Aromatawai Ngā Uara Ahurea o Te Pouwhenua o Tiakiriri Kūkupa Trust me Te Parawhau Hapū

Notice of Requirement and Designation

Under the Fast-track Approvals Act 2024

Brynderwyn Hills Section – Section 2B

Alternative to the Brynderwyn Hills Project

(Northland Corridor)

Waka Kotahi NZ Transport Agency



Photo: View north from the northern slope of Te Mano Hiwa Ariki across the proposed Project alignment toward Waipū.
(Image: Georgina Olsen)

Executive Summary

This Cultural Impact Assessment (CIA) has been prepared by Te Pouwhenua o Tiakiriri Kūkupa Trust on behalf of Te Parawhau Hapū in relation to the Notice of Requirement (Designation) and associated approvals sought by New Zealand Transport Agency Waka Kotahi (NZTA) for the Brynderwyn Hills Section (Section 2B) of the Northland Corridor within Te Parawhau takiwā.

This CIA is grounded in ngā uara ahurea o Te Parawhau Hapū as expressed through Te Pou Tarāwaho o Te Taiao, including Mana Atua, Mana o te Wai, Mana Whenua, Mana Ao Tūroa, and Mana Tāngata. These pou reflect interconnected systems of responsibility that guide the protection of ancestral whenua, ngā wai, ngāhere, taonga species, and the wellbeing of people across Te Mano Hiwa Ariki.

The assessment identifies that the Project, as currently proposed, will result in significant, widespread, and in many cases irreversible adverse effects on ngā uara ahurea o Te Parawhau Hapū, including:

- extensive modification of Te Mano Hiwa Ariki and associated ancestral landforms through large-scale earthworks and landform alteration;
- loss, fragmentation, and degradation of remnant indigenous ngāhere, including kahikatea, tōtara, and pūriri, and their associated systems;
- destruction and modification of interconnected freshwater systems, including awa, repo, and puna wai, and the degradation of te mauri o ngā wai;
- significant adverse effects on taonga species, their habitats, and ecological connectivity; and
- fragmentation of whenua and disruption of ongoing relationships between Te Parawhau Hapū and their ancestral taiao.

These remnant kahikatea stands, associated indigenous ngahere, and their surrounding and connected freshwater systems are taonga of high significance to Te Parawhau Hapū, and must be protected from adverse effects, including loss, modification, and degradation.

Independent technical reviews commissioned by Te Parawhau Hapū identify systemic deficiencies across the ecological and environmental assessments prepared for the Project, including the use of modified or inappropriate methodologies, incomplete baseline information, and reliance on unsupported assumptions. These deficiencies result in a consistent underestimation of ecological values, interconnected system functioning, and the scale and significance of adverse effects.

There is a clear disconnect between the scale, permanence, and interconnected nature of these effects and the reliance on mitigation, offsetting, and future management planning to address them. Key aspects of the Project rely heavily on deferred management plans, outline plan processes, and untested mitigation approaches, resulting in a lack of certainty that adverse effects can be appropriately avoided, remedied, or mitigated.

Therefore, the Project, as currently proposed, does not adequately recognise and provide for ngā uara ahurea o Te Parawhau Hapū, does not give effect to Te Tiriti o Waitangi, and does not provide sufficient certainty that the mauri of te taiao and its interconnected systems will be protected.

Accordingly, Te Parawhau Hapū do not support the Project in its current form.

This CIA concludes that a fundamental redesign of the Project is required, including alignment, interchange locations, and construction methodologies, with a clear emphasis on avoidance of adverse effects as the primary response, particularly where those effects are significant, irreversible, or relate to taonga and interconnected systems. This includes proper and genuine consideration of alternative approaches such as tunnels, bridging, and viaducts to minimise damage to Te Mano Hiwa Ariki and the wider taiao.

Where the Project is to proceed, it must do so within a framework that provides certainty at the point of designation and consent and embeds the role of Te Parawhau Hapū across all stages of the Project. This requires that:

- ngā uara ahurea o Te Parawhau Hapū are embedded at the centre of design, decision-making, and implementation;
- avoidance of adverse effects is prioritised over mitigation or offsetting, particularly where effects are significant, irreversible, or affect taonga and interconnected systems;
- all mahi whakaora identified in this CIA are secured as enforceable conditions of the designation and associated resource consents, including clear outcomes, limits, and performance standards;
- no reliance is placed on deferral to future management plans or outline plan processes to resolve fundamental uncertainties;
- Te Parawhau Hapū partnership and shared decision-making are embedded within a formal Rōpū Mahi, including hapū-appointed kaitiaki and subject matter experts; and
- monitoring, hold points, and tikanga-based processes are enforceable, including the ability to pause or modify works to protect the mauri of the taiao.

These measures are necessary to give effect to Te Tiriti o Waitangi, uphold the rangatiratanga and kaitiakitanga of Te Parawhau Hapū, and ensure that decision-makers, including the Expert Consenting Panel, can be satisfied that adverse effects on ngā uara ahurea and the mauri of the taiao are appropriately avoided and managed.

Recommendations Summary

Following the findings of this CIA, Te Pouwhenua o Tiakiriri Kūkupa Trust, on behalf of Te Parawhau Hapū, recommends that NZTA and the Fast Track Expert Consenting Panel:

- Confirm that the Project, as currently proposed, is not supported by Te Parawhau Hapū and must not proceed in its current form, due to the significant, irreversible, and interconnected adverse effects on ngā uara ahurea and te mauri o te taiao.
- Require a fundamental redesign of the Project, including alignment, interchange configuration, and construction methodologies, to ensure adverse effects on Te Mano Hiwa Ariki, Waipū, and the wider interconnected taiao are avoided, rather than mitigated, including full consideration of alternative approaches such as tunnels, bridging, and viaducts.
- Require that adverse effects on taonga and interconnected systems are avoided, particularly where effects are significant, irreversible, or uncertain, and confirm that reliance on mitigation, offsetting, or restoration is not sufficient where systems are not replaceable.
- Require that all mahi whakaora identified in this CIA are embedded as enforceable conditions across all statutory approvals, including designation conditions, NRC resource consents, WDC conditions, and all Outline Plan and management plan requirements.
- Ensure that statutory certainty is achieved at the designation and consent stage, with clear, enforceable outcomes, limits, and performance standards, and that no reliance is placed on deferral to future management plans or outline plan processes to resolve uncertainty, incomplete information, or untested mitigation.

- Require that management plans are used only to give effect to clearly defined conditions and are not relied upon to determine outcomes fundamental to the protection of ngā uara ahurea or te mauri o te taiao.
- Recognise Te Parawhau Hapū as Te Tiriti o Waitangi partners and require that partnership and shared decision-making are embedded across all stages of the Project, including through a formal Te Parawhau Hapū–NZTA Rōpū Mahi with defined decision-making roles.
- Require that cultural monitoring, ecological monitoring, hold points, and tikanga-based processes are enforceable, including the ability to pause or modify works where ngā uara ahurea, tikanga, wairuatanga, or mauri are at risk.
- Require that Te Parawhau Hapū are appropriately resourced and enabled to participate in governance, implementation, monitoring, and delivery, including opportunities to lead aspects of the Project where it chooses.
- Ensure that decision-making includes appropriate ecological and cultural expertise, including capability in Te Ao Māori and mātauranga Māori, so that cumulative and interconnected system effects are properly understood and responded to.

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Bay Ecological Peer Review – Freshwater Ecological Assessment

Bay Ecological Technical Review – Assessment of Effects on Avifauna

Bay Ecological Technical Review – Assessment of Effects on Terrestrial Ecology

Bay Ecological Technical Review – Fish Technical Review

Kūkūwai Technical Review of Ecological Reporting Prepared for the Northern Corridor Section 2B for Waka Kotahi NZTA

Appendix B: Te Parawhau Hapū Accidental Discovery Kaupapa

Appendix C: Mahi Whakaora

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1 Whakatauaki

Ka tukua te tira mate ki tua o Paerau

Ka noho te tira ora ki te Ao Tūroa

Ka tu te tira o Te Parawhau

“As we stand here and farewell our departed across the divide, we all stay here in the wellbeing of ao tūroa, we stand here as Te Parawhau”.

Na, Matua Te Ihi Tito

2 Introduction

This Cultural Impact Assessment (CIA) evaluates the potential cultural and environmental effects of the proposed Notice of Requirement and Designation under the Fast-track Approvals Act 2024 for the Brynderwyn Hills Section (Section 2B) of the Northland Corridor, from Te Mano Hiwa Ariki to Waipū.

This CIA has been prepared by Te Pouwhenua o Tiakiriri Kūkupa Trust, the Resource Management Unit (RMU) for Te Parawhau Hapū. The Trust holds the appointment to manage the Mana Whakahono ā Rohe with the Northland Regional Council (NRC) (2024), and acts on behalf of Te Parawhau in matters relating to resource management, cultural values, and the exercise of kaitiakitanga.

The Trust has also progressed a Mana Whakahono ā Rohe with the Whangārei District Council (WDC), which has been accepted by WDC and is currently in the process of being formalised. This reflects a consistent and developing statutory relationship framework across both regional and district authorities, reinforcing the role of Te Pouwhenua o Tiakiriri Kūkupa Trust in resource management processes affecting Te Parawhau Hapū.

2.1 Scope

The assessment considers the Project as proposed through the Notice of Requirement (designation) and associated resource consent applications within the rohe of Te Parawhau, with a focus on the area directly affected by the designation extending across the interconnected system of Mano Hiwa Ariki, the ridgeline of a thousand sacred peaks, through to Waipū.

This includes the living taiao associated with Mano Hiwa Ariki and its eastern extent at Te Pae o Tū, the maunga of Mareretu and Taipuha to the west, and the Waihoihoi Awa, Ahuroa Awa, and Waipū Awa, which traverse this whenua to Paepae Atua and Te Parawhau takutai moana.

These are not discrete elements, but form part of a continuous and interconnected taiao, where whenua, ngā wai, and the moana are inseparable, each sustaining and upholding te mauri o te ao tūroa. The integrity of the ridgeline system and its associated freshwater environments is fundamental to the health and wellbeing of downstream systems and the wider taiao.

The extent of Mano Hiwa Ariki is understood by Te Parawhau as a connected ridgeline system comprised of multiple peaks and associated landforms. This includes Piroa Maunga along the western ridgeline and the interconnected peaks on either side of the existing State Highway corridor, incorporating the Artillery Road locality to the east and extending across to Te Pae o Tū. Associated with this system are freshwater features including a wairere to the east of Piroa Maunga, which lies within or in close proximity to the current designation alignment, and Piroa Mānga and associated waterways, which flow along its foot to the south.

These areas sit within the wider whakapapa, which includes Manaia, Te Whara, Matariki, Taranga and ngā motu, and Te Wahapū o Whangārei Terenga Paraoa, including Maungawhati to the north. Together, these are not separate places, but expressions of one interconnected taiao. For Te Parawhau, these relationships are continuous; whenua, ngā wai, and the moana are inseparable, each carrying and sustaining the mauri of the other.

This CIA focuses on the significance of these interconnected taiao to Te Parawhau. It assesses potential effects on ngā uara ahurea o Te Parawhau, including the mauri of the taiao and the wellbeing of the Hapū and wider hapori.

The assessment is informed by hapū engagement, mātauranga Māori, and technical expert reports associated with the Fast-track substantive application, alongside observations of the taiao, ngā wai, and whenua. While this CIA does not independently assess engineering design, economic considerations, or statutory planning provisions, it evaluates the implications of the designation and associated works, including large-scale earthworks, cut

and fill activities, and the degradation and, in some cases, destruction of the mauri and integrity of the taiao and its taonga species.

Relevant statutory frameworks are interpreted through Te Parawhau pou tarawaho and mātauranga, with emphasis on the protection of te taiao in accordance with ngā uara ahurea o Te Parawhau. A suite of mahi whakaora is provided in response to the effects identified, with a focus on protecting and restoring the mauri of ancestral taiao.

This approach reflects engagement undertaken to date with whanaunga hapū and does not seek to define or limit rohe or areas of mana, recognising the interconnected and overlapping relationships of hapū across the wider taiao.

2.2 Limitations

The following limitations apply to this CIA:

Access to areas within the proposed designation has influenced this assessment. Requests by Te Pouwhenua o Tiakiriri Kūkupa Trust to access the designation footprint were not able to be facilitated by NZTA, despite multiple requests made through the project team and appointed pouarahi. This has constrained the ability to undertake comprehensive site-based observations across the full extent of the proposed works.

Notwithstanding these constraints, Te Pouwhenua o Tiakiriri Kūkupa Trust on behalf of Te Parawhau Hapū engaged two independent ecological subject matter experts, including a hapū-appointed kaitiaki/hapū monitor, who were able to access selected sites within the project area. The hapū monitor also worked alongside a Waka Kotahi-appointed archaeologist, whose engagement Te Parawhau acknowledge and support. Observations from these site visits have informed this CIA where access was available.

Accordingly, this CIA should be read in the context of these access limitations, particularly in relation to site-specific assessment of effects.

This CIA has been prepared based on information available to Te Pouwhenua o Tiakiriri Kūkupa Trust at the time of writing, including the Fast-track substantive application and supporting technical reports prepared for Waka Kotahi New Zealand Transport Agency (NZTA). Should material changes occur to the proposal or supporting information, Te Pouwhenua o Tiakiriri Kūkupa Trust, on behalf of Te Parawhau Hapū, reserves the right to amend, withdraw, or replace this CIA in full. The cost of any such amendments shall be met by NZTA.

Note 1: The terms *Hapū*, *Te Pouwhenua o Tiakiriri Kūkupa Trust* and *Te Parawhau* are used interchangeably throughout this report and refer to the collective who whakapapa to a common tupuna.

Note 2: Place names referenced in this CIA reflect Te Parawhau tikanga, whakapapa, and cultural associations with the taiao. Where names differ from those used in technical reports or application documents, the Te Parawhau Hapū naming is adopted to ensure the integrity of hapū whakaaro, kōrero tuku iho and whenua-based mātauranga.

2.3 Methodology

This CIA is grounded in Te Parawhau mātauranga, whakapapa, and ngā uara ahurea, and guided by Te Parawhau pou tarawaho. Assessment arises from the lived relationship of Te Parawhau with their ancestral whenua, ngā wai, and the taiao, and from kaitiakitanga obligations. Effects are therefore understood and expressed in relation to ngā uara ahurea o Te Parawhau, including embedded whakapapa connections, the mauri and wellbeing of the taiao, and the ability of the Hapū to uphold their obligations to all that exists within these relationships, tāngata, taonga species, and the wider taiao, for present and future generations.

This CIA has been informed and shaped through:

- Hapū engagement, including hui with NZTA and Te Parawhau Kaumatua, where whakaaro, kōrero tuku iho, and ngā uara ahurea and associated obligations to the taiao have been shared and included in this CIA.
- The application of Te Parawhau pou tarawaho (cultural environmental design framework), underpinned by ngā uara ahurea o Te Parawhau, which provides the foundation for identifying and assessing effects.
- Multi-criteria analysis (MCA), undertaken at the request of NZTA prior to the preparation of this CIA, to express and communicate ngā uara ahurea o Te Parawhau and assist their understanding of Hapū uara in relation to the proposal.
- Integration of mātauranga Māori with technical information provided through the Fast-track substantive application and associated expert reports prepared for NZTA. This includes both review of NZTA's technical evidence and independent technical evaluation commissioned by Te Pouwhenua o Tiakiriri Kūkupa Trust on behalf of Te Parawhau Hapū.
- An independent technical review of the ecological reporting prepared for the NZTA Project has been commissioned from Bay Ecological Consultancy Ltd (BECL) and Kūkūwai Consulting Ltd (KCL).

- The reviews encompass:
    - the Assessment of Effects on Freshwater Ecology (Document 10722-PTA-2B0-PE-RPT-0010), the Assessment of Effects on Terrestrial Ecology (Document 10722-PTA-2B0-PE-RPT-0011), and
    - the Assessment of Effects on Avifauna (Document 10722-PTA-2B0-PE-RPT-0019).

  Collectively, these reports provide an independent technical evaluation of the ecological methodologies, datasets, analytical frameworks, and conclusions that underpin the Project's ecological assessments.

  The reviews have focused on the application and consistency of ecological assessment frameworks; the adequacy and interpretation of desktop information and field survey data; the derivation of habitat, flora, and fauna values; the scientific basis for the assessment of ecological effects; and the proposed application of the effects management hierarchy.

  Given their technical scope and level of detail, it is neither practical nor appropriate to reproduce the contents of these reviews within this CIA. However, their findings and conclusions underpin many of the analyses and opinions expressed throughout this report and should be read as integral supporting evidence. Accordingly, the independent technical reviews are attached as **Appendix A** to this CIA.

  It is respectfully requested that the Expert Panel, and any reviewer appointed to assist the Panel, consider those reports in their entirety when evaluating the ecological evidence presented in support of the Project and NZTA's application.

- Site-based understanding of the taiao, informed through haerenga and observations where access has been available, including the involvement of hapū monitors and subject matter experts.

- Consideration of relevant statutory and planning frameworks, interpreted through Te Parawhau pou tarāwaho, mātauranga and tikanga.
- Review and feedback provided by Te Pouwhenua o Tiakiriri Kūkupa Trust (Te Parawhau RMU) on behalf of Te Parawhau on NZTA's draft conditions of consent, to inform appropriate project outcomes and protections for ngā uara ahurea.
- Review, guidance, and approval from Te Parawhau kaumātua, to consider the draft CIA, its recommendations and mahi whakaora, and to incorporate their whakaaro, mātauranga, tirohanga, and direction into the final CIA, reflecting the rangatiratanga of Te Parawhau Hapū.

2.4 Engagement with NZTA

Engagement between NZTA, Te Pouwhenua o Tiakiriri Kūkupa Trust (Te Parawhau RMU), and Te Parawhau Hapū has been ongoing throughout the development of the Brynderwyn Hills Section (Section 2B) of the Northland Corridor.

This engagement has included hui, wānanga, and direct engagement with NZTA representatives and their consultants, as well as engagement alongside neighbouring hapū and iwi with shared interests in the taiao.

Key engagement activities have included:

- Participation in a wānanga held in Tāmaki Makaurau (24–26 November), attended by Te Parawhau RMU, Te Uri o Hau/Environs, and members from Patuharakeke Te Iwi Trust Board, to discuss the proposal and its potential effects.
- Regular hui with NZTA and their project team, generally on a monthly basis, to discuss the proposed works for Section 2B and related sections of the Northland Corridor.

- Ongoing engagement with Waka Kotahi representatives, including Hone Motu and Kurataiaho Kapea, to discuss project development and potential effects on Te Parawhau uara ahurea.
- Hui held between NZTA management representatives and Te Parawhau kaumātua rōpū to discuss the proposal and its potential effects on ngā uara ahurea at a governance level.

Through this engagement, Te Parawhau kaumātua have consistently communicated their whakaaro, mātauranga, and expectations regarding the protection of ngā uara ahurea and the mauri of the taiao, including raising concerns regarding the location and alignment of the Project, the scale and extent of damage to ngā taiao, and the need for NZTA to properly consider alternative construction methodologies, including tunnels, viaducts, and bridge structures, to avoid or reduce adverse effects.

2.5 Purpose

The primary purpose of this CIA is to identify and assess the actual and potential effects of the proposed Notice of Requirement and Designation for the Brynderwyn Hills Section (Section 2B) of the Northland Corridor, from Mano Hiwa Ariki to Waipū, on ngā uara ahurea o Te Parawhau, who retain mana i te whenua and exercise rangatiratanga and kaitiakitanga within their rohe over the taiao.

This CIA is prepared in the context of a proposal that involves extensive earthworks, including large-scale cut and fill, and has the potential to result in significant and, in some cases, irreversible effects on the taiao.

This includes the whenua, ngā wai, and the wider taiao associated with Mano Hiwa Ariki, the maunga of Mareretu and Taipuha, the Waihoihoi, Ahuroa and Waipū Awa, and connected coastal and marine environments including Paepae Atua and Te Parawhau takutai moana.

The purpose of this CIA is to:

1. **Acknowledge Te Parawhau** – Recognise the enduring whakapapa connections of Te Parawhau to the taiao, and affirm the mana, rangatiratanga, and kaitiakitanga responsibilities held within their rohe.

2. **Express Ngā Uara Ahurea o Te Parawhau** – Identify and articulate ngā uara ahurea o Te Parawhau as they relate to the whenua, ngā wai, and wider taiao affected by the proposed designation and future works.

3. **Assess Effects** - Assess the extent and nature of effects arising from the proposed works on ngā uara ahurea o Te Parawhau, including those associated with large-scale earthworks and the modification and, in some cases, destruction of waterways, puna wai and associated repo, as well as impacts on taonga species, habitats, and ecological systems.

4. **Interpretation of Statutory Frameworks** – Assess relevant statutory provisions, including the Resource Management Act 1991, the Fast-track Approvals Act 2024, and other applicable legislation and planning instruments, and interpret these through Te Parawhau tikanga, mātauranga, and pou tarawaho in relation to ngā uara ahurea o Te Parawhau.

5. **Mahi Whakaora** – Identify and require appropriate mahi whakaora to avoid, remedy, or mitigate adverse effects, and to protect and restore the mauri of the taiao in accordance with ngā uara ahurea o Te Parawhau. These may inform conditions of consent or designation requirements.

3 Proposal

3.1 Overview of the Proposed Project and Works

New Zealand Transport Agency Waka Kotahi (NZTA) seeks approval under the Fast-track Approvals Act 2024 for the designation and construction of the Brynderwyn Hills Section (Section 2B) of the Northland Corridor, extending from Te Mano Hiwa Ariki to Waipū.

The proposal involves the establishment of a new transport corridor through steep, ecologically sensitive and complex whenua, requiring extensive cut and fill and resulting in significant modification of natural systems within and beyond the proposed designation footprint across Te Parawhau ancestral takiwā.

3.2 Summary of Project Scale and Extent

The Project represents a large-scale infrastructure development extending across Te Parawhau ancestral takiwā. While the detailed components of the Project are described throughout this section, it is important to understand the overall scale and extent of the proposed works.

Across the Proposed Designation, the Project involves:

- extensive earthworks occurring across approximately 299.2 hectares;
- the excavation, movement and placement of several million cubic metres of material, including cut, fill and spoil;
- vegetation clearance across approximately 104.5 hectares, including areas of indigenous vegetation and associated habitats;
- modification of waterways, including approximately 10.9 kilometres of streams subject to diversion, culverting, realignment or crossing;
- direct loss of stream habitat, together with fragmentation and modification of wider catchment systems;

- construction of a four-lane state highway corridor, including associated infrastructure, engineered landforms, and a major interchange at Waipū; and
- establishment of construction infrastructure, including haul roads, laydown areas, spoil disposal sites and construction compounds across multiple locations.

These works occur across interconnected ridgeline, headwater, lowland, and coastal environments, forming part of a continuous taiao extending from Te Mano Hiwa Ariki to Waipū. The scale, intensity and permanence of these activities are fundamental to understanding the potential effects of the Project on ngā uara ahurea o Te Parawhau Hapū.

3.3 Spatial Extent of the Project within CIA Scope - Te Parawhau Takiwā

The effects of the Project are not evenly distributed across the landscape but are concentrated within particular areas of Te Parawhau takiwā where both ecological and cultural values are high.

Within the Brynderwyn Hills (Zone 2), the Project traverses steep ridgelines and upper catchment environments associated with Te Mano Hiwa Ariki. These areas contain headwater systems, indigenous vegetation remnants, and habitats that support taonga species, and are integral to the functioning of downstream freshwater systems.

Within the northern lowlands (Zone 1), including the Waipū area, the Project intersects alluvial plains, wetlands (repo), puna wai, and remnant kahikatea-dominated systems, which are hydrologically and ecologically connected to the wider catchment and downstream coastal environments.

The overlap between areas of intensive earthworks and areas of high ecological and cultural value results in a concentration of effects within interconnected systems of whenua and ngā wai. These systems are not discrete but form part of a continuous taiao that sustains the mauri of Te Mano Hiwa Ariki and its associated environments.

Accordingly, the spatial extent of the Project must be understood not only in terms of its designation footprint, but in relation to the wider taiao to which it is connected.

3.4 Key Components of the Proposed Project

To achieve the proposed highway alignment, NZTA proposes substantial earthworks across steep and highly dissected whenua, including ridgelines, steep slopes, and deeply incised valley systems within Te Mano Hiwa Ariki and the surrounding taiao. This includes the excavation of significant volumes of earth from elevated landforms on Te Mano Hiwa Ariki and the placement of fill material within valleys and lower-lying areas toward Waipū.

The designation footprint extends across a significant area of Te Parawhau ancestral takiwā. While specific construction activities are identified within this footprint, the scale of the designation and the interconnected nature of the whenua, ngā wai, and taiao mean that potential effects are not limited to these discrete areas.

The extent to which the technical assessments address effects across the full designation footprint is considered further in this CIA.

The key components of the proposed works include:

3.4.1 Transport Corridor and Landform Modification

- Construction of a four-lane, high-speed state highway, including traffic lanes, shoulders, batters, and associated transport infrastructure
- Permanent alteration of natural landforms, including the lowering of ridgelines and infilling of valley systems
- Disturbance of soils and underlying geological materials across steep, highly dissected, and geologically fragile terrain
- Formation of engineered landforms, including cut faces, fill areas, and batters required to support the highway corridor

3.4.2 Ngā Wai (Waterways) Puna Wai (Aquifer) and Repo (Wetlands)

- Realignment, crossing, diversion, and modification of waterways, including the Waihoihoi, Ahuroa, and Waipū Awa and their tributaries to accommodate the highway alignment, including installation of bridges, piping, culverting, diversion, and realignment of streams and headwater systems
- Disturbance and, in some locations, loss or modification of small headwater streams, puna wai, and associated recharge systems
- Modification or loss of wetlands (repo), interconnected freshwater environments, and associated hydrological systems

3.4.3 Waipū Interchange and Associated Works

- Construction of a significant interchange at Waipū, including large roundabout structures (currently shown as two roundabouts), associated road connections, and supporting earthworks
- Earthworks and land disturbance associated with the interchange footprint
- Works occurring within an area that includes remnant stands of kahikatea, as well as associated repo, puna wai, and hydrological systems that sustain these environments and the habitats they provide

3.4.4 Vegetation Clearance, Habitats and Taonga Species

- Clearance of vegetation across extensive areas, including indigenous vegetation
- Disturbance, loss, and fragmentation of habitats for taonga species
- Predicted mortality of taonga species arising from vegetation clearance, earthworks, and associated works, including (but not limited to) Hochstetter's frog (*Leiopelma hochstetteri*), which is present within the designation footprint.

3.5 Description of Works

3.5.1 Overview

This section describes the scale and extent of works associated with the Proposed Designation, with a focus on the northern extent of Te Mano Hiwa Ariki (Brynderwyn Hills), encompassing Zone 1 (Northern Lowlands) and the northern extent of Zone 2.

For the purposes of NZTA's technical assessments, the "Proposed Designation" refers to the full designation footprint, including Zones 1–4. The data and values presented within these assessments are generally reported at the scale of the full Proposed Designation.

This CIA recognises that Te Parawhau Hapū has an interest across the full Proposed Designation (Zones 1–4). However, the detailed assessment in this CIA focuses on the primary area of interest, encompassing all of Zone 1 and the northern portion of Zone 2.

Where technical data is presented for Zone 2, this reflects information reported for the full earthworks zone (Zone 2). As only part of Zone 2 falls within the CIA focus area, these figures are provided for context and are not combined into CIA-specific totals (New Zealand Transport Agency Waka Kotahi (NZTA), 2026).

3.5.2 Earthworks

Types of Earthworks Activities include:

- Bulk excavation and cut-to-fill operations
- Removal of unsuitable material
- Import and placement of structural and landscape fill
- Formation of embankments and batters
- Disposal of surplus material at designated spoil sites.

Spoil disposal involves excavation, transport, deposition, and stabilisation of material, often including:

- vegetation clearance and topsoil stripping
- stockpiling and rehandling of material
- drying and dewatering of unsuitable soils
- final stabilisation of land surfaces.

Extent of Earthworks

As outlined in the Construction Water Assessment, the Project is divided into four earthworks zones, of which:

- Zone 1 (Northern Lowlands) lies north of the Brynderwyn Range and includes alluvial floodplains and rolling foothills extending toward Waipū;
- Zone 2 (Brynderwyn Hills) comprises steep hill country with high elevation, deep gullies, and extensive forestry cover.

Earthworks Area (hectares)

Within the Project as a whole, approximately 299.2 hectares are subject to earthworks (cut/fill and spoil). The extent of earthworks within Zone 1 and Zone 2 is as follows:

- **Zone 1**
    - Cut/fill earthworks: 62.4 ha
    - Spoil areas: 11.4 ha
- **Zone 2 (total zone)**
    - Cut/fill earthworks: 50.1 ha
    - Spoil areas: 20.8 ha

Earthworks Volumes (m³)

The following earthworks volumes are estimated and reflect extensive modification of landforms, including cutting of ridgelines and slopes, and placement of fill material across the alignment and at spoil disposal sites.

Zone 1	Zone 2 (Total Zone 2)
Total cut: 821,984 m³	**Total cut: 5,427,645 m³**
Total fill: 1,747,744 m³	**Total fill: 3,168,489 m³**
Total spoil: 713,653 m³	**Total spoil: 1,304,863 m³**

3.5.3 Construction Infrastructure (Access, Compounds and Laydown Areas)

Construction of the Project requires the establishment of both temporary and permanent supporting infrastructure, including haul roads, access tracks, construction compounds, laydown areas, and stockpile locations.

Haul roads and access tracks are required to:

- transport machinery, materials, and excavated fill
- connect work areas across the alignment
- facilitate movement between earthworks zones

In addition, construction compounds, laydown areas, and stockpile locations are used for:

- storage of construction materials
- staging of equipment
- management of excavated soils

These elements extend across multiple parts of the Proposed Designation and collectively contribute to the overall construction footprint and extent of land disturbance.

3.5.4 Waipū Interchange

The Project includes the construction of a major interchange at Waipū, comprising large-scale road infrastructure, including two roundabout structures, connecting road links, and associated earthworks.

The interchange is located within an area that includes remnant vegetation, including stands of kahikatea forest and associated lowland environments. Construction of the interchange requires vegetation clearance, earthworks, and the establishment of supporting infrastructure within this area.

The interchange forms part of the overall transport network associated with the Project and contributes to the extent of land disturbance and modification of existing landforms within the designation footprint.

3.5.5 Stream Works and Watercourse Modification

The Project includes bridge construction as part of stream crossing infrastructure. The specific locations of bridge structures within the CIA focus area are not however identified in the Construction Water Assessment.

The Project also requires works within and adjacent to streams as part of the construction of crossing and drainage infrastructure.

Stream works include:

- temporary stream diversions to enable construction in dry conditions
- permanent stream diversions around embankments or structures
- culvert installation and extension
- bridge construction and associated works

The Project includes bridge construction as part of stream crossing infrastructure; however, the specific locations of bridge structures within the CIA focus area are not identified in the available technical assessments.

These works involve:

- excavation of diversion channels,
- placement of fill and structural materials within or alongside streams,
- pumping and redirection of flows during construction.

3.5.6 Groundwater and Dewatering Activities

Construction of the Project requires the management of groundwater and surface water within excavations.

Dewatering activities are required to maintain dry working conditions during, foundation construction, trenching, structural works and include:

- pumping of groundwater and collected surface water from excavations
- discharge of water to land or to treatment devices, such as sediment retention ponds

3.5.7 Sediment Generation and Treatment

Sediment generation is an inherent outcome of earthworks, with sediment-laden runoff expected during construction activities. Sediment is generated through:

- exposed soils during earthworks
- stockpiles and spoil areas
- disturbed slopes and batters

To manage sediment, NZTA propose the following control measures which will be implemented as part of Construction Erosion and Sediment Control Plans:

- sediment retention ponds (SRPs)
- decanting earth bunds (DEBs)

- silt fences and diversion channels
- chemical flocculation to accelerate settlement of suspended particles

3.5.8 Works within Floodplains

Activities such as the construction of culverts, stream diversions, placement of fill for embankments and the installation of infrastructure within low-lying areas may be located within a floodplain:

The Construction Water Assessment notes that:

- risk of sediment discharge is higher within floodplains
- sediment control devices may be constrained by flood levels
- additional monitoring and maintenance are required where works occur within flood-prone areas (New Zealand Transport Agency Waka Kotahi (NZTA), 2026).

3.5.9 Vegetation Clearance

The Project includes the removal of approximately 104.5 hectares of indigenous and exotic vegetation within the Proposed Designation across Zone 1 and 2 to enable construction.

Vegetation clearance is described in the Assessment of Effects on Terrestrial Ecology (Appendix D6) describes vegetation affected includes:

- indigenous forest and regenerating native vegetation
- plantation forestry (exotic species)
- shrubland and secondary growth
- pastoral vegetation associated with farmland.

Within Zone 2 (Brynderwyn Hills), significant areas of exotic forestry are present and will be harvested prior to or as part of construction activities (New Zealand Transport Agency Waka Kotahi (NZTA), 2026).

3.5.10 Summary of Scale

The Proposed Works are summarised as:

- extensive vegetation clearance and associated habitat loss, with approximately 104.5 hectares of indigenous and exotic vegetation removed across the Proposed Designation (New Zealand Transport Agency Waka Kotahi (NZTA), 2026).
- large-scale earthworks across both ridgeline environments – Brynderwyn Hills within Zone 2 and lowland environments within Zone 1.
- disturbance of approximately 299.2 hectares across the full Project, including substantial areas within the CIA focus area (NZTA, 2026, Appendix D10).
- the excavation, movement, and placement of millions of cubic metres of material, including cut, fill, and spoil.
- construction of a major interchange at Waipū, currently shown as comprising two roundabout structures and associated road connections, requiring substantial earthworks, land disturbance, and supporting infrastructure within the designation footprint.
- the establishment and use of spoil disposal sites, haul roads, access tracks, laydown areas, and construction compounds, contributing to the overall extent of disturbance.
- modification of freshwater systems, including stream diversion, culvert installation, bridge structures and associated instream work.
- ground disturbance within floodplains and low-lying areas, where works are hydrologically connected to receiving environments and sediment discharge risk is elevated (New Zealand Transport Agency Waka Kotahi (NZTA), 2026).

All works are proposed to be carried out over a multi-year construction period and involve staged and extensive earthworks including sequential disturbance of land, waterways, and

remaining vegetated areas, resulting in a substantial and interconnected footprint across both terrestrial and freshwater environments.

3.5.11 Key Information Gaps and Uncertainties

Notwithstanding the level of detail presented within the application and supporting technical reports, there remain significant information gaps and uncertainties relevant to the assessment of effects.

These include:

- limited access to the full designation footprint for Te Parawhau Hapū, constraining comprehensive site-based assessment;
- incomplete or inconsistent mapping and assessment of headwater streams, puna wai, wetlands (repo), and their interconnected hydrological systems;
- limited site-specific detail for certain elements of the Project, including the location and design of stream crossings and bridge structures within the CIA focus area;
- incomplete baseline ecological information for a number of taonga species, including species where targeted surveys have not been undertaken;
- uncertainty regarding groundwater interactions with surface water systems, including the extent of baseflow dependency for streams and wetlands; and
- reliance on modified or non-standard ecological assessment methodologies, resulting in uncertainty regarding the accuracy of ecological values and effects identified.

In many cases, these uncertainties are proposed to be addressed through future management plans, outline plan processes, or adaptive management approaches. However, the presence of these information gaps at this stage limits the ability to fully understand the scale, nature, and significance of effects on ngā uara ahurea o Te Parawhau Hapū.

3.6 Statutory Approvals Sought

As outlined above, NZTA has lodged a substantive application under the Fast-track Approvals Act 2024 for the designation and construction of the Brynderwyn Hills Section (Section 2B) of the Northland Corridor.

The proposal is being progressed through the Fast-track process, which enables the consideration of multiple approvals within a single integrated pathway.

While the Fast-track process enables multiple approvals to be considered concurrently, it also reduces the opportunity to resolve key uncertainties through staged or iterative processes. As a result, there is a greater reliance on the information presented at this stage to fully describe the Project, its effects, and the measures proposed to address those effects.

Reliance on future management plans, outline plan processes, or adaptive management to resolve fundamental issues is limited. Where aspects of the Project are not yet fully defined, or where effects are not clearly understood, this creates uncertainty as to whether ngā uara ahurea o Te Parawhau Hapū and the mauri of the taiao can in practice be appropriately protected.

As part of this process, NZTA is seeking the following statutory approvals:

3.6.1 Notice of Requirement (Designation)

A Notice of Requirement (NoR) is sought to establish new designations for the proposed project across land within both the Kaipara District Council (KDC) and Whangārei District Council (WDC) jurisdictions.

The designations provide for the construction, operation, and maintenance of the proposed four-lane, high-speed state highway and associated infrastructure.

3.6.2 Resource consents under the Resource Management Act 1991 (RMA)

NZTA is seeking a suite of resource consents under the Resource Management Act 1991 (RMA) for activities associated with the construction and operation of the project.

These include:

Resource consents required under National Environmental Standards, including the National Environmental Standards for Freshwater (NES-F) and the National Environmental Standard for Assessing and Managing Contaminants in Soil (NES-CS).

A suite of regional resource consents under the Regional Plan for Northland, relating to activities such as;

- earthworks, vegetation clearance, works within riverbeds and wetlands, diversion and damming of water, and discharges to land, air, and water.

3.6.3 Wildlife Act Approvals

Wildlife Act approvals are sought under the Wildlife Act 1953 to authorise the handling, salvage, transfer/relocation, and incidental killing of protected indigenous species.

This includes species present within the project area such as frogs, lizards, and invertebrates, and is required to enable the construction of the proposed works.

It is noted; however, that neither long-tailed bats nor Northland brown kiwi are included within the Wildlife Act approvals sought by NZTA for this project, despite the high potential for incidental mortality wit projects of this scale.

3.6.4 Archaeological Authority

An Archaeological Authority is sought under the Heritage New Zealand Pouhere Taonga Act 2014 to enable the modification, damage, or destruction of archaeological sites that may be affected by the proposed works. This includes pā and midden sites within Te Parawhau CIA scope extent.

3.6.5 Summary of Approvals Sought

The designation, together with the associated approvals outlined above, enables the establishment of a continuous transport corridor and the full suite of works described in Section 3.2, including large-scale landform modification, alteration of waterways, vegetation clearance, and construction of supporting infrastructure.

3.7 Technical and Expert Reports

The following section summarises the findings of technical and expert assessments commissioned by NZTA to support the Notice of Requirement (NoR) for the Proposed Designation.

The assessments cover a range of disciplines including terrestrial ecology, freshwater ecology, groundwater, hydrology, landscape, archaeology, and construction-related assessments of effects.

The information contained within these reports has been relied upon in preparing this CIA and is reviewed in the context of ngā uara ahurea o Te Parawhau Hapū in subsequent sections.

3.7.1 Assessment of Effects on Terrestrial Ecology

The Assessment of Effects on Terrestrial Ecology identifies a diverse and fragmented terrestrial environment within the Proposed Designation, comprising 35 vegetation types, including indigenous forest, regenerating native vegetation, plantation forestry, shrubland, and modified pastoral systems. Several vegetation types are classified as At Risk or Threatened, indicating the presence of ecologically sensitive communities.

3.7.1.1 Vegetation Clearance and Habitat Loss

The assessment identifies that approximately 104.5 hectares of vegetation will be removed across the Proposed Designation (Zones 1-4), including:

- 39 ha of indigenous-dominated vegetation, including riparian margins associated with streams and wetlands
- 60 ha of exotic-dominated vegetation, including plantation forest

Vegetation loss spans all ecological value classes, including:

- 18 ha of Very High ecological value vegetation
- 7 ha of High ecological value vegetation

The assessment identifies the direct loss of approximately 40 mature kauri trees across the Proposed Designation (New Zealand Transport Agency Waka Kotahi (NZTA), 2026, Appendix D06). The location of these trees is not spatially specified by Earthworks Zone within the assessment; however, kauri-associated vegetation types are described within forested environments of the Project area, including the Brynderwyn Hills (Zone 2). The works will also result in a direct loss of At Risk, Threatened and notable plant species including maire and mokimoki.

In addition to direct loss, the assessment identifies high levels of:

- habitat fragmentation of indigenous forest remnants
- increased edge effects, altering microclimates (light, temperature, moisture)
- increased susceptibility to:
    - weed invasion
    - pest spread
    - long-term decline in forest structure, species composition and regeneration.

3.7.1.2 Hochstetter's Frogs (Leiopelma hochstetteri)

Targeted surveys carried out recorded:

- 318 frogs across 2.9 km of stream habitat

Within Zone 2 (Brynderwyn Hills):

- 287 frogs were recorded
- densities up to 136.4 frogs per 100 m

Within ridgeline environments (Brynderwyn Range Outstanding Natural Landscape, (ONL)), which form a subset of Zone 2, significantly higher densities were recorded:

- including 198 frogs over 390 m with adjusted densities of up to 416.3 frogs per 100 m.

This suggests that ridgeline and upper catchment environments may support the highest concentration of Hochstetter's frog habitat within the Proposed Designation.

Habitat Loss and Fragmentation

The assessment identifies significant effects on Hochstetter's frogs, including:

- direct loss of approximately 14.2 km of stream habitat, comprising:
    - 3.85 km of high-quality stream habitat
    - 10.3 km of low to moderate quality stream habitat
- fragmentation of approximately 6.8 km of stream habitat, resulting in:
    - isolation of individuals and populations
    - reduced ability to disperse and breed
    - restriction of access to high-quality breeding and nesting habitat

Within the Brynderwyn Range ONL, the assessment identifies that:

- several streams will be completely severed by the proposed works,
- remaining habitat upstream of the alignment may, in some cases, be insufficient to retain a viable frog population.

Habitat Degradation (Edge Effects)

The assessment identifies that Hochstetter's frogs require "stable, cool, moist, and shaded riparian habitats" (New Zealand Transport Agency Waka Kotahi (NZTA), 2026, Appendix D06).

The creation of new edges is identified as resulting in:

- increased light
- increased temperatures
- increased wind exposure
- increased desiccation (drying)

- increased susceptibility to weed invasion

These changes are identified as reducing habitat quality, particularly within riparian environments adjacent to disturbed areas.

Hydrological and Water Quality Effects

The assessment identifies potential effects associated with:

- sedimentation, which may:
    - clog interstitial spaces and refuges
    - alter prey availability
    - cause displacement of frogs
- concrete contamination, which may:
    - increase pH to highly alkaline levels
    - cause suffocation and physical harm
- changes to hydrology and groundwater, including:
    - altered stream flows
    - impacts associated with construction cuts

These effects are identified as being more pronounced in low-flow environments, where higher frog abundance is typically recorded.

Construction Effects

The assessment identifies that construction activities may result in:

- injury or death during habitat removal, particularly where frogs are present in high-quality habitat
- displacement into less suitable habitat, which may result in:
    - increased predation
    - increased competition for resources
    - reduced breeding success

The assessment identifies that the low mobility of Hochstetter's frogs increases the risk of injury or death during construction activities.

Operational Effects

Operational effects identified include:

- noise, vibration, and artificial lighting.

These effects may result in:

- behavioural avoidance
- reduced habitat suitability
- increased predation risk

The assessment also identifies that stormwater runoff, and impervious surfaces may contribute to ongoing reductions in water quality and changes to hydrology may continue to affect habitat conditions within streams.

Overall Effect

The assessment concludes that:

- the unmitigated magnitude of effects on Hochstetter's frogs is **High**
- the overall unmitigated level of effects is **Very High** (New Zealand Transport Agency Waka Kotahi (NZTA), 2026, Appendix D06).

3.7.1.3 Bats (Long-tailed bat – Chalinolobus tuberculatus)

Acoustic surveys recorded:

- 106 bat passes during Survey 1
- 16 bat passes during Survey 2
- bat activity at 19 monitoring sites across both surveys

Overall bat activity was described as low across the Proposed Designation (New Zealand Transport Agency Waka Kotahi (NZTA), 2026, Appendix D06).

Despite low recorded activity, the assessment identifies approximately:

- 163 hectares of high potential bat habitat within the Proposed Designation
- including roosting, foraging, and commuting habitat

The assessment identifies that bats:

- utilise mature indigenous and exotic trees for roosting, including trees with cavities, flaking bark and epiphytes
- rely on riparian margins, wetlands and forest edges for foraging
- use forest remnants and vegetated corridors for movement and connectivity

Identified Effects

The assessment identifies the following potential effects:

- direct loss of high potential bat habitat, including areas used for roosting, foraging and commuting
- habitat fragmentation, particularly where the alignment intersects larger forest blocks, affecting connectivity between habitats
- risk of injury or death during vegetation removal, including removal of potential roost trees

Operational Effects Include

- disturbance from noise and artificial lighting, which may alter bat flight paths and behaviour
- avoidance of road corridors and adjacent habitat, reducing habitat use and contributing to fragmentation

The assessment identifies that:

- the introduction of the road may increase the risk of bat–vehicle collision
- however, behavioural avoidance of lighting and traffic may reduce the likelihood of collision

The assessment also notes that:

- loss of even a small number of individuals may affect local population viability

Overall Effects

The overall magnitude of effects on bats is assessed as Moderate to Very High, with an overall level of effects assessed as Moderate to High (NZTA, 2026, Appendix D06).

3.7.1.4 Invertebrates (including Kauri Snails and Peripatus)

The assessment identifies the presence of At Risk terrestrial invertebrate species, including:

- *Amborhytida dunniae* (At Risk – Declining)
- *Paryphanta busbyi* (kauri snail; At Risk – Declining and protected under the Wildlife Act)

Field surveys recorded:

- 60 *A. dunniae* shells (47 empty)
- 18 kauri snails (12 empty)

The assessment identifies that these species are associated with native forest habitats and cool, moist leaf litter environments. Additional notable invertebrate species recorded include:

- peripatus (velvet worms)
- glowworms (*Arachnocampa luminosa*)

The assessment indicates that these species may occur across forested areas within the Proposed Designation, including both indigenous and exotic forest habitats.

Overall Effects

The assessment identifies potential effects on invertebrate species associated with:

- habitat disturbance and vegetation clearance
- modification of microclimatic conditions, including changes to moisture and shading
- disturbance of leaf litter and forest floor habitats.

3.7.1.5 Lizards

The assessment identifies that suitable habitat for native lizards is present within the Proposed Designation. Field surveys confirmed the presence of copper skink (*Oligosoma aeneum*).

The assessment also identifies potential habitat for up to six native lizard species within the Proposed Designation, including Pacific gecko (*Dactylocnemis pacificus*), forest gecko

(*Mokopirirakau granulatus*), elegant gecko (*Naultinus elegans*), ornate skink (*Oligosoma ornatum*), and moko skink (*Oligosoma moco*).
Although suitable habitat is present for these species, no other native lizard species were detected during field surveys.

Potential Effects

The assessment identifies the following potential effects on native lizards:

- direct loss of habitat, including areas of potential higher-value lizard habitat
- habitat fragmentation and edge effects, resulting in reduced connectivity
- risk of injury or death during vegetation clearance and earthworks
- disturbance from construction and operation, including noise, vibration, lighting and dust.

Copper Skink (Confirmed Species)

For copper skink, the assessment identifies:

- habitat loss, including removal of edge habitat and higher-quality habitat areas
- fragmentation effects associated with the formation of a road corridor, which may isolate individuals or sub-populations and reduce opportunities for dispersal and breeding
- risk of injury or death during vegetation clearance and earthworks
- disturbance effects associated with construction and operation

The assessment notes that habitat loss may result in displacement into surrounding areas, increased competition for resources, and increased vulnerability to predation.

The overall unmitigated magnitude of effect on copper skink is assessed as Moderate, with the level of effects ranging from Low to High (New Zealand Transport Agency Waka Kotahi (NZTA), 2026, Appendix D06).

Other Native Lizard Species (Unconfirmed)

The assessment identifies that suitable habitat exists for additional native lizard species; however, no individuals were detected during surveys, and o populations or notable habitat concentrations ("hotspots") were identified within the Proposed Designation.

Based on available evidence and professional judgement, the assessment concludes that:

- unconfirmed species, if present, are likely to occur at low densities
- the unmitigated magnitude of effects is assessed as Negligible to Low
- the overall level of effects is assessed as Very Low to Low

Overall Effect

The assessment concludes that:

- confirmed lizard populations (copper skink) will be subject to habitat loss, fragmentation and disturbance, with effects ranging from Low to High
- potential effects on other native lizard species are assessed as low due to uncertainty of presence and low predicted population densities

3.7.1.6 Summary of Terrestrial Ecological Assessment of Effects

The terrestrial ecology assessment identifies that the Proposed Designation will result in:

- substantial vegetation clearance across the Proposed Designation, including indigenous forest and riparian vegetation, with Very High effects identified for some vegetation communities
- loss and fragmentation of habitat across both lowland and ridgeline environments, including high-value habitats within the Brynderwyn Hills
- Very High unmitigated effects on Hochstetter's frogs, including loss, fragmentation and degradation of stream habitat
- Moderate to High overall effects on bat populations, including habitat loss, fragmentation and behavioural disturbance

- Low to High effects on lizards (copper skink), with lower effects assessed for unconfirmed species
- potential effects on At Risk invertebrate species associated with forest habitats.

The assessment also identifies ongoing effects associated with:

- habitat fragmentation and reduced connectivity
- edge effects and associated microclimatic change
- degradation of habitat quality within affected environments

3.7.1.7 Proposed Ecological Terrestrial Management and Mitigation Measures

The assessment identifies a range of management and mitigation measures to address potential terrestrial ecological effects, including:

- preparation and implementation of an Ecological Management Plan
- species-specific management plans (e.g. Lizard Management Plan, bat management measures)
- salvage and relocation of fauna prior to vegetation clearance
- habitat enhancement, restoration and planting
- pest control and ongoing ecological management
- compliance with Wildlife Act Authorisations and associated conditions

These measures are intended to manage potential effects associated with vegetation clearance, habitat loss, and disturbance within the Proposed Designation (NZTA, 2026, Appendix D06).

3.7.2 Assessment of Effects on Freshwater Ecology

The Assessment of Effects on Freshwater Ecology describes freshwater environments within the Proposed Designation (Zones 1–4) and assesses the potential effects of the Project on

streams, wetlands, and associated aquatic habitats. The assessment is structured around four primary catchments which form the basis for assessing freshwater ecological effects:

- Ahuroa Catchment
- Waihoihoi Catchment
- Wairau Catchment
- Pukekaroro Catchment

The assessment focuses on perennial and intermittent streams, with ephemeral flow paths classified as non-aquatic systems and excluded from detailed assessment.

As set out in Section 2.3, the assessment applies a catchment-scale methodology, recognising freshwater systems as interconnected networks.

The magnitude of effects is assessed proportionally at a catchment scale, based on the extent of stream and wetland habitat affected (Sections 2.3.4–2.3.6), with categories ranging from “negligible” to “very high” depending on the proportion of resource impacted (Waka Kotahi New Zealand Transport Agency (NZTA), 2026).

3.7.2.1 Freshwater Environments and Values

The Proposed Designation intersects a network of freshwater environments including:

- perennial and intermittent streams and tributaries
- headwater stream systems (predominantly within the Brynderwyn Hills)
- modified lowland streams within pastoral landscapes
- natural inland wetlands and wetland features

The assessment identifies that:

- most streams are small headwater systems and largely modified
- wetlands are predominantly pasture or induced systems with exotic vegetation

Water quality across all catchments is described as poor, with:

- elevated nitrogen and phosphorus

- high E. coli levels
- low dissolved oxygen

This is attributed to intensive pastoral land use within the catchments.

3.7.2.2 Streams – Condition and Ecological Value

The assessment states that stream condition and ecological value were assessed using:

- Stream Ecological Valuation (SEV)
- fish surveys (including eDNA)
- macroinvertebrate community indices (MCI, QMCI)
- habitat and water quality assessments

The assessment identifies that:

- most streams are of low to moderate ecological value, reflecting modification and poor water quality
- macroinvertebrate communities are typically “poor” to “fair” (MCI <100)
- only a small number of forested tributaries exhibit “good” or “excellent” ecological condition.

Fish communities recorded in the assessment are limited with species such as longfin eel, banded kōkopu, and bullies present. Threatened species occurring in low numbers and restricted locations.

The assessment notes that habitat suitability is often constrained by sedimentation, poor water quality, and barriers to fish passage.

3.7.2.3 Wetlands – Extent and Ecological Value

A total of 25 natural inland wetlands are identified within the Proposed Designation, based on desktop mapping and field verification. The assessment concludes that:

- the majority of wetlands are “low or negligible ecological value”, being:

- "exotic pasture wetlands"
- "induced" systems
- lacking indigenous biodiversity or hydrological function

- only a small number of wetlands (e.g. Wetlands 8, 16 and 24) are identified as having higher ecological value due to indigenous vegetation assemblages

Overall, wetland values across the catchments are characterised as low at a catchment scale.

3.7.3 Assessment of Freshwater Ecology Effects

3.7.3.1 Stream Loss and Modification

The Project will:

- intersect approximately 10.9 km of streams
- result in a net stream loss of approximately 554 m

This is assessed as a "negligible" magnitude of loss (<1% of catchment stream length) resulting in a "very low" level of effect.

The report states that "the effect on the amount of stream habitat reduced in value or lost is sufficiently small… the magnitude of the effect… is low or typically very low" (Waka Kotahi New Zealand Transport Agency (NZTA), 2026).

3.7.3.2 Culverting and Fish Passage

Culverting is identified as a key effect, with:

- reductions in habitat quality
- potential impacts on fish passage

The assessment states culverts may reduce stream ecological value (SEV), particularly in higher-value streams however, "culverts do provide some habitat and therefore retain some stream values".

Fish passage is considered:

- generally not required for most headwater streams
- required only in “a few of the more major streams”

Overall effects are assessed as:

- “very low” to “less than minor”.

3.7.3.3 Sedimentation and Water Quality Effects

The Project is predicted to increase sediment yield across catchments by 1.66% to 16.35%, depending on catchment.

The assessment concludes “low levels of additional sediment yield… [are] not of concern ecologically” (Waka Kotahi New Zealand Transport Agency (NZTA), 2026).

Sedimentation effects are therefore assessed as:

- low, with monitoring recommended for higher-risk catchments.

3.7.3.4 Wetland Loss and Modification

Wetland effects are largely dependent on the proportion of wetland area affected and the ecological value of specific wetlands. The assessment finds most wetland loss occurs in low-value pastural wetlands and cumulative effects are generally “very low to low” at catchment scale. However, effects on Wetland 24 (located in the Wairau Catchment) are assessed as “high magnitude” and “high level of effect” requiring ecological offsetting.

3.7.3.5 Groundwater and Hydrological Effects

Potential groundwater drawdown is identified as a risk to streams and wetlands. The report however concludes “the effect will be less than minor and likely very difficult to measure”. Monitoring is recommended where uncertainty remains (Waka Kotahi New Zealand Transport Agency (NZTA), 2026).

3.7.3.6 Summary of Freshwater Ecological Effects

The Assessment concludes that:

- stream loss represents a “negligible” proportion of catchment extent,
- culverting and realignment effects are “very low” or “less than minor,”
- sedimentation effects are “low” and not ecologically significant,
- wetland effects are generally low, except for a specific Wetland 24, identified as higher-value, located within the Wairau Catchment,
- groundwater effects are less than minor.

The report states that “freshwater stream effects are of such a scale that little mitigation is required”.

For wetlands, the freshwater ecological report concludes that effects would be “neutral at worst, but more likely positive” where ecological offsetting is implemented and identifies that residual adverse effects on higher-value wetlands should be addressed through such offsetting measures (Waka Kotahi New Zealand Transport Agency (NZTA), 2026).

3.7.4 Assessment of Effects on Avifauna

The Assessment of Effects on Avifauna considers:

- ecological value (based on NZ Threat Classification)
- magnitude of effects
- overall level of effect at an ecological district scale

3.7.4.1 Existing Avifauna Environment

The assessment identifies a total of 87 avifauna species within the wider 5 km buffer area, with 41 species recorded within the Proposed Designation and 25 species within the Indicative Alignment.

Of these, 11 Threatened and 18 At Risk species occur within the wider landscape, with the number of higher-value species reducing within the Project footprint to three Threatened and three At Risk species within the Proposed Designation, and no Threatened species and two At Risk species within the Indicative Alignment.

The report notes that "the majority of species recorded within the Indicative Alignment are primarily associated with farmland/open country habitat" (Waka Kotahi New Zealand Transport Agency (NZTA), 2026).

3.7.4.2 Habitat overview

The Project area is dominated by pastoral farmland, which comprises approximately 66–71% of the landcover, with smaller areas of native forest, scrub and shrubland, wetlands, and exotic forestry present.

Farmland and open country habitats are dominated by introduced and common species but support some native avifauna, including New Zealand pipit (At Risk – Declining), as well as pūkeko, swamp harrier, and welcome swallow. These environments provide secondary habitat for some At Risk species, which are likely to utilise these areas on a transient basis.

Native forest and scrub habitats include multiple Significant Natural Areas (SNAs) and provide habitat for a range of indigenous forest bird species, including kererū, tūī, bellbird, ruru, tomtit and fantail. North Island kākā (At Risk) are present within the wider landscape, and kiwi may also be present at low density.

The assessment notes that "a low number of kiwi … are present or will occur within the Proposed Designation" (Waka Kotahi New Zealand Transport Agency (NZTA), 2026).

3.7.4.3 Freshwater / wetlands

Freshwater / wetlands, while limited in extent within the Project area, are identified as supporting the highest avifauna ecological values. These environments provide habitat for several Threatened and At Risk species, including Australasian bittern (Nationally Critical),

New Zealand dabchick (Threatened), grey duck (Threatened), and North Island fernbird (At Risk – Declining).

The assessment confirms that "freshwater/wetland habitats were found to have the greatest proportion of Threatened and At-Risk species."

Key wetland sites identified within the Proposed Designation include:

- Wetland 13, which provides habitat for fernbird, and
- Wetland 24, a raupō-dominated wetland that provides potential habitat for species such as Australasian bittern and spotless crake.

3.7.4.4 Exotic forest and modified habitats

Exotic forest and other modified habitats within the Proposed Designation provide habitat for a range of common native bird species, including fantail, silvereye and grey warbler. These environments may also provide potential (but unconfirmed) habitat for species such as kiwi and New Zealand falcon.

Overall, the ecological value of these modified habitats is assessed as moderate to low.

3.7.4.5 Assessment of Avifauna Effects

The assessment identifies potential effects on avifauna associated with the Project, including habitat loss, mortality risk during construction and operation, disturbance and displacement, and the effects of artificial lighting.

Key impact pathways include;

- the removal of approximately 370 ha of landcover, predominantly pastoral farmland and exotic forest, together with
- the loss of approximately 2.44 ha of higher-value wetland habitat.

Mortality effects may occur during construction, particularly for breeding or low-mobility species, as well as during operation through mechanisms such as vehicle strike and scavenging behaviour.

Disturbance and displacement effects are also identified, with the assessment indicating that such effects may extend up to approximately 1 km from the road corridor.

Artificial lighting has the potential to affect avifauna, particularly nocturnal species such as ruru and some seabirds; however, these effects are limited due to the Project's location outside of major seabird flight paths.

The assessment concludes that, for most species, effects are Low to Very Low.

Moderate effects are identified for North Island kākā, while High effects (prior to mitigation) are identified for a small number of Threatened and At Risk species, including Australasian bittern, North Island fernbird, New Zealand pipit, and spotless crake.

These higher effects are associated primarily with wetland habitats, scrub and riparian margins, and the sensitivity of species to habitat loss and disturbance, particularly during breeding.

3.7.4.6 Recommended Mitigation

The assessment recommends a range of mitigation and management measures to address potential effects on avifauna. These include:

- the preparation and implementation of an Avifauna Management Plan (AMP), which provides for pre-clearance surveys, restrictions on vegetation clearance during breeding seasons, establishment of exclusion zones around active nests, and ongoing ecological monitoring.

- Habitat replacement is proposed to address the loss of key habitats, including a 1:1 replacement of approximately 2.44 ha of wetland habitat and approximately 39 ha of indigenous terrestrial vegetation.
- Additional habitat enhancement measures are also recommended, including wetland creation or enhancement, multi-site revegetation planting, and pest and weed control to improve habitat quality and support avifauna populations.
- Lighting controls are proposed to minimise potential disturbance effects, including the use of directional lighting and measures to reduce light spill.

3.7.4.7 Summary of Avifauna Ecological Effects

The assessment recommends a range of mitigation and management measures to address potential effects on avifauna. These include the preparation and implementation of an Avifauna Management Plan (AMP), which provides for pre-clearance surveys, restrictions on vegetation clearance during breeding seasons, establishment of exclusion zones around active nests, and ongoing ecological monitoring.

Habitat replacement is proposed to address the loss of key habitats, including a 1:1 replacement of approximately 2.44 ha of wetland habitat and approximately 39 ha of indigenous terrestrial vegetation.

Additional habitat enhancement measures are also recommended, including wetland creation or enhancement, multi-site revegetation planting, and pest and weed control to improve habitat quality and support avifauna populations.

Lighting controls are proposed to minimise potential disturbance effects, including the use of directional lighting and measures to reduce light spill.

The Avifauna report concludes:

“Overall… the level of potential effects [is] Low to Very Low on the majority of species,” with higher effects limited to a small number of Threatened and At Risk species.

3.7.5 Assessment of Effects on Groundwater

The Assessment of Effects on Groundwater is based on a combination of desktop data, field investigations, and numerical groundwater modelling.

Field investigations included, drilling of boreholes and installation of monitoring piezometers (67 installed, 55 instrumented), groundwater level measurements and hydraulic conductivity testing. This information was used to develop hydrogeological and numerical groundwater models to assess:

- groundwater level drawdown
- baseflow changes to streams and wetlands
- potential effects on groundwater users, infrastructure, and water quality

3.7.5.1 Existing Groundwater Environment

Groundwater conditions vary across the Project area, with shallow groundwater in valleys and gullies and deeper groundwater near ridges and hilltops

Groundwater flow is interpreted to follow topography and discharge into streams and wetlands in low-lying areas.

Recharge is primarily from rainfall infiltration, estimated at approximately 40–600 mm/year.

A total of 31 existing bores are located within 2 km of the Project, the majority of which are low-yield domestic or stock water supplies.

Wetlands within the Project area are generally groundwater-fed systems.

3.7.5.2 Assessment of Groundwater Effects

The assessment identifies a range of potential effects associated with construction and operation of the Project and includes:

Construction Phase Effects

Effects such as dewatering and depressurisation may temporarily lower groundwater levels and reduce baseflow to streams and wetlands.

The Groundwater Assessment concludes that these effects are “small-scale, localised and would only occur temporarily”.

Operational Effects – Groundwater Drawdown and Baseflow Reduction

Permanent drainage associated with road cuts below the groundwater table is identified as the primary long-term effect.

Groundwater drawdown associated with the Project may extend up to approximately 970 m from major road cuts and exceed 10 m in areas of deep excavation. This reduction in groundwater levels is predicted to decrease groundwater discharge (baseflow) to streams and wetlands.

The assessment indicates that approximately 37 km of streams may experience greater than 5% reduction in baseflow. Of this, around 10,971 m of streams are predicted to experience very high reductions in baseflow (greater than 80%), with the potential for these reaches to dry during low flow conditions. A further 11,589 m of streams are expected to experience high reductions (30–80%), 14,175 m moderate reductions (15–30%), and 22,126 m low reductions (5–15%).

The report notes that upper stream reaches may “fall dry” where groundwater inputs are lost, with effects being most pronounced near large cuts and within headwater and “hanging” stream systems (Waka Kotahi New Zealand Transport Agency, NZTA, 2026).

Effects on Wetlands

Wetlands are generally located at the margins of groundwater drawdown zones.

The assessment concludes "the mapped wetlands are positioned near the margins of the drawdown zones and fall within areas of negligible to low baseflow reduction. As a result, the direct effects on the wetlands are considered low" (Waka Kotahi New Zealand Transport Agency, NZTA, 2026).

However, it is also acknowledged that:

- baseflow reductions in upstream streams may reduce inflows to some wetlands.

Effects on Groundwater Users

Groundwater drawdown associated with the Project may affect nearby water supply wells and surface water takes. The assessment identifies one groundwater well and one surface water take as potentially affected, with predicted drawdown of less than 1 m.

Settlement Effects

Groundwater drawdown associated with the Project may result in land settlement due to soil compression.

The assessment concludes that settlement is generally less than 50 mm, and that effects on infrastructure, including pylons and pipelines, are expected to be "minimal" or "negligible."

Groundwater Quality Effects

Groundwater quality investigations identified localised contamination at one bore location; however, the report states that analytical results meet ANZECC 2000 guideline values, and the assessment concludes that no specific mitigation is required for groundwater quality effects (Waka Kotahi New Zealand Transport Agency, NZTA, 2026).

3.7.5.3 Recommended Mitigation

The assessment recommends a range of mitigation and management measures to address potential groundwater effects. During the construction phase, temporary augmentation of

streams and wetlands is proposed, including measures such as water diversion or water carting to maintain flows.

For the operational phase, the report does not recommend permanent augmentation for streams located above road cuts, as this would require pumping systems that are considered impractical for long-term operation.

Where effects on existing groundwater users are confirmed, the provision of alternative water supply is recommended. This may include measures such as installing deeper wells, developing new water sources, providing on-site storage, or water carting.

The assessment also recommends that potential settlement effects be confirmed where alignment changes occur, such as lateral shifts greater than 20 m or increases in cut depth below the groundwater table.

Groundwater monitoring is recommended, particularly to assess potential effects on wetlands, along with further investigation where contamination is identified.

3.7.5.4 Summary of Groundwater Effects

The Assessment concludes that construction-related dewatering effects are temporary, localised, and manageable. However, the operation of the Project will result in permanent groundwater drainage, leading to groundwater drawdown and reduced baseflow to streams and wetlands.

The assessment indicates that approximately 37 km of streams may be affected by baseflow reduction, with some headwater streams potentially drying during low flow conditions. Direct effects on mapped wetlands are assessed as low, as most are located outside areas of significant groundwater drawdown.

Effects on groundwater users are considered limited, with a small number of water takes potentially affected.

Land settlement effects are assessed as minimal to negligible, and groundwater quality effects are within guideline limits and do not require specific mitigation.

The report concludes that permanent groundwater drainage "may have permanent adverse effects on the baseflow to nearby streams and wetlands" but that overall effects can be managed through the recommended measures (Waka Kotahi New Zealand Transport Agency, NZTA, 2026).

3.7.6 Assessment of Operational Stormwater and Flooding Effects

The assessment is based on a combination of desktop analysis, stormwater design modelling, and hydraulic flood modelling.

3.7.6.1 Existing Stormwater and Flooding Environment

The Project traverses a range of rural catchments associated with the Ahuroa River, the Waihoihoi River, the Piroa Stream.

The existing environment is characterised by predominantly rural farmland with informal drainage systems. There is no formalised stormwater treatment along the existing SH1 extensive floodplains across the Waipū alluvial plains and more confined gully-based flood systems within the Brynderwyn Hills.

Flood modelling indicates that parts of the existing SH1 are already susceptible to flooding and large areas of low-lying land are within the 1% AEP floodplain.

3.7.6.2 Assessment of Operational Stormwater Effects

The assessment considers effects relating to:

- water quantity (flows and runoff)
- water quality (contaminants)
- ecological connections

- water users

Water Quantity

The Project introduces new impervious surfaces, increasing stormwater runoff volumes and peak flows.

However, the design incorporates:

- conveyance systems designed for 1% AEP rainfall events
- constructed wetlands and wetland swales for extended detention
- drainage systems designed to retain flows within existing catchments
- climate change projections applied to ensure long-term resilience

With these measures, the assessment concludes that effects relating to flow and erosion are negligible.

Water Quality

Stormwater runoff from the road contains contaminants such as sediment, heavy metals (zinc, copper) and hydrocarbons.

Mitigation measures include:

- constructed wetlands and treatment swales
- treatment of all main road runoff
- diversion of clean water away from treatment systems

The report concludes that there will be a net improvement in water quality, as traffic shifts from an untreated to a treated road network. Overall water quality effects are negligible (Waka Kotahi New Zealand Transport Agency, NZTA, 2026).

3.7.6.3 Ecological and Water User Effects

The stormwater design incorporates:

- fish passage in culverts
- avoidance of natural wetlands for treatment
- habitat reinstatement for diverted streams

For water users:

runoff is retained within catchments

- treated prior to discharge
- flows are controlled to avoid erosion

The assessment concludes no adverse effects on water users are anticipated.

3.7.6.4 Residual Effects

Residual effects following mitigation may include:

- minor discharge of contaminants
- localised flood level changes
- minor redistribution of flows between catchments
- sediment bypass during extreme rainfall events

These are assessed as negligible overall.

3.7.6.5 Assessment of Flooding Effects

The assessment concludes that the Project will alter stormwater runoff characteristics due to the introduction of new impervious surfaces; however, these effects will be effectively managed through the implementation of a best-practice stormwater treatment system. All runoff from the main road surface will be collected, treated through constructed wetlands

and swales, and discharged in a controlled manner to receiving environments. As a result, effects on water quality and stormwater flows are assessed as negligible, with an overall net improvement in water quality anticipated compared to existing conditions.

In relation to flooding, the Project will result in some localised changes to flood behaviour, including minor increases in flood levels and small shifts in flow pathways, particularly within low-lying areas such as the Waipū plains. Most predicted flood level increases outside the Proposed Designation are less than 100 mm and are therefore considered negligible to minor in accordance with the assessment criteria.

Limited areas, including parts of the Pukekaroro Stream and the Waipū tie-in, may experience slightly greater increases in flood levels; however, these effects are localised, occur largely within existing floodplains or watercourses, and dissipate downstream. Peak flow changes are minimal and do not result in any meaningful expansion of floodplain extent.

The assessment finds that there will be no significant adverse effects on buildings or infrastructure outside the Proposed Designation, with only isolated cases of very small increases in flood levels identified. Overall, flood effects on surrounding land and property are assessed as less than minor.

Residual effects may include minor redistribution of stormwater flows, small increases in flood levels in certain locations, and the discharge of a small proportion of untreated contaminants during extreme rainfall events. However, these effects are expected to be minor and manageable within the proposed design framework.

Overall, the report concludes that, with the implementation of best practice stormwater management and appropriate design refinement, operational stormwater effects will be negligible and flooding effects less than minor, with no material adverse effects on the receiving environment anticipated.

3.7.6.6 Summary of Stormwater and Flooding Effects

Overall, the assessment concludes that operational stormwater effects will be negligible due to the implementation of best practice stormwater treatment measures, including the treatment of all road runoff prior to discharge. Flooding effects are assessed as less than minor, with only localised increases in flood levels and minor changes to flow pathways identified, primarily within existing floodplains.

While these changes reflect some modification of natural hydrological processes, they are generally small in scale, do not materially increase flood risk to buildings or infrastructure, and are expected to be further reduced through detailed design.

3.7.7 Construction Water Assessment

The Construction Water Assessment evaluates potential effects on freshwater arising from earthworks and construction activities, with a particular focus on sediment generation and discharge.

3.7.7.1 Existing Environment

The Project area includes a mix of:

- alluvial floodplains (e.g. Waipū lowlands)
- steep hill country (Brynderwyn Hills)
- predominantly pastoral land use, with some forestry and native vegetation

Water quality within the wider catchments is generally poor, reflecting:

- intensive land use
- elevated nutrients and sediment
- reduced riparian cover

The Project is expected to interact with already highly modified catchments.

3.7.7.2 Erosion and Sediment Control

The assessment adopts a hierarchy of erosion and sediment control (ESC):

- Prevention: diverting clean water away from works areas
- Capture: intercepting sediment-laden runoff using treatment devices
- Minimisation: staging works and reducing exposed areas
- Management: monitoring, sequencing, and site practices

Key ESC devices and practices include, clean and dirty water diversions, sediment retention ponds, decanting earth bunds flocculation (chemical treatment) and progressive stabilisation of exposed soil (Waka Kotahi New Zeland Transport Agency, NZTA , 2026).

3.7.7.3 Assessment of Construction Water Effects

The report confirms that the primary construction water effect is sediment discharge to waterways during earthworks. This may occur through:

- runoff from exposed soils
- in-stream works (culverts, diversions, bridges)
- pumping and dewatering activities
- accidental releases (e.g. fuels, concrete).

Sediment Yield

Predicted sediment yields are:

- Flat terrain: ~9.6 t/ha/year
- Hill country: ~13.3 t/ha/year (compared to pasture baseline of ~0.5–1.0 t/ha/year).

Catchment-scale contribution from the Project is estimated as:

- Waihoihoi: ~4.6%
- Ahuroa: ~8.5%

- Wairau: ~16.3% (highest)
- Pukekaroro: ~1.7%

Higher effects are associated with steep slopes, works near streams and wetlands and spoil site development.

3.7.7.4 Recommended Mitigation

The assessment recommends a range of erosion and sediment control, construction management, and monitoring measures to minimise sediment discharges during construction. These include the use of sediment control devices and chemical treatment, staged earthworks with progressive stabilisation (including limiting exposed soils), identification and management of high-risk areas, seasonal restrictions on works, and implementation of monitoring and adaptive management through a Continuous Improvement Programme (Waka Kotahi New Zeland Transport Agency, NZTA , 2026).

3.7.7.5 Summary of Construction Water Effects

The assessment concludes that construction-related sediment discharge is the primary risk to freshwater environments; however, these effects can be effectively managed through best practice erosion and sediment control measures. While sediment yields are higher than baseline levels, particularly in steep terrain and during heavy rainfall, the overall contribution to catchment-scale sediment loads is generally low. Effective implementation of controls, including progressive stabilisation, staged earthworks, and ongoing monitoring, is critical to achieving these outcomes.

Overall, the assessment concludes that:

construction water effects, including sediment generation and discharge, can be managed such that overall effects are minor, provided recommended mitigation and management measures are implemented.

3.7.8 Assessment of Landscape and Visual Effects

The assessment evaluates potential landscape, visual amenity, and natural character effects associated with the Project.

3.7.8.1 Existing Environment

The existing environment associated with the Project is described as a diverse landscape including:

- floodplains (Ahuroa and Waihoihoi Rivers)
- the Brynderwyn Hills (including an Outstanding Natural Landscape (ONL))
- rolling rural farmland
- volcanic hills and valleys
- the Waipū township

These landscapes are grouped into six-character areas:

- Waipū
- Northern approaches to the Brynderwyn Hills
- Brynderwyn Hills (northern slopes and summit)
- Brynderwyn Hills (southern escarpment – ONL)
- Southern approaches (Maungaturoto valley)
- Volcanic hills and Pukekaroro Stream valley.

The environment is generally rural and modified, with pastoral land use dominant interspersed with native forest remnants, river corridors, volcanic landforms, containing areas of high natural character and ONL values.

3.7.8.2 Assessment of Landscape and Visual Effects

The assessment confirms that a major highway will have unavoidable adverse landscape, visual, and natural character effects. (Waka Kotahi New Zealand Transport Agency, NZTA, 2026).

Key drivers of effects include:

- large-scale earthworks (cuts, fill, embankments)
- vegetation clearance (including native bush)
- modification of landform
- introduction of infrastructure into rural landscapes.

Key effects

Across the Project, the following effects are identified:

- Modification of rural character
    - increased infrastructure presence
    - loss of natural and rural amenity
- Loss of vegetation and natural features
    - including kahikatea/tōtara stands and native bush
- Landform alteration
    - large cut batters and fill embankments
    - changes to natural topography
- Effects on views
    - moderate to moderate-high effects on a small number of dwellings
    - generally low effects for most properties
- Effects on natural character particularly for rivers, wetlands and headwater streams.

3.7.8.2.1 Effects by landscape area

Waipū: generally, effects are avoided, but localised high effects are evident on kahikatea/tōtara stands.

Floodplains (north): moderate effects overall, with localised high effects on vegetation and river meanders.

Brynderwyn Hills (northern slopes & summit): moderate to moderate-high effects due to extensive earthworks.

Brynderwyn Hills (southern escarpment – ONL): high adverse effects on landscape values, natural character and ONL values.

Southern approaches (valley): moderate effects in a largely modified rural landscape.
Volcanic hills & Pukekaroro valley: moderate-high effects due to large cuttings, vegetation removal and stream modification.

3.7.8.2.2 Recommended Mitigation

The landscape and visual impact assessment recommends a landscape-led mitigation approach focused primarily on:

- Revegetation with native species, particularly cut and fill batters, spoil disposal areas and stream margins.
- Restoration planting requiring replacement of kahikatea/tōtara stands and areas of native forest.
- Naturalising landforms and watercourses including areas of stream diversions designed to mimic natural forms and planting to reinstate natural character.
- Visual mitigation planting to soften infrastructure, overbridges and interchanges
- Long-term ecological rehabilitation including revegetation designed to establish native forest over time.

Mitigation is expected to:

- reduce effects incrementally
- rely heavily on vegetation establishment and growth

3.7.8.3 Summary of Landscape and Visual Effects

The assessment concludes that the Project will result in unavoidable adverse landscape and visual effects, particularly due to its scale and the need to traverse varied terrain.

High adverse effects are identified in:

- the southern escarpment (ONL)

- areas of native vegetation and significant landform

Moderate to moderate-high effects occur across most other landscape areas. Effects on individual properties are generally limited, with only a small number experiencing moderate or greater visual effects.

Mitigation is primarily through revegetation and landscape integration and is expected to reduce effects over time to low-moderate or less. However, the effectiveness of mitigation is dependent on vegetation establishment and maturity, and full mitigation of some values, particularly ONL and mature vegetation, may take decades to achieve (Waka Kotahi New Zealand Transport Agency, NZTA, 2026).

3.7.9 Assessment of Operational Noise Effects

The assessment evaluates the potential operational traffic noise effects generated by the Project.

Noise effects are assessed for:

- existing conditions
- future “do-nothing” scenario
- Project without mitigation
- Project with mitigation (Best Practicable Option)

3.7.9.1 Existing Environment

The existing noise environment is characterised by generally low rural ambient noise levels, typically between 45–55 dB LAeq in areas removed from state highways, increasing in proximity to SH1 and SH12 where traffic noise dominates. Background noise levels are generally low, particularly at night.

Measured noise levels range from approximately 48–69 dB LAeq, depending on proximity to roads.

The receiving environment comprises rural dwellings and properties, with a relatively small number of sensitive receivers (PPFs) reflecting the low population density of the area.

3.7.9.2 Assessment of Operational Noise Effects

The Project introduces a new road noise source into a largely rural environment; however, effects vary depending on proximity to the new alignment and existing road network.

3.7.9.3 Key findings

Many properties currently exposed to SH1 traffic noise are predicted to experience reduced noise levels, as traffic is diverted and the main alignment moves further away

Some properties closer to the new alignment may experience increases in noise levels, particularly where terrain shielding is reduced

Noise level changes may:

- decrease by up to 10–18 dB in some locations (significant reduction)
- increase by up to ~10 dB in other locations (noticeable increase)

3.7.9.4 Noise Exposure Effects

The assessment concludes that most properties will experience no adverse or low-level noise effects. A small number of properties may experience “present and intrusive” noise levels, resulting in minor behavioural effects (e.g. closing windows, increased awareness of noise). Overall:

- noise levels are generally within acceptable ranges and
- no unreasonable adverse noise effects are anticipated.

3.7.9.5 Sector-based outcomes

The alignment is divided into four sectors from north to south, comprising the Waipū area (Sector 1), the Brynderwyn Hills (Sector 2), an unpopulated section (Sector 3), and the southern approaches near SH12 (Sector 4).

The outcomes for each sector are summarised below:

Sector 1:

- mixed effects, including both increases and decreases
- generally acceptable outcomes with mitigation

Sector 2 (Brynderwyn Hills):

- significant reductions in noise (up to 18 dB)
- strong positive effects

Sector 3:

- no sensitive receivers (no effects)

Sector 4:

- generally, noise reductions for existing SH1 properties
- some increases for new receivers, but within acceptable limits

3.7.9.6 Recommended Mitigation

The assessment identifies low noise road surface (LN3) as the primary mitigation measure.

Mitigation includes:

- application of LN3 surface along key sections of the alignment
- optimisation of mitigation at detailed design stage

The report notes that:

- noise barriers are generally not practicable due to terrain
- road surface treatment is the most effective mitigation measure

3.7.9.7 Summary of Operational Noise Effects

The assessment concludes that:

- the Project will introduce a new noise source into a rural environment, resulting in both increases and decreases in noise levels depending on location
- many properties currently affected by SH1 traffic noise will experience reduced noise levels

- some properties close to the new alignment may experience noticeable increases in noise, although generally within acceptable limits
- overall noise effects are low and manageable, with no unreasonable adverse effects anticipated

With the implementation of recommended mitigation measures, particularly low noise road surfaces, the Project is expected to operate within acceptable noise levels for surrounding receivers.

3.7.10 Assessment of Contaminated Land Effects

The assessment evaluates potential effects associated with contaminated land within the Project area, with a focus on risks to human health and the environment arising from disturbance of contaminated soils.

3.7.10.1 Existing Environment

The Project area includes several sites with potential for contamination associated with past and current land uses, including agricultural and horticultural activities, rural industrial uses (e.g. storage of fuels or chemicals) and earthworks and fill areas.

These activities can result in contaminants such as heavy metals, hydrocarbons and agrichemicals.
The presence of contamination reflects historic land use practices where hazardous substances may have been used, stored, or disposed of on site.

3.7.10.2 Assessment of Contaminated Land Effects

The primary potential effects arise during construction, when contaminated soils may be disturbed. This disturbance has the potential to mobilise contaminants within soil and groundwater, with pathways for discharge to surface water, groundwater, and the air through dust generation. As a result, there is potential for adverse effects on construction workers, nearby residents, and ecological receptors.

The extent of these effects depends on a range of factors, including the presence and concentration of contaminants, the scale of earthworks, and the proximity of works to sensitive environments such as waterways. In the absence of appropriate management, disturbance of contaminated land has the potential to result in adverse effects on both human health and the environment.

3.7.10.3 Recommended Mitigation

The assessment recommends a range of measures to manage contaminated land effects, including:

- preparation of a Contaminated Land Management Plan (CLMP)
- further site investigation where contamination is identified
- appropriate handling, containment, or disposal of contaminated soils
- implementation of erosion and sediment controls to prevent contaminant transport
- health and safety measures to protect workers (e.g. dust control, PPE)
- validation and monitoring during and following works

3.7.10.4 Summary of Contaminated Land Effects

The assessment concludes that contaminated land is present or potentially present within the Project area due to historical land use activities.

Potential effects are primarily associated with the disturbance of contaminated soils during construction; however, with the implementation of appropriate investigation, management, and mitigation measures, these effects can be effectively controlled.

Overall, the assessment concludes that contaminated land effects can be managed to an acceptable level, provided that recommended mitigation measures and regulatory requirements are implemented (Waka Kotahi New Zealand Transport Agency, NZTA , 2026).

3.7.11 Assessment of Archaeological Effects

The assessment evaluates potential effects on archaeological values within the Project area, including both pre-European Māori and historic-era sites.

3.7.11.1 Existing Environment

The Project area contains a rich archaeological landscape reflecting long-standing Māori occupation and later European settlement. Recorded archaeological features include:

- pā sites located on elevated ridgelines
- storage pits and terraces associated with kumara cultivation
- a midden site near waterways
- historic sites associated with early settlement and industry (e.g. blacksmith site, timber working)

These sites form part of a wider archaeological landscape extending across the Brynderwyn foothills and surrounding river valleys.

A total of 13 archaeological sites is identified within the total Proposed Designation and does not distinguish sites within the specific rohe or cultural landscape of Te Parawhau Hapū. These sites include:

- 4 pā sites
- several pit/terrace sites
- 1 midden
- a small number of historic European sites.

3.7.11.2 Assessment of Archaeological Effects

The primary effects arise from earthworks associated with the Project, which have the potential to:

- modify or destroy archaeological sites and subsurface features
- disturb previously unrecorded sites
- alter the wider archaeological landscape

Effects are most significant where sites fall within cut and fill areas, spoil disposal areas and construction zones.
The assessment confirms that earthworks affecting archaeological sites would result in more than minor adverse effects due to permanent loss of physical heritage values.

Some sites (particularly pā) are identified as having higher significance and require avoidance, while others may be subject to modification under archaeological authority.

3.7.11.3 Recommended Mitigation

The assessment recommends a hierarchy of avoidance and management measures, including:

- avoidance of all pā sites, with appropriate buffer zones
- obtaining archaeological authorities for sites that may be modified or destroyed
- preparation of a Historic Heritage / Archaeological Management Plan
- archaeological investigation and monitoring during works
- engagement with tāngata whenua and application of appropriate tikanga
- accidental discovery protocols, including procedures for kōiwi

These measures are intended to ensure that effects are appropriately avoided, remedied, or mitigated in accordance with statutory requirements.

3.7.11.4 Summary of Archaeological Effects

The assessment concludes that:

- the Project will affect several identified archaeological sites within the Proposed Designation
- effects on sites within construction areas will be significant, resulting in modification or loss of archaeological features
- higher value sites, particularly pā, can be avoided through design and are recommended to be protected

With the implementation of recommended mitigation measures, including avoidance, archaeological authorities, and monitoring, effects on archaeological values can be appropriately managed; however, some residual adverse effects will remain where sites are unavoidably modified or destroyed.

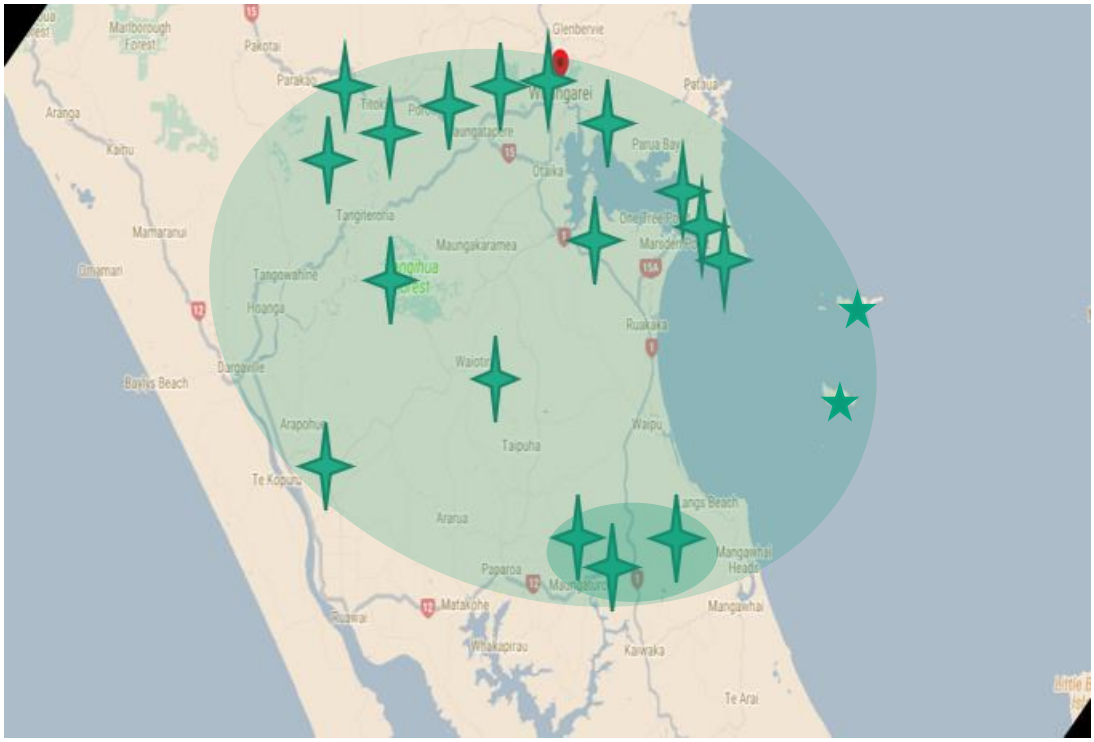
3.7.12 Fast-track Process Context

This section has described the proposed Project, the statutory approvals sought, and the technical information relied upon by NZTA.

The implications of this proposal, including the extent to which it recognises and provides for ngā uara ahurea o Te Parawhau Hapū and protects te mauri o te taiao, are considered further in Section 8 of this CIA.

4 Te Parawhau Hapū

Illustration 1: Te Parawhau Rohe (Large Green Oval) – Te Mano Hiwa Ariki (Small Green Oval)



Source: Matua Pari Walker Matauranga (Walker M. P., 2026)

4.1 History and Te Parawhau Association with Te Mano Hiwa Ariki

Ki Te Parawhau mā te whakapapa, ngā kōrero tuku iho, ngā Atua. Ko te ihi, te wehi, te mana, te rangatiratanga ngā whaiere hauora o te mauri o te Taiao, mai i te aranga mai o te Hōkio, me Te Ata Kurakura e kanapu ana i raro i ōna parirau i tōna haerenga ki ngā whaitua o Te Parawhau. Mai i a Tangihua, ka kake rā ki te taumata o Ranginui, ā, ko tōna aro ki te Rāwhiti, ka mataitia i ngā whenua o Te Parawhau i tōna tiu ki Mano Hiwa Ariki, Tuturu, Te Pae o Tū, Hauturu, Aotea, Taranga, Maui Taha, Maui Roto, Maui Waho, Maui Pae, ka hora atu ki te moana ki Koutu ki te Maioha o Te Whara. Ka hou mai te manu ki te tomokanga o Whangārei Terenga Parāoa. Ka whakamanahia i a Manaia i tana hoka i runga i a Te Ākau, e mau ana i ngā Herenga tangāta ki te moana, hangaia i te waharoa o Te Parawhau ki te

Moana Nui a Kiwa. Ka tāwharautia te kaupapa, ka rere atu te Hōkio ki te taunga manu o ana Tupuna ki Pākau Hōkio, ka hoki ki Tangihua e whakakanohi ana i ngā punga wairua, punga tātai, hei tohutia i tō mātou whakapapa me te mana a te tāngata whenua (Tonga, 2025).

E whakamana mo to whenua o nga hapue heke mai
Ko Ngati Manaia
Ka heke mai a
Ngai Tahuhu
Ka heke mai a
Ngati Ruangaio
Ka heke Mai a Te Parawhau (Walker M. P., 2026).

The connection between Te Parawhau and Te Mano Hiwa Ariki is embedded in whakapapa, atua, and kōrero tuku iho. Te ihi, te wehi, te mana, and te rangatiratanga are living expressions of the mauri of te taiao, carried each day by the rising of Te Hōkio, its underside of its wings glowing red with the dawn of Te Ata Kurakura as it begins its journey across the rohe of Te Parawhau, starting at Tangihua. From here, the Hōkio climbs toward the realm of Ranginui in an easterly direction, scanning the landscape of Te Parawhau as it passes over Mano Hiwa Ariki, Tūturu, Te Pae o Tū, Hauturu, Aotea, Taranga, Māui taha, Māui roto, Māui waho, and Māui Pae, sweeping toward the Sea of Koutu and Te Whara. As it reaches the entranceway to Whangārei Terenga Parāoa, it acknowledges Manaia, flying over Te Ākau and affirming the connection that Te Parawhau has to the moana, our gateway to Moana nui ā Kiwa. Upon delivering the kaupapa, the Hōkio returns to the resting place of its tūpuna manu at Pākau Hōkio, where it rests before returning to Tangihua. In doing so, it marks our spiritual and genealogical anchors, affirming our whakapapa and mana as tāngata whenua (Tonga, 2025).

Destruction of maunga and ancestral whenua and taiao is not a technical matter; it is a cultural and spiritual issue that affects the integrity of the environment and the obligations of Te Parawhau as tiaki o te taiao.

The role of the Hapū is not passive; it is an active, inherited responsibility to protect the mauri of the moana, whenua moana, and all living systems connected to them. This is the essence of kaitiakitanga, grounded in uara ahurea o Te Parawhau.

In this way, the well-being of Te Mano Hiwa Ariki is inseparable from the well-being of Te Parawhau. Protecting the mauri of the taiao and whenua is an expression of mana, tātai, and transgenerational responsibility, a continuation of ancestral duty to uphold balance within the natural world, as articulated by kaumātua Tame Te Rangi.

In continuing this ancestral duty and whakapapa connections, Te Parawhau today is an amalgamation of Ngāti Manaia, Ngāi Tāhuhu, Ngāti Ruangaio and Ngāti Tu.

5 Legislative Framework

There is a wide body of legislation and statutory documents that provide for the recognition of tikanga Māori and Hapū uara ahurea.

This legislative framework is not only important to the context of this CIA but also requires proper consideration as part of the decision-making process for the resource consent applications relevant to this kaupapa. The relevant legislative documents are discussed below:

5.1 Te Tiriti o Waitangi

Te Tiriti o Waitangi is the foundational document of Aotearoa and underpins the relationship between the Crown and hapū. It informs the statutory framework within which this Project is assessed, including the Resource Management Act 1991 (RMA) and the Fast-track Approvals Act 2024 (FTAA).

While legislation refers to the principles of the Treaty of Waitangi, Te Parawhau uphold the Articles of Te Tiriti o Waitangi as expressed in the te reo Māori text signed in 1840. These Articles reflect the original intent of the agreement and affirm the continued exercise of rangatiratanga by hapū.

For Te Parawhau, Te Tiriti o Waitangi affirms:

- the retention of rangatiratanga and mana motuhake in relation to their ancestral whenua, taiao, ngā wai, wāhi tapu, and taonga
- the responsibility to exercise kaitiakitanga
- the protection and enhancement of ngā uara ahurea me te mauri o te taiao

These obligations exist independently of, and are not diminished by, statutory processes.

Te Tiriti o Waitangi Articles

Article One – Kāwanatanga

The Crown is granted the right to govern, provided that this does not override or diminish the authority, tikanga, and decision-making capability of hapū.

Article Two – Rangatiratanga

Te Parawhau retain rangatiratanga over their ancestral lands, waters, and taonga, including the exercise of kaitiakitanga and protection of ngā uara ahurea o Te Parawhau.

Article Three – Ōritetanga

Te Parawhau are entitled to equitable treatment, including environmental protection and meaningful participation in decision-making processes.

Principles of the Treaty of Waitangi (as reflected in legislation)

The principles reflected in legislation include:

- **Rangatiratanga** – recognition of hapū authority and self-determination
- **Partnership** – good faith engagement and shared decision-making expectations
- **Active Protection** – proactive protection of taonga and cultural values
- **Mutual Benefit** – ensuring benefits are shared
- **Right of Development** – enabling hapū aspirations and futures

Application to this Project:

As a Crown infrastructure agency, NZTA operates within the Crown's statutory and Te Tiriti o Waitangi framework. This includes obligations to engage with Te Parawhau as tāngata whenua in good faith, recognise hapū values, and actively protect taonga where they may be affected by development.

5.2 Mana Whakahono ā Rohe

Te Mana Whakahono ā Rohe between Northland Regional Council (NRC) and Te Pouwhenua o Tiakiriri Kūkupa Trust on behalf of Te Parawhau Hapū is a statutory agreement established

under the RMA. It is a binding arrangement that provides a structured relationship between hapū and NRC for resource management processes.

Te Pouwhenua o Tiakiriri Kūkupa Trust has also progressed a Mana Whakahono ā Rohe with the WDC, which has been accepted and is currently being formalised, extending a consistent Mana Whakahono ā Rohe framework across both regional and district authorities.

The purpose of Te Mana Whakahono ā Rohe is to:

- improve working relationships between tāngata whenua and councils
- enhance Māori participation in resource management decision-making
- provide clarity on expectations, roles, and engagement processes.

The agreement reinforces that:

- hapū must be involved in resource consent processes, plan development, and monitoring
- Hapū Environmental Management Plans (HEMPs), where developed, are to be taken into account in decision-making, noting that Te Parawhau Hapū are currently progressing their Iwi/Hapū Environmental Management Plan
- there are opportunities for hapū involvement in monitoring, hearings, and decision-making processes
- mātauranga Māori is recognised as an important framework for environmental management and monitoring

Application to this Project:

Although the Project is being progressed under the Fast-track Approvals Act, it operates within a wider resource management system informed by the RMA and associated statutory agreements such as Te Mana Whakahono ā Rohe.

Te Mana Whakahono ā Rohe establishes clear expectations that Te Parawhau:

- are to be engaged early, meaningfully, and continuously
- have a role in decision-making, not just consultation
- are supported to exercise kaitiakitanga and mātauranga Māori

For Te Parawhau, Te Mana Whakahono ā Rohe represents a contemporary mechanism for expressing rangatiratanga within statutory resource management processes. It does not define or limit hapū authority, which exists independently of statutory frameworks; rather, it establishes minimum expectations for how councils and resource consent applicants engage with Te Pouwhenua o Tiakiriri Kūkupa Trust on behalf of Te Parawhau in resource management matters.

This includes the operative agreement with NRC, and the Mana Whakahono ā Rohe progressed with WDC, reflecting that relationship across both regional and district authorities.

5.3 Resource Management Act 1991 (RMA)

The RMA provides the primary framework for the sustainable management of natural and physical resources in Aotearoa. The purpose of the Act requires safeguarding the life-supporting capacity of air, water, soil, and ecosystems, and the avoidance, remedying, or mitigation of adverse effects on the environment.

Central to this framework are the matters of national importance set out in section 6 of the RMA. These provisions require that persons exercising functions and powers under the Act ***recognise and provide for*** these matters, rather than simply have regard to them.

Of particular relevance to this Project are the following:

- **Section 6(a)** – the preservation of the natural character of rivers, wetlands, and their margins, and their protection from inappropriate use and development
- **Section 6(b)** – the protection of outstanding natural features and landscapes

- **Section 6(c)** – the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna
- **Section 6(e)** – the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, and other taonga
- **Section 6(f)** – the protection of historic heritage, including archaeological sites

These provisions establish a clear statutory expectation that the natural environment, indigenous biodiversity, wāhi tapu, and Māori cultural relationships with the taiao are to be actively maintained and protected.

In addition, section 7(a) requires particular regard to be had to kaitiakitanga, and section 8 requires decision-makers to take into account the principles of Te Tiriti o Waitangi.

