a part of a more expansive Cooks Strait, (Te Moana o Raukawakawa). Rich alluvial deposits poured into it from the ancestors of today's rivers. Then the land rose. The sea receded. The windswept sand and gravel flats became plains, the brackish lagoons freshwater lakes. Mātai, Tōtara and Rimu wooded the drier flats and sand dunes, Kahikatea and Pukatea the swamp and lake.

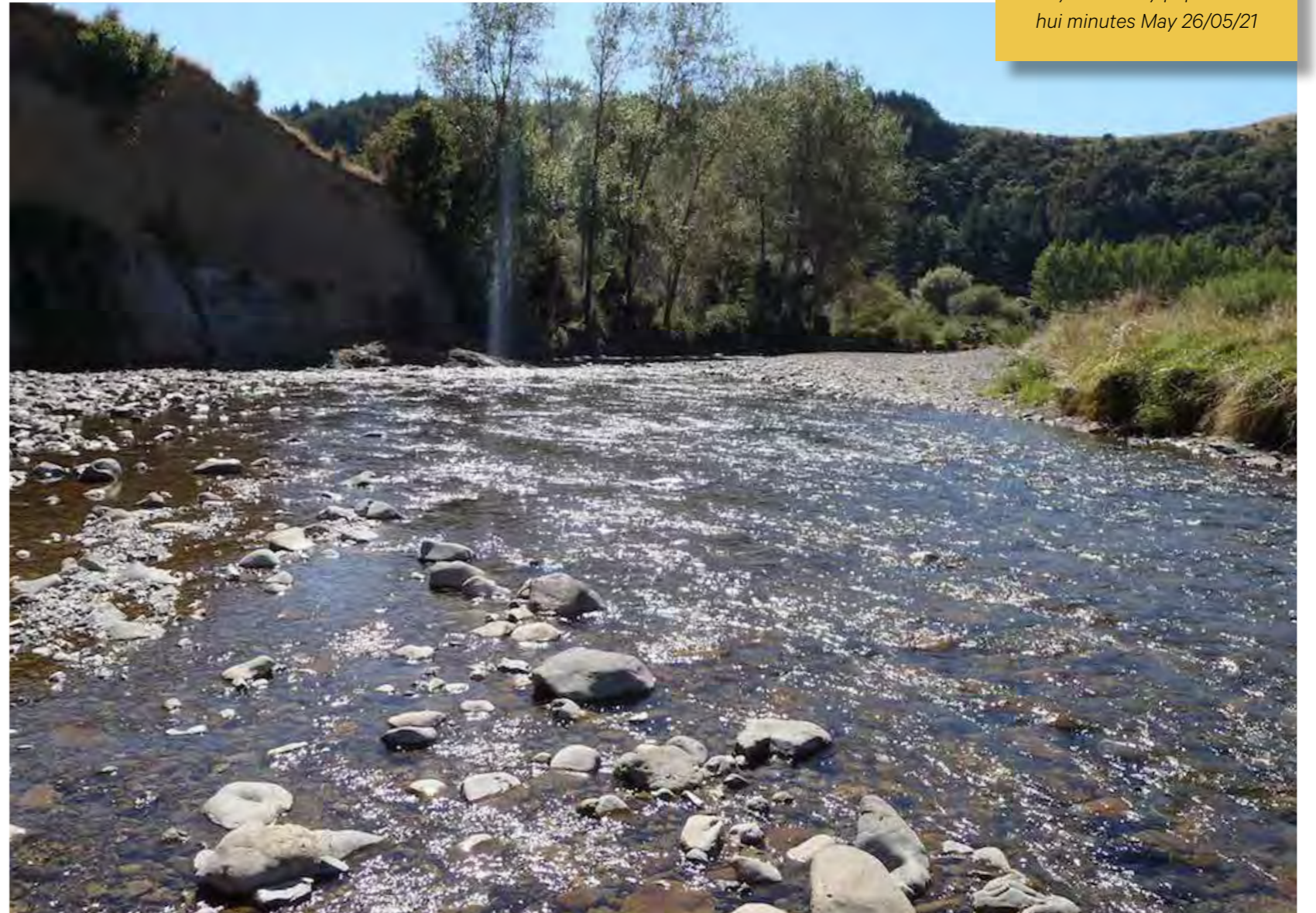
He also notes:

"Never before or since has a New Zealand landscape been so quickly and ruthlessly 'cleared'. Within 20 years of the forest tunnel being cut [for the rail line in 1885], only nature's geological lineaments [and the finest soil in the world] were still there.Right into the late 1880s it was noisy with birdsong. Then it felt silent."

Today, the lower country through which the project will traverse, is often described as a highly modified natural landscape. Transport connections, intensive rural and increasingly urban landuse (as described in more detail below) have further shaped the land, confined and made use of the waterways and retained small areas of indigenous vegetation. In the existing landscape there has been a loss of ki uta ki tai, connections between the maunga and the sea, and health of the whenua (the land) and the wai (the water). These matters are of deep concern to mana whenua.

REVIEW &
COMPLETE WITH
MANA WHENUA

Note: there may be other / additional narratives that are appropriate here to include. e.g. Massey University paper noted in hui minutes May 26/05/21



'Ohau River at Gladstones Reserve'
[<https://www.lawa.org.nz/explore-data/manawat%25AB-whanganui-region/river-quality/Ohau/Ohau-at-gladstone-reserve/>]

Taiao/Natural Landscape

Legend

- Proposed Highway

- Awa - Named Rivers & Streams**
- 1. Manawatū River
- 2. Koputaroa Stream
- 3. Hokiō/Hokiō Stream
- 4. Waiwiri Stream
- 5. Ohau River
- 6. Kuku Stream
- 7. Makorokio Stream
- 8. Waikōkopu Stream
- 9. Waikawa Stream
- 10. Manakau Stream
- 11. Waiauti Stream
- 12. Waitohu Stream
- 13. Otaki River

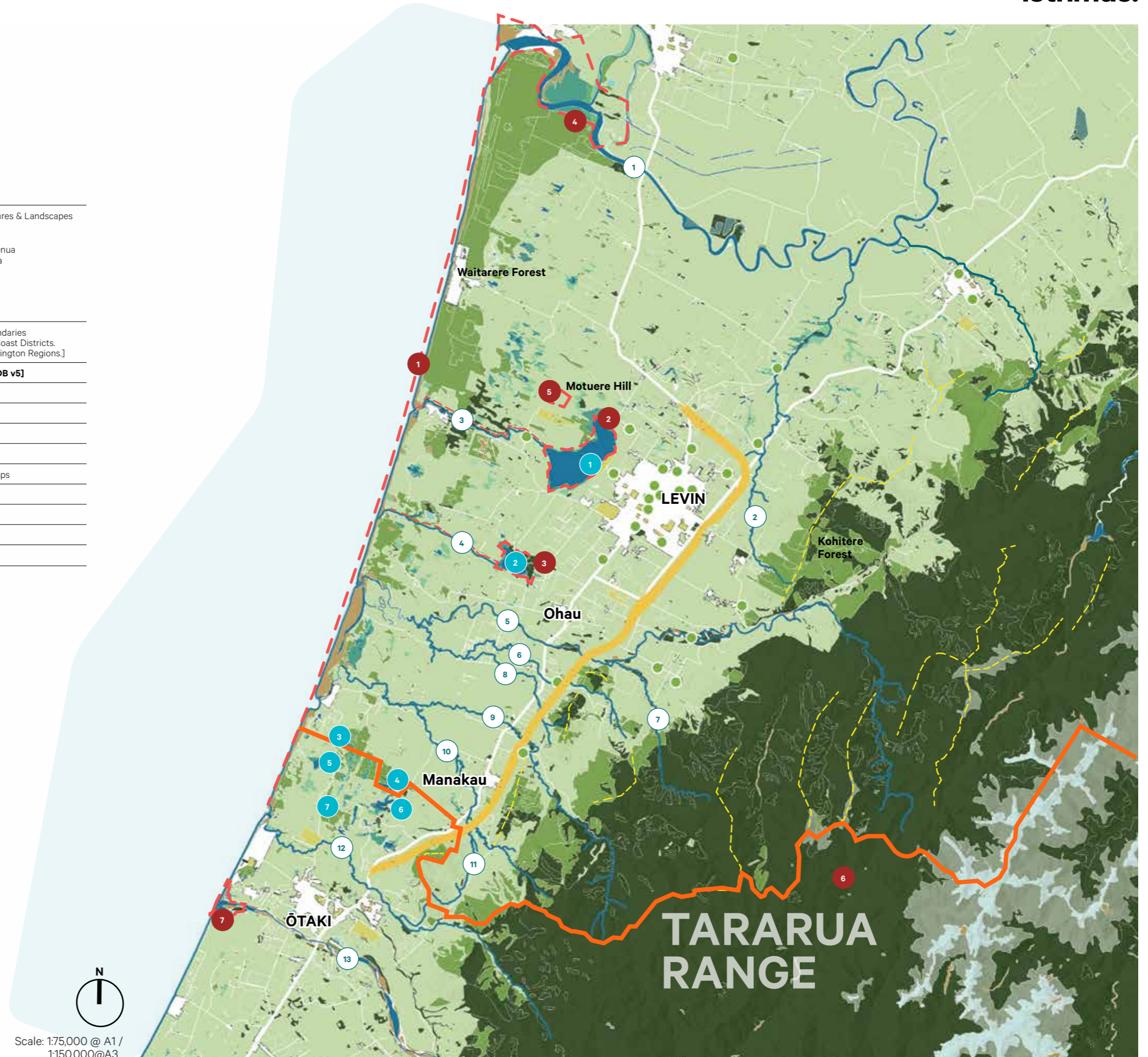
- Roto - Named Lakes**
- 1. Punahau/Lake Horowhenua
- 2. Lake Waiwiri/Papaitonga
- 3. Lake Huritini
- 4. Lake Kopureherehere
- 5. Lake Waiorongomai
- 6. Lake Waitawa
- 7. Ngatōtara Lagoon

- Notable Trees [Ō2NL Route Selection Constraints Data]**

- Outstanding Natural Features & Landscapes [HDC, KCDC]**
- 1. Coastal ONFL
- 2. Lake Punahau/Horowhenua
- 3. Lake Waiwiri/Papaitonga
- 4. Manawatū Estuary
- 5. Moutere Hill
- 6. Tararua Ranges
- 7. Ōtaki River mouth
- Important Ridgelines

- District and Regional Boundaries [Horowhenua and Kāpiti Coast Districts, Horizons and Greater Wellington Regions.]**

- Existing Vegetation [LCDB v5]**
- Sand/Gravel
- Indigenous Forest
- Sub-alpine Shrubland
- Tall Tussock Grassland
- Productive Grassland/ Crops
- Exotic Forest / Shrubland
- Aquatic Vegetation
- Urban Parkland
- Built Areas



Tararua Range and Foothills

The most prominent feature in the area is the Tararua Range and their foothills, which provide a steep backdrop to the outwash plains and coastal dunes. The Range is bush-clad, including areas of original forest. It contains traditional pathways, sacred places, natural resources, and is a traditional location for ceremony and rituals. It is a location for wilderness recreation and customary gathering of resources. Most of the high peaks along the range have original names that tell the stories of the early ancestors. The Tararua Range, named peaks and foothill ridgelines are especially accentuated in certain lights (such as late evening sun) and when covered with winter snow.

The proposed highway follows the foothills near the back of the plains. The foothills are predominantly in pastureland and exotic forestry, and are characterised by their long skyline and occasional landmarks:

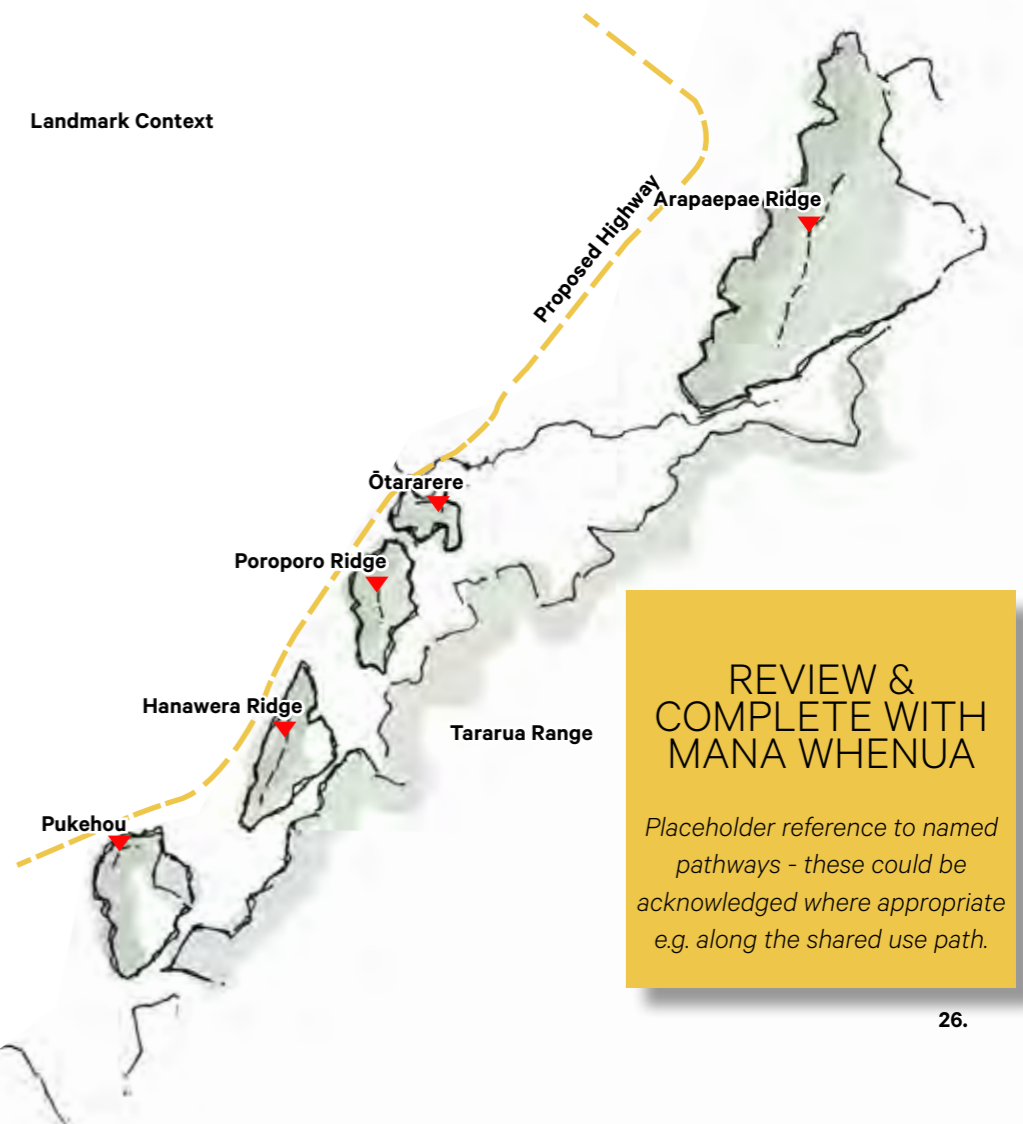
- **Pukehou** is a well known landform which sits forward of the other foothills and the Waitohu stream. Its distinctive circular form and steep hillsides are a gateway landmark at the southern end of the district. Pukehou is associated with events that reinforce its nature as a prominent lookout and landmark:
 - A number of trails mounted and traversed the hill, providing connections/paths to the Tararuas and crossings to the Wairarapa.
 - It was an important bird snaring hill with named ridges and hunting encampments, particularly Te Ahiarangihiwi where there were bird snaring trees towards the south of the hill
 - Te Rangihouhiri (Muaūpoko) had a village/settlement at Pukehou.
 - The name Pukehou translates to ‘Hill of Dedication’, referring to Te Hakeke dedicating his son, Te Rara-o-te-rangi, to the recovery of the Muaūpoko lands lost to invading iwi
 - Muaūpoko had clearings and cultivations on the lower slopes of Pukehou (possibly west of the existing SH1)
- The **Poroporo** ridge backdrops the area from Manakau, between the Waikawa and the Ohau Rivers. The proposed highway follows close to the toe of this ridge. The Waiauti, Waikawa and Kuku Streams each cut gorges through this foothill range.
 - Adkin (1948) states that there was a Muaūpoko camp/refuge on the crest of the ridge (about 200 m, south of Kuku Stream), where tutu was collected, and kaka were hunted
 - An old, possibly over 500 years old, trail traversed the ridge of this hill.
 - Adkin (1948) states that the name Poroporo refers to the ‘cut-off’ nature of the ridge, being isolated from the main body of the Tararua Range, unlike the other foothill ridges. Poroporo is also an indigenous shrub and Rongoa (*Solanum aviculare/laciniatum*)

- The **Hanawera Ridge** stands as a sentinel directly behind the Manakau township in the Ngāti Wehi Wehi rohe.
 - Hanawera means ‘to scorch by the heat of a fire’. One kōrero states that a chieftainess while warming herself at a fire, scorched her sacred cloak. The damage to valued garments in this manner seems to have been extremely common in past times, yet provided a significant enough reason for the naming of large geographic features, such as hill-ridges. In this case the intense tapu and mana of the nobility of past times may have justified it.
 - Pikiwāhine knob is the name of the steep conical hill forming the northern terminus of Hanawera foothill ridge at Manakau. This place, according to Manahi te Hiakai, of Whakahoro and chief of Ngāti Wehi Wehi, was a favourite bird-snaring spot. The tree or trees on which the snares were set could easily be climbed and the snares were therefore frequently attended by women of the hapu, hence the name, which means ‘climbing woman’.
- **Ōtararere** is the prominent headland overlooking the Ohau River at the north end of the range. It marks an entrance to the Tararua Range along the Ohau River and Makorokio Stream:
 - Pukeatua is a ridge/projection of Ōtararere and was a place where very large Tōtara grew. The ridge poles for Rangiatea Church, Ōtaki came from Pukeatua
 - O Tara-rere was a place where Tara-Ika moved quickly along. Tara being one of Muaūpoko eponymous ancestors, rere meaning to fly or move quickly. The O Tara Rere fore-hills are characterised by low slopes and wind the flies along, giving speed to one’s step
 - It is likely to have been another birding spot
 - Early surveyor maps show a path shown over eastern ridgelines, but also clear paths east/west; along with the other foothills, Ōtararere ridgeline was probably an old trail
- The **Arapeapae** ridge backdrops the area east of Levin—on the north bank of the Ohau River.
 - It is connected maunga ki te moana along Muaūpoko spiritual path connecting the ranges with Waiopahu Reserve, wai mārie, Punahau/Lake Horowhenua, Hokioi Stream and Te Moana o Raukawakawa
 - A place for hunting birds, Muaūpoko traversed tracks leading eastwards into the Tararua’s that cross over to the Wairarapa. Te Kiri Totara [Muaūpoko] states that “Te Arapaepae and Haeretuterangi are two places for hunting huia... Te Arapaepae – this is an old war track”
 - Translation of name either references the crossing over the Tararua’s, or is a poetic description referencing the foothills geologic similarity (in front of the main range) to the ara, path, along the paepae, front of a house

Geology






The geomorphology of the area is revealed in its name—Horowhenua, which means “the great landslide.” This name could be a reference to the last significant earthquake event¹⁴ and also to the broader concepts of geomorphology, land and water connections between maunga and moana, and how tectonic movements have resulted in the unique patterns of hydrology. The last significant haowhenua occurred on the Northern Ohariu Fault between several hundred and one thousand years ago, and caused ground surface displacement of 3-4m.¹⁵

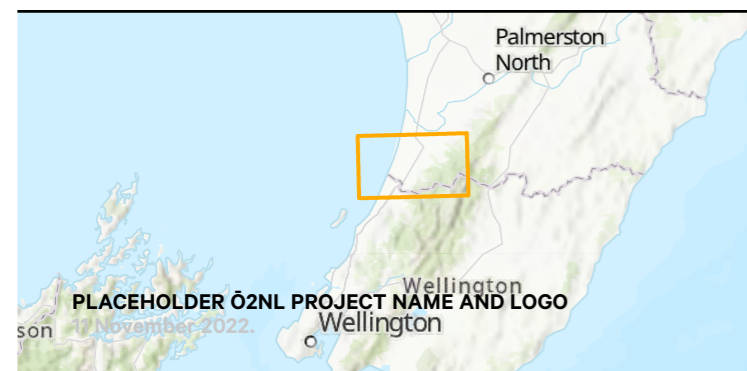
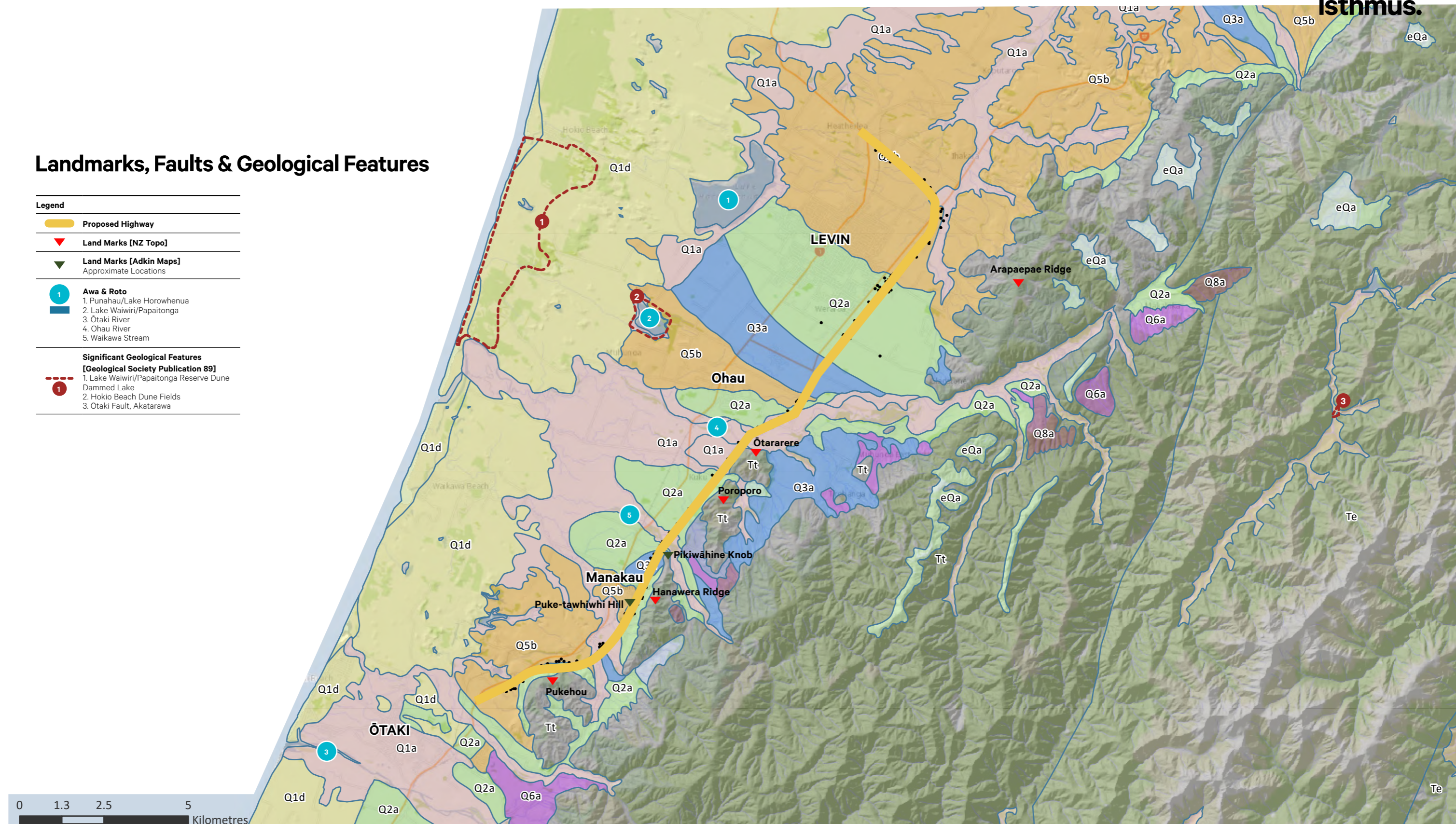
The active Northern Ohariu Fault is visible in the landscape at the edge of the Tararua foothills in the Arapaepae area. The fault remains capable of generating large damaging earthquakes, and, with these, likely landslides on the western flanks of the Tararuas from Ōtaki to Palmerston North, and liquefaction in low-lying parts of Horowhenua, where the young sand country, river terraces and flood plains are known to be extremely susceptible to ground failure.¹⁶




Landmarks, Faults & Geological Features

Legend


-  Proposed Highway
-  Land Marks [NZ Topo]
-  Land Marks [Adkin Maps] Approximate Locations
-  **Awa & Roto**
 - 1. Punahau/Lake Horowhenua
 - 2. Lake Waiwiri/Papaitonga
 - 3. Otaki River
 - 4. Ohau River
 - 5. Waikawa Stream
-  **Significant Geological Features [Geological Society Publication 89]**
 - 1. Lake Waiwiri/Papaitonga Reserve Dune Dammed Lake
 - 2. Hokio Beach Dune Fields
 - 3. Otaki Fault, Akatarawa





O2NL Geotechnical Site Investigation Map

NZL GNS 250K Geology Overlay












Data Sources: Stantec, Land Information New Zealand, Institute of Geological and Nuclear Sciences (IGNS)
 Basemap Service Credits: Eagle Technology, Land Information New Zealand, Kiwi Rail, OpenStreetMap Community, Esri, HERE, Garmin, FAO, NOAA, USGS, Esri, USGS
 Coordinate System: NZGD 2000 New Zealand Transverse Mercator

Author: jgesche, Stantec (2021)

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NZL GNS 250K Geology





















-  Q1a - Holocene River Deposits
-  Q1d - Holocene Windblown Deposits
-  Q2a - Late Pleistocene River Deposits
-  Q3a - Late Pleistocene River Deposits
-  Q4a - Late Pleistocene River Deposits
-  Q5b - Late Pleistocene Shoreline Deposits
-  Q6a - Middle Pleistocene River Deposits
-  Tt - Basement Rock (Wellington Greywacke)

 Site Investigation Locations




Soils/Oneone

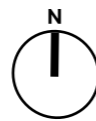
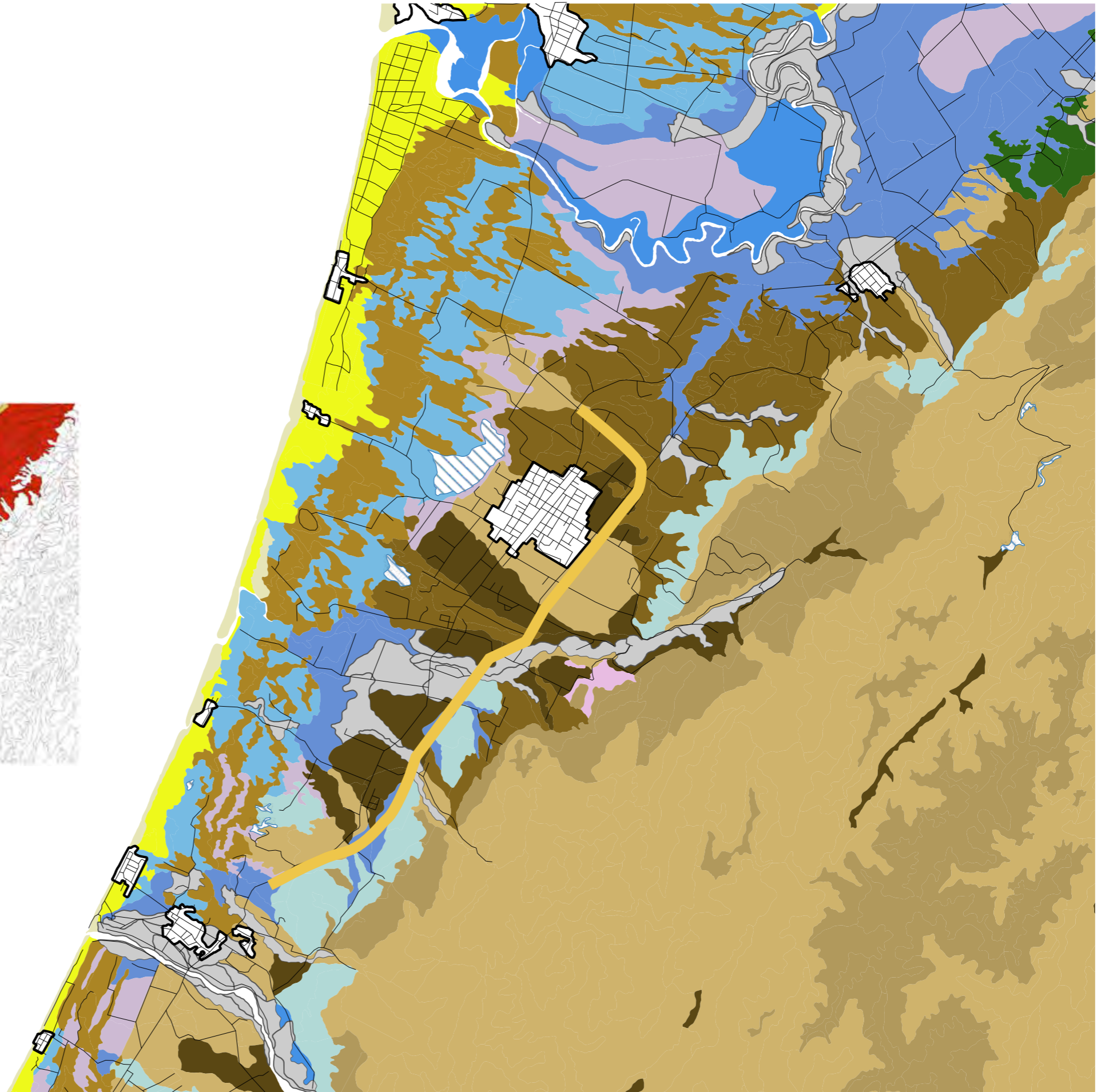
Horowhenua is well known for its fertile soils and effects on Class 1 and 2 soils has been a matter considered in the selection of the preferred route for the project. The proposed designations include a range of productive landuses with dairying, sheep and beef, vegetable growing, horticulture, forestry and lifestyle blocks including some areas categorised as highly productive land.

Māori gardening was common within the high class soils and set the scene for agricultural development post 1840.

Soil Classification Map Legend.	
	Proposed Highway
	Town
	Lake
	NZ Road Centrelines
FSL New Zealand Soil Classification	
	Firm Brown
	Allophanic Brown
	Mafic Brown
	Orthic Brown
	Sandy Brown
	Orthic Gley
	Recent Gley
	Sandy Gley
	Orthic Allophanic
	Humic Organic
	Immature Pallic
	Perch-Gley Pallic
	Fragic Pallic
	Fluvial Recent
	Sandy Recent
	Sandy Raw



Soil Class FSL NZ Soil Classification	
	Proposed Highway
	Class 1 Soils
	Class 2 Soils



Scale: 1:75,000 @ A1 /
1:150,000@A3

Wai/Water

Wai/Water has multiple dimensions in te ao Māori, including:

Wairua—literally refers to the spirit of the water (metaphysical) or of any other element of the environment. This includes the concept of mauri, the essence, life force. Everything in the environment has a mauri. Talking about the mauri of all waterbodies is not dissimilar to talking about the mauri of all elements of the environment of trees and plants, animals, of maunga and of the whenua. This means considering the mauri of the streams and catchments within the project area including the unique subterranean lakes that bubble in puna, springs, that feed the dune lakes and wetlands. Respecting and maintaining wairua is a priority for iwi and hapū.

Waiora—literally means health and well being, and is the natural state of waterways and waterbodies. Assessing, preserving and maintaining the waiora of water requires baseline and ongoing monitoring of waterways and water bodies including the use of matauranga Māori indicators and methods that recognise wairua, mauri and the atua.

Waipuke—literally means flooding, deluge. This is an existing issue for the district and the project, along with ‘huarere taurangi’, weather that changes, or climate change.

The connections between mountains, plains, and coast underpin the area’s ecology. With indigenous vegetation largely removed from the foothills and plains, awa now provide the remaining links between maunga and moana; and the opportunities for re-connections to begin.

Iwi wish to see the waterways including above and below ground sources, as far as possible, preserved, restored and enhanced through the project.

There are numerous wetlands and dune lakes in the band of sand dune country at the western edge of the plains, the largest and most notable of which are Punahau/Lake Horowhenua and Lake Waiwiri/Papaitonga Reserve which are historically rich and especially significant for mana whenua. The health of these lakes and all forms of water is of deep concern to iwi, including all natural flow patterns above and below the ground and how these relate to natural catchments.

The eastern route for the proposed highway, along the toe of the hills, provides as wide a berth as possible from the named lakes—acknowledging that the route still crosses the plains including rivers, tributaries, small areas of open water and wetland areas and where there are complex groundwater patterns and catchment flows to consider. For the purpose of the CEDF, the main catchments are identified as they relate to natural character, as assessed through the RMA process (as shown in the figure alongside) and discussed with iwi partners in the process of determining appropriate ecology and natural character mitigation and offsetting.

The gravel fans spreading out from the Tararua range are highly porous and absorb the majority of rainwater within the landscape. It is only in particularly heavy rainfall events that surface-runoff channels form. As a result, groundwater levels are highly dynamic across the landscape and freshwater springs, known as puna, are common. The movement of water through the Horowhenua fans are dynamic in both time and space. These natural water movements are highly valued by iwi with a number of puna already lost due to past development - known as Waihou, Te Wai o Haunga, and Hau Tū, to name a few. Those that remain, and are recognised by iwi, are extremely valuable.



Manakau Stream
[EOS Ecology]

Major River Catchments Traversed by the Project

Legend

- Proposed Highway

Awa - Named Rivers & Streams

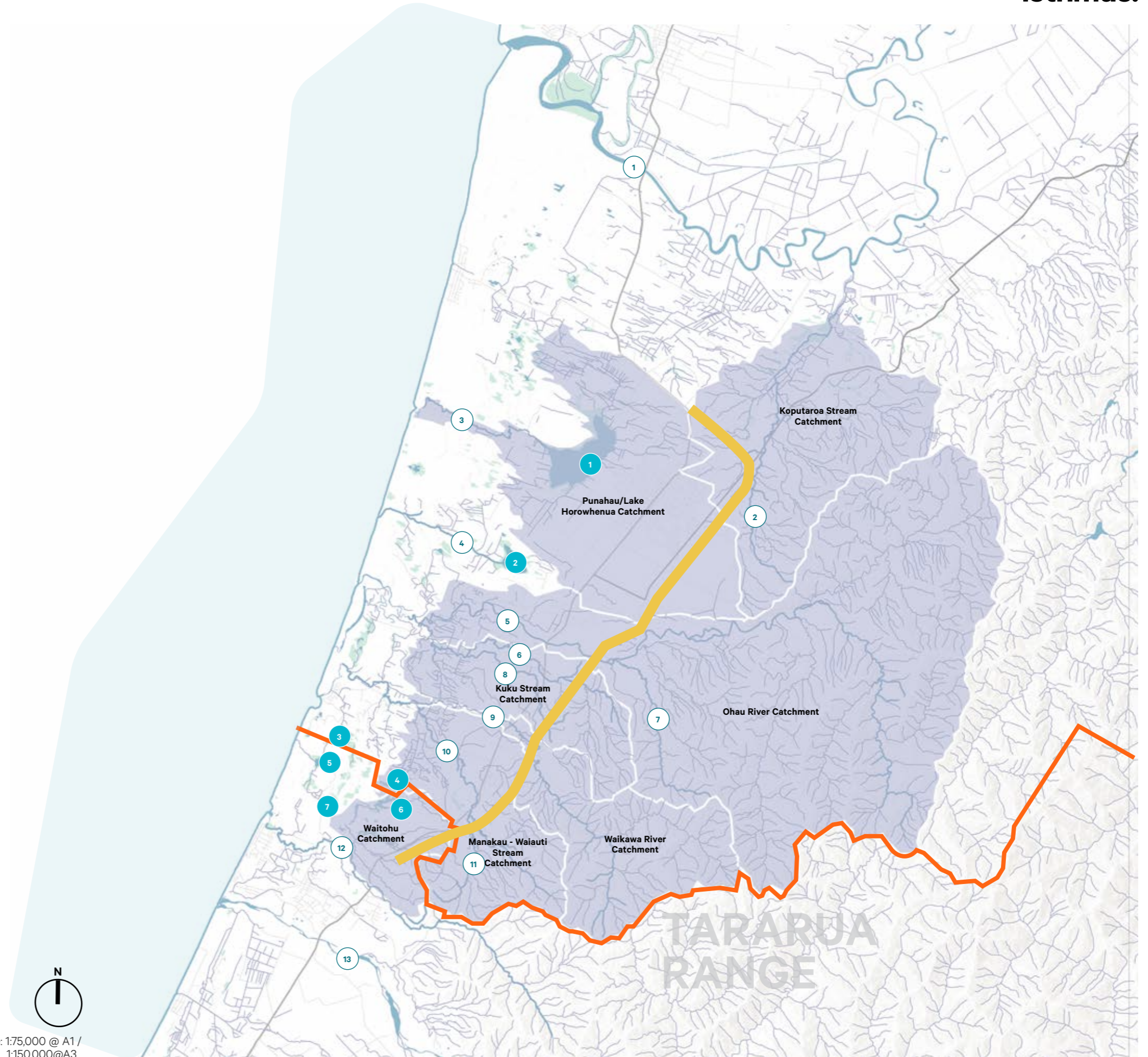
1. Manawatū River
2. Koputaroa Stream
3. Hokiā/Hokioi Stream
4. Waiwiri Stream
5. Ohau River
6. Kuku Stream
7. Makorokio Stream
8. Waikopu Stream
9. Waikawa Stream
10. Manakau Stream
11. Waiāuti Stream
12. Waitohu Stream
13. Ōtaki River

Roto - Named Lakes

1. Punahau/Lake Horowhenua
2. Lake Waiwiri/Papaitonga Reserve
3. Lake Huritini
4. Lake Kopureherehere
5. Lake Waiorongomai
6. Lake Waitawa
7. Ngatōtara Lagoon

District and Regional Boundaries
[Horowhenua and Kāpiti Coast Districts, Horizons and Greater Wellington Regions.]

Major river catchments traversed by the Project
[Ō2NL Hydrological Data]



Scale: 1:75,000 @ A1 / 1:150,000@A3

Extracts from Ōtaki to North of Levin: Technical Assessment - Hydrology and Flooding.

Hydrology and Flood Risk

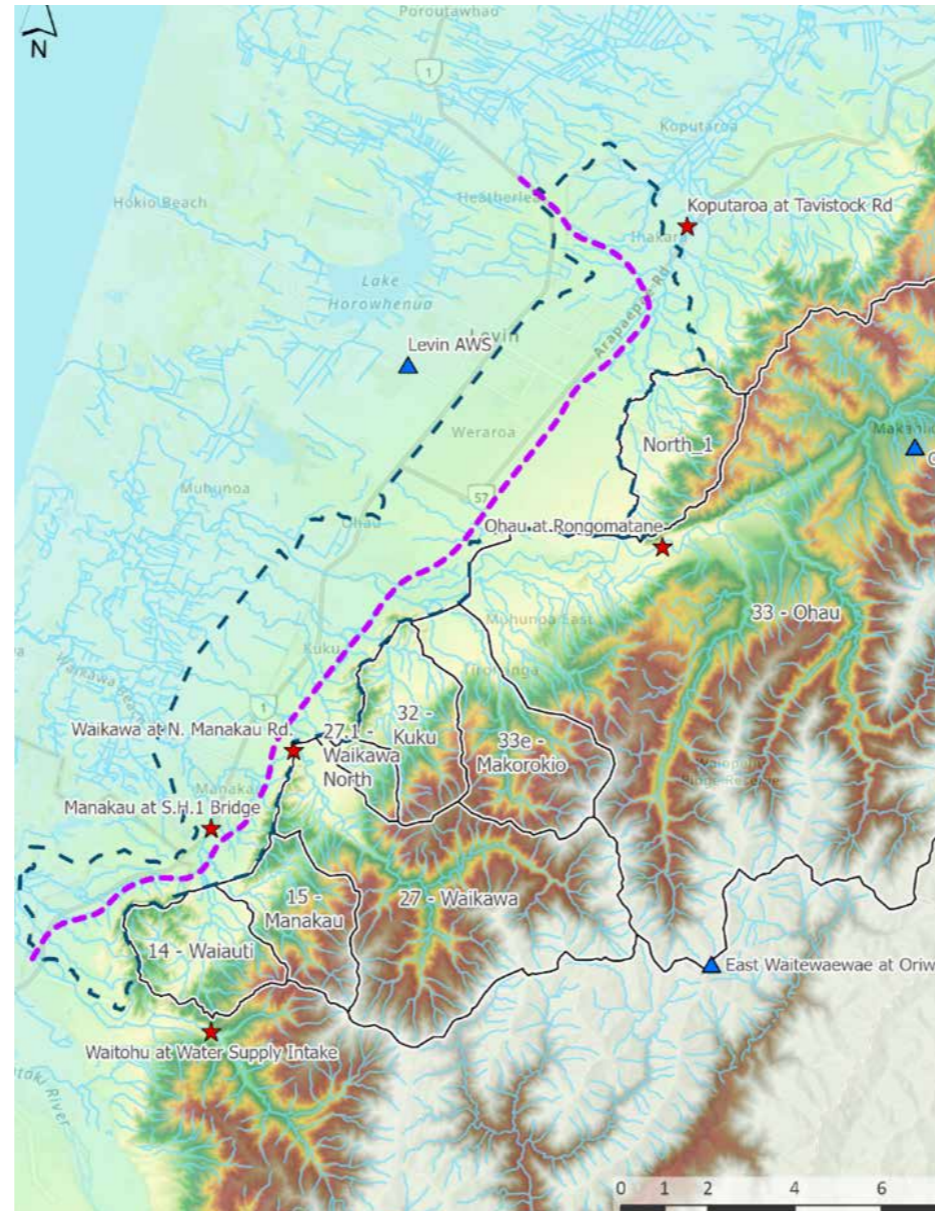
A network of awa, roto, repo, ground water sources, overland flow paths, including areas prone to flooding, extend across the plains from the foothills to the coast. The overland waterways and unique sheeting groundwater patterns are the lifeblood of the plains: providing corridors from mountains to sea, the moist habitat for lowland forest remnants, the groundwater/awa feeding the roto and repo and the water supply for the community and commercial use. In addition to the values provided by wai in these uses, the districts waterways are often linked to the remaining areas of lowland indigenous vegetation and existing and possible restoration projects.

The larger streams in the project area (north to south) comprise Koputaroa tributaries, the Ohau River, Kuku Stream and tributaries, the Waikawa River, Manakau, Waiauti, and Waitohu Streams. The highway will cross each of these, in most cases just downstream of where they emerge from the hills. However, the highway also intersects with numerous smaller tributaries. The Ohau River is recognised as a ‘Group 1 Priority Waterbody’ and the Waikawa as a ‘Group 2 Priority Waterbody’ under the Horowhenua District Plan.

The project will cross numerous existing and past waterways and wetland areas. Many of these are within pasture and grazed, but some are fenced to exclude livestock and support indigenous wetland vegetation. Past watercourses including distinct terraces and oxbow landforms are easily distinguished in the landforms the proposed highway will traverse. These patterns have been used as an important guide through the route selection phase of the project, for example, in helping to avoid additional earthworks. Detailed design measures that complement and deliberately integrate with natural patterns in the whenua and awa, including flood hazards, will have an important role to play in achieving the overarching principles of the CEDF, as detailed further in Section 4.

The topographic and hydrological regimes are both dominated by the Tararua mountain range, with watercourses draining from the mountains in the east to the sea in the west. East and northeast of Levin, some catchments drain toward the Koputaroa Stream which flows north to join the Manawatū River.

The steep topography of the Tararua range results in rapid catchment response, with the larger streams near the Ō2NL Project peaking roughly 3-4 hours after the peak rainfall intensity (or centroid of rainfall). For the very small catchments, that drain directly toward the Ō2NL Project (south of the Ohau River), the time to peak is closer to 1 hour.



Ō2NL Project Topographic Overview
Variation in elevation across the inflow catchments and 2D model area
[Technical Assessment - Hydrology and Flooding]



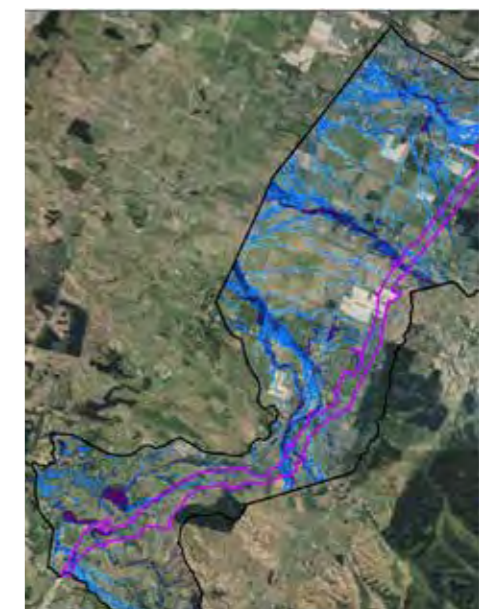
Horizons Regional Council Flood Map
Following the 2004 flood event in Manawātū-Whanganui Region, Horizons Regional Council invested in LIDAR acquisition of fine-scale elevation information across the region's floodplains.
[Horizons Regional Council]



Horowhenua District Council mapping shows Flood Hazard areas, including on the Ohau River through the project area.
[Horowhenua District Council]



Baseline maximum modelled depths, showing 1:100 flood event in 2030 (North)
[Technical Assessment - Hydrology and Flooding]



Baseline maximum modelled depths, showing 1:100 flood event in 2030 (South)
[Technical Assessment - Hydrology and Flooding]

Biodiversity

The outwash plains were naturally clothed in lowland Tōtara-Kohekohe-Pukatea forest. Historically, these forests were distinguished by way of natural clearings and stands of trees. Now the situation is reversed, with just a few remnant areas of forest standing in the open plains. Important remnants in the vicinity of the project include Staples Bush (near the toe of Pukehou), those on the north bank of the Ohau River near Muhunua East Road, and the two stands adjacent to the Ashleigh homestead located on Queen Street East.

The moist forests are especially known as habitat for *Powelliphanta* giant land snails, including a local endemic species restricted to the Ōtaki area. *Wainuia urnula* another not threatened ngata (snail) species is also present in existing bush remnants as is *Peripatus* (velvet worm).

There are records and evidence of indigenous Mokomoko (geckos and skinks) in the area. The lowland forests, rivers, and wetlands support At Risk and Threatened indigenous bird species such as Matuku (Australasian bittern), Pūweto (spotless crane) and Mātātā (fernbird).

All major fauna groups have been subject to surveys through the AEE phase of the project to determine what species are present, and where, to inform the highway alignment and ongoing design response.

Logging has left an historical legacy, and certain localities are associated with mill settlements such as Ohau, Muhunua East and Kimberley with other areas, such as Miranui and Makurerua (near Shannon), known for flax milling and trade by rail.

Exotic forestry remains on parts of the foothills, but in some places indigenous vegetation extends through these towards the plains, often along awa/streams and on the sides of steep gullies.

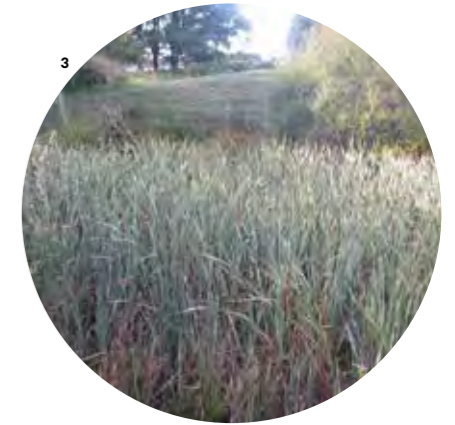
The awa, roto and repo are home to numerous indigenous and endemic fish and aquatic macroinvertebrate species. Fish known from the catchments traversed by the proposed highway include Tuna (longfin eel, shortfin eel), Īnanga, Toitoi (common bully), upland bully, redfin bully, Kōwaro (brown mudfish), shortjaw Kōkopu, banded Kōkopu, Kōaro, Panoko (torrentfish), Pōrohe (common smelt), and Piharau (lamprey eel). With the majority of these fish requiring access to the ocean to complete their lifecycles, the maintenance of fish passage is an important component of the project.

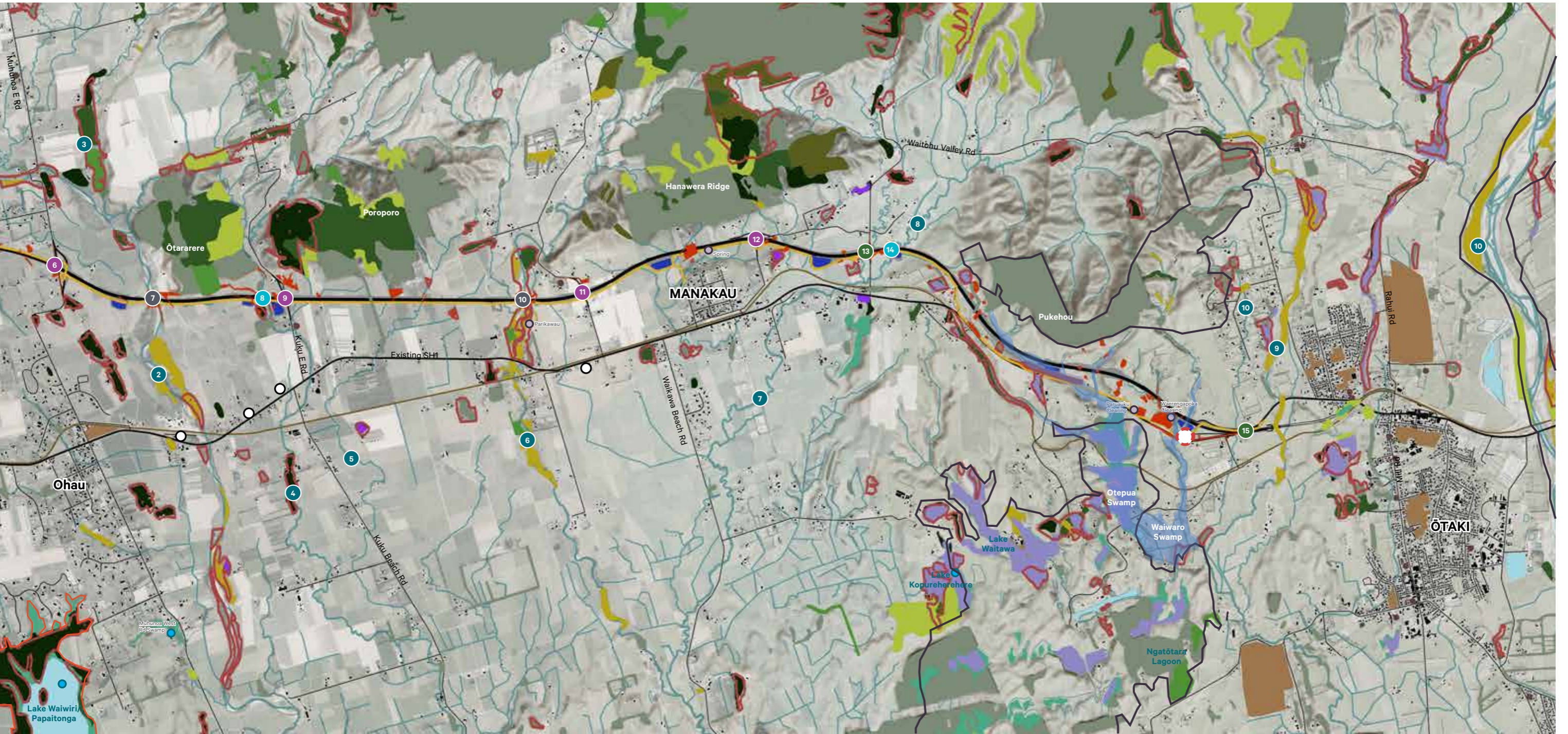
There are a number of wetland restoration projects underway between the project route and the coastal edge including those managed by HDC, mana whenua and on private properties, as shown on the following pages.



Note: Marae and significant features shown are adjacent to the proposed and existing highway, as agreed with the project partners.

- 1. Ohau River. Corridor for movement of wildlife from mountains to sea [Wildlands Consultants Ltd. 2019]
- 2. Ohau River. Indigenous treeland on river alluvium, including Titoki, Manatu, ti Kōuka, Pukatea [Wildlands Consultants Ltd. 2019]
- 3. Koputaroa Catchment. Formerly swamp forest (Maire Tawake, Pukatea), Raupō reedland. [Wildlands Consultants Ltd. 2019]





Legend.

	Existing State Highway 1
	Local Roads
	Railway Line
	Awa/River
	Lake/Roto
	Indicative Highway Alignment
	Proposed Shared Use Path (SUP)
	Stormwater Wetlands
	Awa Bridge - Multispan

	Awa Bridge - Singlespan
	Roundabout
	Interchange with local road over highway
	Local Road connection - Over highway
	Local Road connection - Under highway

Crossings, Roundabouts & Interchanges

1	Northern Termination Roundabout
2	NMIT Bridge
3	SH57 Roundabout
4a	Queen Street E. Road Bridge
4b	Queen Street E. Pedestrian and Cycle Bridge
5	Tararua Road Bridge
6	Muhunua East Rd Bridge
7	Ohau Bridge
8	Kuku Bridge
9	Kuku East Rd Bridge
10	Waikawa Bridge
11	North Manakau Road Bridge
12	Manakau Heights Drive Bridge
13	South Manakau Road Bridge
14	Waiauti Bridge
15	SH1 Bridge

Awa - Named Rivers & Streams

1	Koputaroa Stream
2	Ohau River
3	Makorokio Stream
4	Kuku Stream
5	Waikōkōpu Stream
6	Waikawa Stream
7	Manakau Stream
8	Waiauti Stream
9	Waitohu Stream
10	Greenwood Stream
11	Ōtaki River

Marae & Significant Locations
In close proximity to highway
[Ō2NL Route Selection Data]

	Prioritised Wetlands/Repo [Horizons Regional Council Wetland Prioritisation Map]
	SNA (Indicative) [HDC]
	Ecological Areas (Including significant indigenous vegetation and significant habitats of indigenous fauna) [KCDC]
	Significant Amenity Area [KCDC]
	ONFL [HDC]
	Notable Trees (Indicative) [HDC, KCDC]
	Native Polygons [LINZ]

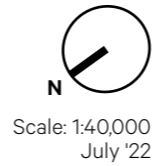
	Identified Constraints - Points In close proximity to highway [Ō2NL Route Selection Data]
Existing Vegetation (Surveyed/mapped as part of Ō2NL)	
Existing Vegetation [LCDCB v5]	
	Indigenous Forest
	Broadleaved indigenous hardwood
	Manuka/Kanuka
	Flaxland (around Punahau/Lake Horowhenua)
	Deciduous Hardwoods
	Herbaceous freshwater vegetation
	Exotic Forest
	Forest - harvested
	Gorse/Broom
	Urban Parkland

Project Flora and Fauna

Threatened, at-risk, declining & notable species have been identified through the surveys for the project. The final list is to be reviewed and developed with iwi and ecologists. It should be noted that, in Te Ao Māori, all indigenous species are valued. Species with revered, taonga values (tbc) are shown in black text.