The RMA framework also requires consideration of:

- actual and potential effects on the environment
- alternatives where significant adverse effects may arise
- cumulative effects across interconnected systems

For Te Parawhau, these are not procedural requirements, but substantive obligations that require outcomes consistent with the protection of mauri, wāhi tapu, and hapū uara ahurea, recognising the interconnected nature of whenua, wai, and the wider taiao.

5.4 Fast-track Approvals Act 2024

The Project is being progressed under the Fast-track Approvals Act 2024 (FTAA). The Act enables multiple approvals to be considered through a single substantive application.

While the FTAA streamlines the process, it does not remove the requirement to:

- assess environmental effects; or
- apply the substantive statutory frameworks relevant to those approvals, including:
    - the RMA

- the Wildlife Act
- the Conservation Act, and
- the Heritage New Zealand Pouhere Taonga Act .

The FTAA does not contain a standalone Te Tiriti o Waitangi (Te Tiriti) clause. The consideration of Te Tiriti and Māori interests is instead provided for through the underlying statutory frameworks that apply to the Project, including the provisions of Part 2 of the RMA and relevant requirements under the Conservation Act and other applicable statutory instruments and planning frameworks.

These frameworks require the recognition of tāngata whenua relationships with the taiao, the protection of indigenous biodiversity and habitats, and the management of environmental effects, including cumulative effects across interconnected systems.

Recent evidence from the Director-General of Conservation, provided to the Panel Convener under the FTAA process (discussed further in Section 8 of this CIA), identifies significant concerns regarding the adequacy of the application, including insufficient information to assess environmental effects, deficiencies in ecological and freshwater assessments, and an over-reliance on future management plans rather than clearly defined avoidance and mitigation measures.

For Te Parawhau, this reinforces the need for the Project to be assessed in a manner that appropriately recognises and provides for hapū relationships with their ancestral whenua, ngā wai, wāhi tapu, and taonga, and ensures the active protection of those taonga and the mauri of the taiao, including the avoidance of adverse effects where these values are at risk.

5.5 Land Transport Management Act 2003

The Land Transport Management Act 2003 (LTMA) governs the planning and funding of land transport infrastructure in Aotearoa and establishes NZTA as a Crown entity responsible for delivering an effective, efficient, and safe land transport system.

In performing its functions, NZTA is required to contribute to a transport system that is safe, resilient, sustainable and to take a long-term view of environmental, social, and cultural outcomes.

As a Crown entity, NZTA operates within the Crown's statutory and Te Tiriti framework. This includes obligations to:

- engage with Te Parawhau as tāngata whenua in good faith
- recognise and respond to hapū values (ngā uara ahurea)
- ensure the protection of taonga where these may be affected by transport infrastructure development.

In practice, this requires that transport projects are planned and delivered in a manner that:

- rigorously identifies environmental and cultural effects
- properly develops, evaluates, and assesses alternative design, construction, and alignment options
- transparently demonstrates how significant adverse effects on the taiao and taonga are avoided or reduced.

For this Project, these obligations extend beyond achieving engineering or cost efficiencies. They require that:

- avoidable damage to te taiao is not accepted
- the mauri of the whenua, ngā wai, and taonga is protected and sustained in practice, with NZTA required to demonstrate how this is achieved through design, construction, and operation
- alternatives that avoid, or significantly reduce, adverse effects are prioritised and demonstrably exhausted before higher impact options are progressed.

5.6 National Policy Statements and Environmental Standards

The Project is subject to national direction under the RMA, including:

- National Policy Statement for Freshwater Management (NPS-FM)
- National Policy Statement for Indigenous Biodiversity (NPS-IB)
- New Zealand Coastal Policy Statement (NZCPS) [where relevant]
- National Environmental Standards for Freshwater
- National Environmental Standard for Contaminated Soil (NES-CS)

These instruments direct:

- the protection and restoration of freshwater ecosystems and the maintenance of mauri
- the protection, maintenance, and restoration of indigenous biodiversity, including the avoidance of further loss
- the preservation of natural character and protection of significant natural and landscape values
- the avoidance of degradation, and where this cannot be achieved, the strict limitation of adverse effects on natural systems

The NPS-FM establishes Te Mana o te Wai as a fundamental concept, requiring that; the health and well-being of water is prioritised, the needs of people are provided for only after the health of the wai is protected.

The NPS-IB establishes a national direction to protect, maintain, and restore indigenous biodiversity, including a requirement to achieve at least no overall loss of indigenous biodiversity. It requires that:

- significant indigenous biodiversity is identified and protected
- adverse effects on indigenous biodiversity are avoided, remedied, or mitigated, with a strong emphasis on preventing further loss

- the relationship of tāngata whenua with indigenous biodiversity is recognised, including the role of kaitiakitanga

For Te Parawhau, indigenous biodiversity is intrinsically linked to taonga and to the mauri of the taiao. These provisions align with ngā uara ahurea o Te Parawhau (Te Parawhau cultural values) and reinforce expectations that the loss or degradation of indigenous biodiversity, including taonga species and their habitats, is not acceptable and must be avoided.

5.7 Regional and District Planning Framework

The Project within the scope of this CIA is assessed against relevant planning documents, including:

- the Northland Regional Policy Statement,
- the Proposed Regional Plan for Northland,
- the Whangārei District Plan.

These documents sit within a broader statutory hierarchy and give effect not only to the RMA, but also to higher order national and regional direction, including national policy statements, environmental standards.

Collectively, they give effect to the matters of national importance, directing the protection of natural character, outstanding natural features and landscapes, significant indigenous vegetation and habitats, historic heritage, and the relationship of tāngata whenua with their ancestral whenua, taiao, ngā wai, wāhi tapu, and taonga.

They also require:

- consideration of cumulative effects
- protection of freshwater and ecological systems
- recognition of hapū environmental management plans

These planning documents establish clear direction that development must not compromise the mauri of natural systems or the cultural values associated with them.

The RPS and PNRP frameworks require that Te Parawhau relationships, tikanga, and mātauranga Māori are recognised and integrated into decision-making. This extends beyond engagement to include the active exercise of kaitiakitanga, rangatiratanga, and mana motuhake in determining outcomes affecting taiao and taonga.

Accordingly, application of these provisions requires that:

- Te Parawhau are involved in decision-making processes that affect their taiao, sites, and taonga,
- mātauranga Māori and tikanga are embedded within the assessment of effects and project design,
- cultural landscapes, including wāhi tapu and mahinga kai, are identified and protected as interconnected systems,
- effects on taiao and taonga are avoided where they would undermine whakapapa relationships and mauri.

These requirements cannot be achieved solely through management plans or post-consent mitigation measures but must be addressed at the level of project design, location, and fundamental approach.

5.8 Wildlife Act 1953

The Wildlife Act 1953 provides statutory protection for indigenous wildlife, making it an offence to kill, injure, capture, or disturb protected species without authorisation for DOC.

The Project involves works that have the potential to disturb, relocate, or cause incidental harm to indigenous wildlife species, including Hochstetter's frog, kauri snail, lizards, avifauna including kiwi, and long-tailed bat. As previously outlined, avifauna, kiwi and long-tailed bats have been excluded in NZTA's current wildlife authority application to DOC,

notwithstanding its presence within the Project area and that Project works will likely result in adverse effects on these species by way of potential harmful disturbance and/or incidental injury or mortality.

The Act imposes a clear requirement that:

- adverse effects on protected wildlife are avoided wherever possible,
- any residual effects are strictly authorised and managed under approval from DOC,
- works must not proceed in a manner that results in unlawful harm to protected species.

The wildlife authority process also provides for engagement with tāngata whenua, including notification to Te Parawhau, recognising the relationship of hapū with taonga species and supporting the exercise of kaitiakitanga and mātauranga Māori within the approvals process.

For Te Parawhau, indigenous fauna are taonga, including the habitats and ecological systems that sustain them. Without the integrity of these systems, including habitat and food sources, these taonga species cannot survive. For Te Parawhau, this reflects a whole-of-taiao approach, where protection from harm extends beyond individual species to the interconnected systems that support them. The protection of these species is therefore inseparable from the protection of the wider taiao. Effects on these species are not isolated ecological matters, but reflect impacts on whakapapa relationships, the mauri of the taiao, and the ability of hapū to exercise kaitiakitanga.

5.9 Conservation Act 1987 and Department of Conservation (DOC) Role

The Conservation Act 1987 establishes the DOC and provides the statutory framework for the protection and management of New Zealand's natural and historic resources. The Act requires that conservation values are safeguarded, and that natural resources are managed to maintain their intrinsic ecological and cultural values.

Under this framework, conservation is defined to include the preservation, protection, and management of ecosystems, indigenous biodiversity, and natural landscapes. DOC has a regulatory and decision-making role in approving activities that may affect these values, including works affecting protected species and their habitats.

The Act requires that natural resources are managed to:

- protect ecological integrity and the functioning of natural systems,
- maintain and restore indigenous biodiversity and associated habitats,
- recognise the interconnected nature of ecosystems and their capacity to sustain indigenous species.

This framework recognises that indigenous species do not exist independently, but as part of complex ecological systems that must be maintained to support their ecological integrity, function of natural systems and species survival.

For Te Parawhau, these systems are inseparable from the mauri of the taiao and the species it supports. Conservation extends beyond the protection of individual species or sites. Indigenous flora and fauna, their habitats, and the broader ecological systems that sustain them are all taonga, interconnected through whakapapa. Effects on these systems therefore represent impacts on te mauri o te taiao and the ability of Te Parawhau to exercise their kaitiakitanga obligations.

Where a project results in the degradation of ecological integrity, the loss of indigenous biodiversity, or damage to the interconnected systems that sustain taonga species, it is inconsistent with the intent and outcomes sought under the Conservation Act. The scale and nature of effects of this scale, including displacement, mortality and risk to entire populations such as the Northland Hochstetter's frog (*L.* aff. *hochstetteri* "Northland"), extend beyond site-specific impacts represent a fundamental destruction of the integrity and functioning of the taiao rather than a reduction that can be addressed through

management or mitigation. Such outcomes are contrary to the Act's requirement to protect, maintain, and restore ecological systems and biodiversity.

Project Relevance

The Project will result in effects on:

- terrestrial and freshwater habitats
- wetland systems
- ecological connectivity
- indigenous biodiversity

While approvals under the Wildlife Act address effects on specific protected species, the Conservation Act framework makes clear that effects cannot be limited to individual species, and must be understood in the context of:

- the integrity and function of habitats and ecological systems as a whole
- cumulative and indirect effects on biodiversity
- the long-term viability of species within their natural environments

For Te Parawhau, this aligns with a holistic understanding of the taiao, where:

- species, habitats, ngā wai, whenua, and mauri are all interconnected,
- effects on one part of the system, or individual species, are inseparable from effects on the wider taiao.

The Project results in the fragmentation, degradation, and loss of interconnected ecological systems that sustain the mauri and functioning of the wider taiao.

Accordingly, the effects of the Project must be understood as impacts on the integrity of the taiao as a whole, rather than discrete or isolated effects. This requires robust assessment, design, and construction methodologies, including the appropriate selection of alignment and location, undertaken in partnership with Te Parawhau Hapū.

In light of this, project design, location, and implementation must avoid compromising ecological integrity, indigenous biodiversity, and the interconnected systems that support taonga species, in order to remain consistent with the purpose and requirements of the Conservation Act. This includes engagement with Te Parawhau in a manner that recognises and provides for the exercise of kaitiakitanga, rangatiratanga, and mana motuhake in relation to taiao, taonga and decision-making.

5.10 Heritage New Zealand Pouhere Taonga Act 2014

The Heritage New Zealand Pouhere Taonga Act 2014 provides for the protection of archaeological sites and requires that an archaeological authority is obtained where works may modify or destroy such sites.

Under this framework:

- archaeological sites are protected from modification or destruction unless authorised
- applications must include an assessment of archaeological and Māori values and the effects on those values
- engagement with tāngata whenua is required, including the opportunity for Te Parawhau to provide input prior to any authority being granted
- Heritage New Zealand Pouhere Taonga typically seeks and considers hapū views before finalising any archaeological authority decision
- decisions must recognise Māori relationships with ancestral lands, sites, wāhi tapu, and other taonga

The Project identifies several archaeological sites within the Project footprint, including pā, pit and terrace sites, midden sites, taonga findspots, and historic sites. The archaeological assessment confirms that multiple sites will be modified or destroyed because of construction activities, and that these effects are more than minor. While some pā sites are proposed to be avoided, numerous other sites forming part of the same archaeological and

cultural landscape are proposed to be modified or destroyed under archaeological authority.

The archaeological authority framework provides for the investigation and recording of sites prior to their modification or destruction. However, this approach is primarily focused on the recovery of physical information and does not retain the integrity of the sites or the relationships associated with them.

The reliance on archaeological authorities to address Project effects enables the loss of archaeological sites and associated cultural values to occur, rather than avoiding that loss.

The archaeological assessment identifies sites spatially but does not define or assess them as part of the Te Parawhau cultural landscape. Although it recognises that sites form part of a wider Māori archaeological landscape, this is not translated into an assessment of interconnected systems of occupation, use, and whakapapa.

Cultural values are identified as matters for tāngata whenua; however, the process of engaging with and incorporating Te Parawhau views on their values, including through input sought by Heritage New Zealand Pouhere Taonga, has not yet been fully realised in advance of these proposed outcomes. Accordingly, the identification and proposed modification or destruction of sites is being advanced ahead of a complete understanding of their cultural significance and before the full expression of Te Parawhau values within the statutory process.

For Te Parawhau, archaeological sites are not discrete features but form part of a wider cultural landscape that includes wāhi tapu, wāhi tūpuna, nohoanga, ara, cultivation areas, and water systems within the taiao. These places are interconnected through whakapapa and carry ongoing cultural and spiritual significance.

Accordingly, the modification or destruction of archaeological sites, even where authorised, represents a loss of taonga and a fragmentation of Te Parawhau ancestral taiao and whakapapa. This undermines the integrity of the taiao and limits the ability of Te Parawhau

to exercise kaitiakitanga, rangatiratanga, and mana motuhake. Such loss cannot be remedied or replaced through investigation, recording, or data recovery and is not consistent with the intent of the Act to recognise and provide for Māori relationships with these ancestral sites and taonga.

6 Ngā Uara Ahurea o Te Parawhau Hapū

6.1 Kaitiaki, Kaitiakitanga and Manaakitanga

In keeping with kaitiakitanga, Te Parawhau Hapū hold inherent obligations to their whānau and to all other hapū and the wider hapori within their rohe. These obligations arise through whakapapa and include the responsibility to nurture and uphold Mana Atua, Mana o te Wai, Mana Whenua, Mana Ao Tūroa, and Mana Tāngata.

Kaitiakitanga and manaakitanga extend beyond notions of guardianship or hospitality. They reflect enduring intergenerational responsibilities inherited at birth and carried across generations. These responsibilities require the ongoing care and protection of the taiao, including the maintenance of wairuatanga and the safeguarding of these from harm. Wairuatanga and mauri underpin the health and wellbeing of the taiao and is fundamental to the identity and wellbeing of Te Parawhau Hapū.

Through whakapapa, Te Parawhau Hapū hold responsibility for mātauranga, tikanga and kawa Māori in relation to the wellbeing, management and use of their taonga and resources. Kaitiakitanga involves not only protecting the life-supporting capacity of the taiao, but also upholding spiritual obligations, retaining mana motuhake over these resources, and ensuring the wellbeing of the people and taonga species who depend on them.

This includes a continuous and enduring obligation to protect, use, and maintain relationships with taonga and wāhi tapu. These relationships are not discretionary; they are inherent to the identity and responsibilities of Te Parawhau Hapū. In this way, kaitiakitanga, manaakitanga, and wairuatanga are maintained through whakapapa and continue to guide the responsibilities of Te Parawhau Hapū across generations.

7 Te Pou Tarāwaho o Te Taiao o Te Parawhau

The enduring relationship that Te Parawhau Hapū hold with their taiao, as outlined in this CIA, must be recognised as a fundamental consideration in decision-making for this Notice of Requirement and subsequent Outline Plan processes.

For Te Parawhau Hapū, all living and non-living elements of the taiao are intrinsically connected through whakapapa, tātai, and whanaungatanga. These relationships bind whenua, wai, species, and people within a single, interconnected system. Within this framework, spiritual dimensions are inseparable from the physical, and both must be upheld.

In accordance with kaitiakitanga, the responsibilities of Te Parawhau Hapū extend beyond individual sites or resources to include ancestral whenua, awa, wetlands, ecological systems, wāhi tapu, tikanga, and the relationships that uphold taonga, mana, tapu, and mauri. Effects of the Project must therefore be understood not as isolated impacts, but as effects on these interconnected systems and relationships.

All elements of the taiao, both animate and inanimate, possess their own mauri. The taiao within the Project area, and the wider surrounding landscape, holds mauri that connects Te Parawhau Hapū through mana, tapu, and whakapapa. These connections reflect an ongoing relationship with whenua, wai, and the living systems that support both people and taonga species within Te Ao Tūroa.

The following concepts represent the pou tarāwaho for environmental management grounded in Te Parawhau Hapū mātauranga and tikanga. These encompass both the tangible and intangible realms, mai i te whenua ki te rangi, mai i te rangi ki te whenua, and guide the appropriate use, protection, and management of natural and physical resources.

These pou form the cultural environmental design framework of Te Parawhau Hapū, expressed as:

Te Pou Tarāwaho o Te Taiao o Te Parawhau

- **Mana atua** • Mana atua (the atua / the spiritual realm's mana): Effects (positive and negative) on the spiritual realm, including tikanga and kawa (protocols and practices), and the ability to uphold wairuatanga.
- **Te mana o te wai** • Te mana o te wai (Tangaroa/Maru's realm, the water's mana): Effects (positive, negative, and neutral) on ngā wai, including Waihoihoi Awa, Ahuroa Awa, Te Waipū Awa, Paepae Atua, and associated freshwater systems. This includes effects on the uri of Maru and Tangaroa, and any physical modification, diversion, or discharge affecting these waters including punawai (aquifers).
- **Mana whenua** • (the realm of Papatūānuku, the mana of the whenua): Effects (positive, negative, and neutral) on the whenua arising from the proposed Designation and development of the 4-lane State Highway, including earthworks, vegetation clearance, modification of landforms, soils, and associated habitats.
- **Mana ao tūroa** • the space between Ranginui and Papatūānuku, the environment's mana): Effects (positive and negative) on the wider taiao, including ecological systems, biodiversity, habitats, and the interconnections that sustain life between Papatūānuku and Ranginui.
- **Mana tāngata** • (the human realm, people's mana): Effects (positive and negative) on people, including cultural wellbeing, identity, relationships with the taiao, and the ability of Te Parawhau Hapū to uphold their responsibilities to present and future generations.

8 Ngā Uara Ahurea o Te Parawhau Assessment of Effects

This section assesses the actual and potential effects of the Project on ngā uara ahurea o Te Parawhau Hapū within their ancestral takiwā.

As outlined in Section 3, the Project involves large-scale modification of whenua, ngā wai, and the wider taiao, including extensive earthworks, vegetation clearance, and the alteration of interconnected freshwater and ecological systems. These works occur within environments that are not discrete, but form part of a continuous and interconnected taiao, where effects extend beyond the immediate designation footprint.

For Te Parawhau Hapū, these systems are understood through whakapapa. The relationships between whenua, ngā wai, taonga species, and people are inseparable, and together sustain the mauri of the taiao. Accordingly, the assessment of effects is not limited to individual sites or resources but considers the integrity and functioning of these interconnected systems as a whole.

The assessment is undertaken in accordance with Te Pou Tarāwaho o Te Taiao o Te Parawhau, comprising:

- Mana Atua
- Mana o te Wai
- Mana Whenua
- Mana Ao Tūroa
- Mana Tāngata

These pou give expression to ngā uara ahurea o Te Parawhau Hapū and the responsibilities held through kaitiakitanga. Effects of the Project are therefore understood in relation to their impact on the mauri of the taiao and the ability of Te Parawhau Hapū to uphold these responsibilities.

In its current form, the Project results in significant adverse effects across multiple interconnected systems. In some instances, these effects are permanent or irreversible, particularly where they involve the modification or loss of taonga and the disruption of relationships that sustain the mauri of the taiao.

Position of Te Parawhau Hapū

Te Parawhau Hapū do not support the Project as currently proposed. Support is contingent on the Project being designed and implemented in a manner that avoids adverse effects on ngā uara ahurea wherever practicable, and where avoidance is not achievable, ensures that robust and enforceable mahi whakaora are embedded within the designation and associated conditions.

Mahi whakaora are identified under each pou below. These represent the actions required to uphold the responsibilities of Te Parawhau Hapū and to protect and restore the mauri of the taiao. A consolidated list of mahi whakaora is provided in **Appendix C**.

The findings of this assessment are set out under each pou below.

8.1 Summary of Independent Ecological Technical Assessments

This subsection summarises the findings of independent Subject Matter Expert (SME) ecological reviews prepared to inform this CIA. These reports provide a detailed technical evaluation of the ecological assessments prepared for the Project, including the Freshwater Fish Technical Review, the Technical Peer Review of the Assessment of Effects on Freshwater Ecology (FER), the Technical Review of Ecological Reporting for Terrestrial Fauna and the Technical Review of Assessment of Effects on Avifauna.

Together, these reviews consider the full suite of ecological assessments prepared for the Project, including freshwater ecology, terrestrial ecology, and avifauna assessments, along with associated technical appendices. The reviews evaluate the adequacy of methodologies,

survey effort, baseline data, effects assessment, and the reliability of proposed mitigation and management measures across all ecological domains.

8.1.1 Summary of Peer Review of Freshwater Ecology

Bay Ecological Consultancy Ltd (BECL) undertook an independent technical review of the Freshwater Ecology Assessment prepared for NZTA.

TECHNICAL REVIEW SUMMARY - FRESHWATER ECOLOGY

This independent technical review concludes that the Assessment of Effects on Freshwater Ecology (FER) does not provide a sufficiently robust, transparent or reproducible basis for assessing the freshwater ecological effects of the Northland Corridor 2B Project. While individual technical matters are identified throughout the review, the principal concern is that a series of interconnected methodological decisions collectively reduce ecological values, predicted effects, mitigation requirements and residual effects. These issues extend throughout the assessment framework rather than representing isolated technical disagreements.

KEY FINDINGS

ASSESSMENT METHODOLOGY

- The assessment departs from recognised New Zealand freshwater ecological assessment methodologies through modification of accepted frameworks, including EIANZ ecological impact assessment, Stream Ecological Valuation (SEV), Fish IBI, wetland assessment approaches and bespoke ecological value and effect magnitude criteria.
- Modified assessment frameworks are insufficiently transparent and cannot be independently reproduced.
- Established significance criteria are altered through weighting, averaging and condition-based adjustments that are not consistent with accepted ecological assessment practice.

- Early methodological assumptions are propagated throughout ecological valuation, effects assessment, mitigation design, monitoring and residual effects, creating an assessment cascade in which ecological outcomes are progressively reduced.

EXISTING ECOLOGICAL BASELINE

- The ecological baseline is incomplete owing to deficiencies in stream mapping, wetland delineation, field survey coverage and habitat assessment.
- Headwater, intermittent and ephemeral streams are under-represented despite their recognised ecological importance.
- Fish surveys provide an incomplete characterisation of indigenous fish communities, with insufficient consideration of seasonal migration, recruitment, spawning and detection probability.
- The FER applies eDNA, Fish IBI and eDNA-derived MCI in ways not supported by current NIWA guidance, using them as surrogates for abundance, ecological value and habitat significance rather than as complementary assessment tools.
- The review concludes that uncertainty associated with the ecological baseline is generally resolved through lower ecological value assignments rather than a precautionary approach.

ECOLOGICAL VALUES

- Subjective condition judgement is repeatedly substituted for ecological value throughout the assessment.
- The FER departs from the recognised ecological significance framework of EIANZ (2018) and Northland RPS (2018) Appendix 5 by replacing the four accepted significance criteria with bespoke value assessments, reducing recognition of regionally significant habitats, species and ecological functions.
- The FER materially modifies the EIANZ (2018) ecological impact assessment framework without providing scientific or technical justification for those departures. Despite these modifications, the revised methodology continues to be attributed to the EIANZ Guidance (Roper-Lindsay et al. 2018), creating the impression that it reflects the published framework when it does not. This contrasts

with the application of the standard EIANZ methodology in the other NZTA ecological assessments prepared for the Project

- The NPS-FM Values Framework is used beyond its intended purpose by treating identified values as a quasi-scoring system. This contributes to reduced ecological value assignments for streams and natural inland wetlands and is inconsistent with the purpose of the NPS-FM values framework.
- Modified streams, exotic-dominated natural inland wetlands and headwater systems are assigned reduced significance despite retaining recognised ecological, hydrological and biodiversity functions.
- Threatened, At Risk and regionally significant freshwater species are not consistently assessed according to recognised conservation status.
- Habitat value relies heavily on surrogate measures such as stream size, fish abundance, Fish IBI, upstream habitat length and proportional stream extent rather than ecological function.
- Ecological connectivity, life-history requirements and ecosystem processes receive insufficient weighting in determining ecological value.

FRESHWATER ECOSYSTEMS

- Headwater streams are systematically undervalued despite their importance for spawning, juvenile recruitment, refuge habitat, nutrient processing and downstream ecosystem function.
- Natural inland wetlands are assessed primarily according to vegetation condition rather than hydrological function, ecosystem processes and restoration potential.
- Ecological connectivity between streams, wetlands, groundwater, floodplains and downstream receiving environments receives limited consideration.
- The Waipū Estuary, despite its direct hydrological connection to the project catchments, receives limited consideration as a downstream receiving environment.
- The assessment gives limited consideration to climate resilience and the role of freshwater ecosystems in responding to future hydrological change.

ASSESSMENT OF EFFECTS

- Ecological effects are assessed using habitat values that have already been reduced through the modified assessment framework.
- Catchment-scale averaging and proportional habitat-loss calculations dilute local ecological effects.
- Habitat extent is repeatedly substituted for habitat function.
- Ecological effects on spawning habitat, migration pathways, recruitment, population resilience and ecosystem processes are incompletely assessed.
- Cumulative fragmentation resulting from multiple stream crossings, culverts and habitat modification is underestimated.
- Consequently, predicted ecological effects are consistently lower than would be expected using recognised ecological assessment methodologies.

FISH PASSAGE, CULVERTS AND STREAM REALIGNMENT

- Fish passage requirements are determined largely by reduced habitat values and simplified upstream habitat assumptions.
- Culvert assessments focus primarily on hydraulic performance and engineering compliance rather than maintenance of natural stream ecosystem function.
- Compliance with minimum fish passage standards is frequently presented as mitigation despite representing baseline regulatory expectations. Adaptive management is unlikely to be achievable
- Stream realignment and reclamation assume ecological equivalence with natural channels despite acknowledged uncertainty and limited supporting evidence in literature or examples.
- Successful construction of replacement channels is assumed to restore ecological function without demonstrating long-term recovery of habitat quality, geomorphic processes or species-specific habitat requirements.

WETLANDS

- Wetland assessment inherits the same methodological limitations applied elsewhere in the freshwater assessment. Mapping is inadequate.

- Natural inland wetlands are systematically undervalued through an emphasis on exotic composition and perceived condition rather than hydrological function, ecosystem processes, ecological context and restoration potential.
- The assessment repeatedly conflates wetland condition with ecological value, resulting in exotic-dominated and grazed natural inland wetlands being assigned reduced significance despite retaining statutory, ecological and hydrological value.
- Wetland management recommendations inherit reduced ecological value assessments established earlier in the FER, resulting in correspondingly reduced avoidance, mitigation and monitoring requirements.
- Application of the effects management hierarchy is weakened because wetland ecological values are reduced before avoidance is considered, diminishing the emphasis on avoiding adverse effects on natural inland wetlands.
- Ecological significance of exotic-dominated natural inland wetlands is underestimated through reliance on exotic character, contrary to the definition of natural inland wetland and hydrological and ecological function.

GROUNDWATER

- Groundwater technical reporting relies heavily on the flawed Freshwater Ecology Report to determine ecological acceptability.
- Consequently, uncertainty regarding stream permanence, wetland hydrology and groundwater-dependent ecosystems is propagated into the groundwater assessment and vice versa.
- The review concludes that groundwater management recommendations do not adequately reflect ecological uncertainty or apply an appropriately precautionary approach.

MITIGATION AND MANAGEMENT

- Avoidance, mitigation, monitoring and offsetting recommendations inherit the reduced ecological values established earlier in the assessment.

- Management recommendations reinforce predetermined assessment outcomes rather than independently addressing ecological risk.
- The assessment framework is insensitive to whether mitigation succeeds in maintaining ecological function because residual effects have already been assessed as low.
- Monitoring is largely directed toward confirming engineering performance and implementation rather than demonstrating ecological outcomes or informing adaptive management.

OVERALL PROFESSIONAL OPINION

- Our review concludes that the FER systematically underestimates freshwater ecological values, ecological connectivity, project effects and management requirements through a series of interconnected methodological departures from recognised New Zealand assessment practice.
- Confidence in the assessment is reduced not by individual technical matters alone, but by the cumulative effect of methodological assumptions that progressively reduce ecological values and predicted effects throughout the assessment process.
- The modified assessment methodologies adopted throughout the FER are generally unsupported by published New Zealand ecological guidance or peer-reviewed literature, and the scientific basis for departing from recognised methodologies is not demonstrated.
- The review considers that the assessment framework does not provide a sufficiently transparent, repeatable or scientifically robust basis for evaluating the project's freshwater ecological effects or the effectiveness of proposed management measures.
- The assessment assumes that uncertainties associated with stream realignment, engineered channels, culvert performance and fish passage can be managed through monitoring and adaptive management. In practice, many failures affecting channel morphology, hydrology, ecological function and connectivity are difficult or

impracticable to remedy once construction is complete, making design for ecological success the primary mitigation measure

- A further concern identified by the review is that adoption of these assessment methodologies within future stages of the Northland Corridor, or more broadly within NZTA infrastructure projects, risks establishing a precedent whereby non-standard assessment approaches systematically reduce freshwater ecological values, effects and management requirements.

8.1.2 Summary of Freshwater Fish Technical Review

BECL undertook an independent technical review of the Freshwater Fish Assessment prepared for NZTA.

- The review concludes that the freshwater fish assessment relies on a series of interconnected non-standard assessment methodologies that collectively underestimate freshwater fish habitat values, ecological connectivity, project effects and management requirements.
- Assessment outcomes are strongly influenced by modified ecological value assignments, particularly through Table 11, which underpins habitat values, effect magnitude, fish passage, mitigation and residual effects.
- Methodological decisions made early in the assessment progressively reduce predicted ecological effects throughout the assessment process.

ECOLOGICAL BASELINE

- Headwater, intermittent and ephemeral streams are incompletely and incorrectly mapped through a bespoke Digital Network Model, reducing the recognised extent of fish habitat.
- Fish survey effort is insufficient to comprehensively characterise indigenous fish communities.
- eDNA survey timing does not adequately capture seasonal migration, spawning and juvenile recruitment.

- Environmental DNA (eDNA) & eDNA Fish Index of Biotic Integrity (eDNA Fish IBI) are interpreted beyond current guidance
- Detection limitations for cryptic and naturally uncommon species are not adequately incorporated e.g. lamprey
- eDNA & NZFFD records are truncated and interpreted without sufficient consideration of survey bias or detection probability.
- Lamprey habitat and ammocoete habitat receive limited species-specific assessment.

FISH HABITAT VALUES

- Ecological condition is repeatedly substituted for ecological value.
- Fish abundance, although not in any way provided by the data, is used as a surrogate for habitat significance.
- Headwater streams are consistently assigned lower ecological values despite their role in spawning, recruitment, refuge, food-web production and downstream ecosystem processes.
- Fish habitat valuation relies on surrogate measures including stream size, eDNA Fish IBI, upstream habitat assumptions and proportional stream length rather than ecological function.
- Threatened, At Risk and Regionally Significant species are assigned reduced significance based on presumed unsupported low abundance rather than recognised conservation status.
- Fish populations are assessed as individual isolated stream reaches rather than connected catchment-scale populations.
- Spawning habitat, migration corridors and recruitment processes receive limited weight within habitat assessments.

ECOLOGICAL CONNECTIVITY

- Fish populations are not recognised as dependent on connected river networks throughout their life cycles.
- Longitudinal connectivity, downstream migration and recruitment processes not sufficiently considered
- The need for fish passage relies heavily on upstream habitat dismissal rather than species ecology and catchment connectivity.
- Cumulative fragmentation arising from multiple barriers is inadequately assessed.

ASSESSMENT OF EFFECTS

- Project effects are assessed using habitat and species values derived from modified assessment methodologies.
- Reduced habitat values directly reduce predicted effect magnitude and significance.
- Catchment-scale averaging dilutes local ecological effects.
- Habitat extent is repeatedly substituted for habitat function e.g. headwaters assigned Negligible value.
- Ecological uncertainty is generally resolved through lower value assignments rather than precautionary assessment.
- Residual effects remain low because habitat values and effect magnitudes have already been reduced before mitigation is considered as a *fait accompli.*

CULVERTS AND STREAM REALIGNMENT

- Fish passage is treated as the principal ecological effect of culverting despite permanent modification of stream ecosystems as a whole.
- Hydraulic compliance is assumed to maintain ecological function without demonstration.
- Culvert assessments give limited consideration to habitat complexity, geomorphic processes, riparian interactions and cumulative fragmentation.
- Stream realignment assumes ecological equivalence with natural channels despite acknowledged uncertainty.

- Replacement channel length is substituted for habitat quality and ecological function.
- Recovery of geomorphic processes, riparian vegetation and habitat complexity is assumed rather than demonstrated.
- Monitoring focuses largely on channel establishment rather than long-term ecological function or fish population persistence.

MANAGEMENT AND MITIGATION

- Management recommendations inherit the reduced habitat values and effect assessments established earlier in the assessment.
- Modified ecological assumptions influence avoidance, mitigation, monitoring and offset requirements.
- Recommended culvert design measures largely reflect baseline engineering standards rather than demonstrated ecological mitigation.
- Stream reclamation and realignment are assumed to restore ecological function despite limited supporting evidence.
- Trial-and-error establishment of streams on engineered spoil sites introduces additional uncertainty.
- Wetland management continues to emphasize vegetation condition over hydrological function and ecological processes.
- Groundwater management relies on the Freshwater Ecology Report to determine ecological acceptability, meaning deficiencies in habitat assessment propagate into groundwater conclusions.

OVERALL SCIENTIFIC OPINION

- We reiterate that indigenous freshwater fish populations are sustained by connected habitat networks and complete life-history processes rather than isolated stream reaches e.g. maintaining passage at Waihoihoi Main stem is not sufficient.

- The assessment framework repeatedly substitutes ecological function with surrogate measures including stream size, fish abundance, Fish IBI, upstream habitat assumptions, proportional stream loss and catchment-scale averaging.
- These methodological decisions systematically reduce habitat values, predicted project effects, fish passage requirements, mitigation measures and residual effects.
- The methodology underpinning Table 11 lacks sufficient transparency and reproducibility to provide confidence in habitat value assignments.
- Confidence that the Freshwater Ecology Report accurately characterizes freshwater fish habitat values, ecological connectivity, project effects and management effectiveness is therefore substantially reduced.
- The review concludes that adoption of these methodologies in future Northland Corridor stages or wider NZTA projects risks establishing a precedent for systematic underestimation of freshwater ecological values, project effects and management requirements.

8.1.3 Summary Effects on Terrestrial Ecology – Vegetation Components

BECL undertook an independent technical review of the Assessment of Effects on Terrestrial Ecology (Vegetation Components) prepared for NZTA. The review evaluated the vegetation assessment methodology, ecological value assessment, effects assessment, proposed mitigation and conclusions against accepted New Zealand ecological practice.

KEY FINDINGS

- The assessment appropriately adopts the Ecological Impact Assessment (EcIA) Framework (EIANZ, 2018) and is supported by comprehensive field survey and vegetation mapping.
- Vegetation classification is not consistently aligned with recognised national and regional vegetation typologies, including Atkinson (1985) structural classification, Singers & Rogers (2014) ecosystem classification, Singers & Lawrence (2018)

Northland Potential Ecosystems, and the Waipū Ecological District Protected Natural Areas Programme (PNAP).

- The vegetation inventory does not include sufficient ecological descriptors aligned with the assessment criteria of EIANZ (2018, Table 4) and the Northland Regional Policy Statement (2018, Appendix 5) to enable independent assessment and verification of the ecological significance assigned to individual vegetation communities.
- The assessment gives insufficient consideration to regional ecological context, including the Waipū Ecological District PNAP, Threatened Environment Classification (TEC), Northland Potential Ecosystems and regional biodiversity prioritisation frameworks. Consequently, highly depleted ecosystem associations, including the WF7 Pūriri Forest Complex (approximately 10–12% remaining), WF8 Kahikatea–pūkatea Forest (10.2% remaining) and lowland examples of WF9 Taraire–tawa–podocarp Forest, are not consistently recognised as regionally significant despite their limited remaining extent and representative value.
- The assessment does not consistently apply the species value criteria of EIANZ (2018, Table 2). Regionally significant or locally distinctive indigenous flora, including lowland ribbonwood (*Plagianthus regius* subsp. *regius*), *Veronica macrocarpa* var. *macrocarpa, Coprosma rigida*, kawaka (*Libocedrus plumosa*) and kōtukutuku (*Fuchsia excorticata*), are in several instances assigned Low ecological value rather than the Moderate value provided for under Table 2 EIANZ.
- Appendix F does not provide sufficient ecological justification or transparent linkage between mapped vegetation units and significance assessments to enable independent review or reproduction of the assigned ecological significance.
- Confidence in the assessment of vegetation effects, residual effects and biodiversity offset calculations is reduced because the ecological significance assessment cannot be independently verified.
- Permanent loss and fragmentation of High and Very High significance indigenous vegetation remain key residual project effects. The habitat fragmentation and edge

effects assessment criteria Table 23 do not adequately account for the existing highly fragmented condition typical within the Waipū Ecological District. Consequently, additional fragmentation and edge effects on remnant indigenous vegetation are not differentiated from effects occurring within larger or more intact indigenous forest.

- Further fragmentation of already depleted WF7, WF8 and WF9 ecosystem remnants within the Waipū Ecological District has disproportionately greater consequences for ecosystem representation, ecological connectivity and long-term ecological resilience.
- Remaining riparian vegetation within the Waipū Ecological District represents remnant alluvial podocarp–broadleaved forest associations, principally WF7 and WF8 ecosystems. Despite historical modification, these remnants retain important canopy dominants including kahikatea, tōtara, pūriri, taraire, kohekohe, tītoki and rewarewa, and provide disproportionately important ecological connectivity, freshwater buffering, indigenous seed sources and restoration potential.
- The proposed mitigation relies principally on restoration planting and vegetation enhancement but does not demonstrate ecological equivalence, like-for-like replacement, or restoration of the composition, structure and ecological function of the affected WF7 Pūriri forest complex, WF8 Kahikatea associations and WF9 Taraire–tawa–podocarp associations.
- The proposed offset strategy places particular emphasis on replacement of kauri but does not demonstrate restoration of the broader indigenous canopy assemblage characteristic of the affected forest communities. Key canopy and fruiting species, including pūriri, taraire, tōtara, kahikatea, northern rātā, kohekohe, rimu, rewarewa, karaka and tītoki, are not specifically addressed despite their important contribution to forest structure, seasonal food resources, ecological processes and long-term ecosystem function.
- The assessment does not adequately address temporal loss, restoration uncertainty, or the time required for replacement vegetation to develop mature indigenous

forest composition, structure and ecological function, consistent with recognised biodiversity offsetting principles.

- The proposed mitigation and biodiversity offset strategy does not adequately demonstrate consistency with the biodiversity offsetting principles contained within the Northland Regional Policy Statement (2018, Section 4.4.2), the National Policy Statement for Indigenous Biodiversity (2023, Appendix 3), and the Department of Conservation's *Guidance on Good Practice Biodiversity Offsetting in New Zealand* (2014).
- The proposed five-year vegetation maintenance programme is insufficient to demonstrate successful establishment of self-sustaining indigenous forest ecosystems or long-term restoration outcomes. Long-term commitments to pest management, browser control, ecological monitoring and adaptive management are not demonstrated, despite these being fundamental to recruitment of late-successional canopy species, ecosystem resilience and achievement of biodiversity offset objectives.
- The report concludes that residual vegetation effects may be acceptable in light of the Project's enabling benefits. This extends beyond the role of an ecological assessment, which should objectively evaluate ecological effects and the effectiveness of proposed mitigation.
- The TER identifies the *Auckland Council Kauri Hygiene Standard Operating Procedures* as the principal biosecurity measure for managing kauri dieback risk. However, the primary statutory framework as the National Pest Management Plan (Biosecurity Act 1993) requires preparation and implementation of an approved Earthworks PA Risk Management Plan for works within Kauri Hygiene Zones.
- The TER does not adequately assess the potential for construction activities, including vegetation clearance, bulk earthworks, spoil handling and machinery movement, to spread *Phytophthora agathidicida* within and between catchments.
- The ecological investigations represented a missed opportunity to undertake baseline sampling for Phytophthora *agathidicida* within indigenous kauri stands

proposed to be disturbed. Reliance on visual canopy assessment or sap exudation is insufficient, as infected kauri may remain asymptomatic for many years.

OVERALL CONCLUSION

The review concludes that, while the vegetation survey and mapping provide an inventory assessment of the vegetation affected by the Project, insufficient recognition of regional ecosystem context, limited transparency in the ecological significance assessment, and shortcomings in the proposed mitigation and biodiversity offsetting reduce confidence in the assessment of vegetation effects. Consequently, the assessment does not adequately demonstrate that ecological equivalence or no overall loss of indigenous biodiversity will be achieved.

8.1.4 Summary of Avifauna Effects Technical Review

An independent technical review of the Assessment of Effects on Avifauna (AER) prepared for NZTA was carried out by BECL. The review focused on the adequacy of the assessment methodology, ecological interpretation, assessment of effects, proposed mitigation and biodiversity offsetting, with particular emphasis on the relationship between freshwater ecosystems and avifauna. The review also draws on field observations undertaken alongside the WSP ecology team during October–November 2025.

ASSESSMENT METHODOLOGY

- The AER adopts recognised ecological assessment frameworks but relies heavily on existing information, desktop interpretation and limited project-specific field data.
- Survey effort represented a missed opportunity to collect robust project-specific ecological information across the Proposed Designation and wider Zone of Influence.
- No targeted surveys were undertaken for several key species including:
    - North Island kiwi (Regionally Significant);
    - Australasian bittern;

  - North Island fernbird; and
  - Spotless crake.
- Habitat values and ecological assumptions are inherited from the Freshwater Ecology Report (FER), meaning limitations in freshwater habitat mapping and valuation are carried through into the avifauna assessment.
- The distinction between the Indicative Alignment, Proposed Designation and progressively constrained Zone of Influence reduces recognition of ecological effects extending into connected wetlands, riparian habitats, indigenous forest and adjacent landscapes.

ASSESSMENT OF ECOLOGICAL EFFECTS

- Habitat availability is underestimated through simplified habitat associations, particularly for pastoral, riparian and wetland environments.
- Several Regionally Significant species are assigned lower ecological values than warranted, reducing the assessed level of ecological effect.
- The assessment places greatest emphasis on direct habitat loss and vehicle collision mortality while giving comparatively limited consideration to:
  - prolonged construction disturbance;
  - indirect mortality;
  - displacement;
  - breeding failure;
  - reduced refugia;
  - increased predation risk;
  - cumulative effects; and
  - reduced prey availability arising from freshwater ecosystem modification.
- Construction lighting is treated as a temporary effect despite security lighting, compounds and night works potentially occurring over several years.

- The interaction between freshwater ecological processes and avifauna is not adequately incorporated into the effects assessment, particularly regarding fish passage, prey production and wetland ecosystem function.

SPECIES SPECIFIC FINDINGS

- **North Island kiwi** – Habitat use is underestimated through an emphasis on indigenous forest with insufficient recognition of pasture, scrub, wetlands and riparian habitats used for foraging and movement. No targeted kiwi surveys were undertaken despite kiwi being Regionally Significant in Northland.
- **Mātātā (North Island fernbird)** – Local occupancy and breeding habitat were not confirmed through targeted surveys. Proposed wetland replacement outside the affected Waihoihoi and Ahuroa catchments does not demonstrate replacement of habitat or ecological function for local populations.
- **Matuku-hūrepo (Australasian bittern)** – No breeding-season booming surveys or targeted occupancy surveys were undertaken. The assessment focuses largely on wetland loss while giving limited consideration to prey reduction associated with altered freshwater ecosystem function, reduced fish passage and diminished fish productivity.
- **Pūweto (Spotless crake)** – No targeted surveys were undertaken despite the species being identified as potentially affected, increasing uncertainty regarding occupancy and the adequacy of proposed mitigation.

MITIGATION AND BIODIVERSITY OFFSETTING

- Mitigation relies heavily on future management through the Avifauna Management Plan, with many important ecological outcomes deferred until post-consent implementation.
- Proposed wetland replacement is derived from the constrained wetland mapping adopted in the FER and focuses primarily on wetlands identified for Threatened or At Risk wetland birds.

- The mitigation does not compensate for the wider freshwater habitat network comprising headwater streams, drains, floodplain wetlands and riparian habitats that support feeding, movement and refuge for indigenous birds.
- Proposed replacement wetlands emphasise raupō establishment but provide no assurance that equivalent shallow-water foraging habitat, natural hydrology, fish passage or prey production will be achieved.
- The principal wetland offset is located south of the Brynderwyn Hills, outside the affected Waihoihoi and Ahuroa catchments, and therefore does not demonstrate ecological equivalence for local wetland bird populations or replacement of biodiversity values within the affected landscape.
- Proposed revegetation and a five-year maintenance period do not demonstrate replacement of mature indigenous forest structure, seasonal food resources or long-term ecosystem processes.
- There is no assurance that canopy species such as taraire, kahikatea, northern rātā, kohekohe, tōtara, pūriri, karaka and rimu will establish at densities sufficient to restore ecological function, nor that pest control and long-term management will maintain these outcomes to maturity.
- The assessment does not adequately address implementation uncertainty, temporal loss, stochastic events or the long-term management required for replacement ecosystems to achieve ecological maturity.
- Overall, the proposed mitigation does not demonstrate consistency with accepted biodiversity offsetting principles, including the **Northland Regional Policy Statement (2018, Section 4.4.2)**, the **National Policy Statement for Indigenous Biodiversity (Appendix 3)** and the Guidance on **Good Practice Biodiversity Offsetting in New Zealand (2014)**.

OVERALL CONCLUSIONS

- The AER is comprehensive within its adopted methodology; however, a series of methodological assumptions progressively constrain recognised habitat extent, ecological interactions and ecosystem function.
- The assessment systematically underestimates ecological effects and overestimates the effectiveness of the proposed mitigation and biodiversity offsets.
- The review concludes that the proposal demonstrates replacement of habitat area rather than replacement of ecosystem function.
- Consequently, it has not been demonstrated that indigenous biodiversity values, ecological processes, habitat connectivity and ecological resilience within the Waihoihoi and Ahuroa catchments will be maintained over the long term.

8.1.5 Summary of Terrestrial Fauna and Avifauna Technical Review

Kūkuwai Consulting Limited carried out a technical review of the Terrestrial Fauna and Avifauna ecological assessments within the overall Project Designation (PD), prepared for NZTA. The review paid particular attention to the robustness of baseline data, the validity of effects assessments, and the adequacy of the proposed mitigation measures.

Vegetation and habitat values within the PD are dominated by modified pasture and plantation forest, with indigenous forest remnants, wetlands, and Significant Natural Areas (SNAs) supporting the highest ecological values. These habitats provide refuge for several Threatened and At-Risk species, including long-tailed bats (*Chalinolobus tuberculatus*), Hochstetter's frogs (*Leiopelma* aff. *hochstetteri* "Northland"), lizards, kauri snails (*Paryphanta busbyi busbyi*), and a range of indigenous bird species. While the baseline desktop assessments and field surveys provide a broad foundation for understanding ecological values, confidence varies considerably between taxa. Survey effort has been substantial for some species such as Hochstetter's frogs, but was more limited for cryptic, low-density and low-mobility fauna such as kauri snail and other invertebrates. Surveys

effort for long-tailed bats was well-targeted and robust but only ran for a limited duration within the survey season, resulting in an overall moderate-high level of uncertainty regarding the distribution, abundance, habitat use and population connectivity for a range of terrestrial fauna.

The EcIAs apply the EIANZ framework in a structured and generally consistent manner; however, post-mitigation assessments rely heavily on assumptions regarding mitigation effectiveness, habitat restoration success, and long-term population responses that are not yet supported by sufficient evidence. Proposed mitigation measures, including salvage and relocation, habitat restoration, seasonal vegetation clearance restrictions, nesting protection protocols, pest and weed control, lighting controls, and habitat enhancement, are generally assessed as reducing residual effects to Low or Very Low. However, confidence in these outcomes is generally constrained by the limited duration of ecological surveys and the reliance on mitigation techniques that remain largely untested at the scale proposed.

These uncertainties are particularly significant for Hochstetter's frogs, where substantial stream habitat loss and fragmentation may affect up to 35,000 individuals (or more). While habitat enhancement, stream restoration and translocation are proposed, there remains very limited scientific evidence demonstrating successful relocation, recipient site carrying capacity, long-term survivorship, dispersal behaviour or population persistence following translocation, particularly for the genetically distinct Northland variant. Consequently, a conservative assessment should recognise that a high proportion of salvaged and unsalvaged frogs are likely to be lost directly or indirectly through construction activities, with residual effects remaining High and potentially unable to be appropriately offset or compensated. The current mitigation package also does not adequately address cumulative effects associated with future plantation harvesting, genetic isolation resulting from habitat fragmentation, or the long-term viability of populations retained within isolated habitat areas.

For terrestrial fauna more broadly, restoration of grazed pasture and harvested forestry areas is intended to compensate for habitat loss; however, significant uncertainty exists regarding the prolonged time required for restored habitats to develop the structural complexity required by lizards, frogs, invertebrates, bats and birds. Habitat loss and fragmentation will occur immediately, whereas restored habitats are likely to require many years, and potentially decades, before achieving equivalent ecological function. This temporal lag is not sufficiently recognised within the current assessment and introduces considerable uncertainty regarding predicted residual effects. Similarly, while avifauna assessments identify appropriate avoidance and mitigation measures at a high level, field investigations are considered to be crucial for cryptic wetland birds, North Island kiwi and other At-Risk or Threatened species that are known to use the PD and surrounding landscape. These have not occurred and this is of significant concern when considering a project of this scale and the sensitivity of the ecosystems and habitats being impacted. Similarly, ongoing surveys to monitor long-tailed bats should be implemented to better understand how this species uses the surrounding landscape for critical activities including breeding, roosting and foraging.

Overall, the greatest ecological uncertainty relates to Hochstetter's frogs, cryptic wetland birds, and other poorly detected low-mobility terrestrial fauna. Current assessments consistently conclude that residual effects fall below the ‘Moderate’ threshold requiring biodiversity offsetting or compensation, yet these conclusions depend on mitigation assumptions that have not been adequately demonstrated. In general, post-salvage monitoring rarely occurs for projects, even for large infrastructure, and consequently it cannot be confidently assumed that animals survive being moved to locations outside of their home range. Thus, a conservative and cautious approach to reducing residual effects to ‘Low’ post management is required, particularly when dealing with large numbers of At-Risk species. Deferring detailed mitigation design, monitoring methodologies and management planning until future consenting stages further reduces confidence that ecological effects can ultimately be managed to the extent currently assumed.

If the designation proceeds, a staged ecological refinement framework is recommended to progressively improve ecological understanding and test mitigation measures well in advance of construction. This should include additional multi-season surveys for long-tailed bats, kiwi and bittern; immediate commencement of restoration activities following approval; small-scale trials in co-ordination with DOC to develop and validate Hochstetter's frog salvage, translocation and monitoring methodologies; quantification of stream habitat requirements capable of supporting relocated frog populations (to the order of tens of thousands); long-term monitoring of recipient sites to establish carrying capacity and population responses; and population viability modelling for frogs kauri snails and other low-mobility species vulnerable to fragmentation. Opportunities to further avoid impacts through detailed design should be prioritised wherever practicable, with greater emphasis placed on retaining existing high-quality habitat and identifying additional mitigation sites that already provide functional ecological values. Greater certainty regarding ecological management, monitoring requirements and mitigation effectiveness should be established before the designation is confirmed, rather than relying on future approvals to resolve fundamental uncertainties.

In summary, there is little confidence that the current proposal will appropriately avoid, minimise, mitigate, offset or compensate the full suite of impacts to terrestrial fauna that are likely to occur. A mitigation package that is not assessed as capable of achieving no-net-loss of values for lizards, bats, invertebrates and avifauna should be revised and modelling must include conservative assessments for cumulative and temporal effects associated with the wider project and restoration objectives. Based on the information currently available for Hochstetter's frogs, significant gaps remain in the evidence supporting the proposed mitigation strategy, and no approach has yet been demonstrated that would adequately offset or compensate for the significant scale of predicted impact to this regionally distinct species.

8.2 Mana Atua

For Te Parawhau Hapū, Mana Atua reflects the relationships between ngā atua, wairuatanga, and the ability to uphold tikanga and kawa across Te Parawhau takiwā. These relationships, expressed through whakapapa, are inseparable from the integrity and form of the taiao.

Within the Section 2B Project CIA scope (Piroa to Waipū), ancestral maunga such as Te Mano Hiwa Ariki hold profound spiritual significance. The name Te Mano Hiwa Ariki, “the ridgeline of a thousand sacred peaks”, reflects the depth of this significance. These landforms are expressions of whakapapa, tūpuna presence, and atua relationships, central to the wairuatanga of Te Parawhau, and are central to the wairuatanga of Te Parawhau. For Te Parawhau Hapū, the extent of Te Mano Hiwa Ariki is not confined to a summit or discrete ridgeline. It encompasses the full expression of the maunga, including the ridgeline comprising multiple sacred peaks, the slopes, and the whenua at its base that extends to the taku tai moana at Paepae Atua to the east.

These elements are intrinsically connected as a single, living system. Ngā wai, including awa, repo, and puna wai within the surrounding low-lying whenua, form an integral part of this system and sustain its mauri and wairua.

Accordingly, any modification to these peaks, slopes, valleys, and associated hydrological systems, including areas within the Waipū lowlands, constitutes an effect on Te Mano Hiwa Ariki.

The Project, as currently proposed, will result in extensive destruction and modification of these areas through significant cut and fill earthworks, reshaping of ridgelines and valleys, including the removal of large swathes of indigenous and exotic vegetation, habitats, and associated construction activities. This level of damage irreversibly alters the form and integrity of the whenua and taiao and, in doing so, desecrates the spiritual relationships that underpin Mana Atua.

Te Parawhau Hapū have raised, through engagement with NZTA, the need to consider alternative design approaches, including tunnels, viaducts, and bridging solutions. These approaches would significantly reduce the extent of damage and enable the integrity of Te Mano Hiwa Ariki and the surrounding taiao to be retained. The exclusion of such options based on cost does not recognise the cultural and spiritual consequences of the current design approach.

In its current form, the Project will result in significant adverse effects on Mana Atua, including:

- Irreversible modification of culturally significant landforms and taiao, including Te Mano Hiwa Ariki;
- Degradation of wairuatanga across Te Parawhau takiwā;
- Disruption of tikanga and kawa associated with wāhi and associated sites of significance; and
- Loss of integrity of whakapapa relationships between te taiao, whenua, ngā atua, and tāngata.

These effects are more than minor and represent a fundamental irreversible impact on ngā uara ahurea o Te Parawhau Hapū.

Accordingly, the following mahi whakaora are required to uphold Mana Atua. These are not mitigation measures but represent the actions necessary to ensure that Te Parawhau Hapū are able to uphold their obligations in accordance with ngā uara ahurea.

8.2.1 Mana Atua - Mahi Whakaora

Avoidance and Design Requirements

Adverse effects on Mana Atua shall be avoided wherever practicable through design and construction methodologies that significantly reduce disturbance to the whenua and taiao. This includes preventing irreversible modification of culturally significant landforms, including Te Mano Hiwa Ariki.

- NZTA shall undertake further design refinement, including alternative alignments and construction methodologies, in partnership with Te Parawhau Hapū to avoid or significantly reduce the extent of cut and fill earthworks within areas of high cultural and spiritual significance.
- Alternative design solutions, including tunnels, viaducts, and bridging, shall be actively considered and implemented where required to retain the integrity of the whenua and uphold Mana Atua.
- The designation shall include conditions requiring that where adverse effects on Mana Atua cannot be avoided, works shall not proceed unless agreed by Te Parawhau Hapū through the established governance structure. These requirements shall be given effect to through the Outline Plan and associated management plans.

Partnership and Decision-Making

Te Parawhau Hapū are Te Tiriti o Waitangi partners with NZTA as a Crown entity. Accordingly, partnership and shared decision-making must be embedded within all aspects of the Project.

- A Te Parawhau Hapū Rōpū Mahi, including kaumātua and kaitiaki, Hapū Subject Matter Expert(s), shall be established in partnership with NZTA and embedded within the Project governance and delivery framework.
- The Rōpū Mahi shall have a defined and active decision-making role in relation to:
    - detailed design;
    - construction methodology;
    - staging of works;
    - identification and management of culturally and spiritually significant areas; and
    - responses to actual and potential effects on Mana Atua.

- All decisions relating to Mana Atua shall be undertaken in partnership with Te Parawhau Hapū through the Rōpū Mahi.
- NZTA shall provide appropriate and ongoing resourcing to enable Te Parawhau Hapū participation at all stages of the Project, including design, construction, monitoring, and post-construction phases.

Outline Plan and Management Planning

Uara ahurea-led outcomes for Mana Atua shall be established at the designation stage and incorporated into designation conditions.

- The Outline Plan shall demonstrate how these outcomes will be given effect to through detailed design, construction methodologies, staging, and environmental management measures.
- The Outline Plan and all associated management plans shall be consistent with, and give effect to, the uara ahurea-led outcomes established for Mana Atua.
- A Te Parawhau Hapū tikanga and kawa framework shall be developed in partnership with Te Parawhau Hapū and incorporated into all Outline Plan and Project management plans, including the Construction Environmental Management Plan and associated sub-plans.

Tikanga and Te Parawhau Cultural Process

- A pre-construction hui shall be held with Te Parawhau Hapū to confirm tikanga, kawa, and cultural expectations prior to the commencement of works, and to guide all stages of the Project.
- Kaumātua and Te Parawhau monitors shall be enabled and appropriately resourced to undertake karakia, whakawātea, and other tikanga at key locations and events within the Project area prior to and during works.

- A Te Parawhau Hapū-led cultural induction programme shall be mandatory for all NZTA staff, contractors, and subcontractors prior to site access and maintained throughout the duration of the Project.
- A tikanga response framework shall be developed in partnership with Te Parawhau Hapū and embedded within designation conditions, the Outline Plan, and all relevant management plans. This framework shall address events affecting Mana Atua, including:
    - discovery of koiwi or taonga;
    - disturbance of wāhi tapu;
    - serious incidents or fatalities; and
    - environmental damage affecting mauri.
- Te Parawhau Hapū Accidental Discovery Kaupapa (including processes for kōiwi, taonga, and wāhi tapu) shall be adopted and implemented for the Project. This kaupapa shall be embedded within designation conditions, the Outline Plan, and all relevant management plans, and shall take precedence over any standard accidental discovery protocols.
- Te Parawhau Hapū tikanga responses, including rāhui, shall be recognised and provided for within designation conditions.

Monitoring, Hold Points and Enforcement

- Te Parawhau Hapū cultural monitoring shall be implemented throughout all stages of the Project.
- Hapū monitors shall have the authority to identify activities that pose a risk to tikanga, wairuatanga, or the mauri of the taiao, and to require works to be paused where such risks are identified.
- Hold points and decision triggers shall be embedded within designation conditions, the Outline Plan, and all relevant management plans to ensure that works do not proceed where adverse effects on Mana Atua may occur.

- Where works are paused due to actual or potential impacts on tikanga, wairuatanga, or the mauri of the taiao, they shall not recommence until:
    - appropriate tikanga responses have been implemented in accordance with the tikanga response framework; and
    - Te Parawhau Hapū, through the Rōpū Mahi, confirm that it is appropriate for works to resume.

8.3 Te Mana o Te Wai

Te Mana o te Wai acknowledges the significance of water and the wellbeing of all water bodies and associated ecosystems. It is the realm of Maru, atua of freshwater environments, and Tangaroa, atua of coastal and marine environments, and reflects the whakapapa and mauri that flows through these life-giving systems.

For Te Parawhau, ngā wai are not isolated physical resources, but are part of an interconnected whakapapa system linking Ranginui, Papatūānuku, and all living uri, including tāngata. Freshwater systems, including streams, wetlands (repo), springs (puna), and groundwater/aquifers (puna wai), sustain the mauri of the taiao and are intrinsically connected to ngāhere, whenua, taonga species and tāngata.

Waterways within the Project Area

The Project traverses, modifies, and in places destroys a network of freshwater systems that form part of wider ecological and cultural relationships extending ki uta ki tai (from the maunga to the moana/wahapu), including the Waihoihoi Awa, Ahuroa Awa, and Waipu Awa, which flow to Paepae Atua. These systems are not discrete or interchangeable, but are connected through hydrological flow, ecological processes, and whakapapa relationships.

The integrity of headwater streams, repo, wetlands (repo), springs (puna), groundwater systems (puna wai), and associated freshwater environments is critical to the mauri of downstream environments, including estuarine and coastal systems.

Additionally, springs identified by the WSP Geotech team are not identified in the Freshwater Ecological Assessment and not credited as supplying waterways otherwise described as rain-fed and ephemeral and thus discounted from the assessment.

Te Mana o Te Wai Assessment Requirements

Te Mana o te Wai requires that the health and wellbeing of freshwater bodies and ecosystems are protected and, where degraded, restored. Any assessment of effects on freshwater systems must therefore adopt an integrated, catchment-based approach that recognises:

- ecological, hydrological, and cultural connections, and does not isolate individual components from the wider system.

Failure to Recognise Integrated Freshwater Systems

The freshwater ecological assessment supporting the Project does not reflect an integrated, catchment-based approach consistent with Te Mana o te Wai. The methodology applied ignores site-specific values, relies on catchment-scale averaging, and excludes or minimises the role of interconnected systems, including headwater streams, wetlands (repo), and ephemeral waterways. This siloed approach fails to acknowledge the independency of wetland avifauna, indigenous fish distribution and abundance and the preservation of fish passage. This fragmented approach fails to recognise the interconnected nature of freshwater systems and is inconsistent with the requirements of the National Policy Statement for Freshwater Management and Te Mana o te Wai.

Exclusion of Cultural Values (Ngā Uara Ahurea o Te Parawhau)

The freshwater ecological assessment explicitly excludes cultural values, including taonga species, from its assessment framework.

While it is appropriate that ngā uara ahurea are articulated and assessed by Hapū, in this case Te Parawhau, this exclusion confirms that the freshwater assessment has been prepared in isolation from those values and does not reflect the integrated nature of freshwater systems and their cultural significance.

Reduction of Ecological Value Through Methodology

Independent review further identifies that ecological value is consistently reduced through the application of modified or non-standard methodologies, reliance on incomplete field data, and the use of assumptions to characterise unsurveyed systems. This results in an under-representation of the function and importance of freshwater environments, particularly headwater streams, wetlands, and ephemeral systems, which are essential to the functioning of the wider catchment. The application of modified non-standard methodologies is contrary to New Zealand Best Practice techniques and are unsupported by professional ecological literature.

Undervaluation of Wetlands (Repo)

The review also identifies that from the onset wetland mapping is incomplete. The classification and characterisation of wetlands (repo) within the Project area contributes to their systematic undervaluation. Wetlands associated with pastoral or modified land are described in a manner that reduces their perceived ecological significance. They are described as wet patches in pasture when they are in fact diagnostically "*natural inland wetland's*" as per the NPS-FM 2020. Their classification as exotic dominant is not considered accurate as many of the Juncus species present are indigenous with no distinguishing species identification provided. This approach fails to recognise that wetlands, including those within pastoral landscapes, continue to perform critical ecological functions, including:

- water filtration, habitat provision, hydrological regulation, and support for biodiversity.

Reducing their value based on surrounding land use understates their ecological significance and risks enabling their further degradation.

For Te Parawhau Hapū, repo are taonga irrespective of the surrounding land use. Their health and integrity are fundamental to the mauri of ngā wai and the wider taiao. Any approach that diminishes their significance due to modification or land use context is inconsistent with Te Mana o te Wai and fails to recognise their ongoing ecological and cultural significance of ngā wai to Hapū.

Masking of Effects Through Catchment Scale-Assessment

The freshwater ecological assessment uses a bespoke digital river network mapping which has been shown to be inaccurate through ground truthing. Refer peer review at Appendix A. The report then relies on catchment-scale averaging and percentage loss calculations to determine effects. Furthermore, the inaccurate mapping is carried through to the Terrestrial Ecological Assessment and impacts on the habitat loss for frogs. This approach masks localised impacts including effects on:

- stream function,
- habitat complexity,
- fish passage,
- spawning habitat, and
- ecological connectivity.

It does not accurately reflect the magnitude and significance of effects at the site or reach scale and results in an incomplete understanding of the actual effects of the Project on these important water systems.

Independent technical review also identifies that proposed mitigation, management, and monitoring measures are derived directly from the same reduced ecological values and modified assessment framework applied within the freshwater ecological assessment.

As a result, management responses do not independently address ecological risk, but instead reinforce conclusions already reached through an assessment framework that underestimates habitat values, ecological function, and the scale of adverse effects.

This approach weakens the effects management hierarchy, as avoidance is subordinated to predetermined low effect ratings, and mitigation measures are treated as sufficient despite uncertainty regarding their ability to maintain ecological function.

Accordingly, the proposed management framework cannot be relied upon to ensure that adverse effects on freshwater systems and their mauri are appropriately avoided, remedied, or mitigated.

Technical review further identifies that core mitigation measures, including culverting, stream realignment, and habitat replacement, assume that ecological function can be maintained or restored through engineered design.

However, maintaining fish passage or achieving hydraulic compliance does not demonstrate the maintenance of natural stream ecosystem processes, including spawning, recruitment, refuge, and ecological connectivity.

Engineered channels and culverts alter natural geomorphic, hydrological, and ecological processes, and ecological equivalence is assumed rather than demonstrated.

Residual effects remain classified as low regardless of uncertainty regarding mitigation success, indicating that the assessment framework is largely insensitive to whether mitigation outcomes are actually achieved.

These methodological assumptions are not confined to the assessment of ecological values and effects, but are carried through into subsequent project design, construction methodologies, mitigation measures, and environmental management responses.

As a result, the entire effects management framework reflects and reinforces the same underlying underestimation of ecological values and effects, rather than independently addressing ecological risk.

The reliance on compliance with minimum statutory requirements as evidence of ecological mitigation further weakens the assessment. Such measures represent baseline regulatory expectations rather than actions that avoid, remedy, or mitigate adverse effects on freshwater systems and their mauri.

Consequences For Freshwater Systems and Te Parawhau Hapū

For Te Parawhau Hapū, the degradation, modification, or loss of any part of the freshwater system diminishes the mauri of the whole. This includes headwater streams, wetlands (repo), springs (puna), and groundwater systems (puna wai) that sustain ecological function and downstream environments.

The approach adopted in the freshwater ecological assessment fails to recognise that effects on individual components of the freshwater system have cumulative and cascading impacts across the wider catchment and surrounding taiao. This fragmented assessment approach is inconsistent with Te Mana o te Wai, which requires recognition of the interconnected nature of freshwater systems and prioritisation of their health and mauri.

The degradation, modification, or loss of any part of this system has consequential effects across the wider catchment, including on the function, connectivity, and integrity of ngā wai and associated ecosystems.

Overall Assessment Conclusion – Freshwater Ecology and Mana o Te Wai Effects

Taken together, the freshwater ecological assessment does not provide an integrated or accurate assessment of effects on ngā wai and associated ecosystems. It fails to adequately characterise the condition, function, and significance of freshwater systems within the Project area.

Independent scientific review concludes that the assessment of freshwater fish habitat, ecological connectivity, project effects, and management is founded on a series of interconnected methodological decisions that systematically underestimate ecological values and the scale of adverse effects.

This includes incomplete ecological baseline information, the undervaluation of headwater and intermittent streams, reliance on surrogate measures rather than ecological function, and the reduction of habitat values prior to the assessment of effects.

Threatened and At-Risk species are assigned reduced significance based on presumed abundance rather than conservation status, and fish populations are assessed as isolated reaches rather than connected catchment-scale systems.

As a result, fish passage requirements, mitigation measures, and residual effects are derived from a framework that does not accurately reflect ecological reality or life-history requirements of freshwater species.

Currently the Northern and Central Mitigation sites are not prioritised for fish passage and will do very little to offset effects on fish populations and abundance particularly when there appears to be a reluctance to identify their presence, acknowledge their importance including their threat status. We query the lack of a Complex Freshwater Fisheries application to DOC under Schedule 9 of the Fast Track Act. For all works demonstrate fish passage for all species at all life stages and during construction require Aquatic Life Transfer Authorisation from MPI for fish salvage is required in conjunction with Te Parawhau Hapū.

Also, freshwater receptors go beyond fish and include species such as koura, kakahi, kōeke and frogs which are largely absent in the freshwater ecological assessment.

The limitations identified in methodology, scope, and integration result in a consistent and material underestimation of adverse effects on freshwater systems and their associated ecological and cultural values. Accordingly, the assessment does not provide a reliable or

sufficient basis to understand the full extent of effects on freshwater systems or to support informed decision-making.

8.3.1 Mana o Te Wai - Mahi Whakaora

To give effect to Te Mana o te Wai, the following requirements must be met:

Freshwater System Identification and Protection

- All freshwater systems within the Project area, including headwater streams, intermittent and ephemeral waterways, wetlands (repo), springs (puna), groundwater systems (puna wai), and associated freshwater environments, shall be fully identified, mapped, and assessed, recognising their ecological function, connectivity, and contribution to the health of the wider catchment.
- Wetlands (repo), including those within pastoral or modified landscapes, shall be recognised as functionally important ecosystems and shall not be assigned reduced ecological value based on land use context. Their ecological, hydrological, and cultural significance shall be appropriately identified and protected.

Ecological Assessment Methodology and Scale

- The assessment of freshwater effects of the Project shall be undertaken using recognised and accepted ecological methodologies and shall provide a robust, site-specific, and evidence-based assessment of ecological value and function. Modified or non-standard methodologies that reduce ecological value shall not be applied.
- The assessment of freshwater effects shall be undertaken at an appropriate ecological scale, including site-specific and reach-scale assessment, and shall not rely on catchment-scale averaging or percentage loss calculations that dilute or mask the magnitude and significance of localised effects.
- The assessment shall not rely on assumptions or extrapolation in the absence of sufficient field data. Baseline information shall be based on comprehensive, multi-

season field survey sufficient to accurately characterise freshwater environments and their ecological values.

- A Chemical Treatment Management Plan (CTMP), as recommended in the Construction Water Assessment (Section 5.4.8), addressing the use and management of chemical treatment agents, including acrylamides, and the potential discharge of contaminants such as zinc and copper from runoff shall be prepared and implemented.
- The CTMP shall demonstrate how adverse effects on freshwater systems and te mauri o ngā wai are avoided, including controls on dosing, monitoring of receiving environments, and clear limits and response measures where contamination is detected.

Avoidance of Effects Management

- The Project shall avoid adverse effects on freshwater systems. Where adverse effects cannot be avoided, they shall be appropriately remedied or mitigated, recognising that measures such as restoration, channel realignment, or offsetting do not provide certainty of ecological equivalence, particularly at the scale of effects associated with the Project.

Freshwater Connectivity and Fish Passage

- The Project shall maintain and protect ecological and hydrological connectivity, riparian buffers, including connections between headwaters, streams, wetlands, groundwater, and downstream receiving environments.
- Fish passage shall be designed, implemented, and demonstrated in accordance with the New Zealand Fish Passage Guidelines (NIWA, 2024) from the out-set, rather than relying on alternative remedial measures. Fish passage shall also meet all relevant requirements of the National Policy Statement for Freshwater Management and National Environmental Standards for Freshwater. Fish passage

shall provide for all relevant species, and life stages present within the receiving environment.

- Monitoring of fish passage performance shall be undertaken following construction, and remedial measures shall be implemented where performance standards are not achieved.
- All works affecting freshwater ecosystems demonstrate effective fish passage for all indigenous species, at all life stages, and across all flow conditions, including during construction and operation.
- NZTA shall obtain all necessary approvals for works affecting freshwater species, including:
    - a Complex Freshwater Fisheries approval from the Department of Conservation (DOC) under Schedule 9 of the Fast-track Approvals Act 2024, where required; and
    - an Aquatic Life Transfer Authorisation from the Ministry for Primary Industries (MPI) to enable the salvage and transfer of indigenous freshwater species.
- All fish salvage, relocation, and associated works must be undertaken in partnership with Te Parawhau Hapū, including the involvement of hapū-appointed monitors and subject matter experts. These requirements must be secured as enforceable conditions of the designation and associated resource consents, with no reliance on future management plans to determine their necessity, scope, or implementation.

Integrated Catchment Approach (ki uta ki tai)

- The assessment and management of freshwater effects shall recognise the interconnected nature of ngā wai ki uta ki tai, including cumulative and downstream effects arising from modification, fragmentation, or loss of freshwater systems.

Water Quality Monitoring

- Water quality monitoring shall be undertaken to assess the effects of earthworks and construction activities on freshwater systems, including sediment, turbidity, and associated contaminants including but not limited to copper, zinc and acrylamides. Monitoring shall be undertaken upstream and downstream of works and at representative locations across the Project area, including receiving environments.
- Water quality monitoring shall be designed to detect changes in water clarity, sediment deposition, and ecological condition, and shall include clearly defined performance standards, trigger thresholds, and response actions.
- Where monitoring identifies degradation of water quality or adverse effects on freshwater systems, immediate corrective actions shall be implemented, including modification of works and reinforcement of erosion and sediment control measures to prevent further effects.
- Water quality monitoring and response measures shall be developed and carried out in collaboration with Te Parawhau Hapū and included as part of the Outline Plan of Works and shall be implemented for the duration of construction and for a sufficient period following completion to demonstrate that effects have been appropriately managed.

Integration and Collaboration with Te Parawhau Hapū

- Freshwater ecological assessment, project design, monitoring, and management responses shall be undertaken in partnership with Te Parawhau Hapū, giving effect to mātauranga Māori and ngā uara ahurea, and shall not separate ecological and cultural values in the assessment of effects.

Mitigation, Offsetting and Ecological Equivalence

- Measures described as mitigation or offsetting shall not be relied upon to justify adverse effects on freshwater systems where those effects are significant,

irreversible, or involve the loss or degradation of interconnected freshwater environments. Such measures shall not be assumed to achieve ecological equivalence.

- Where mitigation or offsetting is proposed, it shall be supported by robust, site-specific evidence demonstrating that ecological function, connectivity, and values will be maintained or restored. In the absence of such evidence, these measures shall not be relied upon.
- A revised and integrated freshwater ecological assessment shall be undertaken to address the deficiencies identified in this CIA and the independent technical reviews. This assessment shall be completed prior to the submission of any Outline Plan of Works and shall directly inform the final design of the Project.
- No works shall commence until this assessment has been completed to the satisfaction of the consent authority, in partnership with Te Parawhau Hapū, including the involvement of hapū-appointed kaitiaki and subject matter experts.
- All freshwater-related design measures, management plans, and mitigation responses shall be prepared and submitted as part of the Outline Plan of Works and shall demonstrate how adverse effects on freshwater systems have been avoided, remedied, or mitigated in accordance with Te Mana o te Wai and ngā uara ahurea o Te Parawhau Hapū.

Adherence to these requirements is necessary to ensure that adverse effects on freshwater systems and Te Mana o te Wai are avoided to the greatest extent possible, and where effects cannot be avoided, are appropriately remedied or mitigated, and that Te Mana o te Wai is upheld through robust and enforceable conditions embedded within the Outline Plan of Works.

8.4 Mana Whenua

Mana Whenua refers to the inherent mana of Papatūānuku, the earth mother, who sustains and supports all life within her realm. Papatūānuku holds the underlying mana and life-

giving mauri of the whenua, nurturing and maintaining the interconnected systems that make up the taiao.

Through whakapapa, and as tāngata whenua, Te Parawhau retain mana i te whenua across their rohe and as such, have an enduring obligation to protect, sustain, and uphold the wellbeing of Papatūānuku and all her uri.

Papatūānuku exists in an inseparable relationship with Ranginui, whose tears fall as rain to sustain the whenua. The space between them, shaped by their separation, is upheld and influenced by Tāwhirimātea, who governs the winds, storms, and the movement of air across the taiao. Together, these realms support all life. The wellbeing of the whenua is therefore intrinsically connected to the wellbeing of ngā wai, vegetation, the atmosphere, and all living systems, including ngāhere (the domain of Tāne), and the wider environmental conditions maintained through the influence of Tāwhirimātea.

Mana whenua reflects the integrity, health, and mauri of Papatūānuku as a whole. When the whenua is intact, clothed, and functioning as a connected system, her mana is upheld. Where the whenua is degraded, exposed, fragmented, or stripped of its natural systems, her mana is diminished, and with it, the mauri of the taiao.

Effects on Papatūānuku and the Whenua

The Project traverses and extensively modifies, and in some areas destroys, the whenua through large-scale earthworks, vegetation clearance, and landform alteration. These activities physically disrupt Papatūānuku, degrading her mana, exposing underlying soils, and fragmenting the interconnected systems that sustain her health, integrity, and ability to manaaki all those within her realm.

The removal of ngāhere and vegetation strips Papatūānuku of her kakahu and korowai of protection, increasing vulnerability to erosion, sediment loss, and the degradation of both whenua and wai systems. The disturbance and reshaping of landforms arising from the

Project interrupts natural processes, including water infiltration, soil stability, and ecological connectivity and integrity.

Earthworks associated with the Project effectively cut through the whenua, severing the relationships between land, water, vegetation, and air. These effects extend beyond the immediate project footprint, contributing to sedimentation, reduced water quality, and downstream impacts on freshwater and the coastal receiving environment (Paepae Atua).

The exposure and modification of the whenua also affect the wider realms of Ranginui and Tāwhirimātea, including air quality, dust generation, and the reduced capacity of vegetation and natural systems to maintain the balance and integrity of the air and wider taiao.

Consequences for Mana Whenua and Te Parawhau Hapū

For Te Parawhau, the degradation, fragmentation, and exposure of Papatūānuku diminishes her mana and disrupts the whakapapa relationships that sustain the taiao.

These effects are not isolated to the physical footprint of the Project but have cumulative and cascading impacts across all interconnected systems, including soil, water, vegetation, and air. The loss of vegetation and stability of the whenua increases erosion and sedimentation, affecting ngā wai and downstream environments, and further degrading the mauri of the wider system.

The scale and nature of earthworks associated with the Project are such that the integrity of Papatūānuku is compromised, and the ability of natural systems to recover is uncertain. Te Parawhau have kaitiakitanga obligations to ensure that the mana of Papatūānuku is upheld and that adverse effects on the whenua and its interconnected systems are avoided.

Landscape Modification and Degradation of Whenua

As identified in the Assessment of Landscape and Visual Effects prepared for NZTA, the Project introduces extensive cut and fill, recontouring of slopes, and modification of ridgelines and valleys. The scale and extent of earthworks and landform modification

associated with the Project fundamentally alters the shape, form, and integrity of the whenua across multiple landscape units.

These changes result in a significant transformation of natural landforms and the disruption of existing landscape patterns, including areas identified for their natural character and, in places, areas noted for their outstanding natural landscape value. The landscape assessment identifies moderate to high adverse effects on landscape and natural character prior to mitigation across several sections of the Project.

For Te Parawhau however, these changes represent more than visual or landscape effects. They reflect the physical destruction of Papatūānuku, including the reshaping and fragmentation of the whenua, and the disruption of the relationships between landform, vegetation, water, and air that sustain the wider taiao.

Furthermore, the modification of ridgelines, slopes, and valleys severs the continuity of the whenua and alters the natural processes that define its form and function. These changes diminish the integrity and mauri of Papatūānuku and are inconsistent with the obligation of humanity to protect, sustain, and uphold her life-supporting capacity and mana.

Statutory and Te Tiriti o Waitangi Obligations

For Te Parawhau Hapū, Papatūānuku holds the inherent mana of the whenua. As tāngata whenua, Te Parawhau retain mana i te whenua through whakapapa, which gives rise to kaitiakitanga obligations to actively protect, sustain, and uphold their ancestral whenua, including Te Mano Hiwa Ariki, and the associated wāhi and resources that sustain the taiao.

The protection of Papatūānuku, and the expression of mana i te whenua through kaitiakitanga, are grounded in tikanga and are also recognised and upheld through statutory and Te Tiriti-based obligations that apply to the Project.

Te Tiriti o Waitangi establishes a relationship between the Crown and iwi and hapū, and affirms the rangatiratanga of hapū over their whenua, resources, and taonga. This gives rise

to obligations on the Crown and its agents, including NZTA, to actively protect those interests and to ensure that decision-making recognises and provides for the relationship of Māori with their ancestral whenua and taiao.

Under the relevant statutory framework, including the RMA and associated national direction, decision-makers are required to recognise and provide for the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, and other taonga, and to have particular regard to kaitiakitanga.

These obligations are directly relevant to the consideration of mana whenua effects. They require that the health, integrity, and mauri of Papatūānuku are not treated as secondary considerations but are central to the assessment and management of effects.

The scale and nature of landform modification associated with the Project engages these obligations in a substantive way. The destruction, fragmentation, and exposure of the whenua represent effects that directly impact the relationship of Te Parawhau Hapū with Papatūānuku, and therefore must be fully recognised, appropriately assessed, and addressed through both design and decision-making processes, in partnership with Te Parawhau.

Failure to recognise and provide for these matters is not only inconsistent with ngā uara ahurea o Te Parawhau, but also inconsistent with the statutory framework and Te Tiriti o Waitangi obligations that apply to the Project.

Overall Assessment Conclusion – Mana Whenua Effects

Considered together, the scale, nature, and extent of earthworks and landform modification associated with the Project result in significant and enduring adverse effects on the whenua. These effects fundamentally alter the form, integrity, and mauri of Papatūānuku, including the reshaping, fragmentation, and exposure of the whenua, and disrupt the interconnected relationships between land, water, vegetation, and air that sustain the wider taiao.

The Project, as currently proposed, fails to recognise or provide for the protection of Papatūānuku, and does not appropriately address the extent, scale, or consequence of effects on the whenua and its associated systems.

These effects are significant, enduring, and in many respects irreversible. They are inconsistent with the obligation of Te Parawhau Hapū to uphold mana i te whenua through kaitiakitanga, and with the statutory framework and Te Tiriti o Waitangi obligations that require the relationship of Māori with their ancestral lands to be recognised and provided for.

More fundamentally, these effects are inconsistent with the broader responsibility of all people, including the Crown, its agents, and decision-makers, to protect, sustain, and uphold the life-supporting capacity and inherent mana of Papatūānuku.

To uphold these obligations, the following mahi whakaora area required:

8.4.1 Mana Whenua - Mahi Whakaora

To uphold Mana Whenua, the protection of Papatūānuku, and Te Parawhau rangatiratanga, the following requirements must be met:

Landform and Earthworks Management

- The Project shall avoid significant modification of the whenua, including ridgelines, slopes, valleys, and areas of natural character, particularly where such modification would result in permanent alteration to the form, integrity, mauri and functioning of the whenua.
- Where earthworks cannot be avoided, they shall be minimised in extent and scale, and designed to maintain, to the greatest extent possible, natural landform, contour, and landscape and topographical patterns.
- The extent, location, and design of earthworks shall be reviewed and refined through an iterative design process to avoid or reduce earthworks and resultant effects on

the whenua, including the evaluation of alternative alignments, and shall demonstrate that all reasonable alternatives have been evaluated.

Vegetation Retention and Restoration (Kākahu o Papatūānuku)

- Clearance of indigenous vegetation shall be avoided. Where clearance is proposed, it shall be clearly demonstrated, in partnership with Te Parawhau Hapū, that avoidance cannot be achieved through alternative design, alignment, or construction methodology, and that all reasonable options to retain indigenous vegetation and the ecological systems that sustain it, including associated freshwater environments, have been exhausted.
- Where vegetation removal is demonstrated to be unavoidable, it shall be minimised in extent and restricted to areas essential for construction and shall not result in the loss or degradation of remnant indigenous vegetation communities, including stands of kahikatea, or the freshwater systems that sustain them. This shall be determined in partnership with Te Parawhau Hapū.
- Restoration planting shall prioritise indigenous canopy species appropriate to local ecological and cultural contexts and shall be designed to restore the protective functions of vegetation, including erosion control, habitat support, landscape integration and enhancement of mauri. Planting widths shall not be less than 20 metres either side of any waterway.
- Remnant riparian vegetation will be buffered to a minimum of 20 metres where they are located within the designation.
- Vegetation removal and restoration shall be undertaken in a manner that maintains the integrity and health of the whenua and supports the recovery of mauri over time.
- All ecological offset planting shall be undertaken in accordance with the National Policy Statement for Indigenous Biodiversity (Appendix 3: Principles for Biodiversity Offsetting in New Zealand), with reference to the Department of Conservation (2014) Guidance on Good Practice Biodiversity Offsetting in New Zealand.

- Ecological offset maintenance shall continue until canopy species reach a minimum height of six (6) metres and the offset demonstrably achieves its intended habitat function and replacement purpose.
- These outcomes must be confirmed by a suitably qualified ecologist before maintenance obligations cease.

Erosion, Sediment, and Soil Stability

- Erosion and sediment control measures shall be designed and implemented to prevent degradation of the whenua, including the loss of soils, destabilisation of slopes, and downstream sedimentation.
- Earthworks shall be staged and managed to minimise exposed surfaces and duration of exposure, and to maintain soil stability at all times.
- Performance standards, monitoring, and response measures shall be established to ensure that erosion and sediment control measures are effective and maintained throughout construction.

Spoil Disposal and Earthworks Material Management

- All spoil disposal sites and locations for earthworks material shall be clearly identified, mapped, and assessed prior to any works commencing. No disposal of spoil shall occur outside of approved and assessed locations.
- Spoil shall not be disposed of by uncontrolled tipping, including the placement or discharge of material over slopes, ridgelines, cliffs, or into ngāhere, valleys, or watercourses.
- The selection, design, and management of spoil disposal sites shall avoid adverse effects on the whenua, including indigenous vegetation, remnant ngāhere, freshwater systems, and natural landforms. Disposal sites shall not be located within, or result in the degradation of, ecologically or culturally significant areas, including stands of kahikatea or associated freshwater systems.

- The extent and volume of spoil shall be minimised through design refinement, and opportunities for reuse within the Project footprint shall be prioritised over disposal.
- The location, design, and management of all spoil disposal sites shall be determined in collaboration with Te Parawhau Hapū and the appointed mahi rōpū. This includes the identification, management, and appropriate containment, treatment, or relocation of:
    - any soils contaminated with Phytophthora agathidicida (kauri dieback) in accordance with the National Pest Management Plan; and
    - any contaminated land or material, including that identified within HAIL sites, in accordance with relevant statutory and regulatory requirements.
- This also includes involvement in the development, survey, and implementation of the Kauri Earthworks Risk Management Plan required under the Biosecurity Act 1993, including compliance with all Ministry of Primary Industry (MPI) requirements.
- All spoil management measures and disposal locations shall be documented and submitted as part of the Outline Plan of Works and shall demonstrate how adverse effects on the whenua have been avoided, and where avoidance cannot be achieved, minimised.
- All spoil disposal activities shall be monitored throughout construction to ensure compliance with approved spoil management measures and to prevent adverse effects on the whenua, including vegetation, landform stability, and associated freshwater systems.
- Monitoring results shall be documented and made available to Te Parawhau Hapū, and where monitoring identifies adverse effects or non-compliance, immediate corrective actions shall be implemented, including modification or cessation of spoil disposal activities until compliance is achieved

Landscape and Natural Character Protection

- The design and construction of the Project shall recognise and protect landscapes identified as having natural character and outstanding natural landscape values, avoiding modification where such values would be compromised.
- Mitigation planting alone shall not be relied upon to address effects on natural character and landscape values.

Integrated Design and Cultural Partnership

- The design, assessment, and management of the Project shall be undertaken in partnership with Te Parawhau Hapū, giving effect to Te Tiriti o Waitangi articles and principles, including active protection, partnership, and rangatiratanga.
- Te Parawhau Hapū shall be involved in the development, review, and implementation of all earthworks, landform modification, landscape, and restoration design. This involvement shall be appropriately incorporated in the Outline Plan and associated Designation conditions of consent.
- Mātauranga Māori and ngā uara ahurea o Te Parawhau Hapū shall be integrated into all aspects of design and decision-making relating to the whenua, and this integration shall be demonstrated through design outcomes and documentation.

Monitoring and Adaptive Management

- Monitoring shall be undertaken to ensure that adverse effects on the whenua are avoided, and where avoidance cannot be achieved, minimised, and that all conditions of the designation and Outline Plan of Works are complied with.
- In accordance with Te Pouwhenua o Tiakiriri Kukupa Trust on behalf of Te Parawhau Hapū Mana Whakahono a Rohe with NRC, Hapū monitors shall be appropriately trained and resourced to carry out this monitoring. Monitoring shall include indicators of soil stability, erosion, vegetation establishment, and broader ecological and cultural health outcomes.

- Where monitoring identifies adverse effects or failure to meet performance standards, immediate corrective actions shall be undertaken, including modification of works and design where necessary.

Reassessment and Outline Plan Requirements

- A revised and integrated landform and earthworks assessment shall be undertaken to address the adverse effects and matters identified in this report and shall be completed prior to the submission of any Outline Plan of Works.
- The revised assessment shall demonstrate how effects on Papatūānuku and the whenua have been avoided through design, and where avoidance cannot be achieved, substantially reduced, including through consideration of alternative alignments.
- No works shall commence until this assessment has been completed in partnership with Te Parawhau Hapū and has informed the final design of the Project.
- All land disturbance, earthworks, vegetation removal, and landscape management measures shall be documented and submitted as part of the Outline Plan of Works and shall demonstrate how adverse effects on the whenua have been avoided, and where avoidance cannot be achieved, minimised, in accordance with Mana Whenua and ngā uara ahurea o Te Parawhau Hapū.

Adherence to these requirements is necessary to ensure that adverse effects on the whenua are avoided to the greatest extent possible, and where effects cannot be avoided, are appropriately remedied or mitigated, and that the integrity, mauri, and mana of Papatūānuku are upheld through robust and enforceable conditions embedded within the Designation and Outline Plan of Works.

8.5 Mana Ao Tūroa

Te Ao Tūroa

Mana Ao Tūroa reflects the integrity and functioning of the living systems that exist between Ranginui and Papatūānuku. This includes indigenous biodiversity, ecological processes, habitats, and the relationships that sustain life across the taiao.

It reflects the interconnected relationship between ngāhere, waterways, wetlands (repo), landforms, ecological processes, and taonga species. For Te Parawhau Hapū, this is not a series of separate ecological values, but a living system held together through whakapapa. The disturbance, fragmentation, or loss of any part of this system has consequences for the whole.

For Te Parawhau Hapū, these systems are interdependent whakapapa systems, where the wellbeing of one element is inseparable from the wellbeing of the whole. The degradation or loss of these systems therefore represents a direct diminishment of mauri and of the ability of the taiao to sustain life.

The Project area, including Te Mano Hiwa Ariki and the surrounding whenua, ngāhere, repo, awa and puna wai, sits within this space between Ranginui and Papatūānuku, where the living systems of the taiao are sustained, and must be understood and managed holistically.

The health and wellbeing of the taiao is a shared responsibility held by all, including NZ Transport Agency Waka Kotahi (NZTA) and Te Parawhau Hapū. The proposed roading works must be undertaken in a manner that upholds the mauri and protects the integrity of the taiao and all living systems within it.

Te Taiao of the Project Area

The Project traverses and will result in significant loss, fragmentation, and degradation of a highly sensitive taiao, including remnant indigenous ngāhere, freshwater systems, wetlands

(repo), and habitats supporting taonga species such as Hochstetter's frogs, lizards, kauri snails, invertebrates including velvet worms, avifauna, and pekapeka (long-tailed bats). The loss of over 40 mature kauri trees further reflects the scale of irreversible impact on ngāhere systems and their associated ecological and cultural values.

From a Te Ao Māori perspective, and when applying ngā uara ahurea o Te Parawhau, the effects of the Project extend beyond individual ecological components. The works will directly impact the realm of Tāne and Papatūānuku and their many uri, including ngāhere, ngā wai, whenua, repo, and taonga species. These are not separate elements, but part of an interconnected whakapapa system that sustains life and wellbeing.

Ecological Effects

As currently designed and located, the Project will result in substantial disruption to these interconnected systems, including the fragmentation of ngāhere, loss of wetlands (repo), modification of freshwater systems, and degradation of habitats that support taonga species. These effects collectively diminish the mauri of the taiao.

For Te Parawhau Hapū, these impacts are not isolated ecological effects, but represent a fundamental disruption of relationships between tāngata, ngā taonga tuku iho, and the natural world, and therefore directly affect mana whenua and the exercise of kaitiakitanga.

Ecological Assessments

Freshwater Ecological Assessment – Methodological Limitations and Underestimation of Effects

Independent ecological review undertaken for Te Parawhau identifies that the issues within the NZTA freshwater ecological assessment are not isolated technical matters but represent a consistent pattern of methodological departures and unsupported assumptions. These departures systematically reduce the ecological values assigned to streams, wetlands, and

freshwater habitats, and correspondingly underestimate the magnitude and significance of adverse effects.

The review identifies that the ecological baseline is insufficiently robust, relying on incomplete field survey, inaccurate stream mapping, inconsistent wetland delineation, and unsupported assumptions regarding unsurveyed freshwater features. Established ecological assessment methodologies have been modified or selectively applied without justification, including departures from recognised frameworks such as EIANZ ecological value assessment, Stream Ecological Valuation, and Fish Index of Biotic Integrity.

The assessment relies on generalised assumptions, including catchment-scale averaging and extrapolation from limited survey data to unsurveyed areas. These approaches assume consistency of ecological values and conditions across complex and heterogeneous environments without sufficient field verification, resulting in the masking of localised effects and an underrepresentation of ecological significance.

Additionally, the freshwater ecological assessment explicitly excludes cultural values, including taonga species, from its assessment framework. While it is appropriate that these values are articulated and assessed by Hapū, this exclusion confirms that the ecological assessment has been undertaken in isolation from those values, limiting its ability to fully characterise the significance of effects on freshwater systems and their mauri.

As a result, the freshwater ecological assessment does not provide a robust or reliable basis for concluding that adverse effects can be appropriately identified, understood, or managed.

Terrestrial Ecological Assessment – Effects on Indigenous Fauna and Habitat Connectivity

Independent ecological review also identifies significant uncertainty within the terrestrial ecological assessment in relation to species distribution, population density, habitat use, and the long-term effectiveness of proposed mitigation measures.

Of particular concern are the potential effects on Hochstetter's frogs, a regionally distinct population with a distribution within Northland that is limited to the Brynderwyn and Waipū forests. Population-level impacts in the order of tens of thousands of individuals are anticipated as a result of the Project.

Proposed mitigation measures, including salvage and translocation, are unproven at this scale and do not provide sufficient certainty that adverse effects can be avoided, remedied, or mitigated. The reliance on such measures introduces significant uncertainty regarding outcomes for this taonga species.

The Project will also result in fragmentation of ecological systems, including the creation of isolated habitat areas between existing and proposed state highway corridors. This fragmentation will constrain species movement, disrupt ecological connectivity, and contribute to genetic isolation for low-mobility species such as lizards, invertebrates, and amphibians.

The Project also involves extensive modification of freshwater systems, including the culverting, diversion, and in some cases complete loss of streams within the Project alignment. These waterways are integral to the functioning of wider ecological systems and the survival of species such as Hochstetter's frogs, reinforcing the interconnected nature of terrestrial and freshwater effects.

These effects represent permanent changes to ecological structure and function and are not adequately addressed within the terrestrial ecological assessment framework.

Avifauna Assessment – Limitations and Underestimation of Effects

Independent ecological technical review identifies significant limitations in the avifauna assessment due to an over reliance on desktop data with only very limited field survey and insufficient assessment of key taonga species and their habitat use.

The Avifauna Assessment supporting the Project relies predominantly on desktop-based data collection, with limited field survey undertaken to verify species presence, habitat use, and ecological function within the Project area.

While the assessment provides generalised species lists based on habitat types, including forest, farmland, scrub, wetland, and coastal environments, this approach represents only a broad proxy for potential species presence and does not constitute a robust, site-specific assessment of avifauna values (Kūkūwai Consulting Ltd, 2026).

The assessment relies in part on outdated information and does not adequately incorporate current data or regional ecological knowledge. It fails to recognise the regional importance of both species and habitats, including the role of the Project area in supporting indigenous bird populations across the wider ecological landscape.

Targeted field surveys have not been undertaken for key taonga species, including kiwi and wetland-dependent species such as matuku (bittern), despite the clear likelihood of their presence. The absence of such surveys represents a significant limitation, preventing accurate identification of habitat use, population presence, and the scale of potential effects.

There is also a lack of assessment of effects on wetland-associated avifauna, particularly species reliant on repo and associated habitats. This omission is of particular concern given the extent of wetland and headwater systems affected by the Project.

The assessment focuses primarily on effects and management for species classified as Threatened or At Risk and does not adequately recognise the broader ecological role of avifauna in maintaining ecosystem function, connectivity, and mauri within the taiao.

Effects associated with habitat loss, fragmentation, and cumulative impacts are not robustly assessed. Residual effects are consistently characterised as low, with reliance placed on assumed mitigation outcomes. However, mitigation measures are not clearly defined and are instead deferred to a future Avifauna Management Plan to be developed post-consent.

This approach does not provide certainty that adverse effects on avifauna will be avoided, remedied, or mitigated, and results in a systematic underestimation of the scale and significance of effects on these taonga species.

These findings are supported by independent technical review undertaken by Jacqui Wairepo (Kūkūwai) and Rebecca Lodge (Bay Ecological), reinforcing the conclusion that ecological values and effects have been systematically underestimated.

Overarching Ecological Assessment Issues

Across all ecological assessments, effects are framed as capable of management through mitigation, offsetting, and restoration. However, this approach does not accurately reflect the scale, permanence, and cumulative nature of the effects identified, and fails to recognise the loss of ecological maturity, complexity, and established habitat relationships.

Significant uncertainty exists in relation to species distribution, population density, habitat use, and the long-term effectiveness of proposed mitigation measures. Where such uncertainty exists, a precautionary approach indicates that residual effects are likely to be materially higher than those assessed, including Moderate to High effects across multiple species and ecological systems.

The ecological assessments consistently conclude that adverse effects can be reduced to low through mitigation. However, these conclusions rely on assumptions that are not supported by evidence, including assumptions regarding the success of translocation, survivorship of relocated species, and the timeframe required for restored habitats to become functionally equivalent. Independent ecological review indicates that these timeframes may extend across decades, with ecological function not readily replaced or replicated within meaningful timeframes.

The scale of earthworks associated with the Project, including the generation of approximately 6.8 million cubic metres of excavated material, and the resulting disturbance and disposal of that material, introduces further uncertainty. The locations and methods for

disposal are not clearly defined within the application, limiting the ability to assess effects on receiving environments, including waterways, ngāhere, repo, and wider ecological systems.

These assessments also rely on generalised assumptions and extrapolation from limited survey data, applying uniform conclusions across complex and variable environments without sufficient supporting evidence.

There is a clear disconnect between the scale and significance of adverse effects identified within technical assessments and the reliance on mitigation measures, management plans, and consent conditions, which do not adequately address the irreversible loss of interconnected cultural and environmental systems.

Collectively, these issues demonstrate a consistent and systematic pattern across the ecological assessments, where uncertainty and unsupported assumptions are carried through into the characterisation of effects and proposed mitigation, resulting in an ongoing underestimation of ecological values, effects, and outcomes.

Statutory Context

The RMA requires an integrated assessment of the relationship between people, ecosystems, and taonga, including the recognition and provision for the relationship of Māori with their ancestral lands, water, sites, and taonga as a matter of national importance (section 6(e)), the protection of significant indigenous vegetation and habitats of indigenous fauna (section 6(c)), and particular regard to kaitiakitanga (section 7(a)).

In addition, section 8 requires that the principles of Te Tiriti o Waitangi (the Treaty of Waitangi) are taken into account, reinforcing the need for active protection, partnership, and informed participation in decision-making.

The Wildlife Act provides absolute protection for indigenous species, including those present within the Project area, while the Conservation Act provides for the protection of

indigenous biodiversity and ecological systems. These statutory frameworks do not operate in isolation and collectively reinforce the need for a comprehensive and integrated assessment of effects on species, habitats, and ecological systems.

For Te Parawhau Hapū, ngāhere, ngā wai, and taonga species are not solely ecological resources, but form part of an interconnected whakapapa system that embodies cultural identity, wellbeing, and kaitiakitanga. The protection of ecological systems is therefore inseparable from the protection of ngā uara ahurea.

Ecological Systems and Species Management

The Project's approach to biodiversity management places significant emphasis on individual species protection and mitigation. However, this approach does not address the wider degradation and fragmentation of habitats and ecological systems.

A focus on individual species protection, without equivalent protection of habitat and ecological systems, risks undermining the long-term integrity, resilience, and survival of indigenous biodiversity.

For Te Parawhau Hapū, this is inconsistent with a holistic understanding of the taiao, where species, habitats, ngā wai, and whenua are interconnected and must be protected as a whole system.

Reliability of Ecological Assessment

In this context, the separation of ecological assessment from cultural values results in a fundamentally flawed assessment approach. It fails to recognise the interconnected nature of ngā wai, ngāhere, and taonga species, and is inconsistent with the statutory framework that applies to this Project. Consequently, the assessment cannot be relied upon to accurately identify, assess, or respond to the full extent of adverse effects, including on species that are both ecologically significant and taonga to Te Parawhau Hapū, and on ngā uara ahurea.

Furthermore, the assessment relies on methodological approaches that reduce the importance of site-specific ecological values, including headwater streams, wetlands, and smaller habitat systems, by assessing effects at a catchment scale. While this approach may reduce the apparent magnitude of effects, it does not reflect the ecological reality of localised habitat loss, fragmentation, and species-specific impacts, particularly in sensitive upper catchment environments.

Independent review identifies that these methodological choices, combined with limited survey data and continued reliance on assumptions regarding mitigation effectiveness, result in a consistent and material underestimation of ecological effects.

Where these uncertainties are properly accounted for, a precautionary approach indicates that residual effects are likely to be materially higher than those presented in the application, including Moderate to High effects across multiple species and ecological systems.

In the absence of a robust and integrated assessment of ecological and cultural effects, the current ecological assessments do not provide a reliable basis for decision-making.

Statutory and Legal Framework

The matters identified in this assessment engage a range of statutory obligations that must be given effect to through the Project and associated approvals.

Under the RMA, there is a requirement to recognise and provide for the relationship of Māori with their ancestral lands, water, sites, and taonga, and to protect significant indigenous vegetation and habitats of indigenous fauna.

The Wildlife Act provides absolute protection to indigenous wildlife, including species present within the Project area such as Hochstetter's frogs, lizards, avifauna, and pekapeka. Independent ecological review identifies that the current Wildlife Approval application does not adequately include all potentially affected species, including long-tailed bats, and relies

on broad or undefined management approaches. This creates uncertainty as to whether all potential adverse effects, including injury, mortality, and disturbance, are appropriately authorised and managed.

The Conservation Act requires the protection of indigenous biodiversity and ecosystems. The removal of mature kauri and associated ngāhere systems, together with the loss and fragmentation of habitats supporting taonga species, represents a significant reduction in these values that cannot be readily replaced or offset.

The Mana Whakahono a Rohe between Te Pouwhenua o Tiakiriri Kūkupa Trust and Northland Regional Council establishes a formal framework for partnership and engagement. The Project must align with this agreement and cannot rely on deferred engagement or decision-making processes that exclude Te Parawhau Hapū from meaningful participation.

The application adopts an “envelope” or indicative design approach, with key ecological management measures and mitigation responses deferred to future management plans and Outline Plans. Independent review identifies that this approach does not provide sufficient information or certainty to demonstrate that statutory obligations can be met, particularly where adverse effects may be significant and irreversible.

Considering this, the issues identified in this assessment reflect both ngā uara ahurea o Te Parawhau Hapū and statutory requirements that require adverse effects on taonga species, freshwater systems, and indigenous biodiversity to be clearly understood, avoided where possible, and appropriately managed at the time decisions are made.

8.5.1 Mana Ao Tūroa - Mahi Whakaora

To give effect to Mana Ao Tūroa, the following requirements must be met:

- The Project shall prioritise avoidance of adverse effects on taonga species and ecological systems, recognising that mitigation measures such as salvage, relocation,

and habitat restoration, at the scale of effects arising from this Project, are uncertain and do not provide sufficient certainty of success.

- The Project shall not rely on untested or unproven mitigation measures to justify adverse effects on taonga species, particularly where population-level or irreversible effects are likely.
- Remnant ngāhere, including kauri-dominated systems, freshwater systems, wetlands (repo), and habitats supporting taonga species shall be protected from loss, fragmentation, and degradation.
- The Project shall be redesigned and refined to avoid adverse effects on high-value habitats, while recognising that all habitats within the Project area, including modified and exotic systems, contribute to ecological function, connectivity, and the wellbeing of the wider taiao, and shall be appropriately protected and managed.
- Additional multi-season ecological surveys shall be undertaken to confirm species presence, habitat use, and ecological function prior to finalisation of detailed design, including for pekapeka, kiwi, bittern, lizards, and invertebrates.
- Wildlife approvals shall fully account for all species potentially affected by the Project, including pekapeka and avifauna, and shall not rely on incomplete or undefined management approaches.
- Ecological assessments shall adopt a precautionary approach where uncertainty exists and shall not assume low levels of effect in the absence of robust evidence.
- Earthworks and spoil disposal locations and methodologies shall be clearly defined and demonstrated to avoid adverse effects on receiving environments, including waterways, wetlands, ngāhere and ecological systems.
- Monitoring frameworks shall include measurable performance standards, trigger thresholds, and enforceable responses where outcomes are not achieved.
- Adaptive management responses shall be implemented in partnership with Te Parawhau Hapū and shall give effect to ngā uara ahurea o Te Parawhau Hapū.
- The ecological and freshwater assessments shall be revised to apply recognised and standard ecological assessment methodologies without modification, and shall

provide a transparent, robust, and site-specific assessment of ecological values and effects. The assessment shall not rely on assumptions, averaging, or extrapolation in the absence of supporting field data.

- Revision of all ecological reports and subsequent application of the effects management hierarchy to include the Waipū Ecological District and regionally significant species and habitats, including WF9, WF8, and WF7 forest types; remnant riparian vegetation; fish; birds; frogs; bats; all wetlands; headwaters; and ephemeral creeks.
- The assessment of ecological effects of the Project shall be undertaken at an appropriate ecological scale, including site-specific and reach-scale assessment of freshwater, terrestrial, and avifauna habitats, including streams, wetlands, and associated ecosystems, and shall not rely on catchment-scale averaging or percentage loss calculations that mask the magnitude and significance of localised ecological effects.
- Measures presented as mitigation shall demonstrate outcomes beyond baseline regulatory compliance and shall be supported by evidence of effectiveness. Compliance with minimum statutory requirements shall not be relied upon as mitigation of adverse ecological effects.
- Ecological and freshwater assessments, design, and management responses shall be undertaken in an integrated manner with Te Parawhau Hapū, giving effect to mātauranga Māori and ngā uara ahurea o Te Parawhau, and shall not separate ecological and cultural values in the assessment of effects or development of responses.

Assessment Outcome – Mana Ao Tūroa

The Project, as currently proposed, will result in significant and irreversible adverse effects on the mauri and integrity of ngāhere, ngā wai, repo, and taonga species. These effects are compounded by uncertainty within ecological assessments and reliance on mitigation measures that are not supported by evidence.

In the absence of fundamental redesign and a robust, integrated, and evidence-based reassessment of ecological and cultural effects, the Project does not give effect to Mana Ao Tūroa or uphold ngā uara ahurea o Te Parawhau Hapū.

8.6 Mana Tāngata

Mana Tāngata refers to the inherent dignity, authority, and wellbeing of the people. It is grounded in whakapapa, whanaungatanga, and the collective strength of the Hapū, including the responsibility to exercise rangatiratanga and manaakitanga for both hapū and those who reside within their rohe.

For Te Parawhau Hapū, Mana Tāngata is inseparable from the health and integrity of the taiao. The wellbeing of the people is directly connected to the wellbeing of Te Mano Hiwa Ariki, ngā wai, ngāhere, and the wider interconnected systems that sustain Hapū identity, occupation, and intergenerational wellbeing.

Effects on Mana Tāngata

The Project, as currently proposed, will result in significant adverse effects on Mana Tāngata through the scale, extent, and methodology of construction, including extensive earthworks, vegetation clearance, stream diversion, culverting, and the placement of large-scale infrastructure across Te Parawhau takiwā.

These works will result in:

- the destruction and fragmentation of Te Mano Hiwa Ariki and associated systems of whenua, ngāhere, repo, puna wai, awa, and manga;
- the permanent loss of indigenous vegetation and habitat, including remnant ecosystems that are the last remaining expressions of once extensive lowland forest and repo systems;
- the disruption of hydrological systems that sustain these environments and their mauri;

- the degradation of taonga species habitat and ecological connectivity;
- the fragmentation of productive whenua and farming systems;
- the disruption of long-standing whānau occupation and intergenerational relationships with the land.

Of particular concern is the proposed Waipū interchange and associated alignment, which cuts through remnant clusters of kahikatea, tōtara, pūriri, and associated species within a wider repo-dominant landscape. These stands represent some of the last remaining expressions of a once extensive lowland forest and wetland system within the Waipū plains.

These trees are uri of Tāne and are part of a living system sustained by surrounding puna wai, ngā wai, and whenua. They provide critical ecological functions, including flood attenuation, habitat provision, and maintenance of soil and water systems. Many of these trees are several hundred years old and cannot be replaced by mitigation planting.

The whenua affected by this proposal is actively used and occupied by whānau, including long-standing farming operations that support livelihoods and intergenerational wellbeing. The land also holds deep personal and ancestral significance, including the placement of tūpāpaku within the remnant ngāhere.

Nature and Scale of Effects

The loss and fragmentation of these interconnected systems, and the whenua and communities connected to them, represents a significant diminution of Mana Tāngata. In its current form, the Project does not adequately recognise or provide for the relationships between people, whenua, and taiao, nor the responsibility of Te Parawhau Hapū to manaaki those who reside within their rohe.

The scale and extent of adverse effects arising from the Project are not limited to individual features but are the result of the overall alignment, design, and construction methodology adopted. These effects are cumulative and systemic.

These effects extend beyond disruption and include the further fragmentation of existing landholdings, reducing the functionality and ongoing use of whenua and creating the potential for displacement of whānau and land-based activities.

Of particular concern are cumulative effects where properties already affected by existing infrastructure are subject to further fragmentation as a result of the Project, including in the vicinity of the proposed Waipū interchange. This ongoing encroachment progressively erodes the ability of whānau and landowners to maintain their connection with, and use of, their ancestral whenua.

Limitations of Assessment

Te Parawhau Hapū note that current technical assessments, including ecological and environmental reporting, do not accurately characterise the full extent of these effects, particularly in relation to interconnected hydrological systems, remnant ecosystems, and taonga species. The reliance on future management plans and outline plan processes to resolve these matters creates uncertainty and does not provide sufficient confidence that adverse effects on ngā uara ahurea will be appropriately avoided.

Required Response

Accordingly, avoidance of adverse effects on Mana Tāngata cannot be achieved through conditions or mitigation alone. Fundamental reconsideration of the Project alignment, interchange design, and construction methodology is required to ensure that the location, scale, and nature of the works do not result in irreversible harm to Te Parawhau Hapū, affected whānau, hapori and the taiao upon which they depend.

8.6.1 Mana Tāngata - Mahi Whakaora

To uphold Mana Tāngata, the following mahi whakaora are required:

Protection of Interconnected Cultural and Environmental Systems

- The Project shall avoid, wherever practicable, adverse effects on Te Mano Hiwa Ariki and interconnected systems of whenua, ngāhere, repo, puna wai, awa, and manga.
- The alignment, interchange design, and construction methodology shall be refined to avoid or minimise the destruction, fragmentation, and modification of these systems.
- The diversion, culverting, or modification of natural waterways shall be avoided wherever practicable, particularly where such systems sustain remnant ecosystems and their mauri.

Recognition of Whānau, Occupation and Livelihoods

- The Project shall recognise and provide for existing whānau, landowners, and residents, including long-standing occupation, land use, and livelihoods within the Project area, including active farming operations and intergenerational land use.
- Fragmentation or loss of productive whenua shall be avoided wherever practicable through design refinement.
- Where land and livelihoods are directly affected, engagement with affected whānau, landowners, and residents shall be undertaken in partnership with Te Parawhau Hapū.

Access and Relationships with Ancestral Whenua, Wāhi

- Access to whenua, wāhi, and areas of personal, cultural, and ancestral significance shall be maintained, and where access cannot be maintained, alternative arrangements shall be developed in partnership with Te Parawhau Hapū and affected whānau, landowners, and residents prior to the commencement of works.

Hapū Participation and Delivery Opportunities

- NZTA shall ensure that procurement and delivery processes for the Project are structured to enable Te Parawhau Hapū, should it choose to do so, to participate in, lead, and undertake the delivery of Project works on a fair and equitable basis.
- Such opportunities shall extend across the full range of Project activities, including construction, restoration works, environmental management, and associated infrastructure delivery, where capability exists or can be developed.
- NZTA shall engage with Te Parawhau Hapū at an early stage to identify and provide for pathways for participation in Project delivery, including joint venture, partnership, or subcontracting arrangements.
- NZTA shall not unreasonably exclude Te Parawhau Hapū from procurement processes and shall take active steps to remove barriers to participation.

Monitoring and Intergenerational Outcomes

- Monitoring and review mechanisms shall be established in partnership with Te Parawhau Hapū to assess ongoing and cumulative effects on Mana Tāngata arising from the Project and shall align with Te Pouwhenua o Tiakiriri Kūkupa Trust's Mana Whakahono a Rohe agreement with NRC.
- Adaptive management responses shall be implemented in partnership with Te Parawhau Hapū where adverse effects on Mana Tāngata, whenua, or taiao are identified, and shall be guided by and give effect to ngā uara ahurea o Te Parawhau Hapū.

9 Conclusion

This CIA has considered the proposed Project in the context of ngā uara ahurea o Te Parawhau Hapū and the interconnected taiao within Te Mano Hiwa Ariki and its wider takiwā.

The assessment identifies that the Project, as currently proposed, will result in significant, widespread, and in many cases irreversible adverse effects on ngā uara ahurea o Te Parawhau Hapū. These effects arise from the scale and nature of the proposed works, including extensive earthworks, modification of landforms, degradation and loss of ngā wai, fragmentation of indigenous habitats, and adverse effects on taonga species and interconnected ecological systems.

These effects are not confined to discrete sites, but occur across interconnected systems of whenua, ngā wai, and taiao that are inseparable through whakapapa and sustain the mauri of the environment. As such, the effects must be understood as impacts on the integrity and functioning of these systems as a whole, and on the ability of Te Parawhau Hapū to uphold their responsibilities as kaitiaki.

The independent technical reviews commissioned by Te Parawhau Hapū identify significant deficiencies in the ecological and environmental assessments prepared for the Project. These include incomplete baseline information, non-standard methodologies, and a systematic underestimation of ecological values, interconnected system functioning, and the scale and significance of adverse effects. Consequently, there is reduced confidence that the actual and potential effects of the Project have been appropriately identified or assessed.

There is a clear disconnect between the scale, permanence, and uncertainty of these effects and the reliance on mitigation, offsetting, and deferred management planning to address them. In many instances, critical aspects of the Project are left to future management plans, outline plan processes, and adaptive management approaches, which do not provide

sufficient certainty that adverse effects on ngā uara ahurea and te mauri o te taiao will be avoided or appropriately addressed.

In its current form, the Project does not adequately recognise and provide for ngā uara ahurea o Te Parawhau Hapū, does not give effect to Te Tiriti o Waitangi obligations, and does not provide sufficient certainty that the mauri of the taiao and its interconnected systems will be protected.

Accordingly, Te Parawhau Hapū do not support the Project as currently proposed.

A fundamental redesign of the Project is required, including alignment, interchange configuration, and construction methodologies, with a clear emphasis on avoidance of adverse effects as the primary response. This must include genuine and demonstrable consideration of alternative approaches, including tunnels, bridging, and viaducts, to avoid damage to Te Mano Hiwa Ariki and the wider taiao.

Where the Project is to proceed, it must do so within a framework that provides certainty and enforceability at the point of designation and consent. This requires that:

- ngā uara ahurea o Te Parawhau Hapū are embedded at the centre of all decision-making, design, and implementation;
- the protection and avoidance of adverse effects on remnant kahikatea stands, associated ngahere, and the interconnected freshwater systems that sustain their mauri;
- avoidance of adverse effects is prioritised over mitigation or offsetting, particularly where effects are significant, irreversible, or relate to taonga and interconnected systems;
- all mahi whakaora identified in this CIA are secured as enforceable conditions of the designation and associated resource consents, including clear outcomes, limits, and performance standards;

- no reliance is placed on future management plans or outline plan processes to resolve fundamental uncertainties or determine key environmental outcomes;
- monitoring, cultural oversight, and tikanga-based processes are enforceable, including clear hold points and the ability to pause or modify works where ngā uara ahurea and te mauri o te taiao are at risk.

Central to this framework is the requirement for partnership and shared decision-making with Te Parawhau Hapū. This includes the establishment of a formal Rōpū Mahi comprising Te Parawhau Hapū representatives, including hapū-appointed SMEs and kaitiaki, alongside NZTA and relevant technical experts.

This Rōpū Mahi must have a defined role in:

- project design refinement;
- implementation of mahi whakaora;
- approval of management plans;
- monitoring and adaptive responses; and
- decision-making at defined project hold points.

This approach ensures that mātauranga Māori, hapū expertise, and independent technical input are integrated into the Project at all stages.

The Expert Consenting Panel, and all decision-makers under the Fast-track Approvals Act 2024, must ensure that the designation and associated approvals only proceed where there is sufficient certainty that adverse effects on ngā uara ahurea and interconnected taiao systems are avoided, and where enforceable mechanisms are in place to uphold the rangatiratanga and kaitiakitanga of Te Parawhau Hapū.

This includes giving full and proper weight to the findings of this CIA, the independent technical reviews, and the mahi whakaora identified within this report.

Without these measures, the Project will result in the loss and degradation of taonga, the fragmentation of interconnected systems, and the undermining of the mauri of the taiao, and cannot be supported.

10 Recommendations

Te Pouwhenua o Tiakiriri Kūkupa Trust, on behalf of Te Parawhau Hapū, recommends that NZTA and the Fast Track Expert Consenting Panel:

10.1 Project Design and Location

- Require a fundamental redesign of the Project, including alignment, interchange locations (including the Waipū interchange), and construction methodologies, to avoid adverse effects on Te Mano Hiwa Ariki, Waipū, and the interconnected taiao, including whenua, ngā wai, ngāhere, repo, puna wai, and taonga species.
- Confirm that the Project, as currently proposed, fails to adequately avoid adverse effects on ngā uara ahurea o Te Parawhau Hapū and must not proceed in its current form.
- Require that design refinement explicitly prioritises avoidance over mitigation, including the full and genuine consideration of alternative methodologies such as tunnels, viaducts, and bridging to protect the integrity of te taiao.

10.2 Avoidance of Irreversible Effects

- Require that adverse effects on remnant taonga ngāhere, including kahikatea, tōtara, pūriri, and associated ecological and hydrological systems, are avoided in full, recognising these systems as irreplaceable and whakapapa-connected.
- Require that adverse effects on taonga species and their habitats, including freshwater, riparian, and terrestrial systems, are avoided where effects are significant, irreversible, or uncertain.
- Confirm that reliance on mitigation measures, including offsetting, replacement planting, salvage, relocation, or future restoration, is not sufficient to address irreversible loss or degradation of te mauri o te taiao.

10.3 Conditions and Statutory Certainty

- Require that all relevant mahi whakaora identified in this CIA are embedded as enforceable conditions across all statutory approvals, including:
    - designation conditions (NoR);
    - resource consent conditions administered by NRC;
    - relevant conditions under WDC; and
    - Outline Plan and all associated management plan requirements.
- Require that all conditions are integrated, consistent, and mutually reinforcing across all approvals, and must not be fragmented, deferred, or diluted between statutory processes.
- Require that all outcomes necessary to protect ngā uara ahurea o Te Parawhau Hapū and te mauri o te taiao are specified with certainty at the designation and consent stage, including:
    - clear performance standards;
    - measurable environmental and cultural outcomes; and
    - enforceable limits and controls.
- Require that no reliance is placed on future management plans, Outline Plan processes, or deferred approvals where:
    - adverse effects have not been fully identified and understood; or
    - mitigation, offsetting, or management approaches are untested or uncertain.
- Confirm that deferral shall not be used to address gaps in technical information, uncertainty, or unresolved adverse effects.
- Require that management plans and Outline Plan processes are used only to give effect to clearly defined and enforceable conditions, and:
    - must not introduce discretion on matters fundamental to ngā uara ahurea; and
    - must not be relied upon to resolve effects that should have been addressed prior to approval.

- Require that where inconsistency arises between conditions across approvals, the outcome that best protects ngā uara ahurea o Te Parawhau Hapū and te mauri o te taiao shall prevail.

10.4 Partnership and Decision-Making

- Recognise Te Parawhau Hapū as Te Tiriti o Waitangi partners and require that partnership and shared decision-making are embedded across all stages of the Project.
- Require the establishment of a Te Parawhau Hapū–NZTA Rōpū Mahi, with defined and enforceable decision-making roles, including:
    - detailed design;
    - construction methodologies;
    - staging and sequencing of works;
    - environmental management responses; and
    - resolution of adverse effects on ngā uara ahurea.
- Require that Te Parawhau Hapū are resourced appropriately and continuously to enable participation in governance, implementation, monitoring, and adaptive management.

10.5 Monitoring, Hold Points and Tikanga

- Require that cultural monitoring, ecological monitoring, and tikanga-based processes are embedded as enforceable conditions, including:
    - mandatory monitoring roles for Te Parawhau Hapū;
    - defined hold points linked to key risk activities; and
    - the ability to pause works immediately where tikanga, wairuatanga, or mauri are at risk.
- Require that all monitoring and response frameworks are co-designed and implemented in partnership with Te Parawhau Hapū.

- Require the implementation of Te Parawhau Hapū Accidental Discovery Kaupapa (Appendix B), including:
    - cultural authority to halt works;
    - hapū-led assessment of findings; and
    - determination of tikanga-based responses.
- Require that adaptive management is not used to justify uncertainty, and is only applied where:
    - clear limits and triggers are defined in advance; and
    - Te Parawhau Hapū hold decision-making roles in responses.

10.6 Hapū Participation and Delivery

- Require that NZTA structures procurement and delivery mechanisms to enable Te Parawhau Hapū, where it chooses, to:
    - participate in Project delivery;
    - lead components of environmental, restoration, and monitoring works; and
    - build long-term capability and capacity.
- Ensure that participation is provided on a fair, equitable, and resourced basis, and is not limited to advisory or peripheral roles.

10.7 Expertise and Decision-Making Capability

- Require that the Fast Track Expert Consenting Panel includes:
    - appropriately qualified freshwater and terrestrial ecological expertise; and
    - at least one member with demonstrated capability in Te Ao Māori and mātauranga Māori, including a strong understanding of ngā uara ahurea o Te Parawhau Hapū.
- Confirm that this expertise is necessary to ensure that:
    - Taiao, ecological and cultural effects are properly understood and assessed; and

- cumulative and interconnected system effects are fully recognised and responded to.

10.8 Outcome Sought

These recommendations are necessary to ensure that the Project:

- is fundamentally redesigned and, if it is to proceed, is implemented in a manner that upholds ngā uara ahurea o Te Parawhau Hapū and recognises their mana motuhake and rangatiratanga;
- protects and maintains the mauri of interconnected systems of whenua, ngā wai, ngāhere, repo, puna wai, and taonga species;
- avoids irreversible harm to these systems and the whakapapa relationships they sustain; and
- provides certainty through enforceable statutory conditions, ensuring that the protection of ngā uara ahurea is achieved in practice, not deferred or diminished through future processes.

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Report Reference:	GO/LFC – 090620206 Revision 3
Date:	01 July 2026
Report Reviewed and Approved By: **Pari Walker** **Chair – Te Pouwhenua o Tiakiriri Kūkupa Trust**	

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References

Bay Ecological . (2024). *Peer Review Ecological Entire Nov 24 V1 Bay Ecological.* Kerikeri: Unpublished report.

Bay Ecological. (2026). *Freshwater Fish Technical Review Companion Document To The Freshwater Ecological Review (Peer Review).* Kerikeri: Unpublished report.

Kūkūwai Consulting Ltd. (2026). *Technical Review of Ecological Reporting prepared for the Northern Corridor Section 2B for Waka Kōtahi NZTA.* Whangārei: Unpublished report.

M, H. T. (2016). *Manaaki: Mana Enhancing and Mana Protecting Practice.* Wellington: Te Rau Matatini.

Ministry for the Environment. (2021, December 21). Te Mana o te Wai implementation How to give effect to Te Mana o te Wai when implementing the National Policy Statement for Freshwater Management. . Wellington, New Zealand .

Ministry for the Environment. (2023, July 10). *Environment Government NZ Acts and Regulations National Policy Statements*. Retrieved from National Policy Statement For Indigenous Biodiversity 2023: https://environment.govt.nz/acts-and-regulations/national-policy-statements/national-policy-statement-for-indigenous-biodiversity/

New Zealand Transport Agency Waka Kotahi (NZTA). (2026). *Assessment of Effects on Terrestrial Ecology Appendix (D06).* Wellington: Unpublished.

New Zealand Transport Agency Waka Kotahi (NZTA). (2026). *Construction Water Assessment – Alternative to the Brynderwyn Hills (Brynderwyn Hills Section) Appendix D10, Volume B.* Wellington: Unpublished report.

Tonga, H. (2025, October 21). (M. P. Walker, Interviewer)

Waka Kotahi New Zealand Transport Agency (NZTA). (2026). *Assessment of Effects on Freshwater Ecology Alternative to the Brynderwyn Hills – Brynderwyn Hills section Revision A.* Wellington: Unpublished.

Waka Kotahi New Zealand Transport Agency (NZTA). (2026). *Assessment of Effects on Avifauna Ecology Alternative to the Brynderwyn Hills – Brynderwyn Hills section.* Wellington: Unpublished .

Waka Kotahi New Zealand Transport Agency, NZTA . (2026). *Assesment of Contaminated Land Effects Alternative to the Brynderwyn HIlls - Brynderwyn Hills Seciton .* Wellington : Unpublished.

Waka Kotahi New Zealand Transport Agency, NZTA. (2026). *Assessment of Operational Stormwater and Flooding Effects Alternative to the Brynderwyn Hills – Brynderwyn Hills section.* Wellington : Unpublished.

Waka Kotahi New Zealand Transport Agency, NZTA. (2026). *Assessment of Effects on Groundwater Alternative to Brynderwyn Hills – Brynderwyn Hills Section.* Wellington: Unpublished report.

Waka Kotahi New Zealand Transport Agency, NZTA. (2026). *Assessment of Landscape and Visual Effects Alternative to the Brynderwyn Hills – Brynderwyn Hills section.* Wellington: Unpublished report.

Waka Kotahi New Zealand Transport Agency, NZTA . (2026). *Construction Water Assessment Alternative to the Brynderwyn Hills – Brynderwyn Hills Section.* Wellington: Unpublished report.

Walker, M. P. (2026, June 19). Te Parawhau Kaiarahi me Kaumatua. (G. Olsen, Interviewer)

Appendix A:

Bay Ecological Peer Review – Freshwater Ecological Assessment

Bay Ecological Technical Review – Assessment of Effects on Avifauna

Bay Ecological Technical Review – Assessment of Effects on Terrestrial Ecology

Bay Ecological Technical Review – Fish Technical Review

Kūkūwai Technical Review of Ecological Reporting Prepared for the Northern Corridor Section 2B for Waka Kotahi NZTA

TECHNICAL REVIEW
FOR TE POUWHENUA O TIAKIRIRI KUKUPA TRUST



ASSESSMENT OF EFFECTS ON FRESHWATER ECOLOGY
NORTHLAND CORRIDOR 2B
DOCUMENT: 10722-PTA-2B0-PE-RPT-0010

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This report may be cited as- TECHNICAL REVIEW FOR TE POUWHENUA O TIAKIRIRI KUKUPA TRUST **ASSESSMENT OF EFFECTS ON FRESHWATER ECOLOGY** NZ Transport Agency Waka Kotahi | Roads of National Significance | Northland Corridor 2B Assessment of Effects on Freshwater Ecology – Document: 10722-PTA-2B0-PE-RPT-0010 Revision:A

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INTRODUCTION

This document presents a technical peer review of the **Assessment of Effects on Freshwater Ecology** (Document 10722-PTA-2B0-PE-RPT-0010, Revision A), prepared in support of the **Northland Corridor – Roads of National Significance, Section 2B** project.

The purpose of the **Effects on Freshwater Ecology Report**, hereafter called the FER, is to describe the existing freshwater environment, assess the potential ecological effects of the proposed designation and associated works, and recommend measures to avoid, minimise, remedy, offset or compensate for those effects. The assessment is presented through the following principal sections:

- **Section 2 – Statutory Framework**
- **Section 3 – Existing Freshwater Environment**
- **Section 4 – Assessment of Effects on Freshwater Ecology**
- **Section 5 – Effects Management Recommendations**

This review has been prepared for **Te Parawhau hapū** to inform the freshwater ecology components of the Cultural Impact Assessment (CIA). While its primary purpose is to provide an independent technical evaluation of the ecological conclusions presented in the FER, it also examines the assessment methodologies used to derive those conclusions as explanatory. Particular attention is given to the application of ecological assessment frameworks, the interpretation of field survey data, the treatment of freshwater values, and the scientific basis for the effects assessment.

The review is intentionally detailed. Given the scale and significance of the proposed designation, and the reliance placed on the FER to inform decision-making, it is important that the ecological assessment therein is robust, transparent, repeatable and consistent with accepted New Zealand freshwater assessment methodologies. Where departures from recognised methods are identified, these are discussed together with the implications for the assessment of ecological effects.

Throughout this review, recurring methodological issues are identified, including modifications to established assessment frameworks, the use of bespoke ecological value and magnitude criteria, and reliance on catchment-scale averaging to characterise effects. These issues are shown to influence not only the assessment of individual streams and wetlands but also the subsequent conclusions regarding significance, mitigation and residual effects. Accordingly, this review seeks not only to comment on individual conclusions, but also to provide insight into the underlying assessment framework upon which those conclusions are based.

EXECUTIVE SUMMARY

This technical review evaluates the adequacy, transparency and reliability of the Freshwater Ecological Report (FER) prepared in support of the Project. The review concludes that the issues identified are not isolated technical disagreements but represent a consistent pattern of methodological departures and unsupported assumptions that collectively reduce the ecological values assigned to freshwater ecosystems, underestimate the magnitude and significance of adverse effects, and substantially reduce confidence in the conclusions of the FER.

KEY FINDINGS:

- The ecological baseline is insufficiently robust, relying on incomplete field survey, inaccurate stream mapping, inconsistent wetland delineation, limited habitat assessment and unsupported assumptions regarding unsurveyed freshwater features.
- The FER repeatedly departs from recognised freshwater ecological assessment practice through modified application of accepted methodologies, including EIANZ ecological value assessment, Stream Ecological Valuation (SEV), Fish Index of Biotic Integrity (Fish IBI), wetland assessment, and bespoke ecological value and magnitude frameworks.
- These methodological departures consistently reduce the assessed ecological value of streams, wetlands and freshwater habitats and consequently reduce the predicted magnitude and significance of ecological effects.
- Ecological condition is repeatedly conflated with ecological value, resulting in modified headwater streams and natural inland wetlands being assigned disproportionately low ecological significance despite retaining important hydrological, ecological and biodiversity functions recognised under the NPS-FM, NES-F and Regional Plan.
- Catchment-scale averaging and percentage-loss calculations are used inappropriately to assess ecological effects, masking localised impacts on ecological function, habitat quality, ecological connectivity, fish passage, spawning habitat, recruitment and ecosystem processes.
- Headwater streams, intermittent waterways, springs and exotic-dominated natural inland wetlands are consistently undervalued despite their recognised contribution to ecosystem health, hydrological function, indigenous biodiversity and catchment resilience.
- The assessment gives insufficient consideration to ecological connectivity, including longitudinal, lateral and hydrological connections between streams, wetlands, groundwater, floodplains and downstream receiving environments, together with the importance of fish migration, spawning and recruitment habitats.
- Predicted ecological outcomes rely heavily on optimistic assumptions regarding the effectiveness of mitigation measures, including stream realignment, culvert design, fish passage, riparian restoration and wetland management, without sufficient empirical evidence or project-specific validation to demonstrate ecological equivalence.
- Compliance with minimum statutory requirements is frequently presented as ecological mitigation, despite representing baseline regulatory expectations rather than measures that avoid, remedy or offset adverse ecological effects.

- Methodological assumptions established early in the FER are propagated throughout subsequent technical assessments, project design, construction methodologies, consent conditions and environmental management plans, extending the implications of the assessment well beyond freshwater ecology.
- Collectively, the methodological departures identified throughout this review form an interconnected chain whereby uncertainties and unsupported assumptions established early in the assessment are carried through ecological valuation, effects assessment, mitigation design and management recommendations. This substantially reduces confidence in the assessment as a whole rather than merely in its individual components.
- Accordingly, the FER does not provide a sufficiently reliable, transparent or repeatable assessment framework to support confidence that freshwater ecological values, project effects and proposed management responses have been appropriately identified or evaluated. Consequently, the conclusions of the FER should be treated with considerable caution.

FIG 1: FER METHODOLOGY – MITIGATION CASCADE



FER 2. ASSESSMENT METHODOLOGY

2.1.1 FAST TRACK APPROVALS

The Freshwater Fisheries provisions under Schedule 9 of the Fast-track regime set a clear expectation for a detailed, species- and structure-specific assessment of effects on freshwater fisheries, particularly where culverts may impede fish passage. This includes explicit consideration of structure design, hydraulic conditions, affected species, habitat quality, connectivity, and alignment with the NZ Fish Passage Guidelines.

The FER does not meet this threshold of specificity. It provides limited detail on culvert design parameters, hydraulic performance, or site-specific species and habitat requirements, and instead relies on generalised assumptions regarding fish presence and habitat value. This results in an insufficiently resolved basis for assessing fish passage requirements in accordance with Schedule 9.

Furthermore, the tendency within the FER to alter established NZ survey methodologies without robust justification or peer support; consider effects at an inappropriate catchment scale; downplay the ecological significance of species, affected reaches and simplify habitat function risks systematically under-representing the likelihood and importance of fish passage requirements. This is inconsistent with the requirement to explicitly evaluate species presence, habitat suitability, and connectivity outcomes at an appropriate spatial scale. The reliance on the FER by other construction and operational technical disciplines risks permanence of undescribed effects.

Overall, the FER does not provide the level of technical or ecological resolution required to support a robust Schedule 9 freshwater fisheries assessment, and therefore offers a limited basis for informing fish passage design and consent decision-making.

The Freshwater Fisheries provisions under Schedule 9 of the Fast-track regime establish a clear and detailed framework for the assessment of complex freshwater fisheries activities, and require applicants to provide substantive information on structure design, hydraulic regime, affected freshwater species and values, habitat quality upstream and downstream, and the manner in which fish passage will be provided or affected. They also require decision-makers to have regard to alignment with the New Zealand Fish Passage Guidelines and to explicitly consider the presence of Threatened, Data-deficient, or At-Risk species, the availability and quality of habitat, and the relative advantages and disadvantages of providing fish passage. Overall, the FER does not provide the level of technical specificity or ecological weighting required to reliably inform a complex freshwater fisheries approval assessment under Schedule 9, as demonstrated throughout our review. In particular, the tendency to minimise the ecological value of affected reaches and simplify habitat importance risks downplaying the presence or potential presence of freshwater fish species and associated habitat functions, thereby reducing the apparent need for fish passage design considerations from the outset. This approach is inconsistent with the Schedule 9 requirement to explicitly evaluate habitat quality, species presence, and connectivity outcomes, and may consequently understate the necessity for appropriately designed fish passage structures.

2.1.2. NATIONAL POLICY STATEMENT FOR FRESHWATER MANAGEMENT 2020

The FER describes the policies of the NPS-FM (2020) relevant to the assessment of the project freshwater context as

- *Policy 6: There is no further loss of extent of natural inland wetlands, their values are protected,*
- *and their restoration is promoted.*
- *Policy 7: The loss of river extent and values is avoided to the extent practicable.*
- *Policy 9: The habitats of indigenous freshwater species are protected.*
- *Policy 10: The habitat of trout and salmon is protected, insofar as this is consistent with Policy 9.*

Policy 10 is quite oddly included, with no apparent relevance in this case, as no trout or salmon populations are identified within the project area. The rationale for limiting consideration to the remainder is unclear, particularly given the broad freshwater management emphasis established by the NPS-FM. **Policy 11** (allocation), **Policy 12** (national water quality targets), **Policy 13** (monitoring), **Policy 14** (reporting), and **Policy 15** (community wellbeing) are generally more directed at regional planning and management frameworks than project-scale ecological effects assessments. However, the assessment does not explain why other relevant policies have been excluded from consideration. In particular, Policies 1, 3 and 5 are directly relevant to the assessment of freshwater ecological effects, catchment-scale impacts, and the maintenance of freshwater ecosystem health.

Policy 1: *Freshwater is managed in a way that gives effect to Te Mana o te Wai.*
Policy 3: *Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.*
We note that the assessment does not consider the Waipū Estuary as a receiving environment, notwithstanding that the Ahuroa and Waihoihoi Streams terminate directly into the estuary. The omission of any comment in the FER or wider substantive application does not adequately reflect the strong hydrological connectivity, including for freshwater fish, between these freshwater systems and the immediate downstream estuarine environment.

Policy 5: *Freshwater is managed (including through a National Objectives Framework) to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.*

The policy does not support the proposition that existing degradation reduces the significance of remaining freshwater values or provides justification for further adverse effects. Rather, it requires maintenance of the health and well-being of freshwater ecosystems and improvement where degradation has already occurred.

Given the large scale permanent impacts of reconfiguration proposed across two catchments immediate to the coastal and estuarine environment, with associated changes to groundwater and surface flows, we would expect some consideration of the cumulative effects of climate change in regard to
Policy 4*: Freshwater is managed as part of New Zealand's integrated response to climate change.*

Commonly cited modelling suggests that Northland will be subject to a decrease in mean annual rainfall, and as per the rest of the country will be subject to an increase in mean annual temperature; greater prevalence of westerly winds and greater incidence of stochastic events e.g.major rainfall, severe wind and high temperature events.

Climate change consideration is absent. The assessment does not comment on the role of wetlands and natural stream systems in providing climate resilience under projected climate change scenarios, including more frequent extreme rainfall events, prolonged droughts. This includes a loss of headwater ephemeral and intermittent waterways, loss of wetland extent and channelization (Waihoihoi). Given the size and expertise of the technical team supporting the project, a more integrated assessment of hydrological and ecological effects would be expected to translate these abiotic and cumulative changes to impacts on habitat and community dynamics, even at a high level.

A subset of indigenous ecosystems and by proxy the individual species that occupy them have been identified at greater level of risk from climate change[1]

- Those at risk of inundation during a 100- year flood event representing gross physical disturbance e.g. īnanga spawning grounds.
- Rare and uncommon species or habitats & those with highly restricted and fragmented distributions e.g. Hochstetters frogs; freshwater fish with niche habitat requirements and spawning grounds of freshwater fish in both lowland (e.g. īnanga; giant kōkopu) and upland (e.g.banded kōkopu; redfin bully)
- Ecosystems at climatic limits e.g. kahikatea associations vulnerable to drought

The ecological field investigations and technical review undertaken for Te Parawhau, including the findings presented in this report and associated specialist assessments, contribute at an initial primary level but are not limited to giving effect to –
Policy 2: *Tangata whenua are actively involved in freshwater management (including decision-making processes), and Māori freshwater values are identified and provided for.*

2.1.4. RESOURCE MANAGEMENT (NATIONAL ENVIRONMENTAL STANDARDS FOR FRESHWATER) REGULATIONS 2020

As activities related to the Project the FER includes

- *Earthworks, vegetation clearance and diversion of water within and/or near to natural inland wetlands,*
- *Reclamation within stream beds, and*
- *The construction of culverts within stream beds.*

We add that the project will invoke
NES F 53 PROHIBITED ACTIVITIES
(1) Earthworks within a natural inland wetland is a prohibited activity if it—
(a) results, or is likely to result, in the complete or partial drainage of all or part of a natural inland wetland; and
(b) does not have another status under any of regulations 38 to 51.
(2) The taking, use, damming, or diversion of water within a natural inland wetland

[1] Bishop & Landers (2019) Climate change risk assessment for terrestrial species and ecosystems in the Auckland region. Technical Report 2019/014 Auckland Regional Council

is a prohibited activity if it—

(a) results, or is likely to result, in the complete or partial drainage of all or part of a natural inland wetland; and

(b) does not have another status under any of regulations 38 to 51.

While drainage (loss) of wetlands is prohibited in general, the Project meets the definition of *specified infrastructure*[2] and therefore has status under *NES F 45 CONSTRUCTION OF SPECIFIED INFRASTRUCTURE* ***DISCRETIONARY ACTIVITIES***

We note however that this is not a free pass as such as *REG (45) 6* requires:

(6) A resource consent for a discretionary activity under this regulation must not be granted unless the consent authority has first—

(a) satisfied itself that the specified infrastructure will provide significant national or regional benefits; and

(b) satisfied itself that there is a functional need for the specified infrastructure in that location; and

(c) applied the effects management hierarchy*.*

A transparent and robust consideration of (b) is expected, followed by (c) of the effects management hierarchy (EMH) where the activity is directly contrary to:

- *Policy 6: There is no further* ***loss of extent*** *of natural inland wetlands, their values are protected,*
- *and their restoration is promoted.*
- *Policy 7: The* ***loss of river extent and values*** *is avoided to the extent practicable.*
- *Policy 9: The habitats of indigenous freshwater species are* ***protected****.*

[2] **specified infrastructure** means any of the following:
*(a) infrastructure that delivers a service operated by a lifeline utility (as defined in the Civil Defence Emergency Management Act 2002) (**b) regionally significant infrastructure identified as such in a regional policy statement or regional** plan (c) any water storage infrastructure (d) any public flood control, flood protection, or drainage works carried out: (i) by or on behalf of a local authority, including works carried out for the purposes set out in section 133 of the Soil Conservation and Rivers Control Act 1941; or (ii) for the purpose of drainage by drainage districts under the Land Drainage Act 1908 (e) defence facilities operated by the New Zealand Defence Force to meet its obligations under the Defence Act 1990 (f) ski area infrastructure*

2.2. EXISTING ENVIRONMENT METHODOLOGY

2.2.1. THE RELEVANCE OF VALUES AND CONDITION OF THE EXISTING ENVIRONMENT

The FER outlines a primary assessment rationale adopted-

Throughout this assessment, I refer to two key measures when assessing the current state of streams and wetlands within the Proposed Designation:
*• **Condition (ecosystem health):** the state of a stream or wetland and its elements (i.e. the level of modification and 'healthiness' of the aquatic habitat) has implications on value. For example:*
A wetland that is inhabited by creeping bent and butter cup and regularly grazed in a farm setting will qualify as a natural inland wetland but is a wetland in poor condition and may change rapidly.
A stream in poor ecosystem health because of water quality issues may nevertheless contain a long fin eel and its presence would trigger the rarity criterion relevant to value. However, the habitat is not conducive to persistence or sustainability of that value.
*• **Value:** reflects rarity, representativeness, diversity, and context.*

The framing here conflates condition with ecological value and underplays the significance of biodiversity attributes independent of habitat "health". The extent of historical modification does not diminish the ecological significance of remaining indigenous biodiversity values, nor does it reduce the relevance of rarity as an assessment criterion.

In terms of the NPS-FM and its intent, the **values[3] to protect / avoid adverse effects on** (including cumulative effects and loss of potential value) are:

(i) ECOSYSTEM HEALTH (Appendix 1A)
5 biophysical components -

- *Water quality – the physical and chemical measures of the water, such as temperature, dissolved oxygen, pH, suspended sediment, nutrients and toxicants*
- *Water quantity – the extent and variability in the level or flow of water*
- *Habitat – the physical form, structure, and extent of the water body, its bed, banks and margins; its riparian vegetation; and its connections to the floodplain and to groundwater*
- *Aquatic life – the abundance and diversity of biota including microbes, invertebrates, plants, fish and birds*
- Ecological processes – *the interactions among biota and their physical and chemical environment such as primary production, decomposition, nutrient cycling and trophic connectivity.*

(II) INDIGENOUS BIODIVERSITY

(III) HYDROLOGICAL FUNCTIONING

(IV) MĀORI FRESHWATER VALUES

(V) AMENITY VALUES

These values must be identified, recognized and provided for. These components reflect modern freshwater science recognition and include regulatory protection of exotic dominant wetlands in a pastoral setting. Although they may inform significance as per RPS (2018) Appendix 5, they are not ranked and are not a quasi-scoring or decision test.

[3] loss of value, in relation to a natural inland wetland or river, means the wetland or river is less able to provide for the following existing or potential values: (a) any value identified for it under the NOF process (b) any of the following values, whether or not they are identified under the NOF process: (i) ecosystem health (ii) indigenous biodiversity (iii) hydrological functioning (iv) Māori freshwater values (v) amenity values

The FER statement that -

A wetland that is inhabited by creeping bent and butter cup and regularly grazed in a farm setting will qualify as a natural inland wetland but is a wetland in poor condition and may change rapidly.

is overly simplistic and does not reflect the NPS-FM (2020) ecosystem health framework. It reduces wetland condition to a subjective vegetation composition judgement and the presence of grazing pressure, which does not characterise the definition of natural inand wetland as per the NPS FM definitions or ecosystem health under the five compulsory biophysical components. Neither unpalatable buttercups, which include native species, or *Agrostis stolinifera (FACW)* are pastoral exclusion list species[4]

The ecological context of *natural inland wetlands* cannot be reduced or discounted due to grazing adapted stoloniferous, rosette or low-palatable exotic species, which often include but are not limited to creeping bent and buttercup in our experience of the proposal *natural inland wetlands.* These species reflect the predominant land use influence across NZ lowland environments and effectively devaluing them as per the FER would allow the destruction of this wetland type nationally, as was the old school status quo and contrary to NPS FM (2020) Policy 6.

Agricultural clearance in the Waipū ED was already finished by the early 1900s. The assertion that such a wetland *will change rapidly* is also unsubstantiated without supporting evidence of inferred hydrological instability or functional collapse. In the absence of grazing they would likely recover quickly in stature and diversity. The modified wetlands of the Waipū ED are representative of the remaining local wetland character. They have persisted with long term fidelity to their 1960s aerial footprint (Retrolens) and we consider their hydrology and reliant hydrophilic vegetation to therefore have resilience.[5]

We disagree with the FER statement that

A stream in poor ecosystem health because of water quality issues may nevertheless contain a long fin eel and its presence would trigger the rarity criterion relevant to value. However, the habitat is not conducive to persistence or sustainability of that value.

We note that the FER fish survey methodologies cannot be used to inform abundance or even robust occurrence data of species and therefore such a statement has no founding. The statement minimises the significance of this *At Risk- Declining* taonga species by decoupling its occurrence from any value. Discounting rarity and occurrence on the basis of condition risks systematic underestimation of ecological significance in modified catchments, where residual habitats often retain disproportionate importance for indigenous biodiversity.

In ecological assessment, the presence of species with threat status, including regional significance, remains a primary determinant of value, even where habitat condition is

[4] Cosgrove, G.P., Dodd, M.B., & James, T.K. (2022). ***National List of Exotic Pasture Species***. Report prepared for the Ministry for the Environment, Wellington, New Zealand. Ministry for the Environment. (2022). *Pasture Exclusion Assessment Methodology*. Wellington, New Zealand.

[5] NPSIB (2025) **resilience**: in relation to an ecosystem, means the ability of the ecosystem to recover from and absorb disturbances, and its capacity to reorganise into similar ecosystems

suboptimal. The presence of low-abundance remnant populations of species, even where habitat condition is considered marginal or approaching assumed limits of tolerance, does not provide justification for expediting their loss. Residual biodiversity contributes to persistence precisely because such habitats may be functioning as refugia or contributing to a metapopulation.

Overall, the approach appears to place undue emphasis on habitat condition as a proxy for value, and to down-weight the significance of *At Risk* taxa and remnant populations without sufficient ecological justification.

The FER goes on to justify a rationale for adjusting the EIANZ and RPS (2018) methodology for assessing significance,, to inappropriately subordinate biodiversity values, including species diversity and rarity, on the basis of the project's modified setting-

FER (PG. 5) *Here, because of the Project's setting (i.e. a long history of use and modification for most of the affected catchments, and the size, setting and condition of the streams and wetlands), I consider that rarity or species diversity of less weight in assessing the state of a stream or wetland. It is the health of the stream or wetland (i.e. its condition) that will more greatly influence the probability or presence and persistence of rare taxa. That said, condition is reflected in many of the metrics used to determine value.*

In these best practice and standard protocols, parameters *(ie. Representativeness; Rarity/ Distinctiveness; Diversity & Pattern; Ecological Context)* are not ranked or weighted more heavily against one another. Only one criteria need be satisfied to concur significance.

The EIANZ (2018) guideline emphasizes

- *When considering assigning an overall significance rating to an ecological unit or context the values assigned to different subsets can be combined to give a single site value* ***as per EIANZ matrices.***
- *Combining values should be done in a way that avoids suppressing project impacts on individual features or components.*
- ***The values and effects on individual species should not be overlooked or amalgamated or averaged***

2.2.2. METHODOLOGY FOR ASSIGNING ECOLOGICAL VALUES

The DoC Freshwater Fish Threat Classification as cited is out of date and was replaced last year by *Dunn et al (2025)*[6]. The threat status of species with the potential to be in the Designation waterways is given below Table 2.

As per the EIANZ (2018) framework below the majority of species have individual species values of *Very High*; *High or Moderate – High,* dependant on their threat status, as below Table 1. From professional regional experience we allocated *Moderate* value species that are *Regionally Significant* to a Moderate -High value, e.g banded kōkopu. We also acknowledge these rankings do not account for ngā uara ahurea o ngā ika.

TABLE 1: EIANZ (2018) TABLE 5 CRITERIA FOR INDIVIDUAL SPECIES VALUE IN ECOLOGICAL IMPACT ASSESSMENT

VALUE	EIANZ EXPLANATION
VERY HIGH	*Nationally Threatened species (Critical, Endangered or Vulnerable) found in the **Zone of Influence** or likely to occur there, either permanently or seasonally*
HIGH	*Nationally At Risk species (Declining) found in the **Zone of Influence** or likely to occur there, either permanently or seasonally*
MODERATE	*Species listed as any other category of At Risk, found in the **Zone of Influence** either permanently or seasonally. Locally (ED) uncommon or distinctive species*
LOW	*Nationally and locally common indigenous species*
NEGLIGIBLE	*Exotic species, including pests, species having recreational value*

BANDED KŌKOPU (AT RISK -NATURALLY UNCOMMON, REGIONALLY SIGNIFICANT; EIANZ MODERATE VALUE) WAIPŪ SOUTH UPPER HEADWATER, ONE OF 3 IN A POOL



[6] (2025) **Conservation status of New Zealand freshwater fishes, 2023** Nicholas R. Dunn, Gerard P. Closs, Shannan K. Crow, Bruno O. David, Jane M. Goodman, Marc Griffiths, Andrew S. Hicks, Michael J.H. Hickford, Daniel C. Jack, Jane C. Kitson, Nicholas Ling, Jonathan M. Waters, Matthew J. Wylie, Rodney A. Hitchmough and Troy Makan New Zealand Threat Classification Series 46. Department of Conservation, Wellington. 66 p

TABLE 2: THREAT STATUS OF REGIONAL FRESHWATER RECEPTORS DUNNET AL (2025)

POTENTIAL NORTLAND SPECIES	COMMON NAME	THREAT STATUS 2025[7]	PREVIOUS THREAT STATUS 2018	STATUS CHANGE	EIANZ TABLE 5 SPECIES SIGNIFICANCE VALUE
Anguilla australis	SHORTFIN EEL	NOT THREATENED	NOT THREATENED	NO CHANGE	LOW
Anguilla dieffenbachii	LONGFIN EEL	AT RISK - DECLINING	AT RISK - DECLINING	NO CHANGE	HIGH
Cheimarrichthys fosteri	TORRENT FISH	AT RISK – NATURALLY UNCOMMON	AT RISK - DECLINING	BETTER	MODERATE-HIGH
Echyridella menziesii	KĀKAHI	AT RISK - DECLINING	AT RISK - DECLINING	NO CHANGE	HIGH
Echyridella aucklandia	KĀKAHI	THREATENED –NATIONALLY VULNERABLE	THREATENED –NATIONALLY VULNERABLE	NO CHANGE	VERY HIGH
Galaxias argenteus	GIANT KŌKOPU	AT RISK - DECLINING	AT RISK - DECLINING	NO CHANGE	HIGH
Galaxias brevipinnis	KŌARO	AT RISK – DECLINING REGIONALLY RARE	AT RISK - DECLINING	NO CHANGE	HIGH
Galaxias fasciatus	BANDED KŌKOPU	AT RISK – NATURALLY UNCOMMON REGIONALLY SIGNIFICANT	NOT THREATENED REGIONALLY SIGNIFICANT	WORSE	MODERATE-HIGH
Galaxias maculatus	ĪNANGA	THREATENED -NATURALLY VULNERABLE	AT RISK - DECLINING	WORSE	VERY HIGH
Galaxias postvectis	SHORT JAW KŌKOPU	THREATENED -NATURALLY VULNERABLE REGIONALLY SIGNIFICANT	THREATENED -NATURALLY VULNERABLE REGIONALLY SIGNIFICANT	NO CHANGE	VERY HIGH
Geotria australis	LAMPREY	THREATENED -NATURALLY VULNERABLE	THREATENED -NATURALLY VULNERABLE	NO CHANGE	VERY HIGH
Gobiomorphus basalis	CRANS BULLY	AT RISK – NATURALLY UNCOMMON	NOT THREATENED	WORSE	MODERATE-HIGH
Gobiomorphus cotidianus	COMMON BULLY	NOT THREATENED	NOT THREATENED	NO CHANGE	LOW
Gobiomorphus gobioides	GIANT BULLY	AT RISK- NATURALLY UNCOMMON REGIONAL SIGIFICANT	AT RISK- NATURALLY UNCOMMON REGIONAL SIGIFICANT	NO CHANGE	MODERATE-HIGH
Gobiomorphus hubbsi	BLUEGILL BULLY	AT RISK- NATURALLY UNCOMMON REGIONALLY RARE	AT RISK- DECLINING	BETTER	MODERATE-HIGH
Gobiomorphus hutonni	REDFIN BULLY	AT RISK – NATURALLY UNCOMMON	NOT THREATENED	WORSE	MODERATE - HIGH
Paratya curvirostris	FRESHWATER SHRIMP KŌEKE	NOT THREATENED	NOT THREATENED	NO CHANGE	LOW
Paranephrops planifrons	KŌURA	NOT THREATENED	NOT THREATENED	NO CHANGE	LOW
Retropinna retropinna	COMMON SMELT	AT RISK - DECLINING	NOT THREATENED	WORSE	HIGH

[7] Dunn et al (2025) Conservation Status of NZ freshwater fishes (2023) NZ Threat Classification Series 46. DoC, Wellington

The FER (PG. 5) states-
I note that with respect to species and threat classification, the presence of an individual or even a small population of a Threatened or At risk species does not automatically cause a habitat to be of high value. There are a multitude of factors (including conservation status) which influence the value of a habitat, with the overall value comprising an "average" of those factors.

This risks masking ecologically significant features, for example, the presence of threatened species, significant indigenous fish habitat, or regionally uncommon ecosystems may warrant a high ecological value irrespective of lower scores for other metrics such as habitat condition or water quality, even disproportionately within modified landscapes. Ecological significance is not inherently additive, and significance criteria operate as triggers that should not be diluted, as before, through averaging with condition-based metrics.

Loss of the habitat of a significant species is an adverse effect. The FER directly contradicts EIANZ methodology, which states *values and effects on individual species should not be overlooked or amalgamated or averaged (PG. 61 EIANZ 2018).*

In reviewing the local context presented in Section 2.2.*3 (Information Sources Used in Desktop Assessment*), the FER states that consideration was given to McArthur & Beveridge (2015), *Freshwater Native Fish in Northland*[8]. As presented, the citation of this report appears largely procedural, as it omits consideration of the expert-derived habitat significance recommendations therein that underpinned Regional Plan objectives, policies, and rules. It also does not address the application of the significance criteria contained within RPS (2018) APPENDIX 5[9] below in relation to the identification and assessment of significant indigenous fish habitat in Northland. As a result, the assessment lacks important regional policy context relevant to the evaluation of freshwater ecological values and habitat significance.

- *All sites in Northland with records of at risk or threatened native fish since 1995 should be considered sites of significance for native fish McArthur & Beveridge(2015)*

RPS (2018) APPENDIX 5	EXPLANATION
(2)RARITY/ DISTINCTIVENESS (B)	*Indigenous vegetation or habitat of indigenous fauna that supports one or more indigenous taxa that are threatened, at risk, data deficient , or uncommon either nationally or within the relevant ecological scale.*

All of the FER survey and referenced sites fit the above criteria. The level of significance would be influenced individual species values with the majority of fish having a HIGH - MODERATE-HIGH species significance due to their Threat status as before. While not adequately surveyed in the FER, Northern mudfish habitat would be encompassed in Criteria 2(C) i as below.

[8] McArthur, K and Beveridge, A (2015) Freshwater Native Fish in Northland Report Conservation status, critical habitat requirements and recommendations for management. NRC

[9] *ASSESSMENT OF SIGNIFICANT INDIGENOUS VEGETATION AND SIGNIFICANT HABITATS OF INDIGENOUS FAUNA IN TERRESTRIAL, FRESHWATER AND MARINE ENVIRONMENTS NORTHLAND REGIONAL POLICY STATEMENT (2018) APPENDIX 5*

RPS (2018) APPENDIX 5	EXPLANATION
(2)RARITY/ DISTINCTIVENESS (C)	*The ecological site contains indigenous vegetation or an indigenous taxon that is* ***(i) endemic to the Northland/ Auckland region*** *(ii) At its distribution limit in the Northland region*

Kākahi (*Echyridella aucklandica*), classified as *Threatened – Nationally Vulnerable* and largely restricted to the Northland–Auckland region, would also be considered to meet this criterion. The species was detected in the Waihoihoi catchment through the eDNA sampling undertaken for the FER (refer Table 18).

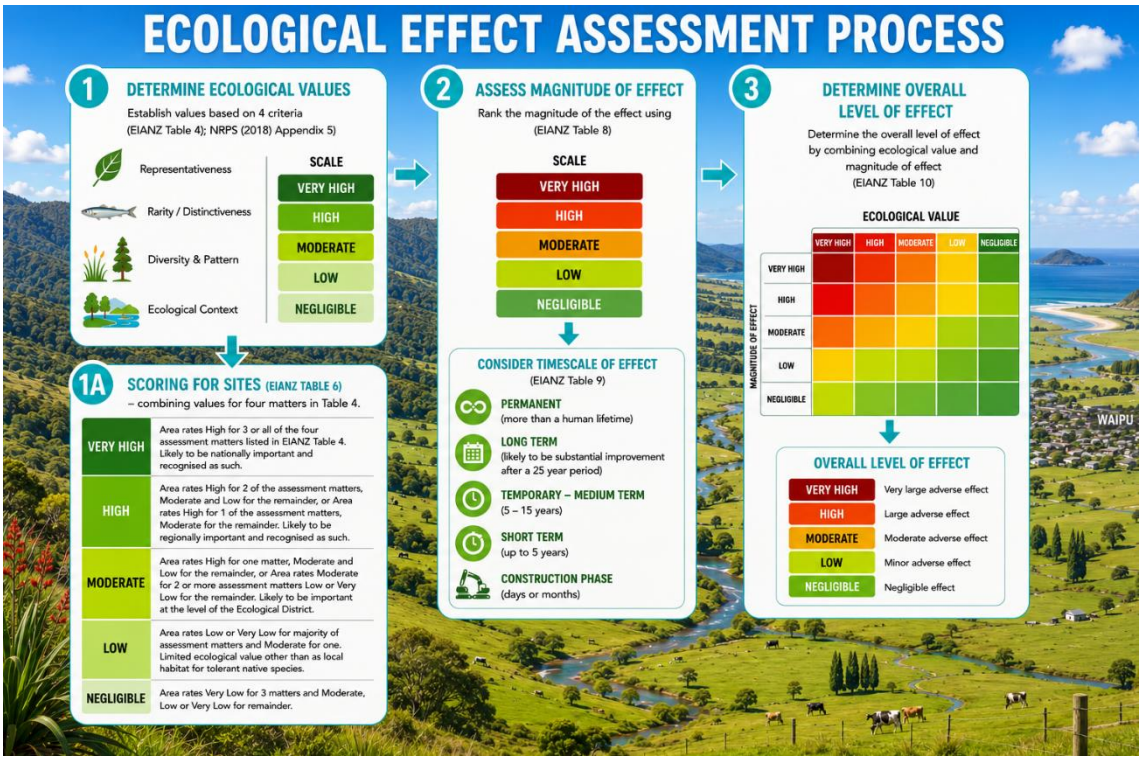
McArthur & Beveridge (2015) recommends .. *A upstream and downstream buffer should be applied to each site to include immediately adjacent habitat/reaches.*

The inclusion of surrounding terrestrial areas as an *ecological site* recognises the importance of adjacent habitats and land areas in maintaining and protecting significant aquatic habitats and ecological functions *RPS(2018) 4(a)(b).* For species that rely on riparian inundation e.g. īnanga this includes landward buffers beyond the spawning sites. These are often exotic dominated, with the primary criteria being a dense shaded root, not necessarily indigenous e.g. exotics *Transcendia,* tall fescue (*Schedonorus arundinaceus);* creeping bent (*Agrostis stolonifera)*. Their protection is still emphasised as per *RPS (2018) 4(c)*

RPS (2018) APPENDIX 5	EXPLANATION
(4) ECOLOGICAL CONTEXT	*(A) Indigenous vegetation or habitat of indigenous fauna is present that provides or contributes to an important ecological linkage or network, or provides an important buffering function: or* *(B) The ecological site plays an important hydrological, biological or ecological role in the natural functioning of a riverine, lacustrine, palustrine, estuarine, plutonic(including karst), geothermal or marine system* *(C) The ecological site is an important habitat for critical life history stages of indigenous fauna including breeding/ spawning, roosting, nesting, resting, feeding, moulting, refugia or migration staging point (as used seasonally, temporarily or permanently)*

As NZ best practice, standard criteria are utilised in the EIANZ (2018) guideline matrix framework to determine the ecological impact of a proposal, incorporating a three step process illustrated below *FIG 2.*

FIG 2: ECOLOGICAL IMPACT ASSESSMENT (ECIA) EIANZ 2018



Representativeness, Rarity/distinctiveness, Diversity & Ecological Context[10] are the primary significance criteria contained within the EIANZ (2018) Guideline & RPS (2018) Appendix 5 , considered the most appropriate basis for assessing ecological value of freshwater ecosystems. While the NPS-IB (2025) does not apply to freshwater ecosystems, it similarly relies on these parameters in the identification of Significant Natural Areas (SNAs), reflecting the continued importance of these criteria in more contemporary biodiversity assessment.
In regard to the 4 EIANZ criterion

- *The values assigned to different subsets can be combined to give a single site value. Combining values should be done in a way that avoids suppressing project impacts on individual features or components.*

The standardised methodology is set out in EIANZ (2018), with Table 6 providing a framework for assigning ecological value based on the matters identified in Table 4. The FER states it follows this guidance, however its Table 1 differs materially from the EIANZ framework and is not reproduced faithfully. Despite these departures, the modified table is attributed to Roper-Lindsay et al. (2018), creating the misleading impression that it reflects the original EIANZ methodology and is endorsed by the authors. The resulting value assessment relies on a bespoke framework rather than the standardised EIANZ approach.

Also in this vein the FER states (PG.5)-
The five parameters typically considered when assigning ecological values to freshwater systems are:

- *representativeness;*
- *rarity/distinctiveness;*
- *diversity and the ecological context;*

[10] EIANZ (2018) Table 4 PG 69

- *ecological integrity in terms of nativeness, pristineness, diversity; and*
- *resilience.*

The EIANZ guidelines suggest the balance of states between those five parameters should be used to determine the value of the feature and/or the site.

The EIANZ guidelines infact note that in regard to these parameters (Schallenberg 2019)[11] *the concept and implementation of measures of ecological integrity as part of assigning value or significance has not found common practice in New Zealand.* (EIANZ PG. 71)
In the context of the EIANZ guideline they are only offered as additional measure of condition. EIANZ does not imply that the value of a feature or site should be determined by balancing or averaging across the five parameters. Rather, it offers the 4 standard criteria as subsets of value (significance) in regard to freshwater environments and offers how some of the matters commonly recognised in terrestrial ecosystem evaluation may be applied in freshwater ecosystems.

There has been a longstanding debate in New Zealand ecology regarding the use of *naturalness* or *pristineness* as indicators of ecological value. Earlier assessment frameworks often placed substantial emphasis on naturalness, reflecting the degree to which ecosystems remained free from human modification. Rather than treating highly modified systems as inherently of low value, contemporary ecological assessment has increasingly recognised the limitations of this approach, where significant values persist in highly modified landscapes and ecosystems that are far from pristine across a continuum of environmental conditions.

We have similar concern about the use of sustainability *viability / trending condition* as *data* or a value criterion. **This is a management criterion and is NOT to be used for assessing significance**[12]. Emphasis on a subjective viability criteria may inadvertently discount small, fragmented, declining, or degraded ecosystems and populations. Prevailing ecological theory recognises that ecological significance is not contingent on a feature being self-sustaining or secure in the long term.

Absent from the FER Table 1 is the concept of the zone of influence (ZOI) included in the original EIANZ Table 5 - defined as *the areas and/or resources potentially impacted by the biophysical changes caused by the proposed project and associated activities.* The ecological processes influencing indigenous ecosystems extend beyond their obvious physical boundaries. In freshwater systems, hydrological and ecological connectivity can link streams, wetlands, springs, groundwater, riparian habitats, and downstream receiving environments across the wider catchment. Terrestrial species also use waterways with even exotic or interrupted riparian cover as corridors through the landscape for dispersal.

As a result, ecological values and functions may be affected by activities occurring well beyond the immediate footprint of a project or an intersection point of the alignment with a mapped waterbody. Restricting assessment to habitats directly affected within project boundaries risks overlooking indirect, cumulative, and connectivity-related effects that may occur across the wider freshwater ecosystem. An example is FER Wetland 11 *Waipū North* catchment (refer FER

[11] Schallenberg, M. (2019). *Determining reference conditions for New Zealand lakes.* **Science** for Conservation 334. DoC, Wellington, New Zealand.
[12] Davis, M., Head, N.J., Myers, S.C., & Moore, S.H. (2016). *Department of Conservation Guidelines for Assessing Significant Ecological Values*. Science for Conservation 327. Department of Conservation, Wellington. 73 p

Appendix A Sheet 3 & 4) and the wider Waihoihoi that weaves in and out of the eastern edge of the Designation (FER Appendix A Sheets 3-5).

The only direct mention of the concept is in *2.3.5. Methodology for determining magnitude of effects on streams.* The FER states *I consider the linear extent of the affected streams (those in the zone of influence (EIANZ 2018)* PG 16

However, the assessment adopts an unduly narrow interpretation of the zone of influence by limiting affected streams to those directly intersected by the alignment works. This fails to recognise that the zone of influence extends beyond the physical footprint and includes upstream and downstream reaches affected by sedimentation, altered hydrology, habitat fragmentation, fish passage constraints and changes in ecological processes. EIANZ (2018) does not support equating the zone of influence solely with direct physical intersection. By restricting the zone of influence in this manner, the assessment excludes indirect effects and artificially reduces the extent and magnitude of impact. This is mirrored in the recent NZTA EcIA guidance[13], which explicitly adopts the EIANZ definition and states *the study area should not be based on a fixed corridor approach.*

The NZTA EcIA guidelines (2023) Appendix E also provides directive for consideration of climate change and states *Climate change will strongly influence future species and ecosystem distribution whose ability to adapt to climate change and directs that the ZOI extent should be considered in the context of potential climate change for species, habitats and ecosystems that are particularly vulnerable*.

Commonly cited modelling suggests that Northland will be subject to a decrease in mean annual rainfall, and as per the rest of the country will be subject to an increase in mean annual temperature; greater prevalence of westerly winds and greater incidence of stochastic events e.g.major rainfall, severe wind and high temperature events. A subset of indigenous ecosystems and by proxy the individual species that occupy them have been identified at greater level of risk from climate change.

- Those at risk of inundation during a 100- year flood event representing gross physical disturbance e.g. īnanga spawning grounds
- Those with highly restricted and fragmented distributions e.g rare and uncommon with a small number of sites ecosystems have a higher vulnerability e.g. wetlands including emphemeral wetlands; seepage- flush systems
- Ecosystems at climatic limits e.g. remnant kahikatea associations vulnerable to drought

It recommends (PG 76) that climate change should be incorporated into EcIA, including identification of potential climate change adaptation and mitigation opportunities. In terms of infrastructure design this includes by *considering tunnel or bridge options that avoid native forest and wetlands, as alternatives to cut and fill.* Also, in regard to effects management the guidance includes *avoid harming important natural carbon sinks such as wetlands and old indigenous forest and, where possible, protect and enhance these.*
There is no singular mention of climate change in the FER.

[13] Waka Kotahi NZ Transport Agency. (2023). *Ecological Impact Assessment Guidelines*. Version 1.0. Wellington, New Zealand: Waka Kotahi NZ Transport Agency

TABLE 3: FER TABLE 1

Table 1: Criteria for assigning ecological value to species and freshwater communities (from Roper-Lindsay et al., 2018)

Value	Species Criteria	Habitat Values
Very High	Nationally 'Threatened' species occur or are expected to occur regularly within a project area on a permanent or seasonal basis.	Area rates High for physical habitat metrics and indigenous assemblage metrics. Likely to be nationally important and recognised as such.
High	Nationally 'At Risk-Declining' species occur or are expected to occur on a permanent or seasonal basis.	Area rates Moderate or High for a physical habitat condition metric and High for an indigenous assemblage metric, or High for a rarity metric. Likely to be regionally important and recognised as such.
Moderate	Species listed as a: ▪ 'At Risk' species occur or are expected to occur on a permanent or seasonal basis; or ▪ Locally uncommon or distinctive species.	Area rates Moderate for physical habitat metrics and High for an indigenous assemblage metric or rarity metric. Likely to be important at the level of the Ecological District.
Low	Nationally and locally common indigenous species.	Area rates Low or Very Low for majority of metrics and Moderate for one metric. Limited ecological value other than as local habitat for tolerant native species.
Negligible	Exotic species, including pests, species having recreational value.	Area rates Low or Very Low for all metrics.

TABLE 4: SCORING FOR SITES COMBINING VALUES FOR SIGNIFICANCE CRITERIA (TABLE 6 EIANZ) C.F FER TABLE 1

VALUE	EIANZ EXPLANATION	FER TABLE 1
VERY HIGH	Area rates High for 3 or all of the four assessment matters listed in Table 4. Likely to be nationally important and recognised as such	Area rates HIGH for physical habitat metrics and indigenous assemblage metrics. Likely to be nationally important and recognised as such.
HIGH	Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or High for 1 of the matters, Moderate for the remainder. Likely to be regionally important and recognised as such.	Area rates Moderate or High for a physical habitat condition metric and High for an indigenous assemblage metric, or High for a rarity metric. Likely to be regionally important and recognised as such.
MODERATE	Area rates High for one matter, Moderate and Low for the remainder, or Moderate for 2 or more matters, Low or Very Low for the remainder Likely to be significant in the ED	Area rates Moderate for physical habitat metrics and High for an indigenous assemblage metric or rarity metric. Likely to be important at the level of the Ecological District.
LOW	Area rates Low or Very Low for majority of matters and Moderate for one. Limited ecological value other than as local habitat for tolerant native species.	Area rates Low or Very Low for majority of metrics and Moderate for one metric. Limited ecological value other than as local habitat for tolerant native species.
NEGLIGIBLE	Area rates Very Low for 3 matters and Moderate, Low or Very Low for remainder.	Area rates Low or Very Low for all metrics.

TABLE 5: SPECIES VALUES FOR SIGNIFICANCE CRITERIA (TABLE 5 EIANZ) C.F FER TABLE 1

VALUE	EIANZ EXPLANATION	FER TABLE 1
VERY HIGH	Nationally Threatened species (Critical, Endangered or Vulnerable) found in the **Zone of Influence** or likely to occur there, either permanently or seasonally	Nationally 'Threatened' species occur or are expected to occur regularly within a project area on a permanent or seasonal basis.
HIGH	Nationally At Risk species (Declining) found in the **Zone of Influence** or likely to occur there, either permanently or seasonally	Nationally 'At Risk-Declining' species occur or are expected to occur on a permanent or seasonal basis.
MODERATE	Species listed as any other category of At Risk, found in the **Zone of Influence** either permanently or seasonally. Locally (ED) uncommon or distinctive species	Species listed as a: • 'At Risk' species occur or are expected to occur on a permanent or seasonal basis; or • Locally uncommon or distinctive species.
LOW	Nationally and locally common indigenous species	Nationally and locally common indigenous species.
NEGLIGIBLE	Exotic species, including pests, species having recreational value	Exotic species, including pests, species having recreational value.

2.2.3. METHODOLOGY FOR DESKTOP AND FIELD ASSESSMENT

INFORMATION SOURCES USED IN DESKTOP ASSESSMENT

This section outlines the published sources cited as *pivotal* to the initial desktop assessment.

The source list is presented largely as a collection of datasets and information repositories rather than as complete references. Although many of the cited datasets are readily recognisable by experienced ecological practitioners, they are prompts rather than traceable citations. Dataset names alone do not identify the specific version, extraction date, spatial layer, report, query parameters, or data release that informed the assessment. Consequently, the information presented cannot be readily reproduced or independently verified, which is inconsistent with the level of transparency expected at an expert technical level of reporting. In the absence of this information, reviewers are required to make assumptions regarding the specific data products relied upon.

One such source is cited as

Northland Regional Council (NRC) Indigenous Biodiversity Ranking (IBR) and Condition Ranking model and GIS maps (Leathwick 2018)
and later separately:
A GIS based IBR for the Northland Region – rivers (Leathwick 2018)

These are neither a correct publication citation nor a clearly identifiable dataset and the repetition implies a lack of familiarity with the regional source by the FER author. These references all appear to derive from the same body of work undertaken for NRC - *Leathwick, J.R. (2018).* Indigenous Biodiversity Rankings for the Northland Region*. Prepared for Northland Regional Council*.

This is a well known regionally specific biodiversity ranking and prioritisation analysis comprised of a report and publically accessible GIS layers[14], including terrestrial, lake and river ranking. The latter is the *Northland Biodiversity Ranking - River Rank* [15]

No '*iNaturalist data'* (www.inaturalist.nz*)* is cited in the FER.

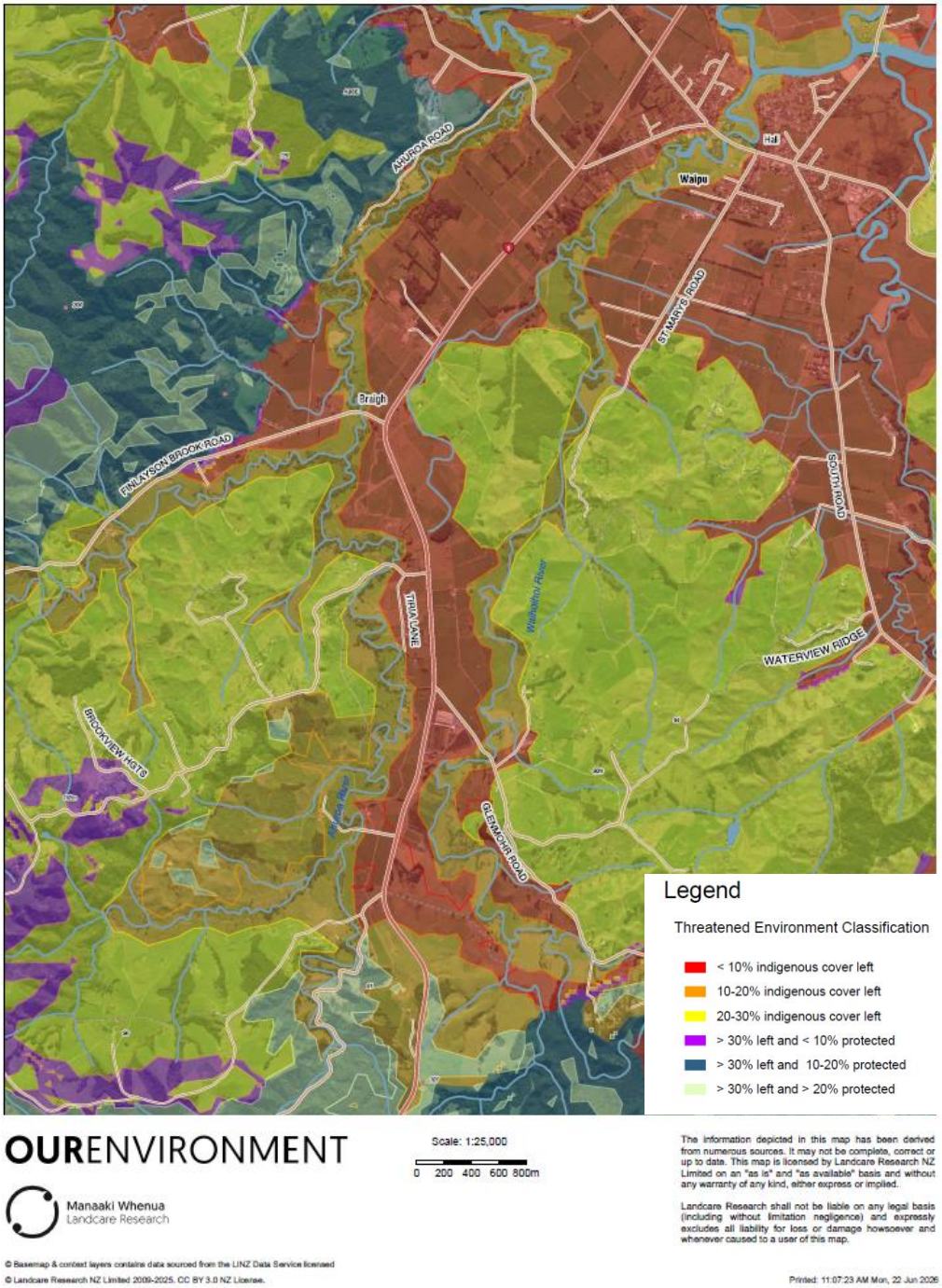
The FER cites LENZ, however we found no consideration of the *Threatened Land Classification* (TEC) mapping in the body of the report, a commonly referenced national biodiversity prioritisation layer derived from LENZ environments which informs one of the 4 *National Priorities For Protecting Rare And Threatened Native Biodiversity On Private Land*[16] –

NATIONAL PRIORITY 1: To protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV), that have 20% or less remaining in indigenous cover.

[14] https://services2.arcgis.com/J8errK5dyxu7Xjf7/arcgis/rest/services/Northland_Biodiversity_Ranking/FeatureServer ;
[15] https://services2.arcgis.com/J8errK5dyxu7Xjf7/arcgis/rest/services/Northland_Biodiversity_Ranking/FeatureServer/3
[16] **Ministry for the Environment & Department of Conservation. (2007). *Protecting Our Places: Information about the Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land*. Ministry for the Environment, Wellington. Reference ME 805.**

The first two classes of the national TEC mapping layer[17] have been incorporated into regional policy to address biodiversity protection on private land[18] and as a measure of significance of any site vegetation. In Northland, as nationally, the great majority of these Classes are located in lowland and coastal areas.

FIG 3: WAIPŪ TEC CLASSIFICATION



[17] Threatened Environment Classification (2012) Landcare Research Manaaki Whenua. Based on Land Environments New Zealand (LENZ), classes of the 4th Land Cover Database (LCDB4, based on 2012 satellite imagery) and the protected areas network (version 2012, reflecting areas legally protected for the purpose of natural heritage protection).

[18] Northland Regional Policy Statement 2018 Appendix 5; Land Environments New Zealand Level VI; Land Cover Database 4 (2012); Protected Areas Network (2012) **Acutely Threatened** (<10% Indigenous Cover remains); **Chronically Threatened** (10-20% Indigenous Cover remains); **At Risk** (20-30% Indigenous Cover Remains); **Critically Underprotected** (>30% cover, <10% protected);**Underprotected**(>30% Indigenous cover remains, 10-20% protected); **Better Protected**(>30 indigenous cover, >20% protected)

National Priority 1 includes TEC *Class 1 Acutely Threatened (<10% indigenous cover)* and *Class 2 Chronically Threatened (10–20% indigenous cover)* land environments shown above in red and orange. Class 1 forms the dominant portion of the Designation.

Indigenous vegetation and fauna habitat that is present is likely to be significantly modified or degraded, and sometimes severely so. This does not detract from their importance, as they may constitute all that remains of indigenous cover in some areas and that is the very reason why it is a national priority to protect them. [19]

[19] Davis, M., Head, N.J., Myers, S.C., & Moore, S.H. (2016). *Department of Conservation Guidelines for Assessing Significant Ecological Values*. Science for Conservation 327. Department of Conservation, Wellington. 73 p.

STREAMS - DESKTOP ASSESSMENT

NORTHLAND REGIONAL COUNCIL BIODIVERSITY AND CONDITION RANKING

Leathwick (2018) explicitly describes the Northland Biodiversity Ranking[20] work as a *landscape-scale assessment of biodiversity priority* and a *spatial conservation prioritisation* exercise designed to assist agencies in identifying where limited conservation resources may be directed most effectively. The primary objective was therefore prioritisation of biodiversity representation across Northland rather than assessment of ecological condition at individual stream reaches. The FER instead uses it to conflate conservation priority, ecological condition and ecological value that is not supported by the framework itself and appears to treat the conservation prioritisation model as if it were a stream condition assessment tool**.** The reliance placed on the Indigenous Biodiversity Ranking (IBR) as a proxy for stream condition and ecological value appears to extend beyond the purpose for which the tool was developed. Rankings are expressed on a continuous proportional scale, and indicate how each site (or lake or river segment) is ranked relative to all other surviving indigenous-dominated sites (or lakes or river segments) in the Northland Region.

The IBR assesses nine FENZ Level Two river ecosystem classes spanning 18,536 km of waterways, representing 99.5% of Northland's entire river network. Rankings are inversely related to the number of river and stream segments occupied by the different ecosystems. River ecosystems occurring in only a few locations are ranked higher. The types present in the Waipū subject area are the most common Northland Region river ecosystem A1, which accounts for more than 5600 km of river and stream segments in Northland. The next two most widespread Northland ecosystems types - A3 and C4, are also frequent in the Waipū ED.

TABLE 6: RIVER ECOSYSTEM TYPES & MEAN CONDITION SCORES

RIVER ECOSYSTEM TYPE	TYPE DESCRIPTION	MEAN TYPE CONDITION SCORE
A1	*Small, gentle gradient streams on sandy substrates, occurring mostly in moderately inland locations; this is the most widespread river ecosystem in Northland, occurring on gentle terrain*	0.262
A3	*Very small, gentle gradient streams on sandy substrates occurring in coastal locations; it is widespread in coastal parts of the Eastern Northland unit*	0.325
A4	*Very small, gentle gradient streams with sandy to fine gravelly beds occurring in moderately coastal locations; this stream ecosystem is relatively restricted in its distribution*	0.309
C4	*Small, moderate gradient rivers with gravelly beds occurring in coastal to moderately inland locations; this group occurs throughout Northland, generally on gentler terrain where streams of steeper uplands, transition into the lowlands*	0.385
C5	Very small, moderate gradient streams with coarse gravelly substrates, occurring in coastal locations, particularly in moderately steep low-elevation hill country	0.509

One important feature of the river ranking analysis is that they are influenced not only by their in-stream values but also by their connectivity with highly ranked terrestrial ecosystems, emphasising management regimes that benefit both terrestrial and aquatic values in an integrated way. Within the subject Eastern Northland sub-unit these include wetlands; *WF7-1 Puriri, totara forest*; *WF7-2 Puriri, taraire forest*; *WF7-3 Puriri kahikatea forest* ; *WF8 Kahikatea, pukatea forest*; *WF9 taraire, tawa, podocarp forest* and *WF11 Kauri, podocarp,*

[20] *Leathwick, J.R. (2018).* Indigenous Biodiversity Rankings for the Northland Region. *Prepared for Northland Regional Council*.

broadleaved forest. These are the remnant ecosystem types of the Project Designation. The need for connectivity along the river network also playing a role e.g. many of the high-ranked segments for the widespread, lowland river ecosystem C4 are located along the main stems of the mid-sized rivers that drain more inland parts of Northland. This is not addressed in FER, for example in the Waipū South catchment waterway associated with FER Wetland 12 and kahikatea WF8 remnants .

A fundamental characteristic of both the IBR ranking and condition metrics is that they are **regional-scale planning tools**. Neither metric was developed to assess the ecological condition, habitat quality, or ecological value of individual stream reaches. Rather, both were designed to support biodiversity prioritisation across Northland by evaluating ecosystems within a larger regional context.

The FER author states

…I have corroborated these through my field observations and consider that the condition ratings assigned to rivers through the IBR are relatively accurate. I consider that the IBR is a good proxy for understanding instream habitat condition and value. In particular, because the IBR reflects what biodiversity types are present within a region, and what might be less represented and therefore necessary to protect to promote greater representation of different biodiversity

The FER conclusions drawn regarding the Indigenous Biodiversity Ranking (IBR) appear to confuse the regional purpose of the Leathwick (2018) methodology with the site or catchment scale questions. The FER does not differentiate between the stream ecosystem types as per Leathwick. The statement assumes that because the IBR reflects the relative representation of river ecosystem types across Northland, it can be used as a proxy for determining the ecological value of specific streams affected by the proposal. However, the IBR evaluates the contribution of type diversity across approximately 18,536 km of Northland's river network. Consequently, the fact that a stream occurs within an ecosystem class that is well represented regionally e.g. A1, does not imply that the stream in itself lacks ecological value or warrants a lower level of protection. It does not assess the ecological attributes, habitat functions, species assemblages or ecological processes present within individual stream reaches. A biologically valuable headwater reach in a catchment may receive a lower regional ranking simply because its ecosystem type is already well represented elsewhere in the region, particularly for more common types e.g. A1; C4 as in the subject area.

The IBR ranking score is explicitly a measure of the relative contribution a river reach makes to maintaining representation of freshwater ecosystem type diversity across Northland. A high ranking does not necessarily indicate a stream is in good ecological condition, contains high-quality habitat, or supports a greater abundance of indigenous biodiversity. Instead, it reflects the importance of that reach within a Northland scale conservation network based on river river type representation. Consequently, the ranking score cannot be interpreted as a direct measure of stream value or representativeness at the site or catchment scale.

By using the IBR to imply what is protection worthy within the footprint, the FER effectively substitutes a regional conservation-planning tool for a site-specific ecological evaluation. This reverses the intended application of the methodology. The IBR was designed to identify

Northland conservation priorities, not project-specific or relative catchment ecological priorities requiring avoidance, or a level of mitigation. Within a project footprint these should be based primarily on field-derived evidence of ecological attributes, functions and species present.

Similarly, the condition score is not a field-derived assessment of habitat quality. It is a modelled estimate of ecological integrity derived from a subset of regional pressure layers including indigenous vegetation cover, modelled nitrogen concentrations, flow modification, fish passage barriers, introduced fish, industrial discharges and urban impervious surfaces. These variables were incorporated to provide a broad indication of ecological integrity across Northland's river network and represent cumulative anthropogenic pressures rather than a direct biological measure, response or status of a site reach.

Consequently, as they measure different attributes, a reach may have:

- a high biodiversity ranking but only moderate condition; or
- a relatively low biodiversity ranking but good condition.

We understand that author's observations were limited to a relatively short period of field investigation (2-3 days) of limited number of stream reaches within the Proposed Designation (which varied at the time) and did not assess the wider Waipū ED stream network, let alone the thousands of river reaches across Northland upon which the IBR framework is based ie. an A3 river in the Waihoihoi catchment compared to A3 waterways across Northland.

Consequently, there is no apparent basis for concluding that the IBR condition scores are *relatively accurate* beyond a subjective impression. The assertion that the IBR is a good proxy for understanding instream habitat condition and value is not substantiated by the design of the IBR. Consequently, any claim that field observations confirm the accuracy of the model should be supported by evidence demonstrating agreement between predicted condition scores and recognised ecological indicators e.g. MCI or fish populations. A stream's value cannot be inferred from its condition score alone. It is a common mistake to infer that a lower condition score = lower ecological value = lower impact significance. A stream with a condition score below the type mean may contain:

- nationally vulnerable īnanga spawning habitat the lower Ahuroa River 0.283 c.f. A3 mean 0.325
- banded kōkopu populations Robertsons Condition score 0.235 c.f 0.325 A3 mean
- longfin eel habitat
- highly connected indigenous fish assemblages e.g. Waihoihoi Main Stem Condition score 0.284 c.f C4 mean 0.385

Modification of the conditions scores in the FER Table 10 & 11 reporting is highly irregular. The IBR condition metric is a continuous, relative index of ecological integrity ranging 0-1. The FER rounds down the reported condition scores without any rationale provided. This removes consistency with the source dataset and introduces unnecessary bias into the assessment.

The *Pine North* site score required correction, as it did given did not align with that in the NRC GIS Northland Biodiversity GIS layer mapping as per the FER eDNA mapped location it

references. Additionally, we could not locate *Pine Mid* site with scores corresponding to that given in the FER. Naming of these locations/ datasets does is an inherent issue in the data reporting throughout the FER. Higher ranked eDNA and Fish IBI sites are not reported e.g. *Lower Ahuroa Rank* 0.0270 *(1st round eDNA).*

The FER then appears to treat condition scores as though they were analogous to ecological grading systems such as MCI or LAWA bands, where predefined thresholds exist. No such thresholds were established by Leathwick (2018), and therefore any conversion of continuous condition scores into qualitative classes represents an additional interpretation by the author rather than an output of the IBR methodology itself.

TABLE 7: EXTRACT OF FER IBR/ CONDITION SCORING TABLE 10 & 11 IN COMPARISON TO LEITHWICK 2018

ECOSYSTEM TYPE	FER SITE	FER SITE CONDITION SCORE LEATHWICK IN RED	ECOSYSTEM CONDITION MEAN	FER CONDITION RATING	FER SITE IBR
A1	PIROA MAIN STEM	0.320 0.321	0.262	LOW	0.88 0.880
	WAIPŪ NORTH	0.243		LOW	0.86 0.855
	WAIPŪ SOUTH	0.328		LOW	0.76
	PINE MID	0.285 0.271		LOW	0.25 0.724
A3	ROBERTSONS	0.235	0.325	LOW	0.31 0.313
C4	WAIHOIHOI MAIN STEM	0.264	0.385	LOW	0.73
C5	PIROA TRIBUTARY WEST	0.45 0.445	0.509	MOD	0.77 0.772
	PINE NORTH	0.36 0.285		LOW	0.86 0.862

Even if we were to follow the FER alternative conceptual methodology, it is still not apparent why a reach above the ecosystem type condition mean would then have a *LOW* rating e.g. A3 type waterways *Piroa Main Stem* & *Waipū South* sites.

Importantly, the condition score does not represent an absolute measure of stream health, nor did Leathwick establish universal thresholds defining *low, moderate* or *high* condition. Leathwick's methodology recognises that different river ecosystem types have inherently different condition distributions. Interpretation of any individual score therefore requires consideration of the broader context in which that score occurs, including the distribution of condition scores across the region and within the type. e.g. A3 type scores lower than the condition mean indicate greater cumulative pressure from factors used in the modelling i.e. catchment modification, nutrient enrichment, flow alteration, connectivity barriers, introduced species, industrial discharges or urbanisation.

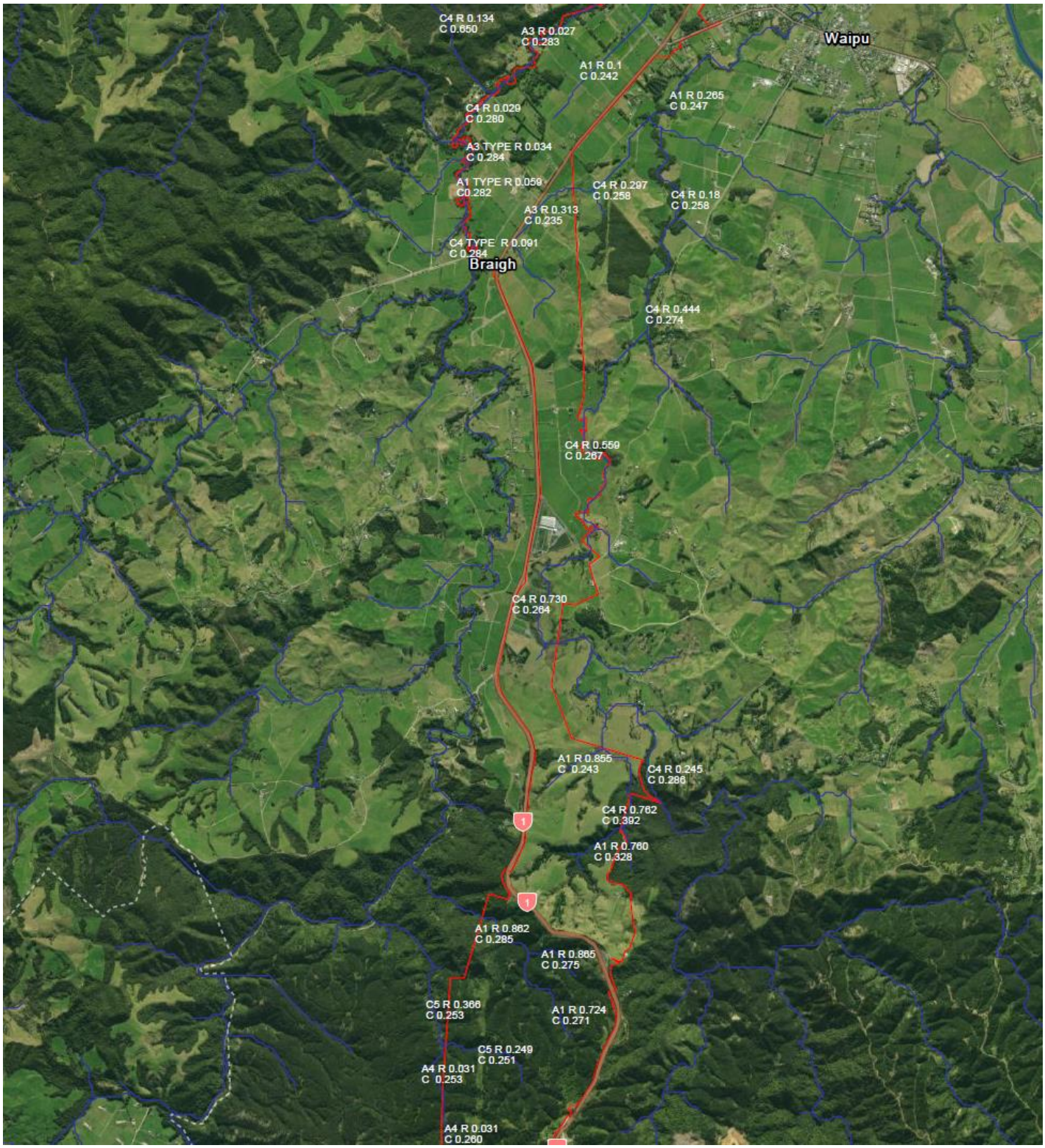
By assigning qualitative descriptors without reference to regional type distributions, the FER effectively imposes arbitrary thresholds that are not part of the original methodology. A condition score that appears *moderate* in absolute terms may in fact be among the highest scores achieved within a particular river class if that ecosystem type has been extensively modified throughout the region. Conversely, a score classified as high may be relatively unremarkable when compared with other rivers of the same class. The model was not designed for fine-scale discrimination between neighbouring streams. If all local streams cluster within a narrow range, then the condition metrics are unlikely to be driving any apparent ecological differences - they are subject to similar cumulative anthropogenic influences.