List of species identified in technical assessments and mana whenua																											
Ngārara/Lizards	<table border="0"> <tr> <td>Ornate Skink</td> <td><i>Oligosoma ornatum</i></td> </tr> <tr> <td>Northern Grass Skink</td> <td><i>Oligosoma polychroma</i></td> </tr> <tr> <td>Copper Skink</td> <td><i>Oligosoma aeneum</i></td> </tr> <tr> <td>Glossy brown skink</td> <td><i>Oligosoma zelandicum</i></td> </tr> </table>	Ornate Skink	<i>Oligosoma ornatum</i>	Northern Grass Skink	<i>Oligosoma polychroma</i>	Copper Skink	<i>Oligosoma aeneum</i>	Glossy brown skink	<i>Oligosoma zelandicum</i>																		
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Te aitanga pepeke/ Invertebrates	<table border="0"> <tr> <td>Ngata/land snail</td> <td><i>Powelliphanta traversi florida</i> <i>Powelliphanta traversi otakia</i> <i>Powelliphanta traversi traversi</i></td> </tr> <tr> <td>Wainuia/ large endemic snail</td> <td><i>Wainuia urnula</i></td> </tr> <tr> <td>New Zealand Mantis</td> <td><i>Orthodera novaezealandiae</i></td> </tr> <tr> <td>Ngaokeoke/ Peripatus, Velvet worm</td> <td><i>Peripatoides novaezealandiae</i></td> </tr> <tr> <td>Kapapa/Spiny longhorn beetle</td> <td><i>Blosyropus spinosus</i></td> </tr> </table>	Ngata/land snail	<i>Powelliphanta traversi florida</i> <i>Powelliphanta traversi otakia</i> <i>Powelliphanta traversi traversi</i>	Wainuia/ large endemic snail	<i>Wainuia urnula</i>	New Zealand Mantis	<i>Orthodera novaezealandiae</i>	Ngaokeoke/ Peripatus, Velvet worm	<i>Peripatoides novaezealandiae</i>	Kapapa/Spiny longhorn beetle	<i>Blosyropus spinosus</i>																
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Freshwater Fauna	<table border="0"> <tr> <td>Longfin tuna/eel</td> <td><i>Anguilla dieffenbachii</i></td> </tr> <tr> <td>Shortfin tuna/eel</td> <td><i>Anguilla australis</i></td> </tr> <tr> <td>Bluegill bully</td> <td><i>Gobiomorphus hubbsi</i></td> </tr> <tr> <td>Inanga/whitebait</td> <td><i>Galaxias maculatus</i></td> </tr> <tr> <td>Giant kōkopu</td> <td><i>Galaxias argenteus</i></td> </tr> <tr> <td>Kōaro</td> <td><i>Galaxias brevipinnis</i></td> </tr> <tr> <td>Brown mudfish</td> <td><i>Neochanna apoda</i></td> </tr> <tr> <td>Shortjaw kōkopu</td> <td><i>Galaxias postvectis</i></td> </tr> <tr> <td>Pirahau/lamprey</td> <td><i>Geotria australis</i></td> </tr> <tr> <td>Redfin bully</td> <td><i>Gobiomorphus huttoni</i></td> </tr> <tr> <td>Banded kōkopu</td> <td><i>Galaxias fasciatus</i></td> </tr> <tr> <td>Kōura/ freshwater crayfish</td> <td><i>Paranephrops zealandicus</i></td> </tr> <tr> <td>Kākahi/ freshwater mussels</td> <td><i>Echydrella menziesii</i></td> </tr> </table>	Longfin tuna/eel	<i>Anguilla dieffenbachii</i>	Shortfin tuna/eel	<i>Anguilla australis</i>	Bluegill bully	<i>Gobiomorphus hubbsi</i>	Inanga/whitebait	<i>Galaxias maculatus</i>	Giant kōkopu	<i>Galaxias argenteus</i>	Kōaro	<i>Galaxias brevipinnis</i>	Brown mudfish	<i>Neochanna apoda</i>	Shortjaw kōkopu	<i>Galaxias postvectis</i>	Pirahau/lamprey	<i>Geotria australis</i>	Redfin bully	<i>Gobiomorphus huttoni</i>	Banded kōkopu	<i>Galaxias fasciatus</i>	Kōura/ freshwater crayfish	<i>Paranephrops zealandicus</i>	Kākahi/ freshwater mussels	<i>Echydrella menziesii</i>
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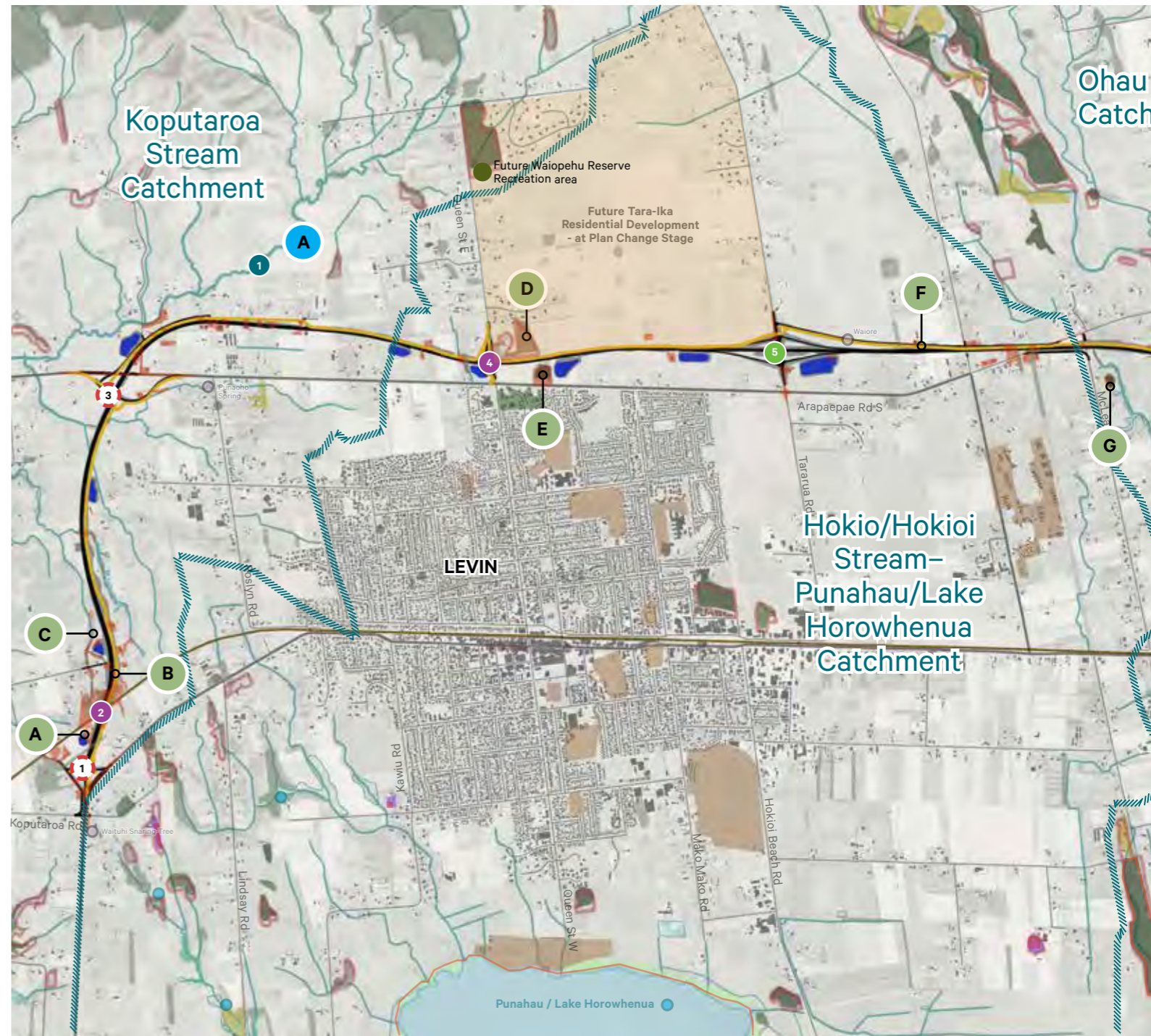
Taonga fauna, Te Reo Māori and locations to be confirmed with Iwi and Ecologists



Legend

- Existing State Highway 1
- Local Roads
- Railway Line
- Awa/River
- Lake/Roto
- Indicative Highway Alignment
- Proposed Shared Use Path (SUP)
- Stormwater Wetlands
- Awa Bridge - Multispan
- Awa Bridge - Single-span
- Roundabout
- Interchange with local road over highway
- Local Road connection - Over highway
- Local Road connection - Under highway
- Indicative Hydrological Catchments
- Awa - Named Rivers & Streams**
 - 1 Koputaroa Stream
 - 2 Ohau River
 - 3 Makorokio Stream
 - 4 Kuku Stream
 - 5 Waikōkopu Stream
 - 6 Waikawa Stream
 - 7 Manakau Stream
 - 8 Waiauti Stream
 - 9 Waitohu Stream
 - 10 Greenwood Stream
 - 11 Ōtaki River
- Marae & Significant Locations In close proximity to highway [Ō2NL Route Selection Data]

Note: Marae and significant features shown are adjacent to the proposed and existing highway, as agreed with the project partners.



A Fauna Notable Species

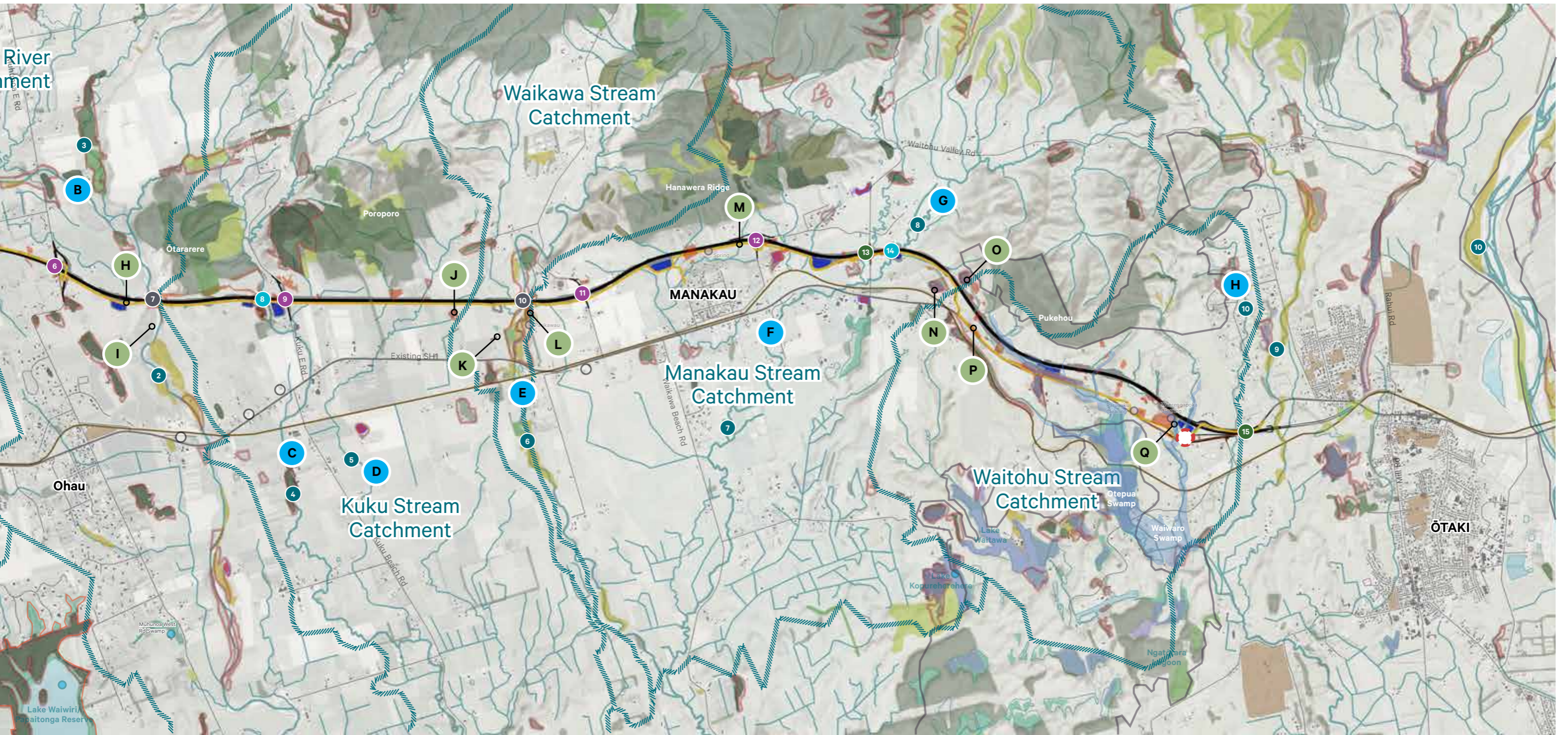
A	Black Shag, Weweia
B	Marsh Crake, Spotless Crake
C	Grey Duck, Black Shag, Long-tailed Cuckoo
D	Ornate Skink
E	Ornate Skink
F	Northern Grass Skink
G	Peripatus

H	NZ Pipit, Black Fronted Dotterel, Yellow Crowned Parakeet
I	NZ Pipit
J	NZ Pipit
K	Black Shag
L	Wainui urnula, NZ Pipit
M	NZ Pipit
N	Peripatus
O	Peripatus, Ornate Skink
P	NZ Pipit, Long-Tailed Cuckoo
Q	Long-Tailed Cuckoo

A Aquatic Notable Species

A	Koputaroa Stream Shortfin tuna/eel, Bullies, Inanga
B	Ohau River Shortfin tuna/eel, Bullies, Banded kōkopu, Shortjaw kōkopu, Kōaro, Lamprey/pirahau
C	Kuku Stream Shortfin tuna/eel, Longfin tuna/eel, Bullies, Banded kōkopu, Kōaro
D	Waikōkopu Stream Shortfin tuna/eel, Banded kōkopu, Inanga

E	Waikawa Stream Shortfin tuna/eel, Longfin tuna/eel, Bullies, Giant kōkopu, Shortjaw kōkopu, Kōaro, Lamprey/pirahau
F	Manakau Stream Shortfin tuna/eel, Longfin tuna/eel, Bullies, Banded kōkopu, Shortjaw kōkopu, Giant kōkopu, Inanga
G	Waiauti Stream Shortfin tuna/eel, Longfin tuna/eel, Bullies, Banded kōkopu
H	Waitohu Stream, Shortfin tuna/eel, Banded kōkopu



New Zealand Dabchick



Black Shag



Koitereke



Ornate Skink



Northern Grass Skink



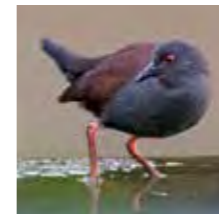
Copper Skink



Koekoëa



Karakahia



Spotless Crake



Long fin tuna



Bluegill bully



Inanga



Giant kōkopu



Kōaro



Brown mudfish



Land Snail



Land Snail



Wainuia



Pihoihoi



Tūturiwhatu



Kākāriki



Shortjaw Kōkopu



Pirahau



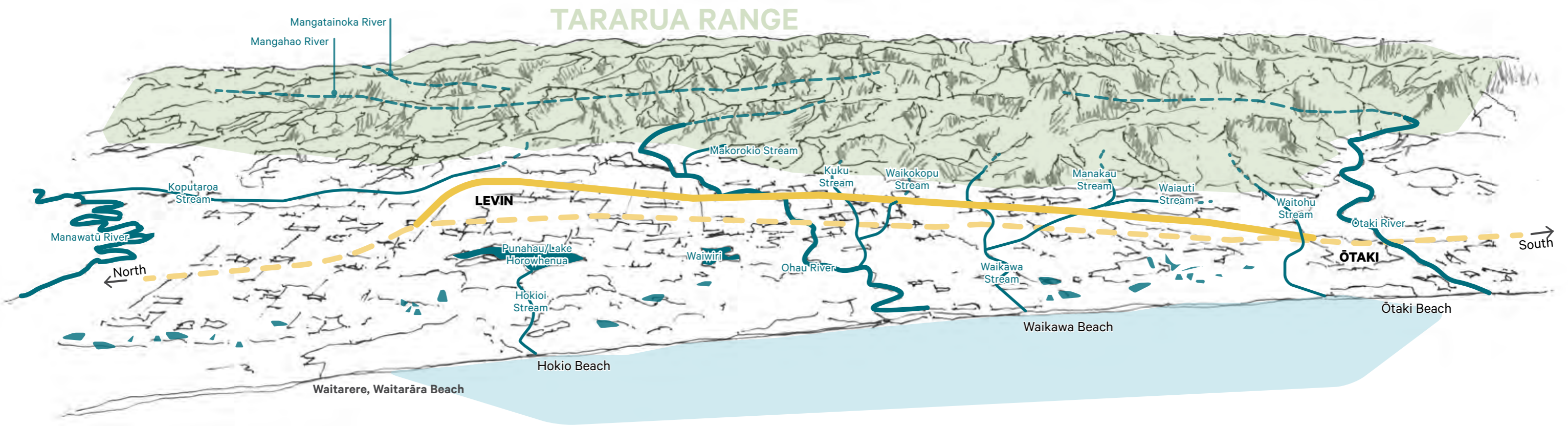
Redfin bully

REVIEW & COMPLETE WITH MANA WHENUA AND COUNCILS

Existing Restoration Projects

Existing terrestrial, riparian and wetland restoration projects and priorities provide an important context within which to consider offsetting and mitigation provided by the project. For example there are existing restoration project led by hapu at Kuku, Arawhata, Waiwiri and Kereru, Koputaroa.

Awa & Ara in Context





Right: Horizons Regional Council Wetland Prioritisation Map
 [Revised Regional Wetland Inventory and Prioritisation, June 2008]

Far Right: Lake Waiwiri/Papaitonga Reserve
 [Department of Conservation]

Below: Waitohu Stream
 [https://otakimail.co.nz/about-otaki/]



2.3 Tāngata/Cultural Landscape.

Tāngata Whenua

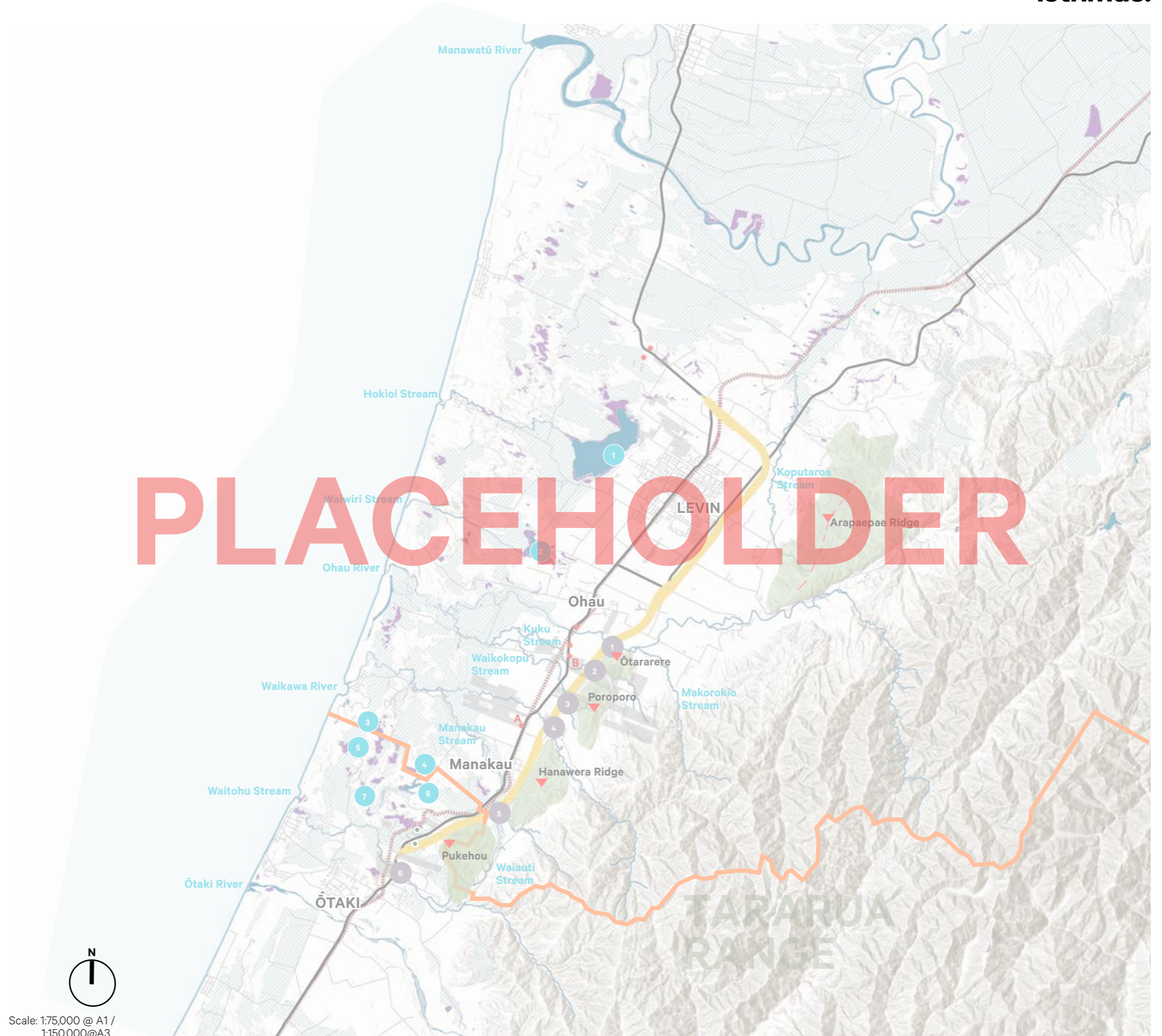
Muaūpoko and Ngāti Raukawa are associated with the project area. Please refer to the cultural impact reporting for the project.

REVIEW &
COMPLETE WITH
MANA WHENUA

Legend

- Proposed Highway
- Named Inland Waterways
- Roto - Named Lakes**
 - 1. Punahau/Lake Horowhenua
 - 2. Lake Waiwiri/Papaitonga
 - 3. Lake Huritini
 - 4. Lake Kopureherehere
 - 5. Lake Waitongomai
 - 6. Lake Waitawa
 - 7. Ngatōtara Lagoon
- Water/Stream connections impacted by proposed route**
 - 1. Ohau River
 - 2. Kuku Stream
 - 3. Waikokopu Stream
 - 4. Waikawa River
 - 5. Manakau Stream/ Waiauti Stream
 - 6. Waitohu Stream
- Māori Land Blocks [Manaaki Whenua Landcare Research] In close proximity to proposed highway
- Historical Wetlands [Manaaki Whenua Landcare Research]
- Current Wetlands [Manaaki Whenua Landcare Research]
- Landforms
- Clearings [Adkin Maps] Approximate Locations in close proximity to proposed highway
- Marae & Significant Locations [Ō2NL Constraints Data]**
 - Marae in close proximity to proposed highway
 - A. Wehi Wehi Marae
 - B. Tūkorehe Marae
- District and Regional Boundaries [Horowhenua and Kāpiti Coast Districts, Horizons and Greater Wellington Regions.]

Note: Significant features shown are adjacent to the proposed and existing highway, as agreed with the project partners.



2.4 Hapori/Community Landscape.

Following the heke and settlement of iwi groups, pākehā contact quickly led to significant road and rail development adding to the pathways and early roads created by Māori, ki uta ki tai, and plains and along the coastline. The Wellington Manawātū Railway (now the North Island Main Trunk Railway—NIMT) was pushed through the forest along the middle of the plains in the 1880s. The remaining areas of lowland forest were then felled and the plains converted to agriculture within a couple of decades. State highway 1 (‘SH1’) paralleled the railway line, with a pattern of no-exit side-roads branching off either side toward the coast or the hills. For iwi, the establishment of transport routes in Horowhenua (rail and the road) is associated with loss of land and removal of connections within communities; of ‘taniwha’ that work against holistic management, ki uta ki tai. An iwi aspiration is that the new road does not continue this trend, and this is reflected in the values, core principles and identified outcomes for the project.

The settlements of Levin, Ohau and Manakau were established in conjunction with the railway and crown acquisition from Muaūpoko. Each settlement was designed on a grid (and retains traces of its original compact ‘four-square’ form) at even distances along the rail line.

- **Levin** is Horowhenua’s main town established in response to a land acquisition process between Muaūpoko and Crown. It is laid out on a much larger grid, bisected by the railway and by SH1 which also serves as the ‘main street’. The perpendicular axis, Queen Street, partitions Levin into four quadrants. The intersection of the main street and Queen Street was the junction of the road to Palmerston North, however SH57 was subsequently re-routed around the eastern outskirts along Kimberley Road and Arapaepae Road.
- **Ohau** was designed on a similar model to Manakau: a compact grid of half a dozen streets built adjacent to the railway line on the north bank of the Ohau River. However, the settlement also stretched along Muhunua East Road on the opposite side of the railway and SH1—including the school and church. Its form reflects the fact that Ohau anchors the road along the north bank of the Ohau River, connecting upstream to Muhunua East settlement, and downstream to Muhunua West.
- **Manakau** was the first station and town established on the Manawātū Wellington Railway in the 1880s. The settlement comprises a small grid of half-a-dozen streets named after early Māori members of Parliament. It retains a quiet, village character with narrow tree-lined streets, outlook to rural and rural residential areas, and several historic buildings and sites. It is out of the main flow: separated from SH1 by the NIMT along there are several businesses along the existing highway that identify with the village such as the Manakau Market.



Levin Railway Station, c1920. [Horowhenua Historical Society Inc.]



Ōtaki Railway Station, c1886 [Horowhenua Historical Society Inc.]



Old Coach Road, Ōtaki [View of the Old Coach Road, Ōtaki. Levin, William Hort, 1845-1893: Wellington and Manawātū Railway Company Ltd. Views on the Wellington & Manawātū Railway. Ref. PA1-f-239-18. Alexander Turnbull Library, Wellington, New Zealand.]



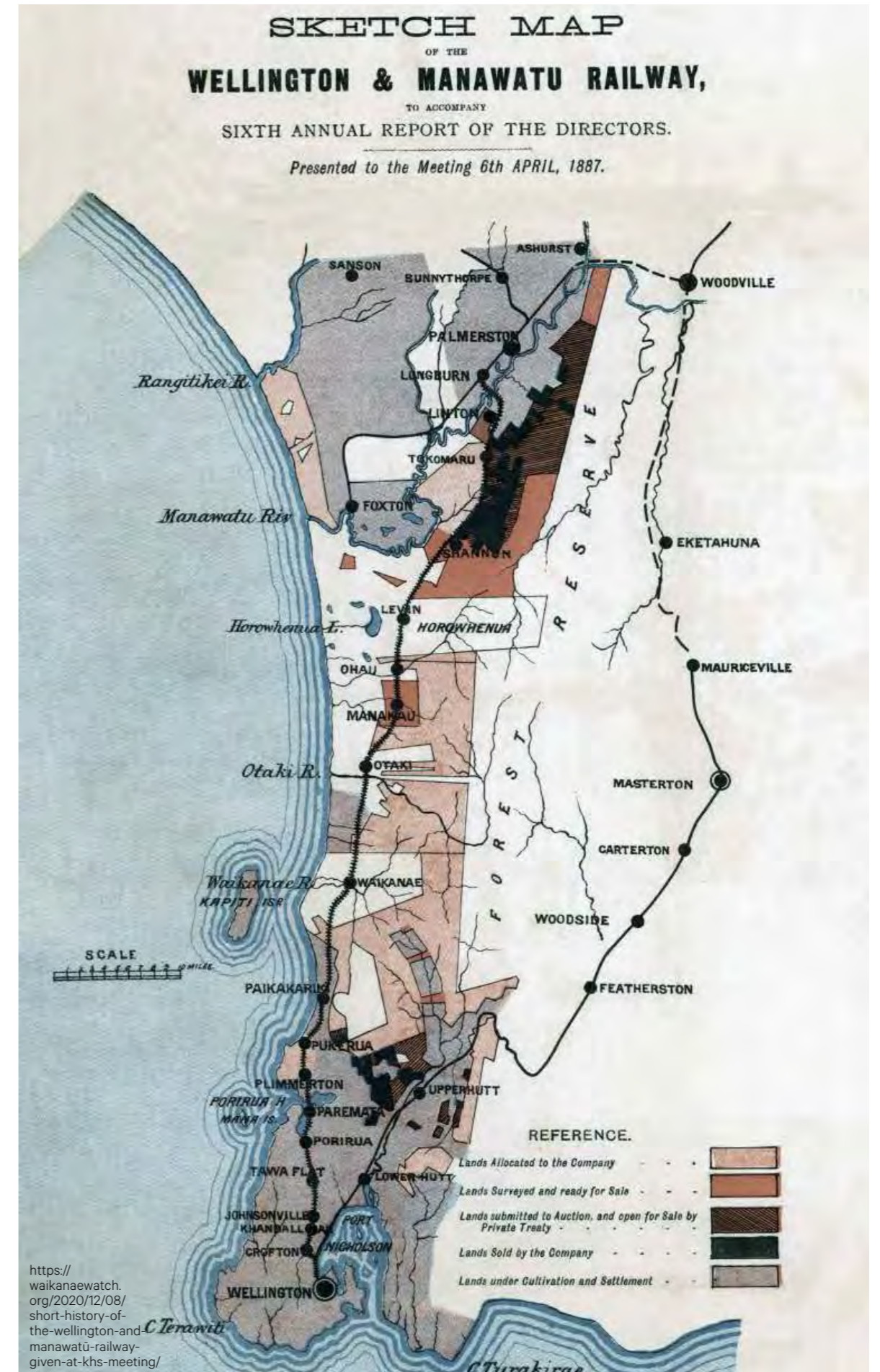
Believed to be Whiley’s Mill at Ohau Railway Station 1892. [Horowhenua Historical Society Inc.]



Manakau Railway Station and Mr M Monk 1916 [Horowhenua Historical Society Inc.]



Manakau Settlement & Railway [Alexander Turnbull Library, Wellington Horowhenua Historical Society Inc.]

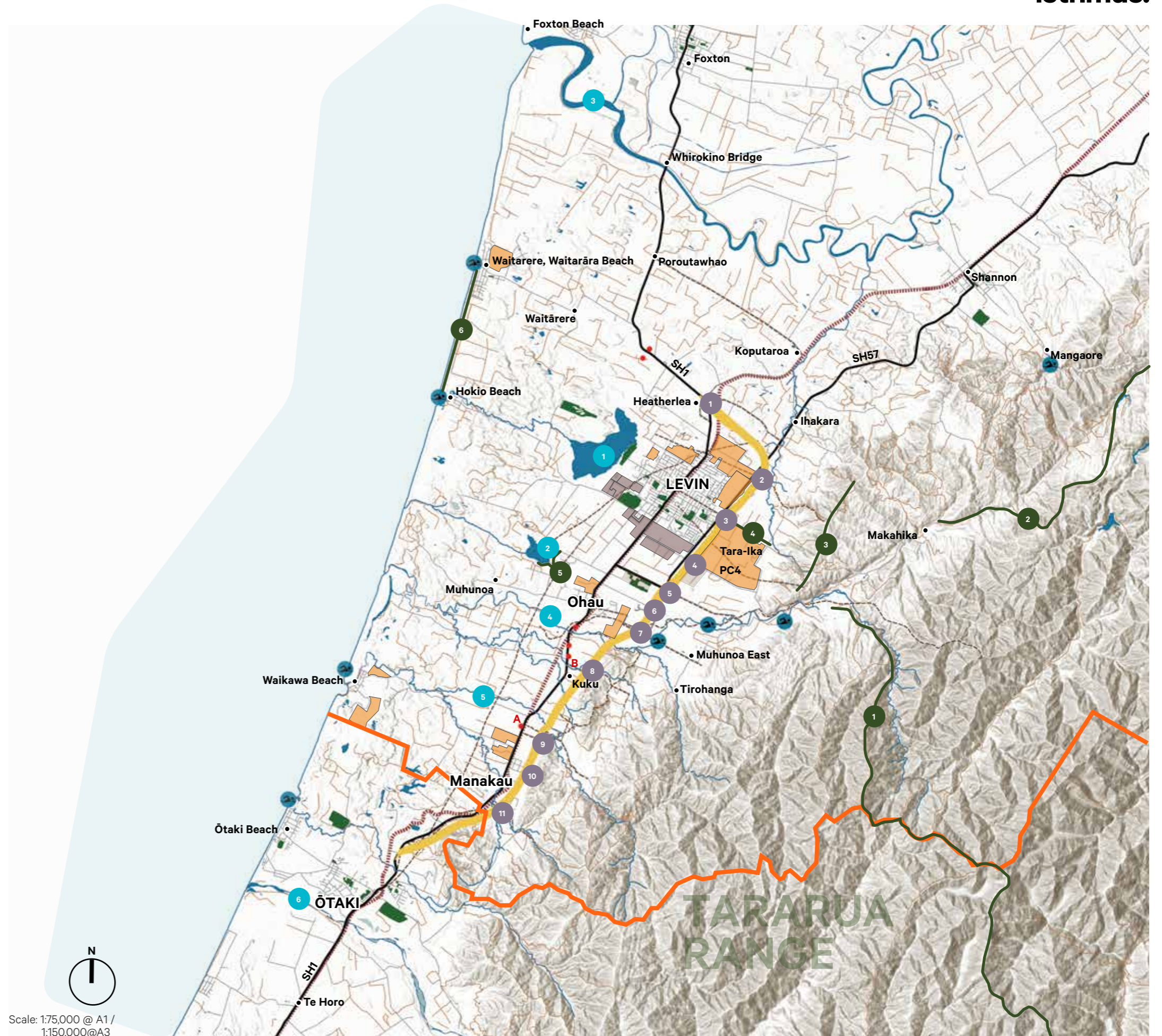


Community Connections

Legend

- Proposed Highway** (Yellow line)
- Settlements** (Black dot)
- Awa & Roto**
 - 1. Punahau/Lake Horowhenua
 - 2. Lake Waiwiri/Papaitonga
 - 3. Manawatu River
 - 4. Ohau River
 - 5. Waikawa Stream
 - 6. Otaki River
- Transport Infrastructure**
 - Existing State Highway (Black line)
 - Local Road Network (Thin black line)
 - Existing Railway Line (Red dashed line)
- Local Roads & Settlements affected by Proposed Routes**
 - 1. Koputaroa Road & Heatherlea East Road
 - 2. MacDonald Road / Waihou Road
 - 3. Queen Street E
 - 4. Tararua Road
 - 5. Kimberley Road / Arapaepae Road S.
 - 6. McLeavey Road
 - 7. Muhunoa E. Road / Arapaepae Road S.
 - 8. Kuku E. Road
 - 9. North Manakau Road
 - 10. Honi Taipua / Manakau Heights Dr.
 - 11. South Manakau Road
- Future Growth [HDC Growth Strategy 2040]**
 - Residential, including Tara-Ika-Plan Change 4 (Light brown)
 - Industrial (Dark brown)
- Urban Parkland/Open Space [LCDB]** (Green)
- Tracks [LINZ]** (Orange line)
- Key Walking/Cycling Tracks [HDC]**
 - 1. Tararua Northern Crossing
 - 2. Te Araroa
 - 3. Trig Walkway & Kohitere Forest
 - 4. Queen Street Walkway
 - 5. Papaitonga Scenic Reserve
 - 6. Hydrabad Wreck Location
- Tracks [Constraints Data]** (Red line)
- Swimming Holes [HDC, LAWA]** (Blue circle)
- Marae & Significant Locations [Ō2NL Constraints Data]**
 - A. Marae in close proximity to proposed highway
 - A. Wehi Wehi Marae
 - B. Tūkorehe Marae
- District and Regional Boundaries [Horowhenua and Kāpiti Coast Districts, Horizons and Greater Wellington Regions.] (Orange outline)

Note: Significant features shown are adjacent to the proposed and existing highway, as agreed with the project partners.



Scale: 1:75,000 @ A1 / 1:150,000@A3

Community Connections from Hokioi Stream to Tararua Foothills

Connections – Community Scale

Connections across the Horowhenua landscape are layered, relating to spiritual connections between mana whenua maunga and wai; physical connections for between places for people and fauna, and connections between communities of flora.

The complexity of these connections becomes clearest at the community scale and for the distinct communities of Manakau, Muhunua East, Kuku, Ohau, Levin East and West and Koputaroa, including commuting routes and everyday destinations.

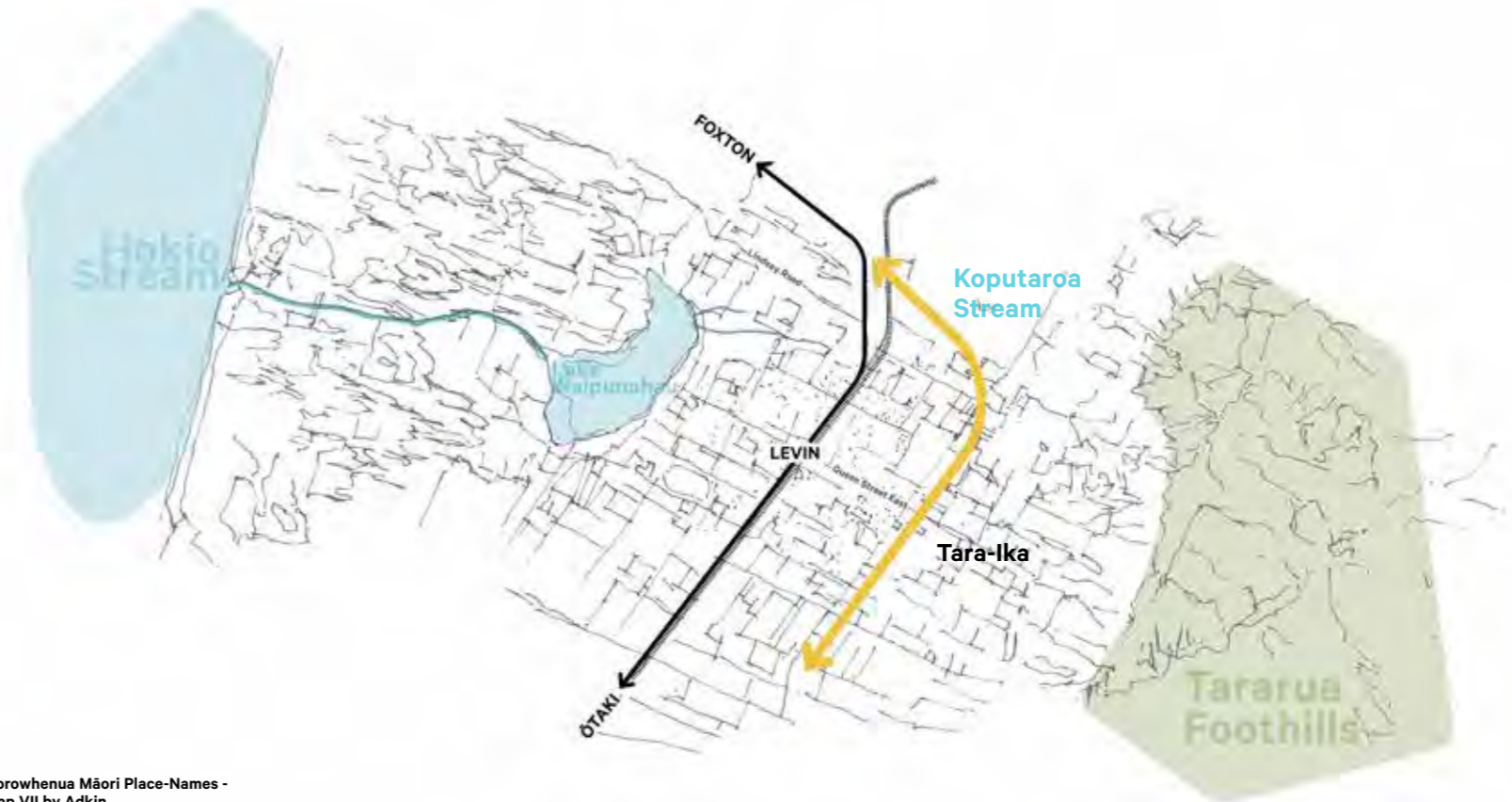
Continuing physical connections in the landscape, ki uta ki tai, between the mountains and the sea, relate to key local roads such as Tararua Rd and Kuku East Rd, the beach connections and awa including popular swimming holes and continuing mahinga kai (food gathering areas) and these are a base for a design response. Historic east-west trails and named landmarks provide further prompts of ongoing associations, which could be highlighted along the shared use path and highway journey through interpretation and the proposed mahi toi strategy.

Connections also exist across broader landscape areas between awa, including for birds with low flight patterns such as Kereru for which potential bird strike is an important consideration (noting also that Pukeko often chooses not to fly), fish and many smaller terrestrial species.

Within the project there is an important opportunity to use the concept of mahinga kai and rongoā (a system of using plants for healing) as a basis for a plant-based design approach to achieving healthy community connections that have been lost through past development.

Future growth plans for the district and planned additional HDC connections, as described in more detail below, provide a further relevant context matter for the Ō2NL project.

Note: Significant features shown are adjacent to the proposed and existing highway, as agreed with the project partners.



Horowhenua Māori Place-Names - Map VII by Adkin [Adkin, G. L. (1948) Horowhenua: Its Maori place-names and their topographic and historical background, Department of Internal Affairs, Wellington]



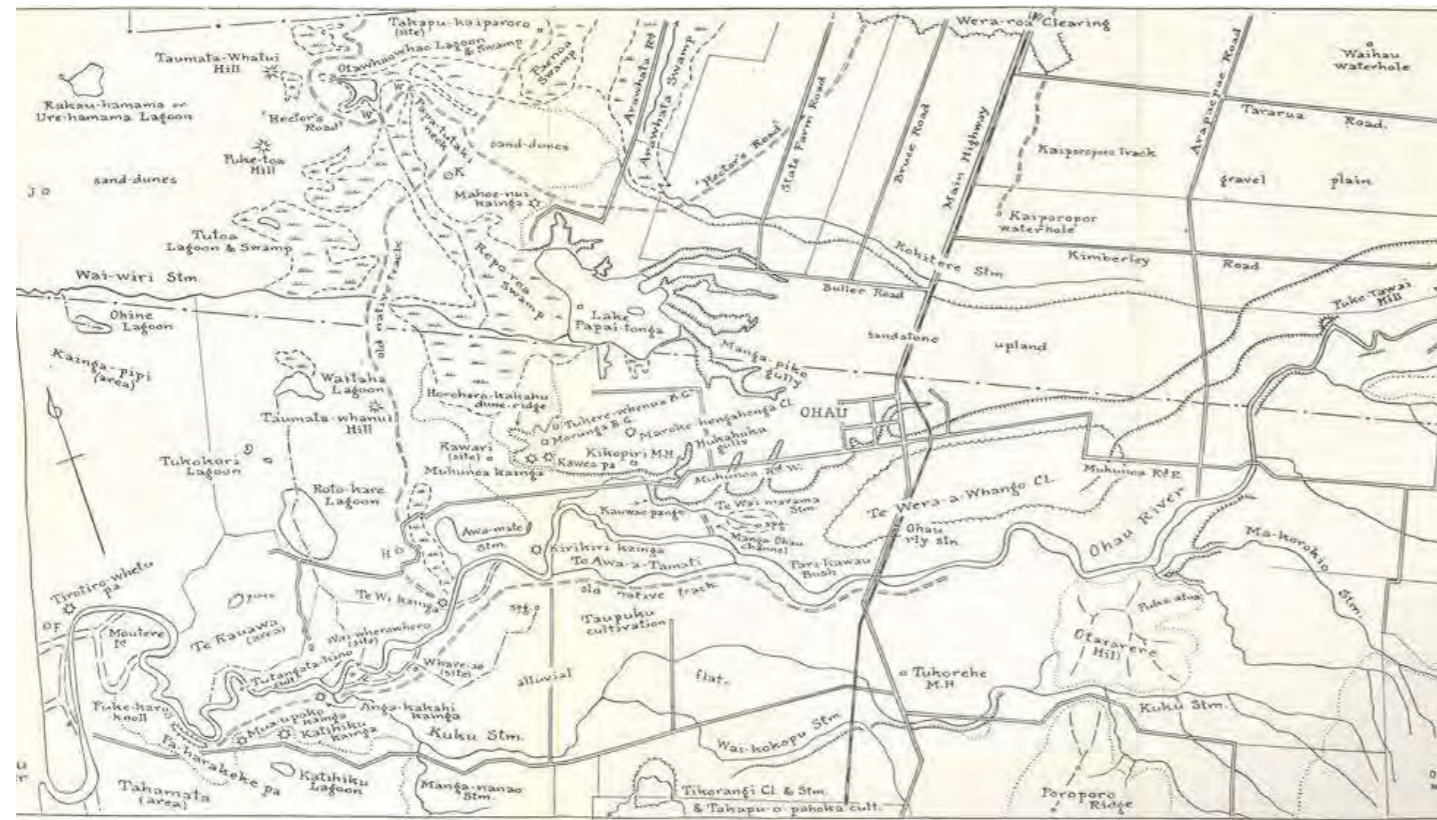
Community Connections along Ohau River



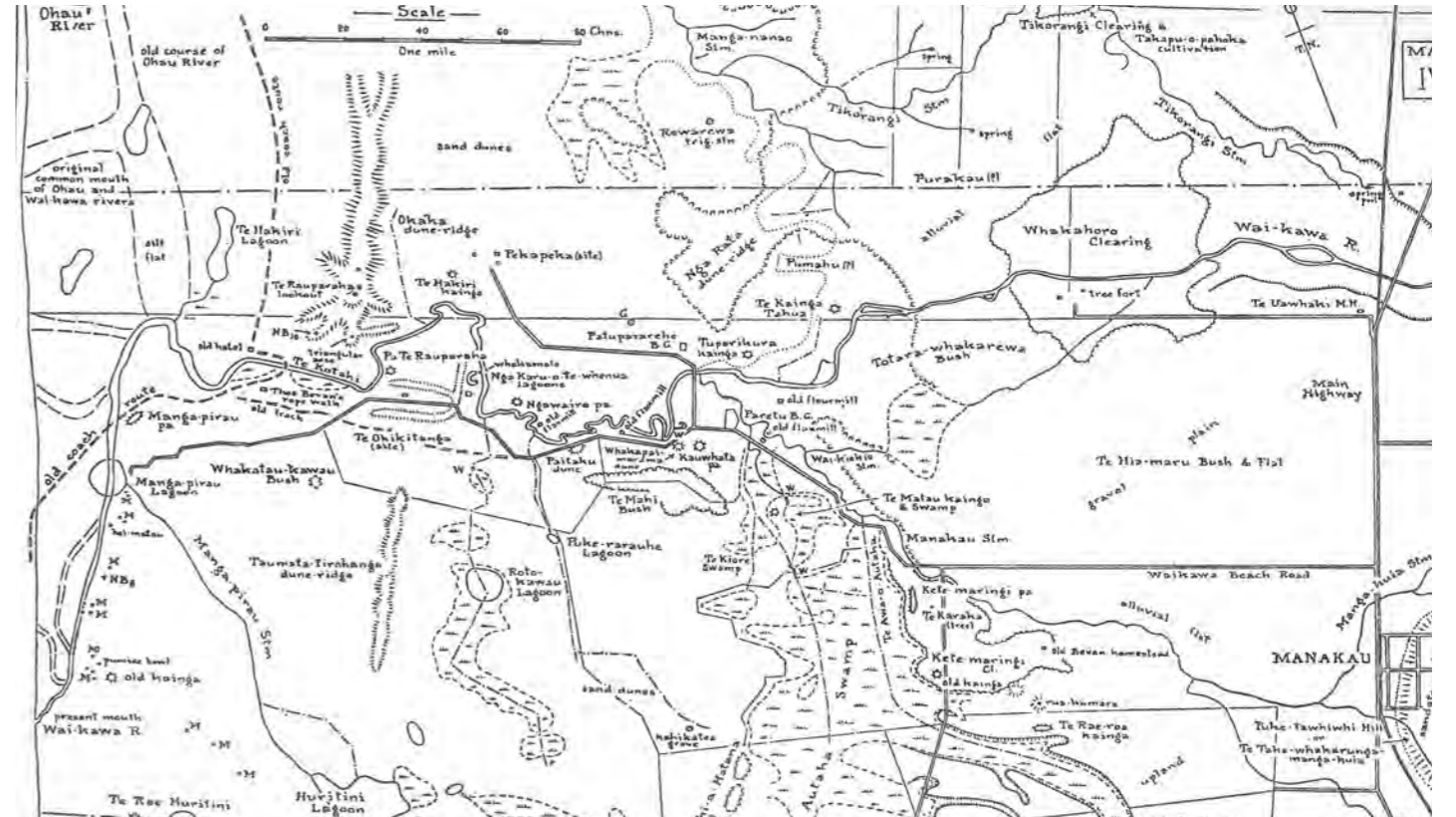
Community Connections along Waikawa Stream



Horowhenua Māori Place-Names - Map VI by Adkin
[Adkin, G. L. (1948) Horowhenua: Its Maori place-names and their topographic and historical background, Department of Internal Affairs, Wellington]



Horowhenua Māori Place-Names - Map IV by Adkin
[Adkin, G. L. (1948) Horowhenua: Its Maori place-names and their topographic and historical background, Department of Internal Affairs, Wellington]



Maps and text TBC with Horowhenua District Council

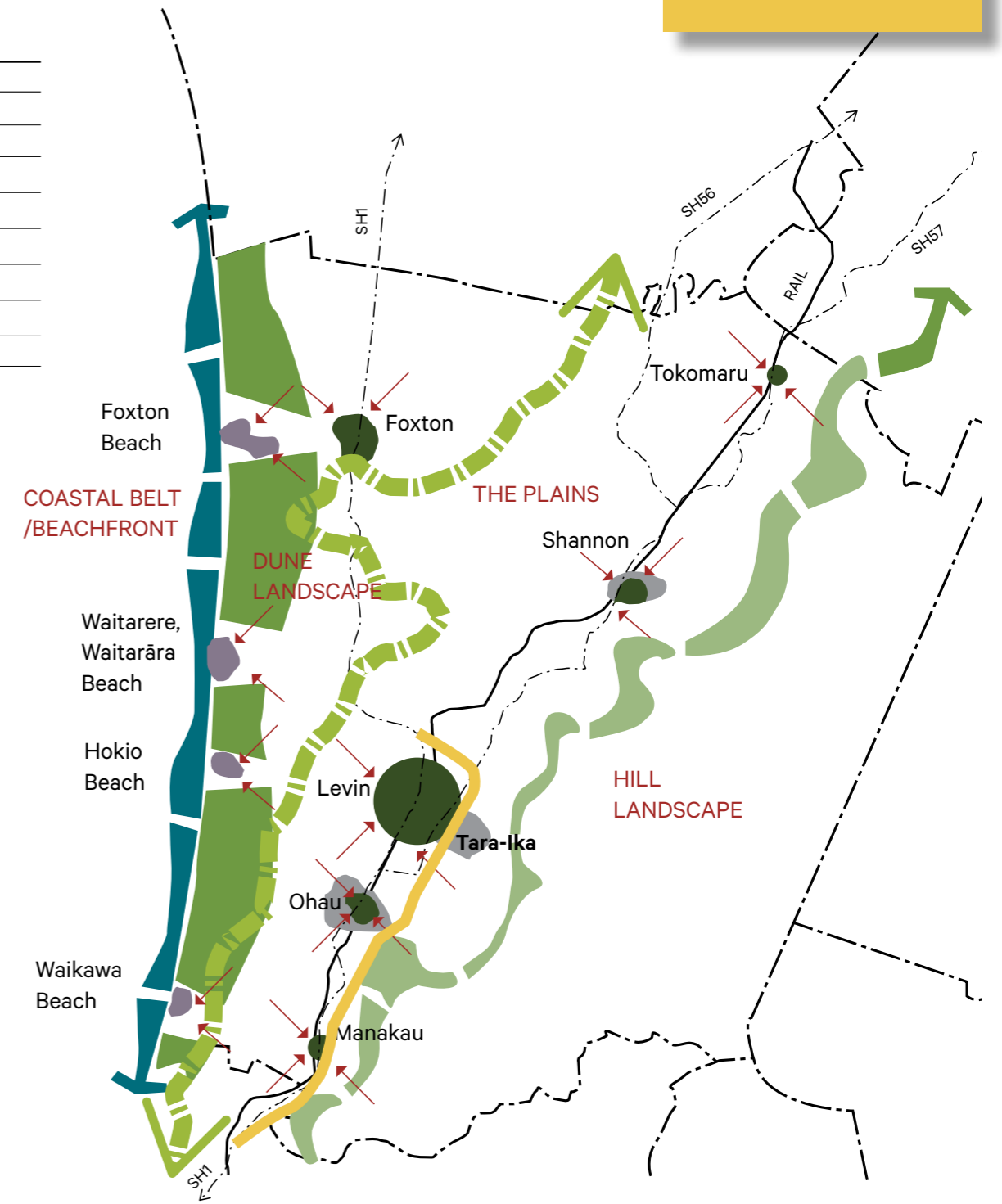
Future Urban Development

Levin and the Horowhenua District is growing quickly and has significant areas of planned urban development:

- Tara-Ika¹⁷ is a proposed master-planned residential area (being progressed through a plan change to be developed adjacent to Levin’s eastern boundary. It is an area of approximately 420ha anticipated to accommodate in the order of 3700 homes. The indicative alignment is near the western edge of Tara-Ika, separated from Arapaepae Road by a strip of land which is also planned for urban residential development. The highway will, therefore, pass between the main part of Tara-Ika and the existing Levin township. To service this development, and in addition to the connections to be provided by the Ō2NL project at Queen St East and Tararua Rd, the Tara-Ika Structure Plan shows an east/west arterial road crossing over the Ō2NL Project, connecting the Tara-Ika Growth Area with Arapaepae Road. It is expected that RMA approvals for this arterial road will be sought in the near future.
- A large area of land is zoned (and being developed) for industrial activities adjacent to Levin’s southern boundary (between the existing town and Tararua Road). This area complements the current clustering of Industrial activities on the southern side of Levin. The Ō2NL interchange at Tararua Road will provide access to this industrial area;
- Other areas identified for potential future urban growth (and subject to future planning processes) as identified in the HDC Draft Growth Strategy 2040, include areas in Levin, Ohau, Manakau, Waikawa, Waitārere, Hokioi and Foxton Beach.

Strategy Plan
[Horowhenua District Council
Growth Strategy 2040—2022 update]

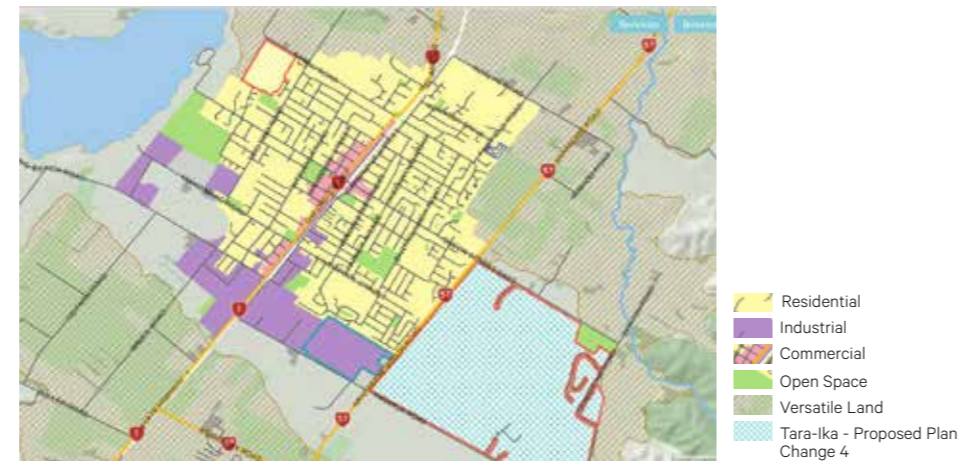
Legend	
	Coastal Belt/Beachfront
	Development Protection Zones
	Existing Coastal Settlement
	Existing Land Settlement
	Greenbelt Residential Cluster Zone
	Existing Secondary Connections
	Concentrated Built Development
	Indicative Highway Alignment



Tara-Ika Draft Masterplan
[Horowhenua District Council - Proposed Plan Change 4]



District Plan Zones & Growth
[Horowhenua District Council Plan]



2.5 Horowhenua Landscape.

The broader setting for Ō2NL is an extensively modified, and culturally important landscape of rolling plains, set between the maunga of the Tararua Range, and a remnant coastal sand-dune system, containing dune lakes and wetlands and many sites of particular significance to mana whenua.

Once a place of diverse and abundant indigenous flora and fauna, known for its wealth of natural resources, fed by rich soils and plentiful water, the area has been almost totally cleared for exotic productive uses, and now has a predominantly “working” landscape character.

Overarching characteristics and qualities through the broader area, which draw together to define the existing landscape character, are:

Wai/Water

Wai is present across this landscape in the form of an extensive network of awa spread across the plains between the Tararua Range and the coast; in the numerous and sizeable wet areas (former indigenous wetlands, repo) and coastal dune roto;

and in the underground aquifers, close to the surface of the land and feeding roto and repo. Wai and its mauri provided for the original (unmodified) landscape character of the area, including the rich variety of flora and fauna and the abundant resources these provided.

Cultural values

Mana whenua retain a strong presence across the area from Ōtaki to Levin, with long-standing and continued occupation and ahi kā by Muaūpoko and Ngāti Raukawa, and active, on-going associations with whenua, including leadership for restoration of Te Ao Māori values.

Ongoing Change - Infrastructure and Growth

Significant landscape change has occurred in the district historically and is continuing through planned growth, as signalled by zoning changes (adopted and proposed). There has been a recent marked increase in land rezoned for industrial use and substantial residential growth is planned Tara-Ika (adjacent to the east of Levin), as well as at a number of the smaller villages. The Ō2NL project is a part of,

and contributes to this dynamic; as it traverses the entire district and has objectives to support and be of benefit to the growth of the district.

Severance and Potential for re-connections

A changing landscape provides potential for improved and positive landscape outcomes.

The setting is currently characterised by severance, with natural east-west connections across the plains, ki uta ki tai/from the mountains to the sea, lost through the historical clearance of almost all indigenous landcover, and further severance occurring through the way in which built development (particularly roads and rail) has occurred historically.

As it moves across existing severance in the landscape, there will be numerous opportunities for the Ō2NL project to take a new approach, to **Preserve, Restore, Enhance and Create** connections, and improve broader contextual landscape values.

Levin
[<https://www.newzealand.com/int/levin/>]



Character Areas and Values

From the mountains to the sea, between Ōtaki and the north of Levin, the modified landscape presents as a number of distinct character areas. In each of these, existing natural, cultural and built layers come together differently to provide differing existing values and opportunities to achieve the project aims to **Preserve, Restore, Enhance and Create**.

As the highway moves through each character area, the design response (for both highway and landscape components) will need to be tailored to respond to the particular constraints and opportunities present, and the differing character values. For example, the outcomes sought will need to respond to the unique catchment characteristics of each awa, varied topography, unique microclimates, vegetation patterns and proximity of settlement or rural-residential cluster.

Recognition of the changing landscape context through design response will provide for variety of landscape experience along the route. As a starting point (to be discussed with the project partners and added to in terms of cultural layers) ki uta ki tai character areas can be drawn between the main awa and include:

Levin-Koputaroa Landscape Domain

- flat and generally open terrain, overlooked by the Arapaepae (Kohitere) hills backdrop;
- distinctive terrace landform between the Arapaepae hills and Punahau (Lake Horowhenua) known as Kei te Whakahoro te Whenua (the great hill slide) from which the name of the district derives.
- absence of permanent streams;
- adjacent to Levin;
- adjacent to SH57 (Arapaepae Road) which is a limited access highway along the eastern edge of Levin;
- the Prouse homestead ('Ashleigh') which has historic values and two close remnant stands of bush;
- the Tara-Ika urban development planned for the area between Queen Street East and Tararua Road.

Levin-Ohau Domain

- The qualities of the Ohau River as the central feature including (i) its wide gravel and cobble bed, terrace scarp, and riparian vegetation, (ii) its valley, which draws the eye towards the Tararua Range, (iii) its cultural significance, (iv) its recreational use, (v) its relatively high natural character and dynamic natural processes.
- The connections along Muhunua East Road between Ohau and the upstream valley.
- The landmark of Ōtararere hill on the south bank overlooking the Ohau River, albeit undermined by the quarry and pine plantation at the northern end of Ōtararere.
- Open dairy farming landscape on the north bank terraces – with nearby distinctive stands of tōtara – Kahikatea forest.
- Rolling topography between Kimberley Road and Muhunua East Road, and the reasonably closely settled, well treed, and pleasant landscape of this area including clusters of rural residential properties.

Kuku Landscape Character Area

- The backdrop hills and setting at the back of the plains.
- The valleys of the Kuku and Waikawa Streams which divide the backdrop hills into three segments (Ōtararere, Poroporo and Hanawera). The valleys draw the eye towards the Tararua Range and provide access from the plains into the hills.
- The relatively intensive agricultural use of the plains' high value soils including extensive cropping.
- Clusters of houses on the plains at Kuku East where the Kuku Stream emerges from between the hills, and at Manakau North where the Waikawa Stream emerges from between the hills.
- The Tūkorehe marae at Kuku and its connections with the Kuku Stream, plains, and backdrop Range.
- The Ngāti Wehi Wehi marae and its connections with the Waikawa Stream, plains, and backdrop Range.
















Manakau Downlands Landscape Character Area

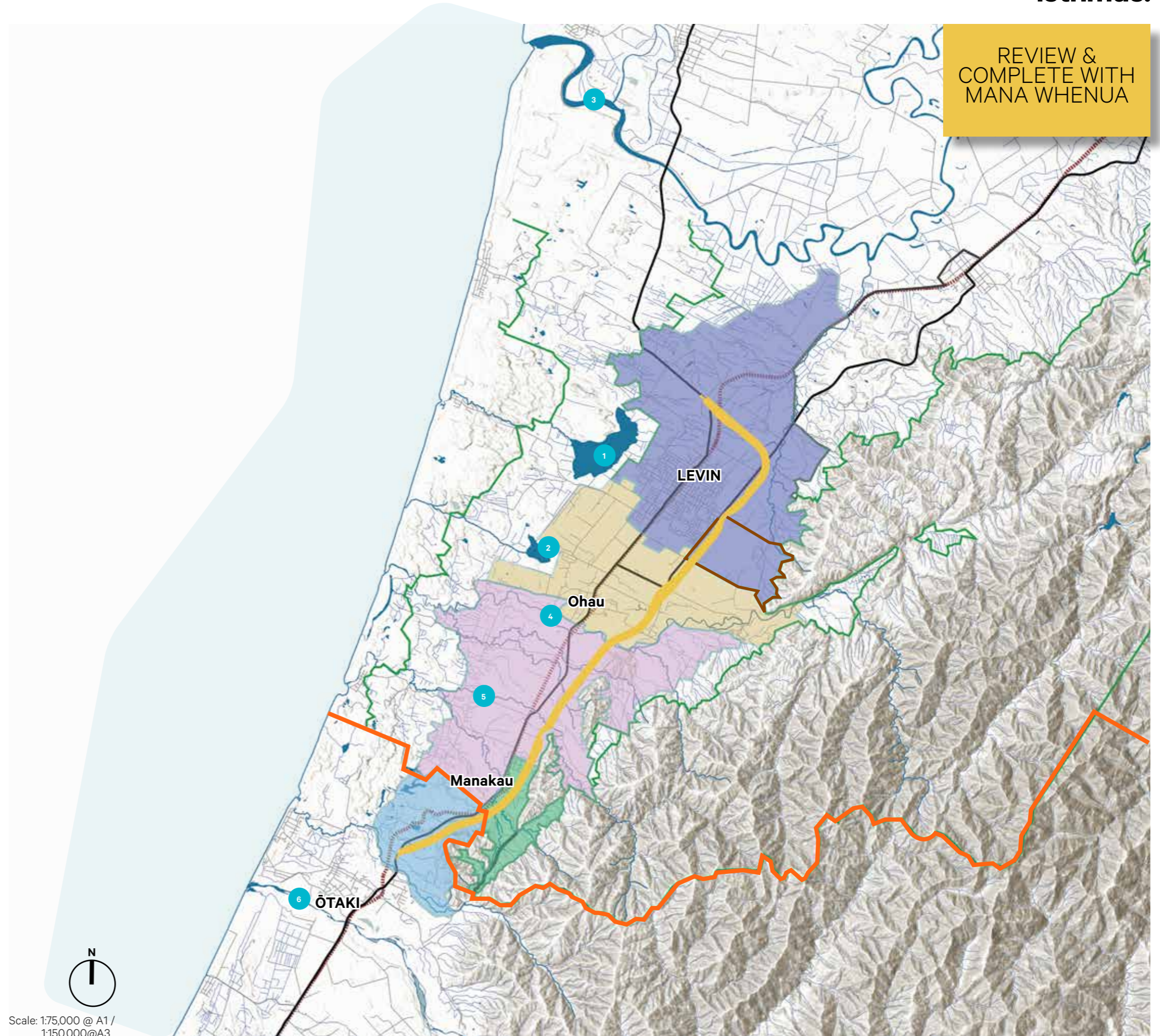
- The amphitheatre-like form of the valley and terraces enclosed by hills.
- The pattern of residential development on the terraces around the 'amphitheatre' (Manakau village, Manakau Heights, Mountain View Drive).
- The relatively intimate scale in contrast to the open plains elsewhere in the vicinity.
- The landmarks of Pukehou, and the backdrop Hanawera hills.
- The sinuous meanders and bubbling nature of the two streams crossing the valley (Manakau and Waiauti Streams).
- The upstream valley of the Manakau and Waiauti Streams which leads the eye toward the Tararua Range.
- The historic character of Manakau village, characteristics of which include its grid street pattern, fine grain, treed nature, collection of historic buildings, and its quietness being off to one side of the existing SH1.

Pukehou Landscape Character Area - KCDC

- The landmark qualities of Pukehou. The hill has a memorable steep-sided, symmetrical shape, and it stands proud of the other foothills, forming a kind of gateway travelling north or south between Horowhenua and the Kāpiti Coast.
- The significance of Pukehou to tangata whenua because of historical events associated with the landmark.
- The radial pattern of gullies incised in the terraces at the toe of Pukehou. The gullies are tributaries of Waitohu Stream. The terraces comprise farmland and some lifestyle properties.

REVIEW &
COMPLETE WITH
MANA WHENUA

Legend	
	Proposed Highway
	Awa & Roto
	1. Punahau/Lake Horowhenua
	2. Lake Waiwiri/Papaitonga
	3. Manawatū River
	4. Ohau River
	5. Waikawa Stream
	6. Ōtaki River
	Transport Infrastructure
	Existing State Highway
	Local Road Network
	Existing Railway Line
	District and Regional Boundaries [Horowhenua and Kāpiti Coast Districts, Horizons and Greater Wellington Regions.]
	Domains/Landscape Character Areas
	Levin - Koputaroa Domain [HDC]
	Levin - Koputaroa Domain Subsection
	Levin Ohau Domain [HDC]
	Kuku Domain [HDC]
	Manakau Downlands Domain [HDC]
	Pukehou Landscape Character Area
	Wider Landscape Domain Boundaries



Scale: 1:75,000 @ A1 /
1:150,000@A3

2.6 Endnotes.

¹¹ While the CEDF notes that the southern section overlaps with the top of Kāpiti Coast District in terms of administrative areas, it is suggested that the CEDF be framed in terms of the Horowhenua as a concept – which begins at Pukehou.

¹² Horowhenua literally means, the great landslide

¹³ Parks, G (1995). Nga Uruora: the Groves of Life. Victoria University Press. Wellington.

¹⁴ <https://envirohistorynz.com/2010/07/14/view-of-tararuas-from-the-land-of-the-great-landslide/#:~:text=%E2%80%9CHorowhenua%E2%80%9D%20is%20made%20up%20of,1948%2C%20the%20author%2C%20G.>

¹⁵ Northern Ohariu Fault, Earthquake Hazard Assessment of a Newly Discovered Active Strike Slip Fault in the Horowhenua; Palmer and Van Dissen, Massey University, for EQC; April 2002; Layman's Abstract, pg ii.

¹⁶ Northern Ohariu Fault, Earthquake Hazard Assessment of a Newly Discovered Active Strike Slip Fault in the Horowhenua; Palmer and Van Dissen, Massey University, for EQC; April 2002; Layman's Abstract, pg ii.

¹⁷ Formerly referred to as 'Gladstone Green'

3. Design Principles



Chapter Overview

This chapter provides a summary of the overarching outcomes sought under each of the core principles and, at a high level, how these could be expressed in the design; to preserve, restore, enhance and create.

Iwi wish to be directly involved through all stages of the project and in confirming the design outcomes in the draft and final CEDF.

Levin
[<https://www.newzealand.com/int/levin/>]

3.1 Design Principles.

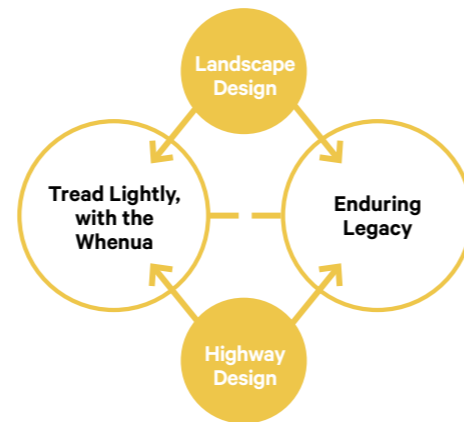
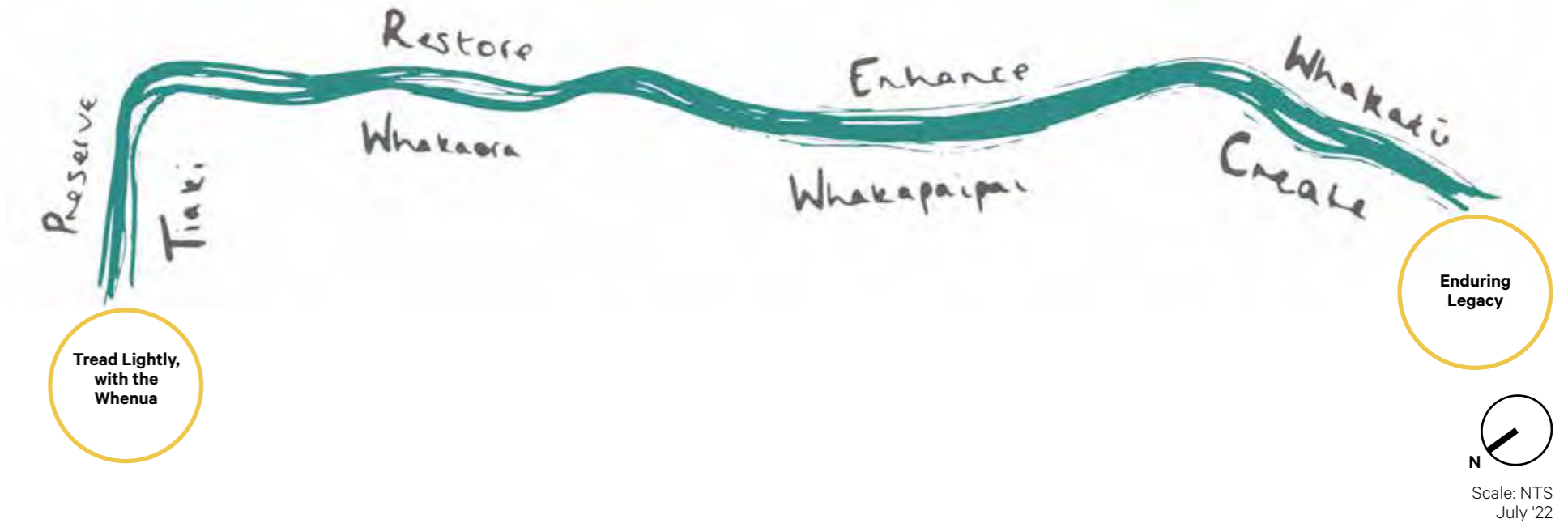
The core principles are relevant to all stages of the project; design, procurement, construction and ongoing management. Those established for the CEDF through the partnership are:

- **Tread Lightly, with the Whenua:**
 - Me tangata te whenua (treat the land as a person)
 - Kia māori te whenua (Let it be its natural self)
- Leave a positive **Enduring Legacy** for our uri (descendants, for all communities – including flora and fauna)
 - Kia māori te whakaaro (normalise māori values)
 - Me noho tangata whenua ngā mātāpono (embed the principles in all things)
 - Tū ai te tangata, Tū ai te whenua, Tū ai te Wai (elevate the status of the people, land and water)

Together these principles place Te Ao Māori and Te Mana o te Wai at the centre of the project. The aim is to indigenise and normalise the thinking, through all stages of the project.

Overarching outcomes, relevant to each principle, are described in the following pages along with a diagrammatic summary of how these could be translated into the preliminary concept design; to preserve, restore, enhance and create.

In the following Design Response chapter, more detailed and indicative outcomes are set out for specific landscape and highway components; as they contribute to both principles. The response chapter also provides a snapshot (point in time) record of the CEDF Design Audit (traffic light assessment). This has been developed with the partners, to evaluate and help refine the framework outcomes, preliminary design and RMA processes, including planning for procurement and construction. This is a tool to be refined in the next stages, to further embed the core principles in the project. The principles can conflict and may not be met in all aspects of the design (refer to Chapter 4 - Design Audit for more details).



3.2 Tread Lightly, with the Whenua.

The challenge and aspiration for the project is to preserve, restore, enhance and create; to leave a **positive environmental footprint**, as will be measured through cultural indicators (tbc), including a net positive impact on water quality. The AEE and environmental requirements of the RMA will complement this. Tread lightly, with the whenua means:

- Reducing the highway's effects on the natural and human landscape through:
 - Choice of the **eastern corridor** and fine-tuning the highway Indicative alignment to reduce potential impacts on the natural and human landscape (for instance by avoiding wetlands and stands of bush with significant values, acknowledged mahinga kai, pātaka kai, heritage sites, and reducing impacts on houses as far as possible)
 - As a further priority, this is to be achieved through an environmentally and visually **refined design**—one that achieves high water-quality treatment, to preserve the health of the rivers and streams, avoids creating a corridor for weeds and pests and achieves a well-integrated highway, that minimises visual clutter
- Restoring and enhancing the landscape around the highway by:
 - Reconnecting streams with forest remnants and wetlands through the use of planted **riparian corridors** upstream and downstream of the highway
 - Using culverts and bridges that maintain **naturalised stream flow**, aquatic habitat and fish passage upstream and downstream of the highway
 - Net improvement in **water quality** in rivers and streams, and water flowing to lakes (noting relative gains will relate to the size of catchment/range of water sources)
 - Avoid the loss of water quality through construction including through sedimentation
 - Considering opportunities to allow **wetlands/streams** to reinstate naturally
 - Enhancing **forest stands** as remnants and ecological stepping-stones
 - Reconnecting **local roads** across the highway—paying attention to the whole network
 - Reinforcing **ki uta ki tai**—from the mountains to the sea including opportunities to restore the whenua, to let it be its natural self, and express this through ongoing stewardship and narrative. This could include opportunities for expression of historic trails and restoration in other areas of the catchment (at some distance from the highway) that can be achieved through the AEE process
 - Integrate opportunities for **mahinga kai, pātaka kai, rongoā and food forests**



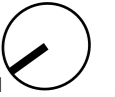
Waikawa Stream
[Wildlands Consultants Ltd 2019]

3.3 Create an Enduring Legacy.

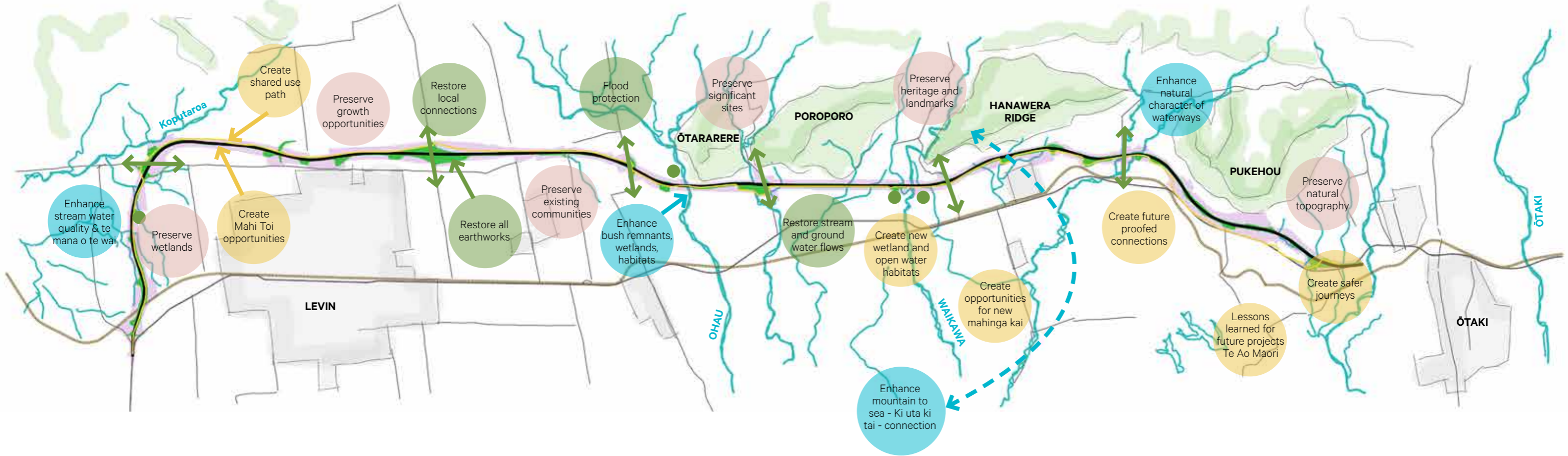
The challenge and aspiration is to leave an **enduring legacy** for all living things through:

- Improving **safety and resilience** into the future by:
 - Replacing the existing SH1 'taniwha' with a **safe system** highway
 - Enhancing opportunities for the community to **connect** through improved access along **local roads** and new options for **multi-modal** movement
 - Designing to manage disturbance and ensure passage/paths for **birds and fish** (indigenous fauna)
 - Considering opportunities to reduce **flooding hazards** and future proof for **climate change** as part of the RMA process for the project
 - Designing the highway for safe **construction, monitoring and ongoing management** practice
- Enhancing **local connectivity**:
 - Repurposing existing SH1 and SH57 as an **enhanced local spine** (with safer speeds and better amenity) linking the Horowhenua's communities, and tying local roads into a network
 - Reconfiguring the **local network** to provide a north-south route to the east of the highway and north of the Ohau River (connecting Levin— Tara-Ika— Kimberley Reserve—Muhunoa East—Ohau and in addition to the planned HDC east-west link from Tara-Ika to Levin).
- Creating a foot/cycle **shared path network** integrating a new path along the highway and to complement a wider shared use path [in conjunction with HDC]
- Enhancing **access** and opportunities for people of the Horowhenua, as part of the region, district and local community:
 - Providing **access** to both SH1 and SH57—improving safety, resilience, and reducing travel time. (Access to the new highway north and south of Levin and at Ōtaki in the south, connected to a strong local network)
 - Increasing the **travel catchment** (area that can be accessed) for such things as employment, culture, sport, entertainment
 - Enhancing the **competitiveness** of Levin and Horowhenua as a location for industry—especially distribution activities
 - Supporting Levin **growth** and planned urban development— increasing Horowhenua's accessibility as a place to live
 - Providing for walking and cycling journeys with different purposes for all ages considering the likely sequence of destinations for **locals and visitors**
- Celebrating and prioritising **kaitiakitanga principles** through the design and mana whenua involvement in researching, designing, creating, maintaining, and monitoring elements such as restoration planting and the stormwater system associated with the highway; and cultural expression in the landscape (noted by the partners as ideas for further discussion)
- Showcasing the Horowhenua landscape. Designing to show the **mana and mauri of Horowhenua** and strengthening how it is experienced from the highway and the shared use path by:
 - Improving the inherent **health** of the landscape along the highway, as evaluated using cultural indicators
 - Creating opportunities for open **views** to the elevated landmarks beyond the highway and areas restored by the project
 - Showcasing the **unique landscape** of Horowhenua along the highway and shared path—highlighting significant places and designing to respond to microclimates through, for example, endemic planting types and improved cycling connections to village communities and valued destinations including for recreation and cultural uses (observing tapu and noa)
 - Expressing a **cultural footprint**—by designing with the whenua (endeavour to first do no harm) and to establish a connected experience or hikoi wānanga (learning journeys, varied experience) along the shared use path and highway including highlighting landmarks, past events, historic trails, pā and marae and the districts unique biodiversity
 - Developing a journey **narrative**, including the potential for digital story telling, through interpretation signage, naming places and features as developed through a coherent mahi toi strategy





Scale: NTS
July '22



The principles are woven together

They relate to the whole environment and are woven together. In summary the design framework focus is to preserve, restore, enhance, and create in an integrated way. At a high level the principles diagram represents this overall outcome—noting the individual references, for example to enhance 'stream water quality', are shown as markers, tohu of the whole project approach, rather than occurring in one place.

Tiaki - Preserve	Whakaora - Restore	Whakapaipai - Enhance	Whakatū - Create
<ul style="list-style-type: none"> — Natural topography, through proposed designations and gentle slopes — Bush remnants, wetlands, open water areas — Significant sites — Heritage and landmarks — Existing communities — Growth opportunities 	<ul style="list-style-type: none"> — Rehabilitate earthworks with indigenous planting & new pasture — Stream and ground water flows — Fish passage — Flood protection — Local road connections 	<ul style="list-style-type: none"> — Stream water quality — Bush remnants, wetlands, riparian habitats, uplifting the expression of ki uta ki tai — Natural character of waterways — Horowhenua identity through planting types, shared use path design and mahi toi opportunities — Te Mana o Te Wai 	<ul style="list-style-type: none"> — Safer journeys — Future proofed connections — Shared use path through the district — New wetland and open water habitats — Opportunities for new recreation areas, mahinga kai, rongoā & food forests — Lessons learned for future projects - to normalise Te Ao Māori

4. Design Response

Chapter Overview

The design, from the big picture concept to details, is integrate and uplift the core values and principles of the CEDF.

The overarching design principles—Tread Lightly, with the Whenua, and Create an Enduring Legacy—are translated into indicative outcomes for specific design elements relating to:

- the **landscape**—the parts of the project that thread through, and connect to, the wider landscape, including all proposed planting, the movement of water under the highway and the treatment of stormwater, and;
- the **highway**—the typical built elements within the footprint extending to the edge of the cut and fill batters, including all minor and major structures, safety features, spoil and material supply sites and the shared used path.

The CEDF Design Audit (traffic light) assessment, as outlined in the following pages, has been developed with the partners, to evaluate and help refine the framework outcomes, preliminary design and RMA process to date, including planning for procurement and construction.

Iwi wish to be directly involved through all stages of the project and in confirming the design outcomes in the draft and final CEDF. This should include further iterative assessment of the design against the principles and refinement of the Design Audit process.

4.1 Design Audit.

The audit process

The overarching purpose of the Cultural and Environmental Design Framework (CEDF) is to integrate the design elements of the Ōtaki to north of Levin Highway Project (the Ō2NL Project or Project) in response to context and agreed overarching principles – Tread Lightly, with the Whenua and Create an Enduring Legacy. These principles place Te ao māori, mātauranga māori and te mana o te wai at the centre of the design framework. Anticipated outcomes, for both the landscape and highway components of the Project, flow from these principles, and the values that underpin them. Overall, the challenge for the Ō2NL, in achieving its planning and investment objectives, is to look for all opportunities to ‘first do no harm’ and to let the whenua and the awa be its natural self.

The CEDF will continue to be expanded and refined throughout the life of the Project. The design audit provided below represents a point in time audit. It is intended to help guide the future stages of design development by identifying areas where improvement, and greater alignment with the principles, is wanted and will be investigated, noting critically that while it is desirable to make all aspects of the Project positive, this is not always possible. It is recognised that the Project will deliver considerable positives, however, due to its nature and extent, there will be unavoidable negative attributes.

The audit helps identify the negatives aspects and actions to address where practicable, along with the reasons for unresolved issues and where there are trade-offs. It is not possible, nor appropriate, to close out all areas where improvement is wanted at the Concept Design stage. There are matters that need to be worked through in the next stages of design. CEDF Audits will be undertaken at important milestones in the Project’s design development to map progress and guide refinement.

Audit Criteria and Grading

Audit criteria have been derived from the key parts of the CEDF. The table below describes the colour coding used in the audit. The audit includes commentary which identifies the direction of the additional mahi required.

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there is a continually changing environment – for example, in response to water. This ensures that appropriate focus on important matters is retained and continuous.

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CEDF Design Audit—Landscape Component Design, excerpt August 2022

The following audit (third iteration) was undertaken during August 2022 in partnership with Muaūpoko Tribal Authority and hapū of Ngāti Raukawa ki te Tonga including reformatting to separate out each focus area and the close out phase.

Supporting evaluation criteria 1. preserve, restore, enhance, create.	Tread lightly, with the whenua	Notes - design focus /key measures tbc. *Long list role in carbon reduction applies	ACTIONS TO RESOLVE	Audit and Close out Phase	Enduring Legacy	Notes - design focus /key measures tbc	ACTIONS TO RESOLVE	Audit and Close out Phase
Landscape								
Awa, Repo and Wai								
		1. Some transfer between catchments of tributaries of the Ōhau and separately between tributaries of the Waikawa occur via the stormwater treatment devices	1- Present more information to hui groups. 1, 2 and 3 - Detailed design stage to seek to eliminate /minimise cross catchment movements, and avoid/ minimise effects on groundwater (ongoing focus of project team-partnership)	Procurement & Detailed Design		1. Rehabilitation and restoration planting (extents, types and indicative species, eco-sourcing and linked to microclimate/landscape narrative including wetlands)	1 -Integrated planting plans (Volume III) and CEDF provide planting approach and palette which imbed species selection being linked to local context and narrative. Monitor through detailed design development. Approach to eco-sourcing to be confirmed during detailed design process/ procurement of resource.	Detailed Design, Construction
		2. Construction methodologies relative to awa, repo and wai minimise and manage effects, including through ESC provided in the DCR and provided for in proposed conditions. Residual effects accounted for through ecological mitigation, offsetting and compensation measures.	1, 2 and 3 - Detailed design stage to seek to eliminate /minimise cross catchment movements, and avoid/ minimise effects on groundwater (ongoing focus of project team-partnership 2 – Monitor construction processes and standards to avoid / manage effects on flora and fauna (as part of ongoing management and improvement (and include consideration of alternative techniques to flocculant in ESC))	Detailed Design		2. Retirement of streams and wetlands from agricultural farming	2 and 3 proposed locations specified, with detail to be developed ahead of construction and subject to ecology planting plans (to be developed as part of detailed design and ecology management plan) and location layout plans	Detailed Design
		3. Road construction intersects with groundwater in 3 places (in the vicinity of CH 11,000-12,000; 26,500-27,500; and 29,000).	1, 2 and 3 - Detailed design stage to seek to eliminate /minimise cross catchment movements, and avoid/ minimise	Detailed Design		3. Creation of new wetland and open water at material supply sites	2 and 3 proposed locations specified, with detail to be developed ahead of construction and subject to ecology	Detailed Design

Commented [LR1]: 21/4 Email from Jack McChoncie 21/04 provides further explanation.

**CEDF Design Audit—Landscape Component Design, excerpt
August 2022**

‘Go’ – the design integrates the best /good outcomes possible relevant to the consent stage (areas for improvement are known and captured in the CEDF and/or other relevant processes)
Work in Progress -general/specific areas to be worked through, with practicable design measures available*
A red flag – not successful (generally or in a specific location) where there is still concern and further investigation is required to determine that all practicable options to resolve / address issues have been explored and discounted
TBC - in future stages (CEDF outcomes will guide this, so need to be developed to an appropriate level)
NA – not relevant to this component
Unknown -requires more information

* the Orange status is likely to be retained for the more complex unknowns/variables in play, and where there is a continually changing environment – for example, in response to water. This ensures that appropriate focus on important matters is retained and continuous.

Supporting evaluation criteria - preserve, restore, enhance, create.	Tread lightly, with the whenua	Notes - design focus /key measures tbc. *Long list role in carbon reduction applies	ACTIONS TO RESOLVE	Audit and Close out Phase	Enduring Legacy	Notes - design focus /key measures tbc	ACTIONS TO RESOLVE	Audit and Close out Phase
Highway								
Material Supply Sites								
		1. Sites assessed against range of ecological, environmental and cultural criteria and those selected avoid on balance sensitive areas and provide a positive legacy opportunity. Legacy principles provided in CEDF	1 – Develop design of material supply sites as part the detailed design phase and which focus on securing positive outcomes to confirm CEDF principles and legacy outcomes	Detailed Design		1. Sites assessed and then selected on basis of ability to provide a positive legacy contribution	1, 2, 3, 4 – plans to be developed for confirmed sites as part detailed design process, with approach specified in CEDF and conditions.	Detailed Design
		2. Carbon saving measures to be investigated during detailed design phases**	2 - Carbon saving opportunities to be targeted workstream during detailed design phase.	Detailed Design		2. Legacy principles established and confirmed in the CEDF	1, 2, 3, 4 – plans to be developed for confirmed sites as part detailed design process, with approach specified in CEDF and conditions.	Detailed Design
						3. Interface with the SUP to be resolved	1, 2, 3, 4 – plans to be developed for confirmed sites as part detailed design process, with approach specified in CEDF and conditions.	Detailed Design
						4. Concept level rehabilitation including habitat types and public access are provided but detail including implementation strategy tbc	1, 2, 3, 4 – plans to be developed for confirmed sites as part detailed design process, with approach specified in CEDF and conditions.	Detailed Design
						5. Access and ongoing management to be resolved including landowner agreements	5 - make access requirements clear part of property agreements.	Procurement

Commented [LR6]: 12/04 workshop comment See above re access and mahinga kai and Rongoa. All sites are of interest. Waikawa and Koputoroa sites purchased/likely to be purchased by Waka Kotahi. North Eastern site provides the greatest access challenge as it may be retained in private ownership- legal easements could be a strategy .

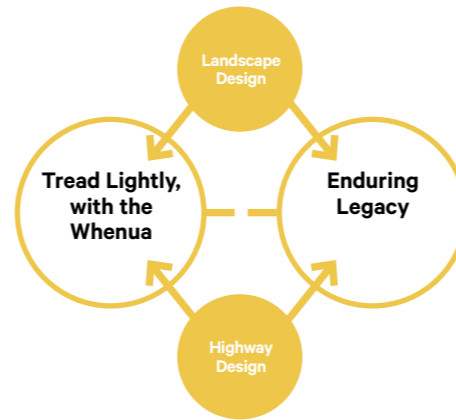
Commented [LR7]: 20/4 hui comment Site 36 is the most appropriate for rongōa

**CEDF Design Audit—Highway Design Component, excerpt
August 2022**

4.2 Landscape.

The **landscape** outcomes relate to:

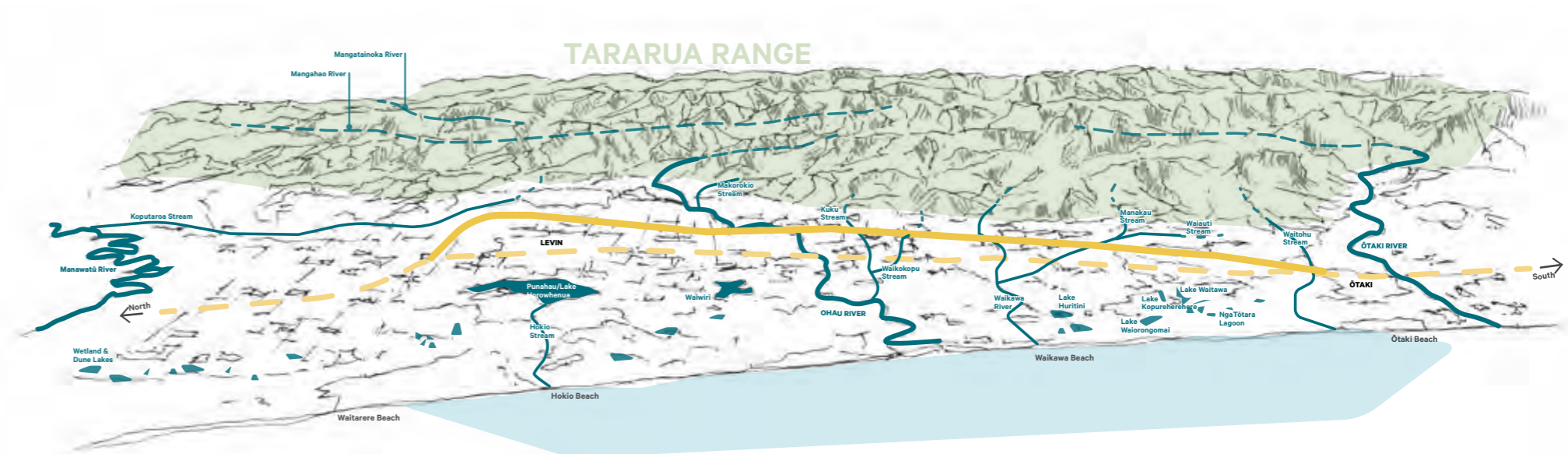
The parts of the project that thread through, and connect to, the wider landscape (including all proposed planting, the movement of water under the highway and the treatment of stormwater).



Treading Lightly, with the Whenua (reducing the environmental footprint) and creating an Enduring Legacy (strengthening the cultural footprint) is to be achieved by a focus on outcomes that restore the landscape, including the natural and human systems that support it, and connect through it.

At a high level the CEDF **Landscape Outcomes** include:

- Connect the project to te pae maunga Tararua through riparian restoration and protect wai as it travels through the construction footprint
- Repair and enhance riparian corridors and stepping-stones for taonga species including mokomoko and ngata through planting
- Establish varied planting types that help tell the story of Horowhenua and Kāpiti Coast and its unique environments, including wetlands, clearings, stands and for traditional uses, mahinga kai and rongoā and community amenity
- Repurpose existing SH1 and SH57 to enhance connections for local communities (this outcome is subject to separate investigations and processes and is not able to be delivered through the O2NL Project, and instead the design of the design of O2NL Project shall be mindful of this outcome)
- Where appropriate (from a Te Ao Māori perspective), enhance community and mana whenua connections to the landscape including for traditional uses and to sites of significance
- Integrate the project earthworks with the surrounding whenua, to enhance the mauri of wai and ngahere and community connections
- Recognise original names, landmarks, historic events, trails, unique biodiversity; to establish a Kāpiti Coast-Horowhenua narrative along the highway and shared path journey



Outcomes sought require an integrated approach to the whole landscape—its natural and human attributes. These outcomes are more than mere mitigation of adverse effects. Rather, they look to enhance the existing situation, as a positive legacy and to enhance the mana of kaitiakitanga and mātauranga māori.

Awa, Roto, Repo - Wai

All forms of water, below and above ground, the habitats they support and community and mana whenua connections are important to consider. Te mana o te wai, mauri and matauranga should underpin design, construction and ongoing management. The outcomes sought are to:

- Revegetate river and stream margins and wetlands either side of the highway using a responsive, catchment by catchment, approach
- Provide for an integrated approach to planting along waterways, connecting existing and constructed wetland areas
- Keep water flows, above and below the ground, within the same catchment as much as practicable
- Enhance biodiversity and habitats. Examples to consider include: ngata along the Waikawa River; skinks within Queen Street—Arapaepae Road bush remnants; kawau, weweia, matuku in Koputaroa wetlands and tuna, Koaro, kōkopu/Korokoro in the Ohau
- Buffer and connect to existing stands of bush, indigenous riparian vegetation and wetlands
- Enhance connectivity for wildlife across the highway (by creating natural staging points on either side) and to avoid bird strike
- Avoid planting types that increase bird strike. For example, avoid fruiting species in close proximity to the highway considering typical flight path movements for kereru and other manu swooping down from the foothills
- Consider the location of stormwater ponds and wetland restoration areas and other measures to discourage flightless birds crossing the highway including pukeko

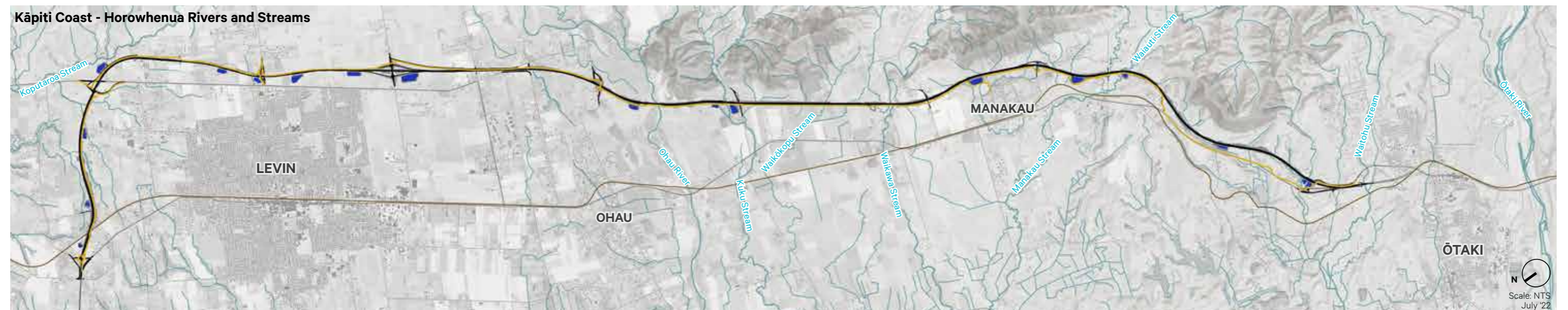
- Look for opportunities to restore access to wai (where appropriate from a Te Ao Māori perspective and to avoid taonga habitat disturbance) including for traditional uses by mana whenua
- Avoid promoting littering around areas of river, stream and wetland restoration. Consider the location of gathering and stopping places to deter dumping and ensure ease of management when this occurs
- Visually accentuate awa, repo and wai in the landscape where these are mapped or identified through mātauranga māori
- Use planting types that are unique, endemic to the catchment and wai type including signature species, groupings and tohu, where appropriate. Highlight habitat and microclimate diversity
- Consider opportunities to integrate small clearings, in recognition of the known historic hunting camps along stream banks
- Avoid impacts on groundwater flows. Ground water flows east—west, to Punahau/Lake Horowhenua and Papaitonga and for rural communities are an important consideration for the project
- Prioritise sedimentation control during construction and consider alternatives to the use of flocculants

Bridges are preferable to culverts for connectivity (for wildlife and people) use;

- Ohau River, Waikawa Streams (multispan)
- Waiauti, Manakau and Kuku Streams (single span- also used for local road connections and the rail crossing)

Iwi wish to be directly involved in all wai outcomes for the project. Details are tbc through the Cultural Impact Assessment process including possible kaitiaki roles.

Horowhenua waterways
[EOS Ecology 2019]



Landscape.

Culverts

While bridges are preferable, the following outcomes apply where culverts are practicable and if appropriate:

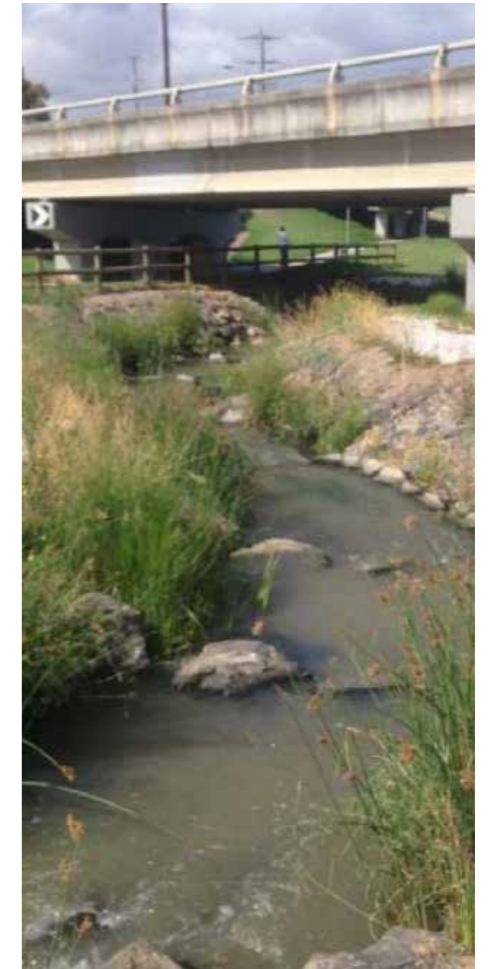
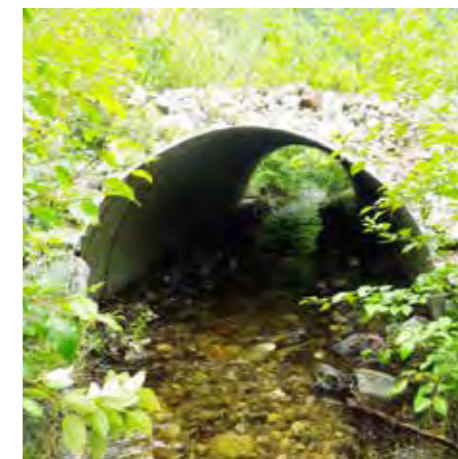
- Minimise culvert length by installing them at right angles to the highway and using head and wing walls in fill batter
- Construct culverts to incorporate fish passage [See New Zealand Fish Passage Guidelines For structures up to 4 metres (DOC/NIWA, 2018)²²] including such attributes as:
 - Avoiding or minimising alteration to natural stream channel alignment and gradient including through the creation of sediment traps
 - Using culvert sizes that are larger than the bank full width of the stream to allow for a naturalised bed to develop
 - Consider the use of open bottomed culverts or burial of culvert invert below the natural stream bed and filling with natural bed substrate material where washout is able to be avoided
 - Ensure water depths and velocities are similar to those of upstream and downstream reaches
 - Carefully designed armoured ramps on downstream side to prevent scour and enable fish to enter the culvert
- Extend the stream margin planting onto the fill embankment around the culvert to soften culvert and accentuate stream crossing

- Extend riparian planting onto the fill embankments at culvert crossings. Use low species near the top of fill embankments where views are to be maintained from the highway, grading to taller species toward the base of the embankment.
- Replant stream margins upstream and downstream of culverts for biophysical and natural character benefits
- Culvert inlets and outlets design and contouring are to ensure smooth transition and tie in to the surrounding earthworks design
- All inlet and outlet pipe structures will be chamfered to match design contours of adjacent landform.


Iwi wish to be directly involved in all wai outcomes for the project including culverts. Details are tbc through the Cultural Impact Assessment process including possible kaitiaki roles.

Fish passage examples

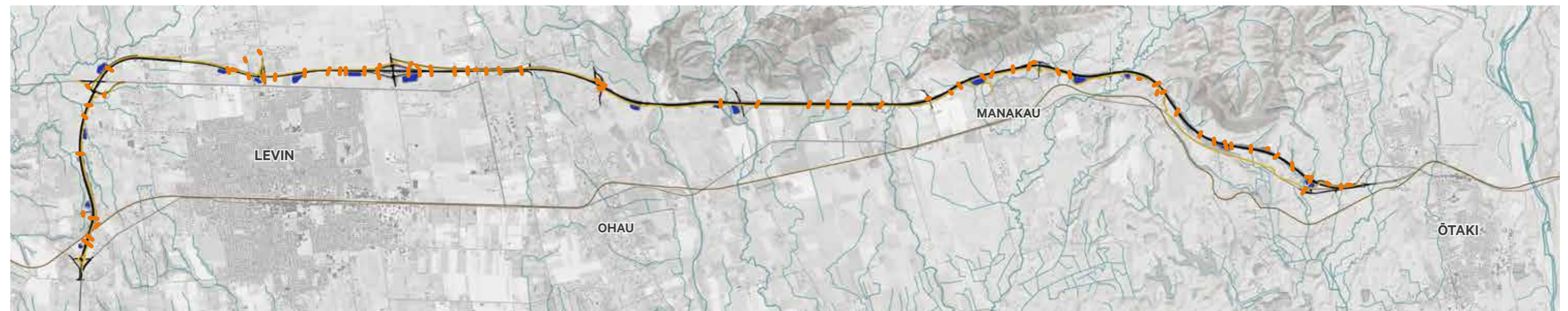
[<https://niwa.co.nz/sites/niwa.co.nz/files/NZ-FishPassageGuidelines-upto4m-NIWA-DOC-NZFPAG.pdf>]
[Stream Simulation culvert: <https://niwa.co.nz/file/43020>]



Culverts

 Culvert locations (not to scale)

N
Scale: NTS
July '22



Stream Diversions

Stream diversion design should seek to minimise the effects on, and enhance, existing plant communities and habitats. Stream diversions will be designed to replicate natural conditions where possible.

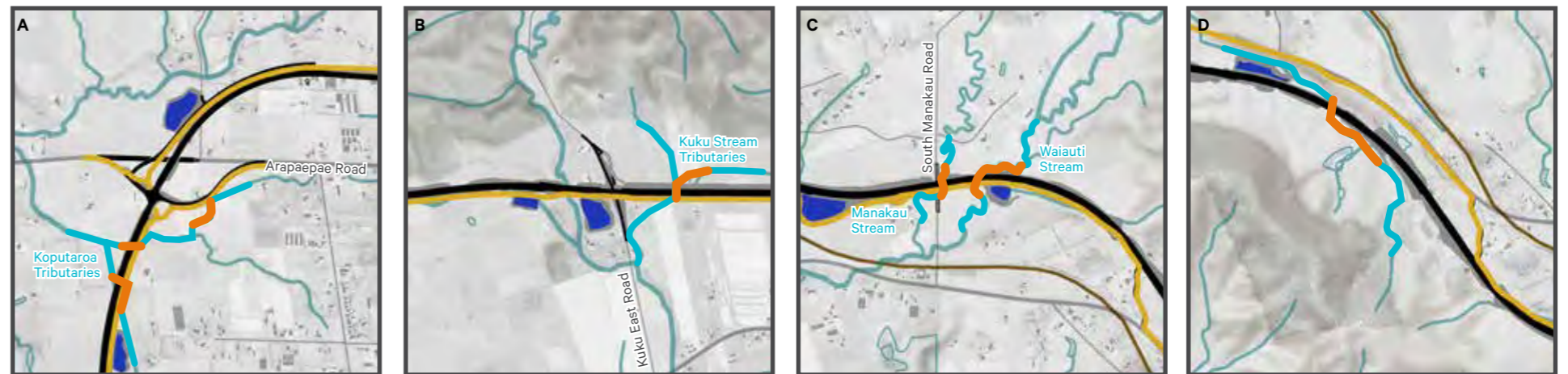
- Stream diversions will not be over-constructed. They will be formed with a naturalistic ‘meander’ within the proposed designations. Existing natural material and indigenous vegetation will be re-used as practicable, such as rocks from diverted stream beds. The stream diversion will be constructed to allow the watercourse to ‘find its way’ through the landscape over time. Stream diversions will also take advantage of the opportunity to enhance natural character values.
- Integrate riparian planting into the overall Planting Plan
- Re-vegetate diverted stream margins to:
 - Enhance habitat and ecological connectivity
 - Visually accentuate the streams as landscape features; and
 - Soften the appearance of their transition into culverts
- Integrate with wider Planting Concept (overall planting) approach

Iwi wish to be directly involved in all wai outcomes for the project including stream diversions. Details are tbc through the Cultural Impact Assessment process including possible kaitiaki roles.

Manakau Stream
[Wildlands Consultants 2019]



Waiauti Stream Tributary
[EOS Ecology]



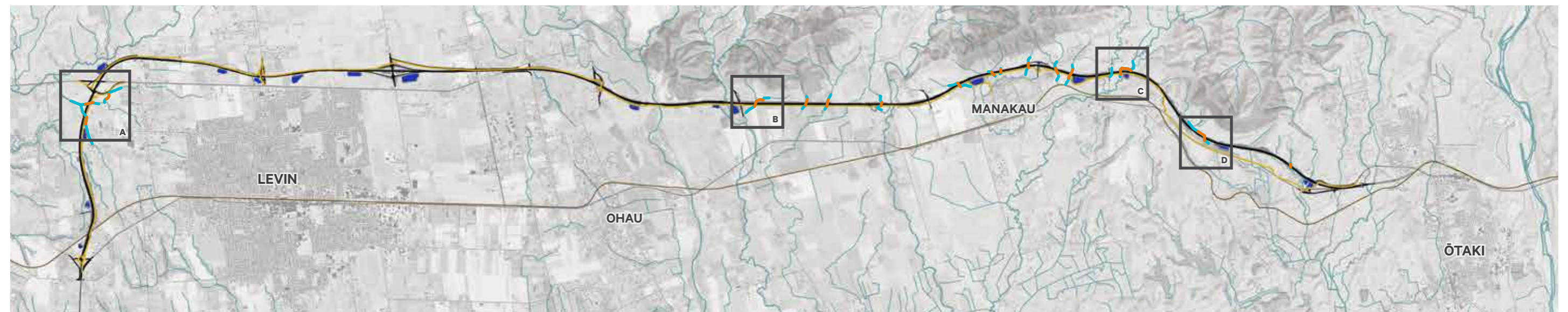
Stream Diversions

— Affected stream
— Diversion



Right - Significant Stream Diversion Locations

- A - Koputaroa Tributaries—short length of stream diverted
- B - Kuku Stream—short length of stream diverted
- C - Manakau and Waiauti Streams—realignment of stream and meanders
- D - Waitohu Tributary—stream realigned parallel to proposed highway



Landscape.

Roadside Stormwater

Stormwater treatment systems include sumps, sediment traps, swales, and constructed wetlands/retention ponds. The roadside elements of the stormwater treatment 'train'—swales and stormwater wetlands—are considered under landscape in the CEDF, given their connections to the wider environment. This integrated system is central to ensure provision of a high quality water treatment to preserve the health of rivers and streams. The overall outcomes are:

- Keep water flows within the same catchment as much as practicable
- Integrate the roadside stormwater design through a coherent and consistent spatial layout and refined 'kit of parts'. A simple palette of refined details should be used to resolve the relationship between stormwater system, any kerbs, barriers, junction of shoulder and planting, and highway furniture (lights, signs). The layout is to be designed to reduce maintenance, minimise herbicide use, and to avoid visual clutter
- Design for clean simple lines and a vegetated appearance (not bare ground and yellow strips maintained by herbicide)
- Prioritise the use of planted swales including the use of endemic wetland plants characteristic of each catchment
- Avoid the use of rock lined swales, shot crete and kerb and channel as much as practicable
- Design for safe inspection and maintenance access

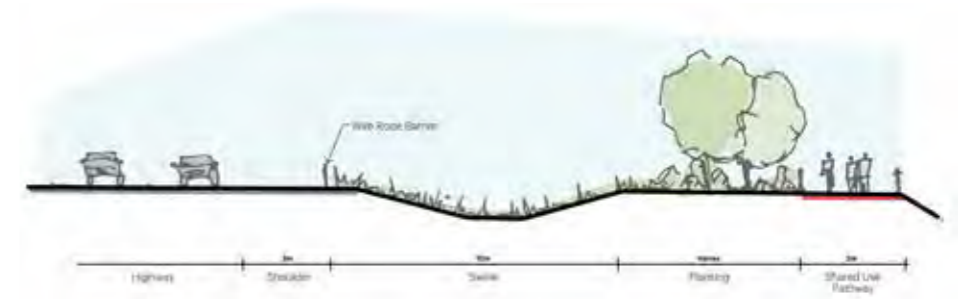
Iwi wish to be directly involved in wai outcomes for the project including stormwater. Details are tbc through the Cultural Impact Assessment process including possible kaitiaki roles.

Swales

Longitudinal swales capture surface water runoff along the length of the highway. The design of all swales should be in keeping with the overall principles, to let the land be its natural self. A naturalistic approach is preferred, which will allow natural processes to establish and continue to shape the landscape. The following outcomes apply:

- Swales are typically 9m wide, have slopes with a batter of 1v:4h, and are planted to reduce the need for mowing, improve filtration and stormwater flows, and promote transpiration. (Further refinement of design, widths, and naturalisation of swale paths will be undertaken during detailed design)
- Prioritise the use of planted swales to enhance the mauri of the wai, improve water quality and reduce mowing (reducing regular roadside maintenance activities such as mowing and herbicide improves safety and reduces whole of life cost)
- Base of swales to be planted at a minimum width of 3m with appropriate water-tolerant endemic species and selected in collaboration with ecologists, hydrologists and mana whenua
- Appropriate topsoil horizons and biodegradable erosion control materials to be applied to assist early establishment of plants and prevent preferential flow paths
- Where swales enter constructed wetlands or are generally part of a wider open space area, they shall be widened in keeping with landform and proposed planting schemes to integrate the swales into the broader vegetated landscape, slow flows and enhance treatment
- Integrate swales with associated highway features such as the Shared Use Path (SUP) to create links between user experience and the wider landscape and provide physical and visual separation from the highway
- Consider how the plant species used and ongoing management can avoid creating a linear edge, that would detract from the expression of ki uta ki tai and support weed and pest transfer along the highway
- Ensure weed management practices are swale species appropriate, to avoid loss of plants resulting from spray drift and clearing of all plants in a herbicide 'band' adjacent to the SUP

Iwi wish to be directly involved in wai outcomes for the project including stormwater. Details are tbc through the Cultural Impact Assessment process including possible kaitiaki roles.



Planted Swale Examples
Top:
Bottom: [Natural Habitats]

Stormwater Wetlands

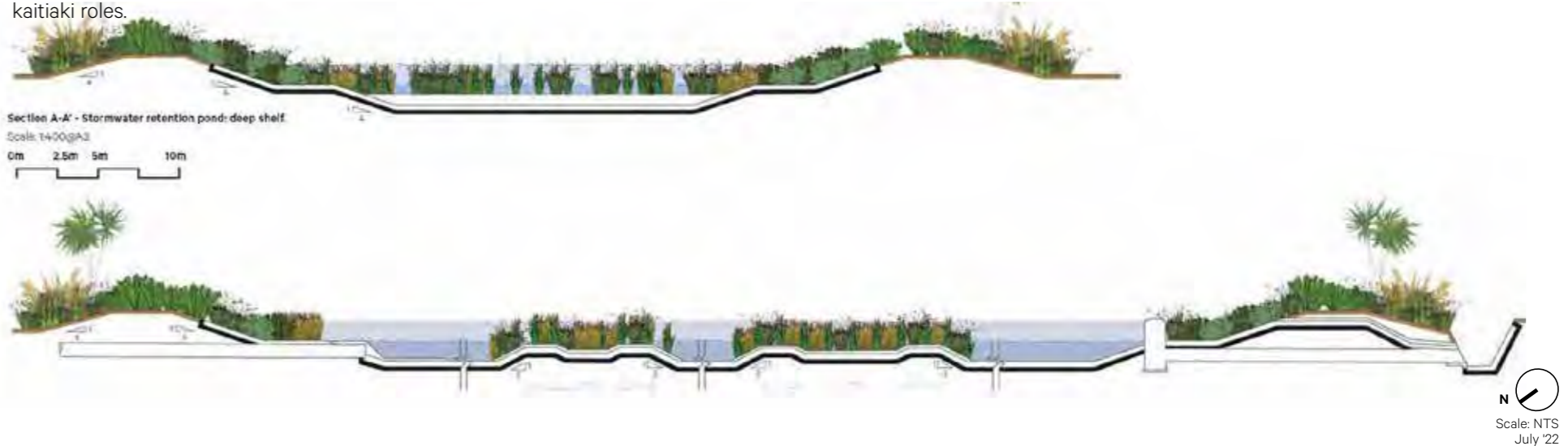
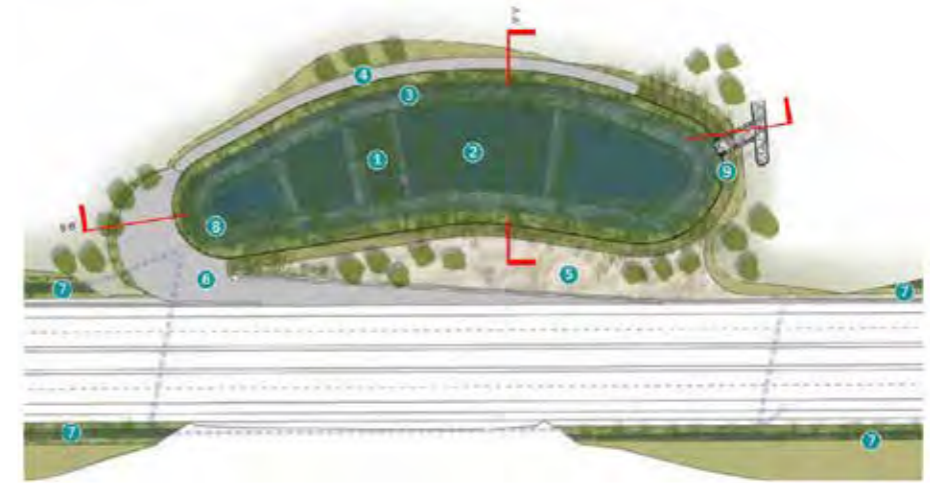
All roadside stormwater elements will be connected (wherever practicable) to constructed stormwater wetlands to improve water quality. The constructed wetlands are made up of retention pond and its planted, sloped banks. As the stormwater passes through a treatment 'train' in the retention pond, with varying depths and plant types it is 'bioremediated'; the plants improve the water quality. Outcomes are:

- The form and contouring of the stormwater wetlands has a natural appearance tying into the natural topography (avoiding geometric ponds and banks). Optimise the natural appearance by riparian and margin vegetation and varied long and cross section
- Enhance the connection of wai with Papatūānuku by ensuring the stormwater wetlands are shallow and full of wetland vegetation (to avoid stagnant open water)
- Look for opportunities for te mana o te wai values to be addressed
- Design to minimise maintenance by revegetating around stormwater wetlands, to avoid narrow grassed areas, provide efficient track access and consider sustainable disposal of any material removed during maintenance
- Consider measures to avoid road kill through location and natural barriers for example, by avoiding stormwater wetlands located on both sides of the highway in the same location
- Integrate the stormwater wetlands into wider ecological enhancement areas and as part of the outcomes to restore natural character and opportunity to

re establish plant species, habitat types and ecosystems that was common historically

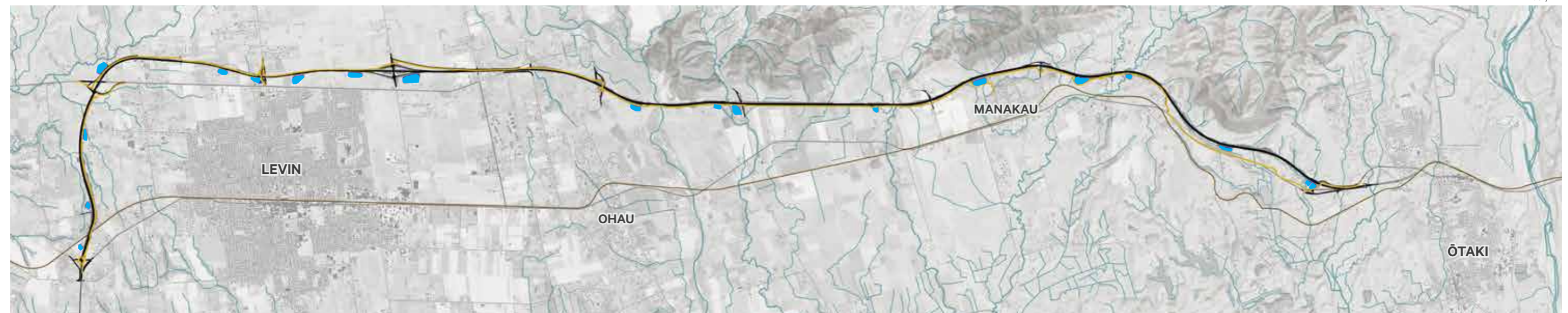
- Ensure that other planned projects in the district are considered in the design and maintenance of the Ō2NL stormwater wetlands, so that net water quality improvement is achieved where and if practicable and the natural streams are protected
- Consider climate change in the design and maintenance of the stormwater treatment 'train' including the sizing of the constructed wetlands

Iwi wish to be directly involved in wai outcomes for the project including stormwater. Details are tbc through the Cultural Impact Assessment process including possible kaitiaki roles.