Furthermore, the use of broad descriptors such as *Low* or *High* may create a false impression of ecological equivalence between stream types with substantially different biodiversity values, ecological functions, or conservation significance.

In contrast, the FER does not assign subjective ratings to the IBR ranking given for each site. We are unclear how that then translated into FER *Table 11: Assessment of ecological values based on relevant metrics.* They are potentially used to inform the row therein titled *Rare Habitat/ Distinctive.* However, in that instance the highest ranked Leathwick site is Robertsons Tributary, assigned a FER NEGLIGIBLE value in *Table 11*.

The descriptors used in the FER should be regarded as further subjective interpretations rather than classifications derived from the IBR itself. From a scientific perspective, corroboration requires a transparent and repeatable comparison between model predictions and independent field data. No such comparison is presented and we contend that the FER reporting of the IBR & condition scores is without merit. Protection priorities should be driven by the actual values present (e.g. īnanga spawning habitat, banded kōkopu habitat, longfin eel migration corridors, high-quality headwater refugia, wetland connections), not by whether the affected stream reach belongs to a generic riverine ecosystem type that is more or less represented elsewhere in Northland. The FER appears to blur that distinction.

FIG 4: NORTHLAND BIODIVERSITY RIVER RANKINGS LEITHWICK 2018



WATER QUALITY

The FER author offers the Ballinger[21] report as the primary basis for assessing current water quality, stating that

no useful regularly updated data were available for the four catchments intersecting the Proposed Designation, apart from bathing water quality guidance and monitoring at the headwaters of the Ahuroa near Piroa Falls. FER PG. 8

However, the NRC Environmental Data Hub provides regularly updated monthly water quality monitoring data for the Ahuroa River at Braigh Flats[22]. In addition, continuous water-level monitoring data are available for the Waihoihoi River at St Marys Road. These datasets provide contemporary information on catchment condition and hydrological variability and could have informed both the assessment of current water quality and the timing of eDNA sampling. In particular, flow data would have assisted in avoiding sampling immediately following flushing events, thereby improving the representativeness and interpretability of eDNA results.

FISH

The author provides reference to the NRC SOE regional fish monitoring reporting 2021-2024. Since 2021 NRC have undertaking fish monitoring at 23 sites across the region's State of the Environment (SOE) River Water Quality and Ecology Monitoring Network (RWQMN). It includes 6 reference sites draining through forest cover considered to be near-pristine potential natural Northland condition. Survey type has an influence i.e NRC monitoring largely utilises electro fishing with some netting, while the national average per standardized Gee Minnow trap run in a wadeable stream is 3 species.

It is correct that none of the sites are located in the current project catchment, as the FER states. The network is considered by NRC as limited for a comprehensive fish database, favouring accessible lowland sites. However, the data therein is useful to consider regional inventory and characterise potential site occupancy and temporal trends. In contrast the FER author states –

he has reviewed the SOE monitoring results from sites nearest to the Proposed Designation

We consider this subset unnecessarily constrained, as the SOE is already biased to lowland & coastal locations with fidelity to the Waipū catchment character and therefore representative. Regardless, it is unclear what sites the FER is referring to within the SOE Report.
The author also cites the Freshwater Native Fish in Northland Report (2015) Kate McArthur and Alistair Beveridge for NRC and the NZFFDB (NIWA). No version; survey numbers or illustration of survey locations for the latter are provided in the FER.

[21] Ballinger, A. (2012). Waipū Ecological District Streams Water Quality Survey, 2011–2012. Prepared for the Northland Regional Council
[22] Temp; ammoniacal nitrogen; conductivity; dissolved copper; dissolved oxygen; DRP; E.coli; nitrate-nitrogen;TSS; TP ; TKN

FISH INDEX OF BIOTIC INTEGRITY

The author uses eDNA to calculate the Northland IBI (using the online MFe IBICalculator) with reference to NPS- FM Appendix 2B (*TABLE 13 – FISH (RIVERS).*

We are unclear as to which dataset is referred to by the statement that they utilize *the eDNA fish record data for the Northland region*. FER PG. 8

Three relevant local datasets were available - local publically available eDNA results[23]; the 1st or 2nd project eDNA sets, or combination thereof.
In terms of the use of eDNA data we note:

- NIWA New Zealand validation trials conclude **six replicate** samples provided optimal detection rates for fish and macroinvertebrates, with diminishing returns beyond approximately five to seven replicates. This is not the standard utilised in the FER
- eDNA sequence read abundance is not considered a reliable surrogate for organism abundance or biomass (dominance; commonness) because it is influenced by multiple environmental and biological factors, including transport, degradation, shedding rates, and dilution effects. In comparison to physical survey it does not directly measure abundance, population structure, or organism condition.
- NIWA have recently identified that eDNA and conventional physical sampling methodologies for fish and macroinvertebrates do not currently produce directly comparable datasets, and that existing Fish IBI, MCI, and related macroinvertebrate index frameworks are not presently transferable between these methodologies without further calibration and methodological standardisation. Review states that eDNA data should not simply be substituted into the current FIBI framework and recommends development of a separate eDNA-FIBI[24].
- As per standard protocols, sampling of reaches is meant to occur between December and April (inclusive)
- The primary NZ lab at the time of survey was Wilderlab, which provides an option to make data publically available. Publically available regional reporting is not incorporated.

The Fish IBI as referenced in the NPS-FM (2020) as a **state-of-environment indicator** to assess how closely a fish community resembles the fish assemblage expected under minimally disturbed or reference conditions against modelled expected communities for a given stream type and develop action plans and management interventions where targets are not being met. It compares observed fish communities, essentially asking:

How similar is the current fish community to the fish community expected under near-natural conditions? **RATHER THAN** *How important is this habitat for fish persistence, recruitment, spawning, refuge, connectivity or threatened species locally?*

This should not be treated as a direct measure of ecological value or significance of habitats proposed for loss. This distinction is important because:

- A site may have a relatively modest FIBI score yet contain critical spawning, recruitment or refuge habitat.

[23] https://www.epa.govt.nz/community-involvement/open-waters-aotearoa/explore-our-edna-map/
[24] White, R. & Baker, C. (2025). Incorporating eDNA into the Fish Index of Biotic Integrity (FIBI). In: *Environmental DNA Indicators for Supporting Implementation of the National Objectives Framework (NOF) in the NPS-FM*. NIWA Project MFE25205. NIWA, Hamilton

- A site may support a regionally significant or threatened species but receive a lower FIBI score because the expected community is naturally species-rich. This limitation becomes particularly relevant in headwater systems with restricted fish passage and/or naturally relatively simple fish communities.
- FIBI does not explicitly assess spawning habitat, recruitment success, migratory function, connectivity, habitat rarity or habitat irreplaceability.

We also note that the FER uses the national NPS-FM framework rather than the original Northland Fish IBI methodology (Joy 2019[25]) adapted used in NRC SOE reporting. These classes were developed from the distribution of Northland fish survey data and represent **relative fish assemblage integrity within Northland**, rather than regulatory thresholds. The descriptions are percentile-based, with *Excellent* representing sites comparable to the best regional sites and *Very Good* above approximately the 80th percentile of Northland sites. These classes pre-date the NPS-FM attribute framework and serve a different purpose:

- **JOY'S NORTHLAND CLASSES** = regional ecological interpretation of fish assemblage condition.
- **NPS-FM BANDS (A–D)** = national regulatory ecosystem health attribute bands.

Applying NPS-FM bands to site-scale ecological value assessment may produce a much harsher interpretation than the original Northland framework intended e.g. Fish IBI score of 26 would be:

- **GOOD** Northland/Joy classification.
- **BAND C (Low integrity)** NPS-FM.

However, neither framework was designed to determine ecological significance or ecological value. Fish IBI is a measure of fish community integrity and should be considered alongside threat status, connectivity.

TABLE 8: NORTHLAND FISH IBI FROM JOY 2019

Fish IBI Score	Integrity Class
41–60	Excellent
33–40	Very Good
25–32	Good
21–24	Fair
16–20	Poor
8–15	Very Poor
0	No Fish

[25] Joy, M. K. (2019). *A fish index of biotic integrity (IBI) for the Northland region – report and user guide for use with the Northland Fish IBI Excel macro.* Victoria University of Wellington / Envirolink report

MACROINVERTEBRATES

The author has elected to use eDNA samples to also characterize macroinvertebrate communities within the Designation, utilising Wilderlabs **New Zealand-specific commercial implementation** of eDNA technology that has already been widely used for aquatic species detection, biodiversity monitoring, invasive species surveillance and fisheries assessments worldwide. Use of eDNA is identified as a complementary tool to physical methodologies for freshwater biomonitoring and macroinvertebrate communities with potential advantages of broader scale biodiversity detection, the ability to distinquish within morphologically difficult groups such as *Diptera* and detection of rare or elusive taxa. The FER utilizes the 2nd round Oct/ Nov 2025 eDNA subset to calculate MCI scores for limited reaches they consider relevant and uses that to substantiate its description of the ecological value of streams in the catchments as a whole. The author states:

Data from eDNA sampling can help understand the presence of particular species, providing a better than typical kick net lab sample return with respect to the number of species recognised. Given various factors that influence how long DNA is present, the results only represent what species have been present in a particular location reasonably recently. This information can be used to generate a normal matrix of information about macroinvertebrates (such as taxa richness, MCIs, and quantitative macroinvertebrate community indices (QMCIs).

However, eDNA is not considered a replacement for conventional macroinvertebrate kick-net surveys. The recent NIWA review has determined NEMS physical habitat-proportional sampling method detects **more species** than eDNA and that eDNA-based metrics and physical sampling metrics – MCI, QMCI, ASPM– are correlated but not equivalent. The review incorporated detailed analysis of extensive data sets, demonstrating that use of eDNA may result in a large proportion of sites (~50%) falling in a different NOF attribute bands, with a greater number of sites falling in lower attribute bands.

Additionally, some eDNA detections must be excluded due to insufficient taxonomic resolution (e.g. *Hydrobiosidae)* for calculating MCI. Varying levels of resolution is also a larger issue with eDNA MCI. While greater taxa richness is obtainable using genus-level eDNA, MCI scores calculated using this data were lower than metrics at further genus resolution due to high diversity of taxa aggregated into a higher level groups with low MCI tolerance values (e.g. *Oligochaetes, Hydra, Ostracods, Nematoda, Platyhelminthes)*. *Chironomids* identified to genus level score much higher than if only to *Chironomidae* (e.g. *Parochlus*).

There is currently no national standardisation (i.e. NEMS) for eDNA macroinvertebrate biotic indexes, which eliminates the need for judgement calls/ professional experience , data noise and bias. Unfortunately we consider the FER findings fall into this category, again without verifiable data or demonstrated analysis workings.

Contrary to the FER statement, QMCI and ASPM (abundance-based indices) cannot presently be robustly derived from eDNA data alone. Sequence read abundance is not considered a reliable surrogate for physically sampled abundance because it is influenced by multiple environmental and biological factors, including transport, degradation, shedding rates, and dilution effects.

Contrary to the FER statement that *the results only represent what species have been present in a particular location reasonably recently,* eDNA detections are problematic to interpret temporally as persistence is strongly influenced by environmental conditions that affect degradation rates. eDNA detections may reflect both current biological presence and the effects of environmental retention processes that extend DNA persistence within aquatic systems It is generally prolonged in cool waters, shaded environments with low UV exposure such as forested headwaters. Low-flow habitats such as pools, wetlands and backwaters can also increase retention by limiting dilution and promoting the accumulation of biological material.
Retention is further enhanced where eDNA binds to fine sediments, clays and organic matter, as in slower lowland waterways and wetlands. Adsorption to these substrates can protect DNA from degradation, allowing it to persist considerably longer than DNA suspended in the water column. Sediment-bound DNA may remain detectable after active site occupancy has ceased and can be remobilised by sediment disturbance or changing flow conditions.

Replication is identified as critical for reliable macroinvertebrate detection due to the heterogeneous distribution of eDNA within aquatic environments. Standardised protocols therefore recommend six replicate 1 L samples collected from the same sampling point and habitat unit, preferably within the thalweg or main flow path of the stream. Preferred sampling locations are fast-flowing, well-mixed habitats, while stagnant areas and locations near tributary confluences are generally avoided. A confined oxbow edge of the *Waihoihoi Main Stem* site was sampled during our fieldwork observations and did not represent variation throughout the immediate reach.
Optimal sampling conditions are during low, stable flows and minimal recent rainfall, preferably during summer months to avoid influence of seasonal lifecycle variability and restructuring of communities by heightened flows e.g. 24/25 Oct 25. This may take several weeks particularly for EPT taxa as pertinent in the FER discussion. The level of sample design and replication to achieve quality data was not undertaken for the targeted sample sites, likely an influence across all the results, including the Waihoihoi Main Stem site:

*The poorest habitat was the Robertsons tributary and the **Waihoihoi main stem**. The Waihoihoi main stem result may be due to undertaking an eDNA sample in such a large volume of water, but also likely reflects the very heavy sediment and longer term nutrient pollution build up on the bed. FER PG. 29*

In light of these expert level NIWA caveats we contend the methodology employed in the FER cannot be used accurately and we additionally disagree due to the lack of survey methodology, data set access and interpretation with the FER statement that:

These data reveal the aquatic taxa present in a more detailed way than standard sample collection laboratory analysis as it often enables identification of the taxa to a species level.

We consider the FER allocation of results to the attribute bands unlikely to be accurate in terms of the lower bands.

MCI was originally developed to assess responses to organic pollution and nutrient-related degradation. The Pohe report[26] cited in the FER was a primary regional State of Environment datasets and review assessing waterway condition using aquatic macroinvertebrate communities as indicators of ecological health and water quality trend:

- Forested and minimally disturbed catchments generally support the highest macroinvertebrate community scores.
- Lowland agricultural and urban streams typically exhibit lower MCI and SQMCI values.

More recently, regional macroinvertebrate metrics to be negatively related to nutrient concentration however, only the relationship with total Kjeldahl nitrogen (TKN) was identified as statistically significant[27]. Additionally, the substantial overlap in nutrient concentrations between sites above and below the NPS-FM national bottom lines of invertebrate metrics suggests that nutrient levels alone may not adequately explain variation in community condition, except for TKN where concentrations were higher in sites below the national bottom line. Macroinvertebrate communities in Northland streams are influenced by multiple environmental factors, including flow permanence, drought, habitat availability, substrate stability, temperature, dissolved oxygen. **Non-nutrient factors often explained more variation in macroinvertebrate metrics than nutrient concentrations alone**, particularly in Northland's naturally warm, low-gradient, soft-bottom streams[28]. Intermittent streams may also display dominance of drought-tolerant and generalist species with fewer EPT taxa not because of nutrient enrichment, rather:

- Flow permanence is limited
- Habitats dry periodically
- Water temperatures are naturally higher
- Recolonisation opportunities are reduced

Stoneflies are generally the most flow-sensitive and are often absent from warm, low-gradient, intermittent Northland streams regardless of water quality.

Recent regional reporting[29] suggests not unexpectantly that fine sediment is the habitat variable most strongly associated with community composition, associated with pastoral use. Most Northland streams were in **moderate to poor ecological condition**, with the majority of sites falling within NPS-FM C and D bands for MCI, SQMCI and ASPM. Targeted drought-monitoring sites sampled in 23 March 2020 included **Ahuroa River (Braighs Flat).** It retained **moderate ecological condition** during the 2020 drought:

- MCI: 84.0
- QMCI: 4.06
- Taxonomic richness: 20 taxa
- EPT richness: 7 taxa

[26] Pohe, S.R. 2010. Northland Macroinvertebrate Monitoring Programme: 2010 Monitoring Report. Prepared by Pohe Environmental for Northland Regional Council.
[27] Halliday, N.J., Hamill, K.D., Hickey, C.W. & Storey, R.G. (2023). *Drivers of Macroinvertebrate Communities in Northland Streams*. Prepared for Northland Regional Council, NIWA Client Report
[28] Pingram, M., Hickey, C.W., Halliday, N.J., Hamill, K.D. & Storey, R.G. (2021). Macroinvertebrate Community Trends and Drought Responses in Northland Rivers. Prepared for the Northland Regional Council. NIWA Client Report 2021088HN, National Institute of Water and Atmospheric Research Ltd, Hamilton.
[29] Death, R.G., Nicholson, C., Chakraborty, M., & Pohe, S. (2023). *Ecological Health of Stream Invertebrate Communities in Northland: Can State of the Environment Data Identify Drought Impacts?* Prepared for the Northland Regional Council, Whangārei, New Zealand

While not pristine, the presence of a substantial EPT component under drought stress indicates ongoing habitat values sufficient to support pollution-sensitive invertebrates.

We suggest that although the results do follow a broad expected pattern for Northland, that the broad reference to nutrient pollution is a simplification. No data is presented as to field readings.

2.2.4. STREAMS - FIELD ASSESSMENT

The FER states that

Site walkovers and freshwater surveys were conducted at each stream that intersects with the Indicative Alignment by myself and / or an aquatic ecologist from WSP. We collected SEV data and eDNA samples during October and November 2025. Field observations were made at all other streams within the Proposed Designation.

These walkovers and surveys allowed us to record the flow type, wetted width and depth, velocity profile, substrate composition, habitat form (pool, run, riffle, waterfalls etc), riparian condition, instream organic debris condition (wood, leaf matter etc), downstream connectivity and upstream condition and extent of each stream, eDNA and condition scores.

Having been present on multiple occasions throughout October – December with the WSP team who's fieldwork underpinned the FER I find this statement misleading. The author was not present on any of these occasions, including on days when I participated at select sites subject to eDNA; RHA[30] & SEv data collection ie *Robertsons; Waihoihoi Main Stem; Waipū North; Waipū South.*

From my experience the assessment parameters described above were only undertaken at the eDNA collection sites. The majority are standard RHA variables scored on a simple 10-point scale per attribute and as such not a specialised or highly detailed habitat assessment methodology that seems implied. No RHA data or scoring is presented in the FER for these sites other than the final summation in Table 10 & 11, or as to all other streams within the Proposed Designation, the footprint of which has changed during the study period. The lead author's direct field involvement appears to have been relatively limited, with site attendance reportedly restricted to approximately 2/3 days. There appeared to be variability in team experience levels, particularly regarding wetland ecology. Although the field team worked constructively throughout the investigations, observations made during site visits, including wetland presence and stream flow classification were not reflected in the final assessment documentation or mapping. This raises questions regarding the extent to which field observations by the onsite team were incorporated into the FER.

The stream classification framework used in the FER contains material errors and inconsistencies. As stream classification underpins the FER evaluation of ecological value, condition and effects, these deficiencies have implications that extend well beyond individual reaches and call into question the robustness of the freshwater ecological assessment as a whole. At the outset, the use of alternative stream classification criteria, in preference to those established within the Northland Regional Plan, is difficult to reconcile with the project's

[30] RHA Rapid Habitat Assessment - Clapcott, J. (2015). *National Rapid Habitat Assessment Protocol Development for Streams and Rivers*. Prepared for Northland Regional Council. Cawthron Report No. 2649. 29 p. plus appendices. Nelson: Cawthron Institute

location and regulatory setting. *Practice and Guidance Note RC 3.3.17*[31] is then abridged, again "*Using expert opinion"*

TABLE 9: COMPARISON OF STREAM CLASSIFICATIONS

FLOW	RC 3.3.17	NRP	FER
PERMANENT	*The continually flowing reaches of any river or stream*	Does not fit the definition of an intermittent or ephemeral river	*continually flowing bodies of water that contain a flow year round*
INTERMITTENT	*"Stream reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definition of permanent river or stream and meet at least three of the following criteria:* *a) it has natural pools* *b) it has a well-defined channel, such that the bed and banks can be distinguished* *c) it contains surface water more than 48 hours after a rain event which results in stream flow* *d) rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel* *e) organic debris resulting from flood can be seen on the floodplain or* *f) there is evidence of substrate sorting process, including scour and deposition*	*A river that is naturally dry at certain times of the year and has two or more of the following characteristics:* *1) it has natural pools, and* *2) it has a well-defined channel, such that the bed and banks can be distinguished, and* *3) it contains surface water more than 48 hours after a rain event which results in river flow, and* *4) rooted terrestrial vegetation is not established across the entire cross sectional width of the channel, and* *5) it appears as a blue line on topographical maps at 1:50,000 scale.*	*flowing bodies of water that seasonally or periodically cease to flow in parts, being above the ground water but usually retain some areas of standing water (pools).*
EPHEMERAL	*Stream reaches with a bed above the water table at all times, with water only flowing during and shortly after rain events. This category is defined as those stream reaches that do not meet the definition of permanent river or stream or intermittent stream*	*Reaches with a natural bed level above the water table at all times, with water only flowing during and shortly after rain events, and which do not meet the definition of an intermittently flowing river.*	*..flow only during rainfall and for several days after rainfall, they do not contain surface water most of the time and are above ground water levels.*

The Northland and Auckland frameworks were specifically developed to reduce ambiguity by applying defined diagnostic criteria to distinguish intermittent and ephemeral systems. Conversely, the FER definition of intermittent adopts a broad definition that depends heavily on professional judgement, as it itself states, dependent on the assessor rather than the characteristics of the stream itself. This introduces unnecessary subjectivity into what should be a transparent and repeatable classification process, risking downgrading of reaches with intermittent characteristics to ephemeral status, particularly when specific observation or the window in which it occurs are limited or undertaken during dry conditions.

The numerous ephemeral flow paths intersected by the Proposed Designation (especially in the Brynderwyn Hills area) were also confirmed by topographic and catchment size hydrological modelling. PG. 9

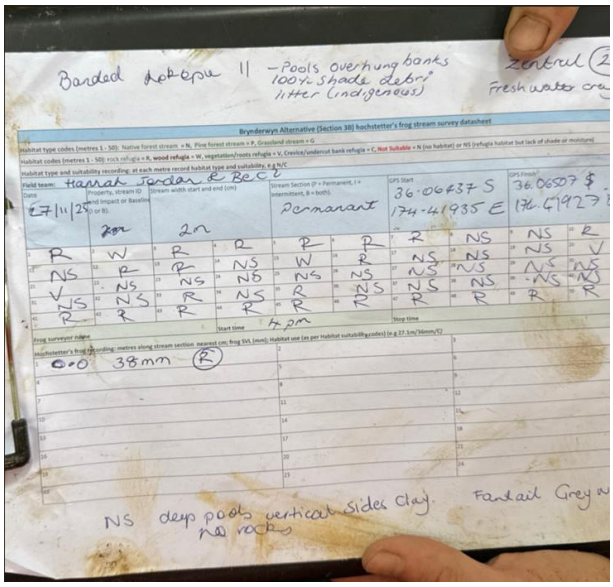
The FER proports to use a bespoke Digital Network (DN) model. The GIS layer was not available on the shared GIS platform, neither is the full extent of the corridor presented in the mapping, with the zoomed in maps excluding some areas e.g. Chainage approx. 11700 at the intersection of Finlayson Brook Rd. The representation of surface flow pathways in such models is highly sensitive to the resolution and accuracy of the underlying elevation data, the user-defined parameters applied during network derivation, and any post-processing modifications. These are usually cited to allow validation. All DN are subject to field validation

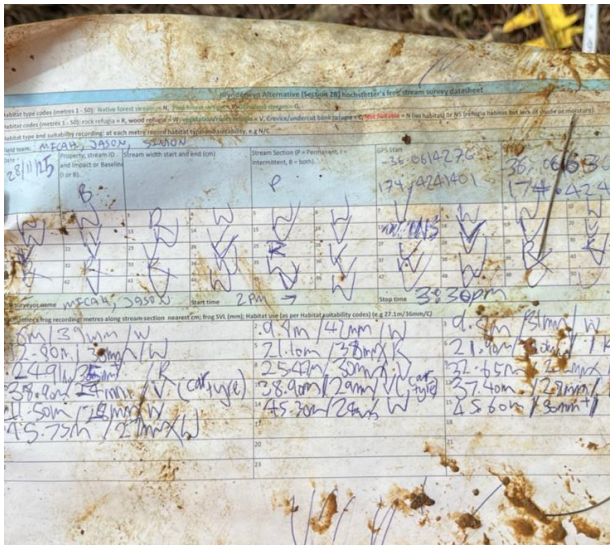
[31] *ARC (* 2021). *River/Stream Classification: Practice and Guidance Note RC 3.3.17 (Version 2).* Auckland Unitary Plan Practice and Guidance Note.

particularly in high topography and narrow headwaters. In the absence of a documented methodology the reliability of the mapped flow network cannot be independently modelled and review is confined to the outputs shown on the clipped maps presented in Appendix D of the FER.

Its inaccuracy in the Bryderwyns was confirmed by ourselves during fieldwork with the WSP team, including as documented on survey sheets during frog searches with and without Te Parawhau representatives.

EXAMPLES OF MULTIPLE FROG SEARCH FIELD SHEETS WHERE REACHES DESCRIBED AS EPHEMERAL WERE GROUND TRUTHED AS OTHERWISE

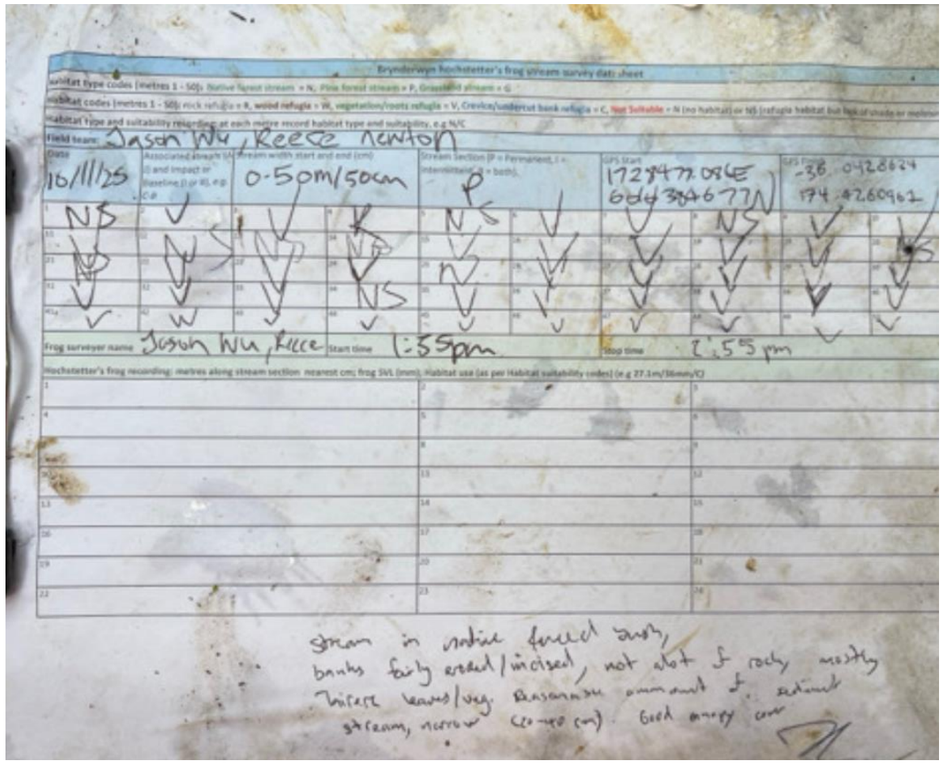




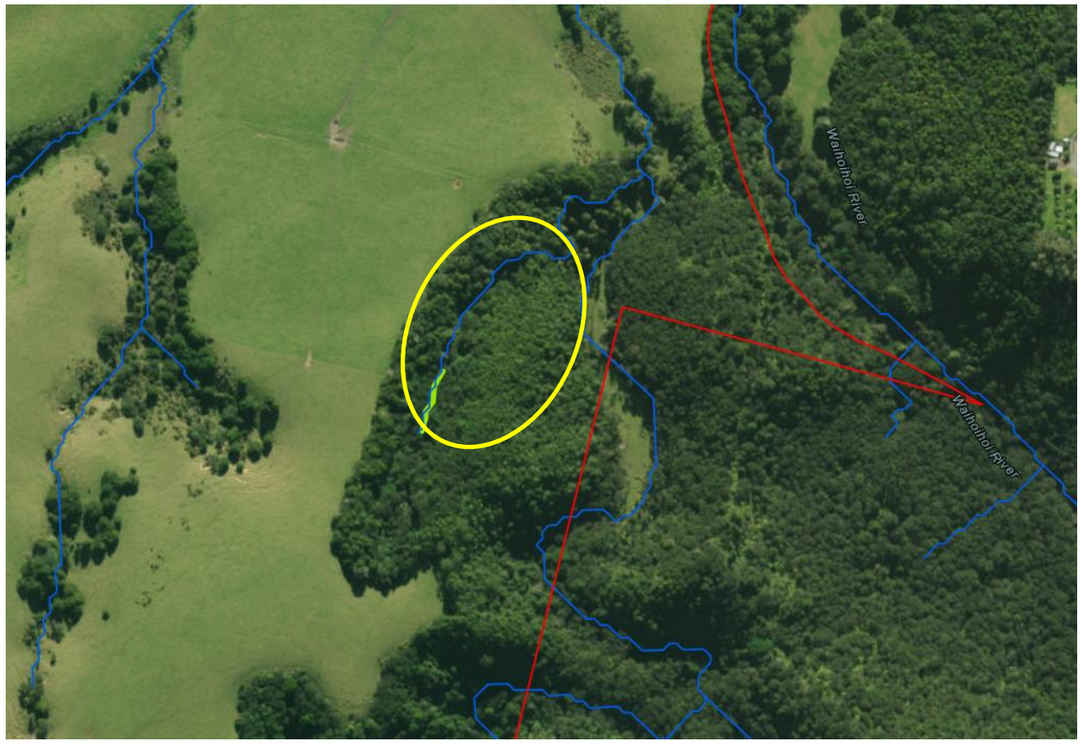
We have indicated multiple examples in our *Appendix A Waterway Mapping* and a further below *Fig 5.*

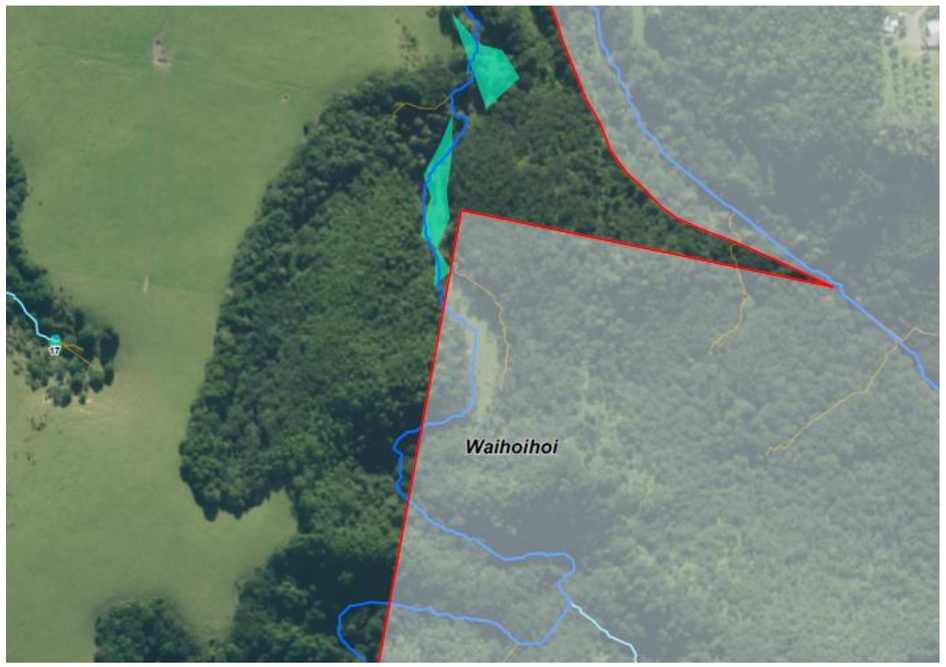
FIG 5: ANOMALY EXAMPLE IN FER DN MAPPING

STREAM OO – MARKED PERMANENT IN FROG SEARCH LINE AND ILLUSTRATED IN THE TER.



REACH IS ABSENT FROM THE FER MAPPING OTHER THAN SUPPOSEDLY EPHEMERAL PORTION AT NORTHERN END





Further more, surface water and groundwater are inextricably linked. WSP Geotech Team investigations investigations (NZTA GIS PLATFORM) illustrate supposedly ephemeral rain fed reaches in the Designation to be spring fed, further diminishing the validity of the FER statement

These are terrestrial systems that drain rain fall to the headwater (ephemeral) and do not have aquatic habitat and aquatic species (native frogs aside) therefore are not relevant for this assessment. Following their classification, I have not considered ephemeral systems further in undertaking this assessment.

SPRINGS FED REACHES AS CONFIRMED BY WSP GEOTECH NZTA GIS PLATFORM LABELLED AS RAIN FED EPHEMERAL APPENDIX C FER. PINE TRIBUTARIES CONFIRMED AS NOT EMPHEMERAL DURING FROG SURVEYS

SPRINGS



6/11/2026

NC_2B Existing Streams VIEW

NC_2B Approved Geotechnical Spring view

Approved

1:20,106

0 0.17 0.35 0.7 mi

0 0.3 0.6 1.2 km

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, NIWA, Vantor

ROBERTSON'S SPRINGS



6/16/2026

NC_2B Existing Streams VIEW

NC_2B Approved Geotechnical Spring view

Approved

NC2B Final Designation Boundary Minor Updates 20260323

1:5,027

0 0.04 0.09 0.18 mi

0 0.07 0.15 0.3 km

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, NIWA, Vantor

The project traverses a substantial number of headwater catchments within the Brynderwyn Hills for instance, where ephemeral and intermittent drainage features collectively comprise a large proportion of the drainage network. Exclusion of all reaches classified as ephemeral from further ecological assessment is one of the most consequential and problematic assumptions within the FER. The conclusion appears to rest on a circular logic whereby channels are first classified as ephemeral using a subjective classification framework and are then deemed ecologically irrelevant solely because they have been classified as ephemeral. By excluding all purportedly ephemeral reaches from further assessment, any classification errors become embedded throughout the remainder of ecological evaluation. The classification process therefore becomes a critical gateway determination, yet the FER simultaneously adopts its own stream flow definitions (*refer Table 9 as before)* that increase reliance on subjective judgement.

Excluding these systems from assessment effectively removes a significant component of the freshwater environment from application of the effects management hierarchy before effects are even considered. This combination raises concerns that stream classification is being used not merely as a descriptive exercise, but as a mechanism for narrowing the scope of ecological assessment.

The approach creates a strong incentive for classification outcomes that minimise the extent of the freshwater environment requiring assessment and potentially the costs and ongoing management associated with offset.

The FER statement that ephemeral flows are …*terrestrial systems* that *do not have aquatic habitat and aquatic species (native frogs aside) therefore are not relevant for this assessment* significantly oversimplifies the ecological role of headwater drainage networks.

The statement further implies that the absence of permanent aquatic habitat equates to an absence of ecological value. This is not supported by contemporary freshwater science. The FER focus on surface water permanence as a surrogate for ecological significance is flawed and more appropriately evaluated through biodiversity contribution, ecosystem function and connectivity within the broader river network. Headwaters, including ephemeral reaches, comprise approximately 70–80% of total stream length within most catchments[32] and therefore represent the dominant aquatic habitat type across landscapes. The assessment commits a common EcIA error by evaluating ephemeral channels individually rather than as part of an integrated headwater network. This is inconsistent with Auckland Council guidance, which emphasises that *rivers are connected systems and individual reaches cannot be considered in isolation* and requires consideration of the "entire reach and upstream and downstream" connectivity (ARC 2021, RC 3.3.17)

Even where channels lack permanent aquatic habitat, they remain integral components of catchment hydrology, sediment transport processes, nutrient cycling, downstream water quality, flood attenuation and ecological connectivity. Headwater systems are increasingly recognised as important contributors to the ecological functioning of downstream receiving environments, despite not supporting permanent surface water.

[32] **Richardson, J.S. (2019).** *Biological Diversity in Headwater Streams*. **Water**, 11(2), 366.

Rather than being biologically insignificant, ephemeral channels provide ecotones between terrestrial and aquatic environments, supporting specialised communities adapted to periodic wetting and drying. While permanently flowing reaches often contain more species at individual sites (α-diversity), headwaters contribute strongly to catchment-scale diversity through high β-diversity, with different headwater tributaries supporting distinct biological assemblages. During dry phases, streambeds provide habitat and movement corridors for terrestrial invertebrates and contribute organic matter accumulation, while flow events mobilise nutrients, sediments, organic material, propagules and aquatic organisms to downstream ecosystems. Temporary channels may appear inactive but continue to function as biogeochemical processing zones and movement corridors within the catchment.

At the landscape scale, ephemeral streams increase habitat heterogeneity and ecological connectivity, linking hillslopes, & riparian areas to permanent waterways. Both ephemeral and intermittent reaches have functions of:

- Retention and transformation of nutrients before they reach downstream waters.
- Processing and storage of terrestrial organic matter.
- Export of carbon, nutrients and invertebrate biomass to downstream food webs.
- Maintenance of hydrological and ecological connectivity across landscapes.
- Provision of refugia and dispersal pathways for aquatic and semi-aquatic organisms, as well as landscape heterogeneity for terrestrial fauna.

From our site experience, ephemeral stretches as mapped in the FER are also associated with *natural inland wetland,* within the Waihoihoi catchment in particular, some uncategorised by the FER (refer our Appendix A). As an ecological unit, along with their varied riparian vegetation they support terrestrial fauna, increasing biodiversity as ecotones. In the wider Waipū North wider site we observed fern bird *(At Risk – Declining)* adjacent one such reach.

Cumulative losses can substantially reduce catchment-scale ecological function, even where individual channels appear small or of limited value in isolation. The ecological significance of ephemeral streams therefore extends beyond the organisms occupying the channel itself. Their value cannot be dismissed solely because they do not support permanent fish or bird habitat as implied by the FER. Their **biological communities are distinct rather than depauperate.**

The *native frogs* referenced briefly in the FER associated with ephemeral reaches are recognized as a genetically and regionally distinct northern clade of Hochstetter frog, (*Leiopelma aff. hochstetteri* "Northland"; *At Risk - Declining*[33]) *that is only present within Brynderwyn and Waipū forests … potentially up to 35,000 frogs will be impacted by the project*[34]*,* with highly uncertain and untested mitigation and translocation success. We are uncertain as to what DN stream length is used to estimate the loss of frog habitat. We caution strongly against the reliability of using the FER DN based on our groundtruthing *(refer Appendix A.)*, which illustrated permanent and intermittent reaches as ephemeral. We emphasis that all DN require ground truthing, particularly when the potential impacts of effects on a threatened and range restricted population are so high. Additionally, from our

[33] 2024 Burns et al Conservation status of amphibians in Aotearoa New Zealand. New Zealand Threat Classification Series 44. Department of Conservation, Wellington. 19 p

[34] J WAIREPO (2026)Technical Review of Ecological Reporting prepared for the Northern Corridor Section 2B for Waka Kōtahi NZTA. Prepared for: Te Pouwhenua o Tiakiriri Kukupa Trust

experience during frog searches with WSP, unmapped seepages perpendicular to stream stems yielded further individuals which cannot be accounted for using the mapped stream length to extrapolate frog numbers.

In regard to the TER estimation of frog loss, we cannot find a blanket inferred 90% loss due to pine harvesting in the cited 2005 Crossland et al paper or other literature. We understand that paper describes a substantially lower detectability of juvenile Hochstetter's frogs in recently harvested plantation-forest catchments (78.4% decrease $\hat{p} = 0.11 \pm 0.05$) compared with mature pine forest ($\hat{p} = 0.51 \pm 0.08$) and native forest ($\hat{p} = 0.79 \pm 0.06$).

However, because the harvested and pre-harvest sites were not the same locations, the study did not infer a causal harvesting effect on frog abundance and explicitly noted that a direct before-after comparison was not possible. In all habitats surveyed, even native forest, juvenile Hochstetter's frogs are inherently less detectable than adults. From an amphibian population ecology perspective, juvenile detectability may be lower because the life stage most vulnerable to predation and desiccation tends to maximize concealment. Consequently, survey counts may underestimate juvenile abundance relative to adults.

TABLE 10: DETECTION PROBABILITIES ($\hat{p}$) JUVENILE AND ADULT/SUB-ADULT HOCHSTETTER'S FROGS IN DIFFERENT HABITAT TYPES (CROSSLAND ET AL. 2005)

HABITAT	JUVENILE DETECTION PROBABILITY ($\hat{p} \pm$ SE)	ADULT/SUB-ADULT DETECTION PROBABILITY ($\hat{p} \pm$ SE)	CHANGE FROM MATURE PINE
MATURE PINE FOREST (PRE HARVEST)	0.51 ± 0.08	0.80 ± 0.07	BASELINE
HARVESTED AREA (POST HARVEST)	0.11 ± 0.05	0.51 ± 0.08	JUVENILES: -78% ADULTS: -36%
NATIVE FOREST	0.79 ± 0.06	0.85 ± 0.06	

We note that Crossland et al (2005) was written prior to the *National Environmental Standard - Commercial Forestry (NES- CF)* which has specific requirements to address impacts on native fauna during earthworks and harvesting:

NES- CF (APRIL 2024)
SCHEDULE 4 FORESTRY EARTHWORKS MANAGEMENT PLAN
OTHER INDIGENOUS SPECIES OF FAUNA
(6)The plan must include procedures to—
(a)identify any threatened or at-risk species of indigenous fauna present within the forestry earthworks activity areas; and
(b)mitigate adverse effects on those species from the forestry earthworks activity
SCHEDULE 6 HARVEST PLAN
OTHER INDIGENOUS SPECIES OF FAUNA
(7)The plan must include procedures to—
(a)identify any threatened or at-risk species of indigenous fauna present within the harvesting activity areas; and
(b)mitigate adverse effects on those species from the harvesting activity

We anticipate that management implications for the identified Brynderwyns frog populations during plantation work/harvest will be subject to high scrutiny, reflecting the more recent

regulatory landscape; the subspecies population's significance and public awareness of the surveys.

While it is not disputed that forestry activities can adversely affect indigenous biodiversity values embedded within the commercial estate, we do not consider the TER assumption that Hochstetter's frog populations will be reduced by up to 90% to be adequately supported by the evidence presented. Consequently, the subsequent adjustment of estimated frog numbers used to determine level of effects does not appear to be robust.

It is currently unclear whether the plantation stands within the Project area have reached their intended harvest age. We are unaware of any formal agreement or management commitment requiring harvest prior to Project implementation. While it may be assumed that the forest owner would ultimately seek to harvest the plantation resource, premature harvesting undertaken to facilitate motorway construction would constitute a direct effect of the Project and should be assessed accordingly.

RAPID HABITAT ASSESSMENT

The RHA[35] is a semi-quantitative standardised assessment of the physical habitat condition of wadeable streams at the reach scale. The author uses a derived acronym renaming it the RHAB, which we have not previously accounted in any literature. The RHA measures physical habitat attributes such as sediment, habitat diversity, fish cover, hydraulic heterogeneity, bank condition, and riparian condition. It does not measure fish communities, macroinvertebrate communities, native biodiversity, or ecosystem function directly. The FER statement that **0 = no aquatic habitat" is not the intended meaning of the method.** The RHA was developed to assess the condition of habitat features present within a reach. A very low score indicates severely degraded habitat condition, not necessarily the complete absence of habitat or ecological function. Even highly modified channels may provide habitat, support biota, contribute connectivity, or perform ecological processes. RHA does not predict or measure *quality of biota expected* (FER PG. 10). It measures physical habitat condition only, and any inferred relationship to biotic condition is indirect, context-dependent, and not formally calibrated within the method

While physical habitat condition is one driver of communities, they are also influenced by dispersal limitation, fish passage, flow permanence, water quality, catchment history, source populations, and network connectivity. Consequently, a reach can have a high habitat score but low biological richness, or vice versa.

The FER attempts to interpret the RHA score as a direct indicator of *value* - stating the RHAB score is

a proxy for value given value is often, but not always, correlated with condition. FER PG. 10

This exceeds the intended application of the methodology. The RHA was devised as a rapid, standardised assessment of physical habitat condition at the reach scale, providing a single habitat condition score intended to complement biological monitoring rather than replace it. The methodology does not directly assess biodiversity, ecological significance, ecological function, or community composition. RHA scores should be interpreted as indicators of habitat

[35] Clapcott, J. (2015). *National Rapid Habitat Assessment Protocol Development for Streams and Rivers*. Prepared for Northland Regional Council. Cawthron Report No. 2649. 29 p. plus appendices.

condition and complexity, not as direct measures of ecological value or the quality of biological communities.
Full scoring is not provided in the FER for each of the 10 components, only the total presented in Table 10, which minimizes interpretative ability. Our own scores vary at sites we were present at, as given in *Appendix B* for illustration.
The FER scoring bands applied in Table 11 depart from the RHA methodology. This introduces an additional layer of professional judgement beyond the standardised protocol and reduces transparency, repeatability, and comparability. A key strength of the RHA is its consistent framework for interpretation across sites and assessors. Altering score thresholds without clear scientific justification introduces the potential for bias.

Importantly, the RHA should be undertaken at the reach scale rather than at a single point location. The standard methodology recommends a reach length of 20 times the mean wetted width of the stream, with a minimum of 50 m and a maximum of 500 m. It is not evident that this reach-scale requirement was applied in the Waihoihoi Main Stem assessment, observed in the field. We question the wadeability of this reach. In this context, the presentation of single representative reach images in FER Appendix D provides a limited spatial representation of each stream system and within-reach habitat variability. This constrained presentation reduces the ability of those unfamiliar with the site to independently assess the representativeness and extrapolate it to the larger reach. A landowner within the Designation area, who has reviewed the application materials online, has also raised concerns regarding the representativeness of the imagery presented in the FER.

STREAM ECOLOGICAL VALUATION

The Stream Ecological Valuation (SEV)[36] methodology was developed as a holistic assessment integrating measurable metrics of physical habitat, hydrological integrity, ecological functioning, biodiversity, and connectivity into a single framework.
The FER use of the SEV continues a pattern of modifying established and standardised assessment methodologies through ad hoc adjustments and reinterpretations. These departures reduce the transparency, repeatability, and comparability of the assessment, undermining the primary purpose of using nationally recognised ecological assessment protocols. In this instance the author-

chose to use only the physical metrics components of the model in forming the SEV. As it is an averaged score, this approach does not overly modify the SEV outcome and better reflects the habitat condition.

Restricting the assessment to physical habitat components fundamentally alters the methodology and removes several independent dimensions of ecological value. The resulting score therefore reflects habitat condition rather than ecological value and cannot be considered directly comparable to a standard SEV assessment. Excluding non-physical components introduces systematic, directional bias which will **deflate value of low-structure but ecologically important systems e.g. ephemeral/headwater networks.** Averaging does not preserve conceptual meaning and is only useable if all components measure the same construct. In the standard SEV methodology:

[36] Storey, R.G., Neale, M.W., Rowe, D.K., Quinn, J.M. et al. (2011). *Stream Ecological Valuation (SEV): A Method for Assessing the Ecological Functions of Auckland Streams*. Auckland Council Technical Report TR2011/009

physical habitat ≠ ecological value ≠ connectivity ≠ biotic integrity

So averaging does not *preserve* SEV — it **redefines it**. Removing non-physical components may produce a clearer habitat condition metric but **it is no longer SEV and should not referred to as such.** W

The modified SEV approach adopted in the FER is not allowed for within the published SEV methodology, nor have we identified any independent validation of the approach. Similar departures from standard SEV application by the same author have previously attracted significant criticism during independent expert review. Notably, the Wildlands peer review for the SH1 Cambridge to Piarere project concluded that the author's application of SEV tended to minimise stream ecological values and challenged several methodological assumptions that materially influenced offsetting requirements and ecological outcomes[37]. These examples reinforce the importance of adhering to published assessment frameworks where consistency, transparency, and comparability are intended outcomes of the methodology.

The author appears to contradict his previous approach of correlating the RHA physical habitat score to an ecological value by emphasizing that the SEV -
describes the measurable or estimated physical components of an aquatic system that relates to function rather than value. Although value and function are often correlated, the functional condition indicated by SEV does not directly equate to aquatic value. FER PG.10

eDNA

The FER utilizes eDNA survey as discussed previously. It states:
One sample is sufficient to undertake eDNA analysis to determine the presence of a particular species. We were able to undertake 2 replicate (2L) samples at each SEV measurement site. FER PG.10

Replication is identified as critical for reliable macroinvertebrate detection due to the heterogeneous distribution of eDNA within aquatic environments. Standardised protocols therefore recommend **six replicate 1 L samples** collected from the same sampling point and habitat unit, preferably within the thalweg or main flow path of the stream. Preferred sampling locations are fast-flowing, well-mixed habitats, while stagnant areas and locations near tributary confluences are generally avoided. A confined oxbow edge of the *Waihoihoi Main Stem* site was sampled during our fieldwork observations and did not represent variation throughout the immediate reach.
Optimal sampling conditions are during low, stable flows and minimal recent rainfall, preferably during summer months to avoid influence of seasonal lifecycle variability and restructuring of communities by heightened flows e.g. 24/25 Oct 25. This may take several weeks particularly for EPT taxa as pertinent in the FER discussion. This level of sample design and replication was not undertaken for the targeted sample sites, likely an influence across all the results, including the Waihoihoi Main Stem site:

*The poorest habitat was the Robertsons tributary and the **Waihoihoi main stem**. The Waihoihoi main stem result may be due to undertaking an eDNA sample in such a large volume of water, but also likely reflects the very heavy sediment and longer term nutrient pollution build up on the bed. FER PG. 29*

[37] Wildland Consultants. (2025). *State Highway 1 Cambridge to Piarere Long-Term Improvements Fast Track Consent Application: Final Ecology Review*. Wildland Consultants Contract Report No. 7566b. Prepared for Environmental Protection Authority.

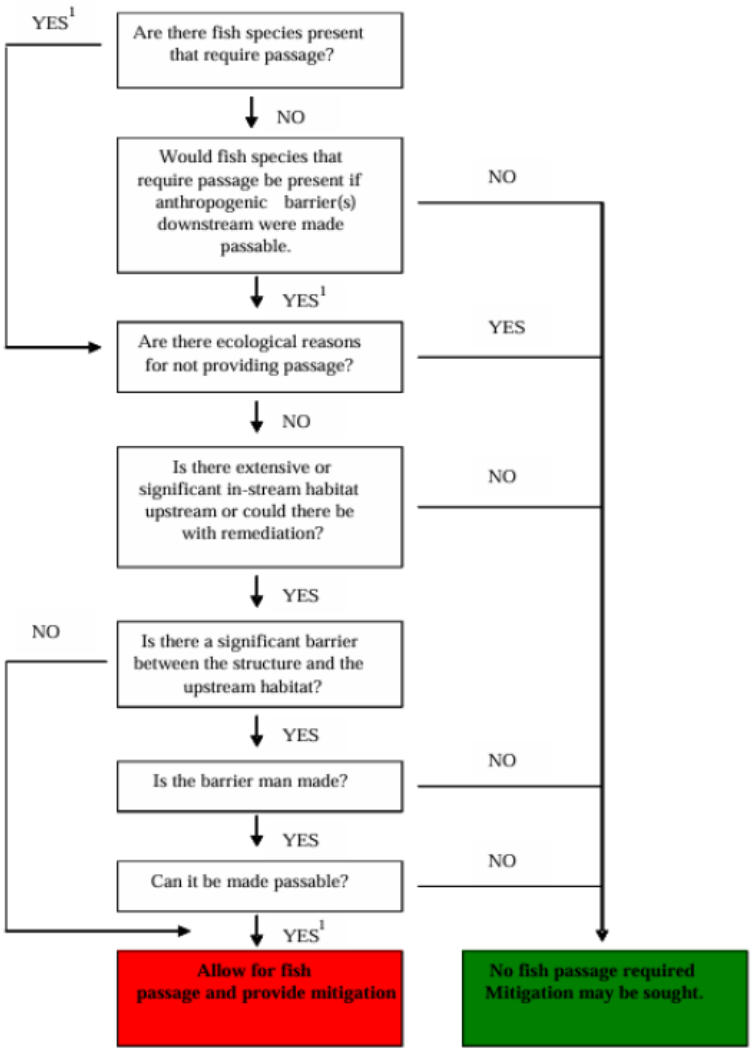
FISH PASSAGE DETERMINATION

The **fundamental objective** of fish passage requirements[38]is :

The passage of fish is maintained, or is improved, by instream structures, except where it is desirable to prevent the passage of some fish species in order to protect desired fish species, their life stages, or their habitats.

This aspiration and means objectives are reflected in NES-F Reg 70 culvert parameters (permitted activity status). The FER approach is to filter this requirement through application of the Auckland Council decision flowchart (2000) [39] rather than direct application of the NES-F (2020) culvert parameters or NIWA fish passage guidance[40] as primary means objectives. This is not adequately justified.

Flow diagram to assist in assessing whether fish passage is required.



The NIWA guidance provides a nationally consistent, species- and life-stage-informed framework for

[38] Ministry for the Environment. 2025. *National Policy Statement for Freshwater Management 2020 (amended December 2025).* Ministry for the Environment, Wellington.

[39] Auckland Regional Council (2000). Fish Passage Guidelines for the Auckland Region (Technical Publication 131).

[40] Franklin, P.A., Baker, C.F., Gee, E., Bowie, S., Melchior, M., Egan, E., Aghazadegan, L., & Vodjansky, E. (2024). *New Zealand Fish Passage Guidelines* (Version 2.0). NIWA Client Report 2024157HN. National Institute of Water and Atmospheric Research (NIWA), Hamilton, New Zealand. July 2024.

assessing fish passage requirements, whereas the simplified flowchart approach risks reducing ecological considerations to a subjective habitat threshold. In the first instance, for example, all supposedly ephemeral streams are ignored in this process as per the FER methodology. Further, the FER states

Where fish passage is currently marginal or relatively unimportant (for example, where there is only a small pool and 30m of intermittent reach up stream), this assessment may not identify the "need" for passage specific considerations and a standard approach to culvert design and installation which may not facilitate well passage will be ecologically acceptable.

In particular, the characterisation of upstream habitat as *small pools* or approximately 30 m of intermittent reach as *relatively unimportant* is not supported in the context of freshwater ecological function, where even short reaches may provide critical spawning, rearing, or refuge habitat, particularly for at-risk and threatened species in modified or fragmented catchments. The assumption that such limited habitat does not warrant fish passage consideration conflates habitat length with ecological significance and does not sufficiently recognise that small, or low flow reaches may still provide critical ecological function, including representative local habitat for certain fish, spawning and refuge.

Furthermore, it minimises the requirements of *Threatened* and *At-Risk* species, particularly in the flawed FER survey effort where species presence/ absence is inferred from limited survey and desktop review rather than confirmed through comprehensive seasonal survey effort. The *Freshwater Fish in Northland Report*[41] cited as a primary desktop source by the FER, includes expert application of significance criteria in regard to Northland fish habitat and regards sites with records of *At Risk* or *Threatened* fish species as significant in terms of (refer also Sec *3.22 FISH SPECIES DESKTOP INFORMATION),* which is reflected in Northland regional significance assessment[42].

This creates a consequential risk that under-detection or under-valuation of species or critical habitat leads to a systematic reduction in the scope of fish passage design requirements and an inappropriate narrowing of mitigation requirements toward conveyance orientated culvert designs.

The FER states …

that the basic parameters reflected in Regulation 70 (2)(b-g)) of the NES-FW are usually sufficient to ensure a similar passage outcome is achieved where the culvert does not alter the velocity profile, bed continuity and absence of structures. Where that is not the case (and passage is required), then I recommend the culvert designers use the new NIWA fish passage guidance.

The NIWA Fish Passage Guidelines (FPG.), including earlier national level iterations, are the underlying technical framework that informed the development of fish passage policy embedded in the NPS-FM and NES F REG 70. NIWA guidance explicitly emphasises that culverts should be designed in the first instance to provide fish passage as the fundamental design objective. This is particularly relevant for long or embedded culverts, where long term

[41] McArthur, K. and Beveridge, A. (2015) Freshwater Native Fish in Northland: Conservation status, critical habitat requirements and recommendations for management. Report No. 2015/036

(1) [42] ASSESSMENT OF SIGNIFICANT INDIGENOUS VEGETATION AND SIGNIFICANT HABITATS OF INDIGENOUS FAUNA IN TERRESTRIAL, FRESHWATER AND MARINE ENVIRONMENTS NORTHLAND REGIONAL POLICY STATEMENT (2018) APPENDIX 5: *(2)Rarity/ Distinctiveness (B) & (C); (4) Ecological Context*

monitoring, adaptive management or remedial intervention is likely impracticable. The implied reliance in the FER on mitigation features e.g. baffles rather than demonstrated passage-by-design risks treating the NES-F Reg 70 regulatory minima as a design ceiling, rather than as goals to be actively engineered.

The absence of itemised culvert specifications materially constrains the ability to assess effects on passage. Without clear information on the number, location, dimensions, and hydraulic design of proposed culverts, it is not possible to determine where fish passage may be impeded, or which species may be excluded. This also prevents a robust assessment of cumulative and reach-scale connectivity effects, including access to spawning, rearing, and refuge habitat. In the absence of such detail, alignment with the New Zealand Fish Passage Guidelines cannot be demonstrated, and effects are effectively generalised rather than explicitly assessed, undermining a reliable effects-based evaluation.

This level of uncertainty is inconsistent with the intent of a substantive application under Schedule 9 for Complex Freshwater Fisheries activities, which requires detailed information on structure design, operating regime, affected species and values, and how fish passage will be provided for or impeded.

ARTIFICIAL WATERWAYS

The FER (PG. 11) describes a substantial part of the lower Ahurora catchment on the Waipū Plains as:
a range of waterways intersected by the indicative alignment and within Designation in the north. These systems are, however, farm drainage channels (artificial waterways). The farm drainage systems do not appear to be modified rivers (i.e. the RMA definition of a river excludes any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal).

The RMA definition of a river is:
*a continually or intermittently flowing body of fresh water; and **includes** a stream and **modified watercourse**, but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal*

The RMA further defines a **water body-** fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.

The term **modified watercourse** is not defined in any planning documents but is derived from case law and regulatory body advice e.g. Wellington Regional Council describes a *highly modified river or stream* as a :
river or stream that has been modified and channeled for the purpose of land drainage of surface or sub-surface water and has the following characteristics:

- *a. It has been channeled into a single flow, and*
- *b. The channel has been straightened, and*
- *c. The channel is mechanically formed with straight or steeply angled banks, and*
- *d. It exhibits these characteristics for at least its entire length through the property in which the activity is being carried out.*

Whether the watercourse has a natural or artificial source of flow is pertinent - if the waterway is the only link between a natural source and a stream or river, then it is considered a stream. The form of the entire watercourse should be considered, not just the reach of interest and if

upstream or downstream reaches exhibit a natural form it is likely that the watercourse is the modified form of a pre-existing river or stream. If the entire watercourse is found to have a constructed/modified form, then review of Retrolens photos or topographic maps can elucidate the stream that would naturally have existed previously. While these resources provide a useful and readily accessible first-pass assessment of drain history, small natural streams, spring-fed channels, wetlands, and shallow flowpaths within low-gradient alluvial environments are often difficult to discern, particularly within cover. Consequently, due to the level of potential effects, more in depth field and catchment-scale assessment would be expected.

This described form is typical of many drains or ditches in both the Ahuroa and Waihoihoi lower catchments and, due to the potential level of effects, requires more consideration than that afforded in the brief but all encompassing FER statement and singular 1971 Retrolens picture, by which time most drainage had occurred. We note several areas below in the Ahuroa Catchment FIG 6. The same is particularly true in the Robertsons Tributary catchment, in comparison to FER Stream Category Sheet 5. Unfortunately without access to the bespoke FER DN we cannot reproduce the layers as we would like and instead use the NRC Digital River Network stream lines and catchments. We note this additionally differs from the *Streams* layer in the NZTA GIS platform, used in the TER. From this platform we have included the NZTA produced layers -*Springs* identified by the WSP Geotech team; *Standing Water* layer that the springs co incide with; as well as the Master Wet Ground layer, combining historic, inferred and observed wetland.

These waterways represent both critical source areas for their larger receiving rivers and are demonstrably capable of supporting indigenous fish populations, including species of conservation concern, at a minimum within the Robertsons catchment, where FER eDNA sampling detected longfin eel (*Anguilla dieffenbachii*; At Risk – Declining), shortfin eel (*Anguilla australis*), banded kōkopu (*Galaxias fasciatus*; *At Risk – Naturally Uncommon, Regionally Significant*), and undetermined *Gobiomorphus* spp. (bullies). These findings are consistent with observations made by the landowner during the eDNA and SEV site visit, who reported that the waterway supported abundant eels and bullies.
Given the lack of adequate ground-truthing of reaches classified as ephemeral in the FER, together with the insufficient assessment of wetland occurrence, spring-fed hydrology, and the status of channels described as "farm drains", we do not consider the available evidence sufficient to support the conclusion that the channels are artificial drainage systems. We cannot place reliance on the statement that:
Retrolens aerial photograph (Figure 2) does not show stream patterns in the paddocks in earlier times and I consider the systems best fit the definition of a drainage systems (artificial waterways) likely dug into the land to assist the tile drains and topography to dry the riverside pastures.
The characterisation of these waterways within the FER, and their subsequent omission from the ecological assessment, further diminishes confidence in the robustness of the effects assessment. It enables their loss; or unmitigated modification and use as permanent stormwater conveyance and drainage systems for the Project.

FIG 6: NATURAL ORIGIN OF DRAINS TO AHUROA APPROX CHAINAGE 11600 1961 & CURRENT MODIFIED WATERCOURSE







FIG 7: 1963 RETROLENS UPPER AHUROA WETLAND BRYHAM PROPERTY TO NORTH OF DESIGNATION ; AS CURRENT LARGE DITCH MODIFIED WATERCOURSE



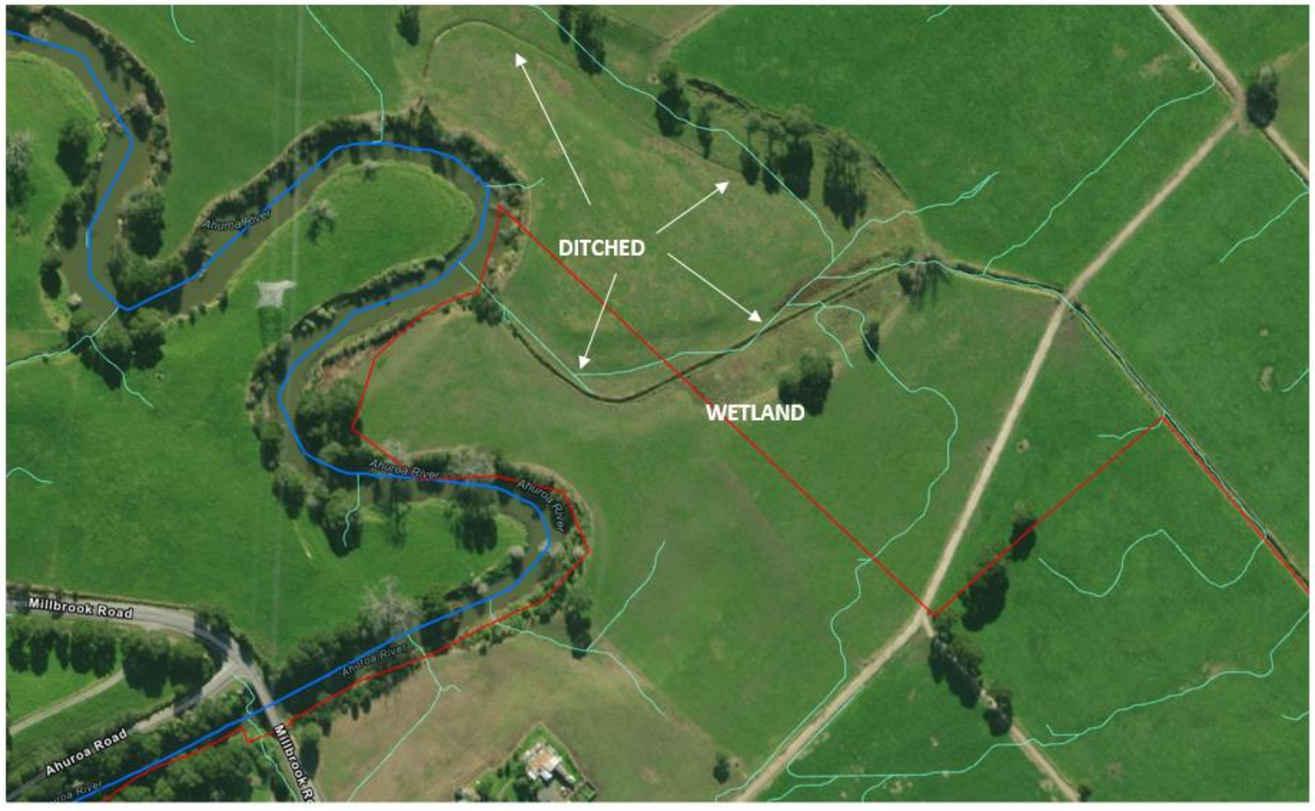
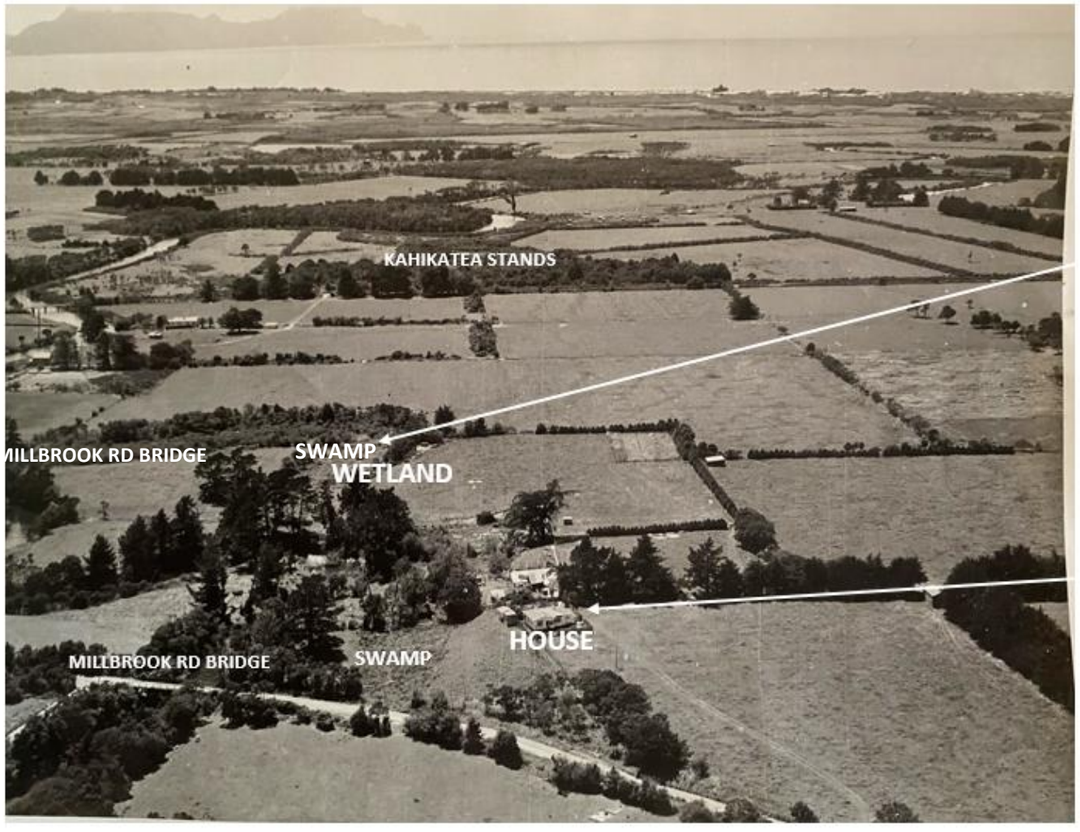
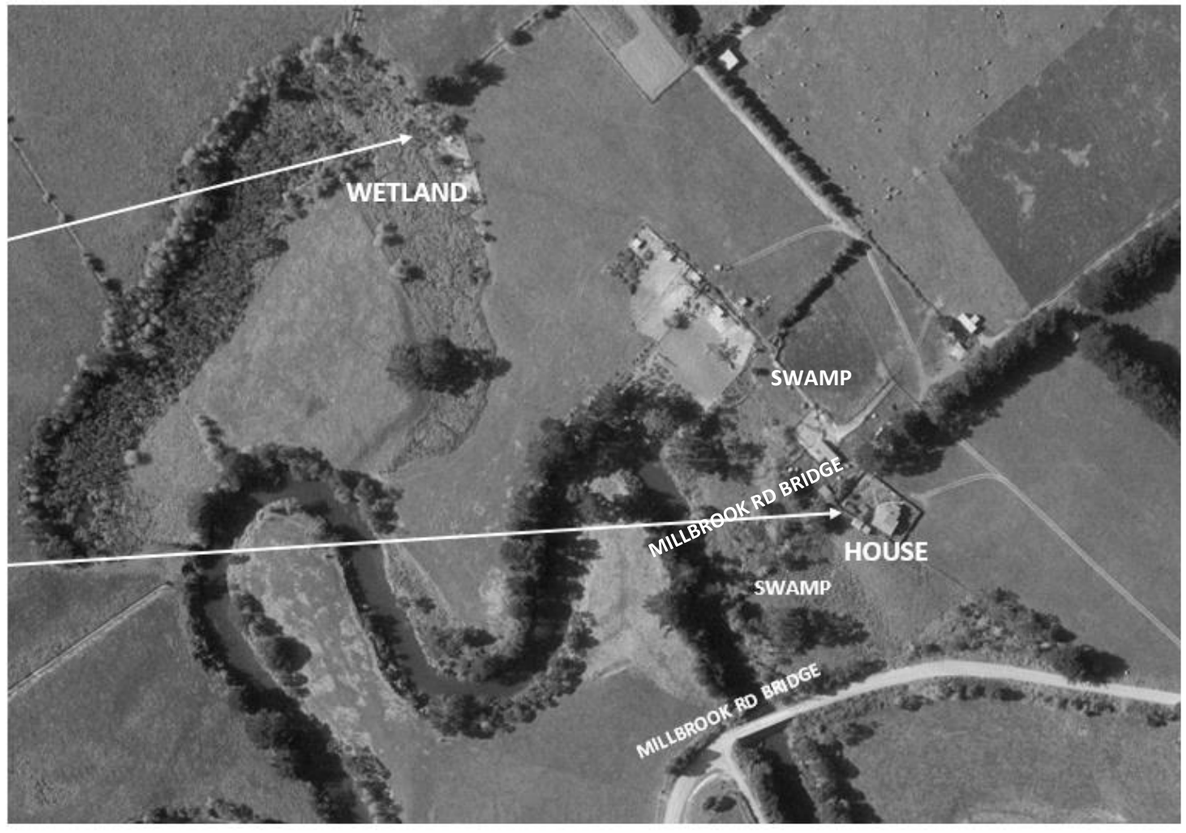


FIG 8: ORIGINAL FORM OF SWAMP PRIOR TO DRAINAGE.





1968 RETROLENS; KAHIKATEA DRAINS TO AHUROA INSTALLED TO DRAIN NATURAL CREEKS & SATURATION IN STAND S DRAINS ARE A MODIFIED WATERCOURSE NATURAL ORIGIN AND TERMINUS STRAIGHTENED ; INTERMITTANT DEPRESSED FLOWPATHS WITH PERSICARIA MACULOSA(FACW); STANDING WATER AFTER RAINFALL WITH GLYD+CERIA (FACW); DEPTH OF WATER COMMON IN PASTURE BENEATH OPEN STAND

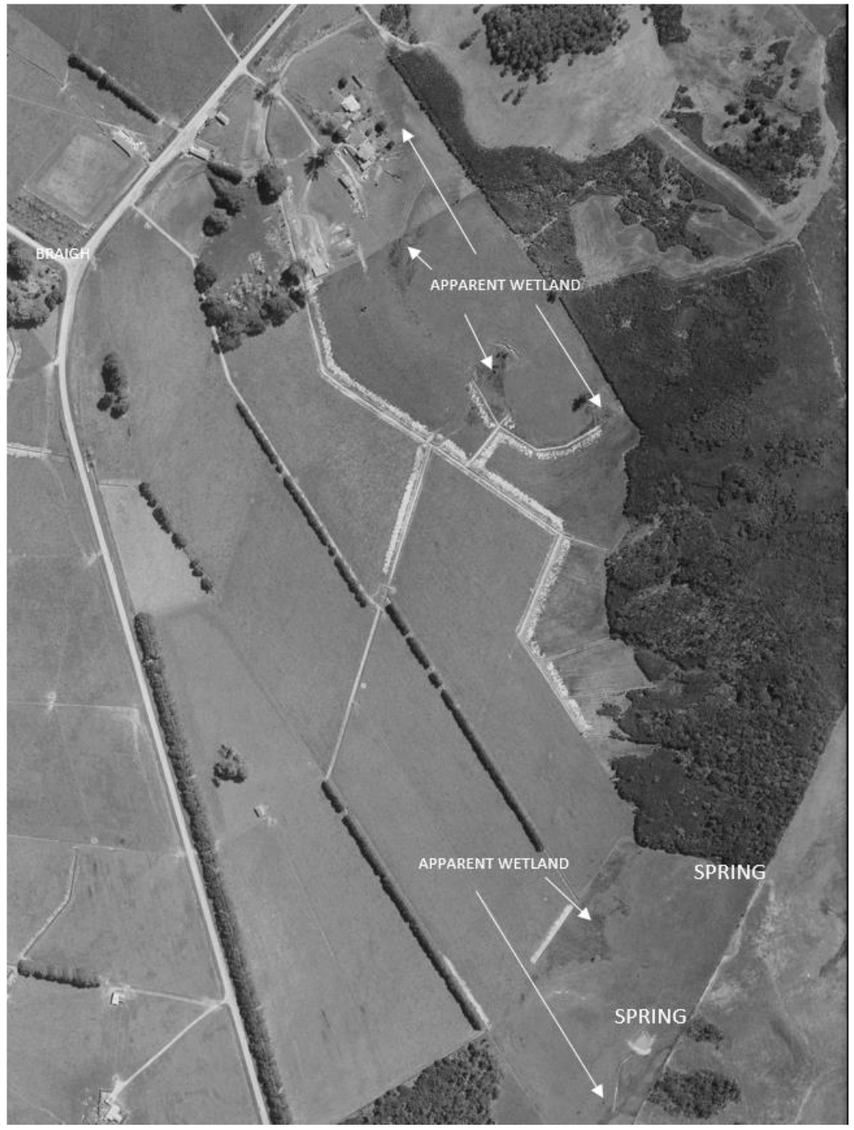








FIG 9: ROBERTSONS TRIBUTARY & FRESHLY DUG DRAINAGE WITH NATURAL ORIGIN 1961 RETROLENS CF SPRINGS/ STANDING WATER & NRC DRN MAIN CHANNEL IN ORANGE





2.2. WETLANDS

2.2.6. WETLANDS - DESKTOP IDENTIFICATION

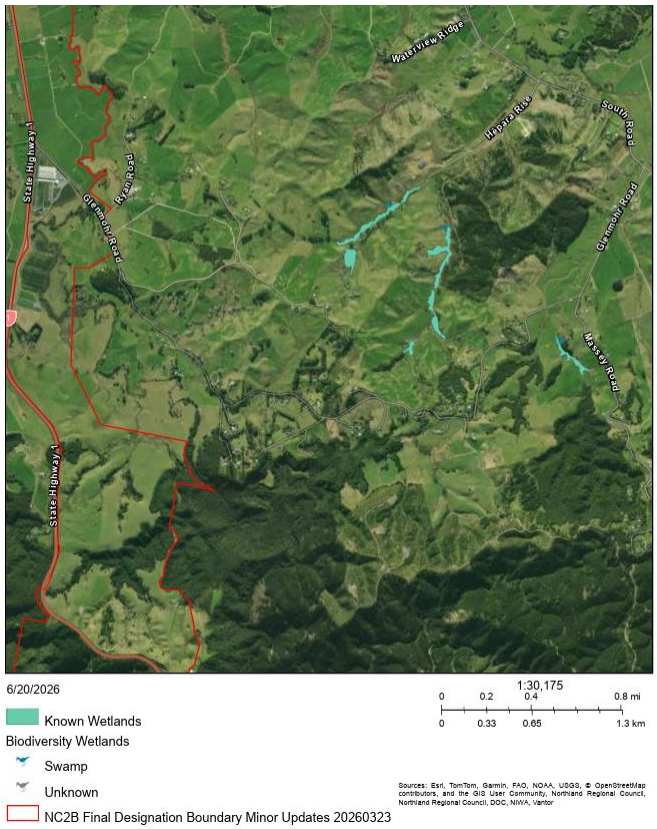
The FER states:

I note that NRC has not undertaken a condition and biodiversity type ranking or mapping exercise for wetlands, although they have mapped some larger indigenous PNAP identified wetlands. I have also not found any publications detailing wetlands in or in the vicinity of the Proposed Designation, or species or factors affecting them.

NRC commissioned Wildland Consultants Ltd to undertake a region-wide assessment of Northland's most significant wetlands[43]. The project evaluated and ranked more than 300 wetlands using criteria including rarity, representativeness, ecological condition, size, and habitat diversity, ultimately identifying the top 150 wetlands for prioritised management and protection. As one of the most comprehensive wetland prioritisation exercises undertaken in New Zealand, inclusion within the ranked dataset, and particularly the top 150 wetlands, is a strong indicator of ecological significance at a regional scale. However, as per the ongoing mapping undertaken by NRC as obligatory under the NPS – FM, wetlands are infrequently mapped in private land or where no resource consent activity has triggered scrutiny. Both of these data sets are available as public GIS mapping.[44]

Glenmohr Road Wetland (PNA #Q08/223)[45] is located 2km to the east of the Designation.

FIG 10: GLENMOHR RD WETLAND PNA#Q08/223



[43] Wildland Consultants Ltd. 2011. *Ranking of Top Wetlands in the Northland Region – Stage 4: Rankings for 304 Wetlands*. Contract Report No. 2489. Prepared for Northland Regional Council. March 2011

[44] https://localmaps.nrc.govt.nz/localmapsviewer/?map=55bdd943767a493587323fc025b1335c

[45] Lux, J., Martin, T., & Beadel, S.M. (2007). Natural Areas of Waipū Ecological District: Reconnaissance Survey Report for the Protected Natural Areas Programme. Northland Conservancy Ecological District Survey Report Series. Department of Conservation, Whangarei. 344 pp

The total length of the gullies in the site is approximately 2 km, making this one of the largest raupo reedlands in the ED. There is a small constructed pond at the head of the westernmost gully.In the southernmost gully head ther is a small fenced stand of kanuka forests with frequent rimu, tanekaha and kahikatea and occasional rewarewa[45].

Under the NRC Top Wetlands Project, the site was ranked 187th regionally and was identified as the 10th highest-ranked wetland within the Waipū ED, one below Doctors Hill Wetland. The dense raupo cover of approx. 44ha represents core breeding habitat for bittern (*Threatened- Nationally Vulnerable*) and a stepping stone for known populations in Mangawhai and Drs Hill Wetlands to the north while located in a separate catchment, the Designation wetlands are within easily accessible distance for foraging adults. Radio tracking[46] indicates that the functional habitat of Australasian bitterns extends beyond tall stature raupō-dominated breeding wetlands approx. 15km into short wetland mosaics in pasture, including drains, spring-fed channels, and flooded paddocks, consistent with their opportunistic carnivorous foraging ecology.

2.2.7. WETLANDS - FIELD IDENTIFICATION

The FER reproduces the standard methodology for determining *natural inland wetland* as per the *MfE (2022) Wetland delineation protocols,* which is comprised of the *Vegetation Tool (Clarkson 2014);* the *Hydric Soil Tool (Fraser et al 2018)* and the *Hydrology Tool (MfE 2021).*

HYDRIC SOILS AND HYDROLOGY

In the event that the Vegetation Tool of the Methodology the FER states:
Two tools are available – Frazer et al 2018 – for soils and Lambie et al 2021(sic). Neither are referenced in the NPS-FM suite of methods to be used in assisting the determination of the presence of natural inland wetland.

Fraser et al (2018)[47] and MfE *(2021)/Lambie et al*[48] are infact incorporated by reference within the Wetland Delineation Protocol into the NPS-FM 2020 and have the same legal effect.

However, these tools were not required in this as the rapid testing and some vegetation plot testing were sufficient to determine areas that could be natural inland wetland.

No plot results are provided.

2.2.8. WETLANDS – VALUES AND CONDITION (ECOSYSTEM HEALTH) ASSESSMENT

NPS- FM Policy 6 states:
There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.

Also that
Policy 2: *Tangata whenua are actively involved in freshwater management (including decision-making processes), and Māori freshwater values are identified and provided for.*

[46] Williams, E.M. 2016. *Seasonal movements and site loyalty of radio-tagged Australasian bitterns: Some insights into what bitterns might consider as 'prime real estate'?* Birds New Zealand Annual Conference Abstracts.
[47] Fraser S, Singleton P, Clarkson B. 2018. Hydric soils – field identification guide. Manaaki Whenua – Landcare Research Contract Report LC3233 for Tasman District Council
[48] Lambie et al (2021) Wetland delineation hydrology tool for Aotearoa New Zealand. Wellington: Ministry for the Environment.

The **values to protect / avoid adverse effects on** (including cumulative effects and loss of potential value) as per the intent of the NPS-FM are:

(i) ECOSYSTEM HEALTH

5 biophysical components -

- *Water quality – the physical and chemical measures of the water, such as temperature, dissolved oxygen, pH, suspended sediment, nutrients and toxicants*
- *Water quantity – the extent and variability in the level or flow of water*
- *Habitat – the physical form, structure, and extent of the water body, its bed, banks and margins; its riparian vegetation; and its connections to the floodplain and to groundwater*
- *Aquatic life – the abundance and diversity of biota including microbes, invertebrates, plants, fish and birds*
- *Ecological processes – the interactions among biota and their physical and chemical environment such as primary production, decomposition, nutrient cycling and trophic connectivity.*

(II) INDIGENOUS BIODIVERSITY

(III) HYDROLOGICAL FUNCTIONING

(IV) MĀORI FRESHWATER VALUES

(V) AMENITY VALUES

These are values that must be identified, recognized and provided for. They are not ranked and are not a quasi-scoring or decision test. The methodological drift of the FER conflates values identification with condition-based evaluation criteria

- species presence as a proxy for biodiversity value
- observed condition as a proxy for ecosystem health value
- landscape setting as a proxy for hydrological function value

2.3. ASSESSMENT OF EFFECTS METHODOLOGY

2.3.1. THE APPROPRIATE SCALE FOR ASSESSMENT OF EFFECTS

Ecological effects are typically assessed relative to the ecological feature being affected, such as:

- a stream reach
- a wetland or wetland complex
- a spring
- a fish spawning site
- a riparian habitat
- a wetland complex

This approach underpins Ecological Impact Assessment (EcIA) practice; most council ecological assessment frameworks and wetland assessments under the NPS-FM and NES-F.
For example, if 0.8ha of a 1 ha wetland is lost, effects are generally assessed against the immediate wetland system, not against the entire catchment in which the wetland occurs. Similarly, if 500m of stream habitat is permanently modified, the effect is assessed against that stream feature and its ecological function, not diluted across a hundred kilometres of waterways within the catchment.

A significant feature remains significant irrespective of how small it is relative to the catchment. Assessing magnitude against the entire catchment risks diluting local habitat loss and function by a much larger denominator, and underrepresenting the significance of direct effects, although it is useful in consideration of

- cumulative effects
- fish passage
- connectivity

The FER states where the features potentially impacted are reflective of the "run of the mill" types of systems within the wider catchment then I consider the catchment scale is the appropriate scale (PG. 16).

The suggestion that catchment-scale assessment is appropriate where features are *run of the mill* introduces a subjective filter that is not regulatory as per the NES-F or standard ecological assessment frameworks. A freshwater element does not need to be exceptional before local-scale effects become relevant.

2.3.2. SCALE FOR ASSESSMENT OF EFFECTS ON STREAMS

The assessment methodology is fundamentally dependent on a bespoke Digital Network (DN) model that has not been made available for independent review and cannot be reproduced from the information provided. The FER states that stream resource length within each catchment was derived from a rainfall-geomorphic modelling approach, with subsequent partitioning of channels into ephemeral, intermittent and perennial classes. However, the underlying model, source datasets, stream initiation thresholds, flow accumulation parameters, DEM conditioning methods, manual edits, and classification rules have not been disclosed.

As before, the FER (PG. 9) states *Following their classification, I have not considered ephemeral systems further in undertaking this assessment.*

Rather than evaluating the ecological functions and values of affected headwater systems, their insignificance is touted as absolute at the outset.

Observed discrepancies between mapped and actual stream characteristics raise concerns regarding the validity of the modelling, as before.

The modelling creates the stream length denominator against which the magnitude of Project effects is calculated. Consequently, any underestimation, omission or misclassification of stream extent or permanence directly influences the effects proportionally and the assessment rests on a resource base whose accuracy and reliability cannot be tested.

Stream length is adopted as the primary measure of freshwater resource, yet a substantial component of that resource is excluded from consideration because it is classified as ephemeral. The result is an artificial reduction in both the freshwater resource recognised as affected and the magnitude of effects ultimately reported. The varied stream ecosystem types identified by Leathwick (2018) are treated as a single homogeneous unit, with no differentiation between them.

The FER further compounds this issue by assessing effects principally at the catchment scale.

In my opinion, the combined effect is to systematically understate freshwater ecological effects. The assessment relies on a non-transparent and non-repeatable stream network model, excludes or discounts entire classes of freshwater habitat based on unsupported

assumptions regarding ecological value, and then evaluates the resulting effects against the catchment-scale denominator that bears little relationship to the scale at which freshwater values and ecological functions are expressed.

2.3.3. SCALE FOR ASSESSMENT OF EFFECTS ON WETLANDS

The FER states (PG. 16)
For each catchment, the total recorded or known area of natural inland wetland is used as the baseline. Council surveys have not yet been completed across the region or within individual catchments. Existing datasets, such as the LCDB6 and other spatial layers tend to capture only larger, predominantly indigenous wetlands, and in most cases overlook smaller and mainly exotic wetlands that will qualify under as Natural Inland Wetlands the NPS-FM. As a result, I consider the baseline I have used in my assessment understates the extent of natural inland wetland within each catchment.

As with the stream assessment, the methodology relies on a broad catchment-scale denominator that tends to dilute the apparent magnitude of effects. The wetland effects assessment relies on a catchment-scale wetland inventory that is acknowledged to be incomplete but still used to calculate proportional effects.

Assessing effects as a proportion of total catchment wetland extent is fundamentally inconsistent with accepted ecological assessment practice, which considers effects at the scale of the affected wetland system and its functions. The loss of a wetland does not become ecologically insignificant simply because it represents a small proportion of the catchment wetland resource.

2.3.4. MAGNITUDE OF EFFECTS

The FER states (p 16)
I have assessed the magnitude of an effect based on:
• a proportional consideration of the amount of resource impacted / removed from the system at a relevant (catchment) spatial scale; and / or
• the temporal extent of an impact (i.e. is it a temporary and recovered condition, or a permanent condition or for how long the temporal process lasts (e.g. will it stop fish migration for a season or more, will the wetland be dry for a month then rehydrate and recover its wetland species).

Again the method for determining magnitude relies on the proportion affected at a catchment scale. This approach is inconsistent with EIANZ (2018), which recommends assessment at the scale of the affected ecological feature. The magnitude of an effect is not determined solely by the proportion of a catchment resource affected, as relatively small areas can support important ecological functions, habitat values, or ecosystem processes.

2.3.5. METHODOLOGY FOR DETERMINING MAGNITUDE OF EFFECTS ON STREAMS

The proposition that site or reach scale assessment has *no ecological meaning* (FER PG. 16) is not supported by EIANZ (2018) or standard freshwater ecology. Freshwater systems are explicitly hierarchical, with ecological values and processes expressed at multiple spatial scales. Important ecological features such as spawning habitat, critical source areas; wetlands, spring systems, and habitat patches are routinely defined and assessed at site or reach scale.

The FER assertion (PG. 16) that site-scale assessment *will always result in a high magnitude of effect* is methodologically incorrect. Magnitude is not a function of spatial scale but of the severity, extent, duration, and reversibility of change relative to the affected ecological

feature. Aggregating effects to catchment scale simply redistributes and dilutes localised effects within a large, heterogeneous resource base.

Reliance on *EIANZ (2018) Section 6.3.1* is also misapplied. The guideline refers to assessment at the scale of the ecological feature (e.g. wetland system, dune system, forest community), not the hydrological catchment. A catchment is not an ecological feature; it is a spatial container comprising multiple distinct ecological units with differing values and sensitivities.

The proposition that effects to parts of a river are adequately r*eflected in catchment health and condition* is an unsupported generalisation. Many ecological values—particularly threatened species habitat, spawning areas, wetlands, and spring-fed systems—are spatially discrete and can be significantly affected by localised impacts that are not represented at catchment scale.
The proposed catchment-only framework conflates hydrological connectivity with ecological equivalence. While catchment context is relevant for cumulative effects, it does not replace assessment at the scale of the ecological feature affected, which is the standard articulated in EIANZ (2018).

The FER applies a subjective banding system to determine magnitude of effects based on the proportion of catchment area affected (<1% negligible, 1–10% low, 10–25% moderate, 25–50% high, >50% very high). However, no primary reference or methodology is provided as justification. They are not derived from EIANZ (2018) or any other recognised ecological impact assessment framework.

The FER use of the proposed fixed percentage bands introduces false precision, assuming a linear relationship between proportion of catchment stream length affected and ecological impact to determine magnitude. This is not consistent with EIANZ (2018), which does not prescribe universal numeric thresholds for ecological impact. Small proportional losses can represent high magnitude effects where important habitats or functions are affected, misrepresenting actual ecological significance.

2.3.6. METHODOLOGY FOR DETERMINING MAGNITUDE OF EFFECTS ON WETLANDS

The FER applies the same fixed percentage banding system to wetland magnitude of effects assessment, again assuming a direct relationship between percentage area loss and ecological effect.

While a reduced denominator may increase calculated proportions, this is a mathematical artefact and does not address the core issue that the underlying methodological flaw –the total resource base against which loss is being measured is unreliable.

Reliance on an incomplete inventory risks understating the significance of additional wetland removal, particularly in modified landscapes such as Waipū, where historic wetland loss is substantial. This is contrary to *NPS-FM Policy 6* avoidance of further loss - absolute loss not proportional normalisation against an incomplete dataset.

2.3.7. OVERALL LEVEL OF EFFECTS

The FER introduces the standard final table in the EIANZ methodology and declares

This framework recommends assigning ecological values and the magnitude of effect of a proposal in order to determine the overall effects in a consistent and transparent way (as shown in Table 3). However, sound professional judgement is required when applying the framework and undertaking the assessment.

While the framework is described as providing a consistent and transparent method for assigning ecological values and determining magnitude of effect, the FER application in this case does not demonstrate the transparency or reproducibility required for that approach to be meaningfully applied. The EIANZ framework explicitly relies on professional judgement, but that judgement must be underpinned by clear, documented methods, traceable data sources, and replicable reasoning. In this instance, the absence of full methodological detail, combined with repeated modification of standard approaches, lack of available workings, and demonstrated omissions in the underlying resource base, means the exercise cannot be independently verified.

In these circumstances, it is difficult to reconcile reliance on the EIANZ framework with the extent to which *professional judgement* has effectively become the primary determinant of outcomes, without sufficient transparency as to how that judgement has been applied. This undermines the stated intent of the framework, which is to ensure consistent and defensible assessment rather than outcome-driven interpretation.

2.4. CHANGES TO THE ALIGNMENT WITHIN THE PROPOSED DESIGNATION

This section of the FER clarifies that the -*Indicative Alignment within the Proposed Designation represents a possible alignment which has been developed for assessment purposes and to illustrate what the Project's final design might look like, and the effects generated by its construction and operation. The alignment that gets built including the design and placement of bridges, culverts, stormwater systems, soil disposal areas and landscaping, will be refined and confirmed during the detailed design stage*. *As a result, this assessment considers the effects of the Indicative Alignment and then goes on to provide sensitivity testing for changes to the alignment within the Proposed Designation. The recommended mitigation is intended to ensure effects on the environment are adequately avoided, remedied or mitigated, regardless of the final design and construction methodology for the Project*.

This a standard statement common to the NZT A consultant reporting, reflecting the use of an indicative alignment pending detailed design, whereby effects are assessed against a representative corridor rather than a fixed final design. It effectively allows works anywhere within the boundaries, including enabling or temporary works.

3. EXISTING ENVIRONMENT

3.1. WETLANDS

The FER states it has determined

25 wetlands within the Proposed Designation identified in Appendices A and B meet the definition of 'natural inland wetland' under the NPS-FM and the definitions of wetland, natural wetland, and natural inland wetland under the RPN. Overall, 22 of these natural inland wetlands are predominantly pastural (exotic) wet features, with a small suite of common exotic wetland species not recognised as pasture, and a few native wetland species.

We reiterate that exotic-dominated wetland systems in pastoral landscapes that meet the definition of a *natural inland wetland* are exactly that and a reductionist label of cannot be wet features is not a valid reclassification on the basis of exotic dominance.

There are a range of wet species the Clarkson 2021 pasture lists (relevant under both the NPS-FM and the RPN) do not recognise as pasture.

We presume the author is referring to the *Cosgrove et al (2022) National list of exotic pasture species*[49] in the *NPS-FM Natural Inland Wetland definition pastoral exclusion clause (e) (i) & (ii).* This only applies while a site is in active pastoral use, and not once its purpose changes[50]. *Exotic pasture species* as per definition do not include common wetland/ wet pasture grasses *Glyceria**; *Paspalum distichum* (FACW), Isachne globosa* (OBL); *Alopecaurus geniculatus (FACW)* and *Agrostis stolonifera* (FACW*) or unpalatable exotics such as innocuous *Ranunculus repens* (FAC).*

In grazed areas as typical in the Waipū ED the influence of stock access switches *wetland* composition to a reduced pastoral character that often is dominated by wetland grasses, herbaceous species such as *Ranunculus repens & R. amphitrichus* (unpalatable to stock); *Leotondon saxitilis* (prostrate rosette) with small *Isolepsis* species as turf and algae from nutrient enrichment. Typical prostrate annual and stoloniferous species have a higher persistence and may respond positively as grazer selectivity may lead to the removal or reduction of competing palatable species. Taller species are more apparent to stock and also slower to replace lost tissue, declining in biomass *(Machaerina; Juncus).* Pugging/ trampling is an accompanying effect on saturated ground or within shallow water. Stoloniferous and seral weedy species able to recover faster.

As a result, no feature could be excluded as wet pasture (or damp gully head). Some features could be excluded as wet pasture with patches of rushes; I did not exclude the larger areas of such features.

In terms of the applicable definitions, the NPS-FM as the more stringent in this regard takes precedent over the NRP. In practice, experienced practitioners would not extend wetland mapping to include isolated occurrences of rushes within pasture, consistent with the intent to exclude incidental vegetation such as small *Juncus* clumps in otherwise grazed land. However, the FER does not establish a threshold or definition of *larger*.

[49] Cosgrove G, Dodd M, James T. 2022. National list of exotic pasture species. Prepared for the Ministry for the Environment by AgResearch Ltd. Wellington: Ministry for the Environment.

[50] *"This exclusion is not targeted at pasture being targeted for urban development or for other land uses. It does not apply to wetlands in other areas of grassland that are not grazed, such as in parklands, golfcourses, landscaped areas and areas of farmland not used for grazing purposes".* MfE (December 2022) Pasture Exclusion Assessment Methodology *Pg 9*

While indigenous wetlands are underrepresented in the Waipū and Otamatea Ecological Districts and wider Northland region, predominantly pastural (exotic) wet features are common and are not underrepresented and do not reflect indigenous dominated assemblages.

If it is in fact referring to exotic dominated *natural inland wetland* (sic pastural exotic wet features) then the statement that they are common and not underrepresented is asserted rather than demonstrated, with no landscape scale quantum provided.
It uses exotic dominance for disqualifying wetlands rather than recognizing their character is indicative of the systemic wetland modification and fragmentation in Waipū ED.
Representativeness in ecological assessment is the extent to which indigenous biodiversity is typical of the natural diversity of the relevant ED[51]*.*

The indigenous component of sedges, rushes and herbs supported in these exotic dominated associations is typical of the remnant indigenous wetland expression and their protection is a high priority as a contribution to maintaining indigenous biodiversity in the heavily modified landscape. Indigenous species are commonly *Juncus australis (FACW); Juncus edgariae (FACW) in our opinion the common Juncus in Northland pastoral landscapes; weedy grass leaved Juncus prismatocarpus (FACW) & Juncus planifolius (FACW) ; Juncus pallidus (FACW) frequent Isolepis prolifer (OBL) & I. reticularis (FACW);Eleocharis acuta (OBL); Isachne globosa(OBL) often associated in a matrix with exotic FACW Paspalum distichum or Agrostis stolonifera; unpalatable Cyperus ustulatus (FACW), Persicaria decipiens (OBL), Ranunculus amphitrichus (OBL) & waoriki Ranunculus glabrifolius (OBL); Centella uniflora (FACW); Gratiola sexdentata (FACW) Callitriche muelleri (FACW); tarawera Epilobium pallidiflorum (FACW)*

The importance of recognising the *commonplace* is emphasised within the key criterion of representativeness, in contrast to the historically narrow focus of 'best examples' or rarity assessments.

The FER goes on to assert-

Accordingly, they do not trigger the representativeness or rarity aspects, nor the diversity and pattern or ecological context criteria of the RPSN

We disagree. In the RPS (2018) Appendix 5 criteria for *Representativeness*, requiring wetland to have an indigenous component typical of what they were before 1840 would set a ridiculously inappropriately high threshold for nearly all wetlands in the ED, including parts of the top rated Waipū swamp *Doctors Hill Wetland* which has a large component of reed sweetgrass (Glyceria maxima), an exotic environmental weed[52]. However, modified exotic dominant wetlands are captured under Appendix 5(1)(B)(ii).

Appendix 5 *Rarity/ Distinctiveness criteria* naturally uncommon ecosystem criteria reference two papers specifically Williams et al. (2007)[53] for ecosystem typology + Holdaway et al. (2012) [54] for threat status. Naturally rare ephemeral wetlands with seasonally high water tables

[51] Davis, M., et al. (2018). Department of Conservation guidelines for assessing significant ecological values. Science for Conservation 327. Department of Conservation, Wellington
[52] McAlpine, K.G. & Howell, C.J. (2024). *List of environmental weeds in New Zealand 2024*. Science for Conservation 340. Department of Conservation, Wellington.
[53] Williams, P.A., Wiser, S.K., Clarkson, B.R. & Stanley, M.C. (2007). *New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework*. New Zealand Journal of Ecology,
[54] Holdaway, R.J., Wiser, S.K. & Williams, P.A. (2012). *Status assessment of New Zealand's naturally uncommon ecosystems*. Conservation Biology, 26(4), 619–629.

throughout are *Critically Endangered* nationally & seepage/ flush systems such as on the project *Waipū North* site are *Endangered.* All OBL & FACW indigenous wetland vegetation is of a restricted occurrence as it needs habitat with wetland hydrology to persist, unlikely to be found in non wetland environments. They fulfil many aspects of the (4) *Ecological Context* criteria in addition to *(3)(b)Diversity And Pattern* reflecting changes in composition between terrestrial and freshwater environments and within the wetland itself.

TABLE 11: RPS APPENDIX 5 CRITERIA AS THEY RELATE TO EXOTIC DOMINANT WETLANDS TYPUCAL OF WAIPŪ ED

(1)REPRESENTATIVENESS **(A)**Regardless of its size, the ecological site is largely indigenous vegetation or habitat that is representative , typical and characteristic of the natural diversity at the relevant and recognised ecological classification and scale to which the ecological site belongs (i) if the ecological site comprises largely indigenous vegetation types: and (ii) Is typical of what would have existed circa 1840 (iii)Is represented by the faunal assemblages in most of the guilds expected for the habitat type **(B) The ecological site** (i) Is a large example of indigenous vegetation or habitat of indigenous fauna **(ii) Contains a combination of landform and indigenous vegetation and habitats of indigenous fauna that is considered to be a good example of its type at the relevant and recognised ecological classification and scale**	**NATURAL INLAND WETLAND** *B(ii) in the Waipū ED* ***landform is*** *lowland and rolling hill country* ***indigenous vegetation*** *is all contributing indigenous rush, sedge and herbaceous species;* ***indigenous fauna*** *are microfauna and meiofauna (e.g., nematodes, earthworms) as well as macroinvertebrates at minimum as established in published Mfe advice*[55] ***recognised ecological classification*** *is natural inland wetland , not pastoral wet patches or exotic wet features.* ***Scale*** *is the Waipū ED* *Good examples are those that remain and are delineatable as natural inland wetland*
(2)RARITY/ DISTINCTIVENESS (A)The ecological site comprises indigenous ecosystems or indigenous vegetation types that: (i) Are acutely or chronically threatened land environments associated with LENZ Level 4 (ii) Excluding wetlands, are now less than 20% original extent (iii) excluding man made wetlands are examples of wetland classes that either otherwise trigger Appendix 5 criteria or exceed any of the following area threshold (a) Saltmarsh 0.5ha (b) Shallow water lake margins and rivers 0.5ha (c) Swamp >0.4 (d) Bog >0.2 ha (e) Wet heathlands>0.2 ha (f) Marsh; fen; ephemeral wetland or seepage/flush >0.05ha (B) Indigenous vegetation or habitat of indigenous fauna that supports one or more indigenous taxa that are threatened, at risk, data deficient , or uncommon either nationally or within the relevant ecological scale (C) The ecological site contains indigenous vegetation or an indigenous taxon that is (iii) endemic to the Northland/ Auckland region (iv) At its distribution limit in the Northland region (D) The ecological site **contains indigenous vegetation** or an association of indigenous taxa that **(i) Is distinctive of a restricted occurrence** **(ii) Is part of an ecological unit that occurs on a originally rare ecosystem** (iii) Is an indigenous ecosystem and vegetation type that is naturally rare or has developed as a result of an unusual environmental factor(s) that occur or are likely to occur in Northland:	(D) (i) indigenous OBL & FACW wetland species (ii)Naturally rare as per Ephemeral wetlands with seasonally high water table/depression are Critically Endangered Nationally & Seepage/ flush systems are Endangered[56]
(3)DIVERSITY AND PATTERN (A) Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of: (i) Indigenous ecosystem or habitat types; or (ii) Indigenous taxa (B) **Changes in taxon composition reflecting the existence of** diverse natural features **or ecological gradients**; or (C) Intact ecological sequences	(B) Between terrestrial surroundings - freshwater environment Even within a small wetland species will partition the niche according to microhabitat saturation; depth, shade both abiotic and interspecific; flow; substrate. C) e.g. Waipū North Rolling hill country spring- seepage/ flush ephemeral wetland- creek-river
(4) ECOLOGICAL CONTEXT (D) Indigenous vegetation or habitat of indigenous fauna is present that provides or contributes to an important ecological linkage or network, or provides an important buffering function: or (E) The ecological site plays an important hydrological, biological or ecological role in the	(D) all indigenous species within the wetland contribute to the buffering of the downstream receiving environment (E) wetland as an ecological site often combined with even seral riparian vegetation or rank grass contributes more so than in the event of its absence or removal to the natural

[55] MfE (2024). *Expert statement: Wetland delineation protocols and animals adapted to wet conditions*. Wellington: Ministry for the Environment (ME 1863).

[56] Holdaway, R.J., Wiser, S.K. & Williams, P.A. (2012). *Status assessment of New Zealand's naturally uncommon ecosystems*. Conservation Biology, 26(4), 619–629.

	natural functioning of a riverine, lacustrine, palustrine, estuarine, plutonic(including karst), geothermal or marine system	functioning of downstream riverine systems or larger palustrine wetland system
(F)	The ecological site is an important habitat for critical life history stages of indigenous fauna including breeding/ spawning, roosting, nesting, resting, feeding, moulting, refugia or migration staging point (as used seasonally, temporarily or permanently	(F) As per MFE recent advice note, and also terrestrial fauna provides landscape territorial heterogeneity for foraging and reliable moist soils or water source. May contain freshwater fish, even seasonally or after flushes; foraging for wetland species fernbird and wider bittern landscape use

Overall, the logic substitutes compositional purity for ecological assessment, and in doing so risks under-recognising functionally important but modified wetland systems.

We have additionally mapped further natural inland wetlands we determined through our use of the Rapid Habitat assessment methodology and own professional experience refer our Appendix C.

3.1.1. CONDITION AND VALUES OF EXOTIC PASTURE WETLANDS

This section is without merit. It seeks to diminish the value of natural inland wetlands on the basis of exotic dominance and, astoundingly, an asserted lack of visually observable differences in plant composition, soil chemistry, or plant ecophysiology distinguishing wetlands from adjacent pasture. Such reasoning is contrary to the fundamental principles by which natural inland wetlands are identified and protected, which recognise that wetland function is determined by hydrology, soils, and ecological processes, not solely by vegetation composition or visual distinctiveness.

The argument relies heavily on a smattering of obscure, dated papers, with no apparent relevance to the wetland systems under consideration. As presented, the section advances an outdated construct that is inconsistent with contemporary freshwater science, wetland ecology, and current policy frameworks.

It claims *I conclude that those natural inland wetlands I class as exotic pasture wetlands are insufficiently different in functions from the surrounding pasture as to allocate a hydrological functioning value to them.*

This conclusion is fundamentally at odds with both wetland science and the policy framework that underpins the identification and protection of natural inland wetlands. Natural inland wetlands are defined by the presence of wetland hydrology, hydric soils, and wetland ecological characteristics that distinguish them from the surrounding terrestrial environment. To conclude that they are “insufficiently different in functions from the surrounding pasture” effectively dismisses the very attributes that led to their identification as natural inland wetlands in the first instance.

The reasoning is circular. The wetlands are acknowledged as natural inland wetlands, yet are then denied hydrological value on the basis that they function similarly to adjacent pasture. If that were genuinely the case, they would not meet the criteria of a natural inland wetland. The protection afforded to wetlands under the NPS-FM and NES-F is founded on the recognition that they perform hydrological and ecological functions distinct from surrounding uplands, irrespective of whether they are dominated by indigenous or exotic vegetation. It in effect attempts to reverses the logic of the legislation: **natural inland wetlands are protected because they possess hydrological functions not present in surrounding pasture. Claiming**

they have no hydrological functioning value because they resemble pasture is contrary to the basis on which they are recognised and protected.

We are not aware of any peer-reviewed, published work by the author that would substantiate this position. In the absence of such evidential support, reliance on established, current scientific doctrine and statutory freshwater management frameworks is more appropriate.

The FER also introduces a new novel construct that appears to discount the value of natural inland wetlands on the basis of a speculative reconstruction of the pre-clearance Waipū lowland and rolling hillscape. This interpretation is not grounded in site-specific reference conditions, particularly given the limited remaining indigenous cover available for meaningful local comparison, and instead relies on an inferred historical landscape state that cannot be robustly substantiated for the subject area.

It attempts to characterise pastoral natural inland wetlands as *induced* purely on the basis of post-colonial clearance is not supported by ecological or hydrological evidence. It conflates vegetation modification with wetland genesis and incorrectly implies that wetland presence is contingent on intact forest cover rather than underlying hydrogeomorphic controls.

In forested catchments, wetlands would have occupied the same landscape positions as today, being governed by groundwater expression, impeded drainage, and catchment hydrology. While clearance has substantially altered vegetation structure and species composition, it does not negate the pre-existing wetland-forming processes.

Pre-clearance vegetation would have included a different assemblage, including ferns, *Carex*, *Cyperus*, and a broader suite of shade-tolerant hygrophytic herbs. Post-clearance conditions have shifted communities toward grazing-tolerant, low-stature, open assemblages, driven by increased light availability, nutrient enrichment, seed limitation, and sustained herbivory. However, this represents a change in ecological expression, not the creation of a new wetland system.

Hydrologically constrained conditions would still have excluded most forest-interior species, except obligate or facultative wetland taxa such as kahikatea (*Dacrycarpus dacrydioides*, OBL), swamp maire (*Syzygium maire*, OBL), and pukatea (*Laurelia novae-zelandiae*, FAC), which themselves indicate long-standing wetland hydrology independent of land clearance history

Accordingly, the assertion that pastoral natural inland wetlands are inherently “induced” due to post-colonial modification is ecologically reductive and fails to distinguish between **hydrological origin (wetland formation)** and **vegetation trajectory (post-disturbance composition)**. The weight of ecological evidence supports the interpretation that these are **modified but naturally occurring wetlands**, not anthropogenically created systems.

3.1.3. SUMMARY OF CONDITION AND VALUES OF NATURAL INLAND WETLANDS

The unsubstantiated opinions advanced in Sections 3.1 and 3.2 are then carried forward into the assessment framework, enabling the author to assign, with the exception of Wetland 8, all wetlands within the Designation in the Waihoihoi and Ahuroa catchments ratings of Negligible, Very Low, or Low value in Table 4. These conclusions are predicated on the assumptions

established in the preceding sections rather than on a robust evaluation of the wetlands' hydrological, ecological, and landscape functions. Consequently, the value ratings presented in Table 4 are only as reliable as the underlying premises, many of which have not been adequately substantiated and are inconsistent with contemporary wetland science and policy.

We note that again the *NPS-FM Ecosystem Health* Appendix value has a range of contributing factors as below.

(i) ECOSYSTEM HEALTH

5 biophysical components -

- *Water quality – the physical and chemical measures of the water, such as temperature, dissolved oxygen, pH, suspended sediment, nutrients and toxicants*
- *Water quantity – the extent and variability in the level or flow of water*
- *Habitat – the physical form, structure, and extent of the water body, its bed, banks and margins; its riparian vegetation; and its connections to the floodplain and to groundwater*
- *Aquatic life – the abundance and diversity of biota including microbes, invertebrates, plants, fish and birds*
- *Ecological processes – the interactions among biota and their physical and chemical environment such as primary production, decomposition, nutrient cycling and trophic connectivity.*

We reiterate that NPS-FM values are not a scoring framework, but to direct consideration of elements for maintenance, protection, and restoration in accordance with Policy 6. The FER assessment appears to have treated these values as though they are directly translatable into a quantitative scoring system. This represents a methodological mismatch between the intent of the NPS-FM framework and the approach adopted in the assessment.

Nevertheless in term of the *Ecosystem Health* value at a minimum we do not consider the FER has considered the refined aspects in the attribution of its scoring. We note that the ratings labels are entirely subjective tiers not referenced in any assessment.

Further unreliability is apparent through consideration of the FER Table 4 below:

FIG 11: FER TABLE 4 WETLAND VALUE SUMMARY AHUROA & WAIHOIHOI

Table 4: Summary of the condition and values of natural inland wetlands within the Proposed Designation

Wetland # (map label)	Wetland Type	Indigenous biodiversity	Ecosystem health	Hydrological function	Value
Ahuroa Catchment					
1	Creeping butter cup drainage	Negligible	Poor	Negligible	Negligible
19	Creeping butter cup		Poor	Negligible	Negligible
Waihoihoi Catchment					
2	Exotic dominated: purslane, water pepper & rushes	Low	Poor	Low	Low
3	Juncus, creeping bent, buttercup	Negligible	Poor	Negligible	Negligible
4	Juncus, buttercup, creeping bent	Negligible	Poor	Negligible	Negligible
5	Juncus, creeping butter cup	Negligible	Poor	Negligible	Negligible
6	Juncus, creeping butter cup	Negligible	Poor	Negligible	Negligible
7	Juncus, Isolepis, Creeping butter cup	Negligible	Poor	Negligible	Low
8	Raupō, Isolepis, water purslane, Juncus	High	Moderate	High	High
9	Juncus, Isolepis, Creeping butter cup	Negligible	Poor	Negligible	Negligible
10	Juncus, Isolepis, Creeping butter cup	Negligible	Poor	Negligible	Negligible
11	Juncus, creeping buttercup, creeping bent, Gylceria.	Negligible	Poor	Negligible	Negligible
12	Kahikatea with creeping bent, Gylceria, water pepper, creeping buttercup.	Negligible	Poor	Negligible	Low
13	Juncus, creeping butter cup, creeping bent.	Negligible	Poor	Negligible	Low
14	Wet pasture with Juncus and creeping bent	Negligible	Poor	Negligible	Negligible
15	Wet pasture with Juncus and creeping bent	Negligible	Poor	Negligible	Negligible
16	Lower, juncus, Gylceria, creeping bent, upper wet pasture, mid - raupō, kiekie, sedges	Low	Mostly poor, centrally some moderate condition	Negligible	Mostly low, but a central 1/3rd is of High value.
17	Headwater small Isolepis and creeping butter cup	Negligible	Poor	Negligible	Negligible
18	Headwater small Isolepis and creeping butter cup	Negligible	Poor	Negligible	Negligible

- We are unclear which is worse on the FER scale - a Poor rating or a Low rating
- We are skeptical of the exotic dominance label
    - The *Juncus* species are not described. In our own experience the dominant species were in fact indigenous with the exception of *Juncus effusus*, comprised of *Juncus australis (FACW); Juncus edgariae (FACW)* in our opinion the common *Juncus* in Northland pastoral landscapes; scattered *J.planifolius* (FACW) &; *J. pallidus* (FACW).
    - Isolepis prolifera as frequent throughout the wetlands is native
    - Buttercups is a genus term that includes native wetland species
    - Water pepper is also used to describe the indigenous species *Persicaria decipiens* which from our experience was present onsite.
    - swamp millet (*Isachne globosa* OBL) was present at minimum in wetlands FER 8; 12;13; 14;16
- We note wetlands such as 14 and 15 are close ecological units linked by flow and should be assessed as such.
- The separation of Wetland 16 into distinct parts is an artificial deconstruction of a single close ecological unit and creates an impression of reduced value. Rating individual portions lower is inappropriate and does not reflect the ecological reality of the site.
- Wetland 18 is a spring with natural wetland vegetation and so has additional hydrological importance.
- We are unclear what is meant by the phrase *wet pasture* in wetlands 14; 15; 16.
    - A wetland in a development footprint that requires stock removal is no longer subject to the pastoral exclusion clause and its current use for grazing is irrelevant to its status as a *natural inland wetland.*

    - A natural inland wetland does not cease to be such because it is dominated by exotic wetland grasses or utilised for grazing.
    - A wetland required to be removed from grazing due to Regional Plan stock exclusion regulations as per Wetland is also not subject to the pastoral exclusion clause as priority in this project i.e. Wetland 16 lowland natural inland wetland >500m^2 was subject to stock exclusion by the 1st January 2025 as was the stream.
- Wetland containing kahikatea (Wetland 12 in FER Table 4, but also 16) is regionally rare ecosystem type representing WF8 Kahikatea swamp forest association or remnant of and a *Negligible* biodiversity value is highly inappropriate
- Biodiversity consideration does not include fish present, regardless of as passage, birds e.g. fernbird Waipū North & pipit throughout or surrounding vegetation e.g. kahikatea Wetland 12
- the entire North South and Murray Tributaries join at Wetland 13 before joining the mainstem of the Waihoihoi. Wetland 16 is the conduit further upstream for the Waipū South and Murray Tributaries. Wetland 13 and 16 and the streams within are therefore ecological bottle necks in terms of both hydrological parameters; indigenous biodiversity and ecosystem health as per NPS-FM values including as vital fish passage. However, the FER assigns them Poor & Mostly Poor Ecosystem Health which includes , Negligible Hydrological Function value, Negligible & Poor Indigenous Biodiversity

3.2. STREAMS

The FER tabulates extent of perennial and intermittent streams within the Proposed Designation based on their methodology.

FIG 13: FER STREAM LENGTH INTERSECTED BY THE DESIGNATION

Table 5: Streams within the catchments intersected by the Proposed Designation for the Project

Catchment	Perennial (km)	Intermittent (km)	Total (km)
Ahuroa	109.93	235.35	638.05
Pukekaroro	51.19	106.88	318.32
Waihoihoi	85.51	178.99	508.78
Wairau	45.72	66.06	222.22
Total	292.35	587.29	1687.36

However, as previously demonstrated, the stream classification and the illustrative maps in Appendix C are unreliable . Several stream reaches have been misclassified or omitted entirely, and spring-fed reaches have been incorrectly identified as rain-fed. Multiple reaches that exhibit intermittent or permanent flow characteristics have been classified as ephemeral, thereby reducing the assessed extent of stream loss and modification. In light of these errors, the classification of reaches identified as intermittent cannot be accepted with confidence, and some may in fact be permanent streams.

We have discussed the level of survey effort along with the mapping methodology in the Sec 2.2.4 Streams Field Assessment review. In the current section the FER continues with ambiguous and unsubstantiated statements as to the level of survey undertaken.

Detailed surveys were undertaken at the following streams (which are impacted by the Indicative Alignment; intermittent or perennial and indicative of the better stream values in the Proposed Designation) numbered 1-12 in Appendix C.

They are not numbered or illustrated in the maps in FER Appendix C Maps of Streams Identified. The limited number of sites is shown in Fig 5. These maps are also highly clipped and do not allow simple consideration of catchment connectivity e.g. the Waipū North & South catchments through Wetland 13 and their combined values, which in regard to rivers are the same under the NPS-FM ***Policy 7:*** *The loss of river extent and values is avoided to the extent practicable.*

In the Ahuroa catchment, the Piroa stream and two tributaries, east and western, and two pine tributaries, (middle and northern). ***There are a range of short intermittent sections of tributaries that may be in spoil sites or dewatering zones that have not been surveyed but based on my field observations I consider they have lower values than the streams surveyed in detail.***

On one hand, here and in Sec 2.2.4 it states that all reaches have been comprehensively surveyed and assessed in detail. On the other, it acknowledges that certain reaches were not directly surveyed, does not provide a reason why yet asserts that these unsurveyed reaches are likely to be of lower value based on observations made elsewhere in the absence of the author, by the WSP field team. We note there are no SEV; RHA & eDNA points on the lower

Ahuroa flats that forms the Designations western boundary. Its differentiation into multiple NZSegs demonstrates its variation along its total length.

• *In the Waihoihoi catchment, the northern and southern Waipū station tributaries and the Waihoihoi River. Again, there is at least one smaller tributary and a range of intermittent reaches that were not surveyed but based on my field observations I consider they are of lesser value than those streams surveyed in detail.*

This reasoning is circular. The conclusion that unsurveyed reaches are unlikely to contain higher values is used to justify the absence of detailed survey effort, yet that conclusion itself is derived from the limited survey effort undertaken.

Field observations were made at all other streams within the Proposed Designation to identify any streams with potential to have better condition or higher values.

The author has already stated that all ephemeral reaches were discounted at the offset. These have been demonstrated not to be ephemeral by myself and the WSP team rendering this statement factually incorrect. The FER detailed surveys were focused on the eDNA points which coincided with the SEV calculation and the RHA assessments in the Waihoihoi, and were conducted in the absence of the author . The Waihoihoi Main Stem site was not representative of the wider Waihoihoi awa. For example, shortly beyond the eDNA, SEV and RHA assessment location, the stream transitions from a slow-flowing, deep, woody debris-dominated oxbow reach to a channel characterised by a rockier substrate, exposed bedrock shelves, and greater hydraulic diversity. These features provide a markedly different habitat setting and demonstrate substantial within-stream variation.
I am confident that they share the same values, fauna and condition as those surveyed and that there are no missed good value aquatic habitats or habitats that are not represented by the focused stream study areas.

We question the use of the term *good value aquatic habitat*, as habitat value is inherently species-dependent. Habitat characteristics that are of limited value to one species may be of high value to another, particularly where different species have distinct requirements for spawning, feeding, refuge, migration.

While additional reaches were visually inspected during walk-through surveys undertaken by the WSP team, no detailed habitat assessments were conducted in our presence.

Consequently, it is unclear whether the full range of habitat conditions present within the Waihoihoi Stream has been adequately characterised by the assessment.
We note that all waterways in the Designation may be directly or indirectly impacted by the proposal as per the statement in *SEC 2.4 CHANGES TO THE ALIGNMENT IN THE DESIGNATION.*

The FER states
Most of the Indicative Alignment intersects with small headwater tributaries and upper reaches of those tributaries and are typically around 1m in width. The Proposed Designation includes (and in some cases the Indicative Alignment intersects with) some lower catchment larger streams that have a wetted width over 2 m (such as the Waihoihoi main stem),

Without having taken stream width measurements throughout s , a waterway of 1 m width or less can generally be stepped across with minimal effort, while channels approaching 2m in

width typically require a bit more of a jump. Based on our field observations and experience within the Waipū North, Waipū South, and Waihoihoi catchments, the majority of mapped reaches in these systems exceed 1m in width. In particular, the Waihoihoi Stream is observed to be predominantly considerably greater than 2m wide throughout its extent, supported by NIWA Predicted Wetted Width mapping[57]. These observations challenge the implied assumption that the stream network is predominantly comprised of narrow ephemeral, readily culvertable channels, and indicate that a substantial proportion warrants recognition of greater hydrological significance.

3.2.1. WATER QUALITY

The FER references the *Waipū Catchment Water Quality Report 2007-2011* (Ballinger 2012)[58]. This presents the results of twelve water quality indicators - total nitrogen, ammoniacal nitrogen, total phosphorus, bacteria, water clarity, suspended sediments, turbidity, dissolved oxygen, pH, water temperature and conductivity. It found that overall the Waipū Catchment is *heavily impacted and fails to meet the majority of relevant guidelines* at the time with Total nitrogen (TN), Total phosphorus (TP), and E.coli were all consistently in exceedance. Results and trends were common to expectations and other highly modified catchments in Northland and nationally –

- Overall, results were similar to other highly modified catchments in Northland e.g. Lower Awanui, Mangere, Mangonui Rivers
- wetter months of winter and spring generally having poorer water quality due to increased runoff
- upstream sites were slightly better than downstream site
- Dissolved oxygen Dissolved oxygen concentrations across the Waipū Catchment were generally poor, with most monitoring sites failing to meet the ANZECC guideline range of 98–105% saturation

The FER does not convey that the Waiohoihoi and Ahuroa tributaries were identified as the best-performing tributaries within the Waipū River catchment.

Oxygen conditions generally declined downstream in both tributaries, consistent with increasing nutrient enrichment, reduced riparian shading, aquatic plant growth and lower stream turbulence. The report notes that monthly daytime sampling likely underestimated the full diurnal variability of dissolved oxygen and acknowledges that the ANZECC guideline range is difficult to apply as measured using monthly spot measurements The relative differences between sites (particularly the stronger performance of upper Ahuroa and upper Waihoihoi) are generally more informative than the absolute compliance percentages The best oxygen conditions occurred in the upper Ahuroa River (Durham Road), which achieved 29% compliance, while the upper Waihoihoi River (St Marys Road) recorded relatively high median oxygen saturation (90.2%) but still failed to consistently meet guideline values. Despite having the best water clarity and relatively good nitrogen and E. coli performance, the Waihoihoi still exhibited depressed oxygen concentrations. While the Ahuroa and Waihoihoi often appeared to "fail" the ANZECC saturation guideline many of those same measurements would likely still comply with the PRP ecosystem health standard of **minimum DO >4–5 mg/L**, particularly at the upper Ahuroa and upper Waihoihoi sites. Therefore, Ballinger's conclusions regarding poor

[57] https://shiny.niwa.co.nz/nzrivermaps/
[58] Ballinger, John (2012) *Waipū Catchment Water Quality 2007-2011*. Technical Report. Northland Regional Council, p. 42.

compliance should not be directly interpreted as failure against current PRP ecosystem health standard.

Turbidity levels throughout the Waipū Catchment were generally low, with most sites consistently complying with the ANZECC guideline of <5 NTU. The Ahuroa and Waihoihoi Rivers were among the best-performing tributaries, exhibiting median turbidity values typically between 1.5 and 2.5 NTU and near-complete guideline compliance. These results indicate good water clarity and relatively low suspended sediment loads. While turbidity increased slightly downstream in both tributaries, values remained substantially lower than those observed in more degraded catchment areas such as the Waionehu and Pohuenui sub-catchments.The Waihoihoi consistently exhibited excellent water clarity. The upper St Marys Road site was among the clearest sites monitored in the entire catchment. Although turbidity increased slightly downstream, values remained very low and indicative of limited suspended sediment inputs.

All Ahuroa sites demonstrated very low turbidity and excellent compliance. A slight increase in turbidity occurred downstream, but values remained well within guideline levels. During recent review of the Ahuroa Water Treatment Plant Discharges, we found similarily that peaks in turbidity and suspended solids at NRC Braighs Flat monitoring site were short term and associated with rain events. The ANZECC turbidity (2018) guideline value for NZ REC WW/L rivers is 5.2 NTU and the reach median was predicted**Error! Bookmark not defined.** at 5 .85NTU. This level is considered sufficient to safeguard benthic invertebrate communities and to prevent modification to broad fish habitats by siltation. Long-term exposure to sublethal turbidities may affect fish behaviour and reduce their populations. TSS median values of 8.95g/m^3 for the Ahuroa at Braighs Flat and within 1.6km downstream at the Millbrook Road Bridge median 8.0g/m^3 are aligned with the ANZECC DGV of 8.8mg/L 80%[59] for REC class WW/L. It is presumed that a test site for which the median of a series of measurements of water quality is below the trigger value has a low risk of environmental impairment[60]. Banded kōkopu as the most sensitive fish species display feeding disruption and avoidance beyond 17 NTU[61].

Low TP compliance rate is partly due to Northland's phosphorus rich sandstone and mudstone catchment geology which provides a high background level of phosphorus to streams naturally, with only two regional sites having 100% compliance with the guideline
Consequently, turbidity and suspended sediment do not appear to be primary water quality stressors within the Ahuroa or Waihoihoi catchment
Comparison with current Proposed Regional Plan Table 22 ***Water quality standards for ecosystem health in rivers*** indicates that most measured parameters would likely comply, noting that Table 22 does not contain numeric turbidity or suspended solids standards and that Ballinger's dissolved oxygen assessment was based on the more stringent ANZECC saturation guideline rather than the current minimum concentration-based standards.

[59] A screening trigger for departure from reference condition. The 80th percentile concentration observed at reference-condition streams within the Warm Wet / Low Elevation (WW/L) REC class in New Zealand compiled data from minimally disturbed ("reference") streams within the WW/L class - 80% of measurements at reference streams were ≤ 8 mg/L**,** while 20% naturally exceeded 8 mg/L.

[60] ANZECC GUIDELINE FOR FRESH & MARINE WATER QUALITY (2018)

[61] West , D; Boubée, J & Barrier, R (1997)Avoidance of suspended sediment by the juvenile migratory stage of six New Zealand native fish species, New Zealand Journal of Marine and Freshwater Research, 31:1, 61-69

The Ahuroa site continues to be sampled on a monthly basis to date for a wide range of water quality data, as it is upstream of the Ahuroa Water Treatment Plant that supplies drinking water to the Waipū area. No review or updated comparison to Ballinger (2012) is provided.

The Ballinger report contains sites that align with eDNA and NZFFD survey locations discussed in the relevant sections of the FER. No analysis has been undertaken to evaluate the degree of correspondence between the datasets.

TABLE 14: BALLINGER (2012) AND ECOLOGICAL SAMPLE SITES ALIGNMENT

BALLINGER 2012	FER	
	NZFFD SITE	eDNA SITE
AHUROA RIVER - DURHAM ROAD	10	-
AHUROA RIVER -BRAIGHS FLAT	1 & 2	AHUROA
WAIHOIHOI RIVER -ST MARYS ROAD	-	LOWER WAIHOIHOI

In terms of fish as receptors, species-specific responses to suspended sediment varied considerably. Banded kōkopu have been found to be the most sensitive species[62] of a range of freshwater fish tested, exhibiting avoidance behaviour at relatively low turbidity levels (17–25 NTU), whereas kōaro and īnanga tolerated substantially higher turbidity exhibiting 50% avoidance responses at 70 NTU and 420 NTU respectively before showing similar responses. Shortfin and longfin elvers and redfin bullies displayed no measurable avoidance behaviour even at extremely high turbidity levels (1100 NTU), indicating a high tolerance to suspended sediment. Due to this sensitivity and their widespread distribution, banded kōkopu have been suggested as a useful benchmark species for the protection of fish in New Zealand.

Responses to low dissolved oxygen also vary[63]. Dissolved oxygen concentrations below approximately 5 mg/L may restrict habitat suitability for sensitive species, while prolonged exposure below 2–4 mg/L can result in avoidance behaviour, habitat exclusion and mortality. Common smelt (*Retropinna retropinna*) are relatively sensitive, exhibiting avoidance behaviour at dissolved oxygen concentrations of approximately 2 mg/L and high mortality when exposure was prolonged. Juvenile banded kōkopu (*Galaxias fasciatus)* were also relatively sensitive, with 50% mortality occurring within eight hours at 1 mg/L dissolved oxygen. In contrast, īnanga (*Galaxias maculatus*), common bullies (*Gobiomorphus cotidianus*) and eels demonstrated substantially greater tolerance to hypoxic conditions. Experimental studies found that īnanga and bullies showed little or no avoidance response to dissolved oxygen concentrations of approximately 2 mg/L, while bully species exhibited some of the highest tolerances to low dissolved oxygen recorded among New Zealand native fish.

[62] Rowe, Hicks & Richardson (2000) Reduced abundance of banded kōkopu (*Galaxias fasciatus*) and other native fish in turbid rivers of the North Island of New Zealand , New Zealand Journal of Marine and Freshwater Research 34(3):547-558
[63] Paul A. Franklin (2014). *Dissolved oxygen criteria for freshwater fish in New Zealand: a revised approach*. New Zealand Journal of Marine and Freshwater Research, **48**(1), 112–126

As follows in our review of fish occurrence, distribution throughout the catchments closely aligns with expected habitat and elevational preferences, indicating that water quality parameters are unlikely to be excluding species from otherwise suitable habitats.

3.22 FISH SPECIES

DESKTOP INFORMATION

Regional reporting[64] is discussed very briefly in the FER as background towards probable local fish community composition.

The FER comments on the latest SOE report, which references a region wide sample event (11/2023 & 2/2024) during which eleven native fish species were recorded: shortfin eel (*Anguilla australis),* longfin eel *(Anguilla dieffenbachia)*, banded kōkopu (*Galaxias fasciatus),* īnanga *(Galaxias maculatus),* kōaro *(Galaxias brevipinnis*), bluegill bully *(Gobiomorphus hubbsi),* common bully *(Gobiomorphus cotidianus),* Cran's bully *(Gobiomorphus basalis),* redfin bully *(Gobiomorphus huttoni),* common smelt *(Retropinna retropinna*), and torrentfish *(Cheimarrichthys fosteri*).

Results demonstrated *very good ecological integrity*[65] for fish communities based on the Northland Index of Biotic Integrity (IBI)[66] values. Scores are derived from interaction of distance from coast and elevation across 6 metrics : potential diversity; invasive spp presence; stream geomorphology; species habitat preference (riffle; pool -benthic occupancy; pool - pelargic occupancy) and intolerance to stream degradation[67]. With the exception of tuna species, Torrentfish and Cran's bully, all species recorded by NRC are classified as *Intolerant* taxa.

The scoring framework incorporates tolerance and occupancy metrics for broadly categorised *Gobiomorphus* and *Galaxias* taxa where species-level identification was not achievable during the survey. The algorithm categorises an IBI score into classes of *excellent* (58–60), *good* (48–52), *fair* (40–44), *poor* (28–34), and *very poor* (0–22). These scores can then be directly compared with the original reference sites used during development of the Northland regional model.

The IBI will be lower above migration barriers and sometimes these are natural barriers like waterfalls so when a low score is found this must be taken into account.
IBI scores recorded during the SOE 2023/24 Survey ranged from 32 to 54, with a regional average of 42, which exceeds the national average of 27.9 reported for the 2000–2007 period. The SOE report attributed the returned diversity was in the in part due to the predominance of lowland near coastal sample sites, where a greater number of species and abundance of some individual species is expected in comparison to inland/upland sites which only climbing species may access due to natural or constructed barriers.

[64] Sanwar, S. (2024) State of the Environment Northland Freshwater Fish Monitoring 2023/24. Technical Report Series. Report No. TR2024/FWQlty/01. Northland Regional Council. Whangārei, New Zealand. p.38
[65] IBI scores 32-54; with a regional average IBI of 42 compared to national of 27.9 -2000-2007 (NRC SOE REPORT 2024)
[66] A FISH INDEX OF BIOTIC INTEGRITY (IBI) FOR THE NORTHLAND REGION
[67] *migration barriers and water quality variables such as dissolved oxygen fluctuation, temperature, sediment and ammonia.*

In addition to constructed barriers, waterfalls and cascades form natural barriers to poor climbers e.g. īnanga and smelt. However, under the right conditions[68] eel, banded kōkopu; shortjaw kōkopu and kōaro may penetrate further inland. The assumption underpinning the use of the species richness metric is that environmental degradation will change diverse communities containing many species to simple assemblages dominated by a few species. However, particularly in headwaters these may not be accurate on a reach scale. Each fish species has a varied climbing ability, characteristic preference (requirement) for habitat variables, and tolerances for water quality, water quality variables such as dissolved oxygen fluctuation, temperature, sediment and ammonia.

Within any accessible stretch fish species subsequently partition to occupy microniches e.g. shortjaw kōkopu riffle and run habitats adjacent to instream cover, holding in interstitial spaces within coarse substrate, while banded kōkopu prefer low velocity habitat areas of deeper water, albiet in small headwater tributaries. Competition within these microhabitats can also influence occupancy e.g. large territorial banded kōkopu (18cm) may exclude other fish from a small deep pool.

The FER states that a diversity of 5–6 species was typical within the SOE dataset; however, the SOE report itself identifies species richness values of n = 5–6 as comparatively high. The reported median catch richness was n = 4, while the maximum richness recorded was n = 7 at Tangowahine, a modified lowland pastoral site with partial riparian cover rather than a potential best-condition reference site.

The FER utilises an undefined eDNA dataset to derive Fish IBI scores reported in Table 11 despite recent NIWA reviews explicitly concluding that eDNA data cannot be directly incorporated into the existing Fish IBI framework without introducing bias. In the absence of clear methodology, calibration and validation, the resulting Fish IBI scores are of uncertain validity. Consequently, conclusions drawn from these metrics are not adequately substantiated for an assessment of this scale and importance.

In systems supporting threatened indigenous fish, reliance on Fish IBI as a surrogate for habitat value may lead to a perverse outcomes whereby habitats of high conservation importance are assigned lower significance because they do not support species-rich communities or achieve high index scores. The apparent use by the FER of Fish IBI to infer that affected habitats are of limited ecological value represents a potential misapplication of the metric. Fish IBI assesses departure from an expected fish assemblage and was not designed to evaluate habitat significance, irreplaceability, spawning function, recruitment value or the conservation importance of threatened species. As such, habitat or community significance and magnitude of impact cannot be robustly inferred from Fish IBI scores alone, particularly in the method used.

The SOE Report FIG 4 shows that the catch **comprises 66% bully (Gobiomorphus spp.)**; 12% eel; 9% torrentfish; 7% galaxid and 6% smelt. Common bully is the only local bully (*Gobiomorphus*) species with no threat status. The FER states that red fin (*At Risk – Declining)* and common bully are the most abundant in survey samples. The SOE report states that redfin bully compose 45% of the total catch abundance. However, the data presented in SOE *Table 5*

[68] Life stage; barrier morphology that is climbable- high surface roughness and wetted pathways; resting zones during the climb; low to moderate flow velocity (during upstream movement windows); habitat continuity above barriers

do not support the same assumption for common bully. The table indicates a substantial proportion of unidentified bully spp., which cannot reasonably be assumed to simply represent Common bully. It is considered more likely that a substantial proportion comprise less frequently encountered species, resulting in uncertainty by the surveyor regarding their taxonomic identification. Where distributions overlap, from professional experience these may include-

- **GIANT BULLY (AT RISK - NATURALLY UNCOMMON)**
  Smaller individuals can superficially resemble large common bullies, particularly in lowland habitats, although giant bullies are generally larger-headed and more elongate.
- **CRAN'S BULLY (AT RISK - NATURALLY UNCOMMON)**
  Less commonly encountered

The SOE report notes that the occurrence of species with a recognised threat status declined from 30% to 18% of the surveyed fish assemblage since the 2021/22 fish survey, suggesting a potential reduction in the proportion of threatened species within the region. We note that 82% dominance of *Not Threatened* species is would need revising under the new threat status classifications e.g. redfin bully is now A*t Risk -Naturally Uncommon*

It is important to consider rarity/ significance within a regional context. *At Risk – Naturally Uncommon* species blue gill and kōaro are considered *Regionally Rare*, in addition to *Regionally Significant* banded kōkopu (A*t Risk – Declining)* and giant bully (*At Risk Naturally-Uncommon)*[69]. In addition to giant bully, not all potential regional species returned catch results in the SOE survey e.g. lamprey (*Threatened – Nationally Vulnerable*); giant kōkopu (*At Risk- Declining*); shortjaw kōkopu *(Threatened -Nationally Vulnerable Galaxias postvectis*). Black mudfish *(Neochanna diversus At Risk – Declining)* and Northland mudfish *(Neochanna heleios Threatened – Nationally Vulnerable)* and lamprey require targeted survey to obtain meaningful results not part of the SOE survey. Primary management focus for threatened species includes survey, mapping and protection of habitat extent. NRC is currently extending exploratory survey to this end.

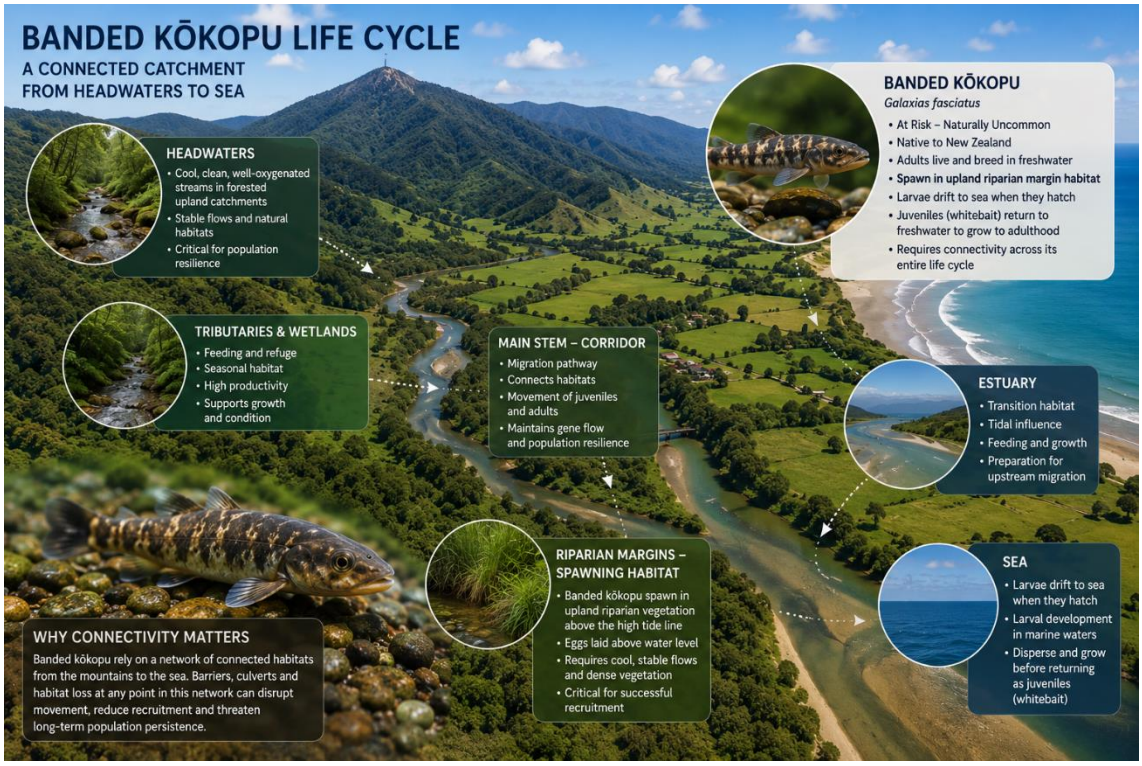
The New Zealand Threat Classification System assesses area of occupancy using the **smallest area essential at any stage of the life cycle**, rather than the broader distribution of adults. Consequently, the species' conservation status is often not determined not by the widespread distribution of mature fish, but by the vulnerability of the limited habitat required for successful reproduction and recruitment [70]. A key implication is that habitats supporting spawning, egg incubation, larval development, juvenile recruitment or migration may be disproportionately important to population persistence. Consequently, relatively small habitat features can have a much greater ecological significance than their area alone would suggest and loss may have implications that extend beyond the immediate footprint of habitat removal.
The cumulative loss of small tributaries can progressively reduce spawning habitat availability, recruitment potential, habitat connectivity and population resilience, particularly for species that are strongly associated with forested headwater environments. Headwaters comprise a substantial proportion of total stream length and support disproportionately important

[69] DoC (2007)Natural areas of Waipū Ecological District Reconnaissance Survey Report for the Protected Natural Areas Programme.
[70] Dunn et al (2023) Conservation status of New Zealand freshwater fishes. NZ Threat Classification Series 46

ecological processes for confirmed species[71] including banded kōkopu; redfin bully and potential species shortjaw kōkopu, lamprey & koaro for which detection is difficult due to rarity, eDNA constraints or targeted catch design. Such environments are disregarded throughout the FER, and as such are targeted for permanent infilling, diversion or piping of headwater tributaries. This will likely generate permanent loss of spawning and juvenile habitat, reduced recruitment opportunities, diminished habitat connectivity, reduced invertebrate production and fragmentation of populations occupying upper catchment environments. Such effects may extend beyond the immediate footprint of habitat loss and influence the long-term resilience and viability of indigenous fish populations at the reach and catchment scales.
Impact assessment in the FER is fundamentally limited due to absence of direct assessment or comment of spawning habitat availability, suitability, or utilisation.

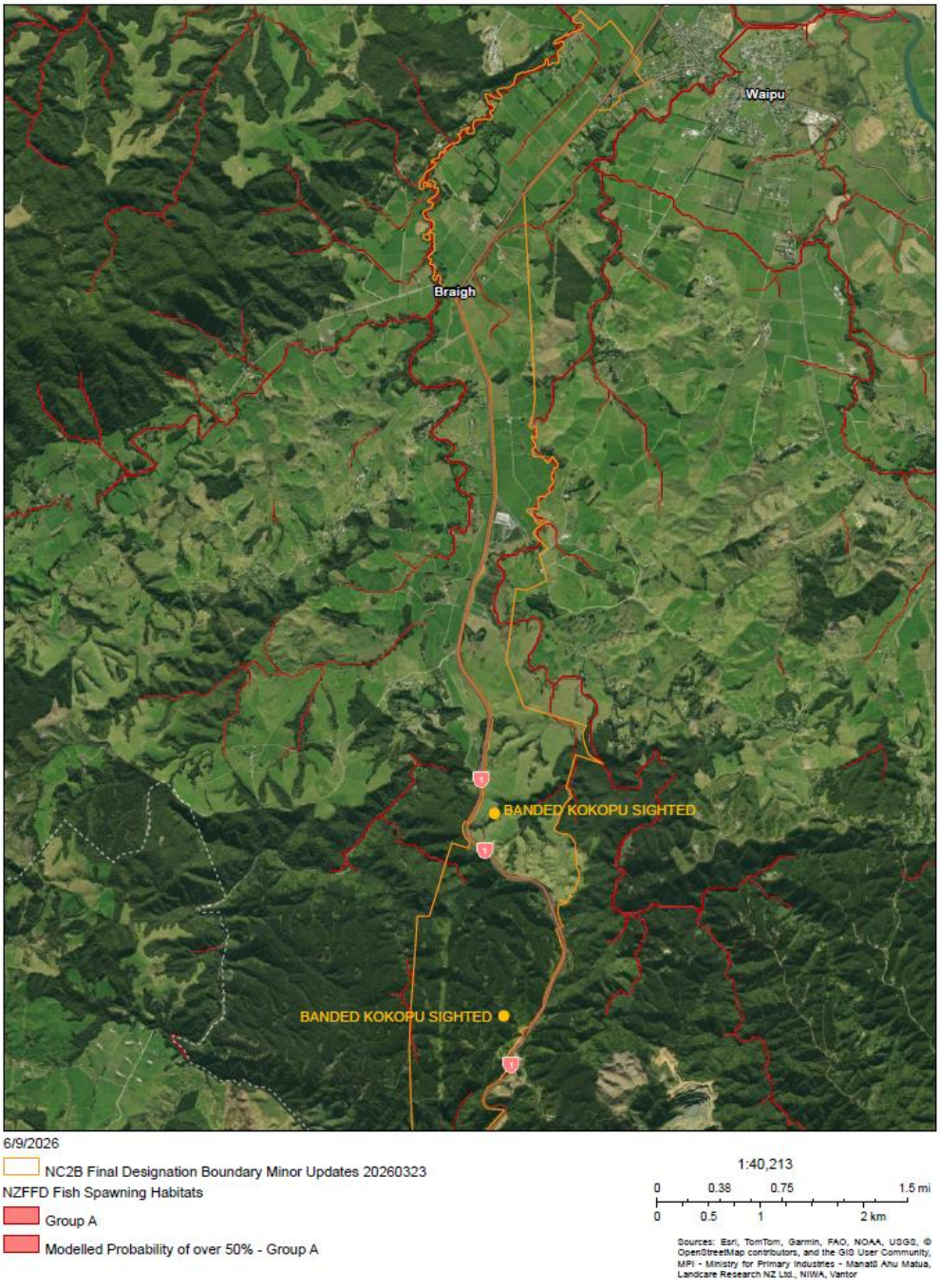
Widely used national and regional *first pass* screening tools for potential spawning habitat are available. In combination with NZFFD occurence data, the MPI Fish Spawning Indicator (FSI) is a nationally derived predictive GIS dataset that identifies river reaches considered likely to support spawning by selected freshwater fish species based on known species distributions, habitat associations and spawning periods (refer FIG13). These would typically be supplemented by site-specific habitat assessment and ground-truthing where substantial impacts are anticipated as in this instance, particularly in headwaters, where spawning habitats and reach extent cannot be reliably identified from coarse-scale spatial datasets alone. Given the confirmed presence of banded kōkopu within the headwaters of both catchments (including our own visual encounters), the assumption that spawning habitat may be absent or of limited significance cannot be supported. We conclude that suitable spawning and recruitment habitats are present within the catchment and should have primary

FIG 12: BANDED KŌKOPU CATCHMENT USE



[71] eDNA & NZFFD records accessed during this review

FIG 13: SPAWNING GROUP A SPECIES BANDED KŌKOPU & REDFIN BULLY (MPI 2026)



The concept of spawning areas as effective area of occupancy is illustrated by recent change of threat status change of īnanga (*Galaxias maculatus*) from ***At Risk – Declining*** to **Threatened – *Nationally Vulnerable*,** driven primarily by a reassessment of extremely limited spawning

habitat estimated to be less than 100 ha nationally [72]. Adult īnanga occupy river, stream, lagoon and wetland habitats typically found at altitudes of < 20 m and < 10 km inland such as the Waipū District lowland flats. However, population persistence is ultimately constrained by specialised spawning habitat concentrated within narrow riparian margins at the upper limit of tidal influence. Īnanga are favoring slow velocity waterways with overhanging vegetation, as small as 1 m wide up to large rivers.

Īnanga spawning sites are generally small in extent, often only tens of metres, and near adult habitat, which is better documented through fish survey. Successive īnanga generations often use the same spawning sites[73], crucial to maintenance of populations. Populations are impacted by the disturbance; loss of habitat and sedimentation through waterway modification combined with limited abilities in respect to fish passage barriers including climbs and velocity.

Īnanga Spawning habitat is defined in the Regional Plan, and a focus of Regional rules:
Īnanga Spawning Site- The margins and of rivers of estuaries that are inundated by spring high tides.

In this regard NRC has undertaken GIS mapping of potential īnanga spawning habitat as a primary indicator[74] to enable scoping and consideration in EcIA best practice as standard. As a regional priority, including in the Waipū Ecological District, progressive refinement is occurring through field survey efforts. A primary body of work has been undertaken through the Northland Īnanga Spawning Habitat Restoration Project (NĪSHRP), representing a significant collaborative initiative[75] aimed at addressing the ongoing decline of īnanga populations within Te Tai Tokerau Northland. Conducted between 2022 and 2025, the project integrated mātauranga Māori with western scientific methodologies to identify, assess, protect, and restore īnanga spawning habitat across the region. Meaningful partnership with mana whenua was identified as a fundamental component of project implementation and outcomes, facilitated by establishment of a Mana Enhancing Agreement (MEA) with Patuharakeke hapu, which emphasised collaborative management approaches. The partnership contributed substantially to the successful identification, protection, and restoration of īnanga spawning habitat within the project area. Investigations were undertaken across 5 waterways within Te Akau Bream Bay and included comprehensive and standardised saltwater wedge surveys, spawning observations, egg searches, and habitat assessments to ground-truth spawning habitat distribution and condition, allowing prioritisation of management interventions.

Technical outcomes supportive of scoping for impact assessment include the establishment of a ESRI digital data management framework allowing spatially referenced survey integration with visualisation of spawning and restoration datasets. The saltwater wedge survey methodology proved highly effective in identifying potential spawning habitat, with the concept of "love zones" validated across all catchments.

While the Pōhuenui River and Ruakākā River supported the highest estimated spawning productivity, with approximately 2,947,419 and 1,859,624 eggs respectively, the Ahuroa River

[72] Dunn et al (2025) Conservation Status of NZ freshwater fishes (2023) NZ Threat Classification Series 46. DoC, Wellington
[73] Taylor & Richardson (2002) A guide to restoring īnanga habitat. NIWA Science and Technology Series No. 50
[74] https://localmaps.nrc.govt.nz/localmapsviewer/?map=3a43eac0021047d6863a9e095da67738
[75] Patuharakeke; Mountains to Sea Conservation Trust;NRC; DoC
Pers.comm Nic Naysmith - Northland Īnanga Spawning Habitat Restoration Project Manager & National Īnanga Spawning Programme National Coordinator Mountains to Sea Conservation Trust

also demonstrated substantial spawning utilisation, with an estimated 352,574 eggs recorded. This result confirms the Ahuroa River as a regionally significant īnanga spawning system supporting meaningful reproductive habitat and recruitment function. Protection and restoration measures implemented through the project included stock exclusion, large scale riparian planting, habitat enhancement, and targeted pest management intended to improve spawning habitat quality, ecological integrity, and egg survival within key īnanga spawning reaches. This includes the Bryham property Millbrook Bridge directly adjacent the Designation west of the Waipū interchange. Work has commenced on the Waihoihoi catchment, including primary salt wedge surveys and spawning habitat identification. Large īnanga populations were also recorded at Ruakākā in the SOE sampling, with a similar estuarine- lowland river- stream character to the Waipū River and Ahuroa &Waihoihoi as tributaries. Extension of further phases of motorway extension represent potential cumulative effects not considered in the FER.

Upstream development can adversely affect downstream spawning habitats through changes to hydrology, sediment supply and channel morphology, even where fish passage remains intact. Many indigenous fish species rely on specific environmental cues, including flow variability, elevated water levels and inundation events, to initiate spawning and recruitment. Altered runoff regimes resulting from vegetation clearance, drainage, wetland loss or stream modification may disrupt these cues and modify the frequency, timing and extent of habitat inundation.

For species such as īnanga, successful spawning depends on spring-tide inundation of riparian vegetation within a narrow elevation range. Changes to sediment delivery, bank morphology or channel form can alter tidal overtopping and floodplain connectivity, reducing the availability and functionality of spawning habitat. Increased sedimentation may also smother eggs, alter spawning substrates and reduce egg survival.

Consequently, maintenance of connectivity alone does not ensure protection of spawning function, as hydrological and geomorphic changes can degrade the environmental cues and physical processes that create and maintain spawning habitat and support successful recruitment.

Until recently it was thought to be the only galaxiid species to spawn in estuarine systems, however recent findings indicate that giant kōkopu may regularly utilise estuarine spawning reaches associated with īnanga, not solely upstream adult habitat[76].

[76] Orchard, S. & Wilkenson, S. (2023)Opportunistic discovery of giant kōkopu (*Galaxias argenteus*) spawning in a tidal reach: site description and implications, New Zealand Journal of Marine and Freshwater Research 58(4): 577-590

FIG 14 : EXTRACT FROM LEFT THE NRC POTENTIAL ĪNANGA SPAWNING SITES; RIGHT: DESIGNATION OVERLAY (NZTA GIS LAYER) NRC LAYER BLOBBY BLUE

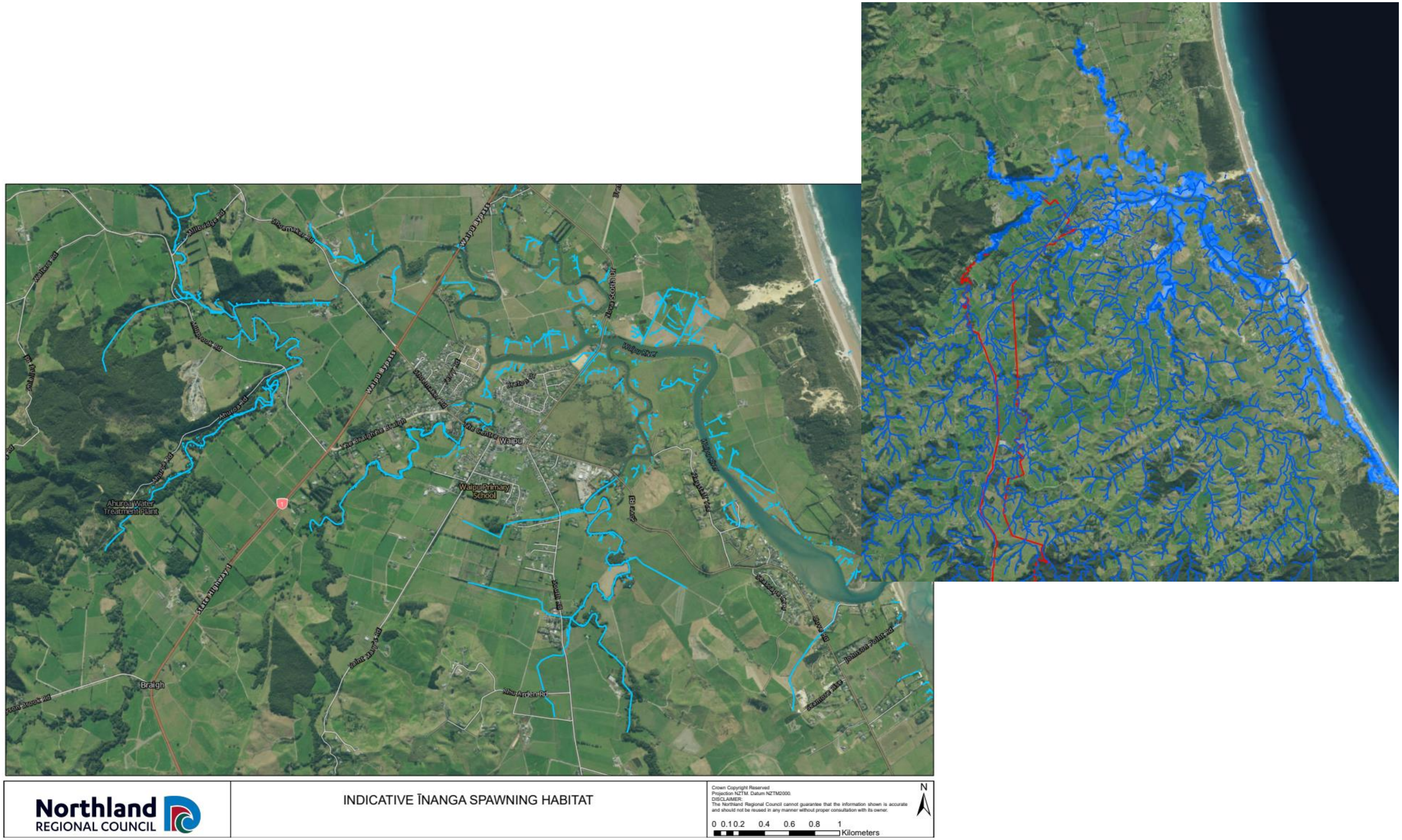


FIG 15: EXTRACT FROM THE ĪNANGA DATA MAP AHUROA & WAIHOIHOI REPRODUCED WITH PERMISSION NIC NAYSMITH NATIONAL ĪNANGA SPAWNING PROGRAMME MANAGER MOUNTAINS TO SEA CONSERVATION TRUST

PINK LINE –SALT WEDGE AT RECORDED FULL & NEW MOON ; BLUE DOTS -SALT WEDGE DATA POINTS; YELLOW SQUARE- POTENTIAL SPAWNING BENCHES; WHITE CIRCLE – CONFIRMED SPAWNING SITES; ORANGE- NRC POTENTIAL MAPPING

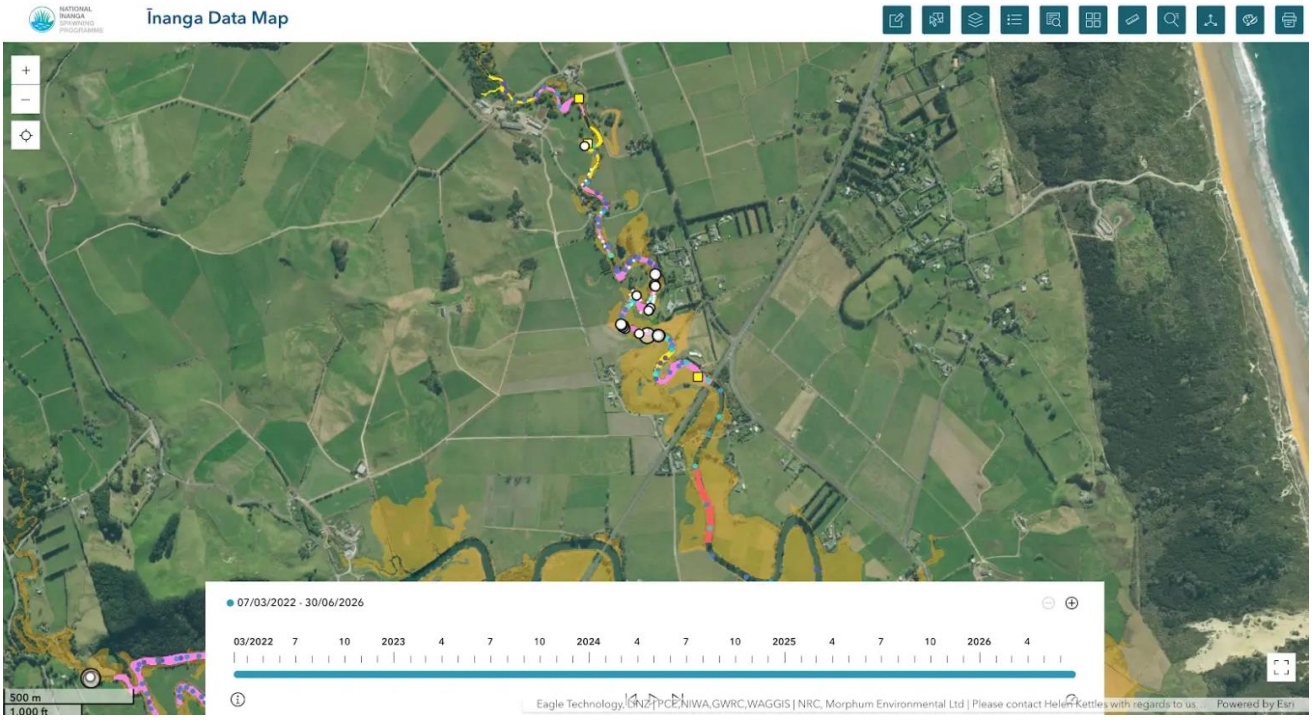


FIG 16: EXTRACT FROM THE ĪNANGA DATA MAP WAIHOIHOI EXPANDED REPRODUCED WITH PERMISSION NIC NAYSMITH NATIONAL ĪNANGA SPAWNING PROGRAMME MANAGER MOUNTAINS TO SEA CONSERVATION TRUST

PINK LINE –SALT WEDGE AT RECORDED FULL & NEW MOON ; BLUE DOTS -SALT WEDGE DATA POINTS; YELLOW SQUARE- POTENTIAL SPAWNING BENCHES; WHITE CIRCLE – CONFIRMED SPAWNING SITES; ORANGE- NRC POTENTIAL MAPPING



FIG 17: NORTH WAIPŪ POHUENUI RIVER CONFIRMED ĪNANGA SPAWNING SITES (WHITE DOTS)



The FER refers to the *Freshwater Native Fish in Northland* report (2015), a NRC assessment[77] of the regional state, conservation status and critical habitat requirements of freshwater native fish.. While the report is non statutory advice, it contributed at the time toward the development of its Regional Plan.

The report provides summary of threats to native fish in Northland as:

1. *Threats are largely associated with loss of habitat, particularly wetlands and streams formerly surrounded by indigenous forest or riparian margins*
2. *Barriers to the migration of diadromous species significantly affect the sustainability of populations of a number of at risk and threatened fish*
3. *Declining water and habitat quality, in conjunction with predation and competition from pest fish (and trout in the Kai Iwi Lakes), are also significant threats*
4. *Deposited and suspended sediment are the key water quality problems in Northland likely to impact on native fish*
5. *Commercial harvesting of eels and whitebaiting reduces already declining populations*
6. *Management of the critical habitat requirements of threatened and at risk species across the full range of regulatory and non-regulatory mechanisms available is recommended*
7. *Migration and spawning times are critical periods requiring additional consideration as part of any management approach*

The FER states that although the review considers the *upper-mid Waihoihoi…and upper mid-Ahuroa, … the paper does not indicate there are any fish taxa of conservation importance within the Project's four catchments. The only taxa that is 'At Risk Declining' are long fin eel and īnanga.*

[77] McArthur, K. and Beveridge, A. (2015) Freshwater Native Fish in Northland :Conservation status, critical habitat requirements and recommendations for management. Report No. 2015/036

This is clearly contradicted by exert of Map 14 of the 2015 review (see below) , which shows the Ahuroa catchment results (yellow oval below) with īnanga *(Threatened -Nationally Vulnerable)* and torrentfish (*At Risk- Naturally Uncommon),* red fin (*At Risk-Declining)* and eel - both long fin *(At Risk Declining)* and also shortfin (*Not Threatened)* in the data[78].

Tributaries of the Waihoihoi (blue oval) are shown to contain īnanga (*Threatened -Nationally Vulnerable),* eel species (again both in the underlying data) and redfin (*At Risk-Declining).*

FIG 18: EXTRACT FROM MAP 14 (PG. 56) MCARTHUR, K. AND BEVERIDGE, A. (2015)



The review additionally notes that torrentfish are the only member of the genus *Cheimarrichthys,* making them extremely important in terms of their biodiversity value.

The report provides summary of threats to native fish in Northland as:

1. *Threats are largely associated with loss of habitat, particularly wetlands and streams formerly surrounded by indigenous forest or riparian margins*
2. *Barriers to the migration of diadromous species significantly affect the sustainability of populations of a number of at risk and threatened fish*
3. *Declining water and habitat quality, in conjunction with predation and competition from pest fish (and trout in the Kai Iwi Lakes), are also significant threats*
4. *Deposited and suspended sediment are the key water quality problems in Northland likely to impact on native fish*
5. *Commercial harvesting of eels and whitebaiting reduces already declining populations*
6. *Management of the critical habitat requirements of threatened and at risk species across the full range of regulatory and non-regulatory mechanisms available is recommended*
7. *Migration and spawning times are critical periods requiring additional consideration as part of any management approach*

[78] NIWA Freshwater Fish Database Records –to 2015

We consider these common issues likely to be further exacerbated by large-scale development and therefore warranting central consideration within an ecologically focused assessment

We do not find that the species results are *contrary to eDNA results for the Project* as per the FER statement *(PG. 25)*, as it presents 2015 best available information (BAI), as an appropriate baseline desktop source based largely on the NZFFD. A recognised caveat of this dataset is that absence of records does not necessarily equate to species absence a site or in nearby habitats, with non-detection often reflecting limited sampling effort or imperfect detectability. NZFFD records were not all collected under a consistent survey design and some species are poorly detected by certain methods e.g. kōkopu by daytime electrofishing. It is generally accepted NZFFD records underrepresent kōaro; mudfish, giant kōkopu, lamprey, shortjaw kōkopu & freshwater mussels in particular. Electrofishing efficiency is often also substantially reduced within brackish and wetland environments where giant bully may be expected due to elevated conductivity, structurally complex habitat, reduced visibility, and extensive refuge availability. Consequently, standard electrofishing methodologies may underrepresent fish presence and abundance within lowland wetland or estuarine transition habitats. Giant bully and giant kōkopu individuals may exceed trap entry dimensions, potentially contributing to false absences within survey result. Results may also have temporal bias. In addition to a NZFFD record of kōaro in the Otaika Creek, we found a September record from the Hatea River of juveniles, representing a subset of upstream migrating fish in terminal reaches of the waterways.

The substantial detectability limitations of both conventional fish survey techniques and eDNA) mean that an absence of data should not be interpreted as definitive evidence of absence. Robust assessment of lamprey presence/absence generally requires species-specific survey design, targeted ammocoete habitat investigation, repeated seasonal sampling, and methodologies explicitly adapted to lamprey ecology. Standard survey approaches such as Gee minnow trapping, fyke netting, and generalised backpack electrofishing are typically poorly suited to both larval and adult lamprey life stages. Adults are typically highly cryptic, occur at low densities, and may undertake nocturnal or short-duration migratory movements, resulting in low encounter probability during standardised survey effort. Recent Lamprey detection NIWA guidance notes that adults are rarely observed except where migration is impeded or concentrated at barriers, reinforcing their low detectability under general fish community sampling protocols. Consequently, both passive gear types (e.g., fyke nets and Gee minnow traps) and standard electrofishing surveys may substantially underestimate presence or fail to detect lamprey entirely, particularly in larger or hydrologically complex catchments.

Ammocoetes are obligate burrowers occupying fine sediment depositional habitats (sand, silt, and organic substrates), where they remain largely sedentary and are therefore unlikely to be captured using passive trapping methods or electrofishing approaches not specifically targeted to soft-sediment environments..

Conventional backpack electrofishing undertaken primarily for general biodiversity assessment may therefore fail to detect ammocoetes even where lamprey are present within a catchment. This is particularly relevant where surveys focus on coarse substrate riffles, pool margins, or general fish habitat rather than targeted depositional zones likely to support larval

occupancy. Effective detection requires specialised electrofishing techniques, involving systematic low-speed coverage of depositional habitats and appropriate electrode placement and settings to induce emergence from burrows; even then, detection efficiency remains highly sensitive to substrate composition, flow conditions, and operator experience. Similarly, Gee minnow traps and fyke nets are of limited effectiveness for lamprey detection because ammocoetes are sedentary, burrowing organisms that do not actively enter passive trapping devices, while adult lamprey exhibit highly cryptic movement behaviour and may not interact readily with conventional fish traps unless deployed specifically within known migratory pathways.

Where project effects on indigenous fish are potentially significant, reliance on nearby NZFFD records without site-specific survey work is usually considered weak evidence. Use of the NZFFD information as a surrogate for site specific sampling is flawed as it assumes

- The returned result is a balanced representation of the fish community at the sample site
- The sample site is representative of a larger geographic area of interest

Other freshwater receptors such as kākahi spp. (freshwater mussel) are not generally retrieved during NZFFD survey, but supplementary sources are easily available, as per the *inaturalist.org.nz* snip below, which may form a base reference for investigation.[79]



We consider records of a species may reasonably infer *potential distribution*, habitat suitability, and catchment-level ecological context where there is hydrologically connectivity including seasonally. Conversely, absence of records should not be equated with absence of occurrence where detectability of a species requires specialised technique or survey effort is non-targeted.

[79] e.g. inaturalist/org.nz ; ala.au.org

The FER (TABLE 6 PG. 25) grouping of NZFFD records into three broad areas of catchment substantially reduces the interpretability of the results and doesn't allow for site specific site consideration or connectivity between sample sites. Additionally, while we acknowledge distance from the sea is a primary surrogate predictor for fish community composition, we consider it is more accurate to measure distance from the Waipū River estuarine salt water influence, rather than absolute distance from the coast.

We accessed and tabulated the most recent NZFFD records[80] for the Ahuroa and Waihoihoi catchment extent that we consider to be in a ZOI of the project assuming connectivity within the catchments through the ZOI of the Designation. We excluded the Mill Brook catchment, although in theory fish species that use its extent have access into the Ahuroa at their convergence west of Shoemaker Rd. This is also true for the Waionehu Stream of the eastern Waipū plain, tributary to the lower Waipū River below Nova Scotia Bridge. Species recorded here include giant bully (*Gobiomorphus gobioides At Risk – Nationally Uncommon; Regionally Significant*), longfin ; shortfin ; common bully and īnanga, utilising Gee Minnow Trap survey.

The absence of spatial mapping and individual record referencing limits the ability to determine the basis for the FER summary TABLE 6. Differences in our tabulated data include records for two sites in the lower Ahuroa (*Coastal Lowland <5km*)near Millbrook Rd which span 1993-2003. These closely associated sites record Cran's bully; eel spp. common bully and īnanga. In contrast there are no (*Coastal Lowland<5km*) records in the FER TABLE 6.

In light of the available NZFFD information, the FER conclusion regarding absence of īnanga records within the Coastal Lowland (<5 km) Ahuroa reach appears erroneous. The Waipū estuary salt wedge is commonly known to extend to the WDC Ahuroa Water Treatment Plant at the southern end of Ahuroa Rd. Estuarine grey mullet are known to penetrate this far. The Designation includes this area, following the western edge of the Ahuroa from north of Millbrook Rd to where it crosses Finlayson Brook Rd adjacent SH1. Brackish influence is extends into the Waihoihoi through Waipū village and is hydrologically connected to the Designation reach. Therefore we disagree with the statement that

*Smelt and giant bully (and marine wanders) are only identified in **lower coastal areas**, and **those habitats are not within the Proposed Designation.***

As the eDNA dataset was not originally correlated against equivalent distance and elevation categories, these groupings have been independently applied during our review (refer next section). We note that giant bully, smelt, and īnanga are subsequently detected within these environments, consistent with expectations for habitats corresponding to the <5 km Coastal Lowland classification in the eDNA results for both the Waihoihoi main stem and lower Ahuroa reaches within the Designation.

Neither the FER *Coast Lowland <5km* or *Lowland Plains 5-10km* groupings record Cran's Bully for the Ahuroa or Waihoihoi. We can only assume this is an earlier data version of the NZFFD, or have excluded sites. This would also explain the statement that

It is curious to note that records from standard fish surveys recorded in the FFDB do not show

[80] NIWA (JULY 2024)New Zealand Freshwater Fish Database (extended) 103cca88-8677-4ab0-9a22-61771ee31af5

the presence of giant kōkopu or torrent fish (despite these being identified through the Project's eDNA sampling).

This is however further contradictory to the FER TABLE 6 NZFFD results itself which shows torrentfish (*At Risk- Naturally Uncommon*) in the Waihoihoi *Coastal Lowland <5km* & *Uplands >10km* grouping and in the Ahuroa *Upland >10km.* Our review which places in the Ahuroa at *5-10km* and *Uplands >10km*. The highly nomadic torrentfish was found >10km from the coast at elevation in the Ahuroa NZFDD combined to Waipū Gorge in eDNA results. In the Waihoihoi it was found from Coastal to mid Waihoihoi in eDNA results. We were unable to identify NZFFD records for torrentfish (*Cheimarrichthys fosteri*) within the Waihoihoi catchment. However, records occurring in approximately equivalent locations to those presented in FER TABLE 6 appear instead to potentially correspond to yellow-eyed mullet (*Aldrichetta forsteri*). Again, in the absence of mapped spatial illustration, the basis for this interpretation remains unclear.

The FER summises the NZFFD with a series of statement (PG. 26) that
The frequency of reporting in the FFDB suggests that the most commonly occurring species within these catchments are long and short fin eel, īnanga, banded kōkopu, redfin and common bully (with lesser amounts of Crans bully). Other species occurrences are much less frequent.

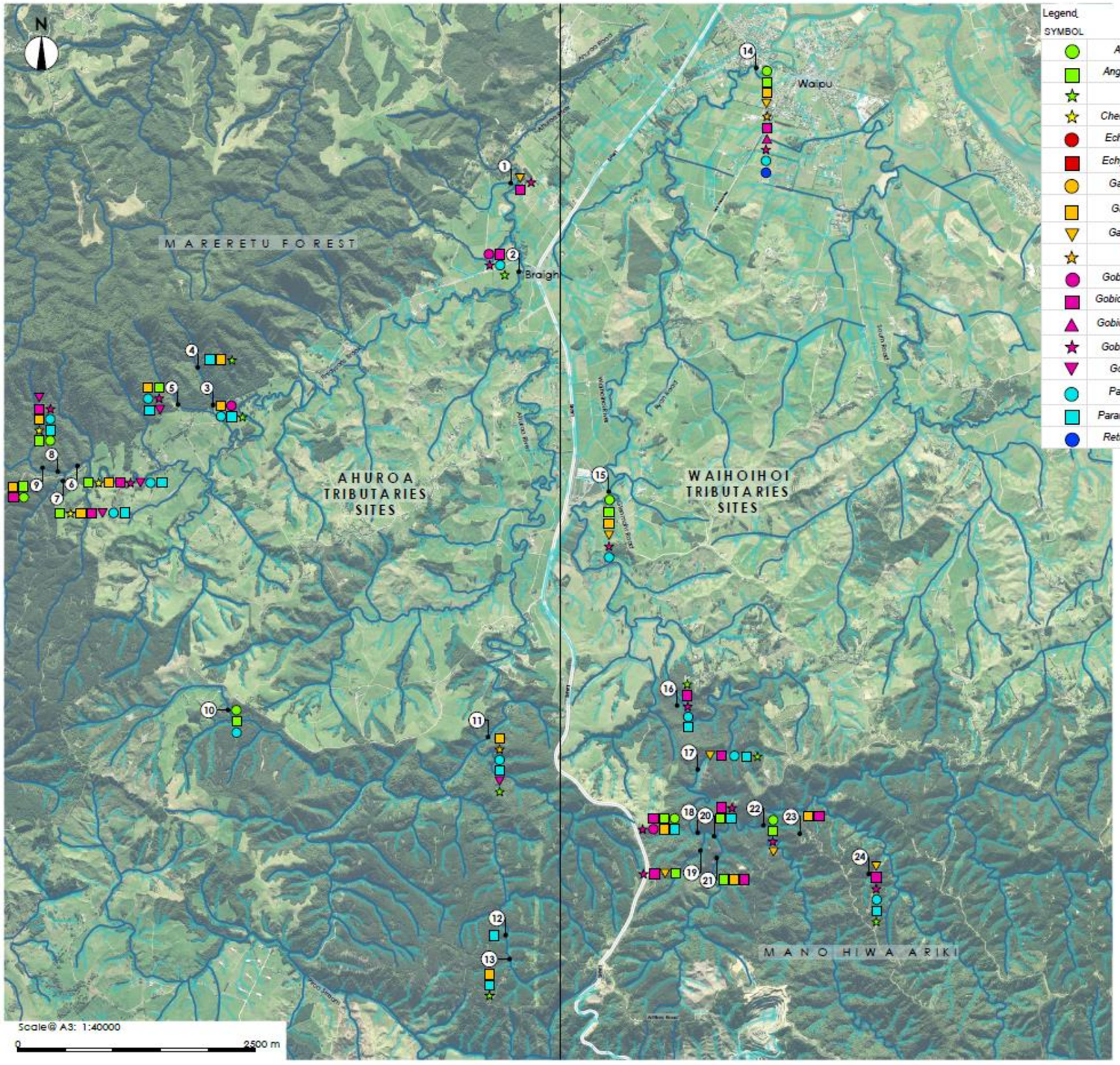
Notwithstanding the reporting limitations identified in the FER, although these species are more frequently represented within the available NZFFD dataset, we consider the subsequent interpretation may understate freshwater fish ecological values given the recognised limitations and sampling biases inherent in NZFFD data procurement. Importantly, record frequency should not be interpreted as an abundance measure.

Survey outcomes are inherently biased by design and intent, and taxa that are not specifically targeted or adequately sampled may remain undetected despite their presence. Kākahi; kōura; banded kōkopu; eel were all noted by ourselves on frog search or vegetation survey with WSP. We note these observations were not included in the *Incidental Observations internal NZTA GIS layer*, despite several being written on the survey sheets and communicated at the time e.g. adjacent *Frog Survey Line 2.16* in the Zentral forest banded kōkopu in supposedly *ephemeral* stream as per the FER mapping (we would consider permanent).

ADDITIONAL STATEMENTS FER PG. 26 NZFDD SUMMARY

FER STATEMENT	REVIEW
In steep and elevated stream tributaries within the Proposed Designation that are high in their respective catchments, only long and short fin eel, banded kōkopu and less often red fin bully are likely to be present.	The presence of these species is to a degree an expected regional ecological pattern based on climbing ability and distance from the sea as emphasized in the FER. The use of the word ONLY minimises its representativeness. However, as noted the NZFFD is unlikely to provide records of other species with fidelity to these habitats e.g. lamprey; and the recognised sparseness of other species e.g. kōaro ; shortjaw kōkopu is unlikely to be expressed in limited snapshot sampling from a *small range* of sample sites (FER PG.25). It is highly plausible that undetermined Galaxias and Gobiomorphus NZFFD records at elevation represent less commonly encountered taxa that may be more difficult to confidently identify in the field, including kōaro, shortjaw kōkopu, and bluegill bully. This is supported by further available unrefined eDNA results at elevation in the Ahuroa and Waihoihoi (this report TABLEs X & X) Again the FER does not appear to fully report on for these in the later eDNA round Oct/ Nov . Species listed in At Risk categories *(Declining & Naturally Uncommon)* or Regionally Significant/ Regionally Rare are likely to occur there, either permanently or occasionally.
Natural barriers (such as the Piroa Falls) will naturally restrict many species from being present in streams within the Proposed Designation, due to the Project being a substantive distance inland from the coast, and the presence of hard climbing barriers.	This is an accepted natural and regionally consistent pattern of NZ freshwater fish. Expected species as per the previous statement are not of a lesser value individually or as a community
The Waihoihoi tributaries within the Proposed Designation currently have some fish passage challenges, and therefore I expect only long fin and short fin eel, and banded kōkopu to be present.	This is not supported by the eDNA or NZFFD results

FIG 19: CATCHMENTS NZFFD MAP



Legend

SYMBOL	SPECIES	COMMON NAME	THREAT STATUS 2025
	Anguilla australis	Shortfin eel	NOT THREATENED
	Anguilla dieffenbachii	Longfin eel	AT RISK - DECLINING
	Eel species	Eel species	Eel species
	Cheimarrichthys fosteri	Torrent fish	AT RISK - NATURALLY UNCOMMON
	Echyridella menziesii	kākahi	AT RISK - DECLINING
	Echyridella aucklandia	kākahi	THREATENED - NATURALLY UNCOMMON
	Galaxias argenteus	Giant Kōkopu	AT RISK - DECLINING
	Galaxias fasciatus	Banded Kōkopu	AT RISK - NATURALLY UNCOMMON REGIONALLY SIGNIFICANT
	Galaxias maculatus	Inanga	THREATENED - NATURALLY VUNERABLE
	Galaxias spp	Galaxias spp	-
	Gobiomorphus basalis	Crans bull	AT RISK - NATURALLY UNCOMMON
	Gobiomorphus cotidianus	Common bully	NOT THREATENED
	Gobiomorphus gobioides	Giant bully	AT RISK - NATURALLY UNCOMMON REGIONALLY SIGNIFICANT
	Gobiomorphus hutonni	Redfin bully	AT RISK - NATURALLY UNCOMMON
	Gobiomorphus spp	Gobiomorphus spp	-
	Paratya curvirostris	Freshwater shrimp kōeke	NOT THREATENED
	Paranephrops planifrons	Kōura	NOT THREATENED
	Retropinna retropinna	Common smelt	AT RISK - DECLINING

Bay Ecological CONSULTANCY LTD

13/06/2026	
NZFFD CATCH AT EACH SITE AHUROA & WAIHOIHOI FISH RECORDS	
Scale	Drawn By
as shown	CD
Drawing #	Rev #
2.0	A

TABLE 15: AHUROA FWFD RESULTS

SPECIES- FRESHWATER FISH DATABASE	COMMON NAME	THREAT STATUS 2025[81]	1	2	3	4	5	6	7	8	9	10	11	12	13
ELEVATION			30m <5km LOWLAND	10m <5km LOWLAND	50m 5-10km HILL COUNTRY	80m 5-10km HILL COUNTRY	138m 5-10km HILL COUNTRY	60m 5-10 HILL COUNTRY	75m 10km HILL COUNTRY	75m 10km HILL COUNTRY	60m 10km HILL COUNTRY	130m 10km HILL COUNTRY	40m 10km HILL COUNTRY	205m 10km HILL COUNTRY	220m 10km HILL COUNTRY
Anguilla australis	SHORTFIN EEL	NOT THREATENED		EEL SPP	EEL SPP	EEL SPP				✓	✓	✓	EEL SPP		EEL SPP
Anguilla dieffenbachii	LONGFIN EEL	AT RISK - DECLINING					✓	✓	✓	✓	✓	✓			
Cheimarrichthys fosteri	TORRENT FISH	AT RISK – NATURALLY UNCOMMON						✓	✓	✓					
Echyridella menziesii	KĀKAHI	AT RISK - DECLINING													
Echyridella aucklandia	KĀKAHI	THREATENED –NATIONALLY VULNERABLE													
Galaxias argenteus	GIANT KŌKOPU	AT RISK - DECLINING													
Galaxias brevipinnis	KŌARO	AT RISK – DECLINING REGIONALLY RARE													
Galaxias fasciatus	BANDED KŌKOPU	AT RISK – NATURALLY UNCOMMON REGIONALLY SIGNIFICANT			✓	✓	✓	✓	✓	✓	✓		✓		✓
Galaxias maculatus	ĪNANGA	THREATENED -NATURALLY VULNERABLE	✓												
Galaxias postvectis	SHORT JAW KŌKOPU	THREATENED -NATURALLY VULNERABLE REGIONALLY SIGNIFICANT													
Geotria australis	LAMPREY	THREATENED -NATURALLY VULNERABLE													
Gobiomorphus basalis	CRANS BULLY	AT RISK – NATURALLY UNCOMMON		✓	✓										
Gobiomorphus cotidianus	COMMON BULLY	NOT THREATENED	✓	✓				✓	✓	✓	✓				
Gobiomorphus gobioides	GIANT BULLY	AT RISK- NATURALLY UNCOMMON REGIONAL SIGIFICANT													
Gobiomorphus hubbsi	BLUEGILL BULLY	AT RISK- NATURALLY UNCOMMON REGIONALLY RARE													
Gobiomorphus hutonni	REDFIN BULLY	AT RISK – NATURALLY UNCOMMON	✓	✓			✓	✓		✓					
Paratya curvirostris	FRESHWATER SHRIMP KŌEKE	NOT THREATENED		✓	✓		✓	✓	✓	✓		✓	✓		
Paranephrops planifrons	KŌURA	NOT THREATENED			✓	✓	✓	✓	✓	✓			✓	✓	✓
Retropinna retropinna	COMMON SMELT	AT RISK - DECLINING													
Gobiomorphus spp	Gobiomorphus spp -	-					✓	✓	✓	✓			✓		
Galaxias spp	Galaxias spp	-											✓		

[81] Dunn et al (2025) Conservation Status of NZ freshwater fishes (2023) NZ Threat Classification Series 46. DoC, Wellington

FIG 20: AHUROA NZFWD RESULTS

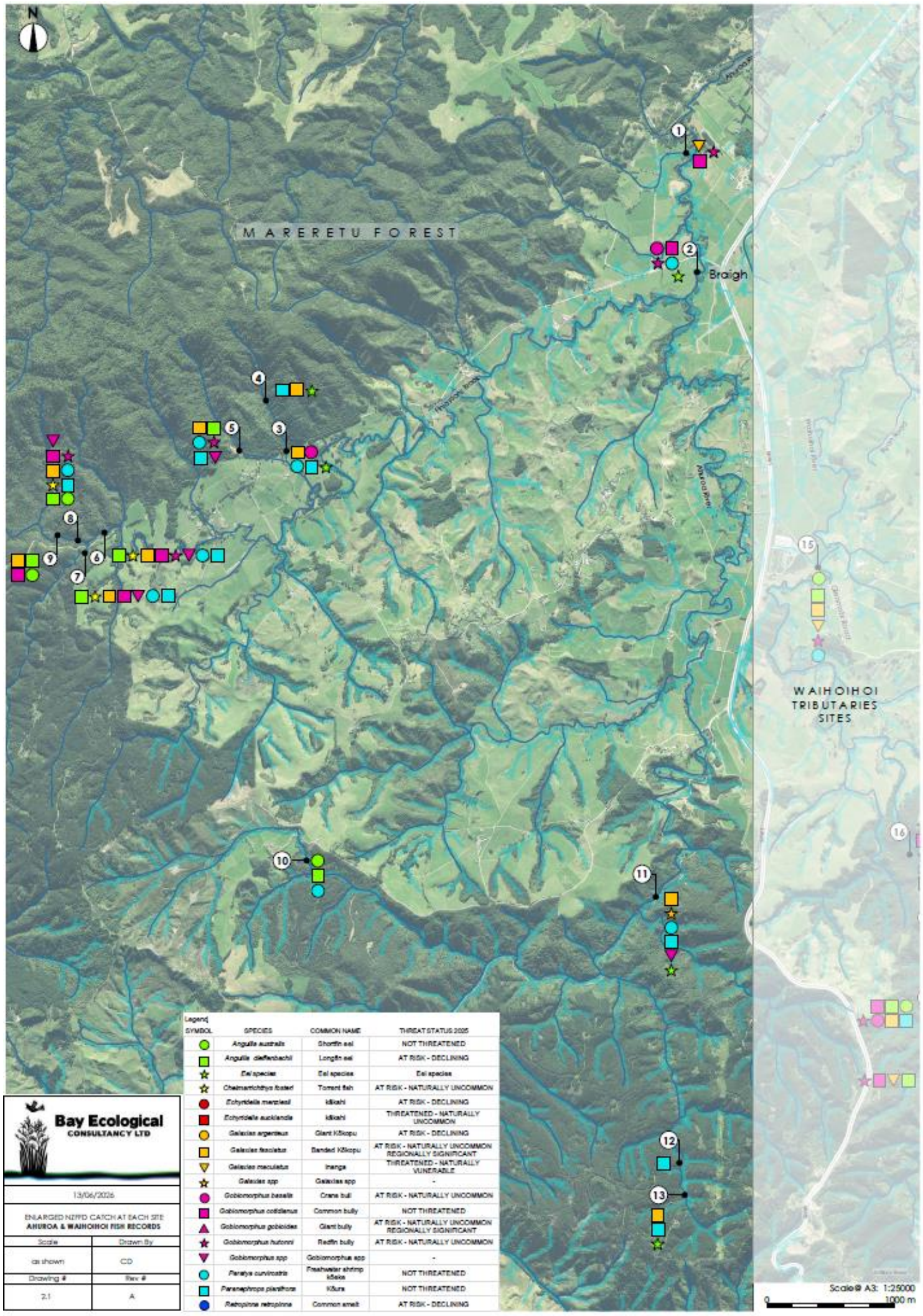


FIG21: NZFFD WAIHOIHOI

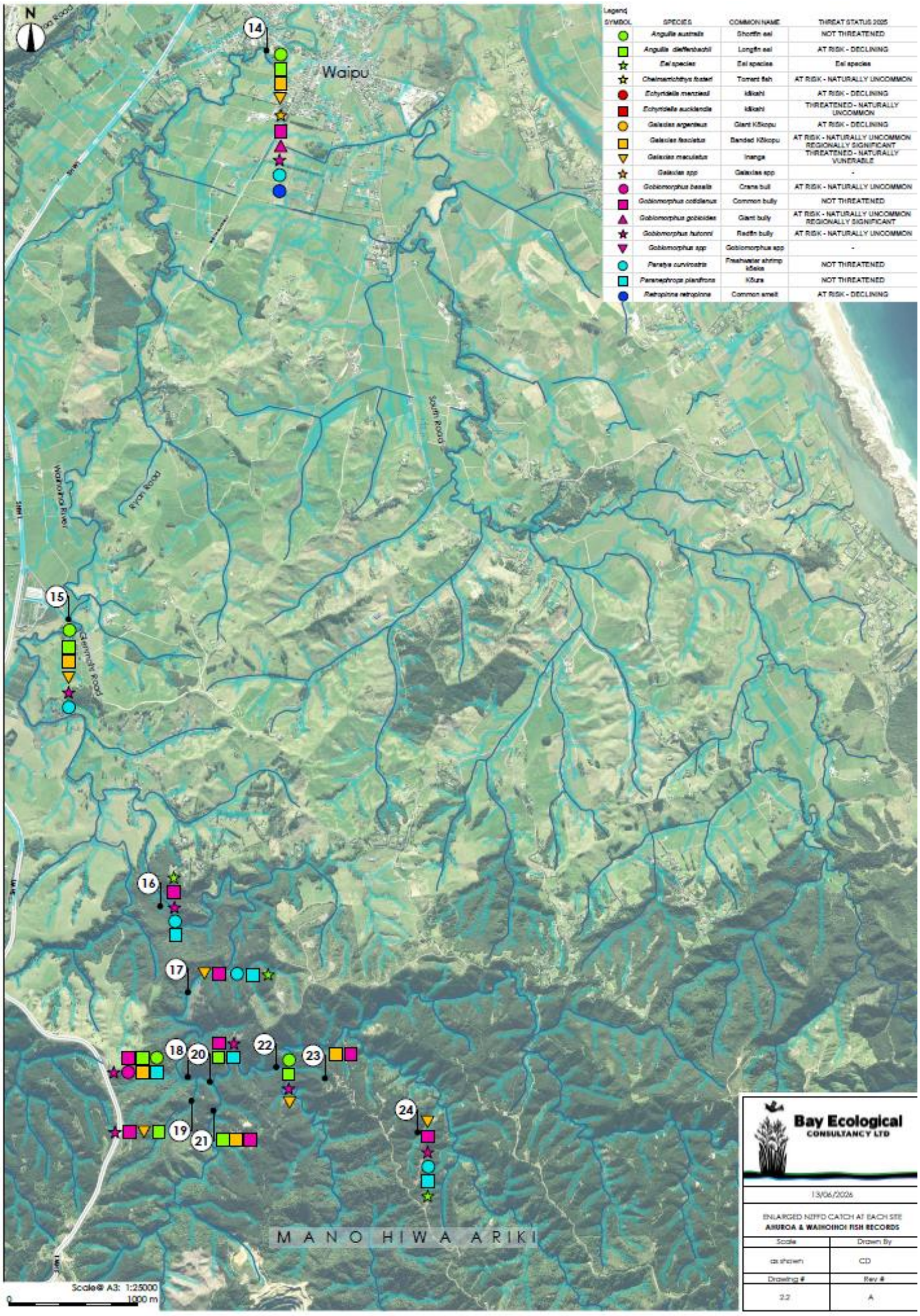


TABLE 16: WAIHOIHOI CATCHMENT NZFFD RECORDS

SPECIES- FRESHWATER FISH DATABASE	COMMON NAME	THREAT STATUS 2025[82]	14	15	16	17	18	19	20	21	22	23	24
ELEVATION			10m	20m	40m	50m	55m	60m	55m	70m	110m	70m	110
DISTANCE FROM COAST			<5KM COASTAL	5-10KM LOWLAND	10KM HILLCOUNTRY	10KM HILLCOUNTRY	10KM HILLCOUNTRY	10KM HILLCOUNTRY	10KM HILLCOUNTRY	10KM HILLCOUNTRY	10KM HILLCOUNTRY	10KM HILLCOUNTRY	10KM HILLCOUNTRY
Anguilla australis	SHORTFIN EEL	NOT THREATENED	✓	✓	EEL SPP	EEL SPP	✓				✓		EEL SPP
Anguilla dieffenbachii	LONGFIN EEL	AT RISK - DECLINING	✓	✓			✓	✓	✓	✓	✓		
Cheimarrichthys fosteri	TORRENT FISH	AT RISK – NATURALLY UNCOMMON											
Echyridella menziesii	KĀKAHI	AT RISK - DECLINING											
Echyridella aucklandia	KĀKAHI	THREATENED –NATIONALLY VULNERABLE											
Galaxias argenteus	GIANT KŌKOPU	AT RISK - DECLINING											
Galaxias brevipinnis	KŌARO	AT RISK – DECLINING REGIONALLY RARE											
Galaxias fasciatus	BANDED KŌKOPU	AT RISK – NATURALLY UNCOMMON REGIONALLY SIGNIFICANT	✓	✓		✓	✓			✓		✓	
Galaxias maculatus	ĪNANGA	THREATENED -NATURALLY VULNERABLE	✓	✓		✓		✓			✓		✓
Galaxias postvectis	SHORT JAW KŌKOPU	THREATENED -NATURALLY VULNERABLE REGIONALLY SIGNIFICANT											
Geotria australis	LAMPREY	THREATENED -NATURALLY VULNERABLE											
Gobiomorphus basalis	CRANS BULLY	AT RISK- NATURALLY UNCOMMON					✓						
Gobiomorphus cotidianus	COMMON BULLY	NOT THREATENED	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Gobiomorphus gobioides	GIANT BULLY	THREATENED -NATURALLY VULNERABLE	✓										
Gobiomorphus hubbsi	BLUEGILL BULLY	AT RISK- NATURALLY UNCOMMON											
Gobiomorphus hutonni	REDFIN BULLY	AT RISK – NATURALLY UNCOMMON	✓	✓	✓		✓	✓	✓		✓		✓
Paratya curvirostris	FRESHWATER SHRIMP KŌEKE	NOT THREATENED	✓	✓	✓	✓							✓
Paranephrops	KŌURA	NOT THREATENED			✓	✓	✓		✓				✓
Retropinna retropinna	COMMON SMELT	AT RISK - DECLINING	✓										
Gobiomorphus spp	Gobiomorphus spp -	-											
Galaxias spp	Galaxias spp	-	✓	✓									

[82] Dunn et al (2025) Conservation Status of NZ freshwater fishes (2023) NZ Threat Classification Series 46. DoC, Wellington

3.2.3 eDNA

The eDNA results are presented for the two main catchments of the Ahuroa & Waihoihoi .

The presentation and organisation of the data substantially limits interpretability and renders independent review unnecessarily labyrinthine and difficult, reducing confidence in the resulting conclusions presented.