Stormwater Wetlands

Stormwater Wetlands



Landscape.

Planting

A planting strategy for the project is one of the key components needed to address the core principles and ensure opportunities to preserve, restore, enhance and create positive outcomes. Along with the mahi toi strategy, planting is central to the opportunity to create an overall narrative and potential for a hīkoi wānanga (learning journey, varied experience) along the highway and SUP. Planting for the project is to include:

- **rehabilitation** planting on the highway earthworked footprint including areas around the stormwater wetlands and material supply sites
- **restoration** planting beyond the highway earthworks including for:
 - **landscape and visual planting** for mitigation of effects of the highway on surrounding properties, perceptions and landscape values
 - **ecological compensation/offsetting and mitigation** to compensate/offset or mitigate for the effects of the proposal on ecosystems
 - **natural character planting** to restore natural character in the stream and hydrological network of waterways that the highway traverses

The outcomes for the planting strategy are to:

- Revegetate and connect to the surrounding landscape (rather than simply planting along the highway edge)
- Planting approach and species types should enhance the landscape's biodiversity and natural processes; to let the land be its natural self
- Consider opportunities for traditional uses and cultural harvest where appropriate from a Te Ao Māori perspective and to avoid taonga species habitat disturbance. For example, mokomoko and ngata [iwi partners to advise]
- Design at a landscape scale. Use broad planting patterns and a palette that reflects the varied ecosystem types and natural groupings of plants. This should **avoid** generic mixes and include bold groupings of plants (rather than a large number of species, mixed together as a 'fruit salad', irrespective of context). This is to include consideration of how species vary naturally, and are endemic to each catchment
- Alongside streams and rivers, tailor plant specie mixes to support flood management and to address varying flow rates. Use indigenous species where ever possible, rather than exotics or rock lining, for bank stabilisation. If and where practicable, in faster flowing rivers, such as the Ohau, this may require a transitional approach, over a number of years, from exotic plants to indigenous species. Where blow outs occur, similarly avoid the use of rock linking and use exotic species transitionally (replace with indigenous species over time), as part of ongoing management where practicable.

- Design to accentuate landscape patterns including named and identified stream corridors, topography, highlight features such as wetlands, and complement existing stands of bush. By contrast, avoid a linear corridor of vegetation that would highlight the highway. Planting should reinforce ki uta ki tai, the connections between the maunga and the moana
- Where fill batters are grassed, avoid narrow strips between the SUP and the planted swale that do not look deliberate and are difficult maintain and mow. As a guide, where these areas are less than 1.5m continue low planting to the edge of the SUP
- Follow eco-sourcing principles for all plants. Eco-sourcing includes propagating plants preferably by seed, selected from sources in the locality where/if practicable (and at least in the ecological district) and preferably from similar conditions to that in which the plants are to be planted
- Tailor plant mixes to echo natural distribution of communities and microclimates
- Buffer and integrate planting with adjacent vegetation
- Configure planting to soften views from houses close to the highway (planting can help manage the effects of noise)
- Repair forest edges that have been created by the project, buffer important ecosystems to enhance their resilience
- Use enhancement measures to support natural succession processes including supporting the planting strategy with pest and weed management
- Consider opportunities for re-use of site won material including live plants, seed duff, and timber where appropriate from a Te Ao Māori perspective
- The success or failure of revegetation depends on specification and implementation:
 - Consider the development of a maramataka based specification for seed sourcing, propagation, planting and ongoing management including pest and weed control. Simplistically this means, guided by the māori calendar.
 - Match planting design with ground conditions and provide for ground preparation, topsoil management, and drainage to ensure successful plant growth
 - Identify and provide appropriate management to remove/control pests and weeds that pose a threat to successful establishment of planting. This will include consideration of appropriate 'no planting' zones along the highway, to break pest and weed transfer pathways. For example, along fill batters where there is no need for natural character or visual effects mitigation, these areas can be grassed, to help reduce weed and pest spread
 - Design planting to minimise whole-of-life cost. Design the planting to be self-sustaining beyond the initial maintenance period. Use both site preparation and planting techniques to support natural regeneration

- Ensure both pioneer and later stage successional species are used in both rehabilitation and restoration. This is to ensure the sustainability of planted areas overtime and avoid monocultures of indigenous species developing
- Design safe access for maintenance and cultural harvest where appropriate
- Provide opportunities for iwi, hapū and communities to connect with the land through planting days

Iwi wish to be directly involved in the planting outcomes for the project. Details are tbc through the Cultural Impact Assessment process including possible kaitiaki roles.

Top: Mackays to Peka Peka Expressway
[Natural Habitats
<https://www.naturalhabitats.co.nz/our-projects/mackays-to-peka-peka/>]
Centre: SUP/road separation planting
[NZ Herald]

Below: Riparian Planting of the Waiwiri Stream
[Tangatatai, T., Patterson, M.G., Hardy, D.J. (2017). Cost Benefit Analysis of Riparian Planting of Waiwiri Stream, Horowhenua. Manaaki Taha Moana Research Report No. 15. Massey University, Palmerston North.]



Existing Vegetation

The planting strategy intends to reflect the character of the surrounding landscape, revegetate with indigenous planting species and preserve, restore, enhance and [re]create the existing vegetation and ecosystems. General principles and values for restoration planting is to include:

- Protection of existing indigenous vegetation through all planted areas
- Indigenous species dominance
- Forest tier development including epiphytes, climbers and fern signatures
- Habitat and food availability across seasons including consideration of mahinga kai, pātaka kai and rongoā where appropriate (at a safe distance from the highway)
- Future resilience against pest and weed invasions through the provision of pioneer and later stage successional species and avoiding planting in some areas along the highway (breaks to stop weed and pest transfer)
- Linkages with other habitats

Forest Remnants

Stands of bush in the vicinity the highway are valuable remnants of the former lowland forest—they provide habitat for *Powelliphanta traversii* Ōtaki and stepping-stones for birdlife and other species. The project offers the opportunity to enhance the values of existing stands by fencing, pest and weed management, and providing edge buffers. Outcomes sought for the identified bush remnants are:

- Fence where practicable to exclude stock from the listed stands

Existing Vegetation (See following pages for detail)



- Revegetate the balance land between the stands of the bush and the highway
- Extend dense planting around the perimeter of the stands (where appropriate and practicable) to improve edge condition
- Include weed management of forest stands as part of the highway maintenance
- Consider QEII type covenant and other measures to connect with local restoration groups

Wetland/Open Water Habitats

Wetlands and open water habitats exist across the project footprint, and are particularly evident within the Koputaroa stream tributaries. Particular outcomes are sought to:

- Re-establish swamp forest and wetland habitat in areas where the hydrological and environmental conditions have been retained or can be restored
- Revegetate areas with endemic species to enhance ecological health of existing wetlands and stretches of open water
- Utilise the project material supply sites, for example, alongside the Ohau river, to re-introduce areas of open water

Stream Riparian

Planting outcomes along existing and diverted streams are to provide natural character restoration and include ecology and cultural matters (tbc through the CIA reports). Many existing streams through farmland have minimal associated planting and revegetation should be priority. Along the larger rivers (Ohau, Waikawa), existing vegetation is dominantly composed of non-native species, and enrichment of these areas should be a priority.

Koputaroa Catchment
[Wildlands Consultants 2019]



Landscape.

Rehabilitation Planting

The following pages set out indicative planting typologies and species palette for all earthworked areas of the project; to be rehabilitated post construction. In RMA terms the purpose of this planting is to achieve landscape and visual mitigation. Where adjacent to streams it will help address natural character effects.

Note: Specific outcomes and opportunities for planting along the highway, associated with roadside and stormwater wetlands, have been addressed above and for the SUP, cut and fill batters and material supply sites, in the following section—Highway design response.

Rehabilitation planting and grassing is required over all altered and modified areas of the construction footprint, such as fill and cut slopes, vegetated swales, stream diversions, construction yards, stockpile and material supply sites. Rehabilitation measures are to support natural regeneration and succession to appropriate and diverse habitat types e.g. native shrubland, wetland or forest (rather than monocultures) and to minimise medium-term maintenance and pest and weed transfer.

Planting typologies have been identified as consistent with the project earthwork components. Outcomes sought and an indicative species palette for each are set out on the following pages, to be developed into detailed planting plans in the following stages of the project. **Fencing requirements** and types are to be confirmed at detailed design, to ensure successful establishment and ongoing management of all areas planted.

Re-established -tall forest stands

The re-establishment of stands of mature tall forest, reminiscent of species historically present and local to the area. This type of planting is intended to help integrate the main highway structures, and at intersections, also contribute to speed mitigation, cues for safe smooth transitions.

Low planting

Low planting on cut and fill batters is used to maintain good visual connection and contribute to an ecologically rich environment. This type of planting is appropriate where there is no need to screen the highway from surrounding properties, and a requirement of advantage to keep more open sight lines, for example, along the SUP.

Tall screen planting

Planting to provide physical and/or visual separation between the highway and locality. This typology is predominantly proposed on fill batters or to provide an appropriate buffer to properties in close proximity to the highway.

Swale planting

Planting to the base and slopes of swales as part of the stormwater treatment.

Stormwater wetland planting

Planting of the stormwater retention ponds and banks to naturalise the effects and integrate with wider landscape.

Tree specimens including avenues

Planted in locations to aid the mitigation of visual effects, provide a distinction between local roads and highway, and at intersections and roundabouts as a speed mitigation method.

Material supply sites

The material supply sites will be rehabilitated with vegetation to respond to their environment and possible future uses including public access etc. There is opportunity to re-introduce expanses of open water and ecologically rich and diverse ecosystems, which the planting palette will reflect. Detailed legacy outcomes for each site are set out in the Highway Design outcome section.

Refer to the following pages for illustrated Planting Concept Plan (the preliminary planting concept) including rehabilitation and restoration planting.

Top: Northern Corridor Improvements
Illustration of integration of earthworks into surrounding
[Waka Kotahi]
Below: Mackays to Peka Peka expressway
[<https://www.naturalhabitats.co.nz/our-projects/mackays-to-peka-peka/>]



Restoration Planting

Restoration planting will occur in areas outside of the project construction footprint; on natural ground. Locations shown on the Planting Concept Plan (refer to drawings provided in Volume III of the lodged RMA documentation) are selected for the purposes of landscape and visual mitigation, natural character restoration and for ecological mitigation and offsetting. **Fencing requirements** and types are to be confirmed at detailed design to ensure successful establishment and ongoing management.

The following categories have been developed for the purposes of restoration planting. Where adjoining existing areas of indigenous vegetation the species chose and planting approach is to help protect and buffer that vegetation, enhancing its overall health and longevity. Planting for landscape, visual and natural character restoration is to include:

Re-established -tall forest stands, low planting & tall screen planting

These planting categories carry the same landscape and visual mitigation function, and indicative species palette, as those in the rehabilitation group, however, will be planted over natural ground. Re-established Tall Forest may be used to buffer existing stands of bush with ecological values.

Slope/open (re-vegetated scarp)

Planting to escarpments and slopes close to footprint.

Riparian margin planting

Re-vegetation to a distance of approximately 20m either side of stream banks upstream and downstream of highway. This also contributes to the restoration of natural character.

Wet forest planting

Planting to areas of slow drainage to re-establish areas of wet forest and contribute to the restoration of natural character. This can also complement terrestrial ecology offsetting activity.

Wetland planting

Re-establishment of wetland environment in appropriate lowland areas to contribute to the restoration of natural character.

Enrichment planting

Planting to enrich stands of existing vegetation for both natural character restoration and landscape and visual mitigation.

Terrestrial ecological offsetting sites

Areas selected by the ecologists, away from the footprint, to offset for the effects of lost terrestrial vegetation.

Wetland ecological offsetting/mitigation sites

As per terrestrial above, however wetland specific.

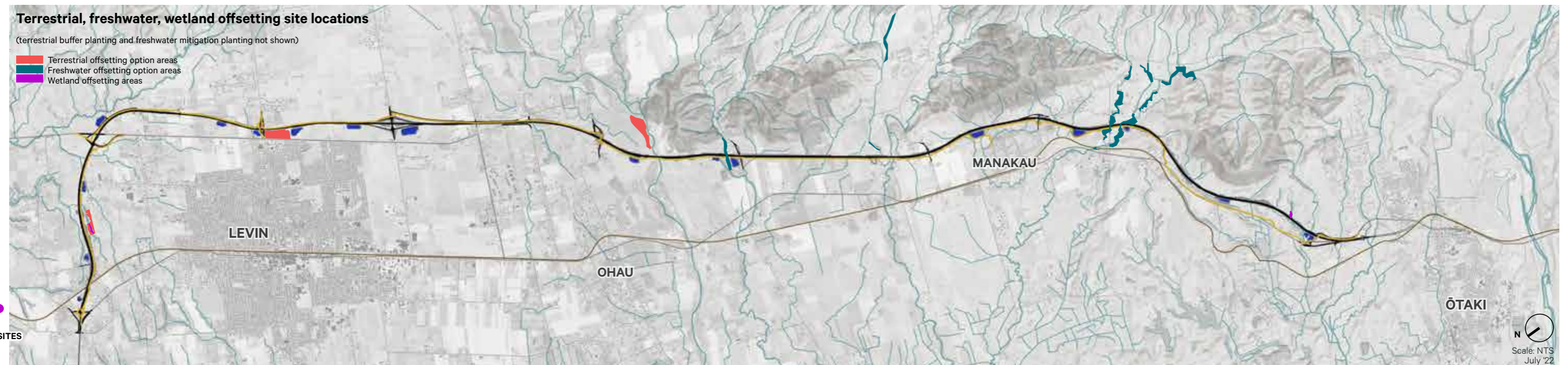
Freshwater ecological offsetting/mitigation sites (riparian margin)

Areas selected by the ecologists to offset ecological effects related to freshwater environments resulting from the proposal of approximately 20m either side of the stream banks.

Terrestrial buffer planting

Planting areas selected by the ecologists around existing bush stands to mitigate effects to existing terrestrial vegetation.

Note: Mitigation sites (compared to compensation/offsetting) are closer to the highway and area of effect, and, where these are associated with rivers, streams and their margins (including wetlands), also contribute to the restoration of natural character.



Landscape.

Scale: 1:40,000
July '22

Rehabilitation and Restoration Planting Strategy

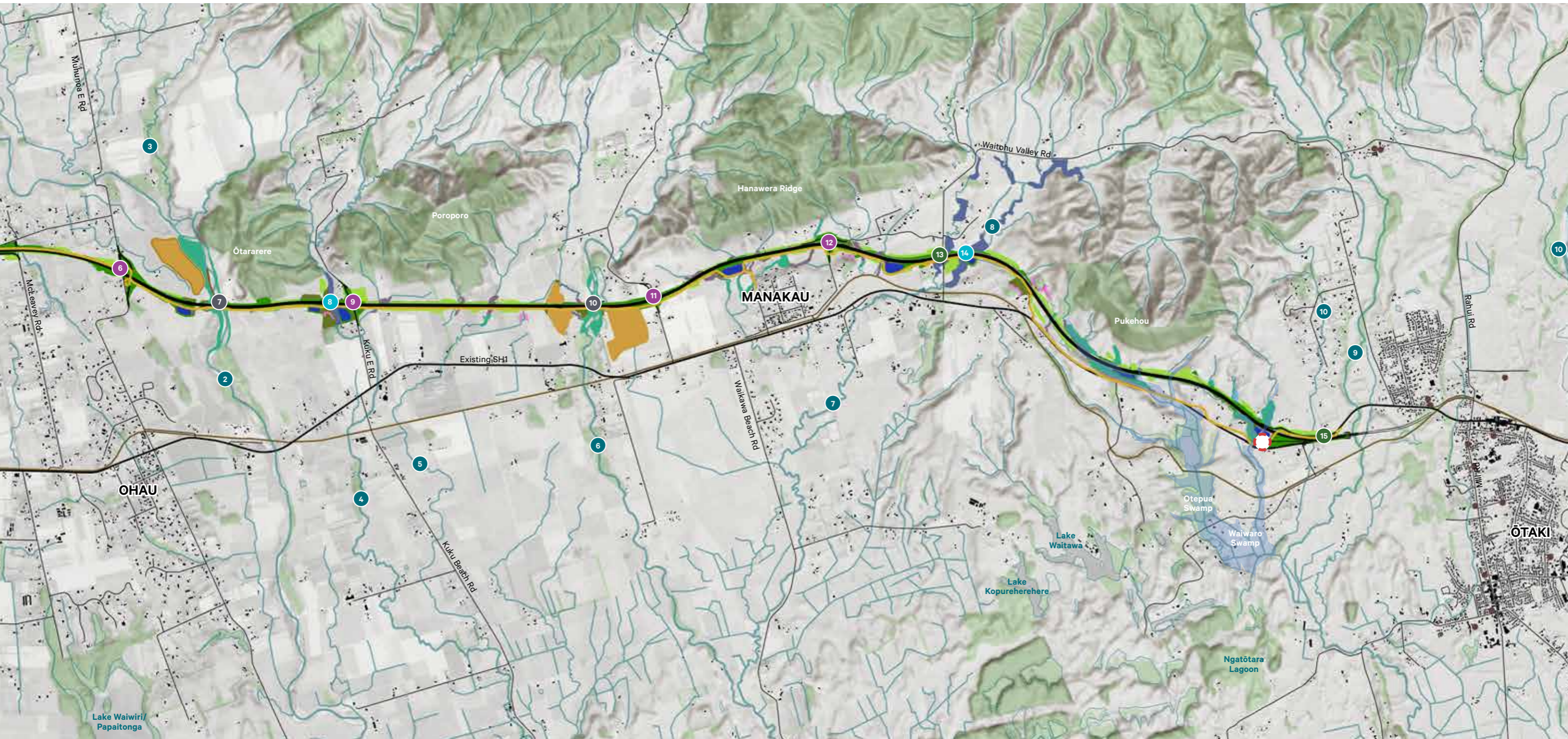
An indicative planting strategy has been prepared to illustrate how the outcomes sought for both rehabilitation and restoration could be achieved. This includes recommendations from the partners and various RMA assessment specialists for the project. This strategy has been developed into the draft Planting Concept Plan (provided in Volume III: Drawings) showing, in greater detail, how the planting types could be located in response to the wider landscape and highway components.

The planting strategy outcomes will combine rehabilitation (earthworked), restoration (non-earthworked areas) including tree avenues along local roads. Proposed planting types and species mixes should be developed to ensure integration into the surrounding environment and broader outcomes of the planting strategy including adverse effects mitigation and offset. The proposed categories of planting and corresponding indicative species palettes will be further developed and refined through the next stages of design in consultation with the project partners, design and assessment specialists, key stakeholders and relevant landowners.

Legend	
	Existing State Highway 1
	Local roads
	Railway line
	Awa
	Lake
	Indicative highway alignment
	Proposed Shared Use Path
	Stormwater wetland
	Awa bridge - multispan
	Awa bridge - singlespan
	Roundabout
	Interchange with local road over highway
	Local Road connection - Over highway
	Local Road connection - Under highway
1	Crossings, Roundabouts & Interchanges
2	Northern Termination Roundabout
3	NMIT Bridge
4	SH57 Roundabout
5	Queen Street East Bridge
6	Tararua Road Bridge
7	Muhunua East Rd Bridge
8	Ohau Bridge
9	Kuku Bridge
10	Kuku East Rd Bridge
11	Waikawa Bridge
12	North Manakau Road Bridge
13	Manakau Heights Drive Bridge
14	South Manakau Road Bridge
15	Waiauti Bridge
1	Awa - Named Rivers & Streams
1	Koputaroa Stream
2	Ohau River
3	Makorokio Stream
4	Kuku Stream
5	Waikōkopu Stream
6	Waikawa River
7	Manakau Stream
8	Waiauti Stream
9	Waitohu Stream
10	Greenwood Stream
11	Otaki River

	Existing Vegetation [LCDCB] For detailed breakdown, refer to Chapter 2
	Ecological Planting
	Riparian / freshwater mitigation planting
	Riparian / freshwater offsetting sites
	Wetland offsetting / mitigation sites
	Terrestrial offsetting sites
	Terrestrial buffer planting
	Landscape and Visual Planting
	Rehabilitation planting (within footprint)
	Naturalised stormwater planting
	Restoration planting (outside footprint)
	Grass rehabilitation
	<i>Swales (not shown on map- see Planting Concept Plan, Volume III)</i>
	Natural Character Planting (Restoration)
	Material Supply Sites (Rehabilitation)
	Specimen Trees
	<i>Intersections and Avenues (not shown on map, refer to following pages for intersection and roundabout approach, see Planting Concept Plans, Volume III)</i>





Left to Right
 - Riparian Planting stream edge character in pastoral landscape [Image: Dairy NZ]
 - Wetland character [Image: Wetland Trust NZ]
 - Open Water/ wetland habitat [Image: Natural Habitats]
 - Screening Vegetation character [Image: GardenDrum]

Rehabilitation - Indicative Species Palette

Refer to **Highway** section following for outcomes relevant to specific earthwork components.

Re-established Tall Forest

Sample Palette

4 10 12 13 15 17

Species

1	Titoki	<i>Alectryon excelsus subsp. Excelsus</i>
2	Tawa	<i>Beilschmiedia tawa</i>
3	Karamu	<i>Coprosma robusta</i>
4	Kahikatea	<i>Dacrydium dacrydioides</i>
5	Kohekohe	<i>Dysoxylum spectabile</i>
6	Hinau	<i>Elaeocarpus dentata</i>
7	Tawhairauriki	<i>Fuscopora solandri</i>
8	Koromiko	<i>Veronica stricta</i>
9	Porokaiwhiri	<i>Hedycarya arborea</i>
10	Houhere	<i>Hoheria sexstylosa</i>
11	Rewarewa	<i>Knightsia excelsa</i>
12	Kānuka	<i>Kunzea robusta</i>
13	Mahoe	<i>Meliccytus ramiflorus</i>
14	Kawakawa	<i>Piper excelsum</i>
15	Tarata	<i>Pittosporum eugenioides</i>
16	Kohuhu	<i>Pittosporum tenuifolium</i>
17	Manatu	<i>Plagianthus regius</i>
18	Tōtara	<i>Podocarpus totara</i>
19	Matai	<i>Prumnopitys taxifolia</i>
20	Kōwhai	<i>Sophora microphylla</i>

Low Planting

Sample Palette

5 7 9 13 14 15

Species

1	Hunangāmoho	<i>Anemanthele lessoniana</i>
2	Oioi	<i>Apodasmia similis</i>
3	Toetoe	<i>Austroderia toetoe</i>
4	Rautahi	<i>Carex geminata</i>
5	Pukeo	<i>Carex virgata</i>
6	Hunangamoho	<i>Chionochloa conspicua</i>
7	Haumata	<i>Chionochloa flavicans</i>
8	Mingimingi	<i>Coprosma propinqua</i>
9	Karamu	<i>Coprosma robusta</i>
10	Pātiti	<i>Microlaena stipoides</i>
11	Tororaro	<i>Muehlenbeckia astonii</i>
12	Pohuehue	<i>Muehlenbeckia complexa</i>
13	Wharariki	<i>Phormium cookianum</i>
14	Takupurenga	<i>Olearia solandri</i>
15	Tauhinu	<i>Ozothamnus leptophyllus</i>
16	Koromiko	<i>Veronica stricta</i>

Tall Screen Planting

Sample Palette

1 2 3 4 5 6

Species.

1	Toetoe	<i>Austroderia toetoe</i>
2	Mānuka	<i>Leptospermum scoparium</i>
3	Red Matipo	<i>Myrsine australis</i>
4	Tarata	<i>Pittosporum eugenioides</i>
5	Kohuhu	<i>Pittosporum tenuifolium</i>
6	Whauwhaupaku	<i>Pseudopanax arboreus</i>
7	Manatu	<i>Plagianthus regius</i>

Swale Planting

Sample Palette

1 2 3 4 5 6

Species.

1	Oioi	<i>Apodasmia similis</i>
2	Rautahi	<i>Carex geminata</i>
3	Pukeo	<i>Carex virgata</i>
4	Hukihuki	<i>Coprosma tenuicaulis</i>
5	Toetoe upokotangata	<i>Cyperus ustulatus</i>
6	Wiwi	<i>Ficinia nodosa</i>

REVIEW TE REO MĀORI NAMES AND CONFIRM LISTS WITH ECOLOGISTS AND MANA WHENUA

Stormwater Wetland Planting

Sample Palette



1 2 3 6 7 8

Species.

1	Toetoe	<i>Austroderia fulvida</i>
2	Kukuraho	<i>Bolboschoenus fluviatilis</i>
3	Makura / Purei	<i>Carex secta</i>
4	Pukeo	<i>Carex virgata</i>
5	Kutakuta	<i>Eleocharis sphacelata</i>
6	Wiwi	<i>Juncus pallidus</i>
7	Tūhara	<i>Machaerina articulata</i>
8	Harakeke	<i>Phormium tenax</i>
9	Raupō	<i>Typha orientalis</i>

Tree Specimens

Sample Palette



1 2 3

Species.

1	Kahikatea	<i>Dacrycarpus dacrydioides</i>
2	Kohekohe	<i>Dysoxylum spectabile</i>
3	Tōtara	<i>Podocarpus totara</i>

Material Supply

Sample Palette



4 11 13 16 17 18 20 27 31 38 40 4

Species.

	1	Rautahi	<i>Carex geminata</i>
	2	Makura / Purei	<i>Carex secta</i>
	3	Pukio	<i>Carex virgata</i>
Wetland	4	Wiwi	<i>Juncus pallidus</i>
	5	Tūhara	<i>Machaerina articulata</i>
	6	Swamp kiokio	<i>Parablechnum minus</i>
	7	Harakeke	<i>Phormium tenax</i>
	8	Raupō	<i>Typha orientalis</i>
	9	Purei	<i>Carex secta</i>
	10	Pukio	<i>Carex virgata</i>
	11	Ti Kouka	<i>Cordyline australis</i>
	12	Kahikatea	<i>Dacrycarpus dacrydioides</i>
Wet Forest Planting	13	Pukatea	<i>Laurelia novae-zelandiae</i>
	14	Mānuka	<i>Leptospermum scoparium</i>
	15	Harakeke	<i>Phormium tenax</i>
	16	Matai	<i>Prumnopitys taxifolia</i>
	17	Nikau	<i>Rhopalostylis sapida</i>
	18	Swamp maire	<i>Syzygium maire</i>

Species.

	19	Titoki	<i>Alectryon excelsus</i> subsp. <i>Excelsus</i>
	20	Tawa	<i>Beilschmiedia tawa</i>
	21	Karamu	<i>Coprosma robusta</i>
	22	Kahikatea	<i>Dacrycarpus dacrydioides</i>
	23	Kohekohe	<i>Dysoxylum spectabile</i>
	24	Hinau	<i>Elaeocarpus dentata</i>
	25	Tawhairauriki	<i>Fuscopora solandri</i>
	26	Koromiko	<i>Hebe stricta</i>
	27	Porokaiwhiri	<i>Hedycarya arborea</i>
Re-established forest	28	Houhere	<i>Hoheria sexstylosa</i>
	29	Rewarewa	<i>Knightia excelsa</i>
	30	Kānuka	<i>Kunzea robusta</i>
	31	Mahoe	<i>Meliccytus ramiflorus</i>
	32	Kawakawa	<i>Piper excelsum</i>
	33	Tarata	<i>Pittosporum eugenioides</i>
	34	Kohuhu	<i>Pittosporum tenuifolium</i>
	35	Manatu	<i>Plagianthus regius</i>
	36	Tōtara	<i>Podocarpus totara</i>
	37	Matai	<i>Prumnopitys taxifolia</i>
	38	Kōwhai	<i>Sophora microphylla</i>
	39	Hunangāmoho	<i>Anemanthele lessoniana</i>
	40	Mingimīngi	<i>Coprosma propinqua</i>
Mokomoko Plantings	41	Hunangāmoho	<i>Chionochloa conspicua</i>
	42	Haumata	<i>Chionochloa flavicans</i>
	43	Pātiti	<i>Microlaena stipoides</i>
	44	Tororaro	<i>Muehlenbeckia astonii</i>
	45	Pohuehue	<i>Muehlenbeckia complexa</i>

Restoration - Indicative Species Palette

Re-established Tall Forest

— Indicative palette as per rehabilitation species

Low Planting

— Indicative palette as per rehabilitation species

Tall Screen Planting

— Indicative palette as per rehabilitation species

Slope/Open (Re-vegetated Scarp)

Sample Palette



2 4 8 10 13 15

Species.

1	Toetoe	<i>Austroderia fulvida</i>
2	Karamu	<i>Coprosma robusta</i>
3	Ti Kouka	<i>Cordyline australis</i>
4	Koromiko	<i>Veronica stricta</i>
5	Houhere	<i>Hoheria sexstylosa</i>
6	Mānuka	<i>Leptospermum scoparium</i>
7	Wharariki	<i>Phormium cookianum</i>
8	Kānuka, rawirinui	<i>Kunzea robusta</i>
9	Mahoe	<i>Melicytus ramiflorus</i>
10	Takupurenga	<i>Olearia solandri</i>
11	Tauhuhu	<i>Ozothamnus leptophyllus</i>
12	Harakeke	<i>Phormium tenax</i>
13	Tarata	<i>Pittosporum eugenioides</i>
14	Kohuhu	<i>Pittosporum tenuifolium</i>
15	Whauwhaupaku	<i>Pseudopanax arboreus</i>
16	Kōwhai	<i>Sophora microphylla</i>

Riparian Margin

Sample Palette



4 9 15 16 20 22

Species.

1	Titoki	<i>Alectryon excelsa</i>
2	Rautahi	<i>Carex geminata</i>
3	Pukio	<i>Carex virgata</i>
4	Mingimingi	<i>Coprosma propinqua</i>
5	Karamu	<i>Coprosma robusta</i>
6	Ti Kouka	<i>Cordyline australis</i>
7	Toetoe upokotangata	<i>Cyperus ustulatus</i>
8	Kohekohe	<i>Didymocheton spectabilis</i>
9	Akeake	<i>Dodonaea viscosa</i>
10	Koromiko	<i>Veronica stricta</i>
11	Porokaiwhiri	<i>Hedycarya aborea</i>
12	Houhere	<i>Hoheria sexstylosa</i>
13	Rewarewa	<i>Knightia excelsa</i>
14	Kānuka	<i>Kunzea robusta</i>
15	Mānuka	<i>Leptospermum scoparium</i>
16	Mahoe	<i>Melicytus ramiflorus</i>
17	Kaikomako	<i>Pennantia corymbosa</i>
18	Harakeke	<i>Phormium tenax</i>
19	Tarata	<i>Pittosporum eugenioides</i>
20	Kohuhu	<i>Pittosporum tenuifolium</i>
21	Manatu	<i>Plagianthus regius</i>
22	Tōtara	<i>Podocarpus totara</i>
23	Whauwhaupaku	<i>Pseudopanax arboreus</i>
24	Patete	<i>Schefflera digitata</i>
25	Kōwhai	<i>Sophora microphylla</i>
26	Kamahi	<i>Weinmannia racemosa</i>

Wet Forest Planting

Sample Palette



1 2 3 4 7 9

Species.


1	Purei	<i>Carex secta</i>
2	Pukio	<i>Carex virgata</i>
3	Ti Kouka	<i>Cordyline australis</i>
4	Kahikatea	<i>Dacrycarpus dacrydioides</i>
5	Pukatea	<i>Laurelia novae-zelandiae</i>
6	Mānuka	<i>Leptospermum scoparium</i>
7	Harakeke / Flax	<i>Phormium tenax</i>
8	Matai	<i>Prumnopitys taxifolia</i>
9	Nikau	<i>Rhopalostylis sapida</i>
10	Swamp maire	<i>Syzygium maire</i>

REVIEW TE REO
MĀORI NAMES AND
CONFIRM LISTS
WITH ECOLOGISTS
AND MANA
WHENUA

Ecological Offsetting/Mitigation

Wetland Planting

Sample Palette




1 2 4 5 6 7

Species.

1	Rautahi	<i>Carex geminata</i>
2	Makura / Purei	<i>Carex secta</i>
3	Pukio	<i>Carex virgata</i>
4	Wiwi	<i>Juncus pallidus</i>
5	Tūhara	<i>Machaerina articulata</i>
6	Swamp kiokio	<i>Parablechnum minus</i>
7	Raupō	<i>Typha orientalis</i>

Enrichment/Buffer Planting

Sample Palette



1 4 7 12 14 17

Species.

1	Titoki	<i>Alectryon excelsa</i>
2	Toetoe	<i>Austroderia fulvida</i>
3	Ti Kouka	<i>Cordyline australis</i>
4	Rimu	<i>Dacrydium cupressinum</i>
5	Kahikatea	<i>Dacrycarpus dacrydioides</i>
6	Kohekohe	<i>Didymocheton spectabilis</i>
7	Hinau	<i>Elaeocarpus dentata</i>
8	Pukatea	<i>Laurelia novae-zelandiae</i>
9	Mānuka	<i>Leptospermum scoparium</i>
10	Kānuka	<i>Kunzea robusta</i>
11	Kaikomako	<i>Pennantia corymbosa</i>
12	Harakeke	<i>Phormium tenax</i>
13	Tarata	<i>Pittosporum eugenioides</i>
14	Manatu	<i>Plagianthus regius</i>
15	Tōtara	<i>Podocarpus totara</i>
16	Matai	<i>Prumnopitys taxifolia</i>
17	Whauwhaupaku	<i>Pseudopanax arboreus</i>
18	Kōwhai	<i>Sophora microphylla</i>

Riparian Margin

Species.

1	Titoki	<i>Alectryon excelsa</i>
2	Rautahi	<i>Carex geminata</i>
3	Pukio	<i>Carex virgata</i>
4	Mingimingi	<i>Coprosma propinqua</i>
5	Karamu	<i>Coprosma robusta</i>
6	Ti Kouka	<i>Cordyline australis</i>
7	Toetoe upokotangata	<i>Cyperus ustulatus</i>
8	Akeake	<i>Dodonaea viscosa</i>
9	Koromiko	<i>Veronica stricta</i>
10	Porokaiwhiri	<i>Hedycarya aborea</i>
11	Houhere	<i>Hoheria sexstylosa</i>
12	Rewarewa	<i>Knightia excelsa</i>
13	Kānuka	<i>Kunzea robusta</i>
14	Mānuka	<i>Leptospermum scoparium</i>
15	Mahoe	<i>Meliccytus ramiflorus</i>
16	Kaikomako	<i>Pennantia corymbosa</i>
17	Harakeke	<i>Phormium tenax</i>
18	Tarata	<i>Pittosporum eugenioides</i>
19	Kohuhu	<i>Pittosporum tenuifolium</i>
20	Manatu	<i>Plagianthus regius</i>
21	Tōtara	<i>Podocarpus totara</i>
22	Whauwhaupaku	<i>Pseudopanax arboreus</i>
23	Patete	<i>Schefflera digitata</i>
24	Kōwhai	<i>Sophora microphylla</i>
25	Kamahi	<i>Weinmannia racemosa</i>

Wetland/Swamp Forest

Species.

1	Kakaha	<i>Astelia grandis</i>
2	Harakeke	<i>Phormium tenax</i>
3	Raupo	<i>Typha orientalis</i>
4	Rautahi	<i>Carex geminata</i>
5	Pukio	<i>Carex secta</i>
6	Toetoe upokotangata	<i>Cyperus ustulatus</i>
7	Purei	<i>Carex virgata</i>
8	Mingimingi	<i>Coprosma propinqua</i>
9	Hukihuki	<i>Coprosma tenuicaulis</i>
10	Mānuka	<i>Leptospermum scoparium</i>
11	Wheki	<i>Dicksonia squarrosa</i>
12	Ti Kouka	<i>Cordyline australis</i>
13	Kahikatea	<i>Dacrycarpus dacrydioides</i>
14	Pukatea	<i>Laurelia novae-zelandiae</i>
15	Swamp maire	<i>Syzygium maire</i>

Terrestrial Offsetting

Species.

1	Harakeke	<i>Phormium tenax</i>
2	Ti Kouka	<i>Cordyline australis</i>
3	Akeake	<i>Dodonaea viscosa</i>
4	Porokaiwhiri	<i>Hedycarya arborea</i>
5	Houhere	<i>Hoheria sexstylosa</i>
6	Kānuka	<i>Kunzea robusta</i>
7	Mānuka	<i>Leptospermum scoparium</i>
8	Rohutu	<i>Lophomyrtus obcordata</i>
9	Poataniwha	<i>Melicope simplex</i>
10	Mahoe	<i>Meliccytus ramiflorus</i>
11	Mapou	<i>Myrsine australis</i>
12	White Maire	<i>Nestegis lanceolata</i>
13	Horoeke	<i>Pseudopanax crassifolius</i>
14	Titoki	<i>Alectryon excelsus</i>
15	Tawa	<i>Beilschmiedia tawa</i>
16	Kahikatea	<i>Dacrycarpus dacrydioides</i>
17	Kohekohe	<i>Didymocheton spectabile</i>
18	Hinau	<i>Elaeocarpus dentata</i>
19	Rewarewa	<i>Knightia excelsa</i>
20	Pukatea	<i>Laurelia novae-zelandiae</i>
21	Kaikomako	<i>Pennantia corymbosa</i>
22	Manatu	<i>Plagianthus regius</i>
23	Tōtara	<i>Podocarpus totara</i>
24	Matai	<i>Prumnopitys taxifolia</i>

Mokomoko

Species.

1	Hunangāmoho	<i>Anemanthele lessoniana</i>
2	Mingimingi	<i>Coprosma propinqua</i>
3	Hunangamoho	<i>Chionochloa conspicua</i>
4	Haumata	<i>Chionochloa flavicans</i>
5	Pātiti	<i>Microlaena stipoides</i>
6	Tororaro	<i>Muehlenbeckia astonii</i>
7	Pohuehue	<i>Muehlenbeckia complexa</i>



Natural Character Restoration

The CEDF has identified opportunities to restore natural character in the streams, rivers and tributaries traversed by the project, in line with the core principles and whakatauki to 'let the land be its natural self'. Following workshops with the project partners, councils and other stakeholders, options supporting a long term vision were translated into spatial diagrams, as included in the following pages. These long term diagrammatic concepts are to be used to inform the planting strategy and Planting Concept Plan for the project (refer to Planting Strategy section above).

The Planting Concept Plan will address natural character matters generally within the project proposed designations and, as required, on private land, where agreement is reached with landowners. Natural character restoration will need to address relevant statutory provisions and can be contributed to by areas for riparian and wetland (ecological) offsetting and mitigation.

Refer to Planting Strategy above for the Planting Concept Plan and Volume III for drawings.

Outcomes/requirements to help confirm the project Natural Character response:

- areas of interest for ecological mitigation and offsetting were refined through the design process. The following plans show broad areas of interest identified in the early stages of the project, that were assessed on merit to develop a short list and confirmed areas
- the Planting Concept Plans will be reviewed to integrate recommended mitigation and offsetting by various specialists—landscape and natural character, ecology, cultural impact, noise, contaminated land etc and to make it clear which parts of the long term vision will be included in the project
- the designations have been refined to only include the land needed for construction
- planted areas may be outside the final designations and is intended to be protected by private land owner agreements
- no existing indigenous vegetation will be removed outside of the highway construction footprint including where areas are proposed for enrichment
- existing local restoration projects can be added to the long term vision and detailed Planting Plans, in future revisions (where information is available) to show their contribution and ensure an integrated response
- opportunities for enhanced access are to be investigated as part of the natural character restoration process including to acknowledge mana whenua connections and to reconnect hapu with mahinga kai and rongoā. For example at Waikarito (karito being seed head of the raupō plant)
- specific requirements for natural character restoration in each area are to be confirmed with the project partners and to acknowledge mana whenua connections. For example along the Koputaroa tributaries this could include

canopy forming ngahere (tree) species that are favourable to Kererū including Kōwhai, Kohekohe, Nikau, Miro, Tawa, and Porokaiwhiri.

- the final natural character restoration areas for the project will be subject to discussions with property owners

The following pages move through the river catchments that the proposed highway traverses. Each watercourse has three associated sketches:

- Locating existing indigenous vegetation
- Restoration planting diagram
- An overall sketch to show the natural character legacy

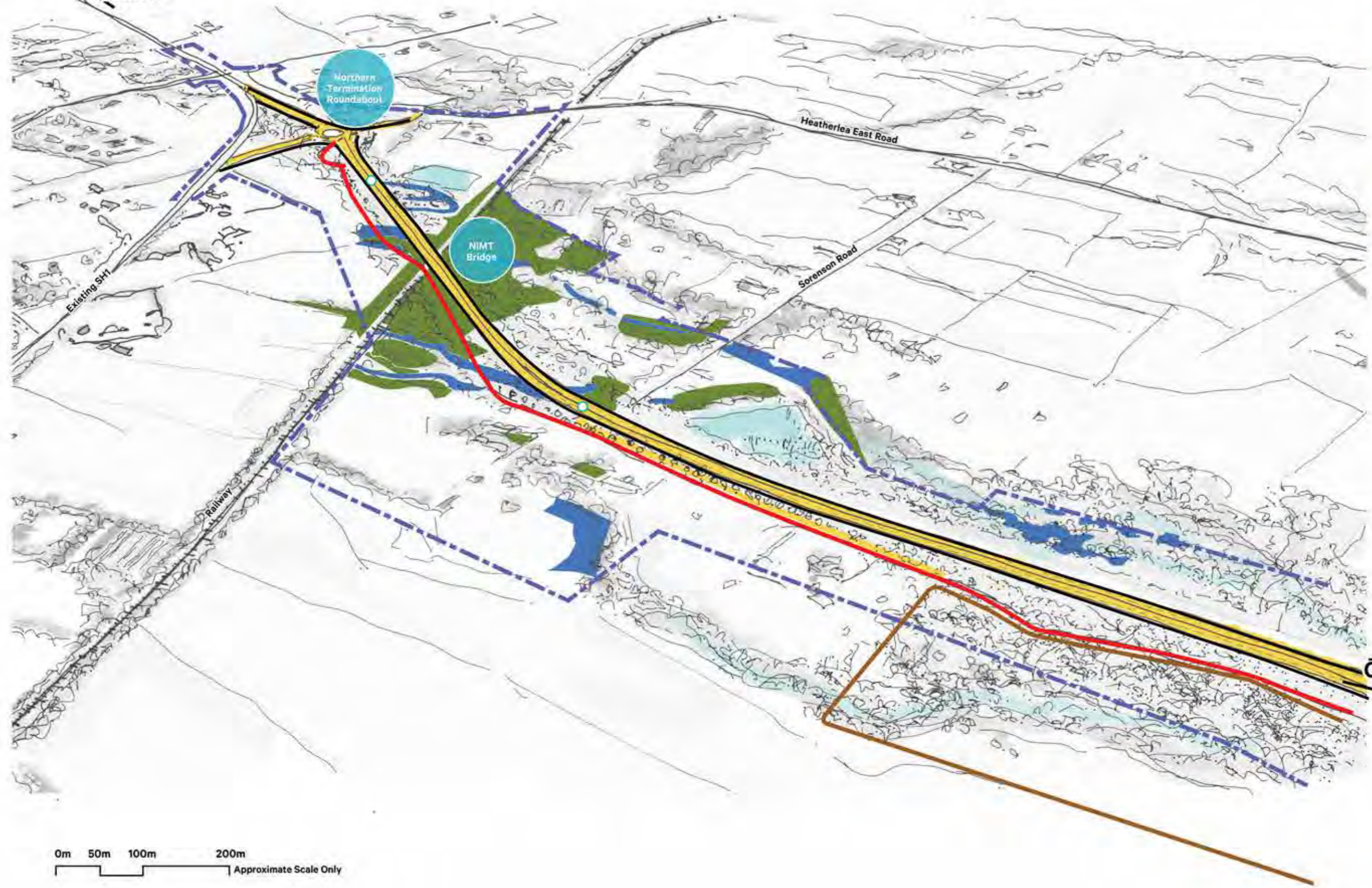
It is important to note that these diagrams are indicative of a long-term vision for the area, and don't necessarily reflect the Planting Concept Plan, in terms of area coverage and proposed planting types. Notwithstanding this point, where land owner agreement has been confirmed for riparian planting, as shown on the Planting Concept Plans, these areas are included. Overall, these diagrams are intended to communicate the possibilities of restoration planting beyond the footprint and further integration into the wider landscape.

Long term restoration concept, to inform the Project Planting Concept Plan

Railway Crossing Existing Indigenous Vegetation.

0m 100m 200m
Approximate Scale Only

← Foxtton



Legend

- Proposed highway
- Designation (draft)
- Shared Use Path
- Culvert

Assessed Existing Vegetation Habitats
(Wildland Consultants Ltd)

- Forest scrub
- Wetland habitat

Terrestrial and wetland offsetting sites

-

Indicative riparian/freshwater mitigation planting

-

Note:

- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and aquatic offsetting and restoration areas to be confirmed including areas outside of designation.

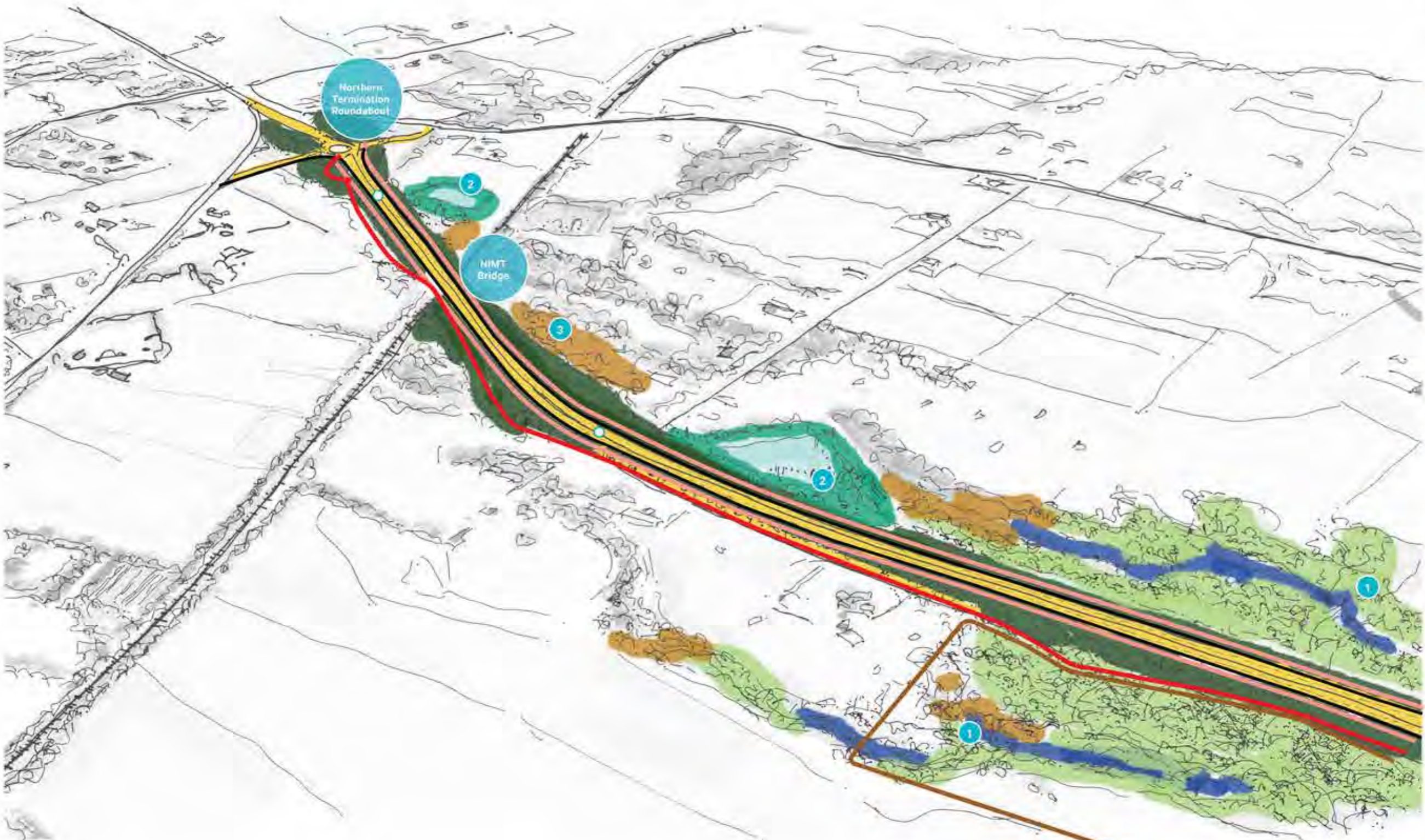
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Approximate Scale Only

→ Ōtaki

Railway Crossing
Restoration planting.

Long term restoration concept,
to inform the Project Planting Concept Plan

0m 100m 200m
Approximate Scale Only



Legend

Long Term Natural Character Restoration

1. Restoring and rehabilitating wetland gullies parallel with the highway- ecological offsetting
2. Oversizing the stormwater treatment ponds as naturalised wetlands and integrating with adjacent areas of replanted swamp forest
3. Restoration to include fencing, weed control, and enrichment planting of a hillside seepage

Proposed highway

Shared Use Path

Existing vegetation

Designation (draft)

Culvert

Terrestrial and wetland offsetting sites

Rehabilitation Planting

1. Cut/fill batters - grass
2. Cut/fill batters - planting
3. Vegetated swale
4. Constructed wetland

Natural Character Restoration Planting

1. Seepage wetland enrichment
2. Oxbow / wetland enrichment
3. Lakelet wetland and riparian enrichment
4. Riparian planting
5. Riparian enrichment/transition to indigenous species

Note:

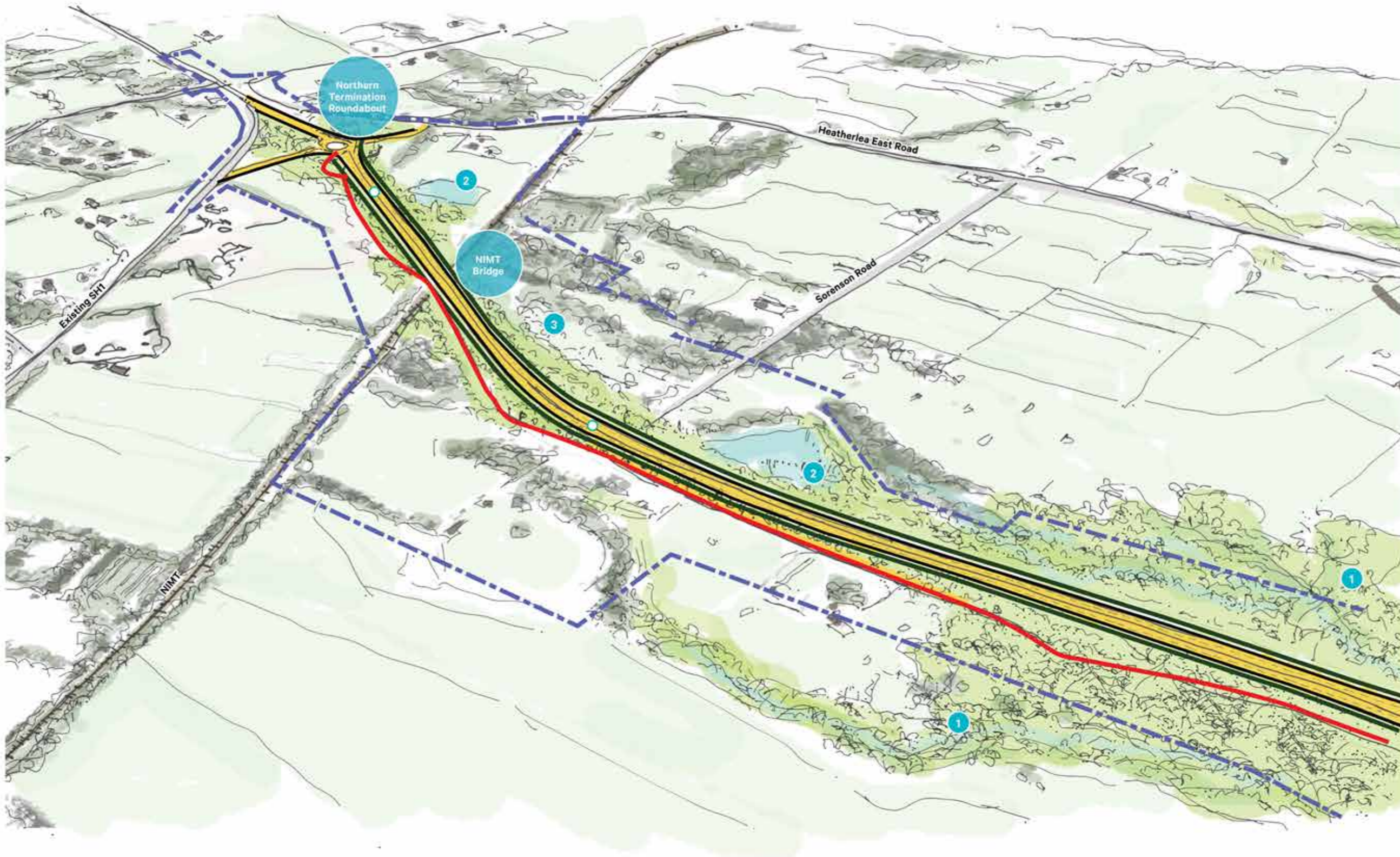
- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and aquatic offsetting and restoration areas to be confirmed including areas outside of designation.

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Approximate Scale Only

Railway Crossing
Long Term Natural Character Restoration.

Long term restoration concept,
to inform the Project Planting Concept Plan

0m 100m 200m
Approximate Scale Only



0m 50m 100m 200m
Approximate Scale Only

Legend

Long Term Natural Character Restoration

- 1. Restoring and rehabilitating wetland gullies parallel with the highway - ecological offsetting.
- 2. Oversizing the stormwater treatment ponds as naturalised wetlands and integrating with adjacent areas of replanted swamp forest.
- 3. Restoration to include fencing, weed control, and enrichment planting into existing

- Proposed highway
- Designation (draft)
- Shared Use Path
- Existing vegetation
- Proposed vegetation
- Culvert
- Vegetated swale

Note:

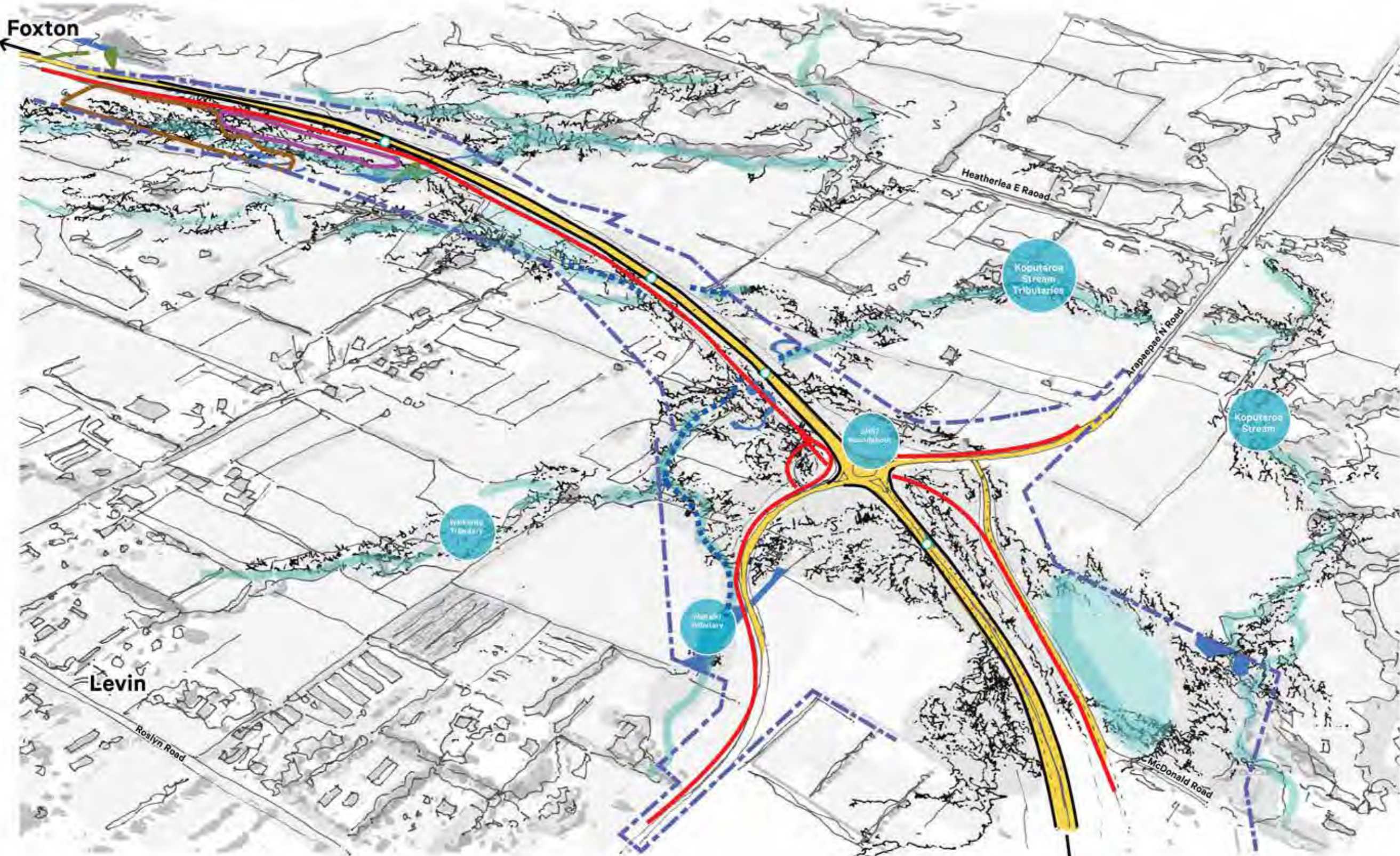
- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and aquatic offsetting and restoration areas to be confirmed including areas outside of designation.

Long term restoration concept, to inform the Project Planting Concept Plan

Koputaroa Stream Existing Indigenous Vegetation.

0m 100m 200m
Approximate Scale Only

Foxton



0m 50m 100m 200m
Approximate Scale Only

Legend

- 62A Key Ecological Sites [Manawatu Plains ED PNAP report]
- Proposed highway
- Shared Use Path
- Designation (draft)
- Culvert

Assessed Existing Vegetation Habitats [Wildland Consultants Ltd]

- Forest scrub
- Wetland habitat

Terrestrial and wetland offsetting sites

- Indicative riparian/freshwater mitigation planting
- Material supply site extent

Note:

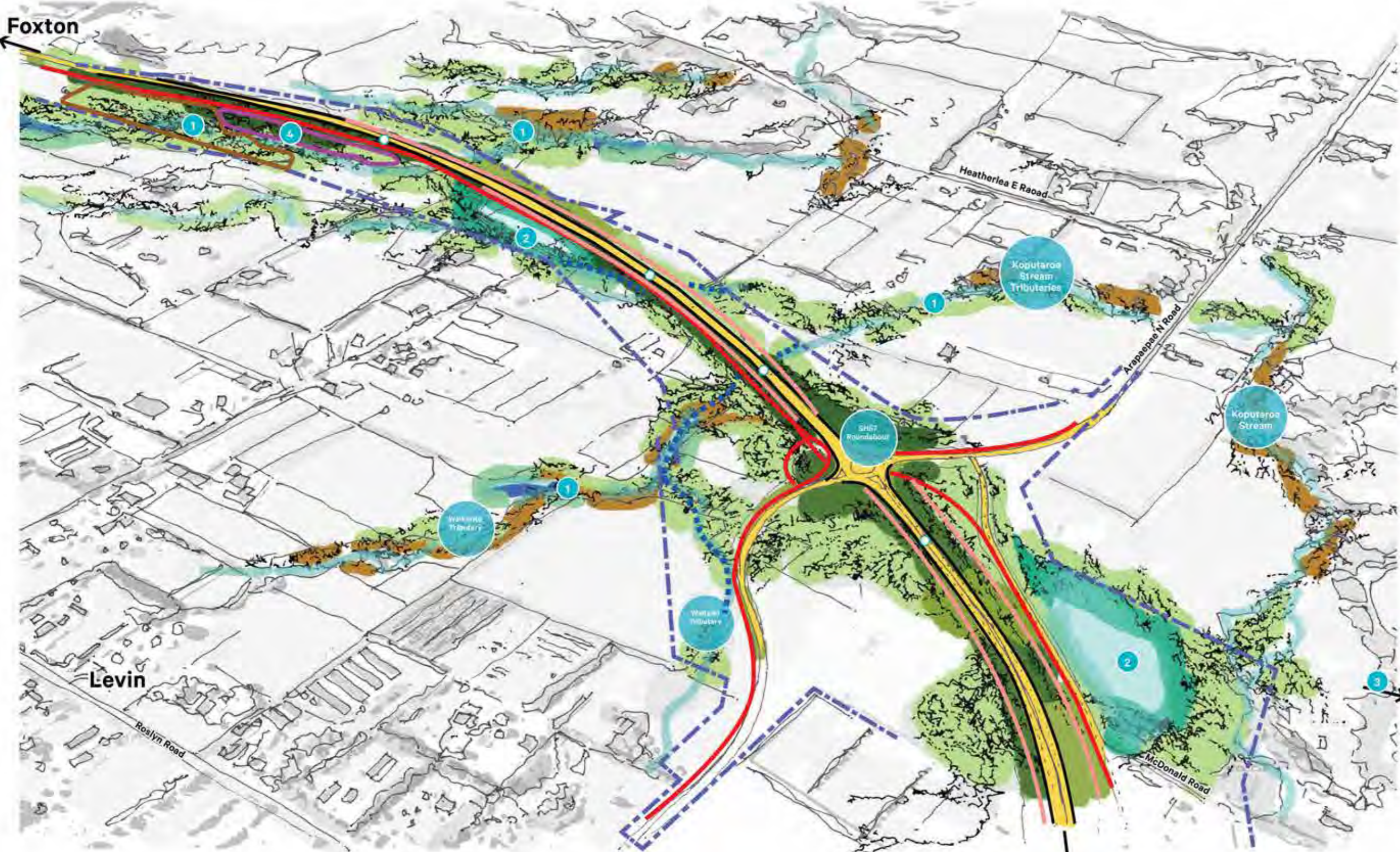
- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and Aquatic Offsetting and Restoration areas to be confirmed including areas outside of designation.

Long term restoration concept, to inform the Project Planting Concept Plan

Koputaroa Stream Restoration planting.

0m 100m 200m
Approximate Scale Only

Foxton



0m 50m 100m 200m
Approximate Scale Only

Legend

Long Term Natural Character Restoration

1. Restoring and rehabilitating wetland gullies parallel with the highway.
2. Oversizing the stormwater treatment ponds as naturalised wetlands and integrating with adjacent areas of replanted swamp forest.
3. Restoration to include fencing, weed control, and enrichment planting of a hillside seepage.
4. Rehabilitation of material supply site.

Proposed highway

Shared Use Path

Existing vegetation

Designation (draft)

Culvert

Possible terrestrial offsetting sites

Material supply site extents

Indicative riparian/freshwater mitigation planting

Rehabilitation Planting

1. Cut/fill batters - grass
2. Cut/Fill batters - planting
3. Vegetated swale
4. Constructed wetland

Natural Character Restoration Planting

1. Seepage wetland enrichment
2. Oxbow / wetland enrichment
3. Lakelet wetland and riparian enrichment
4. Riparian planting
5. Riparian enrichment/transition to indigenous species

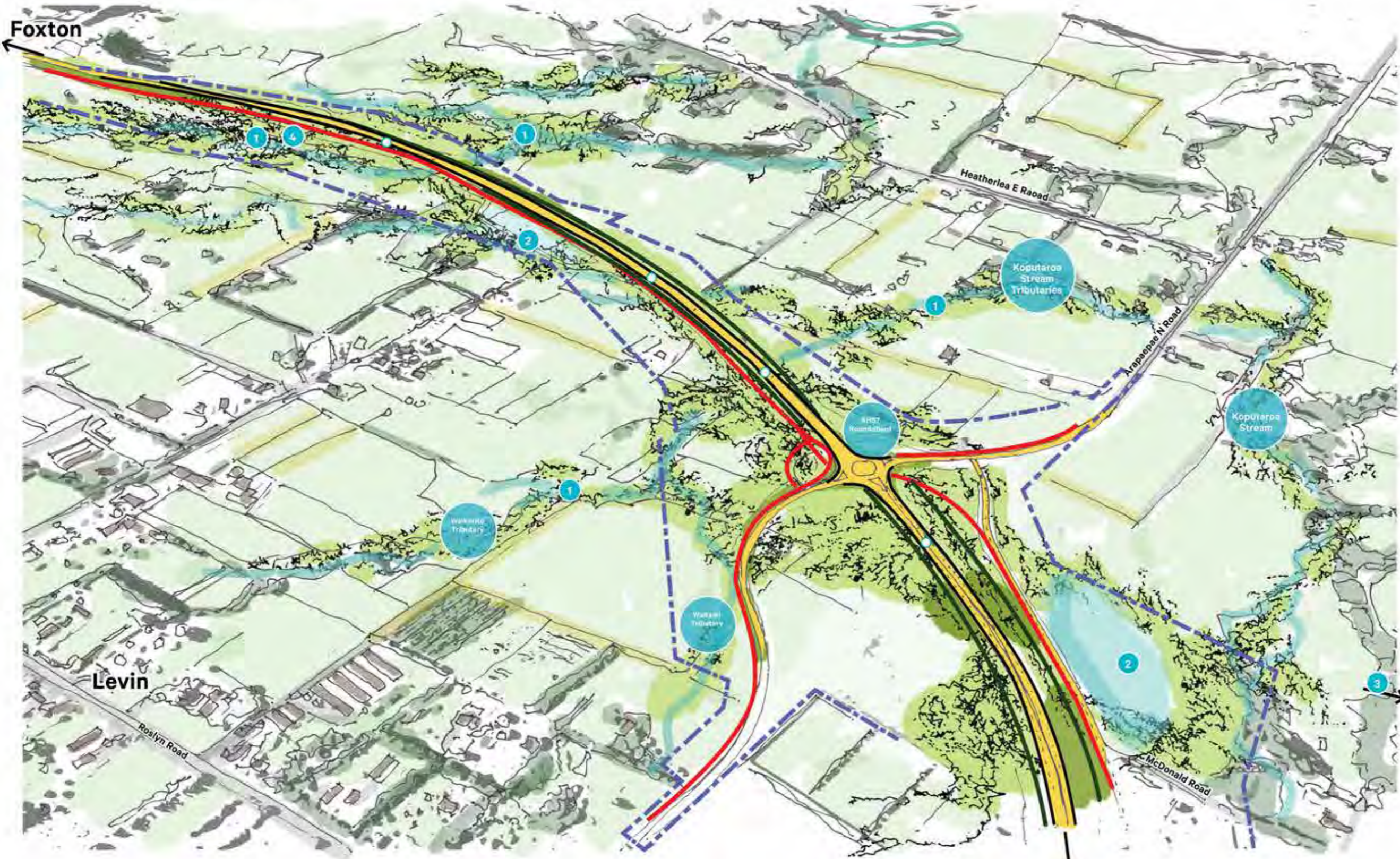
Note:

- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and aquatic offsetting and restoration areas to be confirmed including areas outside of designation.

Long term restoration concept, to inform the Project Planting Concept Plan

Koputaroa Stream Long Term Natural Character Restoration.

0m 100m 200m
Approximate Scale Only



0m 50m 100m 200m
Approximate Scale Only

Legend

Long Term Natural Character Restoration

1. Restoring and rehabilitating wetland gullies parallel with the highway.
2. Oversizing the stormwater treatment ponds as naturalised wetlands and integrating with adjacent areas of replanted swamp forest.
3. Restoration to include fencing weed control, and enrichment planting of a hillside seepage.
4. Rehabilitation of material supply site.

- Proposed highway
- Designation (draft)
- Shared Use Path
- Existing vegetation
- Proposed vegetation
- Culvert
- Vegetated swale

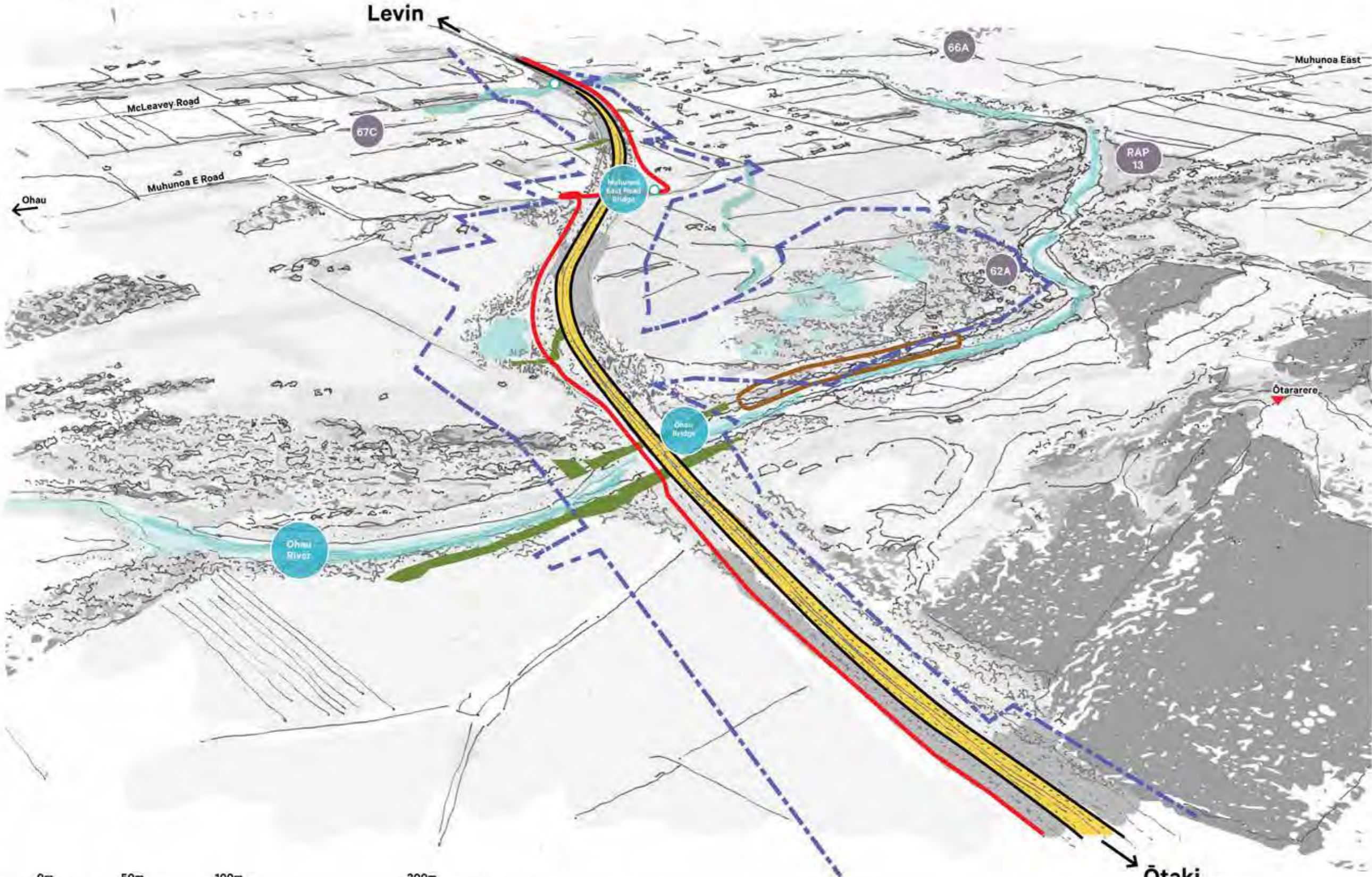
Note:

- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control

Long term restoration concept, to inform the Project Planting Concept Plan

Ohau River Existing Indigenous Vegetation.

0m 100m 200m
Approximate Scale Only



0m 50m 100m 200m
Approximate Scale Only

Legend

- 62A Key Ecological Sites [Manawatu Plains ED PNAP report]
- Proposed highway
- Shared Use Path
- Designation (draft)
- Culvert

Assessed Existing Vegetation Habitats [Wildland Consultants Ltd]

- Forest scrub
- Wetland habitat

Terrestrial offsetting site

Note:

- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and Aquatic Offsetting and Restoration areas to be confirmed including areas outside of designation.

Note: LINZ existing vegetation data to be reviewed

Ohau River Restoration planting.

0m 100m 200m
Approximate Scale Only

Long term restoration concept, to inform the Project Planting Concept Plan

Isthmus.

Legend

Long Term Natural Character Restoration

1. Restoration of riverside vegetation. Restored mountain to sea — Ki Uta Ki Tai — connection.
2. Progressive transition from exotic vegetation by weed control and inter-planting of indigenous species.
3. Rehabilitating the stand of old trees at 62A (fencing, weed and pest control, edge buffer planting) as a nucleus of wider revegetation.
4. Removal of the concrete rubble on the river's south bank in the vicinity of the crossing.
5. Possible access point to river
6. Naturalised stormwater ponds
7. Revegetate along road corridor into existing indigenous forest.

1

Proposed highway

Shared Use Path

Existing vegetation

Designation (draft)

Culvert

Terrestrial offsetting sites

Material supply site extent

Rehabilitation Planting

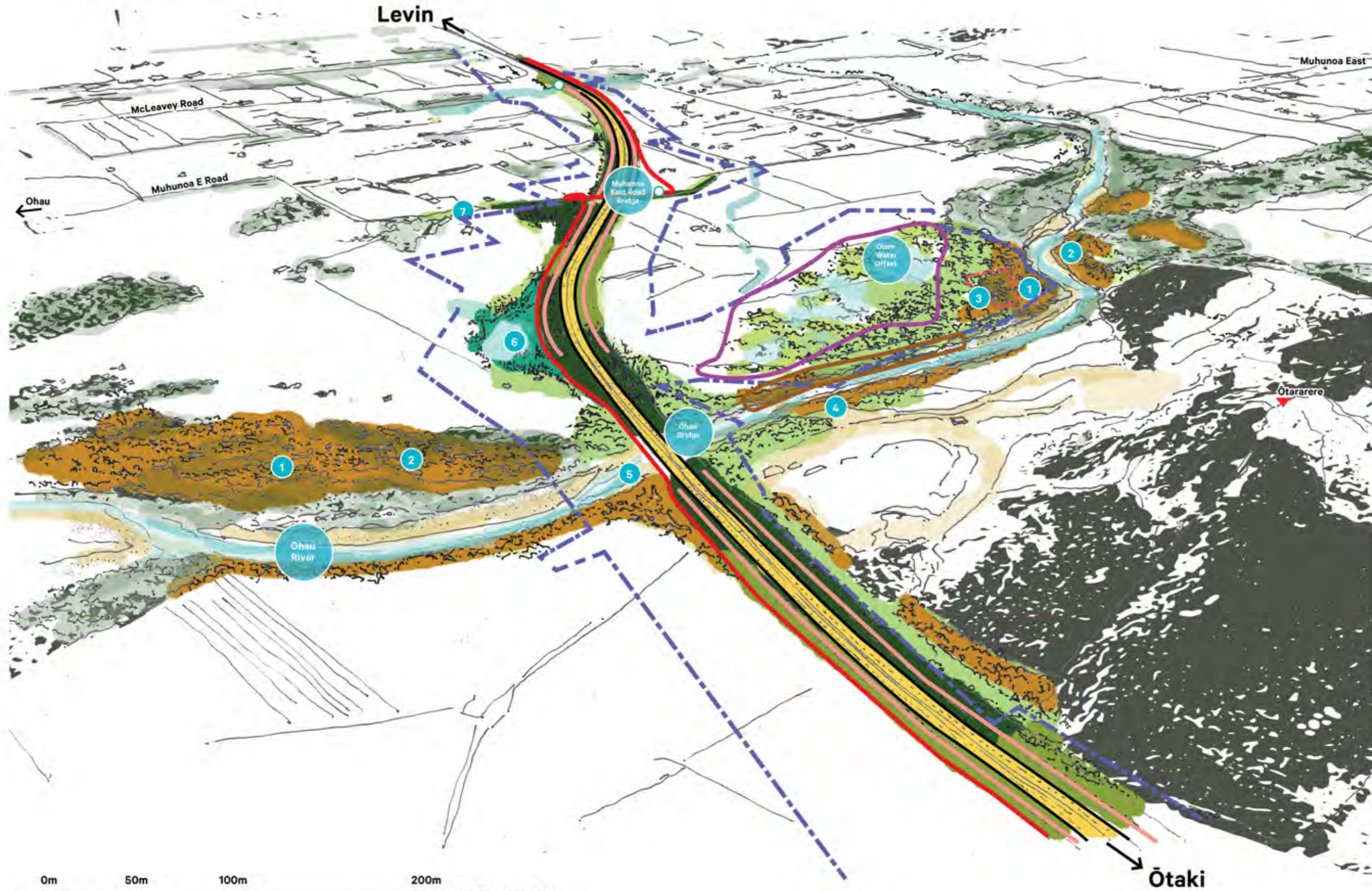
1. Cut/fill batters - grass
2. Cut/fill batters - planting
3. Vegetated swale
4. Constructed wetland

Natural Character Restoration Planting

1. Swampy wetland/enclosures
2. Ponds / waterholes/enclosures
3. Riparian wetland/enclosures/enclosures
4. Riparian planting
5. Riparian enrichment/transition to indigenous species

Note:

- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and Aquatic Offsetting and Restoration areas to be confirmed including areas outside of designation.



0m 50m 100m 200m
Approximate Scale Only

Ohau River Long Term Natural Character Restoration.

Long term restoration concept, to inform the Project Planting Concept Plan

0m 100m 200m
Approximate Scale Only



0m 50m 100m 200m
Approximate Scale Only

Legend

Long Term Natural Character Restoration

1. Restoration of riverside vegetation. Restored mountain to sea — Ki Uta Ki Tai — connection.
2. Progressive transition from exotic vegetation by weed control and inter-planting of indigenous species.
3. Rehabilitating the stand of old trees at 62A (fencing, weed and pest control, edge buffer planting) as a nucleus of wider revegetation.
4. Removal of the concrete rubble on the river's south bank in the vicinity of the crossing.
5. Possible access point to river.
6. Naturalised Stormwater ponds.
7. Revegetate along road corridor into existing indigenous forest.

- Proposed highway
- Designation (draft)
- Shared Use Path
- Existing vegetation
- Proposed vegetation
- Culvert
- Vegetated swale
- Material supply site extent

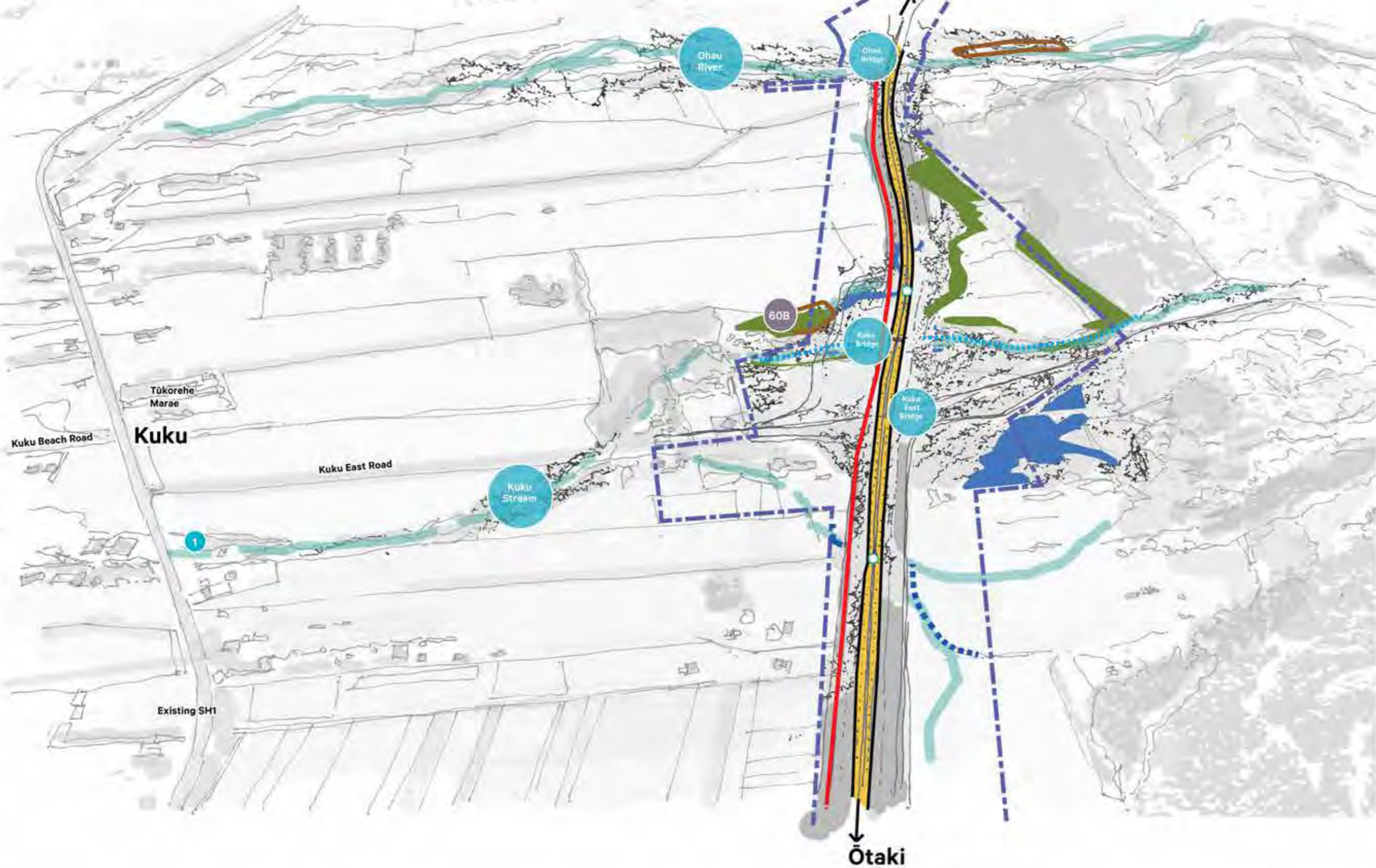
Note:

- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and aquatic offsetting and restoration areas to be confirmed including areas outside of designation.

Long term restoration concept, to inform the Project Planting Concept Plan

Kuku Stream Existing Indigenous Vegetation.

0m 100m 200m
Approximate Scale Only



Legend

- 62A **Key Ecological Sites**
[Manawatu Plains ED PNAP report]
- Proposed highway
- Shared Use Path
- Designation (draft)
- Culvert

Assessed Existing Vegetation Habitats
[Wildland Consultants Ltd]

- Forest Scrub
- Wetland Habitat

Terrestrial offsetting sites/ buffer planting

-

Identified aquatic restoration area
[Wildland Consultants Ltd]

-

Indicative riparian/freshwater mitigation planting

-

Note:

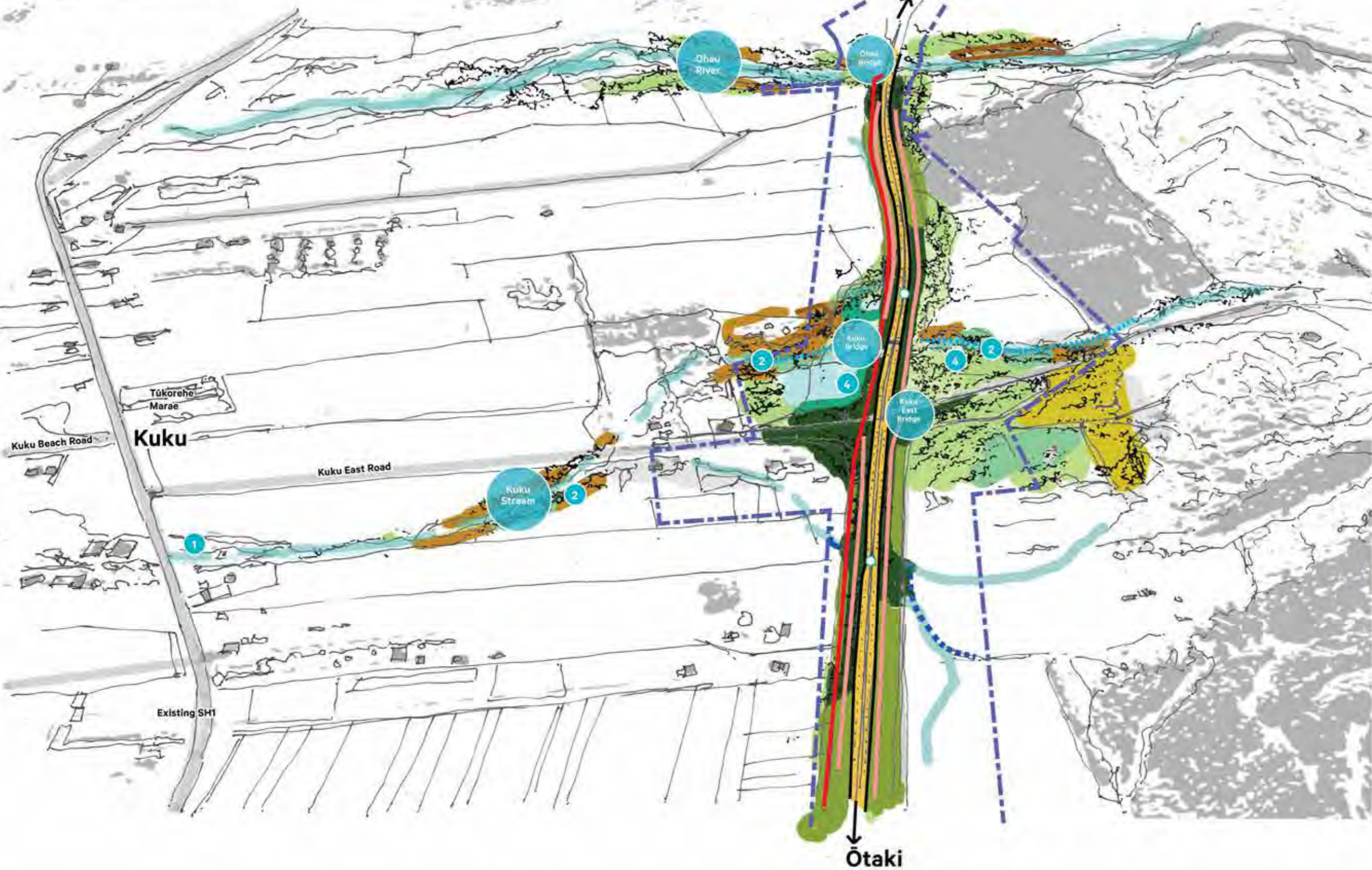
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0m 50m 100m 200m
Approximate Scale Only

Long term restoration concept, to inform the Project Planting Concept Plan

Kuku Stream Restoration planting.

0m 100m 200m
Approximate Scale Only



0m 50m 100m 200m
Approximate Scale Only

Legend

Long Term Natural Character Restoration

1. Investigate practicality of restoring natural flows at the Kuku Stream crossing of the existing SH1 to reduce upstream flooding, or metering of flows at the proposed new crossing.
2. Fencing and revegetation riparian margins to stream banks
3. Restoring the nearby bush remnant 60B (i.e. fencing, weed and pest control, and planting edge buffer vegetation). An oxbow created by diversion of the stream also has restoration of local significance.
4. Naturalised stormwater ponds

- Proposed highway
- Shared Use Path
- Existing vegetation
- Designation (draft)
- Culvert
- Terrestrial offsetting sites / buffer planting
- Potential identified aquatic restoration area (Wildland Consultants Ltd)
- indicative riparian/freshwater mitigation planting

Rehabilitation Planting

1. Cut/fill batters - grass
2. Cut/fill batters - planting
3. Vegetated swale
4. Constructed wetland

Natural Character Restoration Planting

1. Seepage wetland enrichment
2. Oxbow / wetland enrichment
3. Riparian enrichment/transition to indigenous species
4. Riparian planting
5. Riparian enrichment/transition to indigenous species

Note:

- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and aquatic offsetting and restoration areas to be confirmed including areas outside of designation.

Long term restoration concept, to inform the Project Planting Concept Plan

Kuku Stream Long Term Natural Character Restoration.

0m 100m 200m
Approximate Scale Only



Legend

Long Term Natural Character Restoration

- 1 Investigate practicality of restoring natural flows at the Kuku Stream crossing of the existing SH1 to reduce upstream flooding, or metering of flows at the proposed new crossing.
- 2 Restoration to include fencing and revegetation riparian margins to stream banks
- 3 Restoring the nearby bush remnant 60B (i.e. fencing, weed and pest control, and planting edge buffer vegetation). An oxbow created by diversion of the stream also has restoration of local significance.
- 4. Naturalised stormwater ponds

- Proposed highway
- Designation (draft)
- Shared Use Path
- Existing vegetation
- Proposed vegetation
- Grass rehabilitation planting
- Culvert
- Vegetated swale

Note:

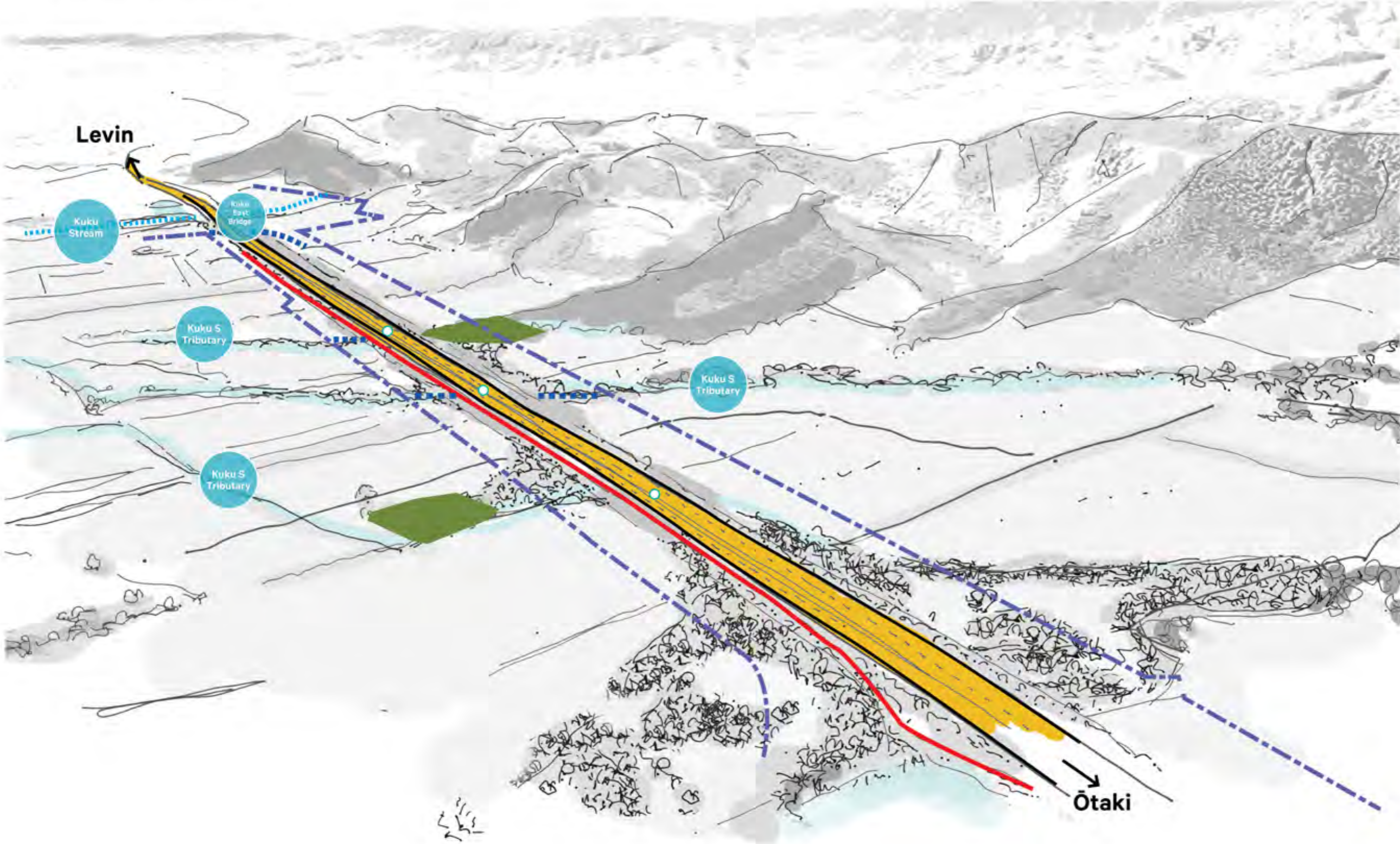
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0m 50m 100m 200m
Approximate Scale Only

Kuku Stream Tributaries.
Existing Indigenous Vegetation.

Long term restoration concept,
to inform the Project Planting Concept Plan

0m 100m 200m
Approximate Scale Only



Legend

- Proposed highway
- Designation (draft)
- Shared Use Path
- Culvert

Assessed Existing Vegetation Habitats
[Wildland Consultants Ltd]

- Forest Scrub
- Wetland Habitat

Potential identified aquatic restoration area
[Wildland Consultants Ltd]

-

Indicative riparian/freshwater mitigation planting

-

Note:

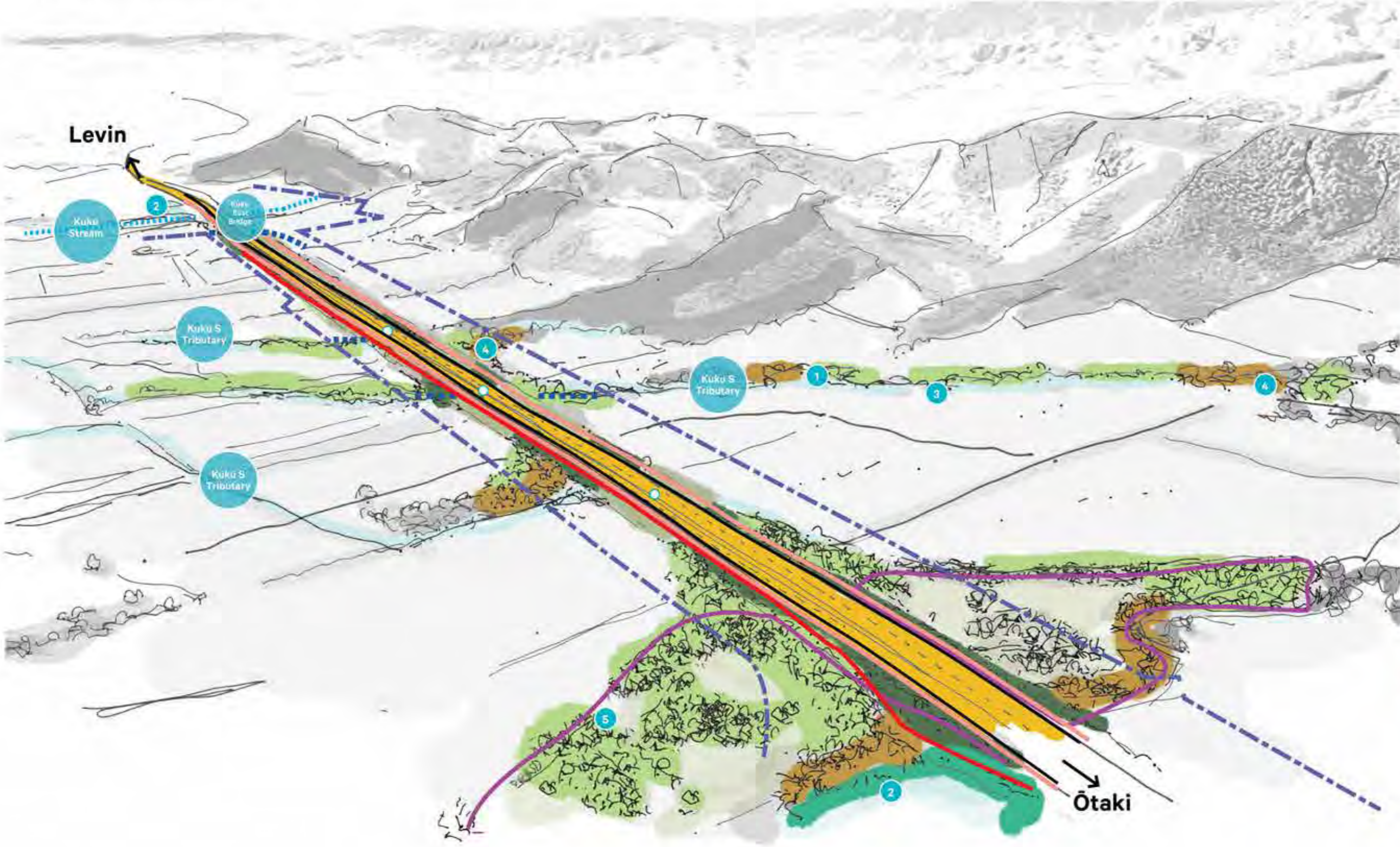
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0m 50m 100m 200m
Approximate Scale Only

Kuku Stream Tributaries. Restoration planting.

Long term restoration concept, to inform the Project Planting Concept Plan

0m 100m 200m Approximate Scale Only



Legend

Long Term Natural Character Restoration

- 1 Restoration to include fencing and revegetation riparian margins to stream banks
2. Naturalised Stormwater ponds
3. Restored mountain to sea — Ki Uta Ki Tai — connection
4. Connection of isolated pockets of vegetation
5. Rehabilitation of material supply sites

Proposed highway

Shared Use Path

Existing vegetation

Designation (draft)

Culvert

Potential identified aquatic restoration area [Wildland Consultants Ltd]

Indicative riparian/freshwater mitigation planting

Material supply site extents

Rehabilitation Planting

1. Cut/fill batters - grass
2. Cut/fill batters - planting
3. Vegetated swale
4. Constructed wetland

Natural Character Restoration Planting

1. Riparian enrichment/transition to indigenous species
2. Riparian enrichment/transition to indigenous species
3. Lakelet wetland and riparian enrichment
4. Riparian planting
5. Riparian enrichment/transition to indigenous species

Note:

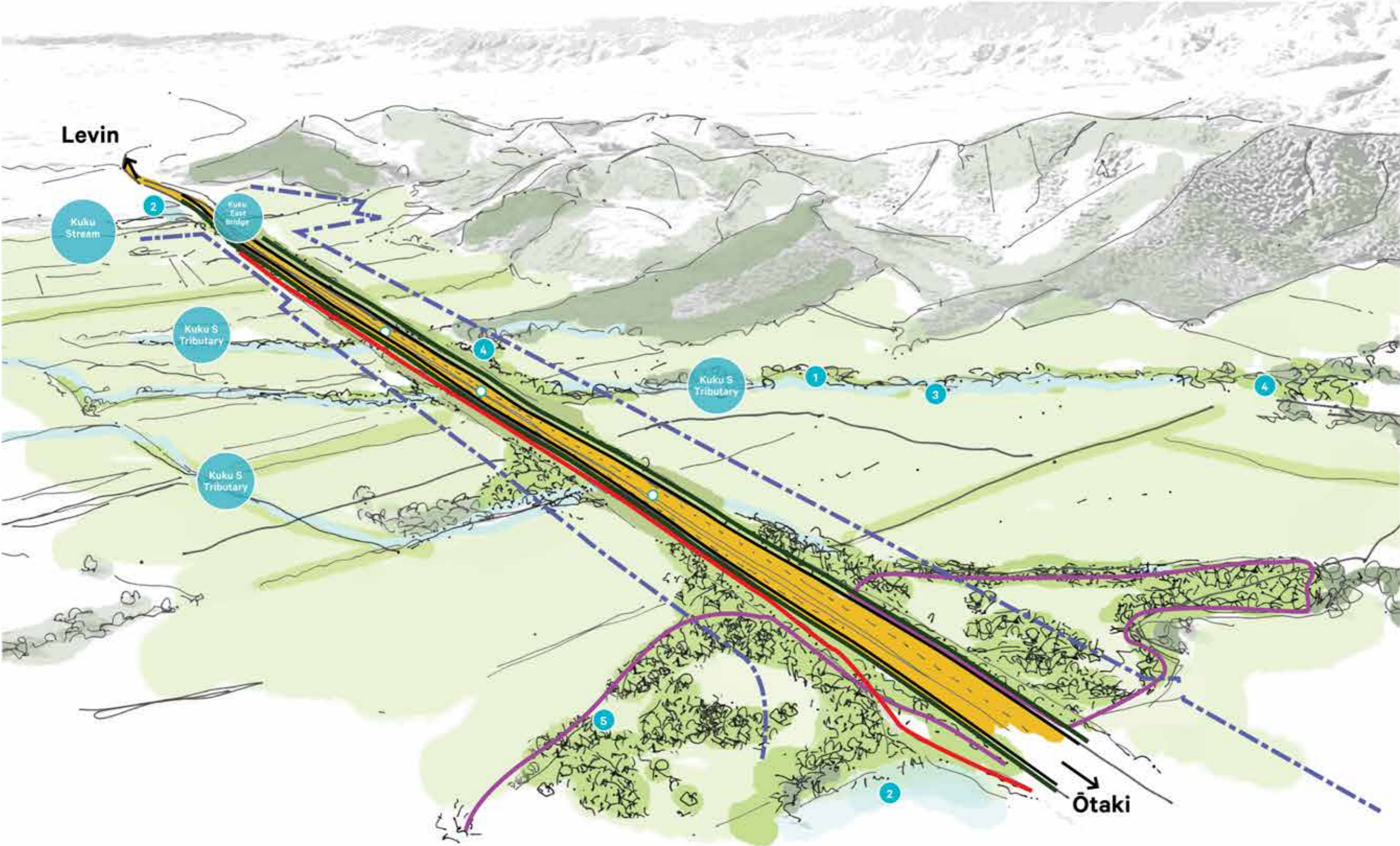
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0m 50m 100m 200m Approximate Scale Only

Kuku Stream Tributaries. Long Term Natural Character Restoration.

Long term restoration concept, to inform the Project Planting Concept Plan

0m 100m 200m
Approximate Scale Only



0m 50m 100m 200m
Approximate Scale Only

Legend

Long Term Natural Character Restoration

- 1 Restoration to include fencing and revegetation riparian margins to stream banks
2. Naturalised stormwater ponds
3. Restored mountain to sea — Ki Uta Ki Tai — connection
4. Connection of isolated pockets of vegetation
5. Rehabilitation of material supply sites.

- Proposed highway
- Designation (draft)
- Shared Use Path
- Existing vegetation
- Proposed vegetation
- Grass rehabilitation planting
- Culvert
- Material supply site extents
- Vegetated swale

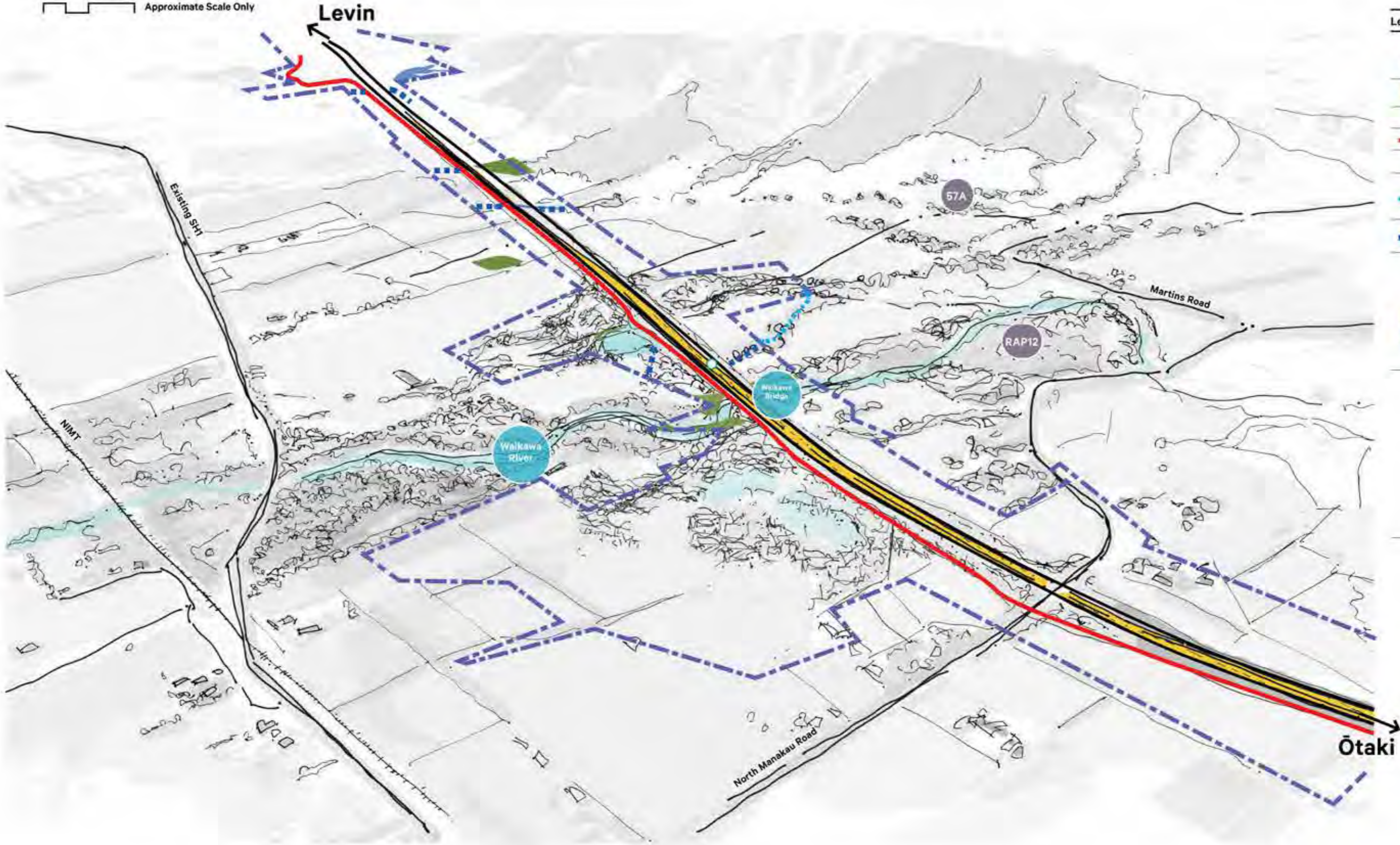
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- Terrestrial and aquatic offsetting and restoration areas to be confirmed including areas outside of designation.

Long term restoration concept, to inform the Project Planting Concept Plan

Waikawa Stream Existing Indigenous Vegetation.

0m 100m 200m
Approximate Scale Only



Legend

- 62A Key Ecological Sites [Manawatu Plains ED PNAP report]
- Proposed highway
- Designation (draft)
- Shared Use Path
- Culvert
- Potential identified aquatic restoration area [Wildland Consultants Ltd]
- Indicative riparian/freshwater mitigation planting

Assessed Existing Vegetation Habitats [Wildland Consultants Ltd]

- Forest scrub
- Wetland habitat

Note:

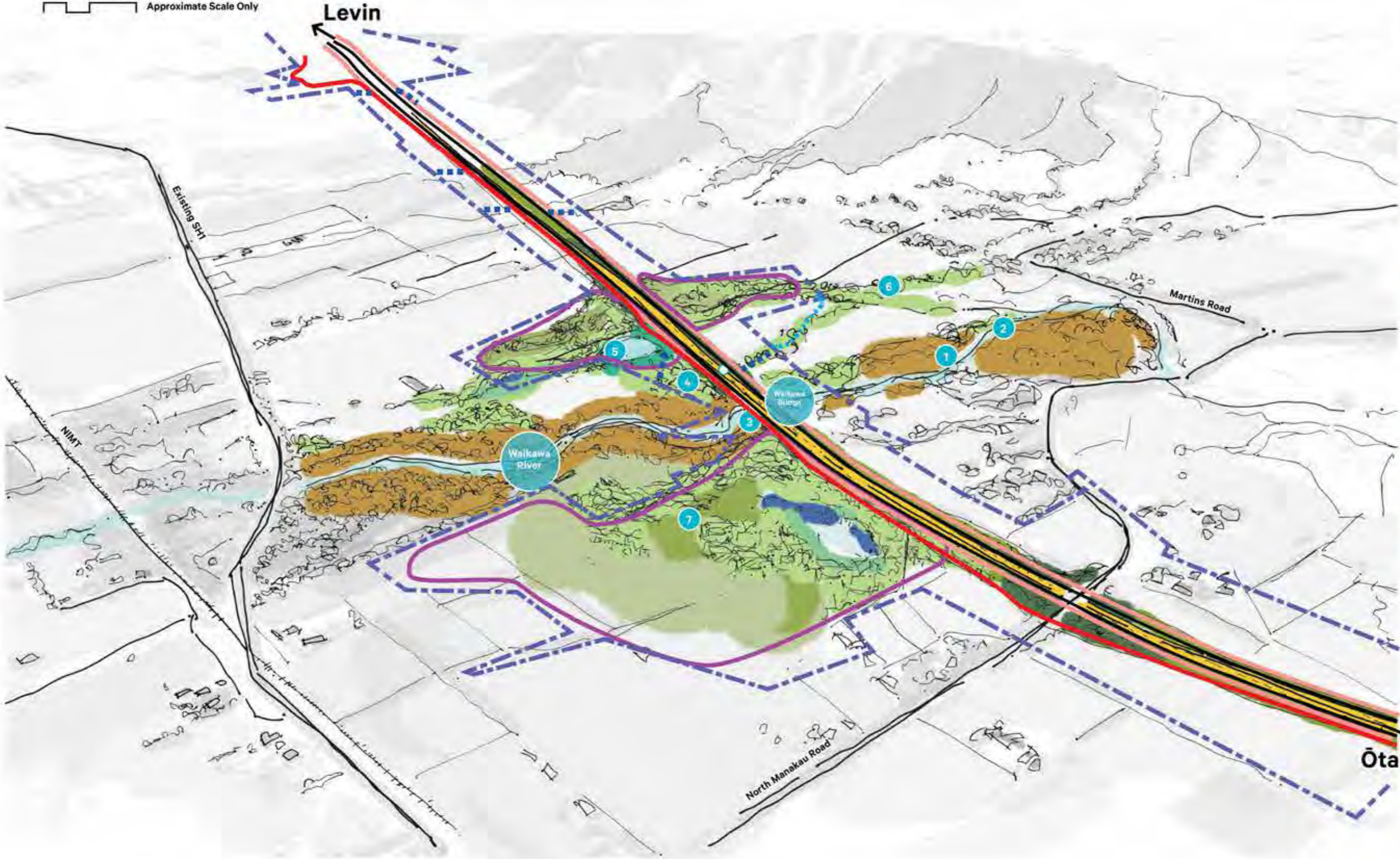
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0m 50m 100m 200m
Approximate Scale Only

Long term restoration concept, to inform the Project Planting Concept Plan

Waikawa Stream Restoration planting.