- The early public access sites (FER TABLE 7) are either named differently in the original data package to the FER Table e.g. data pack *Public 559810/11 Unnamed Waihoihoi Tributary* 1&2 is renamed *Upper Waihoihoi Tributary (SH1)*; or alternatively given a name that does not reference any eDNA batch number.
- This is further complicated by early round TABLE 7 omission from any mapping. They are not *shown on the maps in Appendix E* as stated in the FER. Rather Appendix E is a repeat of FIG 5 of the later sample round. There is consequently no visual representation of the locations, or referencable location of giant kōkopu (*Public 559810/11 Upper Waihoihoi*) or giant bully occurences (*Public 559813/14 Lower Ahuroa*). It is therefore impossible to decipher where they are in relation to the later Oct/Nov round and interpret catchment connectivity and potential effects
- The later site specific round (TABLE 8) are shown in FIG 5 and reproduced in Appendix E despite this supposedly showing the early sample locations (it does not)
    - There is a Waipū Nth Tributary on the maps but no Waipū North as in TABLE 8.
    - Pine Nth & Pine Mid in TABLE 8 appear to have been confusingly renamed Piroa Nth & Piroa Mid in FIG 5
    - Robertsons Site Oct Nov 25 sample sites is not shown Fig 5
    - There is no *Pine Tributary* as per TABLE 8 on the map. The batch numbers are available as popup on the NZTA GIS Platform. The unmapped *Pine Tributary* site is what we assume to be as indicated on the snip below, as no other potential site is shown. It is distinct from the *Piroa Tributary* assigned to a separate data point pop up on the GIS platform with separate results. Although reported on separately in TABLE 8 *Pine Tributary* it has the same batch numbers #554073; 554070 & #554071as *Pine North Tributary* .

LAMPREY AMMOCOETE NOT TAKEN ONSITE ©BAY ECOLOGICAL CONSULTANCY LTD 2026



- the *Murray Property* site is not shown on any mapping in the report. Without knowledge of ownership this is a meaningless reference. The points & batch numbers are available as popup on the NZTA GIS Platform, to which we have select access. The Murray site is within the same small headwater group adjacent to Waipū North Tributary .
- The Murray site shows three points but only one batch number, we assume it was a one kit composite. All other points show three batch numbers

- Neither the map nor the names of the later sampling are clear to which catchment they serve e.g. Robertsons; Waipū North tributary/ Waipū South; Murray are tributary to the Waihoihoi; Pine series and Piroa locations are tributary to the Ahuroa despite from local knowledge being south of the Bryderwyns.
- In the data pack the early round tabulated results all confusingly have BATCH 559815/16 in the top title cell which refers only to Public Waihoihoi 1 (renamed Lower Waihoiho in the FER TABLE 7). Their actual references are then below that.
- Species names in TABLEs 7 & 8 are neither in alphabetic or consistent order between them
- TABLEs 7 & 8 Īnanga (*Threatened – Nationally Vulnerable)* are given the lesser status of *At Risk -Declining*. Smelt(*At Risk –Declining*)are given the lesser status of *At Risk -Naturally Uncommon*.

The FER does not report on the kōura, kōeke or freshwater mussel occurrences reported in either the early or later eDNA analysis, including *Echyridella aucklandia* (*Threatened – Nationally Vulnerable*) in the early se*t (Public Waihoihoi 1; Lower Waihoiho 559815/16).*

The FER does not comment on uncategorized *Galaxias* or *Gobiomorphus (bully)* detection results, which are not displayed for the early sample round (TABLE 7). Our own review showed multiple occurances. A unresolved *Gobiomorphus* detection is shown for the 2nd Oct/ Nov round (TABLE 8) for location After requesting the data recently we established there were multiple further detects in the data set. Unresolved detections remain ecologically meaningful and may indicate the presence of one or more species within the immediate catchment. Broad *Galaxias* detections may plausibly represent kōaro, shortjaw kōkopu, giant kōkopu, or a combination of these taxa. Known overlap in 16S sequence variants may further limit reliable species discrimination between giant kōkopu and shortjaw kōkopu within such datasets.

Unresolved *Gobiomorphus* detections likely reflect known marker overlap among common bully (*G. cotidianus*), upland bully (*G. breviceps*), redfin bully (*G. huttoni*), and Cran's bully (*G. basalis*) taxa. The *Gobiomorphus cotidianus/basalis/dinae* sequence is more selective to a smaller subset of these species (common; Cran's, Dinah's) but not confidently constrained to one exact species e.g. public access site Lower Ahuroa which also contained definitive Cran's Bully sequences.

TABLE 17:FER eDNA SUMMARY STATEMENTS & REVIEW

FER STATEMENT	REVIEW
The early results (Table 7) show that short fin eel were located in all surveyed waterways, and long fin eel, banded kōkopu and red fin bully are common in the lower reaches. Crans bully, giant kōkopu and common smelt were also present in these waterways, but infrequently (one record each). PG. 26	The early results (Public), complimented by provision of the EPA open access data set (Review Tables X & X)demonstrates that in addition to the Not Threatened short fin that species with At Risk Threat Status in fact have extended occupancy • longfin eel present throughout the Waihoihoi and the Ahuroa. • Torrentfish are present in the lower – mid reaches and mid to upper reaches of the Ahuroa. • Banded kōkopu are throughout lower and upper reaches of the Waihoihoi and the Ahuroa • Redfin bully are throughout the lower to upper Waihoihoi sites, as well as the Ahuroa • Smelt are found in expected habitat as per the cited location and that they are not found in upland locations is not indicative of low abundance (one record) or occupancy. Our results record them in 3 sites in the lower – mid Waihoihoi and in the lower Ahuroa. • Both Cran's bully (*At Risk – Naturally Uncommon*) and giant kōkopu with patchy distribution and lower detection likelihood were recorded in expected habitats implying potential wider use. One record each is not insignificant. The eDNA results for Cran's bully when considered with NZFFD results for the Ahuroa demonstrate extended longitudinal presence results. • The detection of diadromous galaxiid species giant kōkopu *(At Risk – Declining)* in the Upper Waihoihoi tributary, as with all other species with Threat status, emphasises the need for longitudinal connectivity between freshwater and marine environments for completion of their life cycle and the presence of significant habitats. • Undetermined Galaxias and Gobiomorpus results are not discussed and are not ecologically insignificant, as before. • Torrentfish are not mentioned. They are recorded in all early and EPA Waihoihoi lower – mid eDNA samples. • Common bully (Not Threatened) are recorded throughout low to middle reaches of both awa. • Kākahi (Echyridella aucklandia(Threatened- Nationally Vulnerable) are recorded from 2 sites in the Waihoihoi; with co occurance of Echyridella aucklandia (At Risk –Declining) which is also recorded further up the catchment • Kōura are in the lower and far removed upper reaches of both the Waihoihoi and Ahuroa
Site specific sampling…Table 8. This sampling confirmed conclusions in the desktop information indicating that banded kōkopu, long fin eel and short fin eel are the fish species with the highest probability of being encountered in the middle to upper reaches of most tributaries.	The Mid Waihoihoi and Main stem Waihoihoi results are both located within the proposed realignment of the Waihoihoi. Species include shortfin eel (Anguilla australis), longfin eel (Anguilla dieffenbachia At Risk - Declining), banded kōkopu (At Risk – Naturally Uncommon Galaxias fasciatus), īnanga (Galaxias maculatus Threatened Nationally Vulnerable), common bully (Gobiomorphus cotidianus), Cran's bully (Gobiomorphus basalis At Risk), redfin bully (Gobiomorphus huttoni At Risk – Declining), common smelt (Retropinna retropinna At Risk Declining), torrentfish (Cheimarrichthys fosteri); giant bully (Gobiomorphus gobioides At Risk- Naturally Uncommon) and Echyridella aucklandia(Threatened- Nationally Vulnerable). We reiterate that climbing species are indeed likely to be at higher elevations but non detects of some of the rarer species in this guild cannot be taken as absence, due to lack of targeted sampling and inherent low detectability. Unrefined Gobiomorphus and Galaxias results are also not considered in the FER, as before.

Non-detection within eDNA datasets should be interpreted cautiously for species such as kōaro (*Galaxias brevipinnis*), which are often naturally patchy in distribution and may occur at low local abundance within suitable habitat. Kōaro frequently occupy spatially restricted forested headwaters, turbulent flow environments, and structurally complex refuge habitat, all of which may reduce eDNA detectability. Detection probability may be further influenced by hydrological dilution, temporal variation in habitat use, low DNA shedding rates, and recognised metabarcoding resolution limitations within migratory galaxiids. Consequently, the absence of kōaro detections within eDNA results should not be interpreted as definitive evidence of species absence from the wider connected catchment, particularly where suitable habitat and hydrological connectivity persist. A site-specific inconsistency is evident within the NZTA *Pine Tributary* dataset, where longfin eel are recorded within WSP field observation notes but are absent from the corresponding eDNA detection results.

In respect to

eDNA sampling also indicated the presence of freshwater mussel (kākahi, Echyridella menziesii) in the Waihoihoi River, specifically in the Waihoihoi tributary that runs up into the Murray property (near Wetland 16). FER PG. 30

We contend that the sampling methodology employed has been insufficient to reliably determine the presence or absence of kōaro that undefined *Galaxias spp* records potentially may represent koaro and that non-detection within the available dataset should not be interpreted as evidence of true absence. Furthermore, we do not consider it scientifically robust to discount the potential presence of kōaro through substitution of functional traits by banded kōkopu.

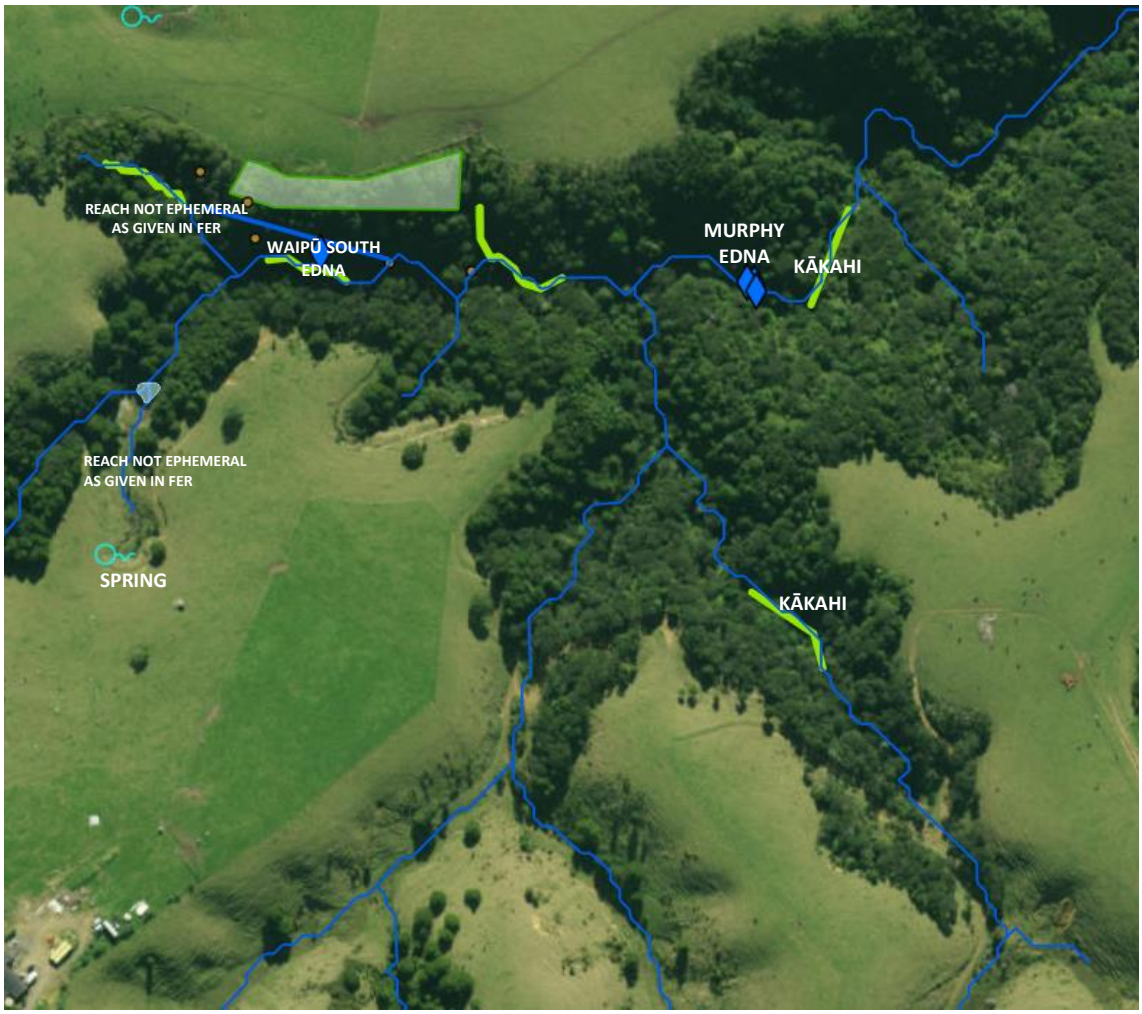
No kōaro have been recorded in any eDNA sampling. Kōaro are commonly understood to act as the transport for kākahi larvae. However, it is possible that banded kōkopu perform the same function FER PG.30

We note again that *Echyridella menziesii (At Risk Declining)* are recorded in the lower reaches in combined Waihoihoi eDNA data, in addition to *Echyridella aucklandia (Threatened – Nationally Vulnerable).* The latter has shown larvael (glochidia) fidelity to smelt in comparison to other fish species[83]*. Echyridella menziesii* are recorded throughout the Ahuroa at differing distances and elevation from the coast.

During frog survey, kākahi were observed instream in an upper Waihoihoi tributary of the Waipū South site closely above and below the Murray eDNA sample point (*refer Fig 22 below*), yet did not show up in the data set.

[83] Melchior,M; Squires,N ; Clearwater, S & Collier; K (2023) Discovery of a host fish species for the threatened New Zealand freshwater mussel *Echyridella aucklandica* (Bivalvia: Unionida: Hyriidae) NZJMFS: 57(1)152-159

FIG 22: OBSERVED KĀKAHI SITES AND FER MURRAY & WAIPŪ SOUTH EDNA SITES



Lamprey *(Geotria australis; Threatened -Nationally Vulnerable)* are a taonga species with very few records in Northland. Interpretation of lamprey absence from standard eDNA survey datasets requires considerable caution. Absence of lamprey detections should not be interpreted as definitive evidence of species absence unless survey design has incorporated species-specific methodologies, appropriate seasonal timing, repeated sampling effort, and targeted investigation of likely ammocoete and migratory habitat. Recent guidance[84] explicitly recognises that lamprey are a *cryptic species that is not routinely captured using standard fish survey techniques* and that specialised methods are required *to determine the distribution of lamprey within a waterway, locate critical habitats, and monitor populations over time*. This limitation is directly relevant to interpretation of broad-scale freshwater eDNA surveys, particularly where sampling design has not been specifically developed around lamprey ecology and life history. NRC are currently planning targeted survey *(pers comm A Ashkettle NRC).*

Importantly, the report does not advocate reliance on single-event eDNA surveys for definitive presence/absence interpretation. Instead, recommended approaches include repeated

[84] NIWA (2024) Locating lamprey Guidelines for identification of critical habitats and population monitoring.

temporal sampling, and integration of species-specific targeted investigation e.g. ammocoete habitat. These recommendations reflect ecological lamprey traits that inherently reduce eDNA detectability- low local abundance; highly patchy occupancy; prolonged burrowing behaviour of ammocoetes, and temporally limited migratory activity.

Seasonal timing is a critical component of effective lamprey detection. Summer–early autumn surveys are needed to target ammocoetes, generally between December and March, when lower flows and stable depositional habitat conditions improve detectability and access to fine sediment larval habitat. Ammocoetes typically occupy highly localised depositional zones containing fine sediment and organic matter, where DNA release into the water column may remain spatially restricted. Consequently, conventional reach-scale water sampling undertaken outside optimal seasonal windows, or without direct targeting of suitable ammocoete habitat, may substantially underestimate lamprey presence.

Hydrological dilution, temporal variability in migration timing, low DNA shedding rates, and the cryptic ecology of both larval and adult life stages further increase the probability of false absences within standard freshwater eDNA metabarcoding datasets.

FIG 23: EDNA MAP CATCHMENTS

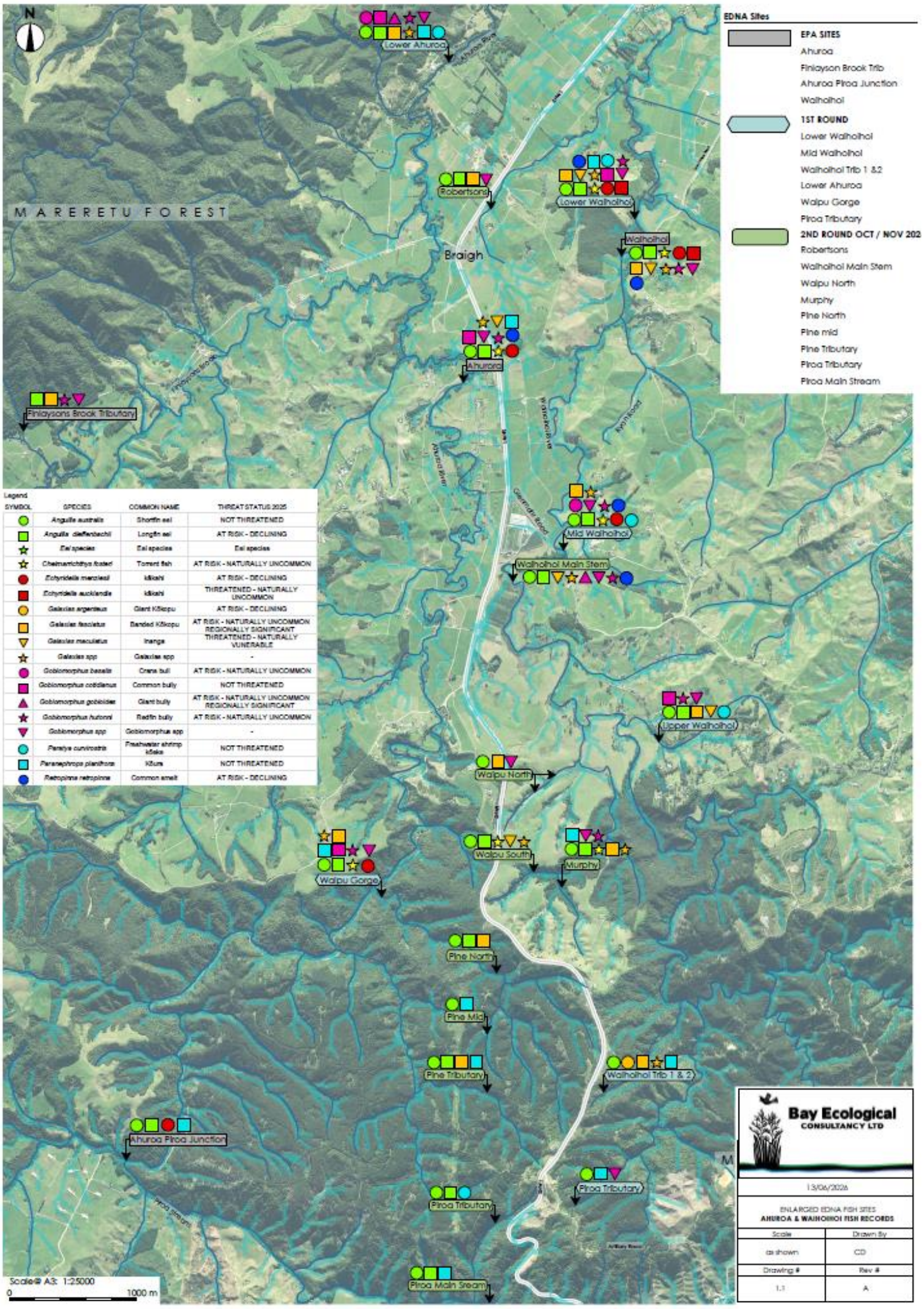


TABLE 18: WAIHOIHOI EDNA

SPECIES	COMMON NAME	THREAT STATUS 2025	1st Round WAIHOIHOI 1/ LOWER WAIHOIHOI 559815/16	EPA WAIHOIHOI 523017 2023	2nd Round ROBERTSONS	1st Round 559806/09 MID WAIHOIHOI	2nd Round WAIHOIHOI MAIN STEM	1st Round 559801/05 UPPER WAIHOIHOI	2nd Round WAIPŪ NORTH TRIBUTARY	2nd Round WAIPŪ SOUTH TRIBUTARY	2nd Round MURRAY	1st Round 559810/11 UNNAMED WAIHOIHOI TRIBUTARY 1&2/ UPPER WAIHOIHOI TRIB (SH1)
Anguilla australis	SHORTFIN EEL	NOT THREATENED	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Anguilla dieffenbachii	LONGFIN EEL	AT RISK - DECLINING	✓	✓	✓	✓	✓	✓		✓	✓	
Cheimarrichthys fosteri	TORRENT FISH	AT RISK – NATURALLY UNCOMMON	✓	✓		✓				✓	✓	
Echyridella menziesii	KĀKAHI	AT RISK - DECLINING	✓	✓		✓						
Echyridella aucklandia	KĀKAHI	THREATENED –NATIONALLY VULNERABLE	✓	✓								
Galaxias argenteus	GIANT KŌKOPU	AT RISK - DECLINING										✓
Galaxias brevipinnis	KŌARO	AT RISK – DECLINING REGIONALLY RARE										
Galaxias fasciatus	BANDED KŌKOPU	AT RISK – NATURALLY UNCOMMON REGIONALLY SIGNIFICANT	✓	✓	✓	✓		✓	✓	✓	✓	✓
Galaxias maculatus	ĪNANGA	THREATENED –NATIONALLY VULNERABLE	✓	✓			✓	✓				
Galaxias postvectis	SHORT JAW KŌKOPU	THREATENED -NATURALLY VULNERABLE REGIONALLY SIGNIFICANT										
Geotria australis		THREATENED -NATURALLY VULNERABLE										
Gobiomorphus basalis	CRANS BULLY	AT RISK -NATURALLY UNCOMMON										
Gobiomorphus cotidianus	COMMON BULLY	NOT THREATENED	✓			✓		✓				
Gobiomorphus gobioides	GIANT BULLY	AT RISK -NATURALLY UNCOMMON					✓					
Gobiomorphus hubbsi	BLUEGILL BULLY	AT RISK- NATURALLY UNCOMMON										
Gobiomorphus hutonni	REDFIN BULLY	AT RISK – NATURALLY UNCOMMON	✓	✓		✓	✓	✓			✓	
Paratya curvirostris	KŌEKE FRESHWATER SHRIMP	NOT THREATENED	✓			✓		✓				
Paranephrops	KŌURA	NOT THREATENED	✓								✓	✓
Retropinna retropinna	COMMON SMELT	AT RISK - DECLINING	✓	✓		✓	✓					
Gobiomorphus spp	Gobiomorphus spp -	-	✓	✓	✓	✓	✓	✓	✓		✓	
Galaxias spp	Galaxias spp	-	✓	✓		✓	✓			✓	✓	✓

TABLE 19: AHUROA eDNA

SPECIES- FRESHWATER FISH	COMMON NAME	THREAT STATUS 2025[85]	1st Round 559813/14 LOWER AHUROA	EPA FINLAYSON BROOK TRIBUTARY 502687 2020	1st Round 559803/04 WAIPŪ GORGE	EPA AHUROA 523021 2023	2nd Round PINE NORTH	2nd Round PINE MID	2nd Round PINE TRIBUTARY	2nd Round PIROA TRIBUTARY	EPA AHUROA PIROA JUNCTION 531271/73	2nd Round PIROA MAIN STEM 55	1st Round 559800/797 PIROA TRIBUTARY
Anguilla australis	SHORTFIN EEL	NOT THREATENED	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Anguilla dieffenbachii	LONGFIN EEL	AT RISK - DECLINING	✓	✓	✓	✓	✓		✓	✓	✓	✓	
Cheimarrichthys fosteri	TORRENT FISH	AT RISK – NATURALLY UNCOMMON			✓	✓							
Echyridella menziesii	KĀKAHI	AT RISK - DECLINING			✓	✓					✓		
Echyridella aucklandia	KĀKAHI	THREATENED –NATIONALLY VULNERABLE											
Galaxias argenteus	GIANT KŌKOPU	AT RISK – NATURALLY UNCOMMON											
Galaxias brevipinnis	KŌARO	AT RISK – DECLINING REGIONALLY RARE											
Galaxias fasciatus	BANDED KŌKOPU	AT RISK – NATURALLY UNCOMMON REGIONALLY SIGNIFICANT	✓	✓	✓		✓		✓				
Galaxias maculatus	ĪNANGA	THREATENED -NATURALLY VULNERABLE				✓							
Galaxias postvectis	SHORT JAW KŌKOPU	THREATENED -NATURALLY VULNERABLE REGIONALLY SIGNIFICANT											
Geotria australis	LAMPREY	THREATENED – NATIONALLY VULNERABLE											
Gobiomorphus basalis	CRANS BULLY	AT RISK – NATURALLY UNCOMMON	✓										
Gobiomorphus cotidianus	COMMON BULLY	NOT THREATENED	✓		✓	✓							
Gobiomorphus gobioides	GIANT BULLY	AT RISK – NATURALLY UNCOMMON	✓										
Gobiomorphus hubbsi	BLUEGILL BULLY	AT RISK- NATURALLY UNCOMMON											
Gobiomorphus hutonni	REDFIN BULLY	AT RISK – NATURALLY UNCOMMON	✓	✓	✓	✓							
Paratya curvirostris	FRESHWATER SHRIMP KŌEKE	NOT THREATENED	✓										
Paranephrops	KŌURA	NOT THREATENED	✓		✓	✓		✓	✓	✓	✓	✓	✓
Retropinna retropinna	COMMON SMELT	AT RISK - DECLINING				✓							
Gobiomorphus spp	Gobiomorphus spp -	-	✓	✓	✓	✓							✓
Galaxias spp	Galaxias spp	-	✓		✓	✓							

[85] Dunn et al (2025) Conservation Status of NZ freshwater fishes (2023) NZ Threat Classification Series 46. DoC, Wellington

3.2.4 MACROINVERTEBRATES

The FER utilizes the eDNA sets collected in the Oct/ Nov 2025 round to calculate MCI scores for the limited reaches they consider relevant and uses that to substantiate its description of the ecological value of streams in the catchments as a whole. It summarises the results in Fig 6 with interpretation that emphasises the lower spectrum of sites condition:
Most sites are poor (<80) to fair (80-100) quality habitat for macroinvertebrates. FER PG. 30

The results were allocated to bands as follows

- *poor (<80)* **4**
- *fair (80-100)* **10**
- *good* (100-120) **3** Pine tributary & Piroa tributary (Ahuroa); Murry (Waihoihoi)
- *excellent (>120)* **1** Pine north (Ahuroa)

Consequently, the majority of sites (78%) achieved fair to excellent macroinvertebrate habitat condition, which contrasts with the impression conveyed by the FER's characterisation. The good and excellent sites are located in upper forested slopes of the Brynderwyns.

Use of eDNA is identified as a complementary tool to physical methodologies for freshwater biomonitoring and macroinvertebrate communities with potential advantages of broader scale biodiversity detection, the ability to distinquish within morphologically difficult groups such as *Diptera* and detection of rare or elusive taxa. In regard to the latter, in our own review of the 1st round eDNA set we noted:

- the double gilled mayfly (*Zephlebia tuberculata At Risk – Naturally Uncommon*; 559815/16 *Lower Waihoihoi;* tolerance value: 7) lives among leaf litter, woody debris, and depositional habitat
- freshwater red algae *Nocturama antipodites* (data deficient) at *Lower Waihoihoi* (sample 559815/16) & *Lower Ahuroa* (559813/814)- occurs attached to stones, wood, or submerged vegetation in relatively good-quality flowing water.

However, eDNA is not considered a replacement for conventional macroinvertebrate kick-net surveys. Recent NIWA review has determined that eDNA-based metrics and physical sampling metrics – MCI, QMCI, ASPM– are correlated but not equivalent. NEMS physical habitat-proportional sampling method detects more species than eDNA. Analysis demonstrated that eDNA may result in a large proportion of sites (~50%) falling in a different NOF attribute bands, with a greater number of sites falling in lower attribute bands. Currently some eDNA detections must be excluded due to insufficient taxonomic resolution (e.g. *Hydrobiosidae)* for calculating MCI. Varying levels of resolution is also a larger issue with eDNA MCI. While greater taxa richness is obtainable using genus-level eDNA, MCI scores calculated using this data were lower than metrics at further genus resolution due to high diversity of taxa aggregated into a higher level groups with low MCI tolerance values (e.g. *Oligochaetes, Hydra, Ostracods, Nematoda, Platyhelminthes)*. *Chironomids* identified to genus score much higher than if only to *Chironomidae* (e.g. *Parochlus*).

There is currently no national standardisation (i.e. NEMS) for eDNA macroinvertebrate biotic indexes, which eliminates the need for judgement calls, data noise and bias. Unfortunately we consider the FER findings fall into this category, again without verifiable data or demonstrated analysis workings. The QMCI and ASPM (abundance-based indices) cannot presently be robustly derived from eDNA data alone. Sequence read abundance is not considered a reliable surrogate for physically sampled abundance because it is influenced by multiple environmental and biological factors, including transport, degradation, shedding rates, and dilution effects.

Interpretation of macroinvertebrate eDNA in streams is complicated by downstream transport, meaning detections may represent upstream communities rather than local site occupancy. Consequently, eDNA approaches are considered less suitable for fine-scale point assessments, and molecular and conventional sampling methods are not always congruent.

In light of these expert level NIWA caveats we contend the methodology employed in the FER cannot be used accurately and we additionally disagree due to the lack of survey methodology, data set access and interpretation with the FER statement that:

These data reveal the aquatic taxa present in a more detailed way than standard sample collection laboratory analysis as it often enables identification of the taxa to a species level.

We consider the FER allocation of results to the attribute bands unlikely to be accurate in terms of the lower bands. We suggest that although the results do follow a broad expected pattern for Northland, that the broad reference to nutrient pollution is a simplification. No data is presented as to field readings.

MCI was originally developed to assess responses to organic pollution and nutrient-related degradation. Regional macroinvertebrate metrics have been found to be negatively related to nutrient concentration however, only the relationship with total Kjeldahl nitrogen (TKN) was identified as statistically significant[86]. Additionally, the substantial overlap in nutrient concentrations between sites above and below the NPS-FM national bottom lines of invertebrate metrics suggests that nutrient levels alone may not adequately explain variation in community condition, except for TKN where concentrations were higher in sites below the national bottom line. Macroinvertebrate communities in Northland streams are influenced by multiple environmental factors, including flow permanence, drought, habitat availability, substrate stability, temperature, dissolved oxygen. **Non-nutrient factors often explained more variation in macroinvertebrate metrics than nutrient concentrations alone**, particularly in Northland's naturally warm, low-gradient, soft-bottom streams[87]. Intermittent streams may also display dominance of drought-tolerant and generalist species with fewer EPT taxa not because of nutrient enrichment, rather:

- Flow permanence is limited.
- Habitats dry periodically.

[86] Halliday, N.J., Hamill, K.D., Hickey, C.W. & Storey, R.G. (2023). *Drivers of Macroinvertebrate Communities in Northland Streams*. Prepared for Northland Regional Council, NIWA Client Report

[87] Pingram, M., Hickey, C.W., Halliday, N.J., Hamill, K.D. & Storey, R.G. (2021). Macroinvertebrate Community Trends and Drought Responses in Northland Rivers. Prepared for the Northland Regional Council. NIWA Client Report 2021088HN, National Institute of Water and Atmospheric Research Ltd, Hamilton.

- Water temperatures are naturally higher.
- Recolonisation opportunities are reduced

Stoneflies are generally the most flow-sensitive and are often absent from warm, low-gradient, intermittent Northland streams regardless of water quality.

Recent regional reporting[88] suggests not unexpectantly that fine sediment is the habitat variable most strongly associated with community composition, associated with pastoral use. Most Northland streams were in **moderate to poor ecological condition**, with the majority of sites falling within NPS-FM C and D bands for MCI, SQMCI and ASPM. Targeted drought-monitoring sites sampled in 23 March 2020 included **Ahuroa River (Braighs Flat).** It retained **moderate ecological condition** during the 2020 drought:

- MCI: 84.0
- QMCI: 4.06
- Taxonomic richness: 20 taxa
- EPT richness: 7 taxa

While not pristine, the presence of a substantial EPT component under drought stress indicates ongoing habitat values sufficient to support pollution-sensitive invertebrates.

Use of the MCI alone, whether by physical or eDNA method, is based solely on taxon presence and absence and does not incorporate relative abundance. Consequently, it reflects taxonomic composition rather than community dominance structure. While lower MCI scores may indicate an increased representation of pollution-tolerant taxa, abundance-based metrics such as QMCI and SQMCI (not assessed in the FER study) may provide a different interpretation where tolerant taxa are present but do not numerically dominate the assemblage. This was demonstrated in a study of Canterbury water races assessed by MCI scores as moderately to severely degraded. However, this result primarily reflected the presence of a greater number of pollution-tolerant taxa within water race communities rather than their relative dominance.

In contrast, the abundance-based QMCI and SQMCI indices distributed water race sites more evenly across all condition classes, suggesting that tolerant taxa did not consistently dominate communities. This indicates that, although water races supported a higher representation of taxa associated with modified or degraded habitats, many sites retained substantial populations of more sensitive taxa.

The races supported significantly fewer EPT taxa and a lower percentage of EPT individuals than natural streams, while taxa commonly associated with enriched environments e.g. molluscs and oligochaetes, were more abundant. These patterns likely reflect the highly modified nature of the races, including elevated fine sediment load, increased turbidity, limited habitat and substrate complexity, and exposure to direct pastoral inputs.

Nevertheless, the QMCI and SQMCI results suggested MCI underestimated ecological condition. Communities were typically dominated by a common suite of generalist taxa, particularly *Deleatidium, Potamopyrgus, and Hydora*, which were capable of persisting under

[88] Death, R.G., Nicholson, C., Chakraborty, M., & Pohe, S. (2023). *Ecological Health of Stream Invertebrate Communities in Northland: Can State of the Environment Data Identify Drought Impacts?* Prepared for the Northland Regional Council, Whangārei, New Zealand

the relatively uniform environmental conditions found throughout the race network. Some races supported communities containing substantial abundance of sensitive taxa despite the presence of tolerant species.

Relatively low EPT abundance or richness does not necessarily indicate poor fish habitat quality, particularly within naturally low-gradient, wetland, or organic-rich freshwater systems. We do not accept the FER statement that

Application of macroinvertebrate expectations across all freshwater habitats and likely to be affected may therefore oversimplify ecological condition assessments and inadequately represent habitat suitability for diverse native fish assemblages. This is reinforced by the NRC SOE Fish Survey 2024-204 which reported the highest fish diversity at a lowland pastoral site.

New Zealand freshwater fish do not rely exclusively on EPT taxa (Ephemeroptera, Plecoptera, and Trichoptera). Feeding ecology among native fish is diverse and generally opportunistic, with diets comprising a broad range of aquatic and terrestrial invertebrates. Common prey items include chironomid larvae, crustaceans, zooplankton, aquatic worms, molluscs, and terrestrial insects derived from riparian inputs. Consequently, the presence of high-quality fish habitat does not necessarily correspond with dominance of EPT taxa.

Species-specific habitat and feeding preferences are important in interpreting these relationships. Upland and forest-associated galaxiids, including kōaro and shortjaw kōkopu, are associated with coarse substrates that also favour EPT-rich macroinvertebrate communities. However, they also consume substantial proportions of chironomids and other non-EPT taxa. In contrast, lowland and wetland-associated species such as īnanga and giant kōkopu commonly inhabit slower-flowing, depositional environments that naturally support lower EPT richness and greater abundances of soft-bodied and lentic-associated invertebrates. Īnanga occupying lentic environments demonstrated strong selective feeding preferences for chydorids (water fleas), which are generally regarded as moderately tolerant to tolerant taxa, and chironomid larvae (non-biting midges; Diptera), a group encompassing taxa ranging from highly tolerant to sensitive depending on taxonomic resolution[89].

The modified watercourses and ditches across the Waipū plains that fed a significant amount of surface water to the Waihoihoi and Ahuroa from within developed pasture. Their character is not homogenous however and although they likely share soft substrate they vary in flow, connection and riparian cover. Nevertheless, they may contributed to the biodiversity of a landscape. The recorded presence of longfin eel (At Risk – Declining), shortfin eel, banded kōkopu (Threatened – Naturally Uncommon; Regionally Significant), and undetermined bully species within Robertsons Tributary, including the potential presence of giant bully (At Risk – Naturally Uncommon; Regionally Significant), indicates that the tributary continues to provide functional aquatic habitat capable of supporting a range of significant fish taxa, notwithstanding the reported low Macroinvertebrate Community Index (MCI) scores. These species records demonstrate ongoing habitat connectivity, ecological function, and the persistence of instream values of regional biodiversity significance.
Within the *Waihoihoi Main Stem* site, the FER calculated an eDNA MCI score of 57, the second lowest recorded value after Robertsons Tributary. Notwithstanding this *POOR* attribute band

[89] STUART,R ; INGRAM, T & CLOSS; G. (2023) GROWTH AND DIET OF ĪNANGA (GALAXIAS MACULATUS) WITHIN A SMALL NEW ZEALAND COASTAL POND SYSTEM. NZJMFR 57(1): 88-103

rating, integration of NZFFD records with eDNA EPA; 1st & 2nd FER sampling rounds identified at least 10 freshwater receptor taxa across multiple genera. These included multiple taxa with recognised national threat classifications – īnanga *(Threatened – Nationally Vulnerable*); the only giant bully record *(At Risk – Naturally Uncommon*); longfin and shortfin eel; redfin bully; banded kōkopu; smelt; and torrentfish. These records indicate the continued presence of ecologically functional habitat of a diverse native freshwater assemblages.
Kākahi comprising both *Echyridella aucklandica (Threatened – Nationally Vulnerable*) and *Echyridella menziesii* (*At Risk – Declining*) are also detected in the eDNA sample. Larval mussels are **among the most copper-sensitive freshwater invertebrates tested in NZ[90].** Toxicology studies on *Echyridella menziesii* larval glochidia to be extremely sensitive to copper and moderately sensitive to zinc and ammonia.

TABLE 20: TOXICOLOGY *ECHYRIDELLA MENZIESII* GLOCHIDIA (AQUEOUS)

CONTAMINANT	EC50 (48-HOUR)	NOEC (48-HOUR)	SENSITIVITY INTERPRETATION
Copper (Cu)	0.0017–0.0034 mg/L	0.0013–0.0026 mg/L	Extremely high sensitivity
Zinc (Zn)	0.229–0.337 mg/L	0.128–0.240 mg/L	Moderate sensitivity

Copper caused effects at very low concentrations indicating sensitivity at the low microgram-per-litre scale. They are also highly sensitive to fine sediment deposition and moderate–high suspended sediment loads, with juvenile life stages being the most vulnerable due to smothering and habitat clogging effects. Kōura present also have *structural sediment impact sensitivity (habitat simplification)* rather than direct water-column effects; freshwater shrimp (*Paratya curvirostris*) are highly sensitive to habitat infilling and turbidity.

Fish habitat suitability is often controlled by reach-scale features rather than whole-catchment characteristics e.g. undercut banks for giant kōkopu; intermittent wetland margins for coarse cobble riffles for torrentfish; slow backwaters for īnanga juveniles. Within a reach fish species will partition to occupy microniches e.g. targeting shallow stream riffles often results in catch of small redfin. Banded kōkopu prefer low velocity habitat areas of deeper water, albiet in rocky, tumbling small tributaries where only kōaro could otherwise access. Common bully are often found with shortfin in a reach, favouring similar intermediate conditions.

3.2.5. SUMMARY OF STREAM CONDITIONS AND VALUE

This section presents a summary of the FER findings based on its value-scoring methodology, as set out in Tables 10 and 11 (PG.s 33 & 34), together with brief narrative explanation.

All streams in this assessment have varying degrees of issues that impact their condition and value including water quality, bed sedimentation, invasion of exotic macrophyte and other species.

These are national issues, certainly common to the majority of east coast Northland waterways where development and population density is highest.

[90] Clearwater, S.J., Thompson, K.J., & Hickey, C.W. (2014). *Acute toxicity of copper, zinc, and ammonia to larvae (glochidia) of a native freshwater mussel* **Echyridella menziesii** *in New Zealand.* Archives of Environmental Contamination and Toxicology, 66**,** 213–226

In addition, these streams generally lack sufficient riparian cover, reducing instream habitat complexity, or where there is some native and appropriate riparian cover (supplying woody debris and leaf litter) this is only in short and few sections. FER PG. 31

The characterisation of the Waipū North, South Waihoihoi and upper Ahuroa (Pine) catchments appears overly pessimistic relative to Waipū ED and Northland waterway condition. Although riparian cover is reduced across portions of these lowland systems, vegetation does not need to be native to provide key ecological functions allochthonous inputs such as such as woody debris and invertebrates. In addition, the lower Ahuroa retains substantial mature riparian cover adjacent to the Designation. Habitat complexity within these waterways is also influenced by channel form, substrate variability and hydraulic diversity, factors that are not adequately reflected in the assessment.

Most of the streams that the Proposed Designation intersects are also partially intermittent because the intersections occur high in the catchments near the upper end of aquatic habitat. FER PG. 31

The FER incorrectly treats this attribute as evidence of reduced ecological value. Intermittent headwater streams constitute a different stream ecosystem type, not an inferior one, and provide important ecological, hydrological and habitat functions that are distinct from those of larger lowland waterways. These high catchment streams are also largely in cover, in contrast to the prior statement. We are unclear if the FER is referring to streams classified in its DN modelling as intermittent, or is implying that streams mapped as perennial are also partially intermittent. The FER methodology has also already discounted ephemeral streams from consideration. Regardless, it has been demonstrated that the mapping is unreliable.

Overall, ecological values of streams within the Proposed Designation are low-moderate due to the poor condition, high levels of historic modification and general lack of representative assemblages and rare species and habitats.

We do not consider this conclusion to be adequately demonstrated within the FER, particularly in a manner that is transparent and reproducible by independent reviewers. This arises from the reliance on bespoke modelling and metrics, the selective application and interpretation of ecological concepts, inadequate analysis of available data, adaptation of established methodologies beyond their intended scope, unsupported extension of eDNA results to inform indices such as IBI and MCI, and the failure to appropriately consider regional representativeness.

We take particular issue with the minimisation of freshwater fish values, both in relation to their intrinsic ecological significance, supported by Threat status classifications, and their role as primary receptors of waterway impacts and inputs e.g. stormwater; flow alteration; stream habitat and passage modification - notwithstanding cultural values which fall outside the author's stated scope.

The FER states (PG. 31)

While few notable species have been found within the Proposed Designation, New Zealand fish species have recently been revised in terms of their threat classification and Dunn et al 2025 have rerevised many species that were not considered threatened to now be At Risk, naturally uncommon which under the EIANZ system creates a moderate value for the presence of populations of those species in a habitat. The data collected shows that all but one stream (the pine tributary) had long fin eel and most also had banded kōkopu which is to be expected and, given only these species, a low

diversity. Only the Waihoihoi main stem had multiple species of conservation concern and can truly be said to be habitat of threatened fish taxa.

This statement is inaccurate. Our Table XXX presents the relevant changes in threat status. Longfin eel (*Anguilla dieffenbachii*) has been classified as *At Risk–Declining* since the last iteration of the DoC Threat Classification (2018), corresponding to a high threat status under EIANZ guidance. Banded kōkopu (*Galaxias fasciatus*) has long been recognised as regionally significant. We have demonstrated, through visual presentation and a review of available data, that there are inconsistencies and omissions in the FER analysis that render this statement unreliable.

It is possible lamprey and īnanga may also be present within the Proposed Designation - most likely associated with the Waihoihoi main stem, but that has not been concluded through any sample data. If so, then there are management options to minimise or avoid effects when the Waihoihoi main stem is realigned. FER PG. 31

The species the FER references are *Threatened – Nationally Vulnerable,* the highest ratings in the catchments. NRC are determining surveys of appropriate techniques for lamprey presence using targeted eDNA; pheromone specialized electro fishing techniques in recognition that the general fish survey methodologies are unlikely to capture lamprey presence. The Designation waterways currently includes potential passage and habitat for all life stages. During frog survey with senior WSP staff and kaitiaki , a probable lamprey ammocoete was observed in a high catchment reach within a depositional mud habitat, consistent with known larval habitat preferences.
Īnanga have been detected in both catchments, with spawning identified as a nationally significant focus within the wider Waipū River catchment, as documented in this review. We therefore consider the FER statement that this has not been demonstrated by sampling data to be highly irregular. Īnanga occupancy extends upstream beyond the Waihoihoi main stem sample site and realignment. The New Zealand Fish Passage Guidelines (NIWA / Earth Sciences NZ)[91] require fish passage design to be based on the weakest-swimming and most vulnerable life stages present, with upstream-migrating juvenile (whitebait) īnanga used as a benchmark in lowland systems, ensuring that bottlenecks such as the Waihoihoi main stem site will enable all species and life stages to pass inland/ upland. This includes the stage, which is particularly dispersive and sensitive.
Īnanga are non-climbing fish that rely on low-velocity boundary layers, margins and hydraulic refugia as they travel inland. While fish can "burst swim' at elevated effort for short distances, reliable passage depends on low-energy pathways and adequate hydraulic heterogeneity for resting.

Stream realignment driven by conveyance can reduce habitat complexity and hydraulic diversity, limiting low-velocity refugia and potentially increasing energetic barriers for juvenile īnanga movement.
Potential effects on both species is not limited to the works period.

[91] NIWA / Earth Sciences New Zealand (2024). *New Zealand Fish Passage Guidelines* Wellington, New Zealand.

The new classification means that all NZ native fish other than short fin eel and common bully have a threat classification of some sort. I do not consider it is appropriate to identify any poor quality habitat with a record of the presence of any native fish as a high value stream, or even in the case of naturally uncommon taxa, a moderate value stream. The condition of the habitat and abundance of those fish species as well asthe values associated with other species (macroinvertebrates etc) presence are averaged to arrive at a site value. With that in mind and that the NPS FM uses fish IBI scores as a measure, then in the following(Table 10) assessment I too use the IBI score rather than threat status, unless there is / was a threatened status fish species (nationally critical, endangered, vulnerable).

The FER recognizes that all but two species found in the Designation waterways have threat status. It then attempts to revalue the presence of fish contrary to EIANZ guidance RPS Appendix 5 assessment criteria and regional expertise (McArthur 2015).
We do not accept the rational. Use of eDNA data for MCI or Fish IBI is not currently supported by NIWA as expert in this methodology. The eDNA data sets includes no translatable measure of abundance, which the FER relies on as its primary data source
The use of simple averaging across disparate ecological parameters, including habitat condition, fish abundance, macroinvertebrate metrics, and fish threat status, is methodologically inappropriate. These variables differ in scale, purpose, and units, and cannot be validly combined without explicit standardisation and justified weighting.

In particular, fish threat status is a national-scale conservation classification. It is not a discardable alternative to Fish IBI, nor is it intended to be subordinate to site-based ecological metrics, especially where those metrics have been modified from their standard methodologies. Treating threat status as one component within an unweighted average conflates distinct ecological concepts and risks obscuring the significance of species of conservation concern.

While these values apply to the reaches where the data has been gathered, the observations of the other streams within the Proposed Designation suggest that the streams up and downstream of those intersected by the Indicative Alignment have the same or similar values and there are no obvious better or poorer reaches that require separate assessment. FER PG 32

The FER appears to imply that all stream reaches within the alignment are of equivalent value, with none considered of greater or lesser ecological significance than another. However, this assertion is difficult to reconcile with the reported assessment results, which span a broad range of condition classes from Very Poor to High. It is therefore unclear what common or absolute value is being attributed across all reaches despite this documented variability. This reflects a similar line of reasoning to the blanket dismissal of all purportedly ephemeral reaches as having no ecological value, irrespective of their individual characteristics, functions, or contribution to the wider freshwater network.

TABLE 10 & 11

We have demonstrated in the relevant sections (see also Executive Summary) that the methodologies and assumptions that inform these tables are unreliable. Modifying score thresholds reduces repeatability, and comparability, which are key strengths of standardised assessment methods like the SEV; RHA; MCI. In Table 11 a further confounding layer is added by summating the scores under EIANZ/ NRP criteria headings- *Representativeness; Rarity & Distinctiveness; Diversity & Pattern, Ecological Context,* followed by an additionally unsubstantiated *Value Conclusion*

We provide brief notes here again notes on the general unsuitability of the value systems

REPRESENTATIVENESS

- **SEV HYDRAULIC & BIOCHEMICAL FUNCTION & SEV HABITAT PROVISION**
  The altered SEV methodology is not considered robust or applicable. No SEV was undertaken for the Waihoihoi Main stem, yet a subjective rating is assigned.
- **NRC BIODIV CONDITION SCORE**
  The Leathwick (2018) methodology is not applicable to the purpose as presented in the FER. Scores are not interpreted corrected regardless e.g. Waipū South has a condition score above the A1 ecosystem type mean yet is assigned a LOW rating in the FER Table 11.
- **RHA**
  Numerical scoring bands differ from the RHA methodology - a RHA score of 28 FAIR is assigned LOW in the FER ratings
- **EDNA FISH IBI**
  This is not a supported methodology by NIWA as expert. There is no numeric score provided. Comparison with regional IBI and SOE reporting would have more value. The supporting data has omissions and is poorly reported

RARITY & DISTINCTIVENESS

- **RARE HABITAT / DISTINCTIVE**
  We understand this metric to be based on purely subjective application of limited fish data and without merit
- **RARE SPECIES**
  The FER author uses a limited data set in comparison to our own and does not apply this rating based on use of national threat classification or EIANZ intent

DIVERSITY & PATTERN

- **FISH SPECIES RICHNESS**
  Based on our own data review and mapping we are unclear how the Waihoihoi Main Stem has a low rating with in regard to regional ED expectation.
- **EDNA MCI**
  this is not a supported methodology by NIWA as expert in this matter.

ECOLOGICAL CONTEXT

- **FISH PASSAGE FUNCTION**
  We are unclear why fish passage function is Negligible in all but Pine North and the Waihoihoi in consideration of the fish with threat status recorded in the FER own EDNA records that utilize these waterways.
- **POSITION REACH IN CATCHMENT**
  That a blanket *Negligible* rating is applied to all headwater sections based simply on catchment position is unsupportable, in addition to the mismapped ephemeral sections already discounted from any consideration. 0
- **WQ (NRC CONDITION RANK)**
  As before not applicable in the manner used in the FER

ECOSYSTEM HEALTH (CONDITION)

- In Table 10 values contribute to this parameter, however are not defined or allocated as to how they fit subunits of the *NPS FM Appendix 1a Ecosystem Health* value for rivers and wetlands which should be considered in regard to Policy 6 & 7 *loss of values to be avoided* . Transferred to Table 11

VALUE CONCLUSION

These are aggregated as a non-reproducible modification of the EIANZ Table 5 method for deriving a summary value.

Overall, the approach to produce the Value Conclusion utilises limited data sets, introduces multiple layers of arbitrary methodological choices and misapplies established methods,

resulting in a completely novel site scoring framework that is difficult to interpret and challenging to defend on scientific grounds.

3.3. SUFFICIENT INFORMATION

The methodology expounded in this section PG 35 effectively assumes that ecological values can be predicted rather than measured, replacing and excusing established field-based assessment and robust methodology with inference based demonstrably on limited data and unsupportable methodology. The absence of such data introduces uncertainty rather than reducing it.
Species presence, abundance, community composition, and ecological function are often highly site-specific and cannot be robustly determined without direct sampling. eDNA is a useful complementary tool but does not provide equivalent information to standard fish surveys, macroinvertebrate sampling, or vegetation assessments and is not a substitute for them.

Absence of data does not equate to absence of occupancy. The proposition that rare or threatened species are unlikely to occur because features exist within a modified landscape is also problematic. Our data review illustrates threatened freshwater throughout the catchments with supposedly *Negligible* overall *Value Conclusions* as per Table 11.

We do not consider the information provided thus far

- characterises the values and condition of streams and wetlands that may be affected by the Project
- will be sufficient to measure the nature and spatial extent of likely effects on those streams and wetlands based on the Indicative Alignment, as well as sensitivity testing for potential changes to alignment;
- be sufficiently informed of fish passage requirements to determine where the Project must maintain fish passage

We reiterate that the determine the catchment level is not the relevant freshwater spatial scale of the assessment.

The FER statements in this section serve to increase uncertainty regarding the nature, significance, and management of freshwater ecological effects.

4. ASSESSMENT OF EFFECTS ON FRESHWATER ECOLOGY

4.1. OVERVIEW

The FER outlines a high level suite of potential effects, minimizing a further tier of potential effects that include

STREAMS

- Alteration of natural flow regimes, including changes in flow timing, duration, velocity, and flood frequency.
- Increased localized peak flows and flashiness resulting from increased impervious surfaces.
- Changes to stream geomorphology, including channel incision, bank erosion, scour, and sediment deposition.
- Loss of natural stream heterogeneity and habitat complexity (pools, riffles, undercut banks, woody debris).
- Reduction in riparian vegetation cover and associated loss of shading.
- Increased water temperatures resulting from riparian vegetation removal and altered hydrology.
- Reduced terrestrial invertebrate inputs to streams due to riparian vegetation loss.
- Disruption of ecological connectivity between streams, wetlands, floodplains, and estuarine environments.
- Effects on fish spawning habitats, including sedimentation or physical disturbance of spawning areas.
- Effects on fish recruitment and recolonisation processes following disturbance.
- Direct mortality or displacement of macroinvertebrate communities during dewatering, diversion, or channel works.
- Loss or disturbance of freshwater mussels, kōura, or other less-mobile aquatic fauna.
- Loss of ephemeral streams and springs

WETLAND

- Loss of wetland extent resulting effects on ecosystem processes such as nutrient cycling, sediment retention, decomposition, and trophic interactions.
- Changes to wetland hydroperiod even if extent retained (frequency, duration, and depth of inundation).
- Edge effects on retained extent of wetlands, including drying, weed invasion, and altered microclimatic conditions.
- Long-term accumulation of road-derived contaminants within sediments, wetlands, and low-energy stream environments including heavy metal accumulation of zinc, copper in particular from stormwater discharges.
- Contaminant pulse events associated with stormwater treatment failures under high rainfall.

OVERALL

- Catchment-scale cumulative effects arising from numerous individually smaller habitat losses, fragmentation and reduction in ecosystem resilience
- Loss of ecological refugia used during droughts, floods, or other disturbance events.
- Effects on threatened, at-risk, or locally uncommon species shown to be present and also that may not be apparent from habitat assessments alone.
- Reduction in already limited ecological representation of wetland, where uncommon stream or wetland types are disproportionately affected.
- Operational secondary effects arising from future maintenance activities (vegetation clearance, sediment removal, culvert maintenance, weed control).
- The potential impact of climate change specifically as per NZTA EcIA guidelines

4.1.1. PROJECT CONSTRUCTION & DESIGN ASSUMPTIONS

The assumptions provided remove a level of responsibility from the assessment by

- Assuming all culverts can be installed as to provide best practice fish passage inherent in NES REG 70
- Inferring effects will be focused on the Alignment footprint, not the wider Designation as per *Sec2.4. Changes to the Alignment within the Designation.* We note that haul roads from the Atlas Quarry through the Brynderwyns northward have been lost from assessments since earlier hui.
- Realigned streams will have *better* morphology than natural streams existing currently. We note these streams allow passage without armouring or an engineered conveyance requirement
- Rip rap focused on culvert stabilization and longevity will simply increase the effect of an adjoining culvert on fish passage as a whole, with comment limited to changes in velocity *(Sec 4.2.5 Impact of Culverting on Stream Values).* The design targets for conveyance create a stream environment may adversely affect fish passage despite maintaining hydraulic connectivity. Channel armouring can alter near-bank hydraulics that enable fish movements up and downstream including obstruction of passage during low flow as the channel is complexed by the rock; increase localised turbulence and velocity gradients, and removal of the combined extent as boundary-layer refugia and habitat including undercut banks, root masses, macrophytes, or natural channel complexity. Armouring is not mentioned further in the effects.

4.1.2 EFFECTS ADDRESSED BY STANDARD MANAGEMENT MEASURES

This section largely describes routine good-practice site management measures rather than project-specific mitigation or impact avoidance measures. We have concerns as to the caveats then provided in the conditions APPENDIX E3 of the Substantive Application- which allow a high degree of unchecked professional judgement and these best practice measures to be discarded at any number of sites. i.e. *Conditions RC10-RC15; RC34-49*

Eg.

RC11 If temporary culverts are anticipated to be in a Watercourse for more than two weeks during the period November to December, prior to installation, a Suitably Qualified Person shall confirm that the culvert design will provide fish passage in accordance with best practice, unless that person deems it unnecessary to do so because:

(a) **there is no upstream fish habitat** at the time the culvert is installed;

We have little confidence in the protection of freshwater fish due to the methodology and interpretation of the FER assessment of value of species populations or individuals and their habitat. Post salvage effects are unclear - where they will be transferred to, the effects of residual loss of habitat and concentration of salvaged fish in what is otherwise expounded as catchment wide *Very Poor; Poor; Negligible; Low or Very low* remnant habitat for fish dependant on individual habitat requirements which are differentiated between species.

We would have concerns if the FER findings or methodology was continued into site works and dictate the concept of a *viable population* of fish as per

RC13 Prior to any dewatering or diversion in a section of Watercourse deemed by a Suitably Qualified Person to support a viable population of such fish, a Suitably Qualified Person shall salvage and transfer indigenous freshwater fish.

We question how a freshwater management framework founded on unidentified and potentially misidentified watercourses and wetlands can credibly deliver best-practice avoidance and mitigation outcomes. Accurate identification and delineation of freshwater features is a fundamental prerequisite for effects assessment, impact avoidance, and mitigation design. Where these foundational datasets are uncertain or flawed, there is a substantial risk that ecological effects will be mischaracterised and management responses inadequately directed.

The lack of identification of waterways and wetlands reduces trust in the protective works procedures as per RC 14-

RC14 Procedures must be implemented:
(a) to avoid the risk of concrete leachate discharges to Watercourses or Existing Wetlands (including no concrete batching or preparation within 50m of any Watercourse or Existing Wetland, pouring concrete outside of running water, covering new concrete surfaces to prevent run off and using prefabricated concrete pipes and structures where practicable);
(b) for the storage of fuels, lubricants, hazardous and/or dangerous materials to avoid discharges to Watercourses and Existing Wetlands
(c) for operating machinery to ensure spillages of fuel, oil and similar contaminants are prevented, particularly during refuelling and machinery services and maintenance (which shall be carried out away from any surface water).

We are puzzled as to what watercourse RC15 refers to and why
RC15 Where practicable, instream crossing devices (ie. bridges or culverts) shall be avoided in the Watercourse identified on the map in Appendix [X].

WETLANDS

Conditions RC40-RC49 apply to Consent RC01 and RC05.

The inadequate mapping, value assessment; incorrect use of pastoral exclusion clause and dismissal of supposedly purely exotic non functional wetlands plays into a lack of management and offset requirement.

WORKS IN WATERCOURSES, FRESHWATER AND WETLAND ECOLOGY

Conditions RC34-RC49 apply to Consent RC02 and RC05

RC 35 The mapping of stream length, discarding of ephemeral waterways and altered methodology of the SEV as per the FER is demonstrably flawed and we have no confidence in how it will inform these conditions.

RC35 inform replacement of riparian vegetation as per RC36. It is therefore unlikely to promote the replacement of cover in general , canopy species or predicted ecosystem types e.g. WF8 Kahikatea forest, that would provide a like for like or additionality in an offset where mature remnant riparian vegetation.

(a) Planting of indigenous vegetation for a width of 10 m on each side of the Watercourse. Such planting must:

- *(i) be of a suitable species composition;*
- *(ii) be sourced from the ecological district in which it is to be planted or be otherwise eco-sourced, except where it is not practicable to do so;*
- *(iii) have spacing between 0.5 and 1.5 m; and*
- *(iv) be maintained for a period of 5 years or until 80% indigenous canopy cover is achieved (whichever is earlier); and*

(b) Fencing or other methods to exclude stock.

We note that a 10m width may be less that what is currently present including of exotic vegetation which remains functional as riparian cover. This width given is the minimum

advisable riparian buffer[92] when management can be provided but will remain subject to edge effect and weed ingress indefinitely without robust internal habitat. A maintenance period of 5 years will be insufficient to ensure its self sustaining resilience and long term persistence, resulting in weedy decrepit buffers.

The FER's conclusions and underlying assumptions are unreassuringly entrenched throughout construction and operational phase controls of other technical disciplines, with material and interacting influences on freshwater outcomes including Land Disturbance conditions (RC16–RC29), Erosion and sediment controls, Groundwater conditions (RC30–RC33), and Operational stormwater conditions (RC50–RC58).

Of particular concern is that this approach effectively displaces the need for independent freshwater assessment input from suitably qualified and experienced practitioners during both construction and operational phases. In doing so, it risks constraining or pre-determining freshwater effects management on the basis of a potentially limited or contestable FER-derived framework, rather than allowing for discipline-specific review, adaptive management, and site-specific technical input.

The result is an embedded reliance on the flawed FER value system to inform a suite of technically distinct management regimes, which may collectively, if inadvertently, entrench the FER's assumptions as regulatory defaults for this project and others in the future on not just a regional but national scale.

4.2. EFFECTS ON STREAMS

4.2.1 HYPOTHETICAL WORST-CASE IMPACTS ON STREAM HABITAT (PRIOR TO REALIGNMENT AND CULVERTING)

This section purports to inform the amount of stream loss per catchment.

We have already established that the bespoke DN mapping used to inform these calculation is heavily flawed including misclassification or reaches as ephemeral and intermittant. We consider the unassessed loss of ephemeral streams to be a flaw in assessment of ecological context. We have little confidence in the figures provided.

Catchment scale assessment of effects is inappropriate, not withstanding the stream length calculations are unreliable.

The culverting of streams represents loss of values. It may also be considered that as culvert length increases, particularly where there is the loss of natural light, habitat complexity, natural substrate, the structure increasingly functions as an enclosed pipe rather than the natural stream channel, representing loss of extent. As culvert length increases, its ability to support natural freshwater ecosystem processes and fish passage is reduced. While short culverts generally present limited fish behavioural effects if designed as per NES F 70, longer culverts can impede fish movement through increased passage distances, altered hydraulics,

[92] NIWA (2000) Review of Information on riparian buffer widths necessary to support sustainable vegetation and meet aquatic functions TP350 Auckland Regional Council

elevated energetic demands, and reduced resting opportunities. Very long enclosed structures may function as substantial behavioural and ecological barriers even if flow hydraulic parameters can be maintained - culverts exceeding 200 m restricted passage by īnanga and reduced the occurrence of banded kōkopu.[93]

4.2.2. HYPOTHETICAL WORST CASE CUMULATIVE EFFECTS ON STREAM HABITAT IN EACH CATCHMENT

The approach in this section reduces ecological Magnitude to a simple arithmetic exercise that is not consistent with EIANZ framework for magnitude of effects assessment. The methodology assumes that magnitude can be represented solely by the percentage of total catchment stream length affected. Again using the inherently flawed FER DN mapping calculated losses of less than 1% are automatically assigned *Negligible* magnitude.

The *Negligible* stream loss magnitude rating applied to all streams in FER (Table 13 PG 38) is taken from bespoke numerical thresholds established by the author in *2.3.5. Methodology for determining magnitude of effects on streams.* These are then reassigned to the original EIANZ methodology Magnitude bands (EIANZ 5). The methodology assumes that all stream kilometres are equivalent and that ecological consequences scale linearly with total catchment length. Consequently, complete loss or culverting of a representative headwater reach may still fall within the <1% *Negligible* category.

Value scores are taken from Table 11, which is demonstrably bonkers. Regardless of what the Value score is in FER Table 13 the overall Level of Effect will resolve as Negligible as per the EIANZ matrix , either the best practice published version , or the FER unsupported interpretation (discussed in Sec

The This introduces an inherent bias towards low effect outcomes because the denominator is the entire catchment stream resource, regardless of the ecological quality or uniqueness of the affected reach.

The analysis focuses almost exclusively on cumulative loss of stream length. However, cumulative effects under the NPS-FM relate to both river extent and river values. Multiple small losses of headwater habitat, culverting, fragmentation and reduced ecological function may collectively diminish catchment integrity even if total stream length loss is numerically small. By focusing on percentage length, the assessment fails to adequately consider cumulative effects on habitat quality, ecological connectivity, fish passage and ecosystem processes.gain the FER references catchment scale which is inappropriate.

4.2.3 IMPACT OF PROJECT ON STREAM EXTENT

Section 4.2.3 is founded on the premise that stream extent is retained where the length of culvert or realigned channel is equal to the length of stream impacted and therefore concludes that there is a neutral outcome with respect to stream extent. **The assessment effectively treats a pipe as ecologically equivalent to a natural stream, a proposition that is**

[93] NZTA (2013) Fish passage guidance for state highways v1.0 NZ Transport Agency

unsupported by freshwater ecological theory and inconsistent with the principles of SEV & RHA it seeks to purport. This assumption that a culverted reach constitutes retained stream habitat consequently understates the magnitude and permanence of effects.

This fundamentally flawed approach equates the continued conveyance of water with stream habitat and ecological function. A culvert is an engineered hydraulic structure and is not ecologically equivalent to a natural stream. Culverting removes natural channel morphology, riparian interactions, light penetration, organic matter inputs, substrate diversity and hyporheic processes, resulting in a substantial reduction in habitat quality and ecosystem function. Stream extent cannot reasonably be assessed solely on the basis of linear length of water flow.

The assessment acknowledges that culverts provide poorer habitat than open channels but nevertheless concludes that stream extent is effectively maintained. This position is inconsistent with the principles underlying the Stream Ecological Valuation (SEV) methodology, which recognises that culverting results in significant reductions in ecosystem functions and habitat provision. Similiarily a culverted reach could not score as a stream in the Rha assessment.

Furthermore, the conclusion that only 554 m of stream loss will occur relies on aggregating effects across the four catchments and assuming that culverted reaches represent retained stream extent. This artificially dilutes the ecological consequences occurring at the reach scale. Ecological effects are experienced locally by aquatic communities and cannot be dismissed solely because they comprise a small percentage of total catchment stream length. The use of catchment-scale percentages masks the direct loss of natural habitat and is inconsistent with the scale at which stream values and ecological functions are expressed.

Again we query the implications of the FER DN mapping and how it underpins these numeric stream length assessments. For example the Murray site south of Chainage 17300-17600 FER Stream Mapping Appendix 3 Sheets 13 & 14 - contains 4 large gullies given to fill with reaches mapped as ephemeral (potentially intermittent) and intermittent reaches we consider may be perennial. All are shortly connected to the larger perennial stream extent directly below the fill sites. The channels are all within wetland. Yet in FER Table 15 only 20m of stream is allocated as lost under fill. We consider that the further demonstrated FER DN allocation of intermittent or perennial streams as ephemeral reaches in the Pine area, the lack of any further assessment and omission from stream length loss calculation, and their consequent unmitigated allocation as fill sites is a gross oversight in the FER.

The western head of Waipū South is marked ephemeral but this is contradicted by our own observation and an October SEV assessment taken there. SEV was developed for perennial streams and subsequently adapted for intermittent streams. It is not a recognised methodology for assessing ephemeral flow paths. We note that photographs on the internal NZTA GIS system are taken after the reach had been walked through, as below.



4.2.4 IMPACT OF REALIGNMENT ON STREAM VALUES

This section suggests that stream values can be maintained with realignment through replication of physical characteristics, including channel form, flow, velocity, riparian condition and substrate.

The assumption that stream realignments can achieve like-for-like replacement and often no residual effect is inconsistent with the scientific literature. Reviews by Palmer et al. (2014)[94], Louhi et al. (2011)[95] and Hawley (2018)[96] demonstrate that channel reconstruction frequently fails to restore ecological integrity. The claim that ecological recovery will occur within 6–12 months is anecdotal, unsupported by monitoring data and contrary to published studies

[94] Palmer, M.A., Hondula, K.L. & Koch, B.J. (2014). Ecological restoration of streams and rivers: Shifting strategies and shifting goals. Annual Review of Ecology, Evolution, and Systematics, 45, 247–269.
[95] Louhi, P., Mykrä, H., Paavola, R., Huusko, A., Vehanen, T., Mäki-Petäys, A. & Muotka, T. (2011). *Twenty years of stream restoration in Finland: Little response by benthic macroinvertebrate communities*. **Ecological Applications**, 21(6), 1950–1961
[96] Hawley, R.J. (2018). *Making stream restoration more sustainable: A geomorphically, ecologically, and socioeconomically principled approach to bridge the practice with the science*. **BioScience**, 68(7), 517–528

showing that stream communities often fail to recover fully even after decades. Importantly, NZTA's own Mt Messenger evidence assumed that permanent stream diversions would have lower ecological value than the streams they replaced and applied offsetting accordingly. The conclusion that realignments will often result in no effect on stream values is therefore overly optimistic and unsupported by both published science and previous NZTA practice.

The conclusion is circular. Having already diluted effects to less than minor through catchment-scale averaging, the assessment concludes that even failure to achieve the proposed design requirements would still result in less than minor effects. This statement renders mitigation meaningless suggesting if unsuccessful stream realignments do not alter the effects outcome, then the mitigation is effectively irrelevant. This approach also precludes the need for any long term monitoring or maintenance permits potentially substantial degradation of stream habitat and fish communities while relying on a pre-determined low effects rating to avoid the need for meaningful avoidance, mitigation or offsetting.

It is particularly concerning that NZTA may adopt this reasoning across this and more broadly future stages of the Northland Corridor or other infrastructure projects. If accepted, it would establish a precedent whereby poor ecological outcomes and failed mitigation can be systematically discounted through catchment-scale averaging, effectively normalising avoidable habitat loss and undermining the intent of the NPS-FM and the effects management hierarchy.

4.2.5. IMPACT OF CULVERTING ON STREAM VALUES

Section 4.2.5 acknowledges that culverts reduce habitat quality, simplify benthic communities and reduce carrying capacity, yet still concludes that stream values are largely retained. This conflates the ability of culverts to support some aquatic life with retention of stream values. The cited studies demonstrate that aquatic organisms can occupy culverts, not that culverts maintain the ecological function, diversity or resilience of the natural streams they replace. Presence of aquatic life is not evidence of ecological equivalence. Culverts are engineered structures, not natural ecosystems, and cannot reproduce the long-term geomorphic, hydrological and ecological processes that underpin stream values.

The recommended culvert design measures are simply a subset of the permitted design requirements of NES-F Reg 70. Compliance with these minimum standards constitutes baseline regulatory expectation, not ecological mitigation, and cannot reasonably be relied upon to support claims of like-for-like replacement or retention of stream values. More concerningly, as in Section 4.2.4, the author concludes that even if these measures cannot be achieved, residual effects would remain less than minor because stream losses comprise less than 1% of catchment stream length. This effectively renders even the minimum NES-F REG 70 requirements ecologically unnecessary. Such reasoning creates a dangerous precedent whereby poor culvert performance and impacts on fish passage can be dismissed through catchment-scale averaging rather than addressed through avoidance and mitigation.

The use of predicted SEV scores to quantify retained value is particularly problematic. The report's earlier application of SEV is already highly irregular and departs materially from the standard methodology. These modified SEV outputs are propagated through the arbitrary value ratings in Table 11 and then combined with the bespoke stream loss thresholds in Table

13, whereby losses of less than 1% of catchment stream length are automatically deemed *Negligible.* The resulting conclusions are driven by this chain of non-standard methodologies and professional opinion. Reliance on a blanket 0.3 SEV after installation of a culvert based on *other project modelling expectations* rather than empirical evidence implies a level of certainty that does not exist. The framing of the final SEV that a culvert retains 40% of stream value also translates to that 60% will be lost. Although the Mayflower North was out of our consideration area, the idea that a stream could have a higher SEV after being placed in a pipe should be treated with considerable scepticism (FER Table 16). Overall, Section 4.2.5 substantially overstates the ability of culvert design to mitigate ecological effects and creates a false impression of retained ecological value.

4.2.6. FISH PASSAGE INTERRUPTION

FER PG 42 *downward migrating species face less challenges where streams are replaced by culverts (if any at all).*

Fish passage is not a singular upstream process. Species such as torrentfish (*Cheimarrichthys fosteri*), longfin eel (*Anguilla dieffenbachii*) and kōaro (*Galaxias brevipinnis*), undertake movements both upstream and downstream during different life stages, and maintaining populations requires bidirectional connectivity. Downstream migration can also be impeded by altered hydraulics, elevated velocities, turbulence and habitat simplification associated with culverts. They are not simply swept down a pipe. The suggestion that downstream migrants face little challenge understates the ecological risks of permanent culverts. Sustaining fish communities depends on maintaining unrestricted movement throughout the catchment, not simply facilitating one-way upstream passage.

Section 4.2.6 effectively dismisses headwater habitats because they are small and contain little water. This confuses stream size with ecological value. Small, steep headwaters are a particular habitat type not a lesser form of stream.

In reference to the ARC (2009) decision tree FER PG 43, the conclusion that there is little or no significant habitat upstream of most crossings is unsupported by either the survey results or field observations. This assumption and effectively predetermines a "no need" outcome. Stream size and catchment area are poor proxies for ecological significance, and the presence of banded kōkopu; eel; kākahi and kōura from simple field observation without targeted survey in upper headwaters demonstrates that these habitats are neither absent nor unimportant.

Banded kōkopu are classified as *At Risk – Naturally Uncommon*[97]. This threat category recognises species whose populations are naturally small or geographically restricted. Consequently, low abundance or limited habitat extent should not be interpreted as evidence of low ecological importance of either the population or the habitat. To the contrary, naturally uncommon species are expected to occur in relatively small populations and specialised habitats. Banded kōkopu are associated with the smallest of headwater streams as illustrated in the eDNA; NZFFD & field work[98]. The statement that only small numbers of fish would be

[97] *Dunn, N. et al (2025).* Conservation status of Aotearoa New Zealand freshwater fishes, 2023. *New Zealand Threat Classification Series 40. Department of Conservation, Wellington. 16 p*

[98] JOWETT & RICHARDSON (2003) NZJMFR Vol. 37: 347–366 Fish communities in New Zealand rivers and their relationship to environmental variables

affected therefore misunderstands the concept of natural rarity and risks discounting habitats that are intrinsically important to the persistence of these species. Additionally eDNA which the author relies upon has been discussed in the Methodology and is not an abundance read.

By effectively answering "no" to Question 3 of the decision framework without empirical support, the assessment predetermines the outcome and risks systematically undervaluing headwater habitats including intermittent and ephemeral types and the fish communities they support. This plays into the statement that in regard to the decision making tree that

no, fish passage is generally not required. FER PG 44

4.2.7. FISH PASSAGE EFFECTS IN THE WAIHOIHOI MAIN STEM, THE PIROA MAIN STEM, THE MAYFLOWER TRIBUTARY MAIN STEM, AND THE WAIRAU NORTH TRIBUTARY

Section 4.2.7 highlights the inconsistency of the preceding assessment. While Section 4.2.6 dismisses most headwaters as lacking significant habitat, the FER then emphasises the Pine North tributary is otherwise. The distinction between important main stems and supposedly insignificant headwaters is arbitrary, and reflects an over-reliance on catchment size rather than ecological evidence. Habitat importance appears flawed DN mapping, extrapolating stream size to stream importance in terms of fish distribution and habitat use.

The conclusion in this section FER PG 44 is fundamentally misrepresents how fish populations are maintained within catchments. By reducing effects to the amount of habitat immediately lost above individual crossings, the assessment ignores the importance of maintaining connectivity throughout the river network. Fish populations persist through access to a mosaic of spawning, rearing, feeding and refuge habitats, not simply because any one reach contains large numbers of fish. Fragmentation of even small headwater systems can therefore have disproportionate consequences for naturally uncommon species and long-lived migratory fishes.

The conclusion that loss of access to habitats supporting At Risk species constitutes only a *very low (less than minor)* effect everywhere except the Waihoihoi Main Stem is unsupported by any of the data. Their low abundance and restricted distribution are intrinsic characteristics of the species, not evidence that the habitats they occupy are expendable. The Waihoihoi is demonstated to be a major passage, not the only one e.g. Waipū North catchment bottlenecks at Wetlands 13 & 16 and the streams within.

Concerningly, the conclusion creates an arbitrary threshold whereby only the largest and most obvious habitats warrant avoidance, while fragmentation of the remainder of the catchment is dismissed as inconsequential. Such reasoning effectively sanctions progressive loss of connectivity and consequently loss of fish populations throughout the catchment.

FISH PASSAGE EFFECTS IN OTHER LOCATIONS

This section further expounds the fundamentally flawed premise that fish passage need only be maintained where large areas of upstream habitat or abundant fish populations exist. Having concluded that fish passage is unnecessary, the author recommends that designers should *not actively design against fish passage*, effectively reducing connectivity to an optional design consideration. The suggested measures are largely a restatement of the minimum requirements of NES-F Regulation 70 and should not be portrayed as meaningful mitigation.

More concerningly, the author explicitly accepts that culverts with gradients exceeding 10%, loss of substrate retention and aggressive erosion protection may impede upstream migration, yet dismisses these concerns because the upstream habitats are considered small, intermittent, or partly removed by the Project. This is circular reasoning: habitat losses caused by spoil disposal and groundwater drawdown are then used to justify poorer fish passage performance and further habitat fragmentation.

The repeated reliance on *small habitat areas*, *single species representation* and *small numbers of fish* minimises the ecology of headwaters and naturally uncommon species. A small suite of climbing species remains a highly representative regional headwater association. Banded kōkopu and longfin eels do not become expendable because they occur in small populations. Their persistence depends on maintaining connectivity throughout the catchment, including access to headwater habitats. The conclusion that loss of these habitats constitutes a very low effect because they comprise only a small proportion of the catchment again substitutes arithmetic for ecology. Again, eDNA data is not a measure of abundance.

It is alarming the assessment effectively accepts the permanent loss of habitats occupied by species with status e.g. longfin eels and banded kōkopu because they are sufficiently small to fit within the author's bespoke *negligible magnitude* category. The FER distinction between significant and insignificant effects is determined not by species requirements or ecological function, but by arbitrary thresholds and catchment-scale averaging. This creates a dangerous precedent whereby loss of connectivity is normalised.

4.2.8. FISH PASSAGE IN CULVERTS INTERSECTING EPHEMERAL FLOW PATHS

I note that many other culverts in the Indicative Alignment only intersect ephemeral flow paths with no upstream aquatic habitat. These culverts do not require fish passage or any further aquatic effects management (aside from ensuring appropriate hydrological connectivity to the correct sub catchments). FER PG 45

Given the established inaccuracies in stream mapping and the exclusion of ephemeral systems from the assessment methodology at the outset, this conclusion is unreliable. Ephemeral and headwater streams contribute important ecosystem functions and connectivity (refer section 2.2.4 of this report for discussion), and their wholesale dismissal is inconsistent with contemporary freshwater ecology and risks underestimating project effects.

4.2.9. SEDIMENTATION EFFECTS

Section 4.2.9 downplays sediment effects by arguing that the catchments are of low value, already experience elevated sediment loads and therefore additional sediment inputs from construction are of limited ecological concern.

Table 17 presents predicted sediment inputs based on the wider technical reporting contained within the *Construction Water Assessment*[99]*(CWA)*. That assessment adopts the conclusions of the Freshwater Ecology Report (FER), stating *historic land-use change and modified catchment conditions have resulted in universally poor water quality* across the receiving environment and

[99] NZTA (2026)Northland Corridor Construction Water Assessment. Document: 10722-PTA-2B0-PE-RPT-0016 Revision: A

furthermore i*nstream habitat is adversely affected by water quality everywhere except for the upper Pukekaroro tributary and native tributaries of the Piroa Stream.*

Additionally the CWA (PG 35) adopts the ecologically unfounded opinion of the FER that

Many reaches intersected by the Proposed Designation occur high in catchments and are partially intermittent, further limiting ecological value.

The FER (p. 45) concludes that *in this context, sediment discharges from construction works will commonly have a low impact* founded on the premise that most receiving environments have limited existing ecological value. We disagree with this effects permissive framing of the Designations freshwater ecosystems. In our opinion, degraded streams have **less capacity**, not more, to tolerate additional sediment inputs. Existing degradation increases their vulnerability to further adverse effects and reduces their ecological resilience.

While I cannot comment on the sediment yield calculations themselves, I am uncomfortable with the FER inference that increases in catchment sediment loads equate to low ecological effects. Catchment-wide averages may mask substantial localised impacts to sensitive headwater streams and high-quality habitats.

The catchments traverse highly erodible terrain[100] and are inherently susceptible to sediment impacts. Existing degradation should not be used to justify further sedimentation, particularly where the baseline condition and stream values have themselves been derived using the report's non-standard and potentially flawed assessment framework. A degraded baseline does not diminish the ecological importance of the remaining values.

The reliance on anecdotal observations from Transmission Gully is also problematic. Differences in geology, soil erodibility, hydrology and catchment characteristics limit the transferability of those experiences to the present project. Persistence of communities elsewhere does not constitute evidence that similar outcomes will occur here. The conclusion that these communities will persist and recover is speculative and unsupported by site-specific evidence.

We consider that baseline turbidity should be established through monitoring at multiple representative locations to adequately characterise existing receiving environment conditions. Available baseline monitoring from the Ahuroa at Braigh Flats[101] site indicates a 90 percentile turbidity of approximately 34 NTU and a maximum recorded turbidity of 140 NTU. A trigger value of 500 NTU is therefore substantially higher than both normal and elevated baseline conditionsA trigger value of **500 NTU** represents an extremely high turbidity event, more consistent with flood conditions or a major sediment discharge than routine construction-related discharges. Such a threshold is generally more appropriate as a contingency or escalation trigger requiring immediate management intervention, rather than as a baseline monitoring criterion. We agree with the use of quantitative SAM 2 & 6[102] from the suite of

100

[101] NRC DATA HUB ACCESSED 25.5.26 https://www.nrc.govt.nz/environment/environmental-data/environmental-data-hub

[102] Clapcott, J.E., Casanovas, P., & Doehring, K. (2020). *Indicators of Freshwater Quality Based on Deposited Sediment and Rapid Habitat Assessment*. Cawthron Report No. 3402. Prepared for the Ministry for the Environment. Cawthron Institute, Nelson, New Zealand.

commonly used instream sediment assessment techniques and question why this wasn't undertaken as part of the FER feild assessments at the outset for transparent, standardized data .

Limiting monitoring to a **500 NTU trigger is unlikely to provide meaningful information on the normal character, frequency, or magnitude of sediment discharges, and would fail to detect more moderate but potentially ecologically significant increases in turbidity.**

Additionally, the CWA defers to the Freshwater Ecology Report (FER) for its assessment of ecological effects associated with culvert construction and stream diversions. It states that fish migration, spawning, and other freshwater ecological values are important considerations during construction. Consequently, the proposed construction methodology is fundamentally dependent on the FER accurately identifying these ecological values and potential effects. As discussed throughout this critique, the deficiencies identified in the FER are therefore propagated into the Construction Water Assessment, undermining the reliability of its conclusions and the suitability of the proposed construction methodology.

4.3. EFFECTS ON NATURAL INLAND WETLANDS

4.3.1. EFFECT OF INDICATIVE ALIGNMENT ON EACH NATURAL INLAND WETLAND

Section 4.3.1 repeats the same methodological shortcomings identified in Sections 4.2.1–4.2.3 for stream assessments. In both cases bespoke methodologies; flawed mapping; subjective judgements (refer Sec3.1) and criteria culminating in Table 11 feed into the conclusion that other than raupo dominant Wetland 24 Wairau South (outside of our consideration in the southern Brynderwyns catchments)

natural inland wetlands affected by the Project are of negligible or low ecological value (including because they are not indigenous assemblages) and the level of effect is very low. These areas are essentially wet pasture areas, without any distinctive wetland functions or indigenous habitat values. FER pg 48

The assessment expresses effects as a proportion of the total wetland area within each catchment (Table 18), thereby diluting localised impacts through catchment-scale averaging. As with stream length, wetland extent is used as a surrogate for ecological significance despite there being no recognised New Zealand methodology supporting proportional catchment loss as the primary determinant of effect.

The assessment is confined to wetlands directly intersected by the current Indicative Alignment and does not evaluate the broader range of effects enabled by the designation. In particular, it excludes indirect effects such as groundwater drawdown, hydrological alteration, sedimentation, habitat fragmentation and edge effects, despite these being acknowledged elsewhere in the report as potential project impacts. This includes wider connected wetlands that should be considered as an ecological unit, illustrated well on FER Appendix 3 Sheet 11 e.g. Wetland 15 above wetland 14; removal of Wetland 12 as the same ecological unit as Wetland 13 portions of Wetland 11 & 13 beyond the artificial eastern boundary of Designation

The report acknowledges that the mapped wetland baseline is *very likely to underestimate the true extent of natural inland wetlands and* therefore concludes that the calculated proportions are *very conservative* because the denominator is incomplete. However, this uncertainty is then used to reduce the apparent magnitude of effects rather than acknowledge limitations in

the assessment. An incomplete baseline cannot provide a robust quantitative basis for determining effect magnitude.

4.3.2. CUMULATIVE EFFECTS TO THE AMOUNT OF WETLAND HABITAT

As with stream Sections 4.2.1–4.2.3, wetlands are first assigned low or negligible values using the report's bespoke value framework and then wetland cumulative effects are determined largely by arithmetic rather than ecological function, resulting in an assessment that substantially understates the significance of incremental wetland loss. While we disagree with the value system used to reach this stage (refer Sec 3.1 & 3.2) we additionally emphasise that The assessment further overlooks that cumulative effects arise not only from the total area lost, but from fragmentation, loss of hydrological connectivity, reduced ecosystem resilience and incremental degradation across the landscape. These processes cannot be adequately represented by percentage area calculations or catchment-scale averaging. By reducing cumulative effects to the area of direct footprint wetland removal, the assessment substantially underestimates the overall ecological consequences of the Project and does not reflect the full extent of effects that may arise under the designation.

4.4. POTENTIAL GROUNDWATER DRAWDOWN EFFECTS ON STREAMS AND WETLANDS

We cannot provide comment of the technicalities of the *Effects on Groundwater Report* (EGW)[103] modelling itself outlined in Section 4.4, but rather the FER ecological interpretation of the modelling. That said, again the wider technical discipline of the EGW defers to the incomplete FER wetland mapping and while it cites expected effects of *Stream and wetland depletion as a result of temporarily or permanently lowering groundwater levels*, no avoidance is inherent due to reliance on the FER assessment of value.

The FER accepts that groundwater drawdown may permanently change the hydrological regime of streams and wetlands, yet repeatedly dismisses those changes because they occur in *small*, ephemeral or low value systems. That conclusion is inconsistent with contemporary understanding of headwater ecology and with the NPS-FM's emphasis on protecting the extent and values of freshwater ecosystems. The FER also makes these assumptions despite the EGW caveat for example thatt *it is not possible to quantify the reduction in stream flow resulting from the drainage of groundwater from a specific realigned stream without a detailed design for that realigned stream EGW PG 26.*

The EGW report also states in terms of monitoring of effects-
Groundwater monitoring to determine the potential impact of drawdown on specific wetlands is outlined in the Assessment of Effects on Freshwater Ecology PG37

This is recommended for 3 years solely in wetland Wetland Q08/696 outside of the Waihoihoi and Ahuroa catchments and our review area.

Section 4.4 acknowledges that groundwater drawdown has the potential to convert perennial streams to intermittent systems, intermittent streams to ephemeral flow paths, and reduce wetland extent. These changes represent fundamental alterations to hydrology and ecosystem function. However, despite recognising these potentially significant effects, the assessment

[103] NZTA (2026) Northern Corridor Assessment of Effects on Groundwater Document: 10722-PTA-2B0-PE-RPT-0019 Revision: A

repeatedly concludes they are less than minor based largely on assumptions regarding existing stream condition, limited fish presence, or small habitat extent rather than an assessment of ecological function.

The assessment continues the methodological approach adopted throughout Sections 4.2.1–4.2.9 by discounting effects in headwater systems because they are described as ephemeral, intermittent, or supporting relatively few fish. This reasoning has already been shown to be unsupported. Headwater streams and wetlands perform important hydrological and ecological functions irrespective of their size or flow permanence, and their ecological significance cannot be discounted simply because they occupy a small proportion of the catchment.

The conclusion that there would be *little impact* because there are minimal fish this high in the catchment is unsupported by the field survey results. Banded kōkopu were recorded in upper Pine and Waipū South headwaters during our surveys, demonstrating that these systems provide suitable habitat for *At Risk – Naturally Uncommon Regionally Significant* species. Low fish abundance in headwaters is an expected characteristic of naturally uncommon species and should not be interpreted as evidence of low ecological importance.

Similarly, the repeated suggestion that conversion of perennial reaches to intermittent streams, or intermittent reaches to ephemeral channels, would result only in subtle macroinvertebrate changes substantially understates the ecological consequences. Such hydrological changes fundamentally alter habitat permanence, water temperature, dissolved oxygen, refuge availability, fish access and ecosystem processes. These are ecosystem-scale changes.

The assessment also relies heavily on personal experience from the Transmission Gully and Mackays to Peka Peka projects to express scepticism that the predicted groundwater drawdown will occur. Personal experience does not provide a scientific basis for discounting the results of the project-specific groundwater modelling prepared elsewhere in the application.

We consider that the both the actual and potential direct and cumulative effects of groundwater alteration to the ecosystems of wetlands and waterways in the Waihoihoi and Ahuroa catchments remain undefined.

5. EFFECTS MANAGEMENT RECOMMENDATIONS

GENERAL COMMENTS

The Section 5 recommendations to manage effects on natural inland wetlands and streams are founded upon a chain of bespoke approaches, including a modified application of EIANZ value criteria, non-standard use of SEV, arbitrary value ratings (Table 11), and catchment-scale stream-loss categories (Table 17 & Table 20) that automatically classify losses < 1% as negligible. These assumptions predetermine low levels of effect, such that the management measures proposed are not required to achieve acceptable outcomes, but merely reinforce conclusions already reached.

5.1 OVERVIEW

Section 5 states that recommendations are intended to manage and mitigate adverse effects. However, throughout Sections 4.2.4–4.2.7 the report repeatedly concludes that even where stream realignment objectives are not achieved, culvert performance is poor, or fish passage is interrupted, residual effects remain *less than minor* because the proportion of catchment stream length affected is small.

Section 5 therefore contains an inherent contradiction: the report proposes mitigation measures while simultaneously concluding they are unnecessary to achieve acceptable outcomes. The recommendations are consequently discretionary rather than ecologically necessary.

5.2 AVOIDANCE OF FRESHWATER EFFECTS

Section 5.2 states:

avoidance of effects should be implemented where practicable.

Yet the assessment repeatedly accepts habitat loss, failed stream realignment and loss of fish passage as less than minor effects.

Effects are first diluted through catchment-scale averaging and bespoke magnitude thresholds and then declared sufficiently minor that avoidance is unnecessary. The effects management hierarchy is effectively reversed, with avoidance subordinated to predetermined low effects ratings rather than ecological significance**.**

The FER informs the wider suite of technical assessments, detailed design and subsequent construction management plans. Consequently, the methodological deficiencies identified throughout this review are not confined to the ecology assessment but become embedded within the project's broader environmental management framework.

The modified application of ecological assessment methods, bespoke value classifications and catchment-scale magnitude thresholds established in the FER underpin decisions regarding avoidance, design, mitigation, monitoring and offsetting. As these assumptions are carried through subsequent technical reports, ecological effects are progressively understated, resulting in management responses that may be insufficient to protect freshwater values. This creates a risk that flawed ecological assumptions become incorporated into project design, consent conditions, construction methodologies and post-construction management, ultimately influencing environmental outcomes well beyond the scope of the FER itself. If

accepted, the methodologies presented in this FER have the potential to become embedded not only in subsequent stages of the Northland Corridor, but also in future NZTA projects nationally. Adoption of these bespoke assessment methods would establish a precedent whereby departures from recognised ecological assessment frameworks become normalised, with the potential to systematically underestimate freshwater effects and weaken the application of the effects management hierarchy across future infrastructure developments.

5.3 STREAMS

5.3.1 RECLAMATION

Section 5.3.1 repeats the unsupported assumption that stream values can be maintained through replication of channel form, flow, velocity, riparian condition and substrate. As discussed in Section 4.2.4, this premise is inconsistent with restoration science, which demonstrates that natural stream ecosystems cannot simply be recreated through engineering design. Published reviews and NZTA's own Mt Messenger project recognise that permanent stream diversions typically retain lower ecological value than the streams they replace.

More concerningly, the report concludes that even if these design objectives cannot be achieved, residual effects remain less than minor because stream losses represent a small proportion of the catchment. This circular reasoning renders the proposed mitigation largely irrelevant and removes any ecological imperative for successful implementation, monitoring or adaptive management. If adopted more broadly, this approach risks normalising failed stream realignments and avoidable habitat loss through catchment-scale averaging rather than the effects management hierarchy.

5.3.2 DESIGN REQUIREMENTS FOR CULVERTS

The report recommends:

"culverts do not reduce the natural stream width";

"the culvert invert is set below the natural bed level";

"headwalls and armouring do not impede the wetted width..."

These measures are largely a subset of the minimum requirements of NES F Reg 70 . The proposed measures constitute baseline regulatory expectations rather than ecological mitigation. Compliance with NES-F Reg 70 should not be presented as evidence that stream values are retained or that ecological equivalence is achieved. Section 4.2.5 concludes that even where these measures are not achieved, residual effects remain less than minor because stream losses are less than 1% of catchment stream length. This renders the recommendations ecologically unnecessary and creates a dangerous precedent whereby poor culvert performance and fish passage failure are accepted provided the affected habitat is sufficiently small.

5.3.3 DESIGN REQUIREMENTS FOR STREAM REALIGNMENTS IN NATURAL GROUND

The report seeks to replicate:

"the same channel morphology, depths and wetted width potentials";

"similar surface flows and depths";

"the same or similar velocity profile";

"a similar riparian condition";

"a similar substrate."

These recommendations assume that physical form equates to ecological function. This premise is unsupported. Natural channels are the product of long-term interactions between hydrology, geomorphology, groundwater exchange, sediment transport and riparian processes and cannot be recreated by reproducing dimensions and substrate alone. Section 4.2.4 already concluded that even if these design objectives cannot be achieved, residual effects remain less than minor. The recommendations therefore become aspirational rather than necessary.

The claim of 6–12 month ecological recovery following realignment was unsupported and based solely on personal experience.

The recommendations rely on assumptions regarding rapid recovery and ecological equivalence that are inconsistent with published evidence and unsupported by monitoring data.

5.3.4 STREAM REALIGNMENT AT SPOIL SITES

This section is particularly problematic.

It is currently unclear how the spoil sites will be developed and designed and if a realigned stream in or at the edge of a spoil site will gain sufficient water and hold sufficient water to reform a suitable aquatic habitat. Stream realignments cannot be successfully established at spoil sites such that intermittent streams may become ephemeral and perennial may become intermittent. FER PG 53 & 54

Section 5.3.4 adopts an ad hoc "trial and error" approach to stream recreation. The recommendation to trial stream reconstruction during construction, and if unsuccessful simply proceed to compensation, is inconsistent with the effects management hierarchy. Mitigation measures should be demonstrably effective before they are relied upon to reduce adverse effects, not tested during construction with compensation considered only after failure.

This approach is particularly concerning given the report's repeated assumption that stream realignments can achieve ecological equivalence despite limited supporting evidence. Rather than acknowledging this uncertainty and requiring robust design validation, monitoring and adaptive management, the report effectively accepts the risk of mitigation failure. The suggestion that NZTA could instead proceed directly to compensation further reinforces that the proposed stream recreation measures are not supported by sufficient confidence to justify reliance upon them as primary mitigation.

The report assumes that even if successful, natural stream functions can be recreated on engineered spoil material. The recommendations are unsupported by empirical evidence and fail to recognise that stream ecosystems arise from long-term interactions with natural

geology and groundwater. Constructed channels on spoil should not be assumed to provide ecological equivalence with the streams they replace.

5.4 NATURAL INLAND WETLANDS

Section 5.4.1 is fundamentally dependent on the wetland values assigned earlier in the FER and therefore inherits the methodological deficiencies identified throughout Sections 3 and 4. The recommended management response is determined by ecological value ratings derived from unsupported assumptions regarding exotic dominance, modified application of ecological criteria and subjective scoring rather than recognised wetland assessment methodologies. Consequently, the proposed level of protection is only as robust as the underlying value assessment.

A fundamental conceptual flaw throughout the FER is the repeated conflation of ecological **condition** with ecological **value**. Modified wetlands are systematically assigned lower ecological value because they are exotic-dominated, grazed or otherwise disturbed. This approach is inconsistent with contemporary restoration ecology and the intent of the NPS-FM, which recognise degraded wetlands as natural ecosystems that retain important hydrological and ecological functions and possess restoration potential. Their modified condition is a reason for protection and restoration, not a justification for assigning reduced ecological significance.

This conceptual error gives rise to a self-fulfilling assessment framework. Wetlands are first reinterpreted through modified value criteria, then assigned low ecological values, resulting in correspondingly low effects ratings and ultimately minimal management recommendations. Consequently, the assessment outcome is largely predetermined by the initial value assignment rather than by an objective evaluation of ecological function and project effects. This recurring pattern is evident throughout the FER and explains why the majority of effects are ultimately characterised as *low, very low or less than minor*.

Particular concern arises from the treatment of exotic-dominated natural inland wetlands. The FER repeatedly diminishes ecological value because of vegetation composition despite these systems meeting the statutory definition of natural inland wetlands. This conflates floristic composition with ecological function and is inconsistent with the NPS-FM, NES-F and Regional Plan. Natural inland wetlands are defined by hydrology, hydric soils and ecological processes. They do not cease to be natural wetlands, nor become ecologically unimportant, because indigenous vegetation has been modified through historical land use.