0m 100m 200m
Approximate Scale Only



Legend

Long Term Natural Character Restoration

1. Corridor management over time to indigenous vegetation
2. Restored mountain to sea — Ki Uta Ki Tai — connection
3. Possible access point to river
4. Restoration focus around Waimua habitat
5. Naturalised stormwater ponds
6. Connection of isolated pockets of vegetation
7. Rehabilitation of material supply sites

Proposed highway

Shared Use Path

Existing vegetation

Designation (draft)

Culvert

Material supply site extents

Potential identified aquatic restoration area [Wildland Consultants Ltd]

Indicative riparian/freshwater mitigation planting

Rehabilitation Planting

1. Cut/fill batters - grass
2. Cut/Fill batters - planting
3. Vegetated swale
4. Constructed wetland

Natural Character Restoration Planting

1. Riparian enrichment
2. Oxbow / wetland enrichment
3. Lakelet wetland and riparian enrichment
4. Riparian planting
5. Riparian enrichment/transition to indigenous species

Note:

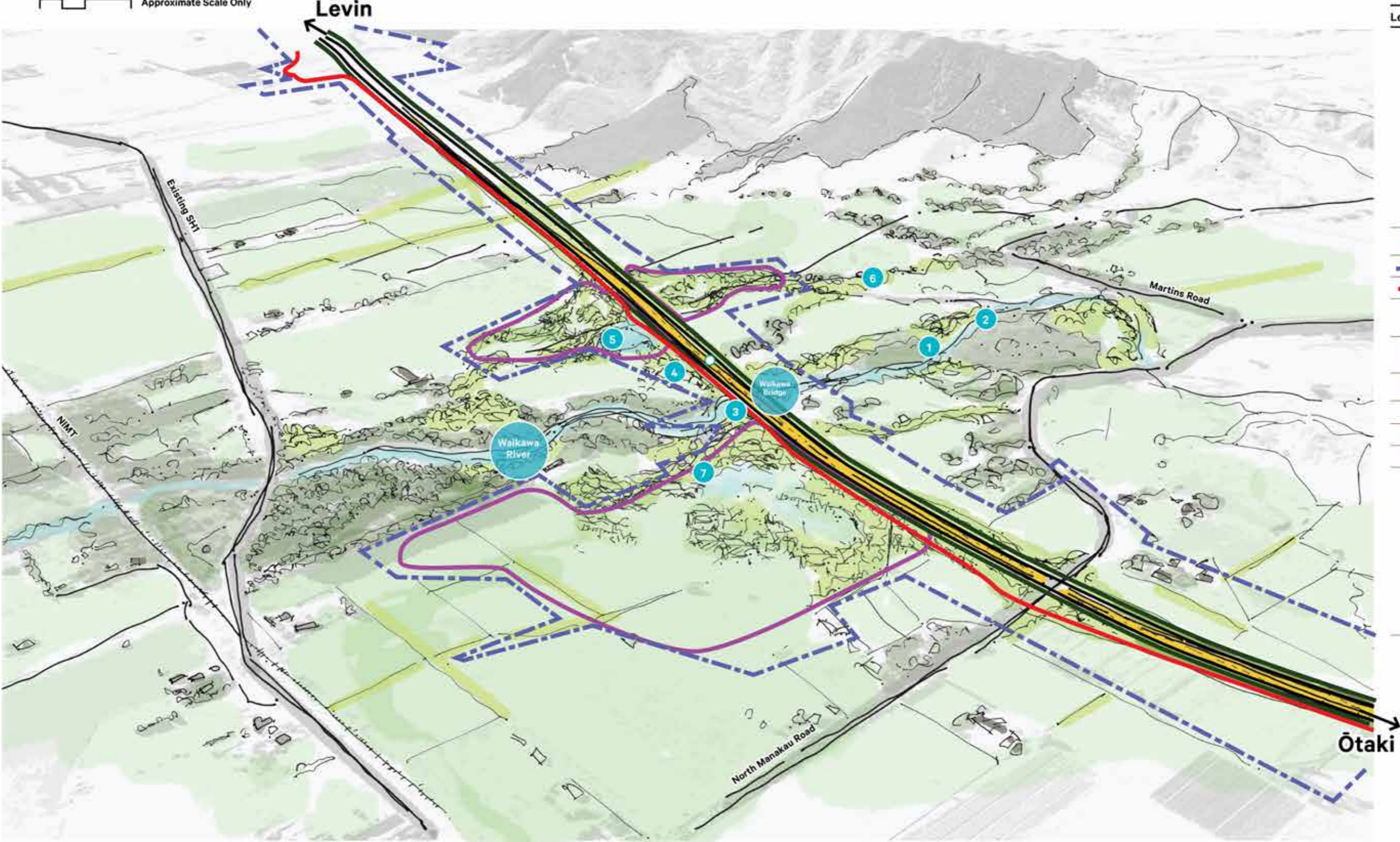
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0m 50m 100m 200m
Approximate Scale Only

Waikawa Stream Long Term Natural Character Restoration.

Long term restoration concept, to inform the Project Planting Concept Plan

0m 100m 200m
Approximate Scale Only



Legend

Long Term Natural Character Restoration

1. Corridor management over time to indigenous vegetation
2. Restored mountain to sea — Ki Uta Ki Tai — connection
3. Possible access point to river
4. Restoration focus around Wainuia habitat
5. Naturalised stormwater ponds
6. Connection of isolated pockets of vegetation
7. Rehabilitation of material supply sites

Proposed highway
 Designation (draft)
 Shared Use Path
 Existing vegetation
 Proposed vegetation
 Grass rehabilitation planting
 Culvert
 Material supply site extent
 Vegetated swale

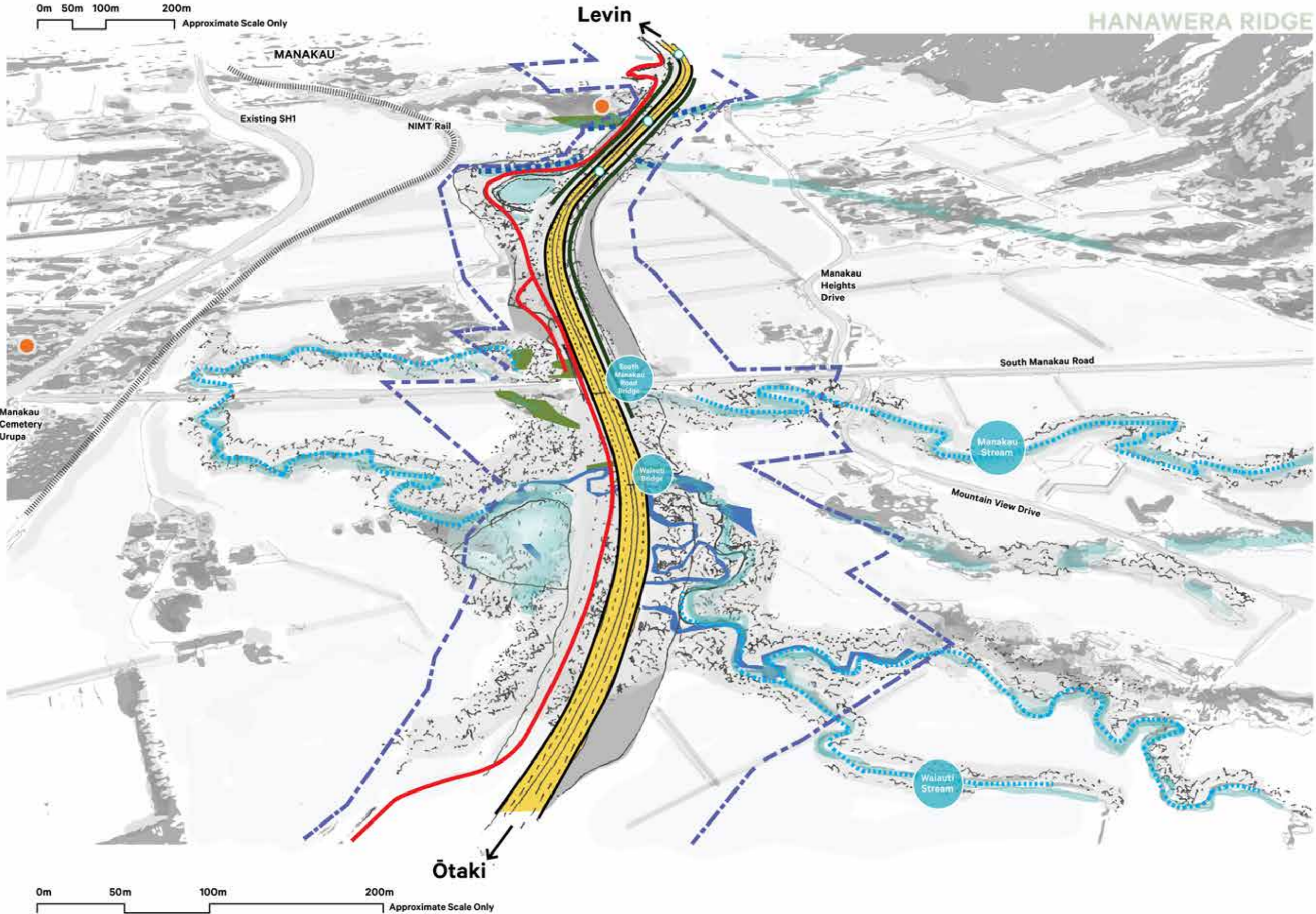
Note:

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0m 50m 100m 200m
Approximate Scale Only

Waiauti & Manakau Streams
Existing Indigenous Vegetation.

Long term restoration concept,
to inform the Project Planting Concept Plan



Legend

- 62A Key Ecological Sites [Manawatu Plains ED PNAP report]
- Proposed highway
- Designation (draft)
- Shared Use Path
- SNA (indicative) [HDC]
- Culvert

Assessed Existing Vegetation Habitats [Wildland Consultants Ltd]

- Forest scrub
- Wetland habitat

Aquatic offset area [Wildland Consultants Ltd]

Indicative riparian/freshwater mitigation planting

Note:

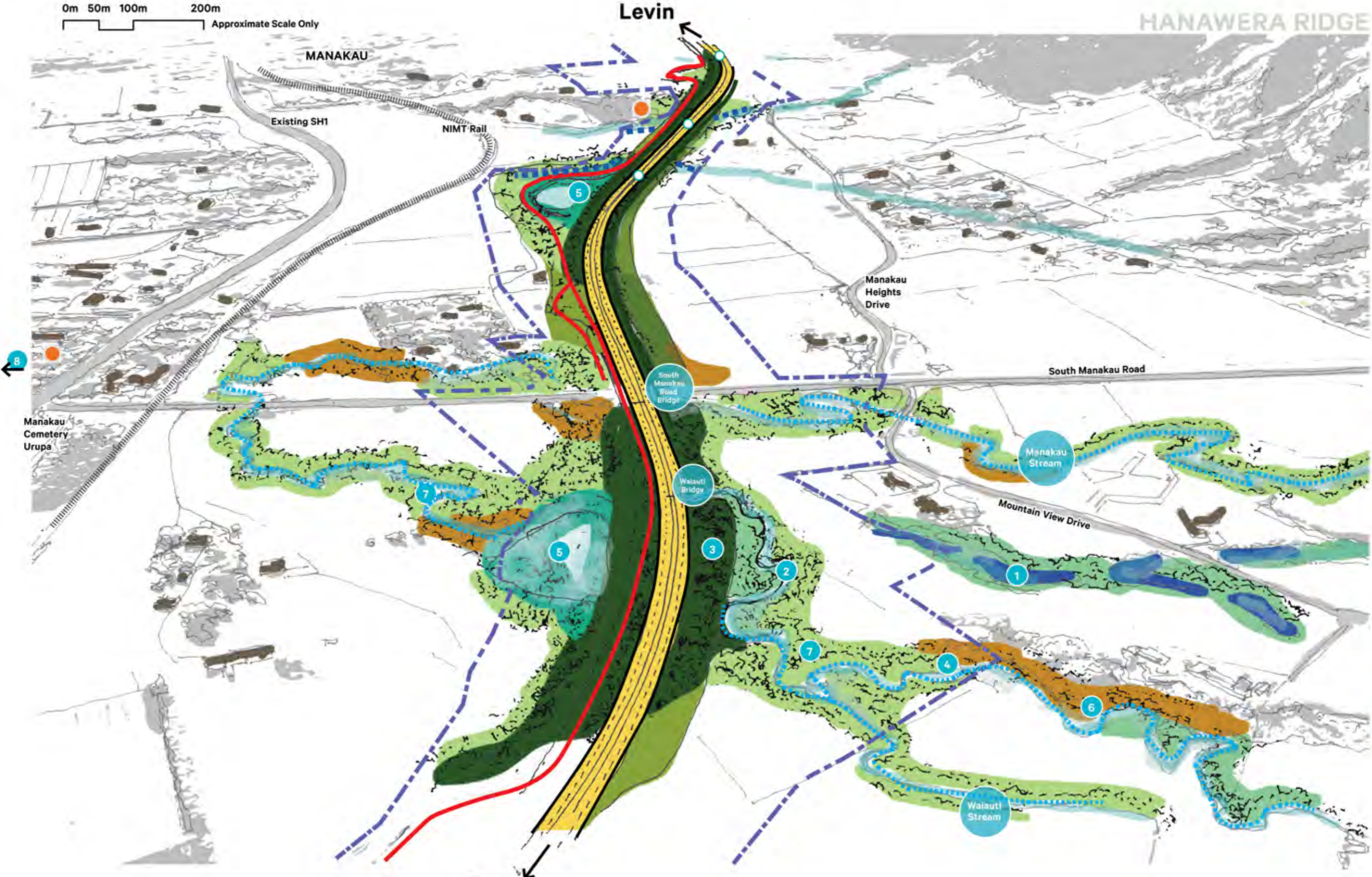
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- Terrestrial and Aquatic Offsetting and Restoration areas to be confirmed including areas outside of designation.

Waiauti & Manakau Streams
Restoration planting.

Long term restoration concept,
to inform the Project Planting Concept Plan

0m 50m 100m 200m
Approximate Scale Only

0m 50m 100m 200m
Approximate Scale Only



Legend

Long Term Natural Character Restoration

1. Restoring ox bow forms as wetlands or recreate adjacent to streams
2. Replicate meanders where diversions are required
3. Fine tune form of fill batters to minimise encroachment on meanders
4. Restoration to include fencing and revegetation of stream banks
5. Naturalise and join stormwater ponds to form wider wetland network
6. Integrate planting into existing vegetation
7. Planting upstream and downstream of Waiauti Bridge to create new oxbow habitats
8. Connection of vegetation to downstream wetlands

1

- Proposed highway
- Shared Use Path
- Existing vegetation
- Designation (draft)
- SNA (indicative) [HDC]
- Culvert

Potential identified aquatic restoration area [Wildland Consultants Ltd]

Indicative riparian/freshwater mitigation planting

Rehabilitation Planting

1. Cut/fill batters - grass
2. Cut/fill batters - planting
3. Vegetated swale
4. Constructed wetland

Natural Character Restoration Planting

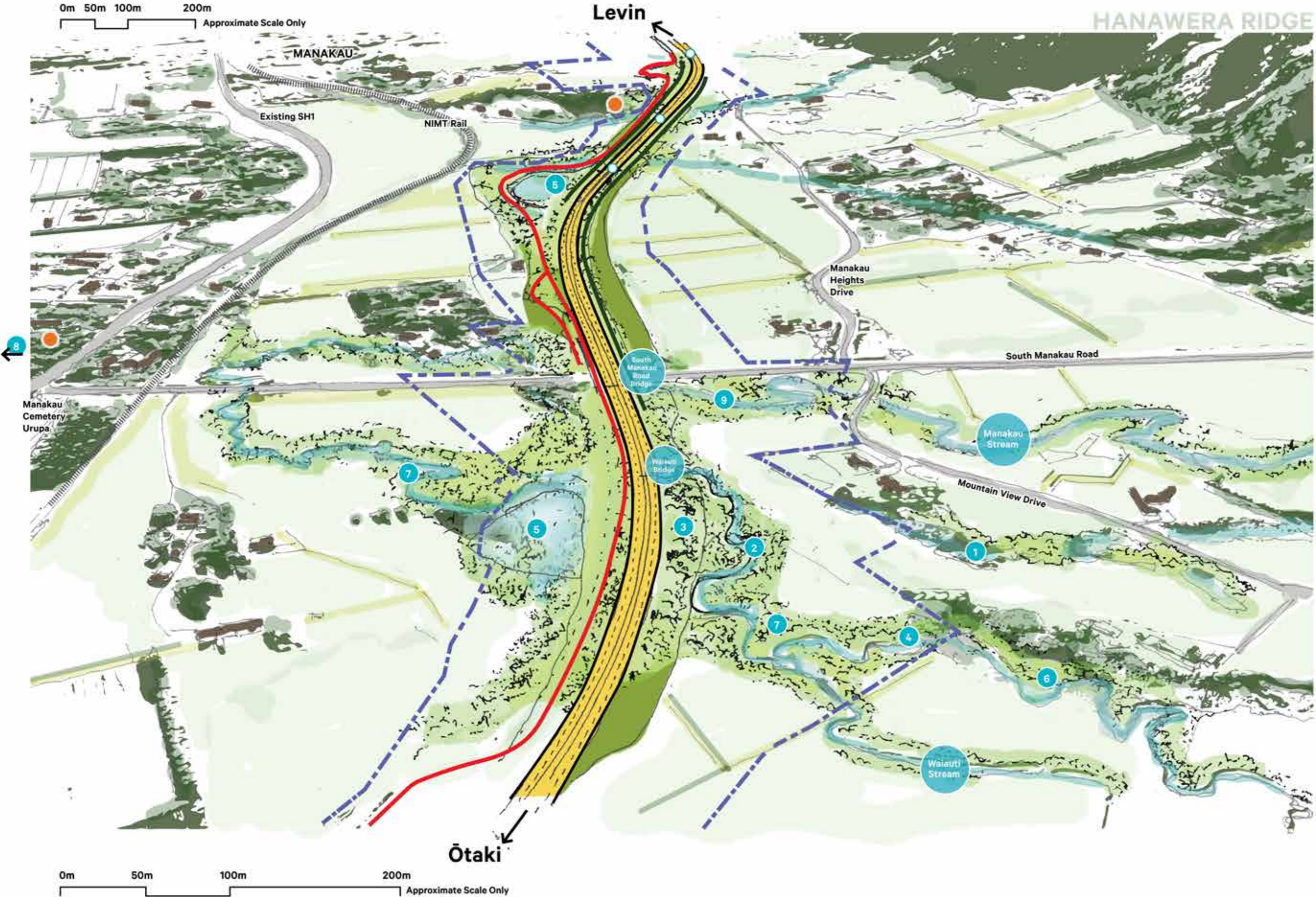
1. Smaller willow inclosures
2. Oxbow / wetland enrichment
3. Lakelet wetland and riparian enrichment
4. Riparian planting
5. Riparian enrichment/transition to indigenous species

Note:

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- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and Aquatic Offsetting and Restoration areas to be confirmed including areas outside of designation.

Waiauti & Manakau Streams
 Long Term Natural Character Restoration.

Long term restoration concept,
 to inform the Project Planting Concept Plan



Legend

Long Term Natural Character Restoration

- Restoring ox bow forms as wetlands or recreate adjacent to streams
- Replicate meanders where diversions are required
- Fine tune form of fill batters to minimise encroachment on meanders
- Restoration to include fencing and revegetation of stream banks
- Naturalise and join stormwater ponds to form wider wetland network
- Integrate planting into existing vegetation
- Planting upstream and downstream of Waiauti Bridge to create new oxbow habitats
- Connection of vegetation to downstream wetlands

Proposed highway

Designation (draft)

Shared Use Path

SNA (indicative) [HDC]

Existing vegetation

Proposed rehabilitation and restoration planting

Grass rehabilitation planting

Culvert

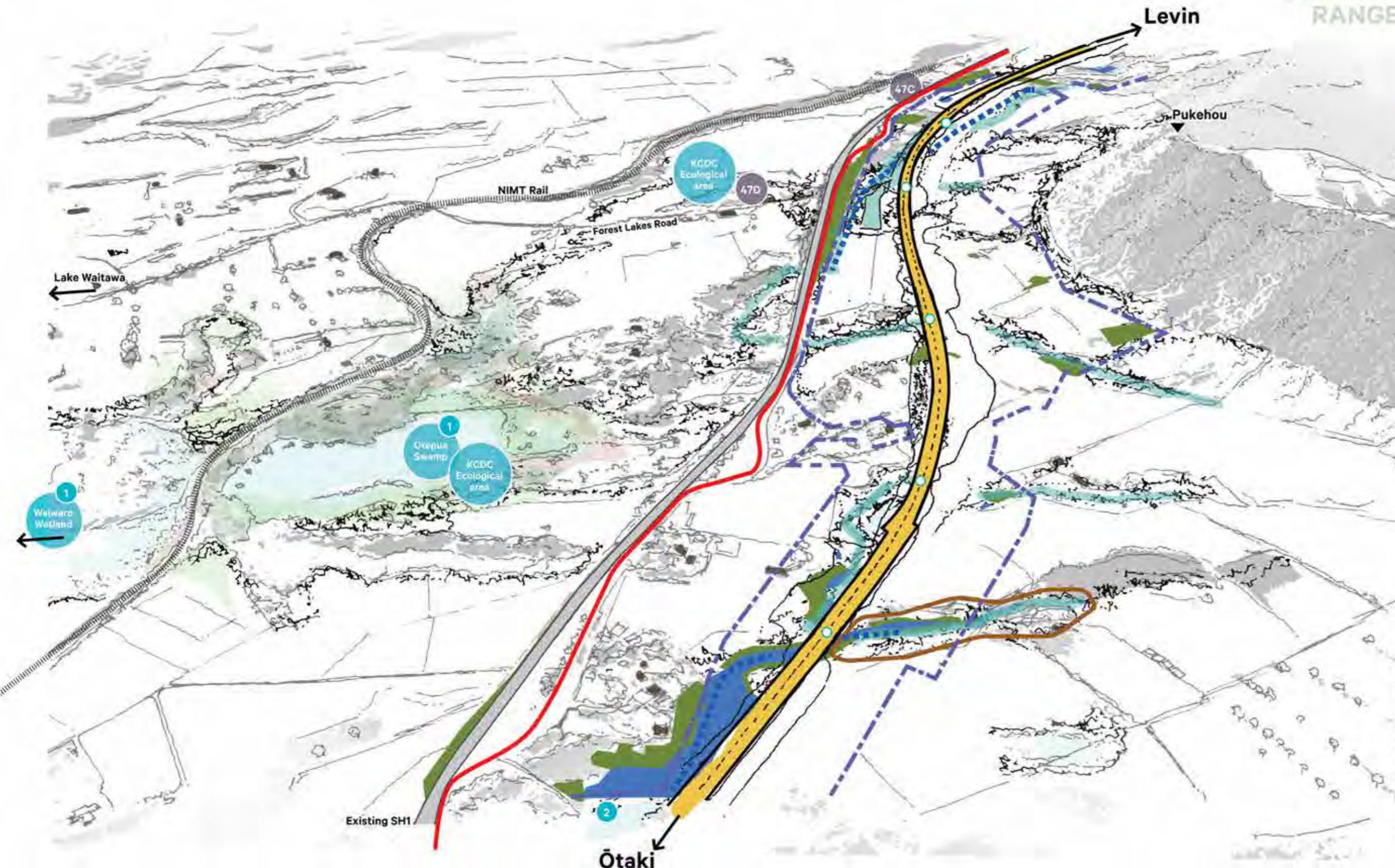
Vegetated swale

Note:

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- Terrestrial and Aquatic Offsetting and Restoration areas to be confirmed including areas outside of designation.

Long term restoration concept, to inform the Project Planting Concept Plan

TARARUA RANGE



Legend

- B2A **Key Ecological Sites**
[Manawatu Plains ED PNAP report]
- Proposed highway
- Designation (draft)
- Shared Use Path
- Culvert

Assessed Existing Vegetation Habitats
[Wildland Consultants Ltd]

- Forest scrub
- Wetland habitat

Indicative terrestrial mitigation site (wetland)

Indicative riparian/freshwater mitigation planting

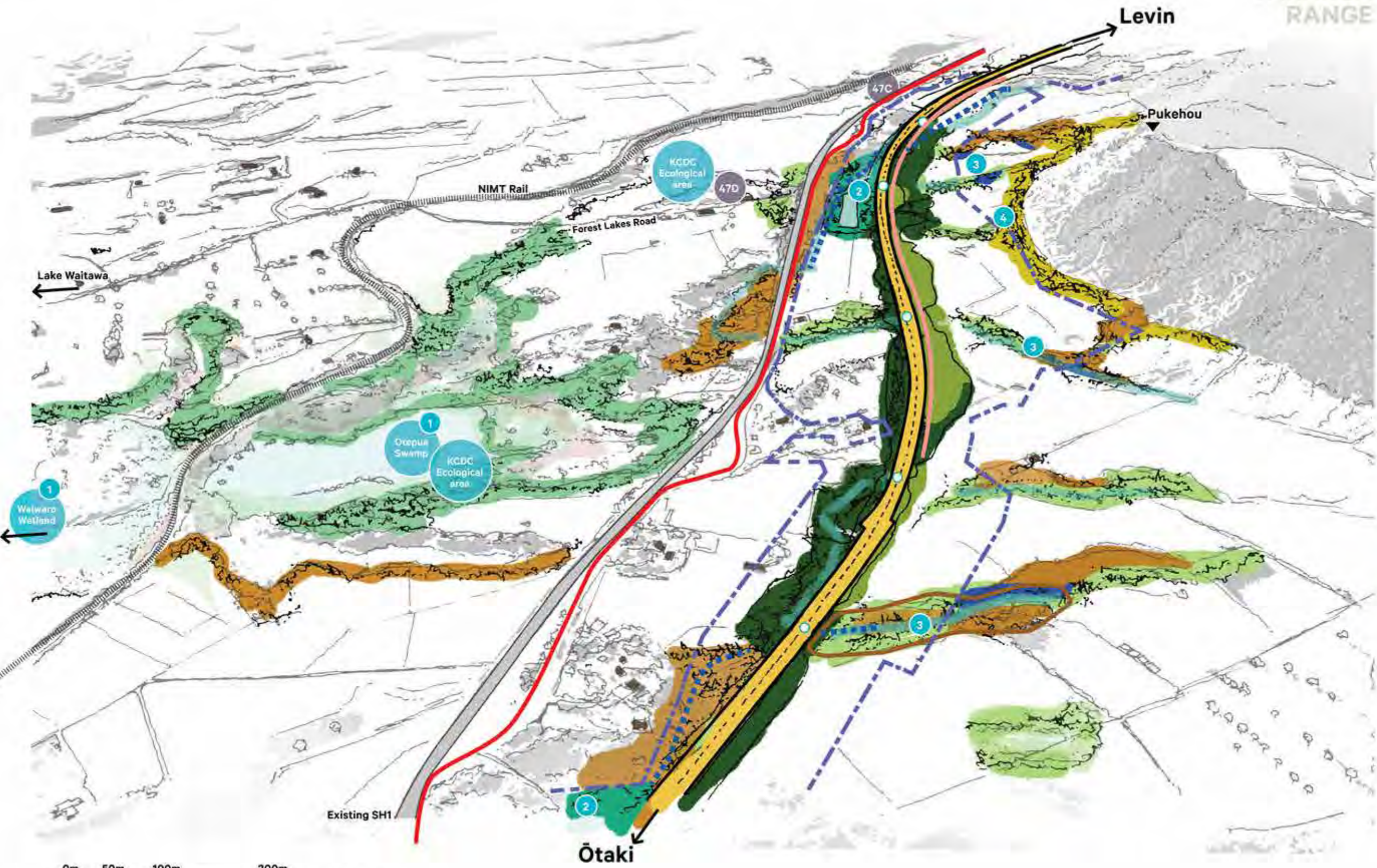
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0m 50m 100m 200m
Approximate Scale Only

Long term restoration concept, to inform the Project Planting Concept Plan

TARARUA
RANGE



Legend

Long Term Natural Character Restoration

1. Restoration focus of Otepuia and Waiwaro Swamp wetlands
2. Stormwater ponds embedded as naturalised wetlands
3. Reversing drainage to create wet gully floors. Fence and replant swamp forest.
4. Fencing, weed control & enrichment planting of a hillside seepage wetland

Rehabilitation Planting

1. Cut/fill batters - grass
2. Cut/fill batters - planting
3. Vegetated swale
4. Constructed wetland

Natural Character Restoration Planting

1. Seepage wetland enrichment
2. Oxbow / wetland enrichment
3. Lakelet wetland and riparian enrichment
4. Riparian planting
5. Riparian enrichment/transition to indigenous species

Note:

- Natural character restoration planting may include fencing and pest control of wider areas
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- Terrestrial and aquatic offsetting and restoration areas to be confirmed including areas outside of designation.

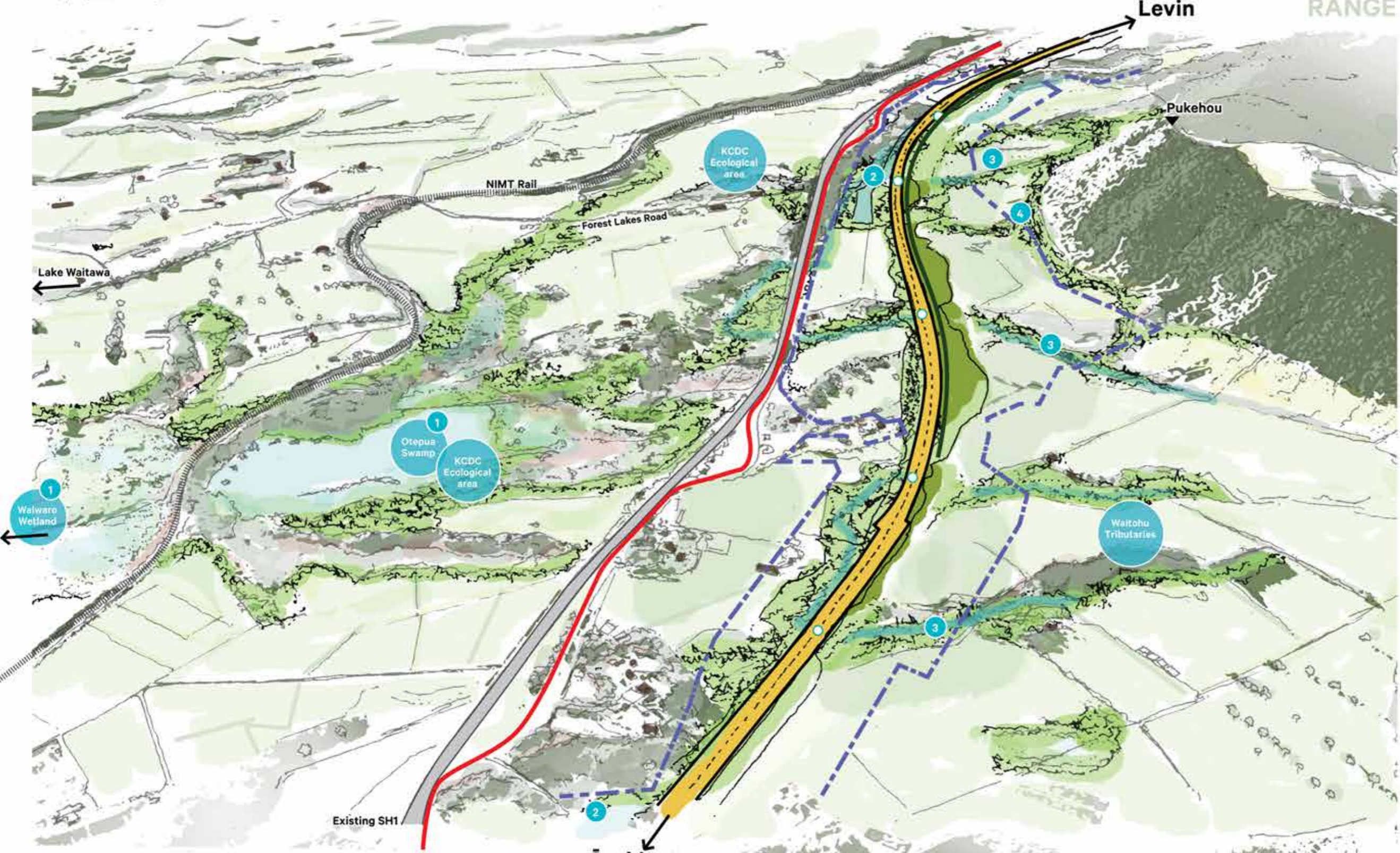
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Approximate Scale Only

Waitohu
Long Term Natural Character Restoration.

**Long term restoration concept,
to inform the Project Planting Concept Plan**

0m 100m 200m
Approximate Scale Only

TARARUA RANGE



0m 50m 100m 200m
Approximate Scale Only

Legend

Long Term Natural Character Restoration

1. Restoration focus of Otepuia and Waiwaro Swamp wetlands
2. Stormwater ponds embedded as naturalised wetlands
3. Reversing drainage to create wet gully floors. Fence and replant swamp forest.
4. Fencing, weed control & enrichment planting of a hillside seepage wetland

- Proposed highway
- Designation (draft)
- Shared Use Path
- Existing vegetation
- Proposed rehabilitation and restoration planting
- Grass rehabilitation planting
- Culvert
- Vegetated swale

Note:

- Natural character restoration planting may include fencing and pest control of wider areas
- Enrichment planting could include planting and/or fencing and pest control
- Terrestrial and aquatic offsetting and restoration areas to be confirmed including areas outside of designation.



4.3. Highway.

The **highway** opportunities and outcomes relate to the built elements within the footprint (the edge of the cut and fill batters) including all minor and major structures, safety features, the shared used path as well as the spoil and material supply sites.

Design for well integrated built elements, with appropriate quality and consistency contributes to opportunities for cultural expression and narrative, ecology, landscape experience, safety and maintenance along with wider network outcomes.

The overall outcomes for the **highway** are:

- To achieve a net positive impact on water quality
- Reduce carbon emissions
- Avoid weed spread along the highway in construction and ongoing management
- Simplify maintenance and reduce herbicide use
- Provide clear cues for movement on and off the highway
- Avoid visual clutter—minimise distraction, emphasise the wider landscape experience
- Contribute to an overall narrative and potential hikoi wānanga (learning journey, varied experience) along the highway and shared use path
- Deliberate, distinct carriageway margins (to reduce unnecessary herbicide use, avoid creating favourable weed habitats, enhance aesthetics)
- Cohesive suite of elements (reduce clutter, consider logical consistency with the network while retaining sense of place),

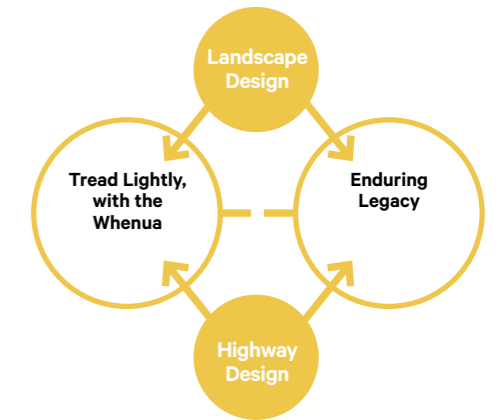
- Standardised spatial system (reduce clutter, simplify maintenance, consistent cues lending safety and moderating noise)
- Consistent materials and colours (reduce clutter)
- Minimalist, simple lines (aesthetically clean, carefully resolved details, integrated components for lighting, safety, stormwater, superstructures)

A well integrated, coherent and less cluttered highway promotes connections across the landscape; east-west, ki uta ki tai. A refined and logical sequence of built elements promotes seamless, safe and intuitive experience, including from one district to the next. By reducing distractions, the design lets the surrounding landscape speak, be its natural self.

A well integrated highway requires a consistent approach to all elements as set out in the following pages:

- Bridges
- Culverts
- Underpasses
- Highway furniture and surfaces (safety barriers, medians, surface finish and character, retaining walls, light poles, night landscape, day landscape, noise-integrated design, roadside weed management)
- Interchanges and roundabouts
- Earthworks and construction yards (cut & fill batters, topsoil, spoil disposal, construction yards and access)
- Material supply sites

- Community and connectivity (names, signage and interpretation, mahi toi, local road connectivity and communities, heritage, Queen Street East concept)
- Shared Use Pathway



Legend.

- Awa bridge - multispan
- Awa bridge - singlespan
- Roundabout
- Interchange
- Local road connection - over highway
- Local road connection - under highway

Crossings, Roundabouts & Interchanges

- 1 Northern Termination Roundabout
- 2 NMIT Bridge
- 3 SH57 Roundabout
- 4 Queen Street East Bridge
- 5 Tararua Road Bridge
- 6 Muhunua East Rd Bridge
- 7 Ohau Bridge
- 8 Kuku Bridge
- 9 Kuku East Rd Bridge
- 10 Waikawa Bridge
- 11 North Manakau Road Bridge
- 12 Manakau Heights Drive Bridge
- 13 South Manakau Road Bridge
- 14 Waiauti Bridge
- 15 SH1 Bridge

N
Scale: NTS
July '22

Bridge Structures

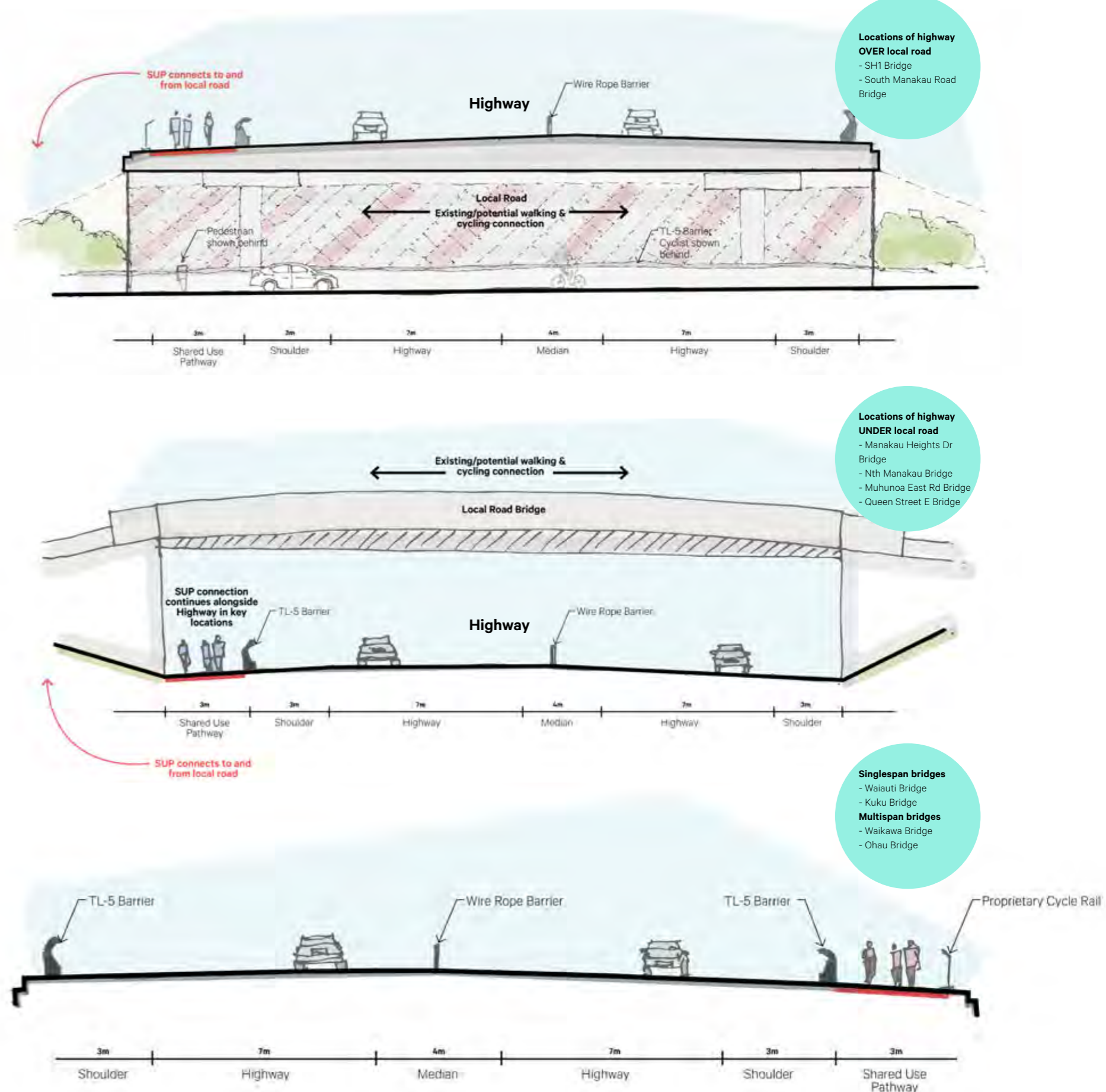


Highway

Bridges

Bridges are likely to use super T beams, with piers for the longer crossings such as the Ohau River. Required outcomes:

- Clean lines and aesthetically resolved details: Techniques include (i) top rails to avoid parapets that block views (unless specifically required for visual mitigation near residential properties) (ii) hanging parapets with strong shadow lines that break up the bridge's visual depth and render the Super T beams visually recessive, (iii) extending pier headstocks beyond Super T beams (to help render beams visually recessive) and a simple, well resolved relationship between the headstock ends and the parapets, (iv) extending side barriers beyond the bridge end to visually anchor the bridge, emphasise its horizontal lines, and locate the barrier transition back from the crossing point, (v) concealing stormwater elements and services within the structure, (vi) resolving rainwater shedding—especially to avoid weeping joints and staining (vii) colour fastness (viii) use local rock for required scour protection with ends tied into the natural contours and planting to the edges, where appropriate, to integrate and reduce visual dominance
- Consistency: Use consistent bridge types. Consider approach used along network including Peka Peka to Ōtaki while retaining sense of place and identity. In particular, consider use of consistent parapets and railing details that will be experienced sequentially by travellers, including opportunities for naming and mahi toi, as part of a whole journey experience and integrated approach to narrative
- Generosity: Sufficiently long bridges to allow streams, their rehabilitated and restored margins/corridor, and bankside tracks (for people and fauna) to pass through unimpeded. Bridge embankment slopes are to ensure planting is able to be successfully established (generally no steeper than 1v:3h) including ability to provide for sufficient depths of topsoil and tree pits for larger specimens
- Clear sightlines (context appropriate abutments): Vertical abutments are typically less expensive than spill-through (angled) abutments but constrict sightlines and have a heavier appearance. Spill-through abutments are typically preferable where sightlines are important, such as over local roads or along key streams and rivers. Use local rock below abutments, open ramps and 'shadow line' areas under bridges, where there are low light levels and no water runoff/dry soil, (rather than planting) and avoid open ground, where weeds and rubbish traps are likely. Detailed Planting Plans are to show these as rock armour, 'no plant' areas
- Pathways: consider measures to avoid sediment traps, harm to fauna through entrapment or bird strike, ensure fish passage and integrate CPTED (crime prevention through environmental design) measures; particularly where pathways connect underneath a bridge (spill through abutments are preferred to provide better sightlines)
- Noise: consider, where practicable, the use of bridge design that allows for seismic movement without mechanical expansion joints. Consider extending the, lower height, bridge barriers along the highway where noise levels require mitigation, and as a preference to a separate, higher noise wall



Underpasses

Light levels

- natural light is best
- minimise cover and the extent of the ‘underpass’ including options for steepened batters near the entrance with integrated retaining ‘wing walls’ and safe light ‘wells’
- increase the apparent width of the ramps (transition areas) and the underpass section—use angled, asymmetric walls and a wider path width
- increase the radius of the curve at the ramp (transition areas) to increase natural light spill into the ‘underpass’
- where required and practicable use a transparent, palisade type balustrade treatment (where there is a fall of more than 1m)
- ensure night light levels limit shadow/blind spots—use wash/ambient light rather than strong directional lighting

Line of sight

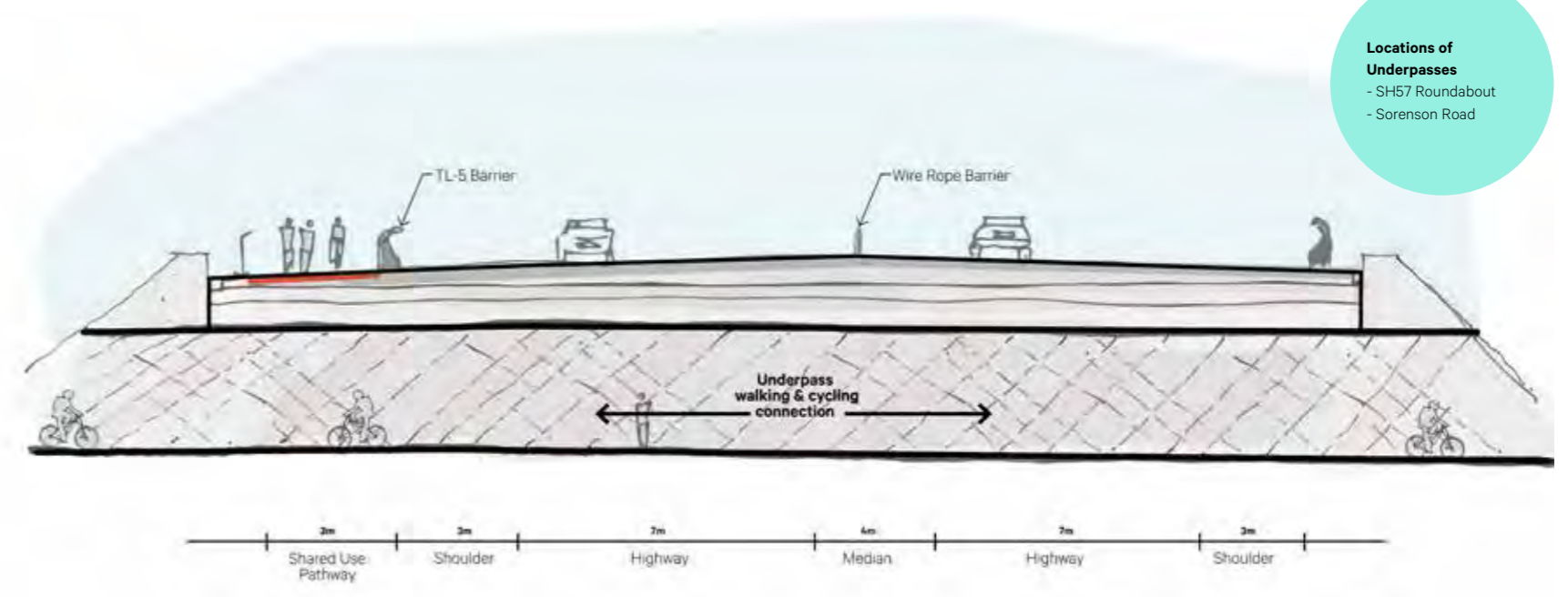
- through alignment—increasing the radius of the curve at the ramp ends (transition into the underpass) will also increase the extent of the ramp/ underpass that can be viewed from a particular location. Provide for a continuous sightline—from one end of the ramp to the other is best.

Smooth journey

- reduce pedestrian and cyclist-cyclist conflict movement on and off the above ground paths through clear cues for movement
- consider alignment and apparent width to provide for safe smooth entry and exit
- gradients- landings are not preferred for cyclists. Where ramps are required, gradients of 1vertical :20 horizontal or gentler should be investigated

Quality of finish

- ensure a quality of finish and detailing that is consistent with the overall experience for cyclist and pedestrians along the shared use path that fosters a ‘duty to care’ - consider anti vandalism measures (for example textured facings)
- consider integration of mahi toi relevant to place (e.g. Koputaroa) and to enhance the quality of experience and duty to care
- use lighting treatments—to vary experience and increase aesthetic quality of mahi toi



Locations of Underpasses
 - SH57 Roundabout
 - Sorenson Road

[<https://www.boffamiskell.co.nz/project.php?v=mackays-to-peka-peka-expressway>]

Taumanu Reserve Bridge _Isthmus



Highway over local road
 [Google Street View]



Ngarara Bridge, Pekapeka to Ōtaki.
Highway under local road
 Ref: Google Street View



Maungatapu underpass
 [<https://www.nzta.govt.nz/media-releases/maungatapu-underpass-artwork-revealed/>]



Bowen Place, Canberra
 [<http://spackmanmossopmichaels.com/project/bowen-place-crossing/>]

Highway Furniture and Surfaces

Highway furniture (small structures, signs, gantries, lighting, barriers) and surface treatment represents an opportunity to simplify maintenance, minimise adverse environment effects and create a cleaner aesthetic; to Tread Lightly, with the Whenua. While each sign and light pole is a minor element, collectively the suite of highway furniture have the potential to either create visual clutter or contribute positively to the aesthetic quality and experience of the highway and surrounding landscape; to contribute to an Enduring Legacy. Required outcomes are:

- Coherence: Design a coherent suite of highway furniture with a consistent design language and a clean aesthetic
- Consistency: For example, minimise the variety of poles and posts. Adopt consistent materials, pole or post type and colour. Design a consistent spatial arrangement (such as standard offsets from barriers/carriageway) that resolves and aligns safety, maintenance, and aesthetic goals
- Resolved details (for example):
 - Design footings to reduce the need for herbicide maintenance. Footings are to be properly boxed, trowelled, and flush, to avoid adding to clutter
 - Design gantries and similar climbable structures to prevent unauthorised access with the need for retrospective fittings such as barbed wire or spike collars

Safety Barriers

Barriers are vital to a safe highway. They have the potential to increase visual clutter and to obstruct views of the surrounding landscape, and add to maintenance. Required outcomes are:

- Consistency: Use a consistent barrier system arranged in a standardised manner. Use a narrow range of typical highway cross-section layouts. Ensure barriers follow clean continuous lines that flow with the highway
- Resolved footing detail: Adopt a consistent footing detail with the typical layouts. Locate barrier footing within paved surface or integrate with kerb detail. Avoid barrier footings in bare ground or grass that will require herbicide use
- Openness: Maximise openness and a light/ non bulky appearance – especially on the highway's outside edge. The order of preference for the outside barrier is (i) wire rope barrier, and (ii) W-section steel barrier. Concrete barriers are least favoured except in special circumstances such as bridges, as they reduce the opportunity for the landscape to connect to, and through, the highway. The exception to this is to consider where there is a co-benefit for required noise mitigation and the concrete barrier is effective and less visually obtrusive than a separate noise wall.

Medians

Medians are to be consistent with those of the wider network while responding to the Kāpiti—Horowhenua context, generally comprising a paved median and rope barrier.

- While planted medians may be appropriate in some locations, on approach to interchanges and roundabouts, paved medians reduce maintenance, and improve safety by reducing the need for maintenance workers in the highway
- While wide medians, including those with separate level carriageways, are also more attractive, the narrower paved carriageway reduces the highway footprint

Surfaces and built, hardscape materials

The palette below is indicative of the 'look and feel' outcomes anticipated for paving, other surface treatments and built materials. As a whole, the palette should be reflect the surrounding environment (including use of local materials) and be consistent and logical; to develop a clear and coherent material 'language' along the highway. For example, coarse materials can reflect the shorebanks of the rivers that the highway traverses. The surface palette will be developed in the next phases and in detailed design, and as part of the overall identity and mahi toi strategy for the project.

Retaining Walls

Vertical retaining walls (including mechanically stabilised earth (MSE) walls) should be part of coherent suite of structures and not contribute to visual clutter. Where these need to be faced, shotcrete, soil nails and rock fall mesh are to be avoided. Outcomes include:

- Visually integrate the design of the retaining wall with associated infrastructure (bridges, structures, SUP)
- Consider planting to base and/or top of wall to soften visual impact
- Design required safety barriers/fencing together with wall as single entity
- Local materials to be used where possible to reflect colour, texture and Horowhenua and Kāpiti Coast identity including opportunities for mahi toi where appropriate and part of the overall strategy for the project
- At culverts—consider retaining walls or reinforced slopes to steepen batters so the length of culverts can be reduced

Light Poles

A dark sky is preferred (see below under 'night landscape') with lighting restricted to locations they are essential for safety. In those instances:

- Design the light standards/poles as part of the coherent suite of highway furniture paying attention to materials, colour, nature of junction between



Mackays to Peka Peka Expressway
[Natural Habitats
<https://www.naturalhabitats.co.nz/our-projects/mackays-to-peka-peka/>]



Horowhenua night sky
[Matt Balkam, Horowhenua Astronomical Society <http://www.horoastronomy.org.nz/>]



Highway light pole example, Te Ara Nui o Te Rangihaeata, Transmission Gully
[Waka Kotahi]



Surface finish character examples

pole and arm (A weathered galvanise steel or metallic grey colour is likely to be unobtrusive. Mitred angles, or fittings horizontal to poles, are typically less dominant and aesthetically pleasing than curved poles)

- Integrate the lights with the standardised spatial configuration of roadside elements
- Use consistent height within each location to reduce visual clutter
- Use sustainable LED. [Light colour and warmth]
- Consider and reduce the effects of light spill on fauna
- Consider and reduce headlight glare for local communities

Night Landscape (Lights)

- A natural dark sky is preferred—especially in the more rural areas south of the Ohau River. Limit lights to only those locations where they are essential for safety and operational requirements (e.g. interchange at Tararua Road and the two roundabouts at the north end of Levin).

Day Landscape (sunstrike and black ice)

- Consider alignment, geometrics and edge treatment measures including planting to avoid sunstrike, particularly when driving in a east- west direction, and black ice due to dense shading by trees

Air Quality

- Consider measures to reduce emissions through final geometrics and highway surfacing
- Consider orientation and separation of SUP from the highway where appropriate to reduce potential for emission impact
- Prioritise planting to cut and fill batters where slopes allow and alongside SUP to reduce emission drift and maximise absorption opportunities

Roadside Weed Management

Minimise roadside weeds, and the need for spraying, to achieve a clean, clear edge to the highway. The effect of spraying (bare ground, yellow vegetation) as a foreground feature of highways and the SUP will potentially detract from experience of the Horowhenua and Kāpiti landscape. Measures to reduce the need for spraying include:

- Kerbs as a hard boundary between paved shoulder and vegetation including flush profile to provide for swale stormwater collection

- A standard spatial configuration that avoids bare ground between carriageway and shoulder (e.g. side barriers installed in the paved shoulder)
- Use hard surfacing where planting is unlikely to thrive (e.g. narrow corners where on ramps merge)
- Low frangible planting immediately behind barriers
- Concrete mowing strips around the base of posts and poles
- Use spatial configuration that simplifies mowing and avoids left-over space e.g. narrow angled connections and to avoid grass and planting in areas of low poor light, moisture and soil conditions
- Plant at appropriate setbacks from the SUP, to avoid overgrowing. Maintain mulch depths to SUP edge, to avoid the need for weed control

Noise - Integrated Design

Measures to manage noise for the wellbeing of those living close to the highway (see following pages for Interchange and Roundabout specific outcomes):

- Reduce noise at the source using low-noise road surfaces, including high performance surfaces where appropriate
- Encourage free-flowing traffic at interchanges by having long enough ramps to enable vehicles to get to common speed
- Manage transitions (change from high to low speed environments), by providing innovative roundabout and interchange design and intuitive cues for reduced speed (see following pages): Measures include:
 - through appropriate approach lengths and manipulation of carriageway alignment (horizontal and vertical)
 - reduced carriageway, shoulder and berm widths
 - bold planting including tall mature height trees and other vertical elements such as gateway/threshold features
 - integrate constructed landforms around stormwater wetlands to increase sense of enclosure and where they are able to be tied into existing contours
 - use specific paving textures/colours at interchanges and roundabouts (in addition to required signage and lighting)
- Separate the shared user path from the highway to provide a more pleasant environment for users. Where this is not possible, consider use of noise bunds within landforms between the highway and shared use path
- Screen elevated sections of the road, using existing topography
- Use contoured earth bunds (especially in rural settings and where space permits)—in preference to noise walls, where additional attenuation is required

- Consider the use surplus material (spoil) to provide further noise mitigation
- Avoid the use of audible edge lines (Audio Tactile Profile) where the highway is close (nom. 200m) to dwellings
- In situations where noise walls are necessary (they are not currently required in the project):
 - Adopt techniques to reduce prominence, such as surface texture, recessive colour.
 - Avoid 'forced' or unnecessary steps in the top edge. A continuous top edge is often preferable
 - Install short returns to prevent end-on views behind the walls.
 - Plant both sides of wall to soften appearance and prevent graffiti
 - Where noise walls are required on bridges, it may be desirable to continue them for a few hundred metres either side to accentuate the approach
 - Avoid short sections or short gaps in noise walls
 - Consider opportunities to integrate mahi toi where appropriate, and as part of the overall project strategy



Low-noise surface being installed ,
Christchurch Northern Corridor
[Altissimo Consulting]

Interchanges and Roundabouts

The highway design has a series of interchanges and roundabouts that require a considered approach in order to ensure safety of road users, speed transitions and mitigate noise in the surrounding environment. Primarily this can be addressed using strategic positioning of highway components to focus the attention of drivers and indicate areas of transition. The following principles and standards outline the primary approach to the design in order to maintain coherence over the course of the highway. The diagrams below demonstrate these principles spatially for each of the respective major intersections.

A series of **standards** applicable to all intersections and roundabouts include:

- Ensuring that sight distance criteria for safe intersection approach is maintained in all directions
- Planting trees no less than 5m away from rope barriers in order to maintain safe clearance distance and avoid likelihood of bird strike

General **principles** for the approach to interchanges and roundabouts include:

- Maintaining coherence across a whole of journey approach, ensuring diversity and interest reflective of the immediate environment
- Planting approach should relate to the surrounding landscape, rather than emphasising the highway elements. For example, to give the appearance a roundabout is located within a stand of trees, rather than lining the edges of the ramps with tall vegetation
- The design and positioning of gateways, or the need for transition or speed change, is to be developed using qualities and characteristics of different planting forms and groupings (sculptural elements as appropriate to the mahi toi strategy may be developed in later stages)
- The character of the planting used for noise and intersection mitigation should respond to the character of the context. For example, the planting approach for the SH57 roundabout should reflect the nature of the surrounding wetland context; whereas the SH1 roundabout, by The Avenue, would be more representative of the urban and built environment of Levin
- Embankment slopes to interchanges and roundabouts are to ensure planting is able to be successfully established (generally no steeper than 1v:3h) including ability to provide for sufficient depths of topsoil and tree pits for larger specimens

Planting and other design measures can be utilised to mitigate the effects of speed and noise in the following ways:

- Planting to be positioned strategically to utilise scale, for example understanding how the tree canopy can affect perception of road users
- Planting to be positioned in order to utilise form and character of the plants, for example density, seasonality and composition, in order to focus driver attention
- Form and positioning of planting should reinforce natural boundaries and views, for example along changes in topography, waterways, and to integrate with natural vegetation
- Consider changing the road width and berms in order to focus driver attention (for example, consider the treatment of the road berm as it transitions between open rural & waterway setting to a more built context in Levin)
- Explore the opportunity to express cultural narratives through mahi toi, sculptural and other landmark features



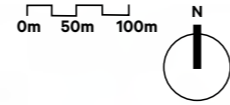
SH1 Roundabout, Whangārei
[Image: NZ Herald]



Highway planting of intersection, Waikato Expressway
[Image: Natural Habitats: <https://www.naturalhabitats.co.nz/our-projects/a-legacy-for-future-generations/>]

Northern Termination Roundabout & NIMT Bridge

Character responding to context - railway/built context of Levin



Legend.