The assessment places disproportionate emphasis on vegetation composition while giving insufficient weight to the hydrological, geomorphic and ecological processes that define natural inland wetlands. Wetland value cannot be inferred solely from floristic composition where statutory recognition is founded on wetland hydrology, hydric soils, ecological function and ecosystem processes. This is reflected throughout the assessment, where botanical composition is repeatedly used to discount wetland significance while the broader ecosystem functions that wetlands perform receive comparatively little consideration.

The reliability of the underlying assessment is further undermined by numerous inconsistencies in Table 4. These include uncertainty regarding the distinction between "Poor" and "Low" condition ratings, apparent misidentification of indigenous wetland species as exotic pasture, treatment of indigenous taxa under generic labels (e.g. *Juncus*, buttercups and water pepper), failure to distinguish indigenous wetland species from exotic congeners, artificial subdivision of hydrologically connected wetlands, under-recognition of spring-fed systems, omission of indigenous fauna and the ecological significance of surrounding vegetation such as kahikatea, and failure to recognise ecological bottlenecks and connectivity within the Waihoihoi catchment. These shortcomings further reduce confidence in the value ratings that underpin the subsequent management recommendations.

The assessment also gives insufficient consideration to ecological context. Hydrological connectivity, landscape position, fish passage, habitat networks and the contribution of wetlands to catchment-scale ecological function are largely absent from the value assessment. Wetlands such as the Waihoihoi wetland complex function as critical hydrological and ecological nodes linking multiple tributaries and supporting ecosystem connectivity, yet are assessed largely as isolated vegetation units. Contemporary wetland ecology recognises wetlands as integrated hydrological and ecological systems embedded within the wider catchment; their significance cannot be determined solely from local vegetation composition or apparent condition.

Finally, the FER appears to treat the NPS-FM values for Ecosystem Health as though they comprise a quantitative scoring framework. They do not. The NPS-FM identifies values and contributing biophysical components to guide the maintenance, protection and restoration of freshwater under Policy 6 rather than providing a mechanism for assigning subjective numerical scores or value classes. This methodological mismatch further undermines the reliability of the wetland value assessments upon which the management recommendations rely.

Overall, Section 5.4.1 perpetuates the same bespoke methodology identified throughout this review. By substituting ecological function with modified value criteria, subjective scoring and floristic simplification, it systematically underestimates the significance of modified natural inland wetlands and weakens the management response proposed for their protection. In doing so, the FER consistently evaluates wetlands as vegetation assemblages rather than as integrated hydrological ecosystems, a conceptual distinction that underpins many of the report's conclusions.

5.5. POTENTIAL GROUNDWATER DRAWDOWN EFFECTS

We refer to Sec 4.4. of this report in full.

6. OVERALL PROFESSIONAL OPINION

This review concludes that the Freshwater Ecological Report (FER) does not provide a sufficiently reliable, transparent or repeatable basis for evaluating the freshwater ecological effects of the Project. The concerns identified throughout this review are not isolated technical disagreements but represent a consistent pattern of methodological departures from recognised freshwater ecological assessment practice. Collectively, these departures reduce confidence in the ecological values assigned, the predicted magnitude and significance of effects, and the conclusions reached throughout the FER.

The reliability of any ecological effects assessment depends upon a robust understanding of the existing freshwater environment. Throughout this review, deficiencies have been identified in stream mapping, wetland delineation, ecological survey coverage, habitat assessment and the interpretation of ecological values. These uncertainties are compounded by modified application of accepted assessment methodologies, including the EIANZ ecological assessment framework, Stream Ecological Valuation (SEV), Fish Index of Biotic Integrity (Fish IBI), wetland assessment methods and bespoke ecological value and magnitude classifications. Rather than operating independently, these methodological departures form an interconnected assessment framework that consistently reduces ecological values and predicted effects at each stage of the assessment.

A recurring theme throughout the FER is the conflation of ecological condition with ecological value. Modified headwater streams and natural inland wetlands are repeatedly assigned reduced ecological significance because they are exotic-dominated, grazed or support naturally small fish populations. This approach is inconsistent with contemporary freshwater ecology and the National Policy Statement for Freshwater Management, which recognise that modified freshwater ecosystems frequently retain important hydrological, ecological and biodiversity functions and often represent priorities for protection and restoration rather than diminished ecological importance. Ecological value is determined by ecosystem function, representativeness, connectivity, biodiversity and restoration potential, not solely by present condition or indigenous vegetation cover.

The assessment similarly concludes that few streams or wetlands warrant avoidance, largely because ecological values have first been reduced through bespoke value frameworks and effects subsequently diluted through catchment-scale averaging. The repeated use of proportional stream loss and wetland area as the primary measure of ecological magnitude places undue emphasis on arithmetic rather than ecology. It gives comparatively little consideration to habitat quality, ecosystem processes, ecological connectivity, representativeness, hydrological function, fish passage, spawning habitat, recruitment or cumulative effects. Consequently, local ecological effects are repeatedly diluted by broader catchment statistics in a manner that is inconsistent with recognised freshwater ecological assessment practice in New Zealand.

The treatment of headwater systems illustrates this concern. Throughout the FER, headwater, intermittent and smaller stream systems are repeatedly discounted because they are considered to contain limited habitat or relatively few fish. However, stream size is not a surrogate for ecological importance. Headwater streams perform critical hydrological and

ecological functions, contribute to downstream water quality, provide refugia and spawning habitat, support food-web processes, and maintain connectivity throughout river networks. Field observations confirming the presence of At Risk – Naturally Uncommon species, including banded kōkopu, demonstrate that these habitats continue to support regionally significant indigenous biodiversity. The ecological significance of naturally uncommon species cannot be discounted because populations are characteristically small or geographically restricted.

Similarly, the assessment of fish passage places disproportionate emphasis on the amount of upstream habitat immediately affected rather than the importance of maintaining longitudinal connectivity throughout the catchment. Indigenous fish populations persist through access to a mosaic of spawning, rearing, feeding and refuge habitats across entire river networks. Fragmentation of even relatively small headwater systems may therefore have consequences that are disproportionate to the physical extent of habitat affected. The conclusion that fish passage is generally unnecessary for many headwater crossings is therefore not adequately supported by the available ecological evidence.

The same pattern extends to natural inland wetlands. Throughout the FER, wetland significance is repeatedly reduced because of exotic dominance and current pastoral land use despite these systems continuing to perform hydrological, geomorphic and ecological functions recognised under the NPS-FM, NES-F and the Regional Plan. Wetlands are consistently evaluated primarily as vegetation assemblages rather than integrated hydrological ecosystems that regulate water storage, groundwater interaction, nutrient cycling, sediment retention, ecological connectivity and habitat provision. Consequently, management recommendations become proportionate to subjective value ratings rather than to ecological function and ecosystem processes.

The assessment of ecological effects similarly relies upon optimistic assumptions regarding mitigation performance. Stream realignments, culverts, fish passage structures, riparian restoration and wetland management are frequently assumed to achieve ecological outcomes approaching natural systems despite limited empirical evidence and acknowledged uncertainty. More importantly, the FER repeatedly concludes that even where these mitigation measures do not achieve their intended ecological objectives, residual effects remain less than minor because the affected habitats comprise only a small proportion of catchment extent. This substantially weakens the practical application of the effects management hierarchy and reduces confidence that avoidance, mitigation, remediation and offsetting have been appropriately evaluated.

Importantly, the implications of the FER extend beyond the freshwater ecology assessment itself. The ecological values, effects assessments and management recommendations developed within the FER inform project design, groundwater and construction water assessments, consent conditions, environmental management plans, monitoring programmes and offsetting strategies. Consequently, the methodological deficiencies identified throughout this review are propagated throughout the wider project framework, influencing multiple technical disciplines and environmental management decisions.

This also raises broader implications beyond the current Project. If accepted, the bespoke methodologies adopted within the FER—including modified ecological value frameworks, non-

standard application of SEV, subjective wetland assessment methods, bespoke effect magnitude thresholds and catchment-scale averaging—have the potential to influence subsequent stages of the Northland Corridor and future infrastructure projects. Such an outcome would represent a significant departure from recognised freshwater ecological assessment practice and contemporary freshwater science, creating a precedent whereby ecological effects may be systematically underestimated through non-standard methodologies rather than transparent, repeatable and scientifically robust ecological assessment.

Overall, the cumulative effect of the methodological departures identified throughout the FER is substantially greater than any individual issue considered in isolation. The assessment framework forms an interconnected chain in which uncertainties and unsupported assumptions established early in the assessment are carried through ecological valuation, effects assessment, mitigation design and management recommendations. In my opinion, this substantially reduces confidence in the FER as a whole.

Accordingly, I consider that the FER should be revisited using recognised, transparent and repeatable ecological assessment methodologies that properly evaluate freshwater ecosystem function, ecological connectivity and freshwater values. Until this occurs, the conclusions of the FER should be afforded limited weight in informing project design, effects management and statutory decision-making,



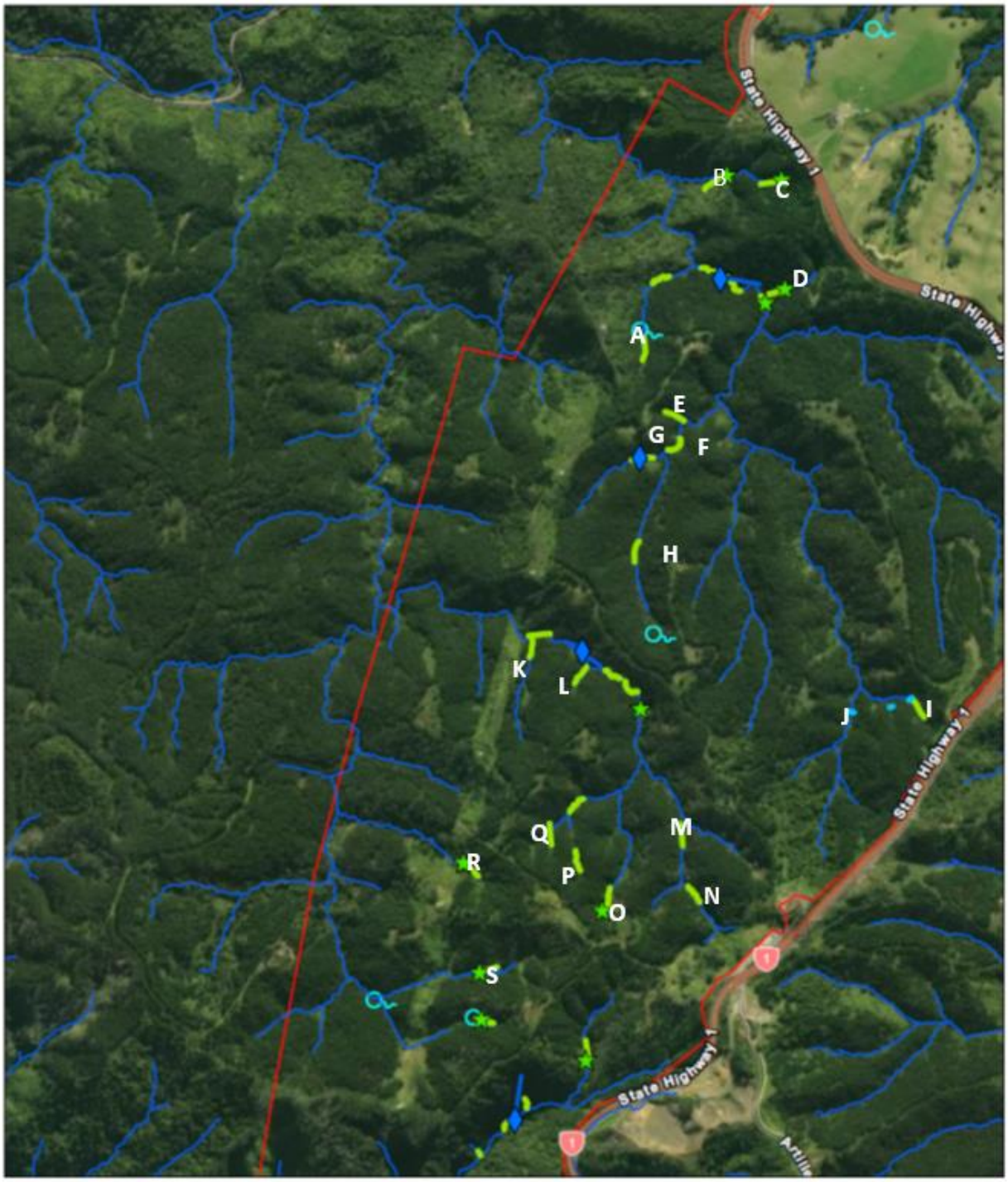
REBECCA LODGE, PRINCIPAL ECOLOGIST
BScEcology **PG.DipSci** (Distinction) Botany

Bay Ecological Consultancy Ltd

APPENDIX 1: WATERWAY MAPS

WATERWAYS THAT ARE MARKED INCORRECTLY IN THE FER DN

PINE TRIBUTARIES



6/16/2026

1:15,088

0 0.1 0.2 0.4 mi

0 0.15 0.3 0.6 km

eDNA Sample point

SEV lines

Stream

Frogs Survey Record

Frog Survey lines

NC_2B Existing Streams VIEW

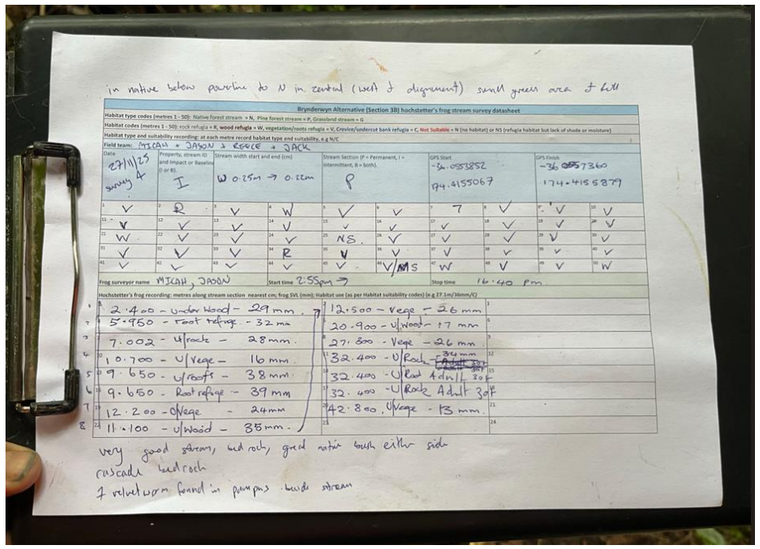
NC_2B Approved Geotechnical Spring view

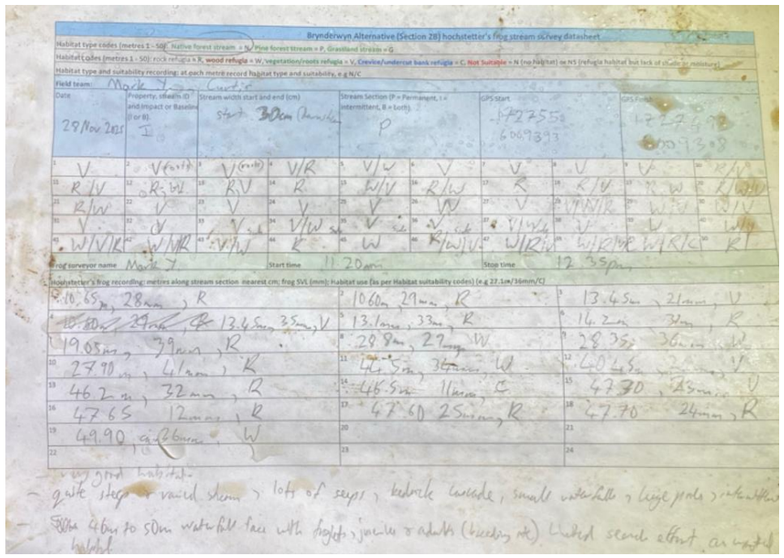
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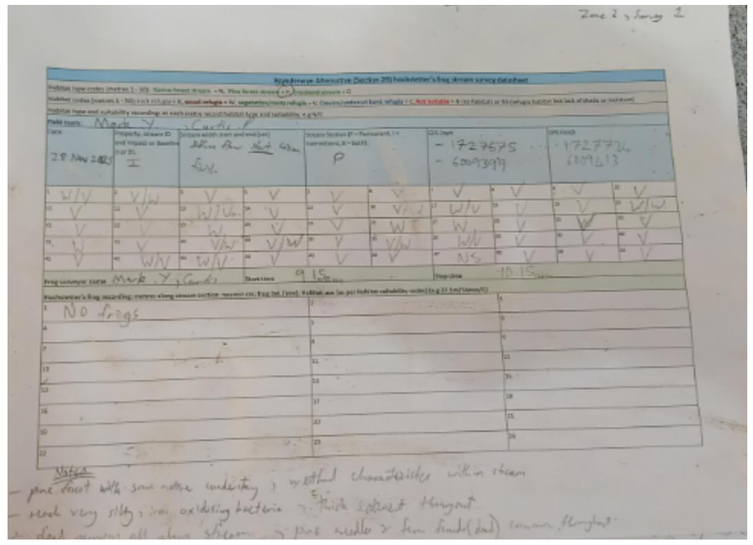
NC2B Final Designation Boundary Minor Updates 20260323

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, NWA, Vantor

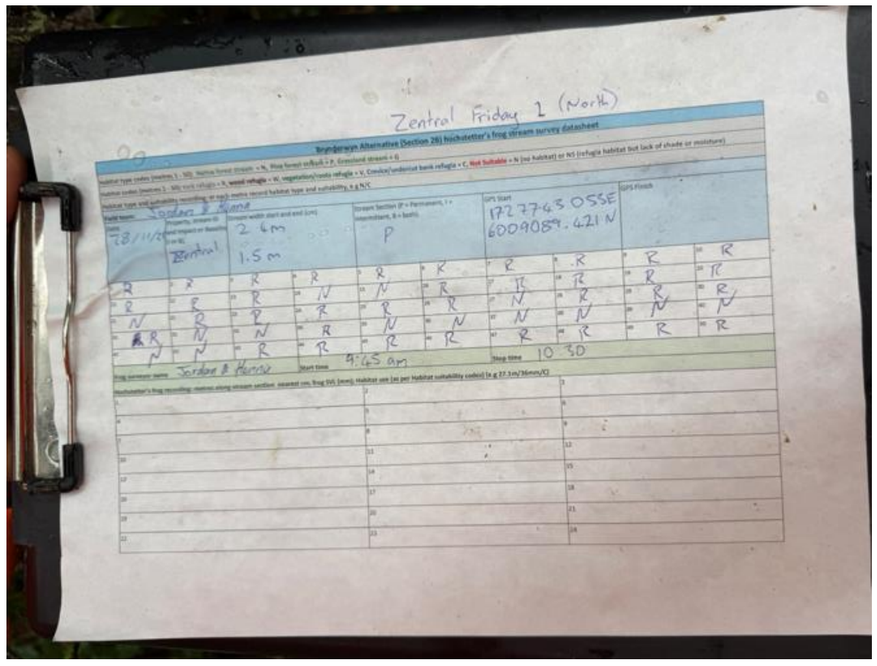
PINE NORTH TRIBUTARY A SPRING FED MARKED AS EPHEMERAL IN FER MAPPING ; B – MARKED PERMANENT FROG SURVEY/ INTERMITTENT FER; C MARKED PERMANENT FROG SURVEY/ EPHEMERAL FER;

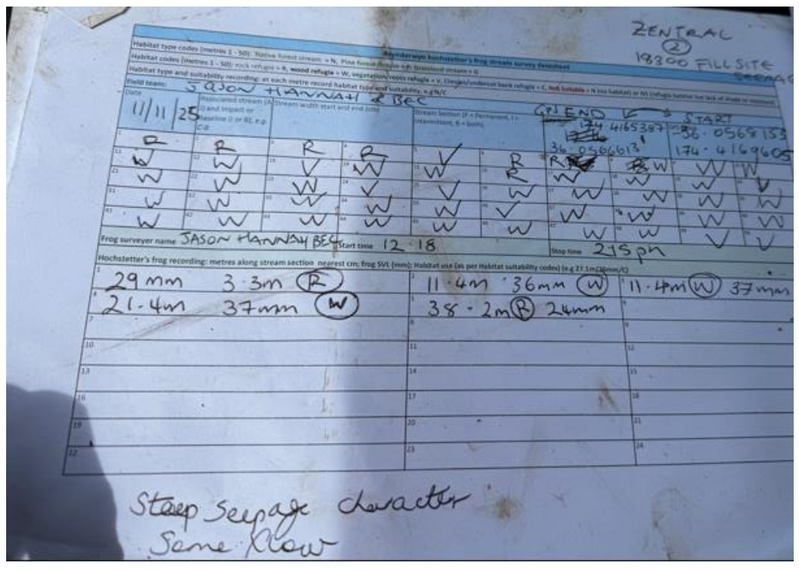


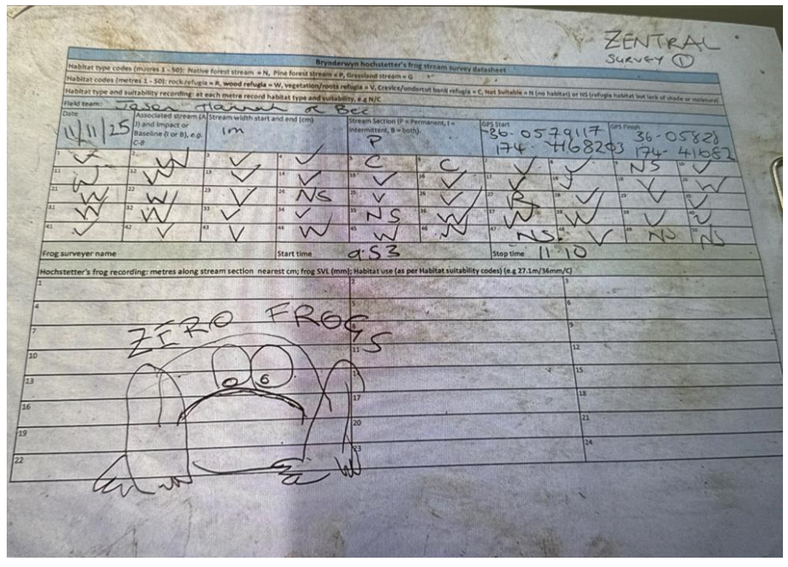




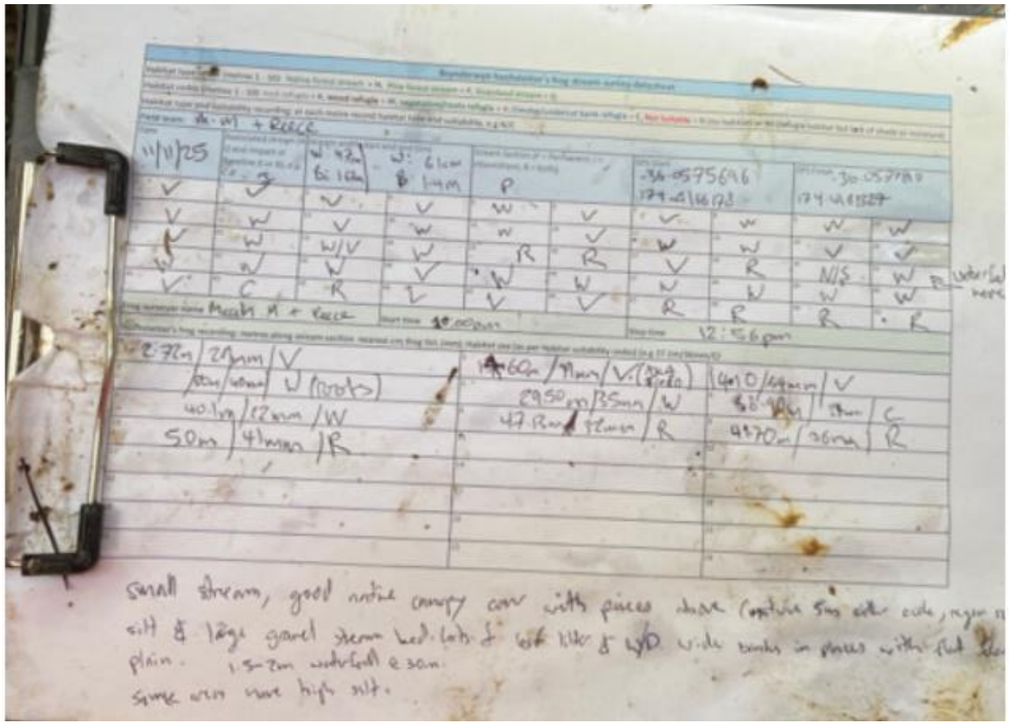
D- PERMANENT FROG SURVEY; E - INTERMITTANT FER; INTERMITTANT FROG SURVEY/ UNMARKED FER; F- FROG SURVEY PERMANANT/ FER INTERMITTANT

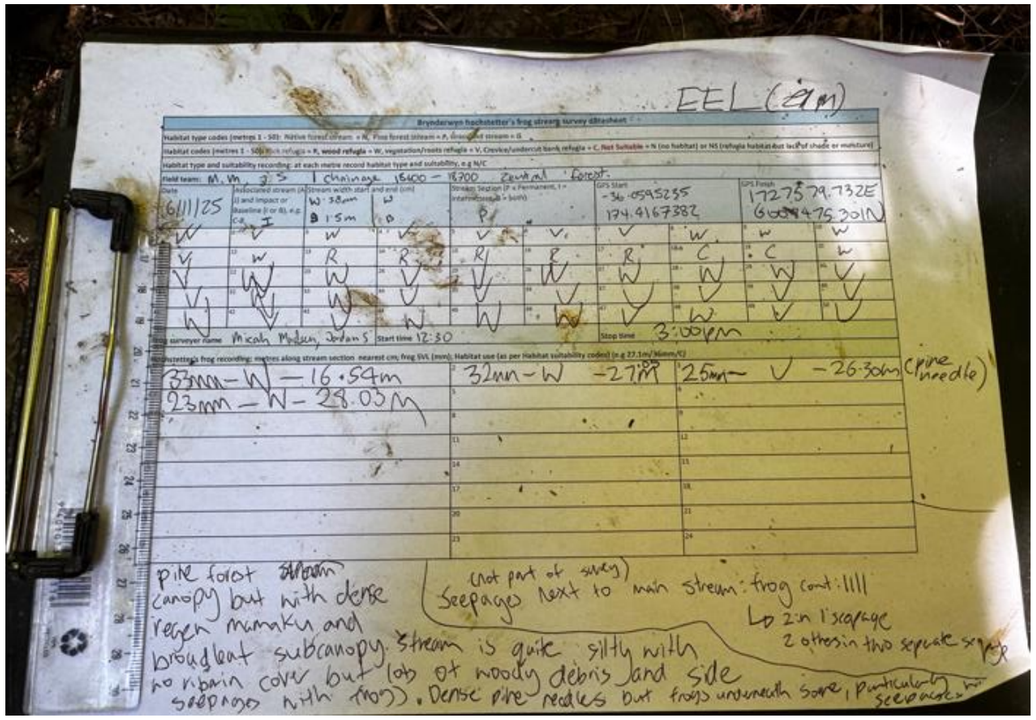






G- FROG SURVEY PERMENANT /EDNA POINT INTERMTTANT/ FER EPHEMERAL FILL SITE'; H- PERMANENT FROG SURVEY/ EPHEMERAL FER FILL SITE FREQUENT UNMAPPED SEEPAGE ADDITIONAL HABITAT FOR FROGS IN EXCESS OF STREAM LENGTH CALCULATION





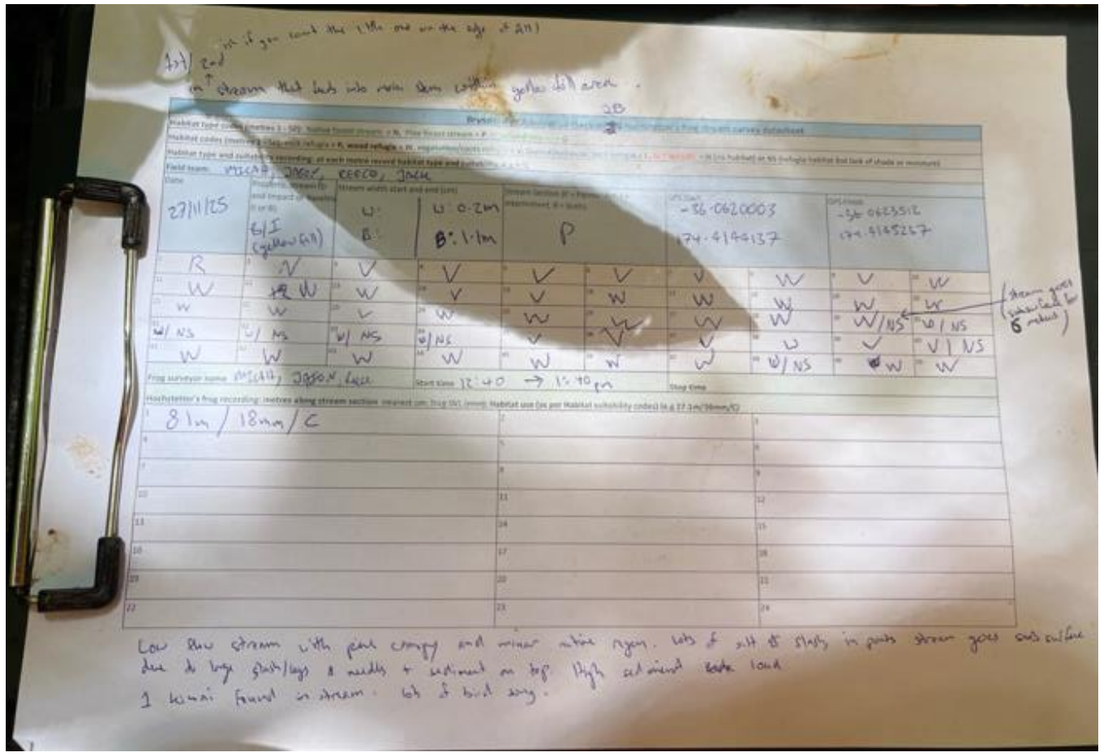
I – FROG SURVEY PERMANENT/ INTERMITTENT FER; WSP FRESHWATER ECOLOGIST RECORDS AS PERMANENT RECOMMENDS SEV SITE NO SEV UNDERTAKEN ; STREAM I; J- FER RECORDS AS INTERMITTANT

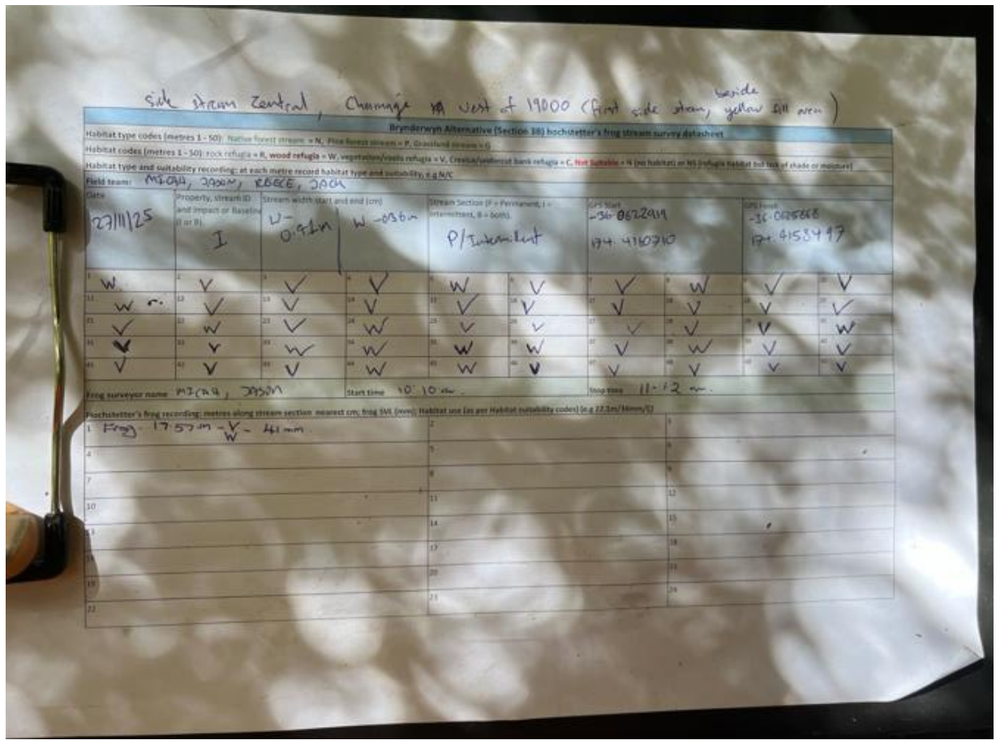




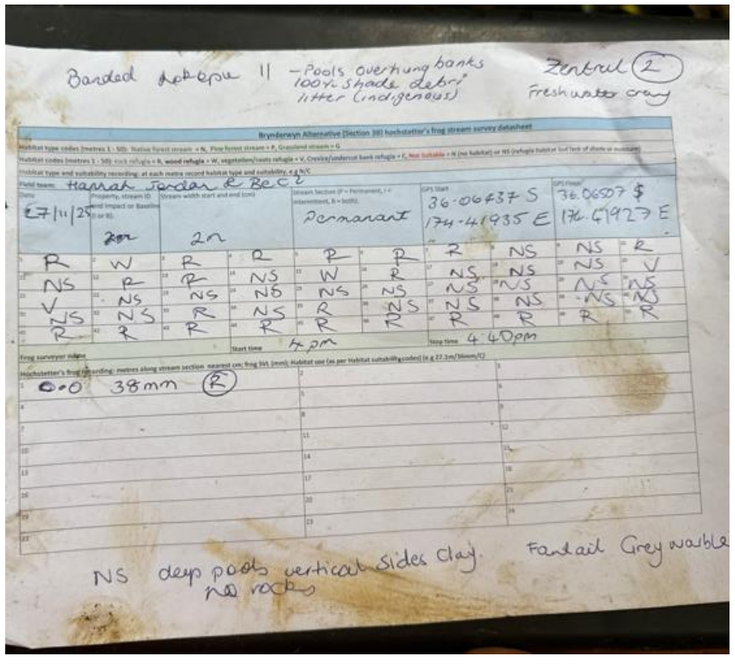


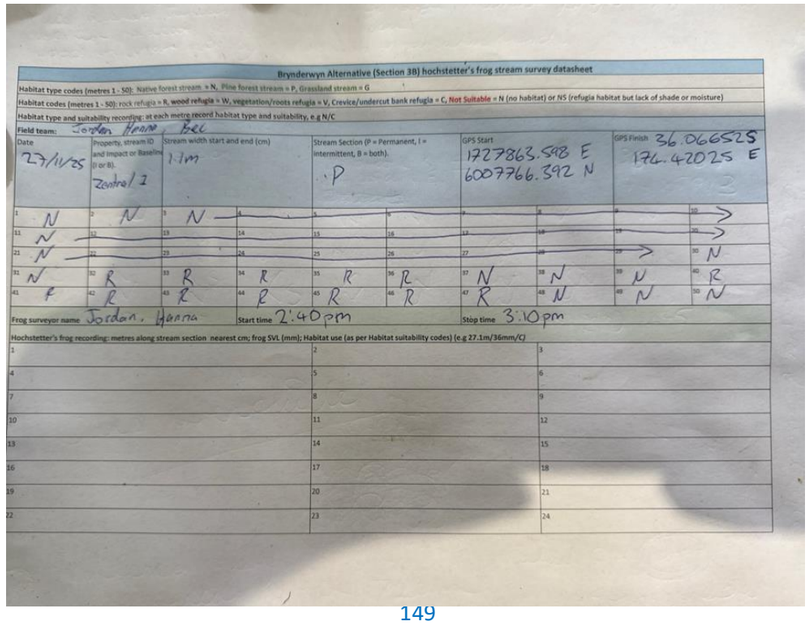
STREAM K FROG SURVEY PERMANENT KĀKAHI FOUND/ FER EPHEMERAL; L-INTERMITTANT/ FER EPHEMERAL





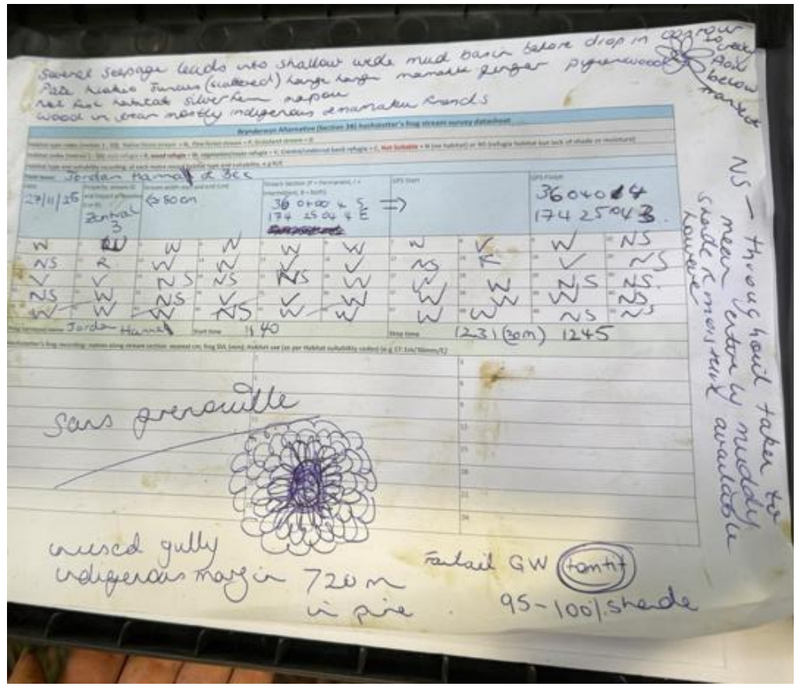
STREAM M FROG SURVEY PERMANENT DEEP POOLS BANDED KŌKOPU/ FER INTERMITTANTL; N – PERMANENT FROG SURVEY / FER INTERMITTANT

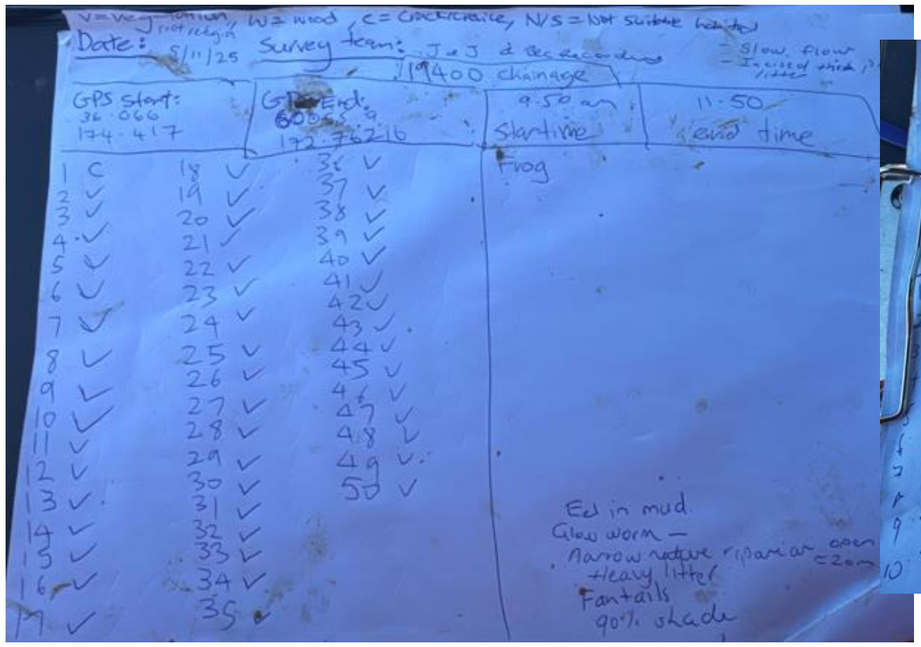


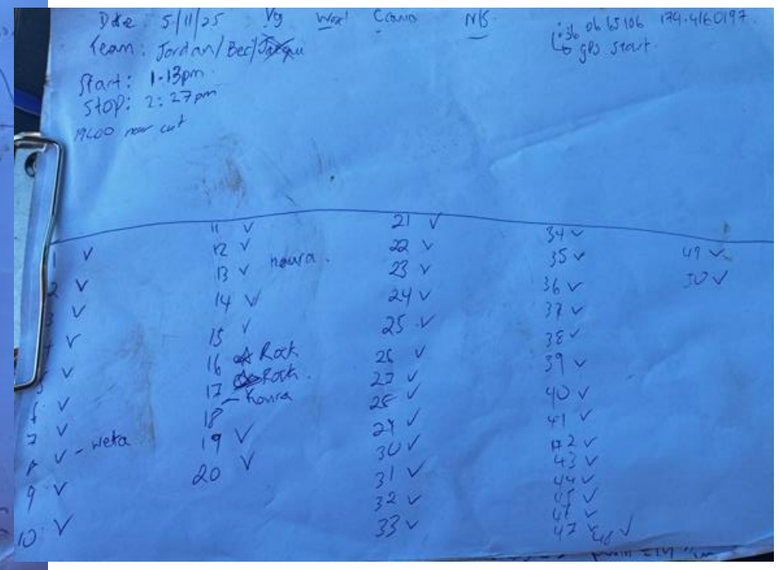




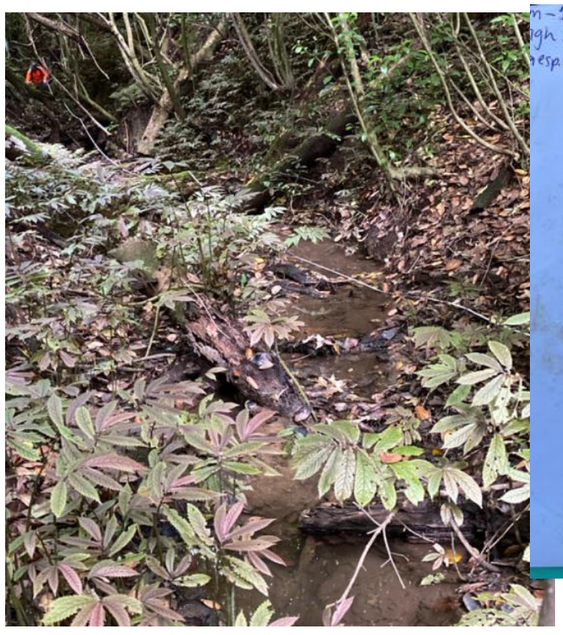
STREAM O PERMANENT/ FER EPHEMERAL; STREAM P INTERMITTANT/ FER EPHEMERAL; STREAM Q INTERMITTANT KŌURA/ FER EPHEMERAL;

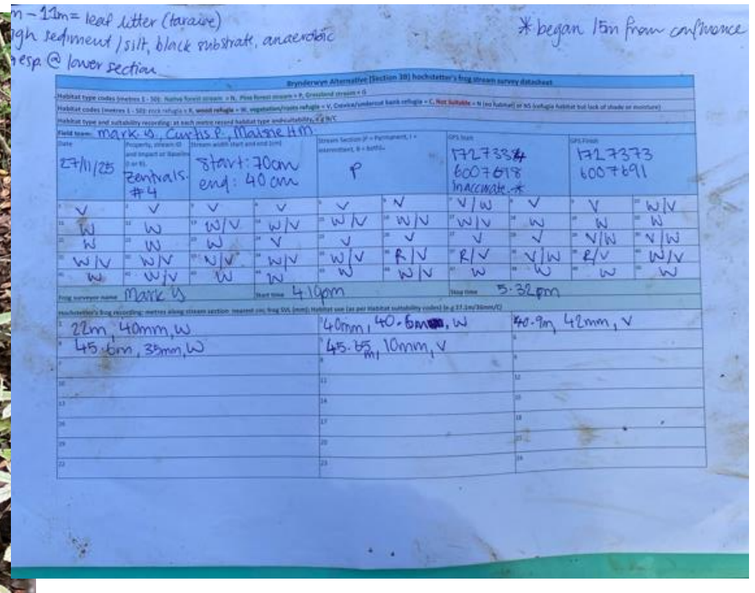


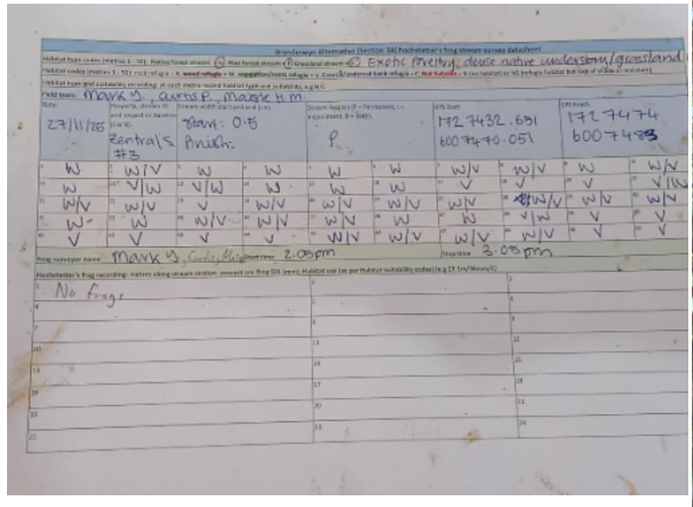


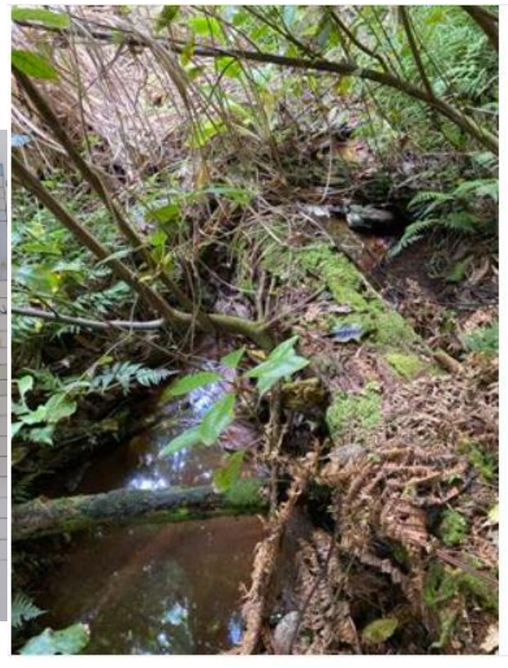


STREAM R PERMANENT FROG SURVEY; EPHEMERAL FER; STREAM S PERMANENT/ FER INTERMITTANT



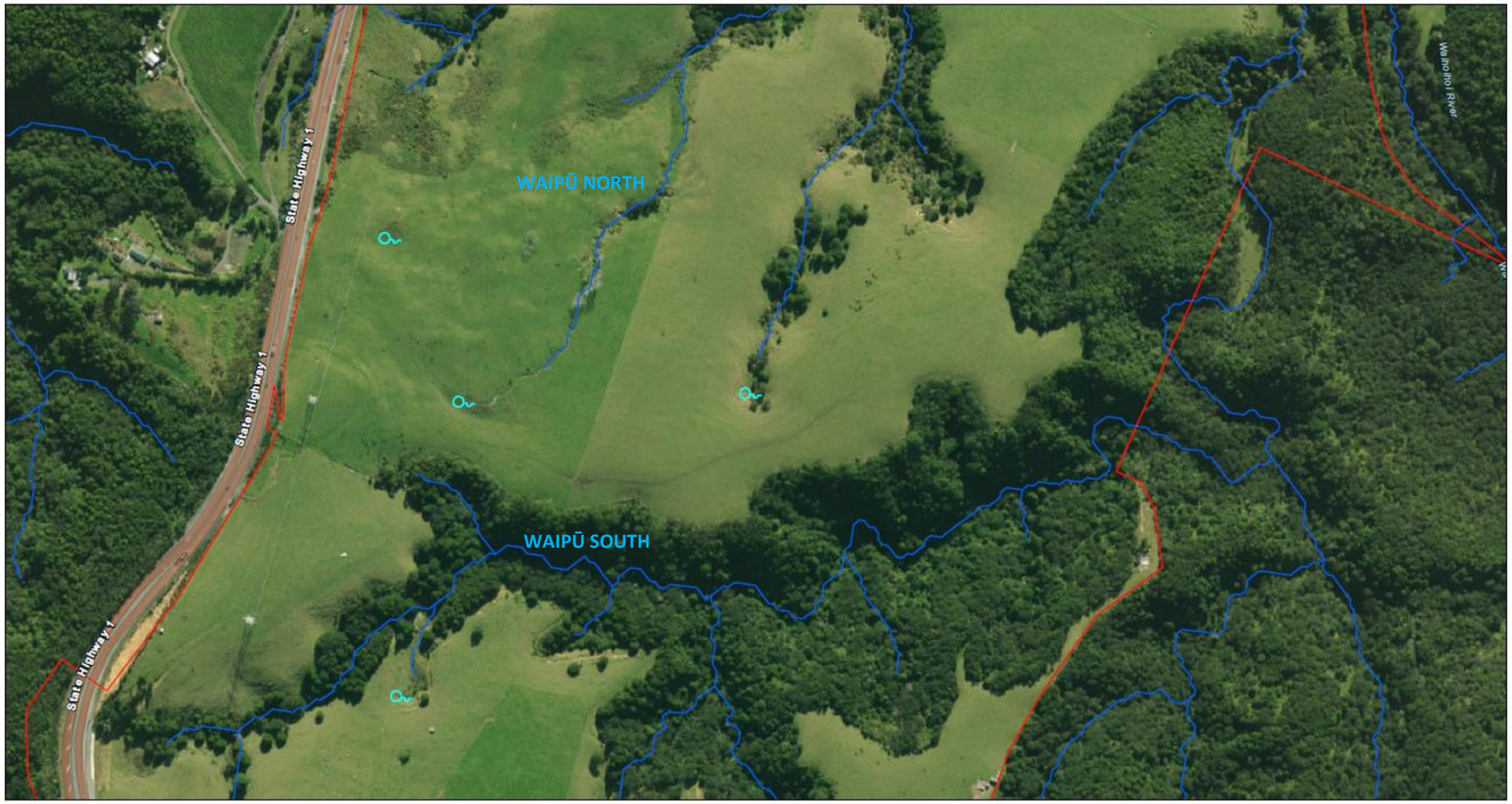






SPRINGS FED REACHES AS CONFIRMED BY WSP GEOTECH NZTA GIS PLATFORM LABELLED AS RAIN FED EPHEMERAL APPENDIX C FER. ALL ARE ASSOCIATED WITH NATURAL INLAND WETLAND UNMAPPED IN THE FER

WAIPU SOUTH & NORTH SPRINGS



6/16/2026

1:4,429

0 0.04 0.09 0.18 mi

0 0.05 0.1 0.2 km

NC_2B Existing Streams VIEW

NC_2B Approved Geotechnical Spring view

Approved

NC2B Final Designation Boundary Minor Updates 20260323

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, NIWA, Vantor

WAIPU NORTH & SOUTH



6/16/2026

EDNA Sample point
SEV lines
Stream
Frogs Survey Record
Frog Survey lines
NC_2B Existing Streams VIEW
NC_2B Approved Geotechnical Spring view
Approved
NC2B Final Designation Boundary Minor Updates 20260323

1:5,027

0 0.04 0.09 0.18 mi
0 0.07 0.15 0.3 km

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, NIWA, Vantor

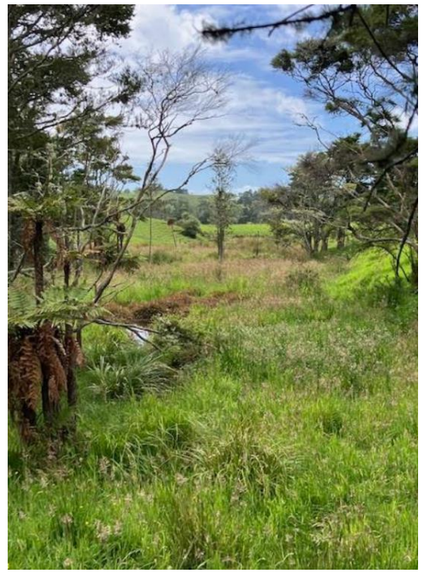
EXAMPLES OF MISCLASSIFICATION OF STREAMS & WETLANDS GROUNDTRUTHED

STREAM AA F FED BY HEADWATER WETLAND WITHIN KAHIKATEA TO FER WETLAND 12 SWAMP HAS PERMANENT CHANNELS NOT INTERMITTANT AS CLASSIFIED IN THE FER;F ROG SURVEY PERMANENT FER EPHEMERAL THEN WETLAND 12

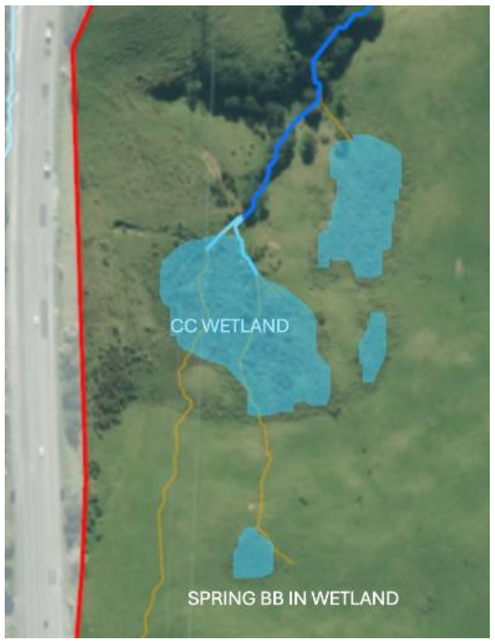






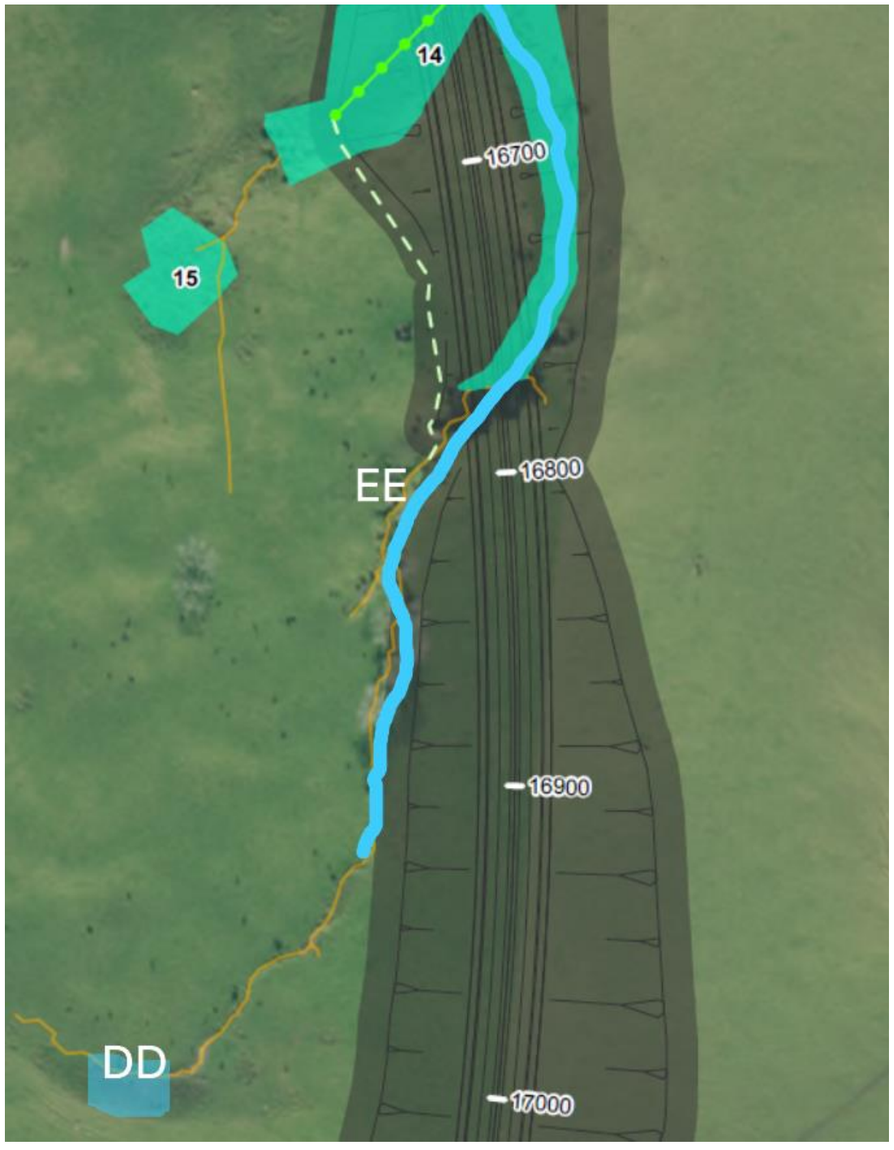


SPRING BB EMERGES AS WETLAND WITH SHORT INCISED FLOW INTERMITTANT TO LARGER WETLAND CC





SPRING DD EMERGES AS UNMARKED WETLAND; WE CONSIDER CHANNELS SHOWN AS EPHEMERAL IN FER BECOME INCISED INTERMITTANT ASLO DOCUMENTED BY DOCUMENTED BY WSP CREW , FLOW INTO FER WETLAND 14 NO RECOGNITION OF SPRING FED CHANNEL (AS OPPOSED TO RAINFED EPHEMERAL CHARACTER CITED)

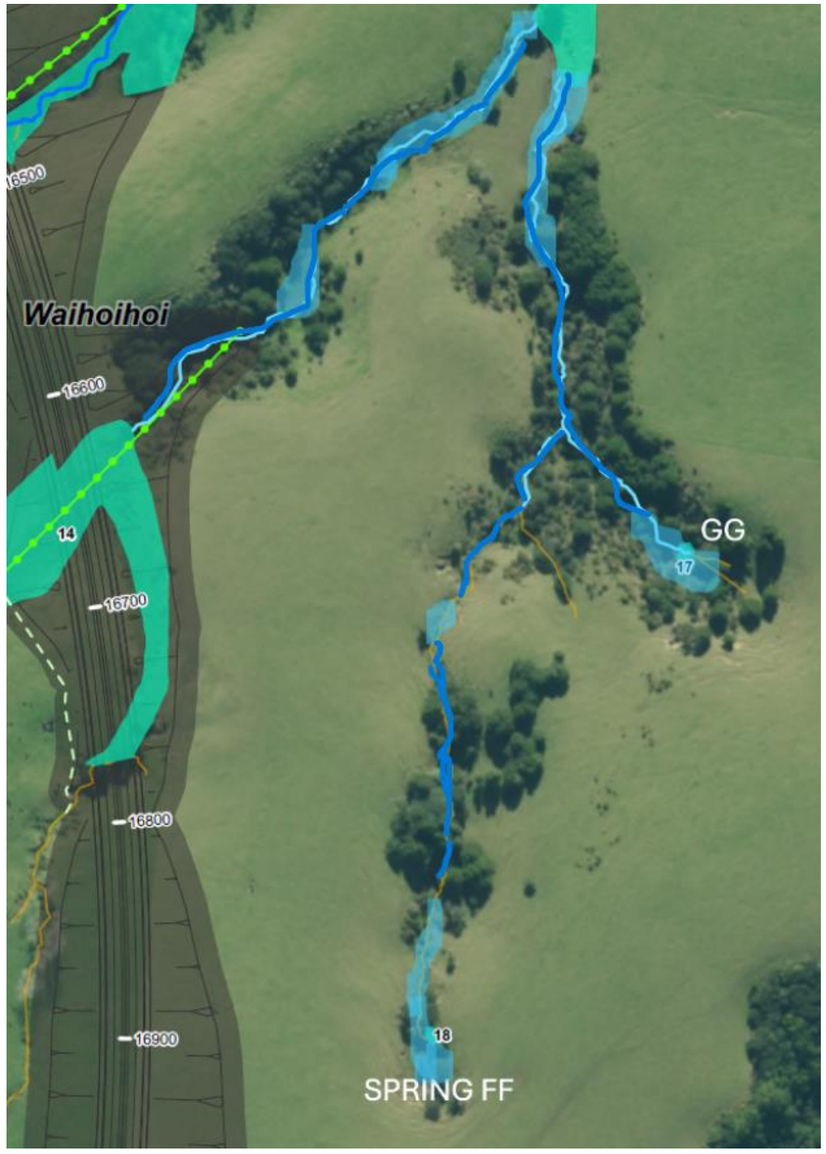








WETLAND GG ; STREAM EXTENT FROM FER WETLAND 14 IS PERMANENT RATHER THAN INTERMITTANT SUPPLYING WETLAND AND SECTIONS DEEPLY INCISED WITH ROCKY BOTTOM









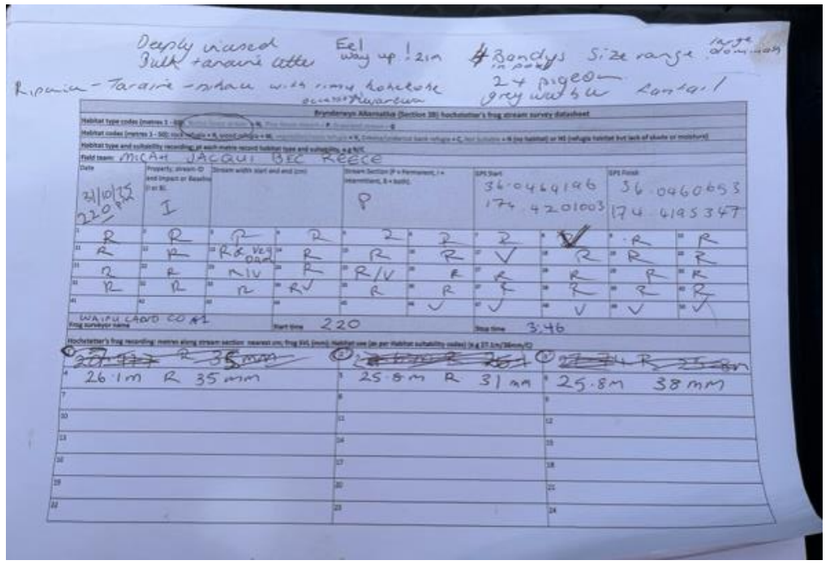
FF WETLAND 17; TOP OF HH NOT EPHEMERAL; KOKOPU IN HH

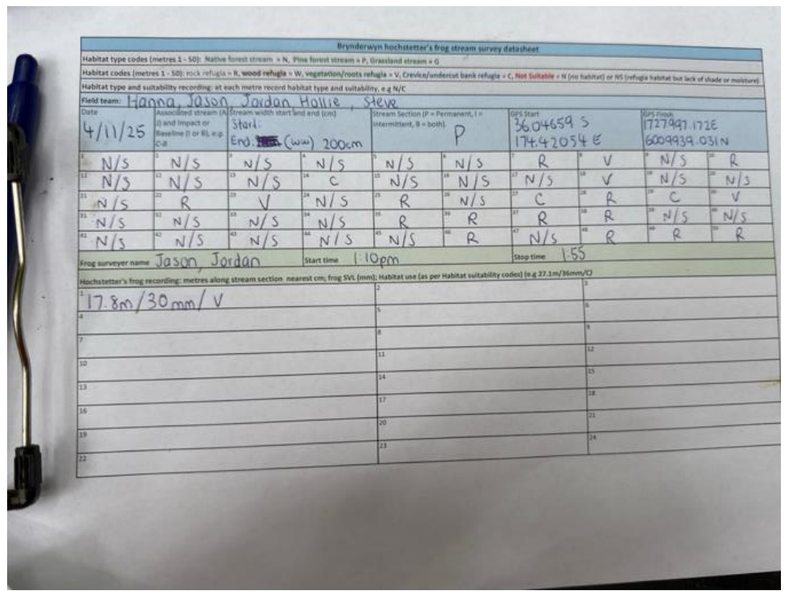


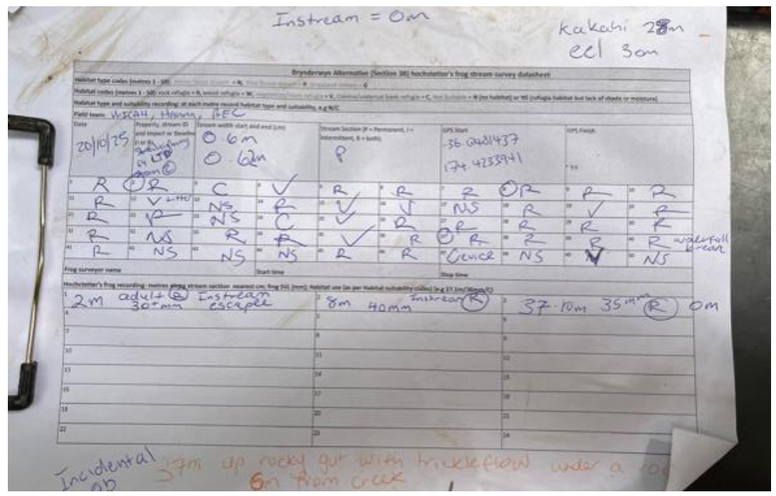




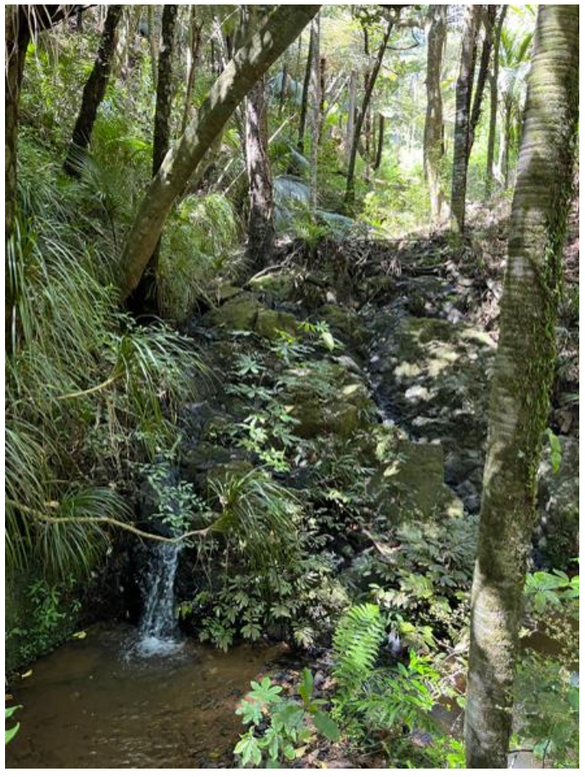
HH FROG SURVEY PERMANENT; II PERMANENT, FROG SURVEY RECORD;MM PEMANENT;

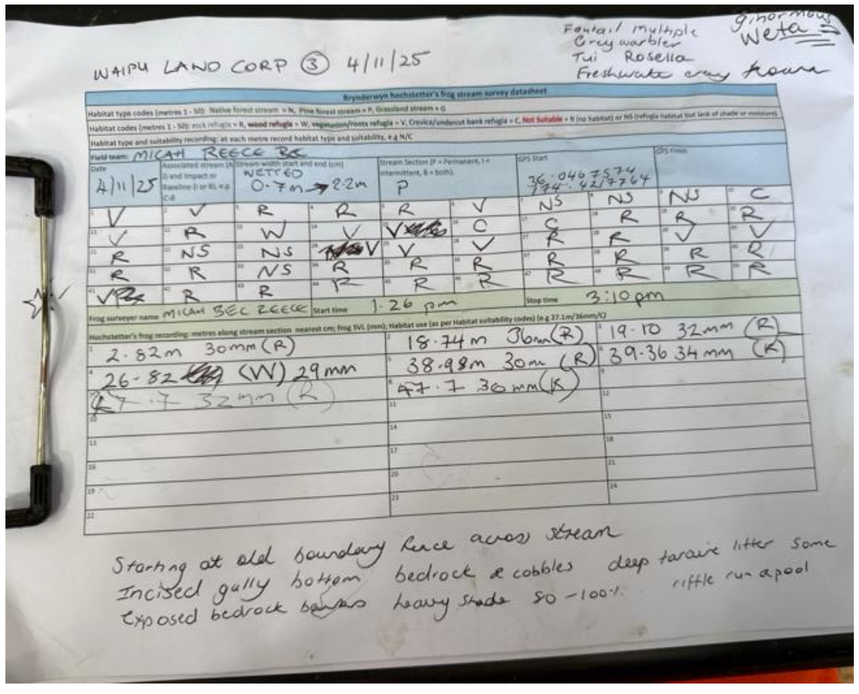






MM;NN PEMANANT FROG SURVEY;NN STREAM







APPENDIX B: RHA SCORES FOR SELECT SITES

NATIONAL RAPID HABITAT ASSESSMENT (RHA)

The National Rapid Habitat Assessment[104] protocol was applied to the water sampling sites, resulting in a habitat quality score (HQS), as sum of the 10 RHA parameter scores. This score represents the overall state of stream habitat at a site, as a useful measure of stream health influenced by adjacent land, including legacy elements. However, broader catchment-scale habitat characteristics, which are not accounted for in the RHA, may have an overriding influence on stream fish populations[Error! Bookmark not defined.]. Full FER scoring was not presented in the reporting.

CLOCKWISE FROM LEFT: WAIHOIHOI MAIN STEM SITE; UPSTREAM;





DOWNSTREAM



APID HABITAT ASSESSMENT PROTOCOL DEVELOPMENT FOR

NATIONAL RAPID HABITAT ASSESSMENT WATER QUALITY SITES

HABITAT PARAMETER	SITE			
	WAIPU SOUTH	WAIPU NORTH	ROBERTSONS	WAIHOIHOI MAIN STEM
Deposited Sediment *% of stream bed covered in sediment*	4	3	0 NATURALLY SOFT BOTTOMED	UNDISCERNIBLE AT SITE TOO DEEP
Invertebrate Habitat Diversity *Complexity substrate types & amount of interstatial space (size; sediment)*	10	8	5	8
Invertebrate Habitat Abundance *% substrate favourable for EPT colonisation*	7	4	1	4
Fish Cover Diversity *Complexity of substrate types and cover*	10	6	5	8
Fish Cover Abundance *% fish cover available*	7	8	9	9
Hydrological Heterogeneity *Variation of hydraulic types e.g pools, riffles slow/fast*	10	6	2	8
Bank Erosion *% of stream bank active at waterline- erosion; pugging; scouring; slumping*	6	4	2	2
Bank Vegetation *Maturity; diversity; density*	9	4	3	4
Riparian Width *Width constrained by vegetation or protected by fence*	9	5	3	1
Riparian Shade *% Shading throughout the day*	10	4	4	4
SCORE POOR <26; FAIR 26-50; GOOD 51-75; EXCELLENT 76-100	**82 EXCELLENT** FER 59	**GOOD 52** FER 59	**FAIR 34** FER 18	**FAIR 48** FER 28

WAIPU SOUTH SITE ; WAIPU NORTH SAME SCORE





River Habitat Assessment (RHA) Field Recording Sheet

Habitat parameter	Condition category										SCORE
1. Deposited sediment	*The percentage of the stream bed covered by fine sediment.*										
	0	*5*	*10*	*15*	*20*	*30*	*40*	*50*	*60*	*≥ 75*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
2. Invertebrate habitat diversity	*The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.*										
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
3. Invertebrate habitat abundance	*The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.*										
	95	*75*	*70*	*60*	*50*	*40*	*30*	*25*	*15*	*5*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
4. Fish cover diversity	*The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.*										
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
5. Fish cover abundance	*The percentage of fish cover available.*										
	95	*75*	*60*	*50*	*40*	*30*	*20*	*10*	*5*	*0*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
6. Hydraulic heterogeneity	*The number of of hydraulic components such as pool, riffle, fast run, slow run, rapid, cascade/waterfall, turbulance, backwater. Presence of deep pools score higher.*										
	≥ 5	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
7. Bank erosion	*The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.*										
Left bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
Right bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
8. Bank vegetation	*The maturity, diversity and naturalness of bank vegetation.*										
Left bank AND Right bank	*Mature native trees with diverse and intact understorey*		*Regenerating native or flaxes/sedges/tussock > dense exotic*			*Mature shrubs, sparse tree cover > young exotic, long grass*			*Heavily grazed or mown grass > bare/impervious ground.*		
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
9. Riparian width	*The width (m) of the riparian buffer constrained by vegetation, fence or other structure(s).*										
Left bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	*0*	
Right bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	*0*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
10. Riparian shade	*The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).*										
	≥ 90	*80*	*70*	*60*	*50*	*40*	*25*	*15*	*10*	*≤ 5*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
TOTAL	(Sum of parameters 1-10)										

APPENDIX C: WETLAND MAPS


N
WETLAND AREAS
FER WETLANDS
NATURAL INLAND WETLAND PREDICTED
NATURAL INLAND WETLAND SITE VISIT
Millbrook Road
Ahuroa Road
Ahuroa River
Waipu Bypass
Kahikatea Stands
The Breigh
State Highway 1
1
Scale@ A3: 1:4000 0 100 150 m
Bay Ecological
CONSULTANCY LTD
30/06/2026
Motorway
AHUROA & WAIHOIHOI WETLANDS
Scale
as shown
Drawn By
CD
Drawing #
1.0
Rev #
A


N
WETLAND AREAS
FER WETLANDS
NATURAL INLAND WETLAND PREDICTED
NATURAL INLAND WETLAND SITE VISIT
Ahuroa River
State Highway 1
SHW1
Scale@ A3: 1:4000 0
Bay Ecological
CONSULTANCY LTD
21/06/2026
Motorway
AHUROA & WAIHOIHOI WETLANDS
Scale
as shown
Drawn By
CD
Drawing #
2.0
Rev #
A


N
WETLAND AREAS
FER WETLANDS
NATURAL INLAND WETLAND PREDICTED
NATURAL INLAND WETLAND SITE VISIT
State Highway 1
Finlayson Brook Road
Braigh
Braigh
Bay Ecological
CONSULTANCY LTD
21/06/2026
Motorway
AHUROA & WAIHOIHOI WETLANDS
Scale
as shown
Drawn By
CD
Drawing #
3.0
Rev #
A


N
Braigh
Braigh
State Highway 1
State Highway 1
State Highway 1
State Highway 1
Spring
Brooks Road
WETLAND AREAS
FER WETLANDS
NATURAL INLAND WETLAND PREDICTED
NATURAL INLAND WETLAND SITE VISIT
Scale@ A3: 1:4000 0 100 150 m
Bay Ecological
CONSULTANCY LTD
21/06/2026
Motorway
AHUROA & WAIHOIHOI WETLANDS
Scale
as shown
Drawn By
CD
Drawing #
4.0
Rev #
A


N
WETLAND AREAS
FER WETLANDS
NATURAL INLAND WETLAND PREDICTED
NATURAL INLAND WETLAND SITE VISIT
Brooks Road
State Highway 1
SHW1
Waihoihoi River
Ahuroa River
Glenmohr Road
Scale@ A3: 1:4000 0 100 150 m
Bay Ecological
CONSULTANCY LTD
21/06/2026
Motorway
AHUROA & WAIHOIHOI WETLANDS
Scale
as shown
Drawn By
CD
Drawing #
5.0
Rev #
A


N
WETLAND AREAS
FER WETLANDS
NATURAL INLAND WETLAND PREDICTED
NATURAL INLAND WETLAND SITE VISIT
Glenmohr Road
State Highway 1
Ryan Road
2
Waihoihoi
Main Stem
Scale@ A3: 1:4000 0 100 150 m
Bay Ecological
CONSULTANCY LTD
30/06/2026
Motorway
AHUROA & WAIHOIHOI WETLANDS
Scale
as shown
Drawn By
CD
Drawing #
6.0
Rev #
A

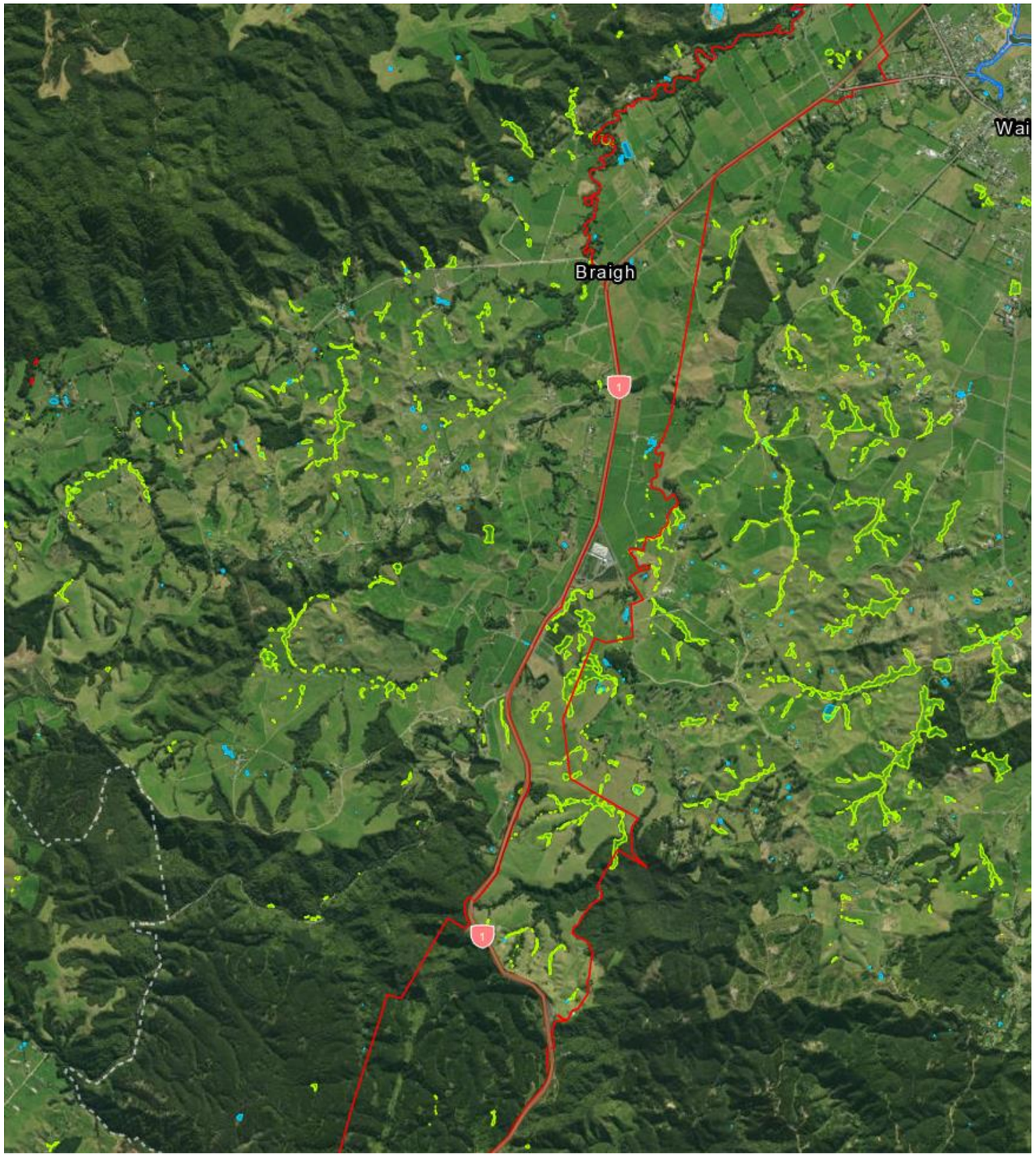

N
WETLAND AREAS
FER WETLANDS
NATURAL INLAND WETLAND PREDICTED
NATURAL INLAND WETLAND SITE VISIT
State Highway 1
Waipu River
Pamp Road
Womack River
3
4
5
6
7
8
9
10
11
11
12
13
Waipu North
Kahikatea
Scale@ A3: 1:4000 0 100 150 m
Bay Ecological
CONSULTANCY LTD
30/06/2026
Motorway
AHUROA & WAIHOIHOI WETLANDS
Scale
as shown
Drawn By
CD
Drawing #
7.0
Rev #
A


N
WETLAND AREAS
FER WETLANDS
NATURAL INLAND WETLAND PREDICTED
NATURAL INLAND WETLAND SITE VISIT
WAIPU NORTH
KAHIKATEA
FERNBIRD
State Highway 1
SH1
11
12
13
14
15
16
17
18
Spring
Spring
Spring
WAIPU SOUTH
Murphy
Scale@ A3: 1:4000 0 100 150 m
Bay Ecological
CONSULTANCY LTD
21/06/2026
Motorway
AHUROA & WAIHOIHOI WETLANDS
Scale
as shown
Drawn By
CD
Drawing #
8.0
Rev #
A


N
Waipu South
Murphy
Spring
Spring
Dam
State Highway 1
State Highway 1
State Highway 1
State Highway 1
WETLAND AREAS
FER WETLANDS
NATURAL INLAND WETLAND PREDICTED
NATURAL INLAND WETLAND SITE VISIT
Scale@ A3: 1:4000 0 100 150 m
Bay Ecological
CONSULTANCY LTD
21/06/2026
Motorway
AHUROA & WAIHOIHOI WETLANDS
Scale
as shown
Drawn By
CD
Drawing #
9.0
Rev #
A

NRC UPDATE INDICATIVE WETLAND MAPPING LAYER 2026

https://www.arcgis.com/sharing/rest/content/items/30f02fda416e4f59ab8b3f690efe3b36/data



TECHNICAL REVIEW

ON BEHALF OF TE POUWHENUA O TIAKIRIRI KUKUPA TRUST



ASSESSMENT OF EFFECTS ON AVIFAUNA
NORTHLAND CORRIDOR 2B
DOCUMENT: 10722-PTA-2B0-PE-RPT-0009

Bay Ecological
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This report may be cited as-
BAY ECOLOGICAL CONSULTANCY LTD. (2026). TECHNICAL REVIEW OF THE ASSESSMENT OF EFFECTS ON AVIFAUNA REPORT 10722-PTA-2B0-PE-RPT-0009 NORTHLAND CORRIDOR 2B: NORTHERN MOTORWAY PROJECT. TECHNICAL REPORT PREPARED FOR TE PARAWHAU HAPŪ.

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COVER PAGE BITTERN FORAGING BY WETLAND IN PASTURE NOT TAKEN ONSITE © BAY ECOLOGICAL CONSULTANCY 2026

TECHNICAL REVIEW
ASSESSMENT OF EFFECTS ON AVIFAUNA
NORTHLAND CORRIDOR 2B
DOCUMENT: 10722-PTA-2B0-PE-RPT-0009

Bay Ecological CONSULTANCY LTD

INTRODUCTION

This review provides an independent technical evaluation of the Assessment of Effects on Avifauna (Document No. 10722-PTA-2B0-PE-RPT-0009), prepared by Lee Bull (Ecology Matters Ltd) for NZ Transport Agency Waka Kotahi (NZTA), with field investigations undertaken with support from the wider WSP New Zealand ecology team. The report documents the avifauna survey methodology, ecological values, assessment of effects and proposed mitigation associated with the Project.

Bay Ecological Consultancy Ltd (BECL) accompanied the WSP ecology team during avifauna field investigations undertaken in October and November 2025, on behalf of Te Parawhau hapū, providing specialist freshwater ecology expertise and general ecological oversight. Particular emphasis was placed on the interaction between freshwater ecosystems and avifauna, including wetlands, riparian habitats, headwater streams and fish-dependent bird species. These site visits provided the opportunity to observe the survey methodology, habitats and ecological context of the Project area and have informed the technical observations presented in this review.

This review evaluates the adequacy of the survey methodology, ecological interpretation, assessment of effects, proposed mitigation and biodiversity offsetting. Particular consideration is given to the application of ecological data, habitat mapping, species occupancy, ecological function and the interaction between the avifauna assessment and the accompanying Freshwater and Terrestrial Ecology assessments.

For brevity, the Assessment of Effects on Avifauna is referred to throughout this review as the **AER.**

EXECUTIVE SUMMARY

Bay Ecological Consultancy Ltd (BECL) undertook an independent technical review of the **Assessment of Effects on Avifauna (AER)** prepared for **NZ Transport Agency Waka Kotahi (NZTA)**. The review evaluated the adequacy of the survey methodology, ecological interpretation, assessment of effects, proposed mitigation and biodiversity offsetting, with particular emphasis on the interaction between freshwater ecosystems and avifauna.

Overall, the AER is comprehensive within its adopted methodology. However, a series of methodological assumptions progressively constrain the ecological evidence available to the assessment, resulting in an underestimation of ecological effects and an overestimation of the effectiveness of the proposed mitigation and biodiversity offsets.

KEY FINDINGS

ASSESSMENT METHODOLOGY

- The AER relies predominantly on interpretation of limited existing ecological information supported by limited project-specific field observations across the Proposed Designation and wider Zone of Influence.
- The field programme provided an opportunity to collect comprehensive project-specific ecological information; however, survey effort was insufficient to verify many of the habitat assumptions that underpin the assessment, resulting in continued reliance on desktop interpretation and existing datasets largely from road view points and outside of the Designation.
- Freshwater habitat mapping and ecological assumptions are carried forward from the Freshwater Ecology Report (FER), progressively constraining recognised wetland habitat, species interactions and ecological values.
- The distinction between the indicative alignment, Proposed Designation and a progressively constrained Zone of Influence limits consideration of ecological effects extending into adjacent wetlands, riparian habitats, indigenous forest and connected ecosystems.

ASSESSMENT OF ECOLOGICAL EFFECTS

- Simplified habitat associations underestimate habitat availability for a number of indigenous bird species, particularly within pastoral, wetland and riparian environments.
- Ecological values assigned to several Regionally Significant species are underestimated, resulting in reduced overall ecological effects.
- The assessment focuses principally on direct habitat loss and collision mortality while giving comparatively limited consideration to prolonged construction disturbance, indirect mortality, displacement, reduced refugia, breeding success and cumulative effects associated with an extended construction programme.
- Construction lighting is treated as a temporary effect despite night works, construction compounds and security lighting potentially occurring over several years and resulting in prolonged nocturnal disturbance.
- Indirect ecological pathways associated with culverting, headwater stream modification, reduced fish passage and altered prey availability are not adequately incorporated into the assessment.

MITIGATION

- The proposed mitigation relies heavily on post-consent management through the Avifauna Management Plan, with key ecological uncertainties and species-specific management deferred until implementation.
- Wetland mitigation is based on limited freshwater habitat mapping and is further reduced to wetlands identified as supporting Threatened or At Risk wetland birds, excluding the wider freshwater habitat network utilised by indigenous avifauna.
- The proposed replacement wetlands emphasise raupō establishment but provide no assurance that equivalent shallow-water foraging habitat, natural hydrology, fish passage or prey production will be achieved.
- The principal wetland offset is located outside the affected **Waihoihoi** and **Ahuroa** catchments, south of the **Brynderwyn Hills**, and therefore does not demonstrate replacement of biodiversity values, ecological connectivity or ecosystem function within the affected landscape.
- Proposed revegetation and a five-year establishment and maintenance period do not demonstrate replacement of mature indigenous forest structure, canopy succession, seasonal food resources or long-term ecological processes for forest birds. The proposed planting schedule provides no assurance that key canopy species, including **taraire, kahikatea, northern rātā, kohekohe, tōtara, pūriri, karaka** and **rimu**, will be established at densities sufficient to restore ecosystem function.

BIODIVERSITY OFFSETTING

- The proposed mitigation demonstrates replacement of habitat area but does not demonstrate replacement of ecological function.
- The assessment does not demonstrate ecological equivalence in relation to hydrology, habitat connectivity, fish passage, prey production, carrying capacity, trophic processes or long-term ecosystem resilience.
- The assessment does not adequately account for temporal loss, implementation uncertainty, stochastic events or the long-term management required for replacement ecosystems to achieve ecological maturity.
- The proposed mitigation package does not demonstrate consistency with the biodiversity offsetting principles of the **Northland Regional Policy Statement (2018, Section 4.4.2)**, the **National Policy Statement for Indigenous Biodiversity (Appendix 3)** or the **Guidance on Good Practice Biodiversity Offsetting in New Zealand (2014)**.

SPECIES SPECIFIC EXAMPLES

- North Island kiwi – Habitat use is underestimated through an overemphasis on indigenous forest, with insufficient recognition of the documented use of pasture, scrub, wetlands and riparian habitats for foraging and movement. No targeted kiwi surveys were undertaken despite kiwi being Regionally Significant in Northland, increasing uncertainty regarding occupancy, movement corridors and the potential effects of prolonged construction disturbance, habitat fragmentation and displacement.
- Mātātā (North Island fernbird) – Significant effects are recognised; however, no targeted surveys were undertaken to determine local occupancy, breeding territories or habitat use within the affected wetland network. The assessment assumes these effects can be mitigated through wetland replacement south of the Brynderwyn Hills, outside the affected Waihoihoi and Ahuroa catchments, without demonstrating that displaced local populations will colonise

the offset site or that equivalent habitat connectivity and ecological function will be maintained within the affected landscape.

- Matuku-hūrepo (Australasian bittern) – No targeted surveys, including seasonal booming surveys during the breeding season, were undertaken to establish occupancy or breeding activity within or adjacent to the Project area. The assessment focuses primarily on direct wetland habitat loss while giving limited consideration to indirect effects associated with reduced fish passage, headwater stream modification and diminished prey availability. The proposed wetland offset does not demonstrate equivalent hydrology, fish production or long-term foraging habitat required to support this species.
- Pūweto (Spotless crake) – The assessment identifies potentially significant effects on this cryptic wetland species; however, no targeted call-playback or occupancy surveys were undertaken to determine distribution or breeding activity. Consequently, the assessment relies on habitat inference rather than project-specific evidence, increasing uncertainty regarding the magnitude of effects and the adequacy of the proposed mitigation

OVERALL CONCLUSION

In our opinion, the cumulative effect of the methodological assumptions identified throughout this review progressively constrains the recognised extent of habitat, ecological interactions and ecosystem function, resulting in a systematic underestimation of ecological effects and an overestimation of the effectiveness of the proposed mitigation.

The assessment demonstrates replacement of habitat area but does not demonstrate replacement of ecosystem function. Consequently, it has not been demonstrated that indigenous biodiversity values, ecological processes and habitat connectivity within the Waihoihoi and Ahuroa catchments will be maintained over the long term.

SECTION 2: ASSESSMENT METHODOLOGY

2.1 ASSESSMENT FRAMEWORK

Section 2.1 states that the assessment:

- has been undertaken on an Indicative Alignment, with the final alignment and construction methodology to be refined during detailed design;
- follows the EIANZ Ecological Impact Assessment Guidelines (Roper-Lindsay et al. 2018);
- assigns ecological values using the New Zealand Threat Classification System;
- uses terrestrial and freshwater ecological assessments to inform avifauna habitat values;
- assesses ecological effects using the EIANZ value × magnitude framework; and

This is the standard and recognised assessment framework for ecological impact assessment in NZ

The report acknowledges that the final alignment, structures and construction methods will not be determined until detailed design, and therefore bases the assessment on an Indicative Alignment considered representative of the broader Proposed Designation.
This is a common approach for notices of requirement and designation-level assessments and is not in itself, inappropriate.
However, it inevitably introduces uncertainty because avifauna effects can be highly dependent on the precise location of:

- vegetation clearance,
- wetland encroachment,
- bridge crossings,
- lighting,
- spoil disposal,
- and habitat fragmentation.

While the report states that outcome-based mitigation will remain appropriate regardless of final alignment, this assumption cannot be fully tested until detailed design is available. Consequently, confidence in the assessment of localised effects is necessarily reduced.
The use of the EIANZ Ecological Impact Assessment Guidelines & assignment of ecological values using the New Zealand Threat Classification System is appropriate and consistent with current best practice.
The report adopts the terrestrial and freshwater ecological assessments to determine avifauna habitat values. While this is an accepted assessment approach, the limited avifauna-specific field investigations mean there is relatively little independent verification of habitat extent, condition and associated bird values. The AER inherits the uncertainties and limitations of the FER in particular.
The freshwater assessment relies on a bespoke digital river network, incomplete identification and delineation of wetlands, and habitat descriptions and ecological values that are not always supported by field evidence. These limitations directly affect the avifauna assessment because the availability, extent and quality of wetland, riparian and stream habitats form the basis for identifying potential bird habitat, assigning ecological values, and assessing effects on wetland-dependent species.

Consequently, where the FER underestimates the extent or ecological significance of aquatic habitats, the AER is likely to similarly underestimate the availability of habitat for wetland-associated avifauna, including cryptic marsh birds and riparian species. This introduces uncertainty into both the baseline characterisation of the receiving environment and the subsequent assessment of ecological effects.

The AER PG 2:
"...the magnitude of effect...has been determined at the scale of the Ecological District..."
The EIANZ Guidelines allow flexibility in selecting the spatial scale for assessment, provided the chosen scale is ecologically justified. However, assessing effects at the Ecological District scale has the potential to reduce the apparent magnitude of impacts where:

- habitat loss affects relatively small but locally important habitat patches;
- breeding territories are affected;
- habitat connectivity within the ED is reduced; or
- local populations occupy only a subset of the Ecological District.

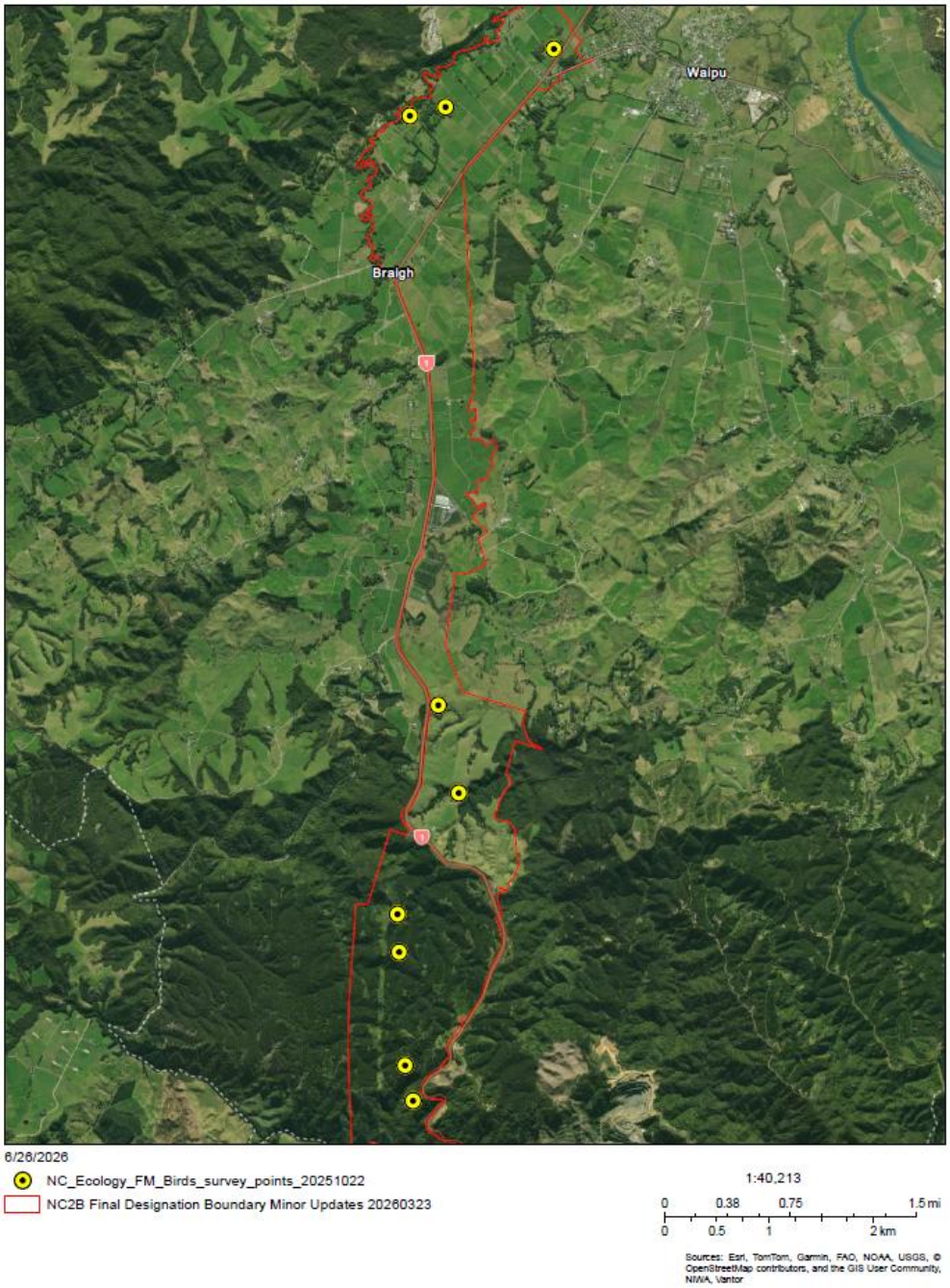
For highly mobile bird species this approach may be reasonable. However, for habitat specialists, territorial species, cryptic wetland birds, or species dependent on discrete habitat patches, assessment solely at the Ecological District scale may under-represent effects occurring at the local population or habitat level.
Accordingly, it would have been preferable for the assessment to demonstrate that the selected assessment scale remained ecologically appropriate for each species or guild of concern.

These matters do not invalidate the methodology but reduce confidence that the assessment fully captures effects on site-specific habitats and local bird populations.

2.2 DESKTOP ASSESSMENT AND 2.3 FIELD ASSESSMENT

The desktop assessment draws on a broad range of information sources, including existing species records, ecological databases, published literature and previous ecological investigations. The field assessment comprised opportunistic five-minute bird counts at 7 locations in our rohe (refer FIG 1 below) undertaken in conjunction with terrestrial ecology surveys, incidental observations by ecological staff, and a single site inspection by the avifauna specialist.

FIG 1: SURVEY LOCATIONS



While the desktop review provides a useful baseline, the avifauna field investigations were not commensurate with the potential occurrence of cryptic or crepuscular birds. Despite an extended programme of ecological investigations undertaken by WSP staff, the assessment did not include acoustic monitoring or targeted field surveys for any particular species including targeted survey during the peak breeding season for Australasian bittern that overran the field work period that would have likewise elucidated other cryptic wetland birds and species of interest e.g. kiwi. From our own professional experience of survey for both kiwi and bittern in Northland, while calls are more frequent during breeding periods, both call all year round. The level of effort contrasts with the species-specific survey approaches adopted for other cryptic fauna groups in the Project survey, including bats, herpetofauna and frogs. This represents a missed opportunity to determine occupancy.