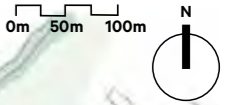
	Stormwater wetland
	SUP
	Proposed designations
	NIMT Railway
	Swale planting
	Existing planting
	Proposed planting (refer to planting concept plan for vegetation type)
	Indicative proposed tall vegetation clusters for traffic management and character enrichment.

Principles.

1. Tall rehabilitation planting east of the highway to integrate into existing vegetation and provide physical, noise and visual separation to properties in close proximity.
2. Tree clusters on approach to roundabout focus driver attention on speed transition and upcoming roundabout - using density, canopies, & scale in order to indicate approach & mitigate adverse effects.
3. Low vegetation rehabilitation planting west of highway to provide visual connection to rural urban character of Levin.
4. Tōtara tree avenues on re-routed local roads to distinguish road hierarchy, provide visual separation and indicate need for slower speeds.
5. Groundcover planting only within sight triangles on immediate approach. Frangible planting with clear sightlines on mid-approach to ensure safety standards and requirements.
6. Road design adjustments to encourage slower speeds. eg. Narrowing of carriageway & hard shoulder
7. Planting alongside SUP to tie in and provide a cohesive language with the wider context.

Arapaepae SH57 Roundabout

Character responding to context - stream/wetland context

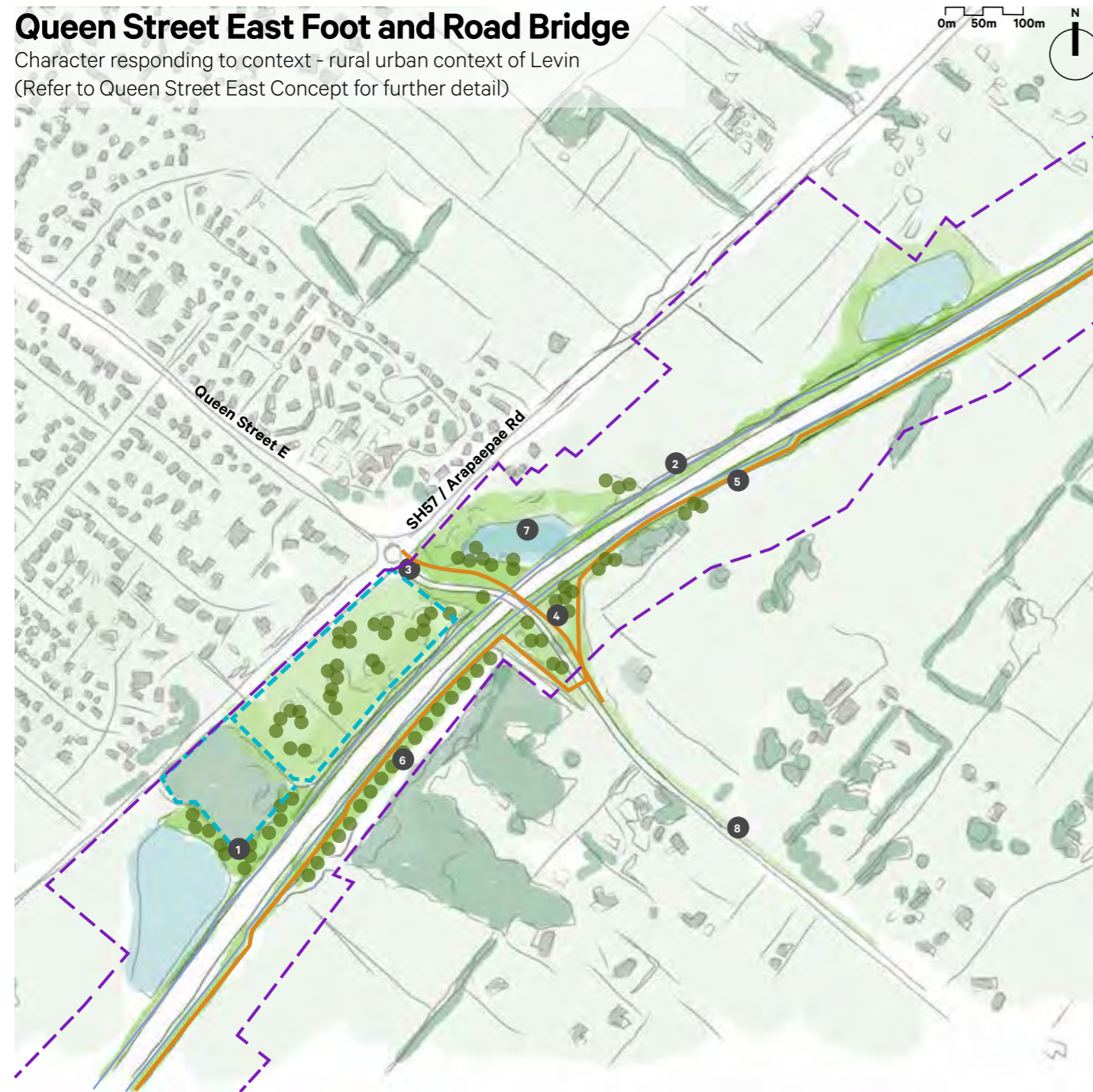


Principles.

1. Establish separate stands of Kahikatea to integrate into wider context and establish transition between areas of the highway. This will assist in indicating upcoming speed transition.
2. Tall vegetation planting west of highway to provide visual mitigation to rural close properties.
3. Tall rehabilitation planting clusters east of the highway to provide in indication of transition for road users and tie into existing vegetation character.
4. Tōtara tree avenues on re-routed local roads to distinguish road hierarchy and slower speeds.
5. Groundcover planting only within sight triangles on immediate approach. Frangible Planting with clear sightlines on mid-approach.
6. Restore riparian planting along Kōputaroa tributaries adjacent to the highway in order to contribute to whole of journey approach principle.
7. Road design adjustments to encourage slower speeds. Eg. Narrowing of carriageway & hard shoulder
8. Planting alongside SUP to tie in and provide a cohesive language with the wider context.
9. Mitigation planting along stream diversion paths.

Queen Street East Foot and Road Bridge

Character responding to context - rural urban context of Levin
(Refer to Queen Street East Concept for further detail)



Legend.

	Stormwater wetland
	SUP
	Proposed designations
	NIMT Railway
	Swale planting
	Existing planting
	Proposed planting (refer to Planting Concept Plan for vegetation type)
	Indicative proposed tall vegetation clusters for traffic management and character enrichment.
	Ecological identified restoration Area/ enhancement area - terrestrial/wetland

Principles.

1. Re-established tall forest to enhance existing bush stands
2. Low rehabilitation planting on batters east and west of highway to provide visual connection to rural urban character of Levin and wider landscape
3. Groundcover and frangible planting only within sight triangles around roundabout.
4. Tall vegetation on road bridge batter to screen height and signify change in character, whilst maintaining key viewshafts to Punahau and Tararua Range. Use of density, canopies, & scale in order to mitigate adverse effects.
5. Amenity planting alongside SUP to tie in and provide a cohesive language with the wider context.
6. Tree avenue for visual mitigation and separation
7. Naturalised planting around stormwater wetlands
8. Potential mokomoko plantings. Opportunity - to be developed by others.

SH1 Roundabout

Character responding to context - establishing a connection to rural setting



Principles.

1. Establish stand of tall forest to integrate into wider context and establish transition between areas of the highway and indicate change in context and connections to local road.
2. Tree stand clusters integrated into restoration planting to reflect landscape character - consider use of density, canopies, & scale in order to indicate approach to roundabout
3. Groundcover planting only within sight triangles on immediate approach. Frangible Planting with clear sightlines on mid-approach to ensure safety standards and requirements.
4. Planting alongside SUP
5. Consider tree clusters on approach to be reflective of expansive rehabilitation and restoration planting area and mitigate noise to wider area.

Earthworks and Construction Yards

Cut and Fill Batters

The landscape traversed by the highway is flat to rolling and this reduces the potential need for and height of cut and fill batters. Possible exceptions are around the base of Pukehou, terraced areas near Manakau Heights Road, bridge approaches (such as at the Ohau River and the NIMT railway) and the need to accommodate water courses resulting in fill above the ground plain. Reduced number, extent and height of cut and fill batters should continue to be a priority for the project. Where they are required, cut and fill slopes should be well integrated with design measures to avoid impacts on hydrological patterns and indigenous vegetation outside the footprint prioritised. The approach to earthworks is an important measure of how the project Treads Lightly, with the Whenua.

In line with the core principles, outcomes for cut and fill batters are:

- To reduce the extent and heights of cut and fill batters through use of alignment, geometry and slopes that tie into the natural contours. The highway passes through a number of sensitive sites including along the base of the maunga Pukehou, wetlands and bush areas
- Cuts and fills to be designed to avoid intersecting puna where practicable (all known puna are currently avoided). Where close to, or intersects, puna, design cuts and fills to allow, as best as possible, for the puna to continue to function and water to remain in its own catchment
- Use monoslopes cut batters in preference to benched cuts. Feather the top edge of the batter face where this does not impact on existing indigenous vegetation. Scarify the face and regrass or revegetate with endemic species, as appropriate to the character of the surrounding landscape; for example plant the batters where alongside areas of restoration planting. Cut slopes should be no steeper than 1v:1h, in constrained instances, ideally 1v:3h, if they are to be planted. Any access requirements post construction should be well integrated, avoiding visually obtrusive structures such as steel ladders
- Where benched cuts can not be avoided one broader bench is preferred, with slopes and drainage to ensure topsoil can be applied and the area is replanted with appropriate indigenous species following construction
- Where crest drains can not be avoided, as they are necessary to ensure cut slope stability, consider measures to avoid concrete and rip rap lining. Where required, use of planting to mitigate landscape and visual effects. Tie the crest drains to the side of the cuts, into natural depressions/valleys where possible. Where drainage flumes are required, ensure their adverse visual effects are reduced through sizing and alignment. If the flumes need to be lined, rip rap is preferred
- Ensure design measures such as appropriate slopes, drainage and timing of cut operations prioritise slope stability such that the use of shot crete and soil nails can be avoided on all cut faces

Example of 'fill' section



- Use monoslopes for fill batters in preference to benched fills. An appropriate approach in rolling terrain is to grade-out the slope (or 'overfill') to marry surrounding terrain and where this avoids further impacts on indigenous vegetation and other ecological features
- Adopt a strategy of grassing steeper cut batters and focus efforts on replanting gentle cut and fill batters and natural ground where planting is likely to thrive and this supports ki uta ki tai and provides breaks to reduce weed and pest transfer. Refer to Planting Concept Plan (provided in Volume III)
- Topsoil and other site won materials should be recovered and stored appropriately for re use along the highway or where surplus and practicable, other projects in the community. The process and protocols of recovery from the construction footprint will be confirmed with tangata whenua through the detailed design stage of the project including that topsoil etc. is used within their original catchment. See following sections re Topsoil, Spoil Sites and Material Supply.

Topsoil

Topsoil is a key component of achieving successful landscape and ecological outcomes and, as part of the whenua, is central to the way in which the project addresses the CEDF principles.

Topsoil Stripping

- A matauranga and cross-disciplinary approach is required to ensure topsoil is maintained as a healthy viable growing medium
- The protection of topsoil structure, fertility and wairua needs to be considered prior to earthworks commencing
- Ensure soil testing is undertaken on any imported topsoil and topsoil harvested from within the proposed designations. Confirm topsoil is fit for planting purposes

- Ensure the topsoil horizon is separated from subsoil
- Remove entire topsoil depth at one time, if practicable
- If woody vegetation is present (excluding weed species), this can be mulched and included in the topsoil.

Degraded Topsoil Enhancement

If topsoil structure is degraded, investigate utilising additives to ensure it facilitates good plant growth and establishment, with input from a soil scientist.

Topsoil Stockpile Management

Where a topsoil stockpile is required, the following practices will help maintain the quality of the topsoil for later use across landscape areas:

- Prepare stockpile areas within the same catchment of origin, in keeping with the core principles for the project
- Ensure surface water is intercepted and diverted around the stockpile. Construct sediment control features to capture and treat runoff from stockpiles if required. Ensure the base is relatively even and sloped or well drained to minimise anaerobic conditions developing at the base of the stockpile. Under-drainage may be beneficial
- Ensure soil condition testing is undertaken to confirm topsoil is fit for planting purposes
- Stabilise the stockpile (such as with mulch or hydroseeding) to reduce erosion, sediment generation and weeds
- Where anaerobic soils have developed at the base of stockpiles, there will typically be elevated iron and reduced pH (as low as 4 to 5). These soils will require amelioration before placement in planting areas

Highway

Topsoil Placement

- Place topsoil with care to avoid compaction and within the same catchment of origin
- Soil depth, refer to NZ Transport Agency P39 Standard Specification for Highway Landscape and other specifications prepared in detailed design for rehabilitated and restored areas
- Specific treatments may apply for the restoration areas, stormwater swales and constructed wetlands and to address the rehabilitation of the spoil and material supply sites
- Refer to the Planting Concept Plan (provided in Volume III)

Spoil disposal

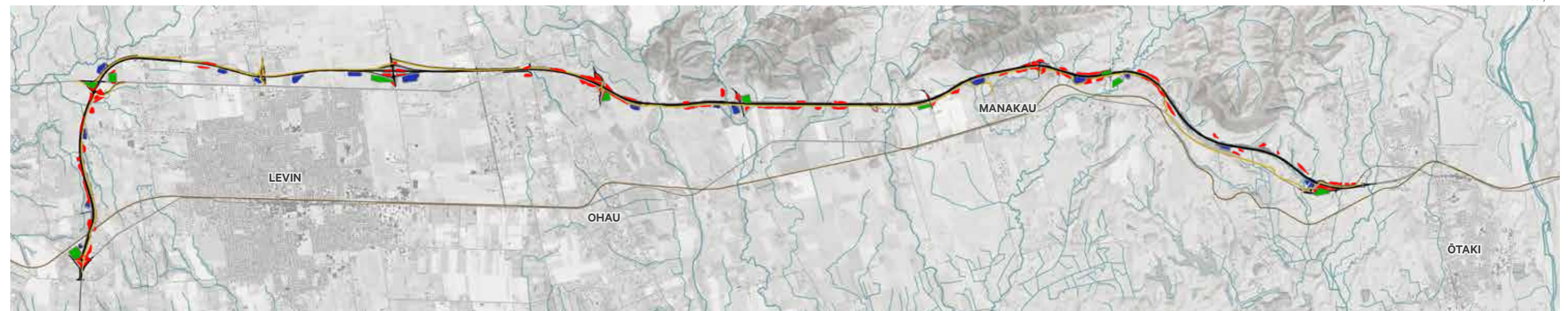
While the highway design will seek to balance cut and fill, some material from outside the area will be required to construct the highway formation, and surplus spoil will also be generated. Iwi consider soil should remain in its catchment, which also has benefits in reducing cartage and placing surplus spoil in small sites throughout the route.

Select surplus spoil disposal sites to:

- Keep spoil within its original catchment

Spoil Site Locations

- Spoil site
- Accommodation works



- Avoid natural watercourses, wetlands, and indigenous vegetation
- Consider opportunities for excess spoil disposal (and other excess site won materials) to be stored in appropriate locations for other projects in the community
- Maximise disposal opportunities of each spoil disposal site to limit the overall footprint and the number of disposal sites.

Merge spoil disposal with the landscape:

- Contour spoil disposal to merge with natural landforms
- Overfilling batters (embankments) may be an appropriate technique to lose spoil in a way that softens the appearance of the highway (especially where such fill is planted)
- Respread topsoil and plant to merge with adjacent planting. In some instances it may be appropriate to re-grass and integrate with the adjacent pasture
- Utilise spoil disposal opportunities to flatten fill batters so the elevated fill areas blend into the adjacent landscape.
- Use excess spoil to reduce the height and impact of structures
- Revegetation of spoil disposal sites will be defined by the context of the site including adjacent land cover. In rural landscapes grassing will be appropriate, whereas in wetland areas or adjacent to remnant indigenous vegetation, planting would be appropriate.
- Refer to Planting Concept Plan (provided in Volume III)

Construction Yards & Access

Outcomes include:

- Where possible, select sites for construction yards in low sensitivity areas e.g. away from residential dwellings, streams and existing habitats
- Consider opportunities to combine haul roads, construction access and hard stand/laydown areas needed for construction; to limit their footprint
- Consider opportunities and design measures required to use erosion and sediment control ponds for construction water storage and to repurpose these areas as permanent stormwater wetlands
- Remove all construction areas and rehabilitate the ground so that it merges with the adjacent land. Construction areas left over adjacent to bridges and roads usually create a neglected appearance. Rehabilitation works may entail removing any hardstand, ripping and likely will require re-topsoiling and replanting or grassing
- Refer to Planting Concept Plan (provided in Volume III)

Material Supply Sites

There is a shortfall of material for structural fill on the project. The process to confirm potential sites for supply has been worked through with the partners using an assessment matrix aligned with the core principles, as set out below. A long list of potential sites has been assessed and then refined to a short list and 4 potential preferred sites described over the following pages. The need to use these sites to supply material will be confirmed through the detailed design process, noting that the current concept design requires them to be used to the full extent. The outcomes described below are scalable dependent on the extent of the Projects ultimate construction requirement.

Initial, high level, indicative concepts, have also been developed to illustrate rehabilitation options; to test the opportunities to preserve, restore, enhance and create positive outcomes at each of the sites.

Tread Lightly, with the Whenua

General outcomes—Applicable to all sites.

- Ensure the Projects mana whenua partners and local hapu are included in further site investigation and the design process and evaluate the final design against the CEDF principles
- Provide for opportunities to further investigate sites of significance, to be avoided.
- Avoid indigenous vegetation and impact on habitats
- Ensure final contouring responds to existing topography and landform type; to recreate e.g. dune, river terrace, oxbow, wetlands
- Ensure smooth transitions/tie into natural contours and the highway footprint
- Excavation is to avoid impacts on groundwater (except where wetland and open water outcomes are desirable legacy outcomes)
- Ensure natural flow paths and hydrology are retained, including flood risk and proximity to active river flows
- Existing and proposed management of the waterways is to be integrated, including plans for growth and other infrastructure projects
- Water quality, capacity and sustainability, to ensure te mana o te wai values are integrated

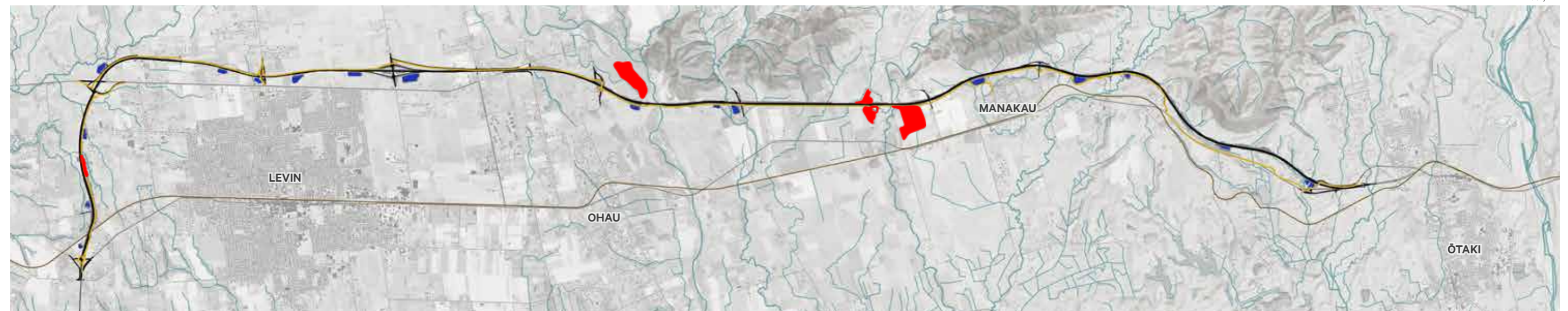
Enduring Legacy

General Outcomes—Applicable to all sites

- Provide for rehabilitation of earth worked areas (including with indigenous planting) to enhance natural character and create new habitats appropriate to the context
- Integrate and connect planting into existing and rehabilitated areas of the highway earthworks and link to Ō2NL restoration (ecology, natural character) areas where possible
- Ensure the SUP is well integrated, allowing experience and, where appropriate, access through the rehabilitated area.
- Provide for, where appropriate, opportunities to engage with the wider landscape through views and physical access (as part of the Ō2NL or a future project). For example, enhance access to the river alongside the SUP including pause points, and car park areas off local roads; to enable appropriate (safe, culturally and ecologically appropriate) recreation and community connections
- Rehabilitation measures are to consider and enhance te mana o te wai and ki uta ki tai

Selected Material Supply Sites

Material supply site

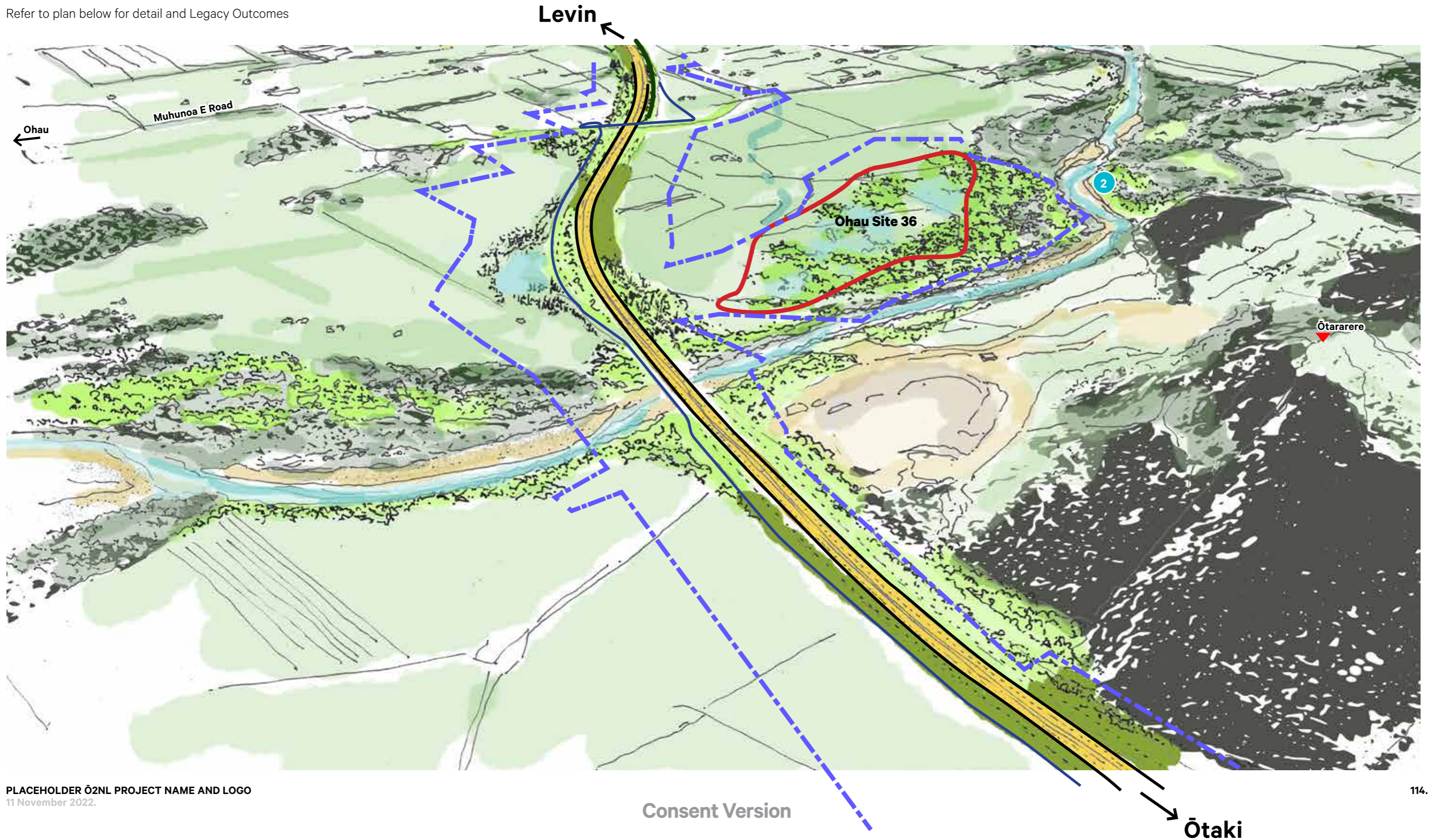


Highway

Material Supply Overview Visuals

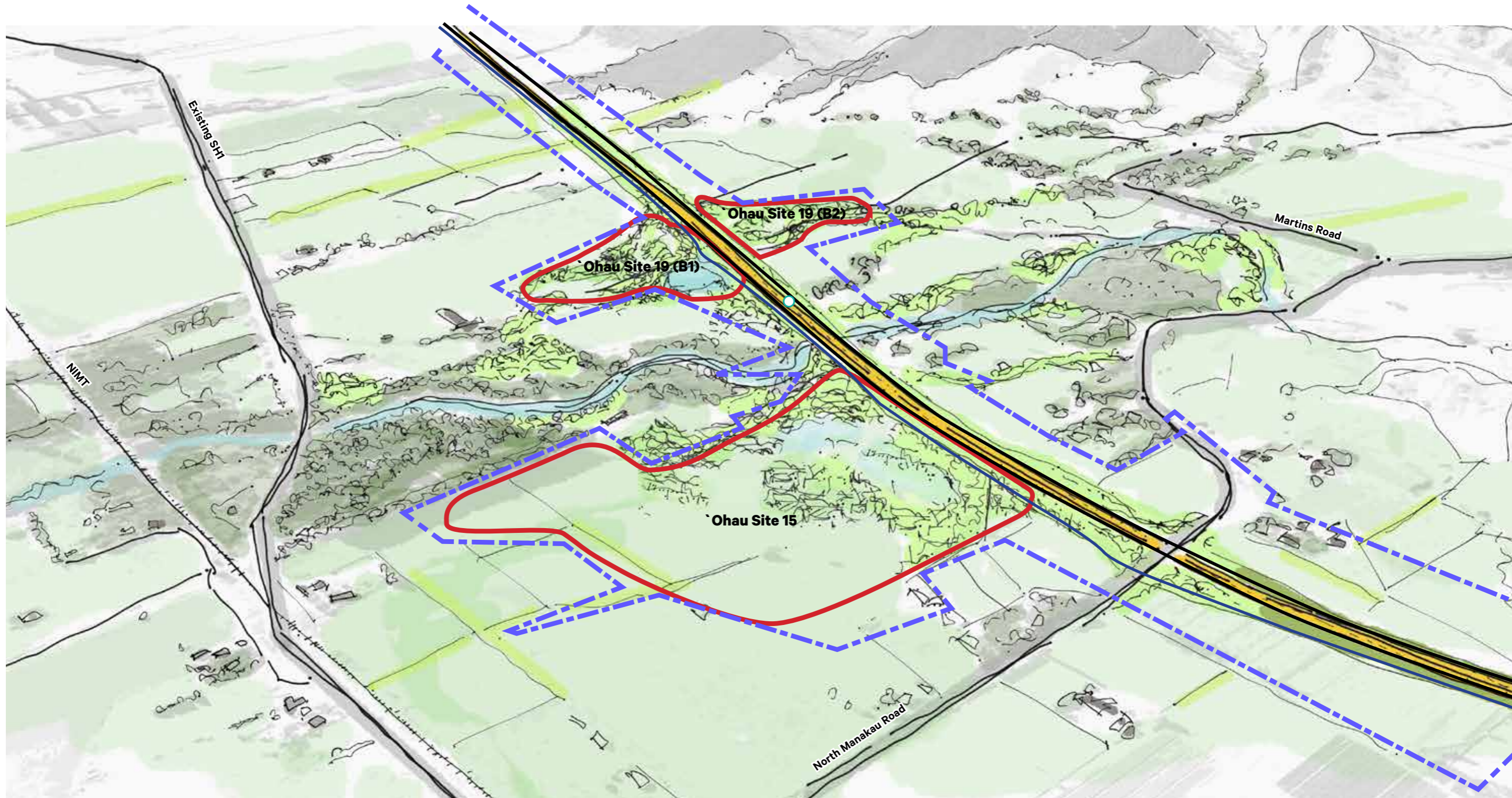
Ohau Site 36.

Refer to plan below for detail and Legacy Outcomes



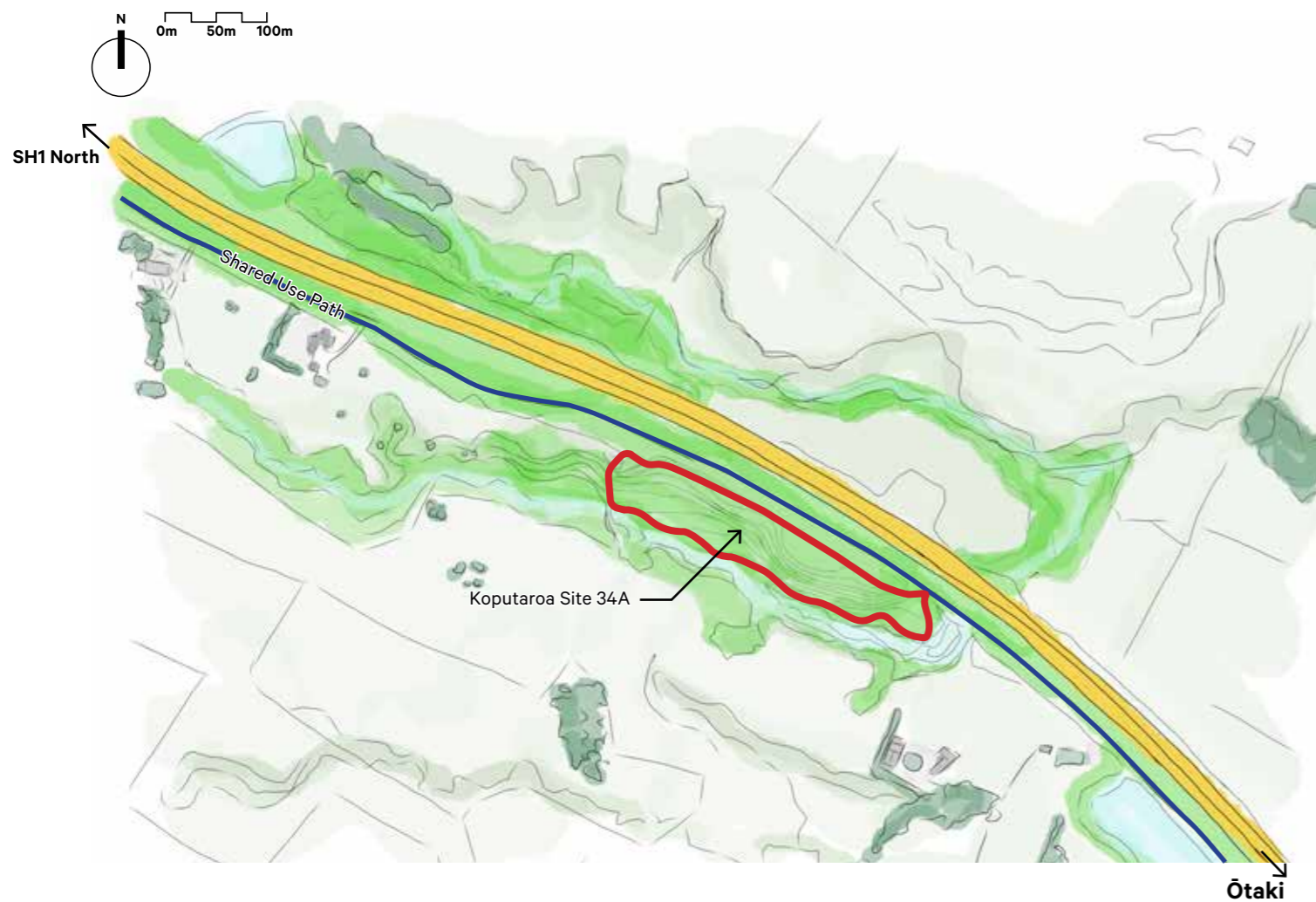
Waikawa Sites 15 & 19.

Refer to plan below for detail and Legacy Outcomes



Koputaroa Site 34A

Sand Site



A rehabilitated wetland landscape featuring species once typical of the Koputaroa. The rehabilitated site contributes to the habitats of the wider catchment (also enhanced by natural character restoration and ecological offset planting), recreates a wetland environment and integrates possible connections from the SUP for mahinga kai and rongoā (at a safe distance away from the highway) including options for interpretation - expression of the site's narrative tbc through the mahi toi strategy.

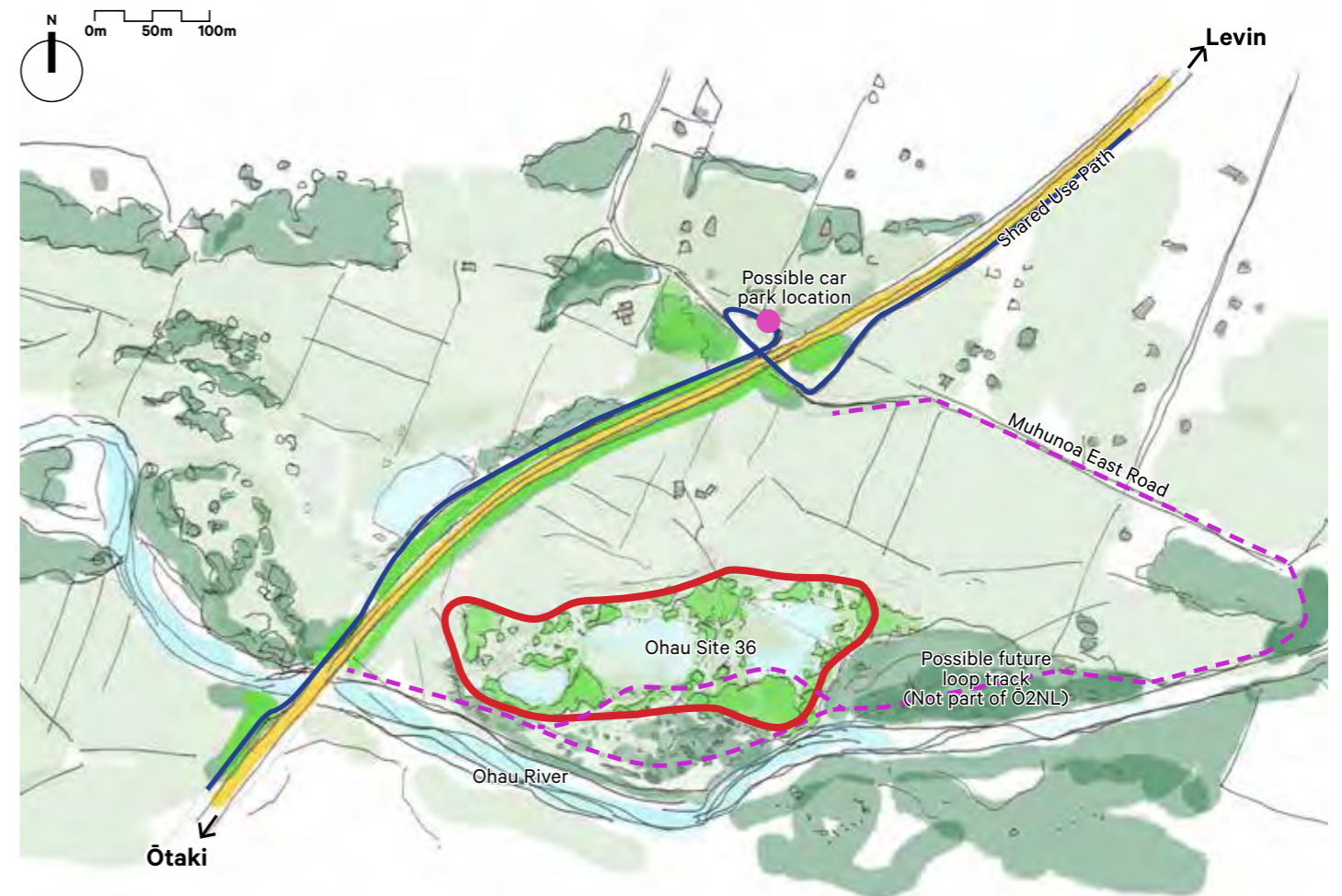
Ensure/provide for:

- final contours are to ensure existing wetland areas are protected, including from sedimentation and consider measures that could enhance flood management for surrounding properties
- design measures are to avoid bird strike
- rehabilitation planting and species selection is to reintroduce wetland species, as appropriate to the catchment, and to enhance existing remnant areas and adjacent ecological offsetting
- consider opportunities to introduce site specific taonga species such as Mānatu, Kōwhai, Maire Tawake, Kakaha, Hukihuki and to create habitat for at risk and threatened Manu (bird), Ngata (snail species, for example, by integrating ferns and shaded boulder piles) shortfin Tuna, Inanga, Kōkopu (where there is a migration path) and/or introduction of brown mudfish (where there is no migration path)

- material supply rehabilitation planting is to be integrated with natural character mitigation and required ecological offsetting in this area
- SUP integration including possible 'off line' gathering space/ rest area lookout above (via the existing knoll to the immediate west) and access to the wider restoration area for mahinga kai and rongoā (at a safe gathering distance away from the highway)
- design measures are to consider possible interpretation and expression of the project's overall narrative, in keeping with the overall principles, mahi toi strategy and SUP outcomes

Ohau Site 36

Rock Source Site - Wetland Option



A rehabilitated river terrace and wetland landscape including open water areas (where adequate recharge, via groundwater, can be provided. Tbc through further investigation) featuring species once typical of the Ohau and lake areas in the district. The rehabilitated site contributes to the habitats of the river corridor, recreates a wetland and larger scale, varied depth, open water environment and integrates possible connections from the SUP for recreation, mahinga kai and rongoā. This includes options for interpretation - expression of the site's narrative tbc through the mahi toi strategy.

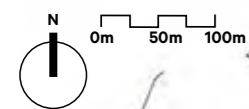
Ensure/provide for:

- final contours are to consider measures that could enhance flood management for surrounding properties
- investigation and design process are to consider options to recreate a wetland environment including larger scaled deep open water areas, whilst appropriately managing flood risk; as required to support ecological offset requirements for the project
- rehabilitation planting and species selection is to reintroduce wetland/ lake edge species, as appropriate, and enhance existing lowland forest areas.
- consider opportunities to introduce site specific taonga species such as Mānatu, Kōwhai, Maire Tawake, Kakaha, Hukihuki and to create habitat for at risk and threatened Manu (bird), Ngata (snail species, for example, by integrating ferns and shaded boulder piles) shortfin Tuna, Inanga, Kōkopu (where there is a migration path) and/or introduction of brown mudfish
- material supply rehabilitation planting is to be integrated with ecology and natural

- character mitigation and any required ecology offsets in this area
- possible links to the Ō2NL SUP under the highway bridge for recreation and mahinga kai and rongoā
- design measures are to consider possible interpretation and expression of the projects overall narrative, in keeping with the overall principles, mahi toi strategy and SUP outcomes
- design measures are to consider a possible future loop trail on northern bank of Ohau -Muhunua East Road (to be developed by others)
- design measures are to consider opportunities for rehabilitation of existing quarry (on the true left bank opposite), to enhance the condition of the river margin and riparian habitats and integration with required natural character restoration and other ecological offsetting in the area

Waikawa North Site 19

Rock Source Site



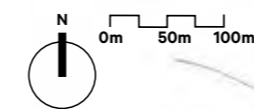
A rehabilitated river terrace landscape featuring large areas of lowland indigenous forest that contributes to the Waikawa Stream habitat corridor, and an enhanced SUP and highway experience.

Ensure/provide for:

- final contours are to tie into the upper terrace, above the 100 year flood plain, on both sides of the highway
- stormwater wetland and SUP integration with western rehabilitated site
- rehabilitation planting and species selection is to enhance existing lowland forest areas and contribute to river corridor habitat
- consider opportunities to introduce site specific taonga species such as Mānatu, Kōwhai, Maire Tawake, Kakaha, Hukihuki and to create habitat for at risk and threatened Manu (bird), Ngata (snail species, for example, by integrating ferns and shaded boulder piles) shortfin Tuna, Inanga, Kōkopu (where there is a migration path) and/or introduction of brown mudfish (where there is no migration path)
- integrate rehabilitation planting with ecology and natural character mitigation and any required ecological offsetting in this area

Waikawa South Site 15

Rock Source Site



A rehabilitated river terrace landscape featuring species once typical of the Waikawa Stream with possible areas of wetland and open water (where adequate recharge via groundwater can be provided). The rehabilitated site contributes to the habitats of the river corridor and integrates possible connections from the SUP to a gathering space and the stream - for recreation mahinga kai and rongoā (at safe gathering distance from the highway). This includes options for interpretation - expression of the site's narrative tbc through the mahi toi strategy.

Ensure/provide for:

- final contours are to tie into the upper terrace, above the 100-year flood plain
- rehabilitation planting and specie selection is to enhance existing lowland forest areas and contribute to river corridor habitats
- consider opportunities to introduce site specific taonga species such as Mānatu, Kōwhai, Maire Tawake, Kakaha, Hukihuki and to create habitat for at risk and threatened Manu (bird), Ngata (snail species, for example, by integrating ferns and shaded boulder piles) shortfin Tuna, Inanga, Kōkopu (where there is a migration path) and/or introduction of brown mudfish (where there is no migration path)
- integrate rehabilitation planting with ecology and natural character mitigation and any required ecology offsets in this area

- SUP integration including possible 'off line' gathering space/ rest area with access to lower terrace and stream and views of the rehabilitated area and wetland for gathering of mahinga kai and rongoā (at a safe distance from the highway)
- design measures are to consider possible interpretation and expression of the projects overall narrative, in keeping with the overall principles, mahi toi strategy and SUP outcomes.

Community and Connections

Names

Highlight local features traversed by the highway, or in proximity, through restoration of original Te Reo Māori names where possible. This could include:

- Streams and Rivers crossed by the project: Waitohu, Waiauti, Manakau, Waikawa, Kuku, Ohau River, Koputaroa
- Historic names recognising features or localities such as Koputaroa, Whakahoro, Wai Mārie, Te Awa a Te Tau, Pukehou, Punahau, Waiwiri, Waitarāra
- Naming the highway where appropriate as part of the wider network and corridor
- Names will need to be confirmed with Ngāti Raukawa and Muaūpoko. For example, these may include traditional routes, ara wairua, or locations of particular activities. The process to recognise these names should be worked through with the project partners and consider any State Highway and HDC, council requirements

As part of detailed design, there is an opportunity to research and record original names and meanings through the area, to be available as a reference source for the project and the mahi toi strategy - see below.

Signage and Interpretation

A signage and interpretation strategy is to be developed in the detailed design stage of the project to support naming, wayfinding and interpretation (narrative) signage. The process for this strategy to be developed is to be confirmed with the project partners including methods to ensure safety, required State Highway and council standards, to avoid visual clutter and ensure links to the overall mahi toi strategy and narrative for the project. For example, the story of how the Ohau awa and Pukehou maunga and Arapaepae Road were named could be included on interpretation signage along the SUP.

Mahi Toi

There is a commitment to work with tangata whenua, through the partnership, to develop a strategy for appropriate mahi toi in the design and this has a role in creating an enduring legacy.

Mahi toi is a powerful way of celebrating key sites on the highway and in telling the overall narrative of the district and its environment. In addition to conventional application of patterns to highway structures such as abutments and retaining walls, potential mediums include free standing elements and sculpted landforms. Where there are simple, refined highway elements this accentuates mahi toi, where it is used to enhance and uphold mana. The outcomes sought for the mahi toi strategy:

- Consider opportunities for a common narrative linked to the experience along the highway and shared used path. There is the potential mahi toi to contribute to a hikoi wānanga, a learning pathway through the district that celebrates and uplifts the mana and mauri of the two districts
- Select locations carefully so the work relates to an appropriate narrative, and does not become wallpaper or contribute to visual clutter. Less is, often, more
- Mahi toi is stronger when it marks the landscape rather than the highway, or where one or two elements are highlighted; such as the bridge over the Ohau
- Conceive the work at a landscape scale—with dimensions and form; to unfold/be noticeable at highway or SUP speeds and alignments
- Mahi toi can enhance legibility (for example, to mark significant milestones, signal approaching exits, terminate sightlines on straight sections)
- The process to develop the mahi toi strategy will be led by the project partners including consideration of cultural safety and intellectual property

Potential locations are:

- Along the shared use path including, for example, as a starting point for discussion, tohu, markers and/or integrated element, for example, to highlight landmarks, streams, historic trails, past events, village connections and habitat types
- Along the highway, for example, as a starting point for discussion, on the Ohau bridge and gateways to Levin.

Local Road Connectivity and Communities

The local road network is typified by the existing SH57 and SH1 and no-exit side roads running towards the hills or coast. The Ō2NL project offers the opportunity to repurpose the existing highway as the local spine road, while maintaining connections on the east-west roads.

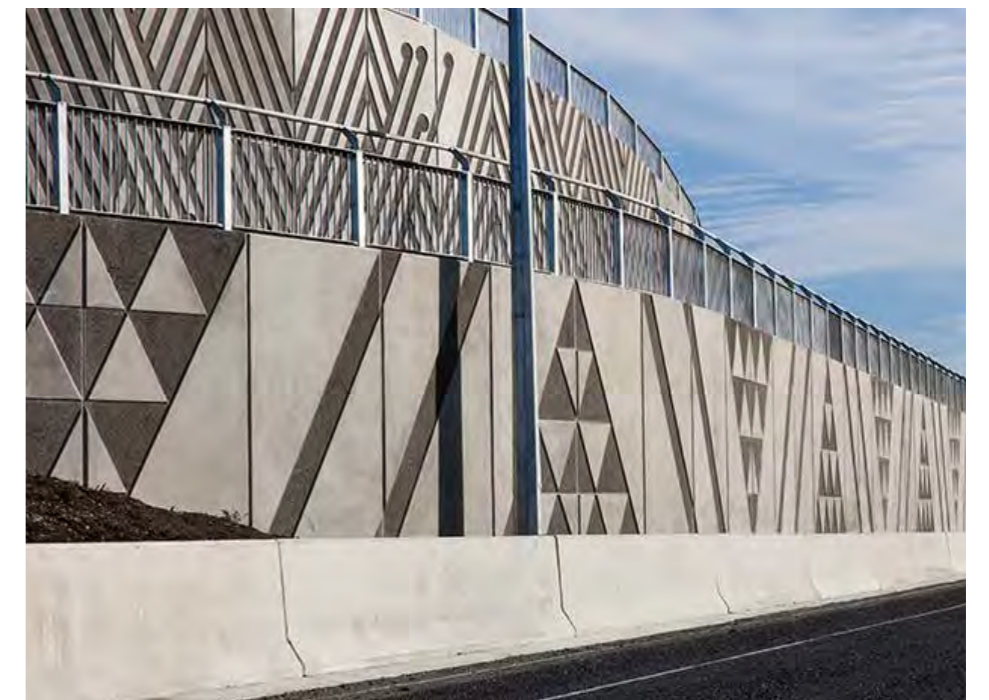
Repurpose the existing SH1 as a local spine and maintain connections on the following local roads:

- South Manakau Road
- Honi Taipua Street
- North Manakau Road
- Kuku Road
- Muhunua East Road

- Tararua Road
- Queen Street East

Repurpose the existing SH1 and SH57 (as will be informed by a separate revocation investigation being undertaken in partnership with local councils. This process has commenced and outcomes from it are not reported here nor are they relied upon, as that investigation is ongoing and outcomes are yet to be agreed. Nevertheless, ideas that are from an Ō2NL project perspective, relevant to that process are:

- Reduce posted speed limit
- Construct shared path between destinations for local community (this may entail connections with other planned shared use path network improvements)
- Introduce traffic calming devices consistent with slower speed and more local function
- Design local crossings of the highway to maximise ease of access, amenity, perception of personal safety, and legibility
- Underpasses should have end to end visibility, generous proportions, good amenity, and be well drained



Te Kakakura Retaining Wall
[<https://www.boffamiskell.co.nz/news-and-insights/article.php?v=te-kakakura-retaining-wall>]

Heritage

Aspects of the heritage landscape intercepted by the highway, as addressed in relevant planning maps and by Heritage New Zealand, relates to:

- Manakau township—located on a hill above the highway
- Kohitere Clearing—former settlement/occupation site and former sawmilling setting—located near Kimberley Road
- The sequence of named landmark foothills such as Pukehou and its terraces. The wetlands below Pukehou were an important occupied landscape with a number of villages and settlements of both Muaūpoko and Raukawa associations
- Historic Trails
- Marae and their connections from the highway and SUP
- Ashleigh House/Prouse property at Levin
- Bush tramways—east of Levin

The Cultural Impact Assessment reporting will provide further recommendations of important heritage features to recognise.

Earthworks for the project are expected to encounter some archaeological sites along waterways/forests. Unavoidable effects are to be managed by the archaeological authority, Heritage NZ and the protocols developed by the project partners. This will address matters such as excavation, documentation and dissemination of information.

Opportunities to express heritage connections are to be developed through detailed design, for example the Queen Street East connection, preliminary concepts of which are shown on the following pages.



Queen Street East Area Photographs
[Isthmus Group]

Highway

Queen Street East Concept

A concept for the Queen Street East connection has been developed in RMA phase of the project to help embed the core principles and recognise the important connections for mana whenua and the wider community in this area.

The outcomes sought are to be developed further in detailed design, as are illustrated in the two concepts on the following pages.

Tread Lightly, with the Whenua

- Investigate and seek to avoid sites of significance
- Avoid indigenous vegetation and seek to avoid impacts on nearby habitats including possible lizard habitat in grassland areas
- Ensure smooth transitions/tie into natural contours and the highway footprint including adjacent stormwater wetland and ecology offsetting sites
- Excavation is to avoid impacts on groundwater
- Ensure access is maintained to homes and properties retained in private ownership—including along the cul de sac end to Queen Street East and specifically that the physical access to the Prouse Homestead property is retained as is at its current location
- Ensure existing access to the Queen Street East shared path is maintained/ provided for, including potential relocation of a like for like informal carpark
- Through planting and other design measures, provide for appropriate screening of the bridge structure and elevated views from vehicles and the SUP for nearby residences including Ashleigh (Prouse Homestead)
- Ensure ephemeral waterway flows are diverted through a naturalised

pathway to and around the stormwater wetland near the shared use path

Create an Enduring Legacy

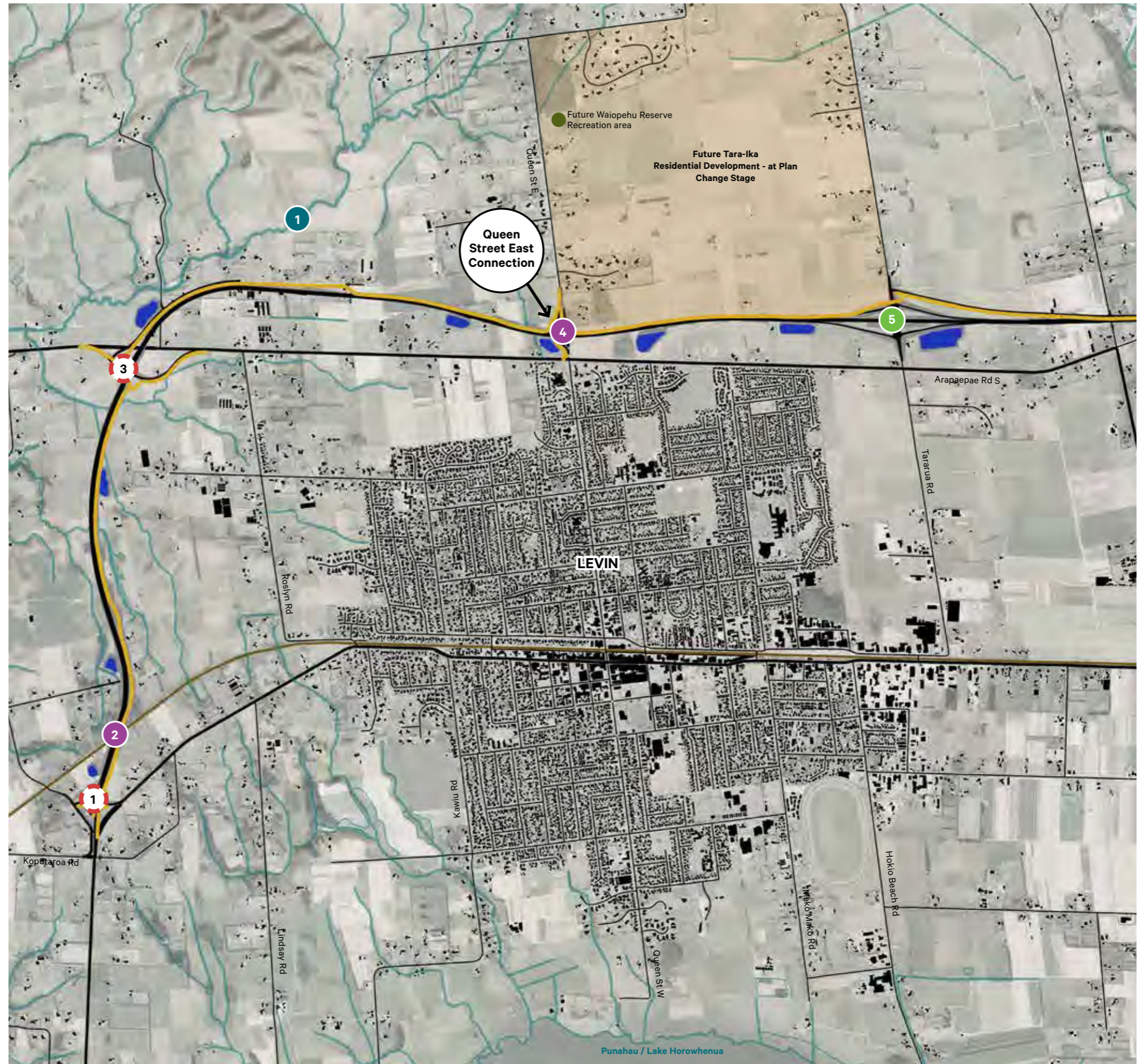
- Provide for rehabilitation of earth worked areas (including with indigenous planting) to enhance the natural character, corridor connections along Queen Street East and to create new and enhanced habitats appropriate to the context such as for mokomoko—lizards
- Through design and planting approach, maintain clear sight lines along Queen Street East including through the rehabilitation of the discontinued road reserve and in detailing of the cul de sac provided to access private properties
- Consider appropriate access to the southern ecological offsetting area (including fence protocols) from the shared path connection to Arapaepae Road
- Integrate appropriate separation and universal access grades along the walking and cycling connections including through use of timber in the

decking and railings

- Ensure clear sightlines through to the Tararua Range and Punahau / Lake Horowhenua are integrated into the design including the opportunity for lookout areas, off the main path
- Develop the design of the bridge connection/s, lookout areas and shared use path and planting to respond to the area's significance as a spiritual and traditional pathway. This will include possible expression of the Wai Mārie stream and reference to historic structures within the lookout and bridge forms, as part of the wider narrative for the area (including reference to the HDC concept developed for Waiopēhu Bush Reserve) and the mahi toi strategy for the project
- Consider opportunities to mark the historic path of Wai Mārie through the treatment and planting of the existing ephemeral waterway, including through alignment of a naturalised diversion within the designation and near the SUP

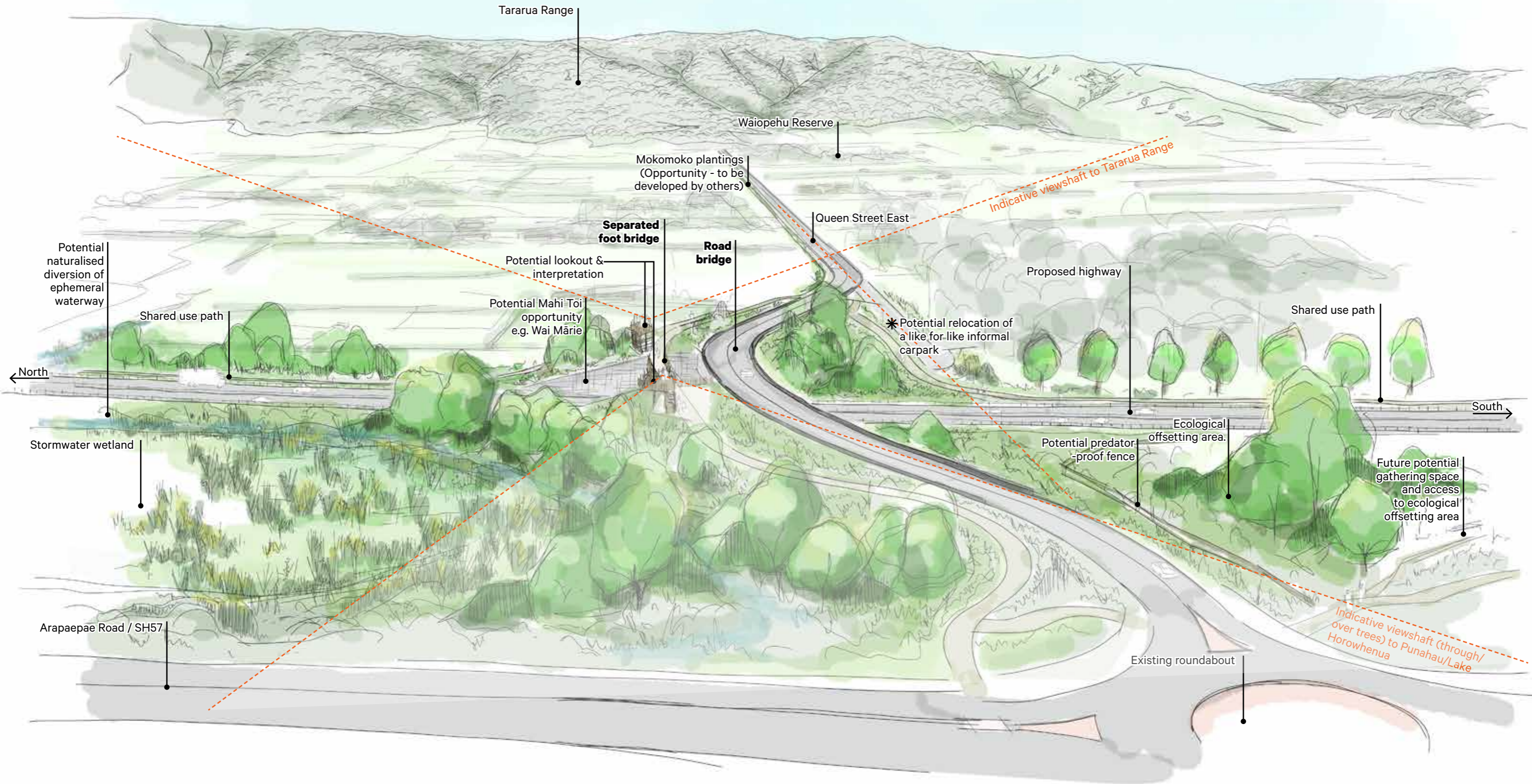
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 July '22

Legend.	
	Existing State Highway 1
	Local roads
	Railway line
	Awa, river
	Indicative highway alignment
	Proposed shared use path (SUP)
	Stormwater wetlands
	Roundabout
	Interchange with local road over highway
	Local road connection - over highway
Crossings, Roundabouts & Interchanges	
1	Northern Termination Roundabout
2	NMIT Bridge
3	SH57 Roundabout
4	Queen Street East Bridge
5	Tararua Road Bridge
Awa - Named Rivers & Streams	
1	Koputaroa Stream



Option A

East Outlook. Separated Foot and Road Bridge



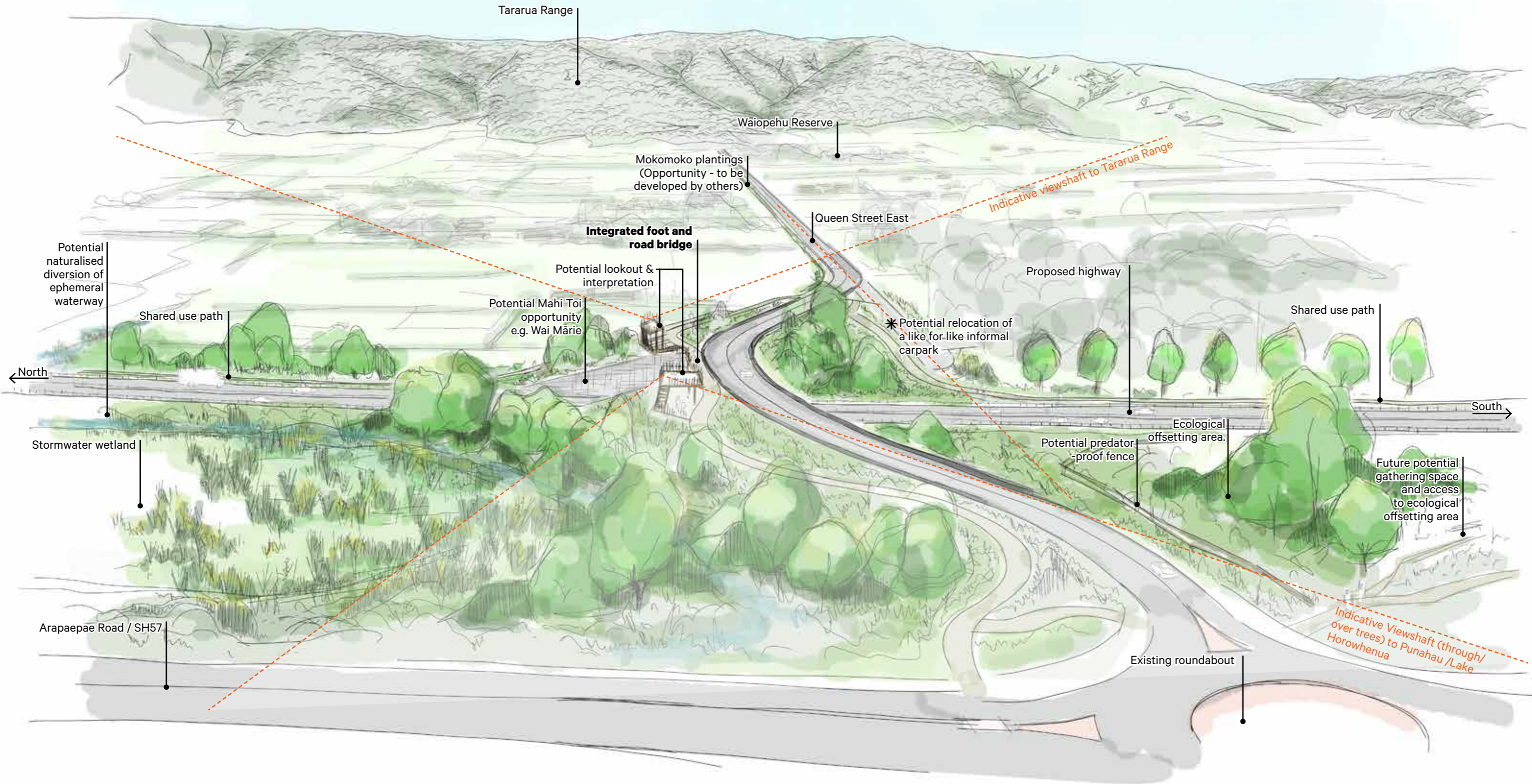
Option A

West Outlook. Separated Foot and Road Bridge



Option B

East Outlook. Separated foot and road bridge



Option B

West Outlook. Separated foot and road bridge



Shared Use Pathway

The shared use pathway (SUP) is to be generally aligned with the new highway, although separated by areas of planting, swales and batters to enhance experience of the wider landscape. The exception to this is to the south of Flat Bush where it follows the existing SH1. The outcomes for the SUP are:

- Provide consistent cues for movement and detailing where the shared use path crosses bridges over and under the highway, to connect with local roads and other parts of the walking and cycling network
- Provide connections between the Ō2NL shared-use/cycle path (i.e. adjacent to the new highway) to and from all local roads crossed including:
 - South Manakau Road
 - Honi Taipua Street (for Manakau Heights)
 - Mokena Kohere (school connection, requiring extension from existing road end)
 - North Manakau Road
 - Kuku Road
 - Muhunua East Road (for Ohau)
 - Kimberley Road
 - Tararua Road
 - Queen Street East
 - Waihou Road
 - The Avenue
- Consider improved connections between the Ō2NL shared-use pathway and SH1 where cycling and walking connections are proposed as part of revocation works (as will be determined in the revocation strategy). For example, consider improved connections along:
 - Honi Taipua Street
 - Muhunua East Road
 - Avenue Road

- Consider possible future connections to destinations including lakes, rivers, beaches, reserves such as Lake Waiwiri/Papaitonga Reserve and Punahau /lake Horowhenua, including tie ins to existing and planned shared path network
- Provide a sequence of pause points or rest areas including, for example, trees planted as tohu, sculptural markers including interpretation and options for digital storytelling, as part of the mahi toi strategy and narrative for the project
- Provide for rest areas in appropriate locations (from a Te Ao Māori perspective) and to enhance access to streams and for traditional uses
- Ensure CPTED (crime prevention through environmental design) principles are integrated including measures to deter dumping and rubbish traps within planting and ease of management to remove it
- Ensure weed management and mulching alongside SUP avoids a herbicide strip of bare ground

Stopping Places

A strategy for required stopping places along the highway is to be developed with locations to consider both maintenance requirements and connections to the shared use path.



Mackays to Peka Peka Expressway
[Natural Habitats
<https://www.naturalhabitats.co.nz/our-projects/mackays-to-peka-peka/>]

Highway

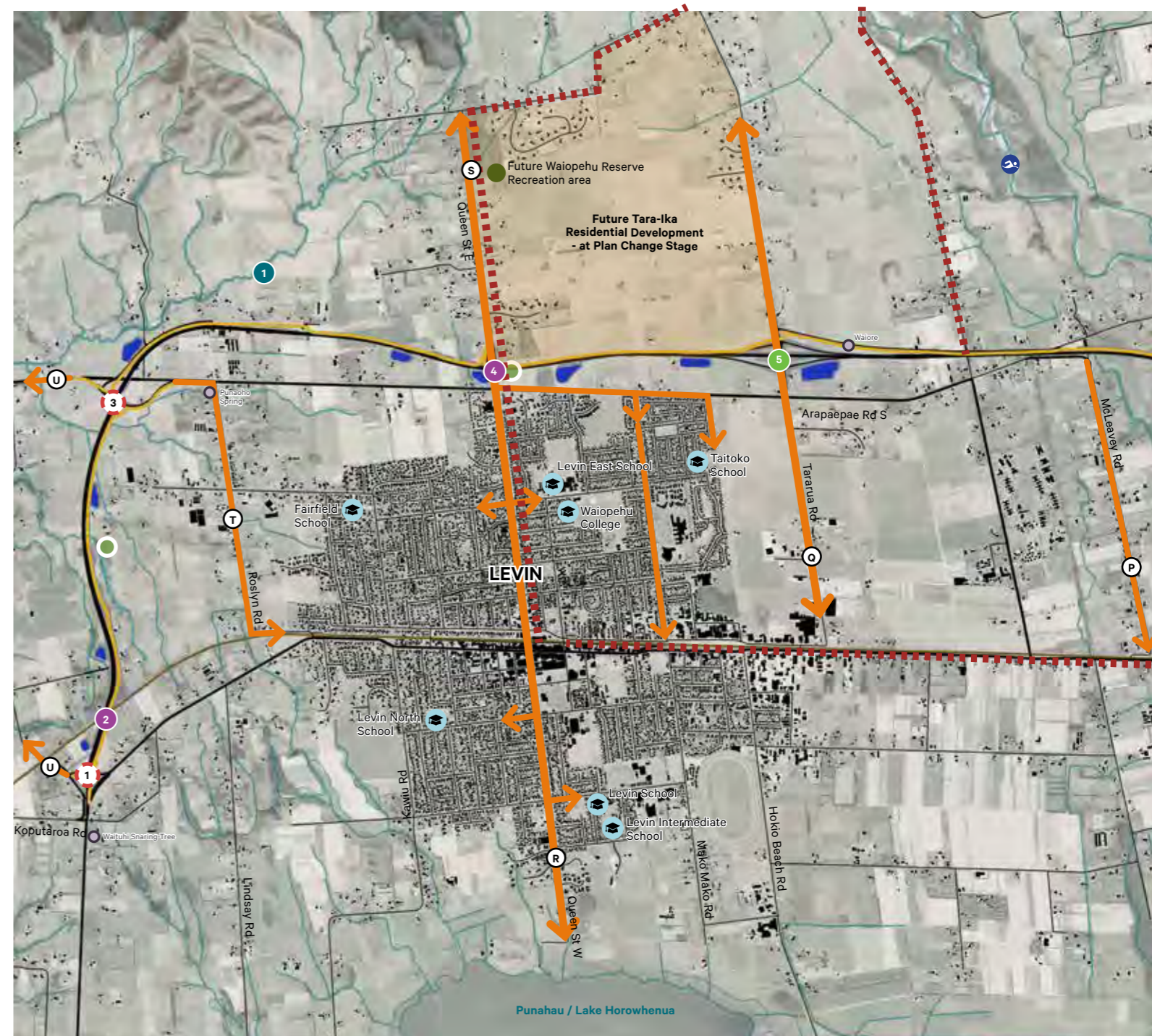
Project Shared Use Path and Possible Future Connections - Indicative, not part of Ō2NL Project

The project will develop a shared use path (SUP) along the highway with connections to and from local roads it crosses. Future connections, as could be provided in other projects, would support logical loops and connections between destinations. Possible future connections are shown on these indicative plans to illustrate how these have been considered in the design of the SUP. They are indicative and not part of the Ō2NL project.

Legend	
	Existing State Highway 1
	Local roads
	Railway line
	Awa/river
	Lake/roto
	Indicative highway alignment
	Shared use path
	Awa bridge - multispan
	Awa bridge - singlespan
	Roundabout
	Interchange with local road over highway
	Local road connection - over highway
	Local road connection - under highway
	Potential future SUP connection links - Not part of Ō2NL Project
	Possible future loop connections - Not part of Ō2NL Project
Crossings, Roundabouts & Interchanges	
1	Northern Termination Roundabout
2	NMIT Bridge
3	SH57 Roundabout
4	Queen Street East Bridge
5	Tararua Road Bridge
6	Muhunoa East Rd Bridge
7	Ohau Bridge
8	Kuku Bridge
9	Kuku East Rd Bridge
10	Waikawa Bridge
11	North Manakau Road Bridge
12	Manakau Heights Drive Bridge
13	South Manakau Road Bridge
14	Waiauti Bridge
15	SH1 Bridge

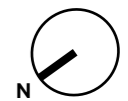
Awa - Named Rivers & Streams	
1	Koputaroa Stream
2	Ohau River
3	Makorokio Stream
4	Kuku Stream
5	Waikōkopu Stream
6	Waikawa River
7	Manakau Stream
8	Waiauti Stream
9	Waitohu Stream
10	Greenwood Stream
11	Ōtaki River
Marae & significant locations	
	In close proximity to highway [Ō2NL route selection data]
	Identified Constraints - Points In close proximity to highway [Ō2NL route selection data]
	Schools
	Swimming holes [HDC, LAWA]
	Possible SUP pause points

Possible future connections - not part of Ō2NL	
A	Connection of beginning of SUP into central Ōtaki
B	Connection to Taylors Road and beyond to Lake Waitawa and Kopureherehere tracks
C	Connection to Pukehou via existing track
D	Connection along local road to Lake Waitawa and camp
E	Connection to Pukehou along Waiauti Stream
F	Connection to Pukehou and Loop route around
G	Connection along Honi Taipua St. to proposed connection to Waikawa Beach
H	Connection to Mokena Kohere Manakau School
I	Connection to Waikawa Beach
J	Connection to Ebey settlement towards Panatewaewae Ridge Track in Tararua Range
K	Connection to Kuku
L	Connection to Kuku wider settlement
M	Potential future connection along Ohau River - to swimming locations
N	Connection into Ohau
O	Connection to Ohau River - potential loop track
P	Connection into Ohau along McLeavey Road
Q	Connection to Levin
R	Connection to Lake Punahau/Lake Horowhenua
S	Connection to Waiopahu Reserve and walking tracks
T	Connection to Levin
U	Connection to wider settlements

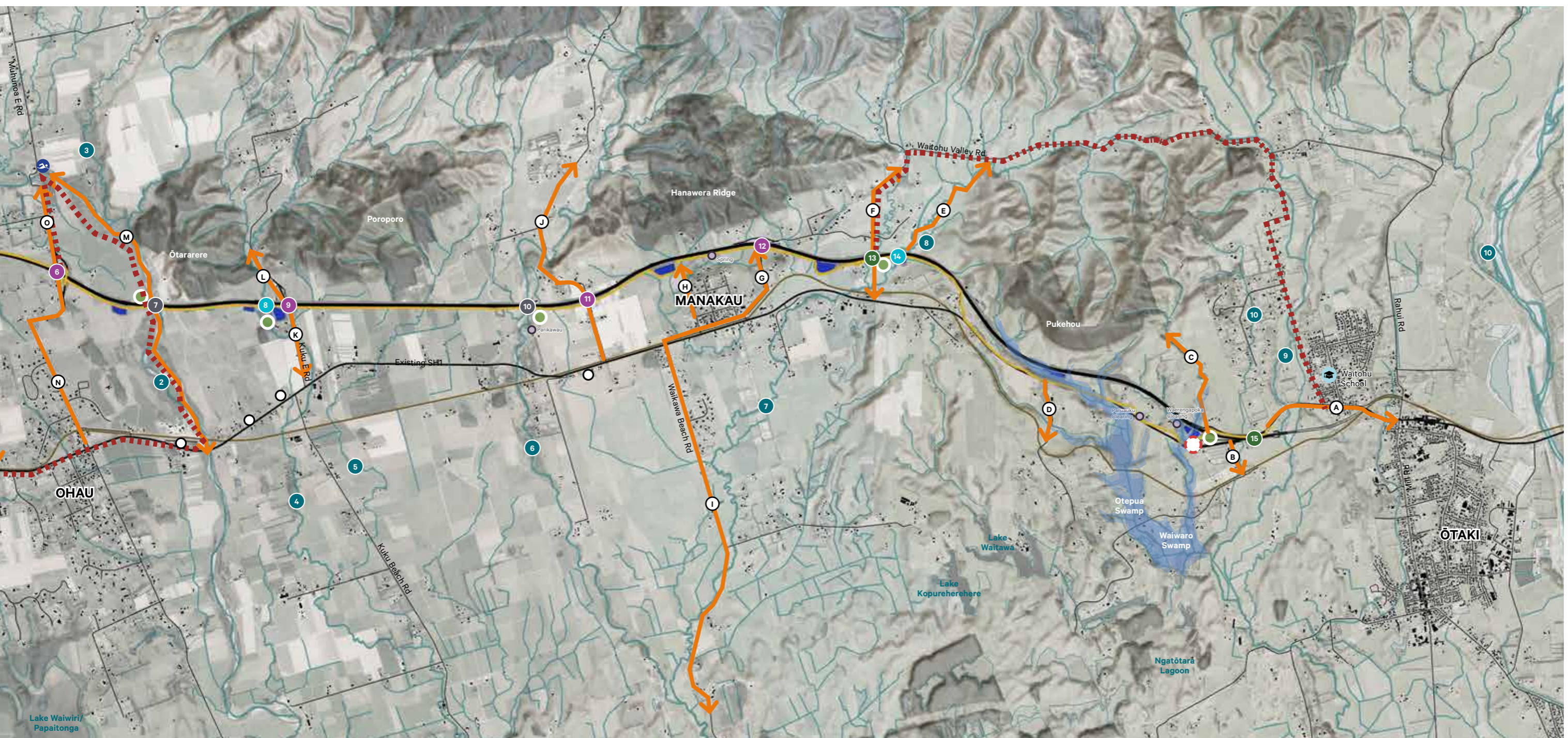


Note: Marae and significant features shown are adjacent to the proposed and existing highway, as agreed with the project partners.

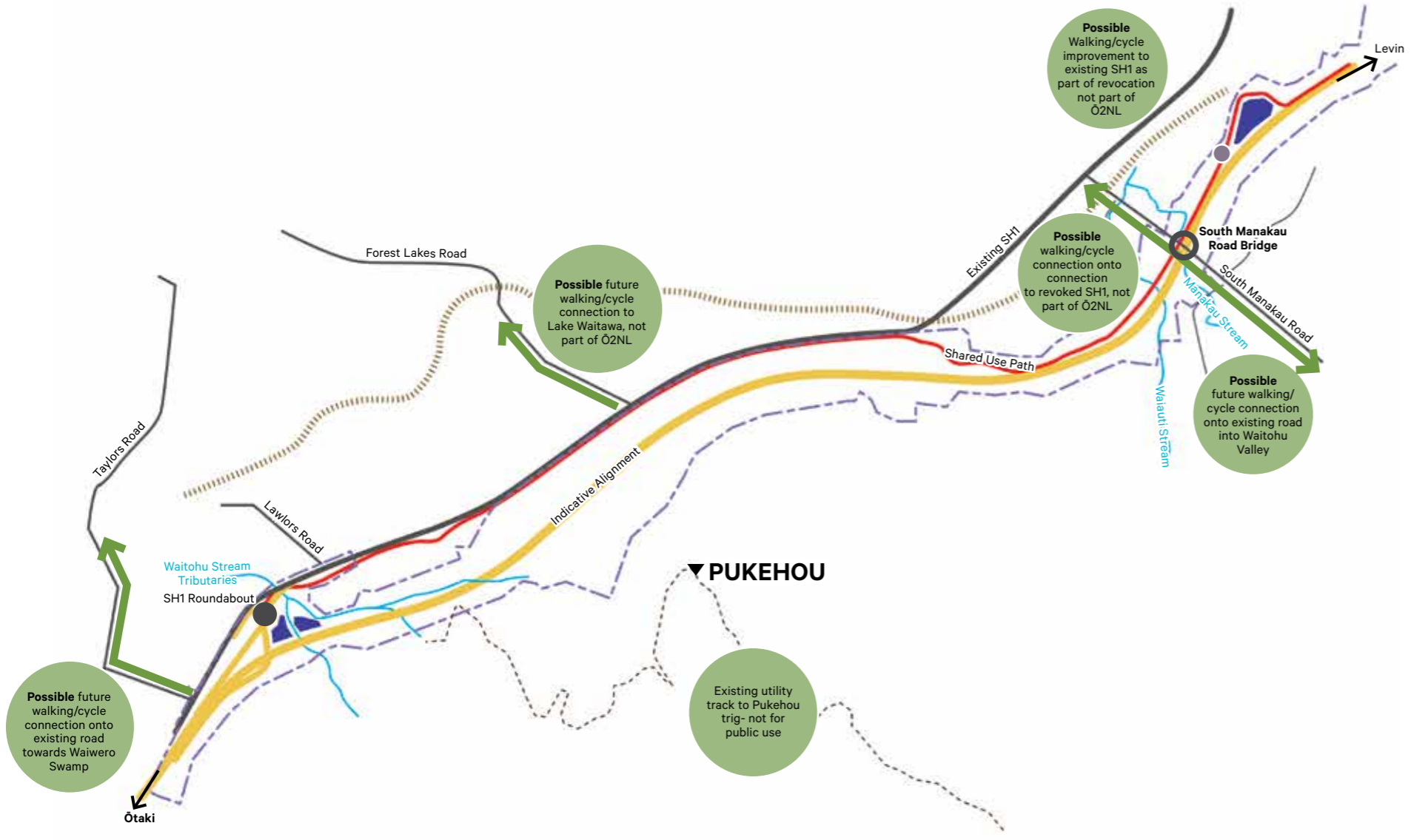
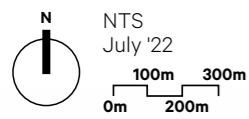
Note: these connections are shown as a possible future network, as considered in the design of the SUP, they are not part of the Ō2NL project or any confirmed cycling and walking strategy.



Scale: 1:40,000
July '22

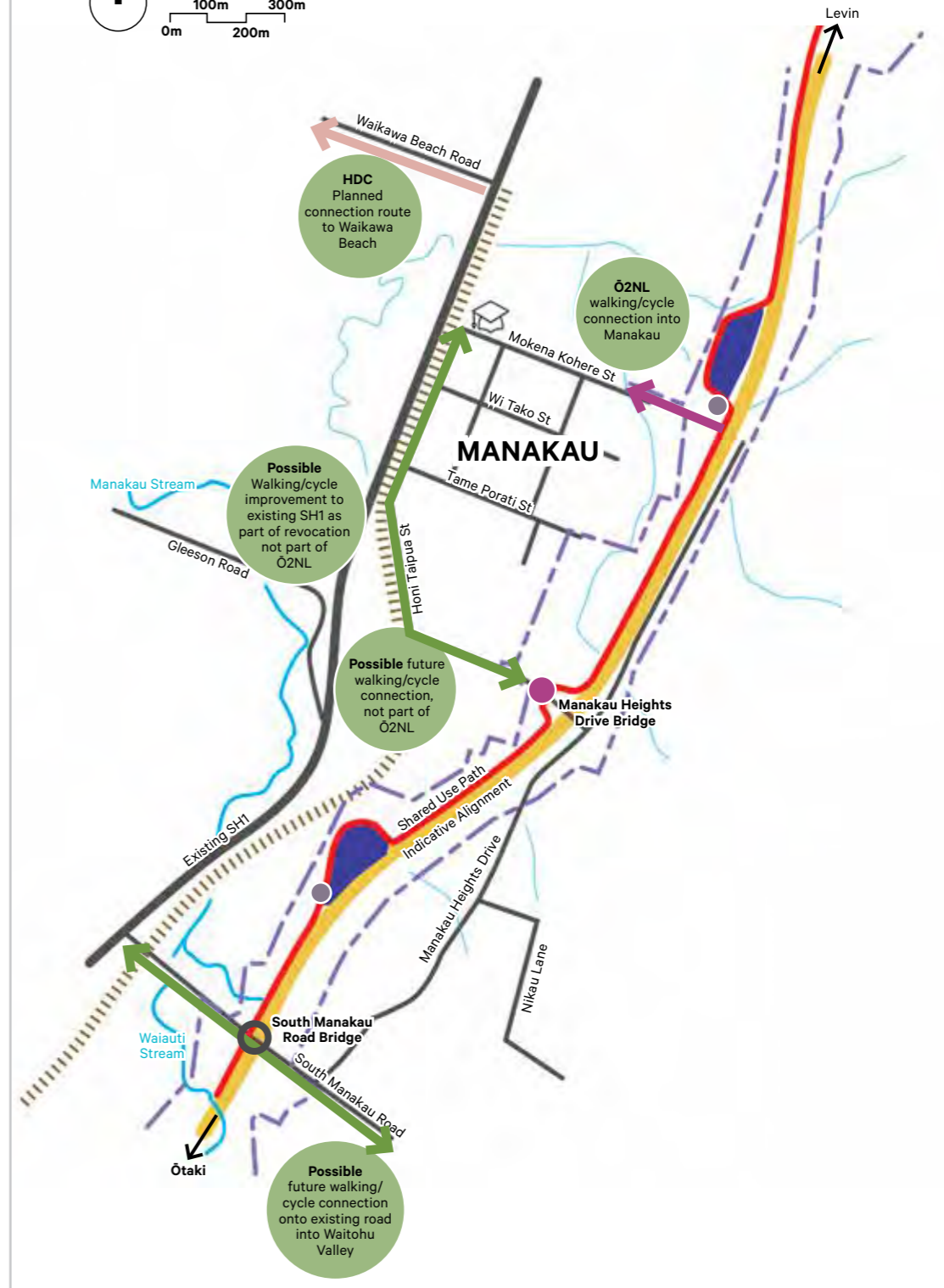
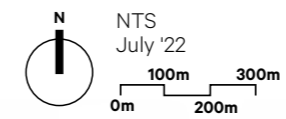


Pukehou

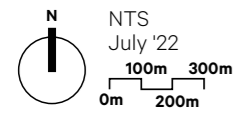


Legend	
	Ō2NL indicative alignment
	Ō2NL shared use path (SUP)
	NIMT railway
	Local roads
	Awa/waterways
	Proposed designation
	Stormwater wetland
	Potential SUP pause points, rest areas
	SUP connections to all local roads
	Ō2NL possible connection links to SUP
	Possible future walking/cycle connections, not part of Ō2NL project
	Existing utility maintenance tracks, not for public access
	HDC planned walking/cycle connection

Manakau

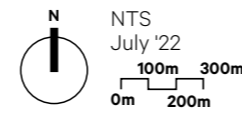


Ohau



Legend	
	Ō2NL indicative alignment
	Ō2NL shared use path (SUP)
	NIMT railway
	Local roads
	Awa/waterways
	Proposed designation
	Stormwater wetland
	Potential SUP pause points, rest areas
	SUP connections to all local roads
	Ō2NL possible connection links to SUP
	Possible future walking/cycle connections, not part of Ō2NL project
	Existing utility maintenance tracks, not for public access
	HDC planned walking/cycle connection

Queen Street East



5. Next Steps



5.1 Next Steps.

Outcomes and documentation to guide procurement, construction and management practices are being developed in parallel with the CEDF and to integrate the core principles.

The consent version of the CEDF is provided in support of the RMA applications. During the following phase (once consents have been granted) the outline plan design is to be developed in accordance with the CEDF principles. The design should be reviewed against the design principles to show how it has been developed from the CEDF. A draft template for the review - the CEDF Design Audit matrix - is shown below.

Design Review Audit

The overarching purpose of the Cultural and Environmental Design Framework (CEDF) is to integrate the design elements of the Ōtaki to north of Levin Highway Project (the Ō2NL Project or Project) in response to context and agreed overarching principles – Tread Lightly, with the Whenua and Create an Enduring Legacy. These principles place Te ao māori, mātauranga māori and te mana o te wai at the centre of the design framework. Anticipated outcomes, for both the landscape and highway components of the Project, flow from these principles, and the values that underpin them. Overall, the challenge for the Ō2NL, in achieving its planning and investment objectives, is to look for all opportunities to ‘first do no harm’ and to let the whenua and the awa be its natural self.

The CEDF will continue to be expanded and refined throughout the life of the Project. The design audit represents a point in time audit. It is intended to help guide the future stages of design development by identifying areas where improvement, and greater alignment with the principles, is wanted and will be investigated, noting critically that while it is desirable to make all aspects of the Project positive, this is not always possible. It is recognised that the Project will deliver considerable positives, however, due to its nature and extent, there will be unavoidable negative attributes.

The audit helps identify the negative aspects and actions to address where practicable, along with the reasons for unresolved issues and where there are trade-offs. For example, it is not possible, nor appropriate, to close out all areas where improvement is wanted at the Concept Design stage. Some matters will need to be addressed in detailed design, construction and in ongoing operation and management; and this is to be signalled in the audit column ‘close out phase’. CEDF Audits will be undertaken at important milestones in the Project’s design development to map progress and guide refinement.

Outcomes and documentation to guide procurement, construction and management practices are being developed in parallel with the CEDF and to integrate the core principles.

The consent version of the CEDF is provided in support of the RMA applications. During the following phase (once consents have been granted) the outline plan design is to be developed in accordance with the CEDF principles. The design should be reviewed against the design principles to show how it has been developed from the CEDF. A draft template for the review - the CEDF Design Audit matrix - is shown below.

Audit Criteria and Grading

The audit criteria have been derived from the key parts of the CEDF. The table below describes the colour coding used in the audit. The audit includes commentary which identifies the direction of the additional mahi required.

In undertaking the grading it has been agreed that the Orange status is likely to be retained for the more complex unknowns/variables in play, and where there is a continually changing environment – for example, in response to water. This ensures that appropriate focus on important matters is retained and continuous.

‘Go’ – the design integrates the best /good outcomes possible relevant to the consent stage (areas for improvement are known and captured in the CEDF and/or other relevant processes)
Work in Progress -general/specific areas to be worked through, with practicable design measures available *
A red flag – not successful (generally or in a specific location) where there is still concern and further investigation is required to determine that all practicable options to resolve / address issues have been explored and discounted
TBC - in future stages (CEDF outcomes will guide this, so need to be developed to an appropriate level)
NA – not relevant to this component
Unknown -requires more information

* the Orange status is likely to be retained for the more complex unknowns/variables in play, and where there is a continually changing environment – for example, in response to water. This ensures that appropriate focus on important matters is retained and continuous.

CEDF Design Audit Draft Matrix

Supporting evaluation criteria preserve, restore, enhance, create.	Tread lightly, With the Whenua	Notes - design focus /key measures tbc including role in carbon reduction	ACTIONS TO RESOLVE	Audit and close out phase	Enduring Legacy	Notes - design focus /key measures tbc	ACTIONS TO RESOLVE	Audit and close out phase
Landscape								
Awa, Repo and Wai								
Culverts								
Stream diversions								
Stormwater swales								
Stormwater wetlands								
Rehabilitation Planting -on earthworks								
Restoration Planting -on natural ground								
Highway								
Bridges								
Underpasses								
Safety barriers								
Medians								
Surfaces, built materials								
Retaining walls								
Lighting/sunstrike								
Air Quality								
Roadside Weed Management								
Noise- Integrated Design								
Interchanges and Roundabouts								
Cut and fill batters								
Topsoil								
Spoil Disposal								
Construction Yards								
Material Supply								
Names								
Signage and Interpretation								
Mahi Toi								
Heritage								
Shared Use Pathway								
Stopping Places								

5.2 Design Audit.

The following audit (third iteration) was undertaken during August 2022 in partnership with Muaūpoko Tribal Authority and hapū of Ngāti Raukawa ki te Tonga including reformatting to separate out each focus area and the close out phase.

Supporting evaluation criteria 1. preserve, restore, enhance, create.	Tread lightly, with the whenua	Notes - design focus /key measures tbc. *Long list role in carbon reduction applies (to be updated)	ACTIONS TO RESOLVE	Audit and Close out Phase	Enduring Legacy	Notes - design focus /key measures tbc	ACTIONS TO RESOLVE	Audit and Close out Phase
Landscape								
Awa, Repo and Wai								
		1. Some transfer between catchments of tributaries of the Ōhau and separately between tributaries of the Waikawa occur via the stormwater treatment devices	1– Present more information to hui groups. 1, 2 and 3– Detailed design stage to seek to eliminate /minimise cross catchment movements, and avoid/ minimise effects on groundwater (ongoing focus of project team-partnership)	Procurement & Detailed Design		1. Rehabilitation and restoration planting (extents, types and indicative species, eco sourcing and linked to microclimate/landscape narrative including wetlands)	1– Integrated planting plans (Volume III) and CEDF provide planting approach and palette which imbed species selection being linked to local context and narrative. Monitor through detailed design development. Approach to eco-sourcing to be confirmed during detailed design process / procurement of resource.	Detailed Design, Construction
		2. Construction methodologies relative to awa, repo and wai minimise and manage effects, including through ESC provided in the DCR and provided for in proposed conditions. Residual effects accounted for through ecological mitigation, offsetting and compensation measures.	1, 2 and 3– Detailed design stage to seek to eliminate /minimise cross catchment movements, and avoid/ minimise effects on groundwater (ongoing focus of project team-partnership 2 – Monitor construction processes and standards to avoid / manage effects on flora and fauna (as part of ongoing management and improvement (and include consideration of alternative techniques to flocculant in ESC))	Detailed Design		2. Retirement of streams and wetlands from agricultural farming	2 and 3– proposed locations specified, with detail to be developed ahead of construction and subject to ecology planting plans (to be developed as part of detailed design and ecology management plan) and location layout plans	Detailed Design
		3. Road construction intersects with groundwater in 3 places (in the vicinity of CH 11,000-12,000; 26,500-27,500; and 29,000). Construction methods and design	1, 2 and 3– Detailed design stage to seek to eliminate /minimise cross catchment movements, and avoid/ minimise	Detailed Design		3. Creation of new wetland and open water at material supply sites	2 and 3– proposed locations specified, with detail to be developed ahead of construction and subject to ecology	Detailed Design

Supporting evaluation criteria 1. preserve, restore, enhance, create.	Tread lightly, with the whenua	Notes - design focus /key measures tbc. *Long list role in carbon reduction applies (to be updated)	ACTIONS TO RESOLVE	Audit and Close out Phase	Enduring Legacy	Notes - design focus /key measures tbc	ACTIONS TO RESOLVE	Audit and Close out Phase
		means no effect on groundwater movement anticipated.	effects on groundwater (ongoing focus of project team-partnership)				planting plans (to be developed as part of detailed design and ecology management plan) and location layout plans	
		4. Material supply sites (Ōhau River North, Waikawa Stream South and at Koputoroa will intersect groundwater. Legacy outcome principles developed to provide positive ecological and hydraulic outcomes, including creation of wetland and open water habitats.	4– Ongoing involvement in detailed design of legacy outcomes of material supply sites.	Detailed Design, Construction		4. Stormwater treatment design result in improvement in water quality	4– Monitor through detailed design progress through construction management and long term operation and maintenance plans	Detailed Design, Construction
		5. Detailed design of each stream diversions to be developed ahead of construction, including planting, maintenance, and management regime. Typical outcomes shown in drawing set (Volume III) and outcome principles specified in DCR and CEDF.	5– Ongoing involvement in stream design and monitoring of stream diversion construction.	Detailed Design and Construction		5. Whole of Project cultural water quality monitoring plans to be developed	5– Develop complementary project 'Te mana o te wai' strategy and implement.	Detailed Design, Construction
		6. Process for involving Kaitiaki / iwi in design development and construction methodologies is not clear and should include broader outcomes.	6– define scope of involvement of kaimahi and kaitiaki in design development and construction methodologies during detailed design phase leading into construction. Broader outcomes subject to Project Charter and Partnership process.	Procurement				
		7. Seek to minimise construction water requirements, and to reduce new water take requirements by using existing takes.	7 and 8– develop a 'Te mana o te wai' monitoring strategy (water baseline and construction monitoring) and implement prior to construction start.	Detailed Design				
		8. Develop detailed construction freshwater monitoring regime	7 and 8– develop a 'Te mana o te wai'	Detailed Design				

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		that incorporates cultural health monitoring aspects.	monitoring strategy (water baseline and construction monitoring) and implement prior to construction start.					
		9. Opportunity to embed the Maramataka in construction (and design) methodology	9- Develop a Maramataka strategy and embed in ecology, planting/ landscaping, and construction management plans.	Detailed Design				
Culverts		1. Existing fish passage retained	1, 2 and 3 monitoring to be stipulated in management plans / conditions	Detailed Design		1. Fish passage provided with ongoing monitoring requirements	1 - monitoring to be stipulated in management plans / conditions	Detailed Design
		2. Longer culverts only where minimises length of stream diversion/ reduces loss of stream length.		Detailed Design		2. Flood management improvements	2 - flood performance of road to be checked and to be confirmed through the detailed design process through management plans/conditions	Detailed Design
		3. Monitoring of long- term effectiveness unclear		Detailed Design		3. Design of culverts (and how integrated with streams) to be confirmed prior to construction	3 - performance of culverts to be confirmed through detailed design process (RMA conditions in accordance with NES requirements)	Detailed Design
		4. Involvement of kaitiaki in construction methodology not clear.	4 - define scope of involvement of kaimahi and kaitiaki in design development and construction methodologies during detailed design phase leading into construction.	Procurement / Construction				
		5. Carbon saving measures for construction of culverts to be investigated during detailed design phases*	5. Carbon saving opportunities to be targeted workstream during detailed design phase.	Detailed Design				
		6. No structure which creates a barrier to native fish passage	6 +7 detailed design to include fish passage and	Detailed Design				

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			sediment control with ongoing management and monitoring during construction and operation					
		7. All new in stream structures should avoid the creation of sediment	6 +7 detailed design to include fish passage and sediment control with ongoing management and monitoring during construction and operation	Detailed Design				
Stream Diversions		1. See above, included in the assessment of awa, repo and wai		Detailed Design		1. See above, included in the assessment of awa, repo and wi		Detailed design
Stormwater swales		1. Plant species check to ensure that reduces / avoids species attractive to birds so as to reduce opportunity for bird strike	1 - species used & design approach to listed the CEDF.	Detailed Design		1. Concept planting plans provided in Volume III which show how stormwater planting integrated to create an overall habitat and contributes to natural character (form and function)	1 – integrated planting plans to be developed as part detailed design process.	Detailed Design
		2. Rock lining check on cut faces / steep areas	2 COMPLETE- all swales will be vegetated	Detailed Design				
		3. Carbon saving measures for construction of swales to be investigated during detailed design phases *	3 - Carbon saving opportunities to be targeted workstream during detailed design phase	Detailed Design				
Stormwater wetlands		1. Location and/or planting to avoid bird strike	1 and 2 – CEDF specifies planting palettes. Detailed design phase to confirm integrated planting plans which will seek to avoid bird strike. Continued involvement in detailed design phases, including ongoing monitoring. Note: treatment train need plants to help reduce water temperatures.	Detailed Design		1. Concept planting plans provided in Volume III which show how stormwater planting integrated to create an overall habitat and contributes to natural character (form and function). Form and function, to ensure contribution to natural character and habitats including planting linked to microclimate/landscape narrative and biodiversity.	1 – Integrated planting plans to be developed as part detailed design process	Detailed Design
		2. Location and design of discharges to whenua and then awa, wai and repo to be confirmed and will take into consideration water		Detailed Design		2. Undertake representative monitoring of stormwater systems for treatment effectiveness.	2 - develop a 'Te mana o te wai' monitoring strategy	Detailed Design

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		temperature (overheated water to be managed through planting)					Note: overall improvement in water quality anticipated to be achieved by the Project	
		3. Carbon saving measures for construction of wetlands to be investigated during detailed design phases *	3 - Carbon saving opportunities to be targeted workstream during detailed design phase.	Detailed Design, Procurement				
Rehabilitation Planting – on earthworks		1. Areas of planting by type shown on planting plans (Volume III)	1, 2 - involved in detailed design development of planting plans to identify where specific mahinga kai or rongoa planting can be provided, or to celebrate cultural values	Detailed Design		1. Planting species and design that responds and celebrates the cultural landscape	1, 2 - principles provided in the CEDF and will inform development of detailed design including planting plans.	Detailed Design
		2. Planting types to avoid bird strike and consider sustainable harvesting opportunities (e.g. totara), but also to appropriately integrate the Project into the landscape		Detailed Design		2. Integrated planting concept plans showing extent, types and indicative species provided in Volume III. Details of eco-sourcing and specific species to be linked to microclimate/landscape narrative to be developed.	1, 2 - principles provided in the CEDF and will inform development of detailed design including planting plans.	Detailed Design
		3. Ongoing management and maintenance of planting to be confirmed including pest plant management strategies	3 - maintenance and management regime include pest plant management is provided for in the conditions (attached as Appendix Six to Volume II)	Detailed Design, Procurement		3. Front foot broader outcomes e.g. supply/management	3 - Detailed design to include safe/practicable access to mahinga kai and Rongoa opportunities delivered by the project e.g. Material Supply Sites. Broader outcomes subject to Project Charter and Partnership process.	Detailed Design
		4. Carbon saving measures for rehabilitation planting to be investigated during detailed design phases *	4 - Carbon saving opportunities to be targeted workstream during detailed design phase.			4. Pest plant corridor management strategy to be developed	4 - pest plant plans will be in place for construction period and until plants establish. Ongoing corridor maintenance plan will include pest management and forms	

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							part of Waka Kotahi broader strategies.	
Restoration Planting – on natural ground		1. Areas for planting to be confirmed, including approach for planting and on-going monitoring and management requirements.	1 where has not been secured, then conditions will require land owner engagement to discuss natural character planting opportunities. Detailed design phase to develop final planting plans that provide integrated outcome in accordance with the CEDF. 1, 2 - principles included in the CEDF. Integrated concept planting plans (Volume III) and these will be developed as part detailed design process, in accordance with CEDF and as specified by conditions.	Detailed Design		1. Integrated concept planting plans provided in Volume III and show extent, types and indicative species. Details to be developed to ensure that plans for each place are appropriately linked to microclimate/landscape narrative. Planting plans to include mahinga kai and Rongoa opportunities.	1 Design response outcomes for all types of restoration included in CEDF and detailed design process will provide next level of detail. Identify opportunities for and where possible include mahinga kai and Rongoa access in design layouts.	Detailed Design
		2. Integration of planting requirements with fauna requirements to be confirmed Pest control strategy approach now provided in Technical Report J with detail to be developed through the ecology management plan.	1, 2 - principles included in the CEDF. Integrated concept planting plans (Volume III) and these will be developed as part detailed design process, in accordance with CEDF and as specified by conditions 2 – animal and plant pest management to be developed as part of implementation of the ecological response package and management plans, with performance requirements specified in conditions (Appendix Six to Volume II).	Detailed Design		2. Front foot broader outcomes e.g. supply/management.	2 Broader outcomes subject to Partnership process.	Procurement
Natural Character Restoration (part of restoration planting)		3.General alignment matters are green, as informed by the preferred option selection	3. review detailed design	Detailed Design		3.Natural Character legacy results from landscape and highway outcomes - associated with streams and rivers	3. - review designs.	Detailed Design

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		4.Natural character opportunities to be confirmed with landowners (who can say no)	4 - landowners to be approached to discuss opportunity to plan during detailed design phase	Detailed Design		4.Outcomes depend on agreement with landowners being reached	4 - landowners to be approached to discuss opportunity to plan during detailed design phase	
		5.No drainage of any wetland or any areas which have significant natural ecosystems	5. review detailed designs, monitor through construction including roles for kaimahi and kaitiaki	Detailed Design				
		6.The protection and conservation of acknowledged "Pataka Kai"	6. review detailed designs, monitor through construction including roles for kaimahi and kaitiaki	Detailed Design				
Highway								
Bridges		1. Construction methodology and design of bridges provided in the DCR and shown on drawings. Processes to appropriately avoids awa, wai and repo are included and effects otherwise identified and assessed through the Plans.	1– review detail of construction footprint during detailed design phases to identify opportunities to further reduce effects. Identify opportunities for early planting to provide early offset benefits ahead of construction proper.	Procurement ,Construction		1. Typical details, landscape and habitat connections, urban design qualities shown on drawings and principles provided in the CEDF.	1– Planting plans to be developed as part detailed design process, with approach specified in CEDF and conditions.	Detailed Design
		2. Concept planting plans take into consideration passage of birds across the new road. Limited opportunities for lizards and animals to traverse under / across the new road where bridges over water courses proposed at Ohau River and Waikawa, Kuku and Manakau Streams.	2– develop detailed designs and develop flora and fauna cross project movement options.	Detailed Design		2. Mahi toi opportunities reserved in the CEDF allowing process to secure outcomes across the Project landscape.	2– High level approach and outcomes included in CEDF to be developed further in detailed design	Detailed Design
		3. Carbon saving measures to be investigated during detailed design phases *	3– Carbon saving opportunities to be targeted workstream during detailed design phase.	Detailed Design, Procurement		3. Stopping places and pause points (SUP) strategy to be developed in CEDF linked to mahinga kai and rongoa	3– strategy signalled in CEDF to be developed in detailed design	Detailed Design
Underpasses		4. Location and intent of underpasses shown on drawings (Volume III)	4– Develop design of underpasses to ensure that integrated with landscape and the	Detailed Design		4. Check typical details, best practice crime prevention, landscape and habitat connections, urban design qualities	4– plans to be developed as part detailed design process, with approach	Detailed Design

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			whenua and provides appropriate access to appropriate locations.				specified in CEDF and conditions.	
		5. Carbon saving measures to be investigated during detailed design phases *	5- Carbon saving opportunities to be targeted workstream during detailed design phase.	Detailed Design, Procurement		5. Mahi toi opportunities, develop high level principles	5- agree approach in CEDF to be developed in detailed design	Detailed Design
Safety barriers	TBC	1. Refer to CEDF outcomes			TBC	1. Refer to CEDF outcomes		
Medians	TBC	1. Refer to CEDF outcomes						
Surfaces, built materials	TBC	1. Performance requirements of road surface (pavement) is specified in Technical Assessment B (Noise and Vibration).	1- Review designs as developed in detailed design phase.	Detailed Design	TBC	1. Refer to CEDF outcomes		
Retaining Walls		1. Check locations and general treatment (vertical, stabilised embankments) as part of footprint	1- review drawings and resolve issues through CEDF	Detailed Design		1. See below- could be considered in high level mahi toi strategy	1- agree approach in CEDF to be developed in detailed design	Detailed Design
Lighting		1. Planting of riparian margins to ensure that aquatic life (and users of streams) not affected by light spill from the new road	1- COMPLETE		TBC	1. See below - could be considered in high level mahi toi strategy eg feature lighting	1- consider principles / agree approach as signalled in CEDF to be developed in detailed design	
		2. Carbon saving measures to be investigated during detailed design phases *	2- Carbon saving opportunities to be targeted workstream during detailed design phase.	Detailed Design, Procurement				
Air Quality		1. Construction dust control protocols developed in principle (Technical Assessment C (Air Quality) to manage effects on vegetation, water courses and people.	1- review development of air quality management plans during detailed design phase leading to construction	Detailed Design, Construction		1. No operational air quality issues anticipated	COMPLETE	
		2. Opportunity to locate SUP away from the new road to be subject to ongoing design development to ensure 'best safe spaces' for active users.	2- review detailed design drawings to secure further improvements in design of the SUP	Detailed Design				
		3. Opportunity to use planting to help absorb air pollutants	3- consider planting types relative to communities and the SUP, as included in CEDF outcomes.	Detailed Design				

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Roadside Weed management		1. Construction weed pest management details will be included in the CEMP (as proposed by conditions) based on pest management principles provided in the DCR.	1– review pest management process in CEMP, developed as part of detailed design process.	Detailed Design, Construction		1. On-going corridor weed pest management plan to be developed.	1 and 2– pest plant plans will be in place for construction period and until plants establish. Ongoing corridor maintenance plan will include pest management and forms part of Waka Kotahi broader strategies.	Detailed Design, Construction
						2. Consider pest control and maintenance as part of the design of material supply sites.	1 and 2– pest plant plans will be in place for construction period and until plants establish. Ongoing corridor maintenance plan will include pest management and forms part of Waka Kotahi broader strategies.	Detailed Design
Noise -Integrated Design		1. CEDF principles developed and indicative designs for intersections/interchanges to reduce noise (Volume III and Technical Assessment B (Noise and Vibration))	1 and 2– review detailed designs. Review and consider integrating approaches to manage noise with planting plans and in a manner that celebrates cultural values.	Detailed Design		1. Approach and design of noise management to consider appropriate opportunities to acknowledge cultural values and narratives (to - be considered in high level mahi toi strategy)	1– plans to be developed as part detailed design process.	Detailed Design
		2. Noise mitigation strategy is to treat 'at source' through the use of high quality road surfaces	1 and 2 – review detailed designs. Review and consider integrating approaches to manage noise with planting plans and in a manner that celebrates cultural values.	Detailed Design		2. Improvement to noise environment for those who live on or close to the current SHs	2– COMPLETE	
		3. Noise barrier needed in some locations to provide further attenuation and integrated with road furniture, i.e. bridge barriers extended	3 and 4– review detailed designs. Review and consider integrating approaches to manage noise with planting plans and in a manner that celebrates cultural values.	Detailed Design				
		4. Opportunity to develop specific further noise treatment via barriers / bunds to be considered	3 and 4– review detailed designs. Review and consider integrating	Detailed Design				

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		between Tararua Rd and Queens St East (including Prouse homestead) to be considered at next phase of design	approaches to manage noise with planting plans and in a manner that celebrates cultural values.					
		5. Carbon saving measures to be investigated during detailed design phases *	5– Carbon saving opportunities to be targeted workstream during detailed design phase.	Detailed Design, Procurement				
Interchanges and Roundabouts		1. Principles for each interchange/roundabout included in the CEDF linkages also to rehabilitation planting, earthworks	1– review design development in detailed design phase	Detailed Design		1. Principles for each roundabout included in the CEDF. Refer also to local road connectivity, mahi toi and heritage	1– review design development in detailed design phase	Detailed Design
Cut and fill batters		1. General alignment matters are green, as informed by preferred option	1– COMPLETE			2. Concept rehabilitation planting including contribution to natural character and landscape impacts shown on drawings (Volume III)	2.– review drawings developed in detailed design phase.	Detailed Design
		2.Principles to integrate earthworks associated with material supply and spoil sites have been developed	2– Review of design of spoil and material supply sites during detailed design phase.	Detailed Design		3. Design of spoil sites and legacy outcomes of material supply sites to consider how integrity of soils / earth structures can be retained so land remains useful	3– review during detailed design development as part of construction methodology development.	Detailed Design
		3.Carbon saving measures to be investigated during detailed design phases*	3– Carbon saving opportunities to be targeted workstream during detailed design phase.	Detailed Design				
		4.Design of earthworks to collect and allow reuse of topsoil in catchment as part of planting and outcome / legacy strategies.	4– detailed methodologies to be developed as part of detailed design phase.	Detailed Design	TBC			
Topsoil		1. Review inclusion of topsoil stripping, placement and storage protocols in CEMP	1– review topsoil management process in CEMP, developed as part of detailed design process.	Detailed Design		1. See above – legacy outcomes associated with rehabilitation planting		
Spoil disposal		1. Sites selected based on MCA process and which avoid all ecologically sensitive areas and reduce effects on cultural areas of interest	1– Concept integrated planting plans provided and to be reviewed in detailed design phase.			1. End design of spoil sites to be confirmed and to recreate natural landforms	1– plans to be developed as part detailed design process, with approach specified in CEDF and conditions.	Detailed Design

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		2. Spoil sites to be integrated into rehabilitation planting strategy where practicable	2- Concept integrated planting plans provided and to be reviewed in detailed design phase.			2. Rehabilitation including habitat types, to contribute where appropriate to natural character outcomes. Concept integrated planting plans provided in Volume III.	2- plans to be developed as part detailed design process, with approach specified in CEDF and conditions.	Detailed Design
		3. Carbon saving measures to be investigated during detailed design phases *	3- Carbon saving opportunities to be targeted workstream during detailed design phase.					
Construction Yards		1. Sites selected based on MCA process and which avoid ecologically sensitive sites and reduce effects on cultural areas of interest	1- Concept integrated planting plans provided and to be reviewed in detailed design phase	Detailed Design		1. See above-legacy outcomes are associated with rehabilitation planting		
		2. Construction yard sites to be integrated into rehabilitation planting strategy	2- Concept integrated planting plans provided and to be reviewed in detailed design phase	Detailed Design, Construction		2.Store top soils to assist rehabilitation of areas within construction footprint, including compounds.	2- reviewed during detailed design development as part of construction methodology development.	Detailed Design
		3. Carbon saving measures to be investigated during detailed design phases *	3- Carbon saving opportunities to be targeted workstream during detailed design phase.	Detailed Design				
		4. Seek to combine haul roads, construction accesses, hard standing/ laydown areas needed for construction. Already looking to use stormwater ponds and ESC ponds for construction water storage	4- construction process / method to be reviewed through next phase.	Detailed Design				
Material Supply Sites		1. Sites assessed against range of ecological, environmental and cultural criteria and those selected avoid on balance sensitive areas and provide a positive legacy opportunity. Legacy principles provided in CEDF	1- Develop design of material supply sites as part the detailed design phase and which focus on securing positive outcomes to confirm CEDF principles and legacy outcomes	Detailed Design		1. Sites assessed and then selected on basis of ability to provide a positive legacy contribution	1- plans to be developed for confirmed sites as part detailed design process, with approach specified in CEDF and conditions.	Detailed Design
		2. Carbon saving measures to be investigated during detailed design phases **	2- Carbon saving opportunities to be targeted workstream	Detailed Design		2. Legacy principles established and confirmed in the CEDF	1 to 4 – plans to be developed for confirmed sites as part detailed	Detailed Design

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			during detailed design phase.				design process, with approach specified in CEDF and conditions.	
						3. Interface with the SUP to be resolved	1 to 4 – plans to be developed for confirmed sites as part detailed design process, with approach specified in CEDF and conditions.	Detailed Design
						4. Concept level rehabilitation including habitat types and public access are provided but detail including implementation strategy tbc	1 to 4 – plans to be developed for confirmed sites as part detailed design process, with approach specified in CEDF and conditions.	Detailed Design
						5. Access and ongoing management to be resolved including landowner agreements	5– make access requirements clear part of property agreements.	Procurement
Names	TBC	1. Refer to CEDF outcomes			TBC	1. Refer to CEDF outcomes		
Signage and Interpretation	TBC	1. Refer to CEDF outcomes			TBC	1. Refer to CEDF outcomes. Linkages also to mahi toi strategy		
		2. Linkages also to mahi toi strategy						
Local Road Connectivity and Communities						1. Principles for SUP provided in CEDF. Principles and Indicative design for Queen St East provided in Drawings (Volume III) and included in CEDF.	1– plans to be developed as part detailed design process.	Detailed Design
						2. Material supply sites provide opportunity for access to Ōhau River and Waikawa Stream	2– plans to be developed as part detailed design process.	Detailed Design
Mahi Toi		1. General principles provided in CEDF.	1– Mahi toi strategy to be developed in next phase of detailed design.	Detailed Design		1. Mahi toi narrative (e.g. natural environment focus including kaitiaki strategy) to be developed	1– mahi toi strategy to be developed in next phases.	Detailed Design
Heritage		2. General alignment strategically avoids direct impact on built heritage with detailed design aspects to be resolved to manage residual effects.	2– review design development in detailed design phase.	Detailed Design		2. Heritage high level principles, possible sites of focus for detailed design included in CEDF which are linked to mahi toi strategy.	2– Review detailed design plans	Detailed Design
						3. Opportunity to respond to built heritage values of marae that	3– consider opportunities to	Detailed Design

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						Project passes by to be considered in detailed design phase.	appropriately recognise, respect and celebrate nearby marae through planting plans, mahi toi, signage as appropriate.	
						4. Consider opportunities through integrated planting plan to recognise and celebrate natural 'heritage'	4- Review integrated planting plans.	Detailed Design
Shared Use Path		1. Alignment integrated into current and where known, the planned future network.	1- review design development in detailed design phase.	Detailed Design		1. Location of pause points (focus for mahi toi, interpretation) tbc	1- Review design development in detailed design phase..	Detailed Design
		2. Carbon saving measures to be investigated during detailed design phases *	2- Carbon saving opportunities to be targeted workstream during detailed design phase.	Detailed Design, Procurement		2. Inclusion and then design of local road car park areas tbc through detailed design process	2- Review design development in detailed design phase..	Detailed Design
		3. Design of local road connections integrated with planting plans and includes pedestrian and cycling facilities. Access opportunities to rivers and streams opportunities included in CEDF principles (legacy outcomes for material supply sites). Specific CEDF principles developed for Queen Street East reconnection. Carbon saving measures to be investigated during detailed design phases *	3- Review detailed design to ensure footprints efficient and integrated with planting plans. Carbon saving opportunities to be targeted workstream during detailed design phase	Detailed Design		3. Access for traditional uses, to cultural sites for mana whenua tbc.	3- plans to be developed as part detailed design process.	Detailed Design
Stopping Places		1. Strategy and principles for potential locations to be developed. Consider opportunities to align with cultural history / appropriate locations to celebrate the landscape, and or to access mahinga kai/ rongoa.	1- review design development in detailed design phase.	Detailed Design	NA	1. See above – strategy to be developed and locations selected. Where stopping places are for maintenance bays only	1- High level outcomes, process to develop a strategy to be included in next version of the CEDF.	Detailed Design