Bird observations made by project ecologists were incidental to other ecological investigations and cannot be assumed to represent a systematic inventory of avifauna. Detection and recording would have been influenced by the objectives of the field programme, level of expertise and the opportunity to identify species during other survey tasks.

- The singular fernbird observation (MAP 5) was by myself while walking to a eDNA point with the WSP freshwater ecologists. This was of **3** fernbird, startled into flight along the edge of kanuka adjacent wetland in the Waipū North catchment. This observation did not make it to the internal NZTA GIS *Incidental Observations* layer accessible by the team, or reported to the AER author, and was only communicated by myself to her directly at a later date.
- little black shag (*At Risk -Declining)* Waihoihoi – Alignment downstream of eDNA point perching in riparian tree above river ; Ahuroa western boundary of Designation perching in riparian tree above river
- pied shag – Waihoihoi *(At Risk- Declining)* riparian tree Waihoihoi
- tomtit (*Not Threatened Regionally Significant*) multiple encounters in the Brynderwyn Pine; Waipū South

This limitation is compounded by the AER's reliance on the Freshwater Ecology Report to characterise wetland habitats and their ecological values, which underrepresents extent and minimises wetlands, drains and headwater habitats as degraded or of negligible to low condition. For Australasian bittern, however, these habitats may collectively provide an important network of foraging habitat and movement corridors. Consequently, the habitat valuation adopted from the FER has the potential to under-represent the ecological importance of the Project footprint for this species.

Furthermore, nocturnal or crepuscular e.g. kiwi (*Regionally Significant);* pateke (*Threatened - Nationally Increasing*) and wetland species Australasian bittern, fernbird and crake are cryptic species that are unlikely to be reliably detected from opportunistic roadside observations or distant survey locations that form the wider available dataset for the desktop survey. In this regard, species rich occupancy sites tend to those readily surveyable e.g. Waipū Estuary annual survey. In the absence of focused surveys local to the Alignment or Designation,

confidence in the assessment of occupancy, habitat use and the resulting effects assessment is reduced.

We not at the outset that the report does not take account of the regional significance of a number of species that is not inherent in the national Threat Classification[1]. These are given *Regional Significance* status as per the Waipū ED reconnaissance report-

KAWAU TŪĪ LITTLE BLACK SHAG (*PHALACROCORAX SULCIROSTRIS* IS *AT RISK – NATURALLY UNCOMMON)*

breeds mainly in freshwater wetlands at selected sites throughout the North Island, with many birds moving to coastal areas in Northland and Auckland in the autumn (Heather & Robertson 1996). Small groups of little black shag are often seen feeding in the Waipū River (Ray Pierce pers. comm.; CSN Notornis 38). Flocks are present in Whangarei Harbour every winter and can number in excess of 100 birds (Richard Parrish pers. comm.).

KORIMAKO (BELLBIRD *ANTHORNIS MELANURA MELANURA, NOT THREATENED)*

Within Waipū ED, bellbirds are occasionally seen in the southern Brynderwyn Hills (Q08/225h). Bellbirds were formerly widespread throughout New Zealand but became locally extinct on the mainland north of the Waikato in the 1860s (Heather & Robertson 1996). Previously it was thought that females were unable to reach the mainland in sufficient numbers from offshore islands, e.g. Hen and Chicken Islands (Heather & Robertson 1996). However, pest control at
Bream Head (Manaia ED) in recent times has resulted in successful breeding there and increased bellbird sightings away from the control site (Ray Pierce pers. comm.).

PĀPANGO *(NEW ZEALAND SCAUP; AYTHYA NOVAESEELANDIAE; NOT THREATENED*

NZ scaup are widespread in New Zealand, but have a patchy distribution. In Northland they mostly occur on dune lakes (Heather & Robertson 1996), and they are uncommon due to loss of habitat (Wendy Holland pers. comm.). Within Waipū ED one was observed at the Ruakaka Racecourse Dune Lake (Q07/129) in March 2007 (Ray Pierce pers. comm.).

TOITOI (NORTH ISLAND *TOMTIT PETROICA MACROCEPHALA TOITOI; NOT THREATENED)*

Persists in forest remnants Within Waipū ED, tomtits are most frequently seen in the Brynderwyn Hills Forest Complex (Q08/225) to the east of State Highway 1, where indigenous forest cover is more extensive.

KIWI (*NORTH ISLAND BROWN KIWI APTERYX MANTELLI; NOT THREATENED*)

Prior to the late 1970s, brown kiwi were widespread throughout the larger forest remnants of Waipū ED, including the Brynderwyn Hills & Mareretu Forest (Q08/220), and Ruakaka Forest (Q07/121) and North River Forest (Q07/117) (SSBI Q07/R07/H059). An assessment of North Island brown kiwi distribution and abundance in 1992 detected no kiwi in southeastern Northland.

Kiwi were thought to be extinct in the Waipū ED at the time of the PNAP report. However, more than 40 kiwi have since been released in the Piroa/ Brynderwyns area from 2012 and are now successfully breeding and beginning to expand their range throughout. As this is contiguous habitat it is assumed that kiwi move freely within the range.

Species occupancy within the Piroa/Brynderwyn (Mangawhai/Waipū) NRC High Value Area is bolstered by the Piroa-Brynderwyns Landcare Trust, a collective of more than a dozen community-led conservation projects to restore biodiversity in the Brynderwyn Hills range and environs, spanning more than 22,374ha.
As per the EIANZ methodology (*AER Table 1)* kiwi, korimako; toitoi and pāpango are assigned

[1] Robertson, H.A.; Baird, K.A.; Elliott, G.P.; Hitchmough, R.A.; McArthur, N.J.; Makan, T.D.; Miskelly, C.M.; O'Donnell, C.F.J.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A.; Michel, P. 2021. *Conservation status of birds in Aotearoa New Zealand, 2021.* New Zealand Threat Classification Series 36. Department of Conservation, Wellington

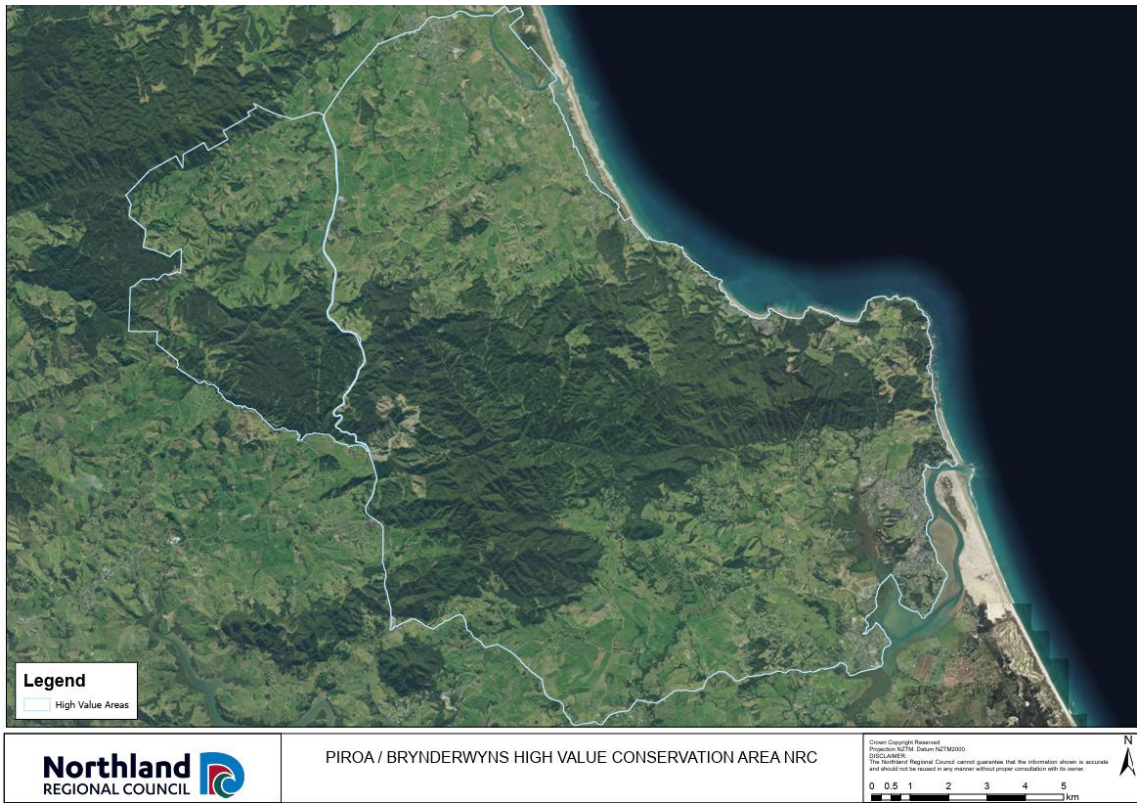
Low value *– nationally and locally common indigenous species.*

The more appropriate value is

Moderate value *- found in the ZOI permanently or seasonally, locally uncommon or distinctive*

Under the AER/ EIANZ methodology, each species or population is assigned an ecological value (Table 1). For a given magnitude of effect, the overall level of effect is determined by this ecological value through the effects matrix. Consequently, the same magnitude of effect results in a higher level of effect for a species assigned ***Moderate*** ecological value than for one assigned ***Low*** ecological value, with these outcomes carried through to the assessment in Table 16 (Section 4).

FIG 2: PIROA/ BRYNDERWYNS HCV AREA



2.6. ALIGNMENT CHANGES WITHIN THE PROPOSED DESIGNATION

Section 2.6 concludes that the Indicative Alignment is representative of the wider Proposed Designation and that the recommended outcome-based mitigation would remain appropriate should the final alignment change during detailed design. The conclusion that the current effects assessment and proposed mitigation will remain applicable regardless of future alignment refinements is not fully supported.

Throughout the report, avifauna records and habitat values are repeatedly distinguished between the Indicative Alignment, the Proposed Designation and the surrounding 5 km buffer. While these distinctions accurately describe the available observations, they create an artificial separation between areas that the report subsequently treats as interchangeable. If the

Indicative Alignment is considered representative of the wider Proposed Designation, and the final alignment may ultimately shift within that designation, then species and habitats currently outside the Indicative Alignment remain directly relevant to the assessment of effects. Consequently, limited emphasis should be placed on whether species were recorded within the current Indicative Alignment, with greater weight instead given to the distribution of habitats and species across the Proposed Designation as a whole.

This assumption is further weakened by the report's reliance on the Freshwater Ecology Report (FER) to identify and characterise wetland habitats. As discussed previously, not all freshwater habitats have been identified or appropriately characterised, and the ecological values assigned to some wetlands, headwater streams and farm drains (modified rivers) are considered to underestimate their ecological function. Future alignment refinements therefore have the potential to affect habitats that have not been recognised or whose ecological importance has been undervalued, reducing the likelihood that appropriate avoidance, mitigation or offset measures will be applied.

The ecological implications of this uncertainty are particularly relevant for Australasian bittern (matuku-hūrepo). As discussed in the Freshwater Ecology Review, the Glenmohr Road Wetland (PNA Q08/223), located approximately 2 km east of the Proposed Designation, comprises one of the largest raupō wetlands within the Waipū Ecological District and provides high-quality potential breeding habitat for matuku-hūrepo. Radio-tracking studies[2] have demonstrated that breeding adults utilise extensive foraging territories extending well beyond breeding wetlands, using farm drains, spring-fed channels, ephemeral wetlands and flooded pasture as a connected wetland mosaic. Consequently, wetlands, drains, headwater streams and riparian habitats within the Proposed Designation should not be considered as isolated habitat, but as components of a wider functional habitat network.

Loss or Incremental degradation of these habitats, particularly where they are omitted or undervalued within the underlying freshwater assessment, has the potential to reduce the the availability and functional integrity of this foraging habitat network for birds breeding in taller stature raupo/ reed sweet grass wetlands. Consequently, there is reduced confidence that the current assessment and proposed mitigation adequately capture the potential effects of future alignment refinements on matuku-hūrepo and other wetland-dependent avifauna.

Consequently, there is reduced confidence that future alignment refinements and their effects on **matuku-hūrepo** and other wetland-dependent avifauna have been adequately assessed.

[2] Williams, E.M. 2016. *Seasonal movements and site loyalty of radio-tagged Australasian bitterns: Some insights into what bitterns might consider as "prime real estate"?* Birds New Zealand Annual Conference Abstracts

3.1 AVIFAUNA HABITATS AND SPECIES

Figures 3–6 present numerical summaries of species occurrence, threat status and primary habitat associations within the Indicative Alignment, Proposed Designation and 5 km buffer.

The reported totals are derived from a combination of desktop records and limited field investigations. Desktop records are largely opportunistic observations from existing databases and are inherently influenced by observer effort, accessibility and reporting bias, while the field investigations comprised only opportunistic bird counts, incidental observations and a single specialist site visit. This is particularly relevant for cryptic wetland birds such as matuku-hūrepo, mātātā and crake species, whose presence is unlikely to be reliably reflected by opportunistic observations or roadside survey locations. There are very records at all in the Designation. As before, the fernbird record was our own. The clustering of records in the 5km buffer, around the Waipū Estuary for example, is the result of independent repeat annual surveys at points and greater access.

The separation of the landscape into an Indicative Alignment and the wider Proposed Designation is of limited ecological relevance when assessing avifauna. Birds respond to habitat distribution, quality and connectivity rather than planning boundaries. .

Consequently, recorded species richness is better interpreted as the number of species detected, rather than of species present. While these figures accurately summarise the compiled dataset, they should not be interpreted as representing the actual distribution or relative abundance of avifauna between Designation and Alignment areas. The limited dataset snapshot dataset within the Designation cannot account for movement throughout an artificial boundary between foot print and wider designation, or the temporal use of habitats that may become important for feeding and seasonal movements. For example, annual and seasonal rainfall can increase the extent and duration of standing water within shallow wetlands, farm drains and ephemeral freshwater habitats, resulting in greater freshwater productivity and increased availability of fish and other aquatic prey.

This distinction is particularly important when comparing the Indicative Alignment (25 recorded species), Proposed Designation (41 species) and 5 km buffer (87 species). The increasing number of recorded species largely reflects increasing survey area and the availability of historical records rather than a measured ecological gradient. Similarly, the comparatively low number of Threatened and At Risk species recorded within the Indicative Alignment should not be interpreted as evidence that these species are absent or that habitats within the Project footprint are of lower ecological importance.

The habitat association Figures are also constrained by the underlying dataset. They illustrate the primary habitat associations of species recorded in the Indicative Alignment (Fig 4) and Proposed Designation (Fig 5) but do not quantify the relative importance of habitat use.

Figures 3 & 4 show no Threatened[3] bird species occur within the Indicative Alignment, with 3 Threatened wetland birds only associated with the wider Proposed Designation. In *Table 6 List of Threatened & At Risk species,* these are identified as:

- pārera (grey duck, *Anas superciliosa superciliosa; Threatened – Nationally Vulnerable*),
- weweia (New Zealand dabchick, *Poliocephalus rufopectus; Threatened – Nationally Increasing)*
- kōtuku (white heron, *Ardea modesta*; *Threatened – Nationally Critical*).

We note the latter represents the only known record in our area of focus –Brynderwyns to Waipū.

The distinction drawn between the Indicative Alignment and the wider Proposed Designation habitats is of limited ecological significance and largely artificial. The wetland, open water, drain and riparian habitats associated with these species are also present within the Indicative Alignment, and Section 2.6 acknowledges that the final alignment may shift within the Proposed Designation. Species recorded within either area should be considered capable of occurring throughout suitable habitats across both areas. Likewise for tall stature forest species, which are present in the Brynderwyns and alongside the Ahuroa.

We also consider that highly mobile species in the 5km buffer associated with either wetland or forest may be present in the Designation habitats e.g. kaka (*At Risk – Recovering*); bittern (*Threatened – Nationally Vulnerable*); shag species.

The occurrence of white faced heron (*Egretta novaehollandiae- Not Threatened*) demonstrates that the Project area supports productive freshwater habitats capable of sustaining large wetland predators. During fieldwork with WSP ecologist we encountered them in *natural inland wetland* and alongside drains throughout the Designation, including the Alignment, and are surprised that more records are not included *Appendix A (Map 4)*. Like matuku-hūrepo, grey-faced herons are a larger bird with relatively high diet requirements and forage widely across interconnected wetlands, drains, flooded pasture and riparian habitats in search of prey. Unlike matuku-hūrepo, it is a species habituated to disturbance and is regularly seen in close proximity to people and development. Consequently, the presence of suitable habitat for more apparent grey-faced heron implies that the wider landscape contains the functional foraging niche for matuku-hūrepo, notwithstanding the absence of unlikely direct survey records.

Additionally, in my own experience of weweia (NZ dabchick); pāteke (brown teal *Threatened - Nationally Increasing*) they are associated with pastoral character waterways that are available within the designation. This is reinforced by grey duck sightings on the manmade pond at the Kauri Park Waipū Nursery, 36 Glenmohr Rd**.** Fernbird (*At Risk Declining*) is invariably encountered in proximity to wetland. Although these species differ in their ecology, they share a reliance the availability of productive freshwater habitats. Collectively, these

[3] THREATENED Species facing a high risk of extinction. **NATIONALLY CRITICAL** – extremely high risk of extinction. **NATIONALLY ENDANGERED** – very high risk of extinction. **NATIONALLY VULNERABLE** – high risk of extinction

species indicate wetlands; open water, drains and vegetated freshwater margins capable of supporting a diversity of feeding guilds, from dabbling and diving omnivores to insectivores and larger predatory wading birds.

The apparent absence of Threatened species records from the Indicative Alignment should not be interpreted as an absence of suitable habitat. Rather, it more likely reflects the limited survey effort and opportunistic nature of the available records than the true distribution of Threatened wetland birds.

We consider the figures and statistics should be regarded as a summary of recorded observations rather than a comprehensive representation of avifauna values within the Proposed Designation or the habitats potentially affected by the Project.

PATEKE DURING TRANSLOCATION RELEASE (NOT TAKEN ONSITE)



3.1.1 FARMLAND/ OPEN PASTURE

Section 3.1.1 describes the predominant land cover within the Proposed Designation. However, by considering pasture largely as a discrete land-cover class, the assessment underrepresents its ecological function for avifauna. In modified rural landscapes, pasture forms part of an integrated habitat mosaic where its ecological value is strongly influenced by its association with wetlands, streams, farm drains, riparian vegetation and indigenous cover.

These habitat interfaces (ecotones) concentrate complementary resources for feeding, shelter, nesting and movement, creating high territorial economics for many species.

This functional relationship is evident across a range of avifauna. Kiwi utilise pasture extensively for foraging, particularly where it adjoins wetlands and streams that support high soil moisture and prey availability. Swamp harrier forage across pasture, wetlands and riparian habitats, while welcome swallow exploit open pasture for aerial feeding over wetlands, streams and grazed land where flying insects are abundant. Similarly, pīhoihoi (New Zealand pipit) forage along ecotones e.g. wetland; seepage where invertebrate productivity is greatest. Pīhoihoi/ NZ pipit *(At Risk -Declining)* were observed on multiple occasions during fieldwork in the Waihoihoi catchment including close or within the Alignmnent e.g. Waipū South pasture. Species respond to connected habitat mosaics rather than individual vegetation classes, and that ecological value is often concentrated at habitat interfaces rather than within any single land-cover type.

The accompanying kiwi distribution map should also be interpreted with caution. It is based largely on a limited number of kiwi call-count stations and therefore represents recorded detections rather than the actual spatial distribution of kiwi across the Proposed Designation. Given the mobility of kiwi and their use of integrated habitat mosaics, the mapped records should not be interpreted as defining the extent of kiwi occupancy or habitat use.

3.1.2 NATIVE FOREST AND SCRUB/ SHRUBLAND

Sec 3.1.2 presents the identified SNAs[4] within the Designation and discusses their avifauna values based on the underlying survey dat. We have shown the PNAP Waipū ED mapping[5] of these below Fig 3.

We note that even the smallest of these is capable of sustaining the smaller bodied insectivores.

The AER inherits a degree of confusing classification of habitat nomenclature. Scrub; shrubland and forest are structural classifications with standard botanical meanings that are confused to a degree in the TER report. It is most coherent to use the generalised meanings as per the regional PNAP report series, modified from Aitkinson (1985)[6], which introduce a recognisable character typical of Northland in their shared Glossary definitions[7]. For example, Waipū Gorge Remnant (Q08/222) - *Broadleaved species scrub forest* . This vegetation unit**,** described in TER Appendix D, is not easy to reconcile with either the structural vegetation classification of

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[4] Lux, J., Martin, T., & Beadel, S. (2007). *Natural areas of Waipū Ecological District: Reconnaissance survey report for the Protected Natural Areas Programme*. Department of Conservation, Northland Conservancy, Whangarei.

[5] https://services2.arcgis.com/J8errK5dyxu7Xjf7/arcgis/rest/services/Significant_Natural_Areas/FeatureServer/0

[6] Atkinson, I.A.E. 1985. Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand. *New Zealand Journal of Botany* **23**(2): 361–378.

[7] **SCRUB:** seral communities, often dominated by or with a large component of exotic species such as gorse, Hakea, tobacco weed, etc. and/or commonly lacking a closed canopy and in which an understorey is either absent or composed primarily of exotic species. **SHRUBLAND:** Successional vegetation dominated by seral species such as manuka, kanuka, mahoe etc or shrubs such as hangehange, bracken, kumerahou. There are 2 main types: (i) Successional vegetation dominated by seral species such as manuka, kanuka, mahoe, etc. or shrubs such as hangehange, bracken, kumerahou. As used in this report it implies a closed canopy and in more advanced stages contains an understorey of indigenous species. (ii)Seral vegetation where the rate of further succession is extremely slow, being limited by abiotic factors such as soil structure and fertility, wind shear, etc., e.g. gumland manuka shrubland, Muehlenbeckia shrubland on dunes. **TREELAND** A tree canopy of 20–80% however the tree cover is discontinuous above a lower canopy of predominantly non-woody vegetation or bare ground **FOREST:** A tall, predominantly closed canopy consisting mainly of tree species. Include secondary manuka/kanuka forest where those species have reached tree size and may contain other canopy species. **SERAL** Describes a plant community in the process of succession.

Atkinson (1985) or the vegetation terminology used throughout the Northland Protected Natural Areas Programme (PNAP) reports. While the TER does not define these structural terms at the outset, it adopts vegetation nomenclature that differs from both recognised classification systems. The unit combines *forest* and *scrub* into a single vegetation type despite these representing distinct structural classes under the Atkinson and PNAP frameworks. This distinction is not just semantic as in planning and many ecological assessments, the term *scrub* is commonly perceived as implying lower ecological value or an early successional state and can inadvertently influence the reader.

In regard to AER Table 8:

AHUROA RIVER REMNANTS (Q08/235)–

This forms the western boundary of the Designation north of the Braigh. The description does not recognise these remnants as a potential foraging resource for **kākā**. As highly mobile, generalist seasonal foragers, kākā utilise a wide range of indigenous food resources according to seasonal availability. The mature canopy species present, including tōtara, kahikatea, taraire, karaka, kohekohe, pūriri and rewarewa, provide a diversity of **fruit, seeds, flowers, nectar and wood-boring invertebrates**. Kākā are also well documented feeding on the sap of mature rātā and rimu. Collectively, these remnants have the potential to contribute seasonal foraging habitat and movement resources within the wider landscape, despite being unlikely to provide breeding habitat.

NORTHERN BRYNDERWYNS HILLS REMNANTS (Q08/227)-

Areas of sapling and shrub-layer vegetation adjacent to productive wet ground provide habitat structure suitable for **mātātā (North Island fernbird)**. Given the proximity of my recent fernbird record and the connectivity of these habitats as a single ecological unit, the species is considered likely to occur within these remnants.

FIG 3: LOCAL WAIPŪ PNA REPORT AREAS IN RELATION TO DESIGNATION; AER TABLE 7



3.1.3 FRESHWATER WETLANDS

Sec 3.1.3 presents wetlands, riparian margins and ponds within the Indicative Alignment and Proposed Designation individually, primarily through Tables 9 and 10, with habitat values assigned to each wetland feature. These are based on the flawed assessment and mapping assigned to wetland in general throughout the FER, other than those with raupo cover. Therefore it follows that, within our focus area Brynderwyns north:

Most wetlands are characterised as supporting common freshwater species such as pūkeko, pūtangitangi (paradise shelduck), kōtare (kingfisher), warou (welcome swallow) and matuku moana (white-faced heron), with only selected wetlands identified as potentially supporting *Threatened* or *At Risk* wetland birds. The AER states the *low stature exotic dominated features in pasture are of limited value to wetland birds.*
Although white face heron utilize a similar feeding niche and are predicted at the majority of wetlands regardless of apparent exotic cover and *Negligible* value (FER), bittern are only considered to utilize Wetland 8 throughout the Ahuroa and Waihoihoi catchments. Neither is predicted for Waipū nursery pond, with shallow edges and concealing cover, or slow open water edges of the Waihiohoi.

Closely adjacent raupo habitat is available in the Glenmohr Rd Wetland (2nd largest in the ED; <2km; PNA#Q08/223**; refer Fig 3 above)** and Wetland 8. However, we feel this idealization of the raupo breeding habitat as the only important bittern habitat within the Designation does not recognize the extensive feeding requirements of bittern and their wide territorial habits to 15km from breeding sites (raupo). In a recent NZ study[8] of bittern mortality records from New Zealand, starvation was the second most common cause of death (17.5%) after impact trauma-primarily vehicle and powerline collisions (56.3%). A further 5.8% of birds showed evidence of both starvation and impact trauma, suggesting starvation may predispose birds to collision. The study identifies maintenance of indigenous fish distribution and abundance, through the preservation of fish passage, as a key conservation priority. This contrasts with the Project's freshwater assessment (FER), which concludes that fish passage to upper catchments, including headwater streams and wetlands, is unnecessary for freshwater ecological function. The differing conclusions illustrate a siloed approach to ecological assessment inherent in the NZTA assessments that fails to recognise the role of fish connectivity in supporting broader ecosystem processes, including the prey base of wetland-dependent avifauna.

In regard to my fernbird sighting, (refer Fig 4 below; AER Sheet 5; FER Sheet 11) Wetland 13 is determined in the AER to be part of a network for this species (*High* value EIANZ). Wetlands 12 and 14 are then given as potential habitat in Table 9, however, as the wetland extent toward gully head Wetland 17 and additional area of Wetland 14 are not recognized, habitat is under estimated. Additionally, we consider Wetland 16 has similar habitat within short flights distances typical of fernbird, achievable through cover.

[8] **Williams, E.M., Jarman, T. & Battley, P.F. (2025).** *Bone marrow fat content analysis confirms starvation as a cause of death for Australasian bitterns (Botaurus poiciloptilus) in New Zealand. New Zealand Journal of Zoology.*

FIG 4: WAIPŪ NORTH SITE FERNBIRD SIGHTING & WETLAND HABITAT WITH RIPARIAN VEGETATION[9]



Ponds are also identified as habitat for weweia (New Zealand dabchick), pārera (grey duck) and occasionally pāteke. Seasonal availability of ponding in larger wetland also represents habitat, not accounted for despite allocation as potential paradise duck habitat e.g. Wetlands 12; 13; 14; 16 with associated cover and small creeks.

Within farmland, the Waihoihoi is relatively undisturbed throughout the day other than stock. We consider that both the Waihoihoi River margins and the Waipū Nursery Pond provide conditions suitable for bittern foraging in shallow margins with associated wetland.

The *Waipū PNA report*[10] recognises that indigenous wetlands on the Waipū Plains have been extensively reduced through drainage and land development. Consequently, the remaining wetlands and associated riparian habitats have increased ecological significance as components of a connected landscape. This is relevant to both highly mobile species, such as **matuku-hūrepo**, which forage across interconnected wetland networks, and less mobile

[9] From BAY ECOLOGICAL CONSULTANCY LTD (2026) TECHNICAL REVIEW FOR TE POUWHENUA O TIAKIRIRI KUKUPA TRUST ASSESSMENT OF EFFECTS ON FRESHWATER ECOLOGY NZ Transport Agency Waka Kotahi | Roads of National Significance | Northland Corridor 2B Assessment of Effects on Freshwater Ecology – Document: 10722-PTA-2B0-PE-RPT-0010 Revision:A

[10] Lux, J., Martin, T., & Beadel, S. (2007). *Natural areas of Waipū Ecological District: Reconnaissance survey report for the Protected Natural Areas Programme*. Department of Conservation, Northland Conservancy, Whangarei.

species, such as **mātātā**, which rely on continuous wetland and riparian vegetation for dispersal. Artificially partitioning the landscape within the Designation therefore risks underestimating the ecological role of habitat connectivity and the contribution of smaller wetlands, drains and riparian corridors to the persistence of wetland-dependent avifauna.

We note the singular wetland pictures are not overtly representative of entire wetlands e.g. 6; 7; 8; ; 9; 10; 12;11; 13; 14; 15; 16.

3.1.4. EXOTIC FOREST/ SHELTERBELTS ORNAMENTAL PLANTING

The AER identifies a range of potential species associated with these habitats, with which we concur. We consider all listed species likely to occur throughout suitable habitat within the Proposed Designation, including the Indicative Alignment. However, conclusions regarding species occurrence are constrained by the limited project survey dataset. As discussed previously, the distinction between the Proposed Designation and Indicative Alignment has little ecological relevance where habitats are continuous and connected.

We note that kūkupa (NZ wood pigeon; *Hemiphaga novaeseelandiae*) *occurs in small numbers throughout Waipū ED and individuals will usually travel between several forest remnants to utilise seasonally available food resources*[11].
Kūkupa utilise more than 70 native and introduced plant species[12]. In modified lowland landscapes, kererū make extensive use of exotic trees, feeding on the leaves and buds of species including willow (*Salix* spp.), poplar (*Populus* spp.), elm (*Ulmus* spp.) and tree lucerne (*Cytisus proliferus*), as well as palm fruit. Within the predominantly pastoral Waipū ED kererū are therefore expected to utilise both exotic shelterbelts and gardens as complementary components of a connected foraging landscape.

4. ASSESSMENT OF EFFECTS

4.1. ASSESSMENT OF ACTUAL AND POTENTIAL EFFECTS

Section 4.1 outlines the framework used to assess construction and operational effects on avifauna.

Effects are assessed using the ecological value assigned to each species or population together with the magnitude of effect to determine the overall level of effect. Potential effects considered include habitat loss and modification, disturbance, fragmentation, mortality and operational impacts.

The assessment relies on the species records, habitat values and ecological assumptions established in Sections 3.1–3.4, which directly determine the significance ratings presented in Table 16.

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[11] Lux, J., Martin, T., & Beadel, S. M. (2007). *Natural Areas of Waipū Ecological District: Reconnaissance Survey Report for the Protected Natural Areas Programme.* Department of Conservation, Northland Conservancy, Whangārei

[12] McEwen, W. M. (1978). *The food of the New Zealand pigeon (Hemiphaga novaeseelandiae novaeseelandiae).* New Zealand Journal of Ecology, 1, 99–108

SECTION 4.1 – KEY ASSUMPTIONS

- Table 11 associates kiwi primarily with indigenous forest and identifies pasture principally as a movement corridor. Wet pasture, wetlands, streams, riparian margins and scrub that provide productive foraging habitat within the predominantly pastoral Project area are not similarly recognised.
- Table 8 describes the **Ahuroa River Forest Remnants (PNA Q08/235)** but does not identify the mature tōtara, kahikatea, taraire, karaka, kohekohe, pūriri and rewarewa canopy as seasonal foraging habitat for kākā.
- Section 3.1.4 recognises kūkupa within exotic habitats but does not reflect the documented extent of their use of exotic shelterbelts, gardens and scattered farm trees, together with indigenous riparian remnants, as complementary seasonal foraging habitat within pastoral landscapes.
- Fernbird habitat is principally associated with mapped wetlands. The connected habitat formed by **Wetlands 12, 13, 14, 16 and 17**, associated riparian vegetation and shrubland is not fully recognised because wetland extent and connectivity are incompletely mapped.
- Matuku-hūrepo habitat is centred on **Wetland 8** and breeding raupō habitat. The wider network of shallow wetlands, drains, headwater streams, flooded pasture, pond margins and riparian habitats available for foraging, including the nearby **Glenmohr Road Wetland (PNA Q08/223)**, receives comparatively limited recognition.
- Habitat values for wetlands, headwater streams, drains and riparian habitats are adopted directly from the Freshwater Ecology Report despite identified limitations in wetland delineation, habitat mapping and ecological valuation. This includes available as habitat and areas lost (ha).
- The **Waipū Ecological District PNAP** identifies extensive historical loss of lowland indigenous forest and wetlands. Consequently, the remaining riparian remnants and wetlands within the Project area have increased landscape-scale ecological significance.
- Under the EIANZ criteria, **kiwi, korimako, toitoi and pāpango** satisfy the definition of **Moderate ecological value** as locally uncommon or distinctive species occurring permanently or seasonally within the Zone of Influence. Assignment of **Low ecological value** reduces the resulting level of ecological effect generated by the EIANZ value–magnitude assessment matrix.
- No targeted surveys were undertaken for any Threatened or At Risk avifauna despite the potential occurrence of **kiwi, matuku-hūrepo, mātātā, pūweto, weweia** and **pāteke** within the Proposed Designation. The assessment relies on desktop records, incidental observations, opportunistic five-minute bird counts and a single specialist site inspection to characterise species occurrence.

4.1.1. DIRECT HABITAT LOSS

While thorough within the context of its adopted assessment framework, Section 4.1 carries forward a number of assumptions regarding species occupancy, habitat use and ecological value established in earlier sections of the AER and the underlying terrestrial and freshwater ecology assessments:

- Habitat loss calculations are derived from the Freshwater Ecology Report (FER) and therefore inherit the identified limitations in wetland delineation, headwater stream mapping, riparian habitat extent and ecological valuation.

- The assessment continues to distinguish species records and habitat values between the Indicative Alignment and Proposed Designation despite multiple Project components (e.g. access tracks, spoil disposal, stormwater infrastructure and other enabling works) having the potential to occur throughout the Designation.
- This partitioning has limited ecological relevance as bird distribution is determined by habitat availability and connectivity rather than planning boundaries.
- Habitat assumptions established in Sections 3.1.1–3.1.4 are carried through to the effects assessment. For example, kiwi are principally associated with indigenous forest despite the availability of wet pasture, wetlands, riparian habitats and scrub for foraging throughout the Designation.
- Similarly, matuku-hūrepo habitat is centred on Wetland 8 despite the availability of connected foraging habitat within drains, headwater streams, flooded pasture and shallow wetlands, while mātātā habitat is limited to mapped wetlands despite connected habitat occurring between Wetlands 12, 13, 14, 16 and 17.
- Kākā and kūkupa habitat is primarily associated with indigenous forest despite the documented use of the Ahuroa River Forest Remnants (PNA Q08/235), exotic shelterbelts and scattered farm trees as seasonal foraging habitat.

4.1.2. INJURIES AND / OR MORTALITIES

- Table 13 carries forward the habitat associations established in Sections 3.1.1–3.1.4 and therefore the same limitations in identifying species exposed to construction-related injury and mortality.
- The assessment confines breeding and mortality risk principally to the Indicative Alignment despite enabling works, access tracks, spoil disposal, stream diversions and stormwater infrastructure potentially occurring throughout the Proposed Designation.
- Kiwi injury and mortality risk is assessed principally in relation to indigenous forest. Mortality associated with vegetation clearance and earthworks within wet pasture, wetlands, riparian habitats and scrub is not similarly recognised despite these habitats providing important foraging areas.
- Mortality risk to cryptic wetland birds is principally associated with mapped wetlands. The potential for injury or mortality during works, including seasonally, within connected riparian vegetation, drains, shrubland and wet pasture used by matuku-hūrepo, mātātā and pūweto is not fully considered.
- Breeding mortality is based on inferred habitat occupancy. No targeted breeding surveys were undertaken for any Threatened or At Risk avifauna to confirm before assigning species-specific mortality risk.
- The assessment assumes mobile species avoid adverse effect of construction-related mortality through relocating/ the adverse effect of displacement. Other than collisions it does not consider mortality associated with displacement and loss of habitat including increased exposure to predation, competition for territories and reduced access to food resources.
- Does not consider indirect mortality associated with the extensive culverting, stream realignment and headwater stream loss identified in the Freshwater Ecology Report. These works have the potential to reduce longitudinal fish passage and the distribution and abundance of indigenous fish populations, an important food resource for fish-dependent avifauna including matuku-hūrepo, kawaupaka, kawau tūī and māpunga.

4.1.3. DISTURBANCE AND / OR DISPLACEMENT

- The opening paragraph characterises construction disturbance as high intensity but of limited duration relative to operational traffic noise. For a project of this scale, vegetation clearance, bulk earthworks, culverting, stream diversion, haul roads, spoil disposal and associated

construction activities will occur progressively over an extended construction period, resulting in sustained disturbance rather than isolated short-term events.

- Paragraph 2 identifies that construction disturbance may extend up to **1 km** from the source. As the Proposed Designation is only approximately **1.2 km** at its widest extent, construction disturbance has the potential to extend across almost the entire Designation and into contiguous habitats beyond it, including the **Brynderwyn Hills indigenous forest**, **Ahuroa River Forest Remnants (PNA Q08/235)**, connected riparian corridors and wetland complexes.
- Although Table 15 assesses disturbance within the Proposed Designation, the assessment does not explicitly evaluate the ecological consequences of disturbance extending into connected habitats beyond the Designation. As disturbance progressively affects contiguous habitats, the availability of undisturbed refugia is reduced, increasing displacement, competition for remaining habitat and the likelihood of repeated disturbance events.
- The assessment assumes mobile avifauna avoid construction activities through displacement. The ecological consequences of prolonged displacement, including territory abandonment, reduced breeding success, increased competition for limited habitat and increased mortality risk associated with repeated movement through active construction areas, are not explicitly evaluated.

4.1.4. ARTIFICIAL LIGHTING

- The assessment primarily considers artificial lighting as an **operational** effect, with a focus on seabird attraction. Temporary construction lighting, including floodlighting for night works, security lighting, construction compounds and traffic management, is not specifically assessed.
- The assessment does not distinguish between lighting spectra. The ecological effects of broad-spectrum white lighting, commonly used for construction and road lighting, are not discussed despite evidence that light spectrum influences ecological responses of wildlife.
- The Project introduces artificial lighting into a predominantly rural landscape with low existing night-time illumination. The assessment does not evaluate light spill and skyglow extending beyond the Proposed Designation into adjacent habitats, including the **Brynderwyn Hills indigenous forest**, **Ahuroa River Forest Remnants (PNA Q08/235)**, connected wetlands and riparian corridors.
- The assessment focuses primarily on direct attraction effects. Broader ecological effects of artificial light at night, including changes in behaviour, movement, habitat use, circadian rhythms and ecological interactions, are not explicitly evaluated.
- Temporary construction lighting has the potential to operate concurrently with vegetation clearance, earthworks, haul road operation, stream works and other construction activities. The cumulative effects of artificial lighting together with construction noise, vibration and human activity are not evaluated.
- The assessment does not evaluate the potential effects of temporary night lighting on breeding behaviour, nest attendance, territory occupancy or nocturnal activity despite construction disturbance being recognised elsewhere in the assessment.
- The assessment appears to assume that birds displaced from active construction areas are no longer exposed to lighting effects. However, light spill from temporary floodlighting and permanent road lighting has the potential to affect adjacent habitats occupied by displaced birds beyond the Proposed Designation.
- Lighting mitigation is limited largely to minimising operational lighting. Consideration is not given to ecological lighting design measures such as reduced colour temperature, minimising blue wavelengths, shielding, directional lighting and adaptive lighting controls.

4.1.5 EFFECTS ASSESSMENT SUMMARY

Section 4.1.5 states that a "*holistic approach has been taken*" whereby the combined construction and operational effects are considered for each species to derive an overall level of ecological effect. Table 16 concludes that, at the scale of the Waipū Ecological District, the majority of species will experience **Very Low to Low** effects, with **High** effects identified only for Australasian bittern (*matuku-hūrepo*), North Island fernbird (*mātātā*), New Zealand pipit (*pīhoihoi*) and spotless crake (*pūweto*), and **Moderate** effects for North Island kākā. The assessment attributes these higher effects principally to the Threatened or At Risk conservation status of the species, injury or mortality during construction, and loss of habitat considered limited within the Ecological District. Proposed mitigation is then addressed in Section 5.

REVIEW

- While described as a holistic assessment, Table 16 carries forward the habitat assumptions, ecological values, species distributions and effect pathways established throughout Sections 3 and 4.1. Consequently, the overall effects assessment reflects the limitations of the preceding assessment rather than an independent evaluation of ecological effects.
- Table 16 assigns **Negligible magnitude** and **Low levels of effect** to a number of nationally Threatened species where disturbance and displacement are identified as principal impact pathways. For example, **pārera**, **pāteke** and **weweia** are assessed as potentially affected by construction disturbance, displacement and vehicle strike, yet these pathways result in negligible or low overall effects. These ratings do not adequately reflect the prolonged and extensive construction disturbance anticipated for a project of this scale.
- The assessment characterises construction disturbance as a temporary effect, yet construction will involve progressive vegetation clearance, bulk earthworks, haul roads, stream diversion, culverting, spoil placement, heavy machinery, construction compounds and temporary lighting over an extended construction period. These activities have the potential to generate sustained disturbance across almost the entire Proposed Designation and into adjacent habitats beyond it.
- Disturbance and displacement are treated primarily as behavioural responses rather than ecological effects. The assessment does not adequately consider the consequences of prolonged displacement, including territory abandonment, reduced breeding success, increased energetic expenditure, reduced access to food resources, or increased mortality associated with repeated movement through active construction areas.
- The cumulative effects of habitat loss, prolonged disturbance, displacement, artificial lighting, injury, mortality and reduced habitat connectivity are not explicitly evaluated as interacting stressors acting concurrently on local populations.
- Regionally significant species including **kiwi**, **korimako**, **toitoi** and **pāpango** are assigned **Low ecological value**, reducing their resulting level of effect within the EIANZ assessment matrix. In our opinion these species satisfy the EIANZ criteria for **Moderate ecological value**, reflecting their regional significance, ecological function and contribution to indigenous biodiversity within the Waipū Ecological District.
- The assessment continues to rely on simplified habitat associations that underestimate habitat utilisation within the predominantly pastoral landscape. For example:
    - **Kiwi** are principally associated with indigenous forest despite recognised use of pasture, wetlands, scrub and riparian habitats for foraging and movement.

    - **Kākā** and **kūkupa** are principally associated with larger indigenous forest despite documented seasonal use of riparian remnants, scattered indigenous canopy trees and exotic food resources throughout the Project area.
    - The ecological importance of the **Ahuroa River Forest Remnants (PNA Q08/235)** as a seasonal foraging resource for canopy birds is consequently understated.
- The assessment similarly underestimates the ecological significance of smaller wetlands, drains, ephemeral wetlands, riparian margins and headwater streams that collectively contribute to habitat connectivity and foraging opportunities for wetland birds throughout the landscape.
- The effects assessment does not adequately incorporate indirect ecosystem effects arising from freshwater habitat modification. The Freshwater Ecology Report identifies extensive culverting, stream realignment, reclamation and reduced fish passage to headwater streams and wetlands, yet Table 16 does not consider the potential reduction in indigenous fish abundance and distribution as an indirect effect on fish-dependent avifauna.
- This omission is particularly relevant to **matuku-hūrepo**, together with other fish-dependent wetland birds, where prey availability is intrinsically linked to functioning freshwater ecosystems. Published research identifies food limitation and starvation as recognised causes of mortality in Australasian bittern, yet the indirect consequences of reduced prey production arising from diminished freshwater ecosystem function are not considered.
- Artificial lighting effects are considered principally in relation to operational lighting. Temporary construction lighting associated with night works, construction compounds, security lighting and traffic management is not incorporated into the assessment despite the potential for prolonged night-time disturbance occurring concurrently with vegetation clearance, breeding activity and displacement.
- Overall, the effects assessment is driven primarily by direct habitat loss and immediate mortality pathways. Indirect ecological processes, including ecosystem connectivity, trophic interactions, prey production, landscape function and cumulative stressors, are given comparatively limited consideration, resulting in an underestimation of residual ecological effects for a number of indigenous bird species.

5. REVIEW OF PROPOSED MITIGATION

Section 5 proposes mitigation comprising habitat avoidance where practicable, preparation of an Avifauna Management Plan (AMP), wetland and terrestrial habitat replacement, revegetation, pest management and operational lighting controls. The proposed mitigation is intended to reduce the residual ecological effects identified in Table 16.

GENERAL

- The proposed mitigation carries forward the habitat mapping, ecological values and species assumptions adopted throughout the Freshwater Ecology Report (FER), Terrestrial Ecology Report (TER) and Avifauna Effects Report (AER). Consequently, the mitigation reflects the same limitations identified throughout this review.
- Species-specific mitigation is directed principally towards **Threatened** and **At Risk** species. No equivalent mitigation is proposed for **Naturally Uncommon** or **regionally significant** species despite their contribution to indigenous biodiversity values and, in our opinion, their qualification as **Moderate ecological value** under the EIANZ framework.

- The principal construction mitigation is deferred to preparation of an **Avifauna Management Plan**. Breeding surveys, confirmation of occupancy, exclusion zones, ecological supervision and adaptive management therefore form part of post-consent implementation rather than informing the assessment of ecological effects.

WETLAND MITIGATION

- Wetland replacement is proposed for **Wetlands 11, 12, 13, 14 and 24**, based on freshwater habitat mapping and ecological assumptions carried forward from the Freshwater Ecology Report.
- Replacement habitat is subsequently reduced to wetlands identified as supporting **Threatened** or **At Risk wetland birds**, excluding the broader freshwater habitat network utilised by indigenous avifauna.
- The proposed replacement area (**2.44 ha**) does not account for the ecological functions provided by farm drains, ephemeral wetlands, riparian margins, floodplain wetlands, headwater streams and connected freshwater habitats identified elsewhere in this review.
- The proposed wetland design appears to emphasise **raupō** establishment. No equivalent emphasis is placed on maintaining extensive shallow-water margins, seasonally inundated foraging habitat, open-water interfaces or structurally diverse littoral zones required by many wetland birds.
- The principal wetland offset is located **south of the Brynderwyn Hills**, outside the affected **Waihoihoi** and **Ahuroa** catchments. Consequently, the proposal does not replace wetland habitat, ecological function or habitat connectivity within the landscape where ecological effects occur.
- No evidence is presented that wetland birds displaced from the Waihoihoi and Ahuroa catchments will colonise replacement habitat south of the Brynderwyn Hills. This is particularly relevant for relatively localised species such as **mātātā (North Island fernbird)**.
- The proposal assumes biodiversity gains outside the affected catchments compensate for habitat loss within the impacted landscape. Effects on local populations and local ecological function north of the Brynderwyn Hills are not evaluated.
- Existing wetlands have developed through natural geomorphic and hydrological processes including groundwater discharge, spring-fed systems, floodplain connectivity and seasonal inundation. No evidence is presented that equivalent hydrological processes will be established or maintained within the proposed constructed wetlands.
- The long-term resilience of replacement wetlands is not demonstrated. No assessment is provided of groundwater decline, sedimentation, drought, climate change or adaptive management should wetland performance decline over time.
- Potential hydrological leakage effects are not assessed. Artificial wetland construction, bunding and water retention have the potential to alter upstream and downstream hydrology, water residence time, stream connectivity, sediment transport and fish passage within connected waterways.
- The proposal assumes replacement wetlands will provide equivalent ecological function despite concurrent modification of headwater streams, reduced fish passage and altered freshwater connectivity identified in the Freshwater Ecology Report.
- No evidence is presented that equivalent indigenous fish abundance, aquatic prey production or freshwater food-web function will be maintained within replacement wetlands.

TERRESTRIAL HABITAT REPLACEMENT

- Indigenous revegetation is proposed to offset approximately **39 ha** of terrestrial habitat through planting, weed control and pest management.
- A **five-year** establishment and maintenance period is proposed. No evidence is presented that this period is sufficient to establish self-sustaining indigenous forest or replace mature forest structure, composition and ecological function.
- Development of mature canopy structure, vertical stratification, cavity formation, coarse woody debris, understory complexity and seasonal food resources occurs over decades rather than years. These temporal losses are not accounted for within the assessment.
- The proposed consent conditions emphasise establishment and maintenance of indigenous planting but provide no assurance that canopy species will be established at densities sufficient to recreate the seasonal succession of fruit, flowers, sap and seed currently supporting indigenous avifauna.
- While **kauri** is specifically identified within the proposed planting schedule, no equivalent requirement is provided for **taraire, kahikatea, northern rātā, kohekohe, tōtara, pūriri, karaka** or **rimu**, despite these species collectively providing complementary seasonal food resources for indigenous birds.
- The proposal assumes revegetation will provide equivalent habitat for **kākā** and **kūkupa** despite these species depending upon mature canopy structure and seasonally diverse food resources that develop over many decades.
- Recruitment of **taraire, kahikatea, northern rātā** and **kohekohe** cannot be assumed. These species are highly palatable to introduced browsers and require sustained long-term ungulate exclusion and pest management to successfully recruit into the canopy.
- Recruitment of large-seeded canopy species including **taraire, pūriri** and **karaka** is dependent on seed dispersal by **kūkupa**. No evidence is presented that restored habitats will support sufficient seed dispersers to maintain natural forest succession and long-term ecosystem function.
- No evidence is presented that revegetation will achieve equivalent structural diversity, carrying capacity, seasonal food availability or ecological function within ecologically meaningful timeframes including uncertainty from stochastic events.

PEST MANAGEMENT

- Pest management is proposed as part of habitat restoration.
- The duration, intensity and certainty of long-term predator and browser control required to achieve ecological maturity are not defined.
- No evidence is presented that ecological performance monitoring or pest management will continue beyond the initial establishment period.
- The proposal assumes restoration trajectories will continue following cessation of active management despite no demonstration that ecological objectives will have been achieved.

ARTIFICIAL LIGHTING

- Artificial lighting mitigation is confined principally to the operational phase and focuses on minimising attraction of seabirds. Construction lighting is characterised as a temporary effect; however, for a project of this scale it will occur over an extended construction period and represents a prolonged source of nocturnal disturbance rather than a short-duration impact.

- Temporary construction lighting associated with night works, construction compounds, security lighting and traffic management is not specifically assessed or mitigated despite the potential for prolonged night-time disturbance during construction.
- No assessment is provided of the cumulative effects of artificial lighting occurring concurrently with vegetation clearance, prolonged construction noise, vibration and human activity.
- The assessment assumes displaced birds are no longer affected by construction lighting despite light spill extending beyond active construction areas into adjacent habitats.
- No consideration is given to ecological lighting design principles including spectral composition, colour temperature, shielding, directional lighting or adaptive lighting controls for construction activities.

FRESHWATER ECOSYSTEM FUNCTION

- The mitigation package does not address the indirect ecological effects arising from freshwater habitat modification identified in the Freshwater Ecology Report.
- No mitigation is proposed to maintain indigenous fish abundance where fish passage, headwater stream connectivity and wetland connectivity are reduced.
- The assessment assumes replacement wetlands will provide equivalent ecological function despite reduced longitudinal connectivity within the freshwater network.
- No evidence is presented that equivalent prey production, aquatic invertebrate communities or indigenous fish populations will be maintained following extensive culverting, stream realignment and wetland modification.
- Consequently, no evidence is presented that equivalent food resources will remain available for fish-dependent wetland birds.
- This is particularly relevant to **matuku-hūrepo**, where published research identifies food limitation and starvation as recognised causes of mortality. The assessment does not evaluate whether reduced fish abundance may diminish habitat suitability despite proposed wetland replacement.

REVIEW AGAINST BEST PRACTICE BIODIVERSITY OFFSETTING

The proposed mitigation package has been reviewed against:

- **Northland Regional Policy Statement (2018), Section 4.4.2 – Biodiversity Offsets and Environmental Compensation**;
- **National Policy Statement for Indigenous Biodiversity (NPSIB), Appendix 3 – Principles for Biodiversity Offsetting**; and
- **Guidance on Good Practice Biodiversity Offsetting in New Zealand** (Department of Conservation, Ministry for the Environment and partner agencies, 2014).

In our opinion, the assessment does not demonstrate that the proposed mitigation satisfies several recognised biodiversity offsetting principles.

EFFECTS MANAGEMENT HIERARCHY

- The proposal relies extensively on habitat replacement and future management to address residual effects.
- The assessment does not demonstrate that all practicable opportunities to avoid and minimise biodiversity loss have been exhausted before reliance on offsets.

LANDSCAPE CONTEXT

- The principal wetland offset is located **south of the Brynderwyn Hills**, outside the affected **Waihoihoi** and **Ahuroa** catchments.
- Consequently, the proposal does not demonstrate replacement of ecological values, habitat connectivity or ecosystem function within the landscape where impacts occur.
- Biodiversity gains within another catchment are assumed to compensate for biodiversity losses north of the Brynderwyn Hills, despite no assessment of local population-level effects.

LIKE-FOR-LIKE REPLACEMENT

- Wetland replacement is based on freshwater habitat mapping and ecological assumptions carried forward from the Freshwater Ecology Report and is further reduced to wetlands identified as supporting **Threatened** or **At Risk wetland birds**.
- The proposal therefore excludes the wider network of wetlands, drains, riparian margins, ephemeral wetlands, floodplain habitats and headwater streams that collectively contribute to habitat availability, ecological connectivity and ecosystem function.

ECOLOGICAL EQUIVALENCE

- The assessment demonstrates replacement of habitat area but does not demonstrate replacement of ecosystem function.
- No evidence is presented that replacement wetlands will achieve equivalent hydrology, fish passage, prey production, carrying capacity, habitat complexity, ecological connectivity or seasonal habitat availability.
- Likewise, no evidence is presented that revegetation will restore mature forest structure, canopy succession, seasonal food resources or ecological processes within ecologically meaningful timeframes.

LOCAL POPULATION EFFECTS

- No evidence is presented that wetland birds displaced from the Waihoihoi and Ahuroa catchments will colonise replacement habitat south of the Brynderwyn Hills.
- This is particularly relevant for relatively localised species such as **mātātā (North Island fernbird)**.
- The assessment does not evaluate increased **intraspecific** or **interspecific competition** within retained habitats or replacement wetlands.

TEMPORAL LOSS

- Mature indigenous forest and naturally developed wetlands will be removed
- Replacement ecosystems require many decades to develop equivalent ecological structure and function.
- The assessment does not quantify or account for these temporal ecological losses.

IMPLEMENTATION RISK AND UNCERTAINTY

- Successful establishment of replacement wetlands, revegetation and ecological succession is assumed

- No evidence is presented that replacement wetlands will maintain natural hydrological processes, groundwater inputs, ecological connectivity or long-term ecosystem function.
- The assessment does not evaluate the resilience of replacement habitats to **stochastic events**, including prolonged drought, flooding, severe storm events, wildfire, pest or disease outbreaks, sedimentation or catastrophic vegetation failure during the decades required for ecological maturity.
- Likewise, no assessment is provided of the effects of climate change, groundwater decline or altered catchment hydrology on the long-term viability of replacement wetlands and revegetation.
- No contingency measures, adaptive management triggers or ecological performance thresholds are identified should restoration trajectories deviate from those assumed in the assessment.

LONG-TERM MANAGEMENT

- A **five-year** establishment and maintenance programme is proposed.
- No evidence is presented that five years is sufficient to establish self-sustaining indigenous ecosystems or achieve the ecological objectives of the proposed offsets.
- Long-term pest management, ungulate exclusion, ecological monitoring and adaptive management beyond the establishment period are not secured.

CANOPY COMPOSITION AND ECOSYSTEM FUNCTION

- The proposed consent conditions provide no assurance that canopy species will be established at densities sufficient to recreate the seasonal succession of fruit, flowers, sap and seed currently supporting indigenous avifauna.
- While **kauri** is specifically identified, no equivalent requirement exists for **taraire, kahikatea, northern rātā, kohekohe, tōtara, pūriri, karaka** or **rimu**, despite these species collectively providing complementary seasonal food resources and ecosystem functions.
- Recruitment of **taraire, kahikatea, northern rātā** and **kohekohe** cannot be assumed because these species are highly palatable to introduced browsers and require sustained long-term browser management.
- Recruitment of **taraire, pūriri** and **karaka** is dependent upon seed dispersal by **kūkupa**. No evidence is presented that restored habitats will support sufficient seed dispersers to maintain natural forest succession and long-term ecosystem function.

WETLAND ECOSYSTEM FUNCTION

- The proposed wetland design appears to emphasise **raupō** establishment for bittern.
- No equivalent requirement is provided for extensive shallow-water margins, seasonally inundated foraging habitat, or structurally diverse littoral habitat that support a broader assemblage of wetland birds and fish.
- Existing wetlands have developed through natural groundwater discharge, spring-fed systems, floodplain connectivity and seasonal inundation.
- No evidence is presented that artificial wetland hydrology will reproduce or maintain these natural ecological processes over the long term.

FRESHWATER ECOSYSTEM PROCESSES

- The proposal does not demonstrate replacement of ecological functions lost through reduced fish passage, headwater stream modification and altered freshwater connectivity.
- Consequently, no evidence is presented that equivalent indigenous fish populations, aquatic prey production or freshwater food-web processes will be maintained.
- These indirect trophic effects are particularly relevant for **matuku-hūrepo**, where reduced prey availability may contribute to food limitation and starvation.

MEASURABLE ECOLOGICAL OUTCOMES

- The proposal does not identify measurable ecological performance criteria demonstrating that replacement habitats will achieve equivalent biodiversity values, ecosystem function or carrying capacity.
- Nor does it identify contingency measures should restoration trajectories fail to achieve predicted ecological outcomes.

OVERALL ASSESSMENT

In our opinion, the proposed mitigation package relies on assumed ecological equivalence rather than demonstrated ecological outcomes. Habitat replacement, revegetation, pest management and adaptive management are proposed; however, the assessment does not demonstrate that ecological function, hydrological processes, habitat connectivity, prey production, carrying capacity, seasonal food resources or long-term ecosystem resilience within the **Waihoihoi** and **Ahuroa** catchments will become equivalent to those lost.

The proposal also does not demonstrate that replacement habitats located **south of the Brynderwyn Hills** will offset ecological effects occurring **north of the Brynderwyn Hills**, particularly for local wetland bird populations and connected freshwater ecosystems.

Furthermore, the assessment does not adequately account for restoration uncertainty, implementation risk or the effects of stochastic events over the decades required for replacement habitats to reach ecological maturity. Consequently, the likelihood of achieving long-term ecological equivalence remains insufficiently demonstrated.

Accordingly, the proposed mitigation does not demonstrate alignment with the biodiversity offsetting principles set out in the **Northland Regional Policy Statement (2018, Section 4.4.2)**, the **National Policy Statement for Indigenous Biodiversity (Appendix 3)** or the **Guidance on Good Practice Biodiversity Offsetting in New Zealand (2014)**. In particular, the proposal does not adequately demonstrate:

- application of the effects management hierarchy;
- landscape equivalence;
- like-for-like replacement;
- ecological equivalence;
- replacement of ecosystem function;
- maintenance of local biodiversity values;
- accounting for temporal loss, implementation uncertainty and stochastic risk; or
- achievement of **no overall loss** of indigenous biodiversity.

6. CONCLUSION

The AER is primarily a review and interpretation of existing ecological information, supported by relatively limited project-specific field observations, rather than a comprehensive field-based assessment of avifauna across the Proposed Designation and its wider Zone of Influence. Project-specific observations are largely derived from accessible farmland, road corridors, public viewpoints and targeted habitat inspections, with comparatively limited survey effort across the full range of habitats likely to be affected. Consequently, habitat use, species occupancy and ecological interactions are inferred largely from existing datasets and desktop interpretation rather than comprehensive field verification.

In our opinion, the conclusions reached are not consistently supported by the application of the available ecological data. Ecological values and effects are progressively constrained through the habitat mapping and ecological assumptions carried forward from the Freshwater Ecology Report, the artificial distinction between the indicative alignment and the Proposed Designation, and a progressively restricted Zone of Influence that does not adequately account for ecological effects extending beyond the designation boundary. Wetland habitats are subsequently further refined to only those identified as supporting Threatened or At Risk wetland birds for the purposes of mitigation and offsetting. Consequently, the assessment does not fully evaluate the extent of habitat interactions, ecosystem processes or residual ecological effects associated with the Project.

Specifically:

- Ecological values are systematically reduced through simplified habitat associations, constrained habitat mapping, incomplete survey information and reduced ecological valuation of regionally significant species.
- Mortality is considered principally as a direct collision effect, while indirect mortality pathways including construction disturbance, breeding failure, reduced refugia, increased predation and reduced prey availability associated with freshwater habitat modification are not comprehensively evaluated.
- The Zone of Influence is progressively constrained throughout the assessment, despite ecological effects such as disturbance, lighting, hydrological change, habitat connectivity and displacement extending beyond the Proposed Designation into adjacent wetlands, riparian corridors and indigenous forest.
- Freshwater, terrestrial and avifauna assessments are considered largely independently. Consequently, indirect ecological pathways associated with reduced fish passage, headwater stream modification, riparian cover, prey availability, trophic interactions and ecosystem function are not incorporated into the assessment of effects on wetland birds.
- The proposed mitigation relies heavily on future management through the Avifauna Management Plan, with key ecological uncertainties and species-specific management deferred until post-consent implementation.
- Wetland and terrestrial offsets are based principally on replacement of habitat area rather than demonstrated replacement of ecological function. The assessment does not demonstrate equivalent hydrology, fish passage, prey production, habitat connectivity, carrying capacity or long-term ecosystem resilience.
- The principal wetland offset is located outside the affected **Waihoihoi** and **Ahuroa** catchments, south of the **Brynderwyn Hills**, and therefore does not demonstrate

replacement of biodiversity values or ecosystem function within the landscape where Project effects occur. It unclear how displaced birds would access this area.

- Proposed revegetation and a five-year establishment and maintenance period do not demonstrate replacement of mature indigenous forest structure, canopy succession, seasonal food resources or long-term ecological processes. The proposed planting conditions provide no assurance that key canopy species such as **taraire, kahikatea, northern rātā, kohekohe, tōtara, pūriri, karaka** and **rimu** will be established at densities sufficient to replace existing ecosystem functions.
- The assessment does not adequately account for restoration uncertainty, temporal losses during ecosystem development, long-term management requirements or stochastic events that may influence restoration success over the decades required for replacement habitats to reach ecological maturity.
- The proposed mitigation package does not demonstrate consistency with recognised biodiversity offsetting principles, including **Northland Regional Policy Statement (2018) Section 4.4.2**, **Appendix 3 of the National Policy Statement for Indigenous Biodiversity**, and the **Guidance on Good Practice Biodiversity Offsetting in New Zealand (2014)**, particularly in relation to landscape context, ecological equivalence, ecosystem function, temporal loss, implementation risk and no overall loss of indigenous biodiversity.

Overall, while the AER is comprehensive within its adopted methodology, the cumulative effect of the methodological assumptions identified throughout this review progressively constrains the recognised extent of habitat, ecological interactions and ecosystem function. This results in a systematic underestimation of ecological effects and an overestimation of the capacity of the proposed mitigation and biodiversity offsets to maintain indigenous biodiversity values within the affected landscape

TECHNICAL REVIEW

ON BEHALF OF TE POUWHENUA O TIAKIRIRI KUKUPA TRUST



ASSESSMENT OF EFFECTS ON TERRESTRIAL ECOLOGY NORTHLAND CORRIDOR 2B

DOCUMENT: 10722-PTA-2B0-PE-RPT-0011

Bay Ecological
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BAY ECOLOGICAL CONSULTANCY LTD. (2026). TECHNICAL REVIEW OF THE ***ASSESSMENT OF EFFECTS ON TERRESTRIAL ECOLOGY REPORT*** *10722-PTA-2B0-PE-RPT-0011 NORTHLAND CORRIDOR 2B: NORTHERN MOTORWAY PROJECT. TECHNICAL REPORT PREPARED FOR TE PARAWHAU HAPŪ.*

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TECHNICAL REVIEW
ASSESSMENT OF EFFECTS ON TERRESTRIAL ECOLOGY
NORTHLAND CORRIDOR 2B
DOCUMENT: 10722-PTA-2B0-PE-RPT-00011

Bay Ecological CONSULTANCY LTD

INTRODUCTION

This report provides an independent technical review of the *Assessment of Effects on Terrestrial Ecology – Alternative to the Brynderwyn Hills – Brynderwyn Hills Section* (Document No. 10722-PTA-2B0-PE-RPT-0011, Revision A), prepared by WSP New Zealand Ltd for New Zealand Transport Agency Waka Kotahi (NZTA), hereafter referred to as the Terrestrial Ecology Report (TER). The TER draws on desktop investigations and field surveys undertaken during October to December 2025. This review has been commissioned by Te Parawhau Hapū to independently evaluate the technical adequacy of the assessment and the conclusions reached.

The review focuses primarily on the vegetation component of the TER and considers the assessment methodology, ecological surveys, ecological valuation, assessment of effects, proposed mitigation and residual effects. Relevant aspects of the wider terrestrial ecology assessment are discussed where they influence the overall conclusions.

The TER has also been considered alongside the Assessment of Effects on Freshwater Ecology (FER) and Assessment of Effects on Avifauna (AER) as part of the independent review of the ecological technical assessments prepared for the Project

Note: To facilitate comparison with the TER, this review adopts the same section numbering. As only selected sections are reviewed in detail, the numbering may appear discontinuous.

EXECUTIVE SUMMARY

This report provides a technical review of the vegetation components of the *Assessment of Effects on Terrestrial Ecology* (Document 10722-PTA-2B0-PE-RPT-0011). The review evaluated the vegetation assessment methodology, ecological value assessment, effects assessment, proposed mitigation and conclusions against accepted New Zealand ecological practice.

KEY FINDINGS

- The assessment appropriately adopts the Ecological Impact Assessment (EcIA) Framework (EIANZ, 2018) and is supported by comprehensive field survey and vegetation mapping.
- Vegetation classification is not consistently aligned with recognised national and regional vegetation typologies, including Atkinson (1985) structural classification, Singers & Rogers (2014) ecosystem classification, Singers & Lawrence (2018) Northland Potential Ecosystems, and the Waipū Ecological District Protected Natural Areas Programme (PNAP).
- The vegetation inventory does not include sufficient ecological descriptors aligned with the assessment criteria of EIANZ (2018, Table 4) and the Northland Regional Policy Statement (2018, Appendix 5) to enable independent assessment and verification of the ecological significance assigned to individual vegetation communities.
- The assessment gives insufficient consideration to regional ecological context, including the Waipū Ecological District PNAP, Threatened Environment Classification (TEC), Northland Potential Ecosystems and regional biodiversity prioritisation frameworks. Consequently, highly depleted ecosystem associations, including the WF7 Pūriri Forest Complex (approximately 10–12% remaining), WF8 Kahikatea–pūkatea Forest (10.2% remaining) and lowland examples of WF9 Taraire–tawa–podocarp Forest, are not consistently recognised as regionally significant despite their limited remaining extent and representative value.
- The assessment does not consistently apply the species value criteria of EIANZ (2018, Table 2). Regionally significant or locally distinctive indigenous flora, including lowland ribbonwood (*Plagianthus regius* subsp. *regius*), *Veronica macrocarpa* var. *macrocarpa*, *Coprosma rigida*, kawaka (*Libocedrus plumosa*) and kōtukutuku (*Fuchsia excorticata*), are in several instances assigned *Low* ecological value rather than the *Moderate* value provided for under Table 2 EIANZ.
- Appendix F does not provide sufficient ecological justification or transparent linkage between mapped vegetation units and significance assessments to enable independent review or reproduction of the assigned ecological significance.
- Confidence in the assessment of vegetation effects, residual effects and biodiversity offset calculations is reduced because the ecological significance assessment cannot be independently verified.
- Permanent loss and fragmentation of High and Very High significance indigenous vegetation remain key residual project effects. The habitat fragmentation and edge effects assessment criteria Table 23 do not adequately account for the existing highly fragmented condition typical within the Waipū Ecological District. Consequently, additional fragmentation and edge effects on remnant indigenous vegetation are not differentiated from effects occurring within larger or more intact indigenous forest.

  Further fragmentation of already depleted WF7, WF8 and WF9 ecosystem remnants within the Waipū Ecological District has disproportionately greater consequences for ecosystem representation, ecological connectivity and long-term ecological resilience.
- Remaining riparian vegetation within the Waipū Ecological District represents remnant alluvial podocarp–broadleaved forest associations, principally WF7 and WF8 ecosystems. Despite historical modification, these remnants retain important canopy dominants including kahikatea, tōtara, pūriri, taraire, kohekohe, tītoki and rewarewa, and provide

disproportionately important ecological connectivity, freshwater buffering, indigenous seed sources and restoration potential.

- The proposed mitigation relies principally on restoration planting and vegetation enhancement but does not demonstrate ecological equivalence, like-for-like replacement, or restoration of the composition, structure and ecological function of the affected WF7 Pūriri forest complex, WF8 Kahikatea associations and WF9 Taraire–tawa–podocarp associations.
- The proposed offset strategy places particular emphasis on replacement of kauri, but does not demonstrate restoration of the broader indigenous canopy assemblage characteristic of the affected forest communities. Key canopy and fruiting species, including pūriri, taraire, tōtara, kahikatea, northern rātā, kohekohe, rimu, rewarewa, karaka and tītoki, are not specifically addressed despite their important contribution to forest structure, seasonal food resources, ecological processes and long-term ecosystem function.
- The assessment does not adequately address temporal loss, restoration uncertainty, or the time required for replacement vegetation to develop mature indigenous forest composition, structure and ecological function, consistent with recognised biodiversity offsetting principles.
- The proposed mitigation and biodiversity offset strategy does not adequately demonstrate consistency with the biodiversity offsetting principles contained within the Northland Regional Policy Statement (2018, Section 4.4.2), the National Policy Statement for Indigenous Biodiversity (2023, Appendix 3), and the Department of Conservation's *Guidance on Good Practice Biodiversity Offsetting in New Zealand* (2014).
- The proposed five-year vegetation maintenance programme is insufficient to demonstrate successful establishment of self-sustaining indigenous forest ecosystems or long-term restoration outcomes. Long-term commitments to pest management, browser control, ecological monitoring and adaptive management are not demonstrated, despite these being fundamental to recruitment of late-successional canopy species, ecosystem resilience and achievement of biodiversity offset objectives.
- The report concludes that residual vegetation effects may be acceptable in light of the Project's enabling benefits. This extends beyond the role of an ecological assessment, which should objectively evaluate ecological effects and the effectiveness of proposed mitigation.
- The TER identifies the Auckland Council *Kauri Hygiene Standard Operating Procedures* as the principal biosecurity measure for managing kauri dieback risk. However, the primary statutory framework as the National Pest Management Plan (Biosecurity Act 1993) requires preparation and implementation of an approved Earthworks PA Risk Management Plan for works within Kauri Hygiene Zones.
- The TER does not adequately assess the potential for construction activities, including vegetation clearance, bulk earthworks, spoil handling and machinery movement, to spread *Phytophthora agathidicida* within and between catchments.
- The ecological investigations represented a missed opportunity to undertake baseline sampling for *Phytophthora agathidicida* within indigenous kauri stands proposed to be disturbed. Reliance on visual canopy assessment or sap exudation is insufficient, as infected kauri may remain asymptomatic for many years.

OVERALL CONCLUSION

The review concludes that, while the vegetation survey and mapping provide an inventory assessment of the vegetation affected by the Project, insufficient recognition of regional ecosystem context, limited transparency in the ecological significance assessment, and shortcomings in the proposed mitigation and biodiversity offsetting reduce confidence in the assessment of vegetation effects. Consequently, the assessment does not adequately demonstrate that ecological equivalence or no overall loss of indigenous biodiversity will be achieved.

SECTION 2: ASSESSMENT METHODOLOGY

2.1 ASSESSMENT FRAMEWORK

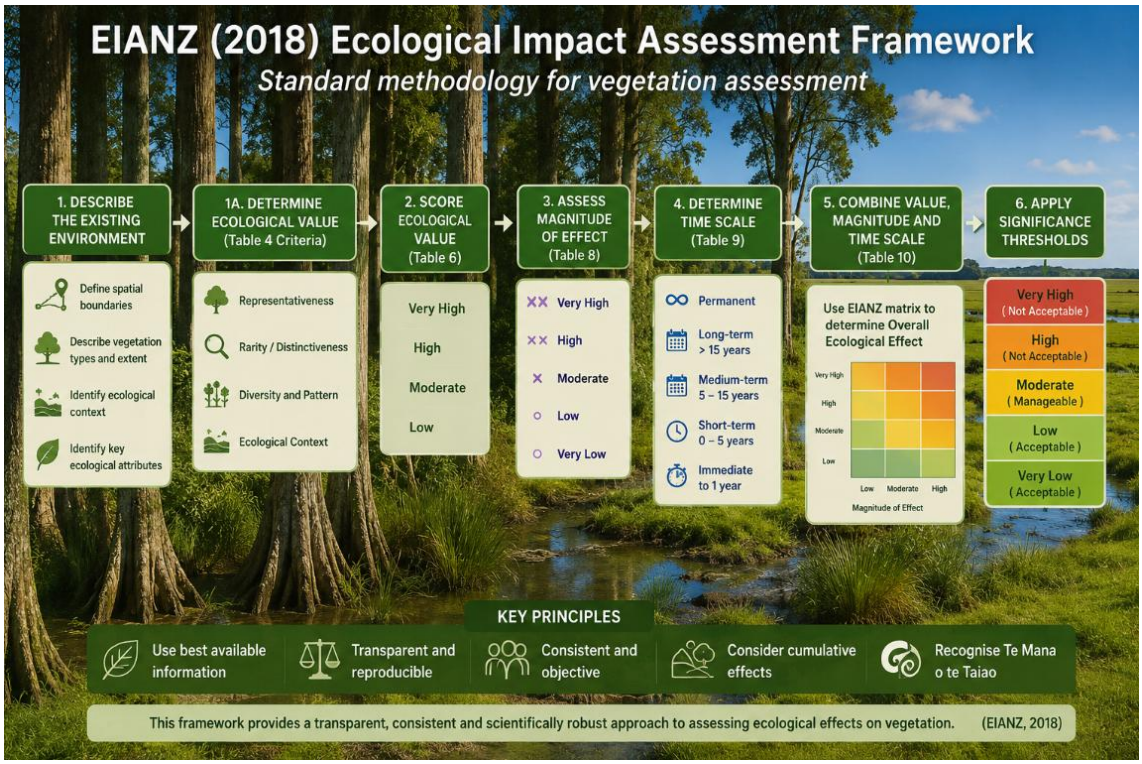
The TER adopts the Ecological Impact Assessment (EcIA) Guidelines (EIANZ, 2018) as its overarching assessment framework. Unlike the Freshwater Ecology Report, which modified aspects of the EIANZ methodology, the TER follows the standard EcIA process for assigning ecological value and determining the significance of ecological effects.

The report appropriately describes the sequential assessment process by:

- identifying ecological values using the four EIANZ criteria of representativeness, rarity/distinctiveness, diversity and pattern, and ecological context;
- assigning ecological value to vegetation and habitats;
- assessing the magnitude of effects;
- combining ecological value and effect magnitude to determine overall ecological effect; and
- identifying mitigation requirements where moderate or greater adverse effects are predicted.

The report reproduces the key EIANZ assessment tables for ecological value (Tables 1–3) and the ecological effects matrix (Table 4), providing a transparent and nationally recognised framework for evaluating terrestrial ecological effects. This represents good ecological assessment practice and provides a consistent basis for evaluating vegetation effects.

FIG 1: EIANZ (2018) FRAMEWORK



2.2 DESKTOP ASSESSMENT

The desktop assessment draws on a comprehensive range of information sources and provides an appropriate foundation for vegetation mapping and ecological assessment. The assessment could have been further strengthened by greater reference to established national and Northland vegetation classification and significance frameworks, including:

- Atkinson, I.A.E. (1985). *Derivation of vegetation mapping units for an ecological survey of New Zealand*. *New Zealand Journal of Botany*, 23, 361–378.
- Walker, S., C., Price, R., Rutledge, D., Stephens, R.T.T., Lee, W.G., et al. (2007). *New Zealand's Threatened Environment Classification*. Manaaki Whenua – Landcare Research.
- Singers, N.J.D. & Rogers, G.M. (2014). *A Classification of New Zealand's Terrestrial Ecosystems*. Science for Conservation 325. Department of Conservation, Wellington.
- Singers, N.J.D. & Lawrence, J. (2018). *Potential Ecosystems of Northland*. Report prepared for Northland Regional Council.
- Leathwick, J. (2018). *Indigenous Biodiversity Rankings for the Northland Region*. Report prepared for Northland Regional Council.

In particular, the Northland framework

- explicitly adapts the national ecosystem classification of Singers & Rogers (2014) to Northland environmental conditions and ecological districts;
- integrates soils, geology, landform, hydrology, climate and historical vegetation to predict **potential ecosystem distribution**, rather than describing existing vegetation alone. This is relevant for revegetation programmes to inform a natural and expected community or association.
- uses Northland-specific datasets, including PNAP surveys, NZ Forest Service mapping, soils, geology and historical vegetation to develop regional ecosystem mapping;
- provides ecosystem descriptions linked to the environmental drivers that determine where each ecosystem naturally occurs, improving interpretation of highly modified landscapes;
- provides the regional mapping framework that underpins biodiversity assessment and restoration planning across Northland through provision of predictive ecosystems, their rarity and rankings of areas[1]

[1] https://services2.arcgis.com/J8errK5dyxu7Xjf7/arcgis/rest/services/Northland_Biodiversity_Ranking/FeatureServer

Potential Ecosystems: The ecosystem classification used to map potential ecosystems of Northland was developed by the Department of Conservation, as a tool for prioritising ecosystem management (Singers & Rogers 2014). This classification is a synthesis that amalgamates previous classifications and ecological studies aligned to an abiotic framework. It describes a full range of ecosystem types at a variety of scales in an approximation of the natural or potential state as they would have been observed if people arrived today in New Zealand. The classification system has two tables that describe ecosystem drivers of the abiotic environment (Singers and Rogers 2014) and biotic compositional description, which further includes ecosystem distribution and relevant source references (Singers and Rogers 2014). The data contained within these two tables have been used as the fundamental basis for mapping ecosystem types, v supported by other readily available ecological descriptions, vegetation maps and relevant GIS layers such as soil maps of the Northland Region. **Ecosystem Rarity:** This layer consists of the intersection between the primary (see note below) ecosystem cover (as identified in the report 'Indigenous Biodiversity Ranking for the Northland Region by J. R. Leathwick 2018) and the Northland Potential Ecosystem mapping (as identified in the report 'A potential ecosystem map for the Northland Region: Explanatory information to accompany the map. **Northland Biodiversity Ranking - Terrestrial Top 30 Sites**: Delineation of the high priority terrestrial sites comprising 30% of the surviving indigenous-dominated ecosystems (or 10.6 % of the Northland Region) as identified in the ranking of terrestrial ecosystem areas derived from a ranking analysis of indigenous-dominated terrestrial ecosystems for the Northland Region. **Northland Biodiversity Ranking - Terrestrial Top 30 Sites Additional 5**: Delineation of the top 5 % of additional sites that would potentially make the largest additional gains assuming management is applied to the top 30% of sites as identified in the ranking of terrestrial ecosystem areas derived from a ranking analysis of indigenous-dominated terrestrial ecosystems for the Northland Region

Collectively, these frameworks provide additional regional context for vegetation classification, ecosystem rarity, representativeness and ecological significance within the Waipū Ecological District.

On a district level, species that

2.3 FIELD ASSESSMENT

The field surveys undertaken between September and November 2025 provide an appropriate basis for vegetation mapping and ecological assessment. Vegetation communities were described using the structural classification of Atkinson (1985), with ecosystem types supplemented by the Auckland ecosystem guide (Singers et al., 2017).

While the TER references Atkinson (1985) and reproduces the structural notation, the application of vegetation nomenclature is not always consistent with either Atkinson (1985) or the terminology adopted throughout the Northland Protected Natural Areas Programme (PNAP) reports. The report combines structural classes into composite vegetation units, for example *Broadleaved species scrub forest*, despite **forest** and **scrub** representing distinct structural classes under the Atkinson and PNAP frameworks. Similarly, units such as *Tōtara forest/native broadleaf scrub*, *Kahikatea-pukatea forest/native scrub/tradescantia*, and *Tōtara-kauri/broadleaf scrub* combine structurally distinct vegetation classes into a single mapping unit.

This distinction is more than semantic. Under the Atkinson (1985) and PNAP frameworks, **scrub**, **shrubland**, **treeland** and **forest** have specific structural definitions that provide a consistent basis for vegetation mapping and comparison between surveys. Combining these structural classes into composite vegetation units reduces transparency and makes comparison with PNAP mapping, regional ecosystem classifications and other ecological assessments more difficult. As discussed in the AER review, terminology such as *scrub* may also be interpreted as implying an earlier successional stage or lower ecological value, potentially influencing the reader's perception of indigenous vegetation.

2.4 ALIGNMENT CHANGES WITHIN THE PROPOSED DESIGNATION

- The TER correctly recognises that the Indicative Alignment is subject to refinement during detailed design and that ecological effects have therefore been considered across the wider Proposed Designation.
- However, the ecological values within the Proposed Designation are spatially heterogeneous and include highly variable vegetation types, wetlands, riparian corridors and regionally significant indigenous ecosystems.
- Consequently, changes to the final alignment within the Proposed Designation have the potential to materially alter the extent, location and significance of ecological effects.
- The conclusion that the ecological assessment, proposed mitigation and recommendations would remain appropriate irrespective of future alignment refinement is not fully supported by the variation in ecological values across the designation footprint.

- The Proposed Designation includes remnants of the **WF7 Pūriri Forest complex**, **WF8 Kahikatea–pūkatea Forest**, **WF9 Taraire–tawa–podocarp Forest**, significant riparian corridors, wetlands and regenerating indigenous forest. These ecosystems are unevenly distributed and cannot reasonably be assumed to be interchangeable from an ecological perspective.
- Alignment refinement should therefore continue to apply the mitigation hierarchy, with priority given to avoidance of regionally significant indigenous vegetation, riparian remnants, wetlands and highly depleted ecosystem types before consideration of mitigation or restoration.
- Greater discussion of how ecological constraints have influenced alignment refinement would strengthen the assessment and provide greater confidence that the final design will avoid or minimise effects on the highest value terrestrial ecosystems.
- Given the scarcity of remaining indigenous vegetation within the Waipū lowlands, all remnant indigenous vegetation within the Proposed Designation should be regarded as a potential ecological constraint during detailed design, rather than assuming that equivalent mitigation can be achieved irrespective of final alignment location.

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3. EXISTING ENVIRONMENT

3.1 VEGETATION ASSESSMENT

The desktop assessment and subsequent field verification provide a generally robust inventory of vegetation communities and indigenous flora across the Project area.

- Vegetation descriptions are comprehensive and supported by field observations.
- The assessment appropriately adopts the EIANZ Ecological Impact Assessment framework and Atkinson (1985) structural vegetation classification.
- Greater use could, however, have been made of established regional ecological frameworks including:
    - Atkinson, I.A.E. (1985). *Derivation of vegetation mapping units for an ecological survey of New Zealand*. New Zealand Journal of Botany, 23, 361–378.
    - Walker, S., Price, R., Rutledge, D., Stephens, R.T.T., Lee, W.G. et al. (2007). *New Zealand Threatened Environment Classification*. Landcare Research.
    - Singers, N.J.D. & Rogers, G.M. (2014). *A Classification of New Zealand's Terrestrial Ecosystems*. Science for Conservation 325. Department of Conservation.
    - Singers, N.J.D. & Lawrence, J. (2018). *Potential Ecosystems of Northland*. Prepared for Northland Regional Council.
    - Leathwick, J. (2018). *Indigenous Biodiversity Rankings for the Northland Region*. Prepared for Northland Regional Council.
    - Manaaki Whenua – Landcare Research (2025). *Northland Ecosystem Typology*.
- Collectively these frameworks provide important regional context regarding ecosystem identity, rarity, representativeness, historical extent, ecological processes and restoration potential.
- Throughout the assessment vegetation is interpreted principally according to present floristic composition and structural characteristics, with comparatively limited consideration of the underlying potential ecosystem and regional ecosystem context.
- The PNAP report mapping in regard to remnants or forest are not discussed refer below Fig 2).
- The Threatened Environment Classification is not discussed (refer below Fig 3)
- This distinction is particularly important within the Waipū Ecological District where much of the remaining indigenous vegetation represents modified, fragmented or successional expressions of formerly extensive lowland indigenous ecosystems.

3.1.1 APPENDIX D – VEGETATION DESCRIPTIONS

GENERAL

- Botanical descriptions are generally comprehensive, accurate and supported by field observations.
- The principal issue relates to the vegetation classification framework rather than the botanical descriptions themselves.
- Several vegetation units combine vegetation type, vegetation structure, ecological condition, disturbance history and land use within individual mapping units.
- Greater consistency with Atkinson (1985), Singers & Rogers (2014), the Northland Potential Ecosystems framework (Singers & Lawrence 2018), Leathwick (2018) and the Northland ecosystem typology would improve ecological interpretation and regional comparability.

REGIONAL ECOSYSTEM CONTEXT

The Ahuroa River, Waihoihoi and adjoining Waipū lowlands occupy one of Northland's most extensively modified landscapes. The Waipū Ecological District PNAP identifies the original lowland forests, floodplain forests and wetlands as having been extensively cleared, drained and fragmented through agricultural development, leaving only scattered indigenous remnants.

- Under the Northland Potential Ecosystems framework these landscapes were historically dominated by:
    - **WF7 Pūriri Forest complex**
        - WF7.1 Pūriri–tōtara Forest
        - WF7.2 Pūriri–taraire Forest
        - WF7.3 Pūriri–kahikatea Forest
    - **WF8 Kahikatea associations** occupying floodplains, wetlands and poorly drained alluvial soils.
    - **WF9 Taraire–tawa–podocarp Forest** on fertile lowland terraces and lower hill slopes.
    - **WF11 Kauri–podocarp–broadleaved Forest** on surrounding ridges and hill country.
- Leathwick (2018) demonstrates that these ecosystem types underpin regional biodiversity prioritisation.
- The **WF7 Pūriri Forest complex** retains only approximately **10–12%** of its original regional extent.
- **WF8 Kahikatea–pūkatea Forest** retains only **10.2%** of its original extent and is one of Northland's most depleted floodplain ecosystems.
- Although **WF9 Taraire–tawa–podocarp Forest** retains approximately **61%** of its regional extent, fertile lowland examples within the Waipū Ecological District have been extensively reduced and fragmented.
- At the time of the PNAP report (2007) there were only very tiny remnants of the following habitat types which approximate the former vegetation (though in much poorer condition): taraire forest (WF9), titoki–kowhai– totara forest, titoki–totara forest, puriri–totara treeland (WF7.1), totara–taraire–kanuka treeland, kahikatea–puriri treeland (WF7.1), and kowhai–kahikatea forest.
- Consequently, many indigenous remnants derive much of their ecological significance from representing these highly depleted ecosystems rather than their present floristic composition alone.
- This important regional context is not consistently reflected within the assessment. All kahikatea-dominated vegetation associations representing WF8 Kahikatea dominant associations are considered highly significant because they represent one of Northland's most depleted indigenous ecosystem types. However, several kahikatea-dominated vegetation associations are assigned only **Moderate** ecological value within Appendix F. Owing to the absence of transparent linkage between the vegetation assessment codes in Appendix F and the mapped vegetation polygons in Appendix E, it is not possible to determine where they are, the basis for these significance ratings or independently verify whether they appropriately reflect the ecological significance of these highly depleted WF8 ecosystems. We note that Q08/ 233 & Q08/227 are kahikatea dominant (refer Fig 2 below).

FIG 2: LOCAL WAIPŪ PNA REPORT AREAS[2] IN RELATION TO DESIGNATION

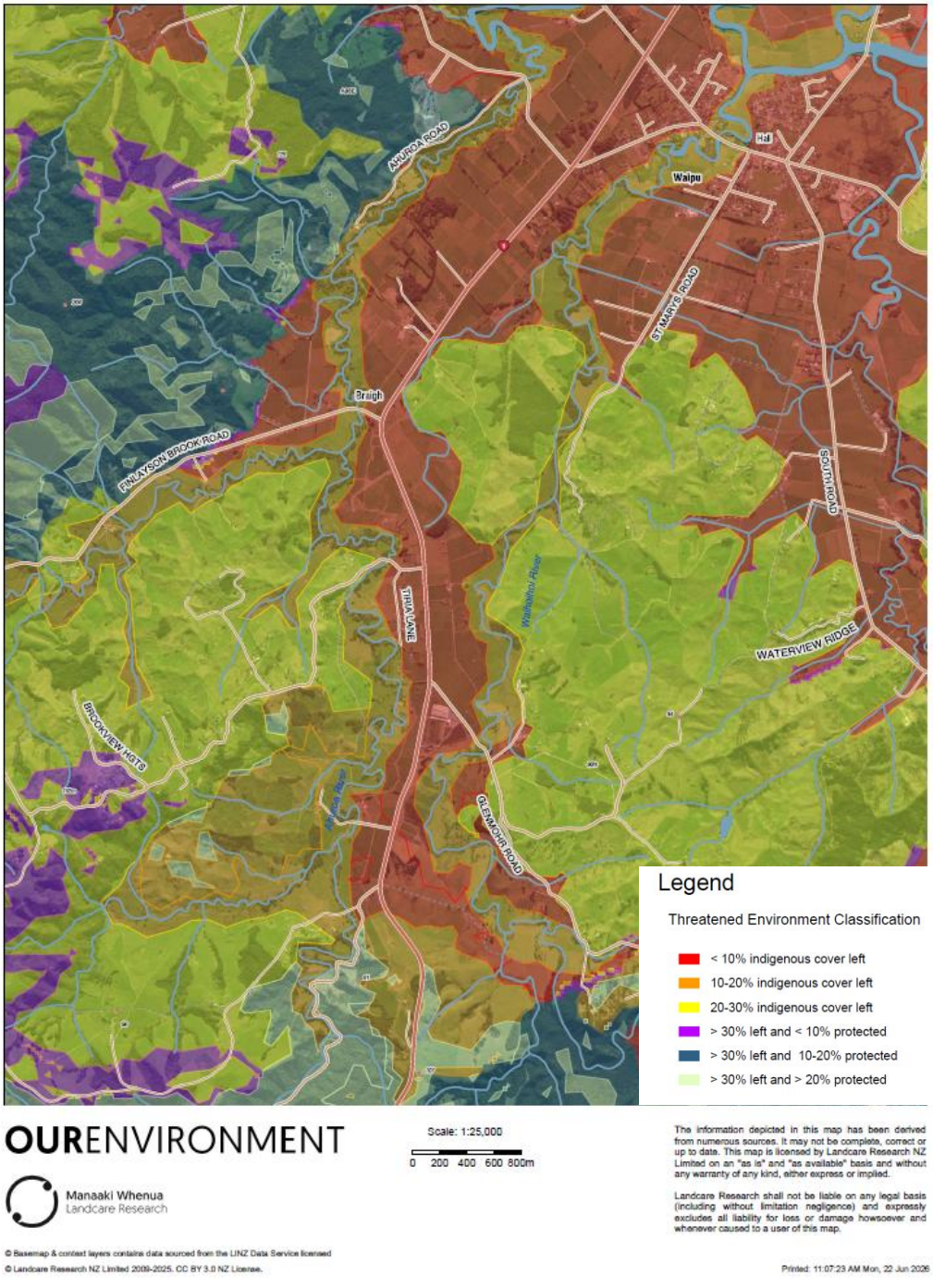


[2] Lux, J., Martin, T., & Beadel, S. (2007). *Natural Areas of Waipū Ecological District: Reconnaissance Survey Report for the Protected Natural Areas Programme*. Department of Conservation, Northland Conservancy, Whangārei

There is no consideration of the *Threatened Land Classification* (TEC) mapping in the body of the report, a commonly referenced national biodiversity prioritisation layer derived from LENZ environments which informs one of the 4 *National Priorities For Protecting Rare And Threatened Native Biodiversity On Private Land*[3] –

NATIONAL PRIORITY 1: To protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV), that have 20% or less remaining in indigenous cover.

FIG 3: WAIPU TEC CLASSIFICATION



[3] **Ministry for the Environment & Department of Conservation. (2007). *Protecting Our Places: Information about the Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land*. Ministry for the Environment, Wellington. Reference ME 805.**

The first two classes of the national TEC mapping layer[4] have been incorporated into regional policy to address biodiversity protection on private land[5] and as a measure of significance of any site vegetation.

National Priority 1 includes TEC *Class 1 Acutely Threatened (<10% indigenous cover)* and *Class 2 Chronically Threatened (10–20% indigenous cover)* land environments shown above in red and orange. Class 1 forms the dominant portion of the Designation. In Northland, as nationally, the great majority of these Classes are located in lowland and coastal areas.

Indigenous vegetation and fauna habitat that is present is likely to be significantly modified or degraded, and sometimes severely so. This does not detract from their importance, as they may constitute all that remains of indigenous cover in some areas and that is the very reason why it is a national priority to protect them. [6]

Both the TEC and PNAP mapping as standard assessment scoping were initially including in draft versions of both the TER and FER, but such consideration is omitted from the application documents.

[4] Threatened Environment Classification (2012) Landcare Research Manaaki Whenua. Based on Land Environments New Zealand (LENZ), classes of the 4th Land Cover Database (LCDB4, based on 2012 satellite imagery) and the protected areas network (version 2012, reflecting areas legally protected for the purpose of natural heritage protection).

[5] Northland Regional Policy Statement 2018 Appendix 5; Land Environments New Zealand Level VI; Land Cover Database 4 (2012); Protected Areas Network (2012) **Acutely Threatened** (<10% Indigenous Cover remains); **Chronically Threatened** (10-20% Indigenous Cover remains); **At Risk** (20-30% Indigenous Cover Remains); **Critically Underprotected** (>30% cover, <10% protected);**Underprotected**(>30% Indigenous cover remains, 10-20% protected); **Better Protected**(>30 indigenous cover, >20% protected)

[6] Davis, M., Head, N.J., Myers, S.C., & Moore, S.H. (2016). *Department of Conservation Guidelines for Assessing Significant Ecological Values*. Science for Conservation 327. Department of Conservation, Wellington. 73 p.

VEGETATION TYPES

It not only regional types that are undervalued in the TER.

- The TER states that ecological values have been assigned in accordance with the EIANZ EcIA Guidelines. However, the assessment does not consistently apply the species value criteria presented in **Table 2**. Under Table 2, species that are **locally (Ecological District) uncommon or distinctive** are assigned a **Moderate** ecological value. However, several regionally significant indigenous plant species are not recognised as such and instead have been assigned **Low** ecological value as nationally and locally common indigenous species in Appendix G .
- Examples of speciesinclude lowland ribbonwood (*Plagianthus regius* subsp. *regius*) within riparian forest remnants, *Veronica macrocarpa* var. *macrocarpa* within the TER Broadleaved Scrub Forest and Kānuka Forest vegetation types, *Coprosma rigida* within Tōtara–Broadleaved Scrub, and kawaka (*Libocedrus plumosa*) within the Kohekohe–taraire–tawa–podocarp/broadleaf forest community.
- *Coprosma rigida* was also recorded within the Braigh Road kahikatea remnants (Q08/233) identified in the Waipū Ecological District PNAP, further supporting the representative nature and regional significance of these alluvial forest remnants.
- Failure to recognise these regionally uncommon or locally distinctive species, as provided for under **Table 2** of the adopted EIANZ framework, has the potential to underestimate both the ecological value assigned to the affected vegetation communities and the subsequent assessment of ecological effects.

ANTHROPIC TŌTARA FOREST

- Not recognised within accepted New Zealand vegetation classification systems.
- Represents ecological condition rather than ecosystem identity.
- Associated occurrences of tōtara together with pūriri, kahikatea, rimu, tānekaha and other podocarps indicate modified expressions of the **WF7 Pūriri Forest complex**, and locally **WF8** or **WF9** depending upon soils and landform.
- Classification principally as tōtara forest under-represents the significance of these remnants as highly depleted lowland podocarp–broadleaved forest.

KAHIKATEA FOREST VARIANTS

- Several mapped variants represent differing structural or disturbance states rather than separate ecosystem types.
- Closely correspond with **WF8 Kahikatea–pūkatea Forest**.
- Greater recognition should be given to the rarity of this ecosystem and its importance as one of the last remaining floodplain forest types within the Waipū Ecological District.

BROADLEAVED SCRUB FOREST

- Combines mutually exclusive structural vegetation classes.
- Forest and scrub should remain separate structural units consistent with Atkinson (1985).
- The description of these communities as having a *low stature canopy (<10 m)* is also misleading, as vegetation approaching 10 m in height is more appropriately described as short or low forest rather than low-stature scrub. This conflation of vegetation classes may understate differences in structural complexity, successional stage, and ecological value.

CRACK WILLOW–EXOTIC TREES–REMNANT NATIVE TREES/MIXED EXOTIC AND NATIVE SHRUB

- Existing exotic canopy dominates the vegetation description.
- Indigenous remnant trees become secondary descriptors despite representing the principal ecological values.
- Better interpreted as highly modified riparian remnants of former **WF7** and **WF8** alluvial forest.
- Continue to provide important riparian shading, bank stability, freshwater habitat, ecological connectivity and restoration opportunity.
- The indigenous component reflects the former composition of these riparian forests and should contribute more strongly to significance assessment.

REMNANT RIPARIAN PODOCARP–HARDWOOD–KĀNUKA TREELAND

- Represents one of the most ecologically significant vegetation types identified within the Project area.
- Species assemblages including tōtara, pūriri, taraire, kohekohe, kahikatea, miro, rewarewa, coastal kōwhai, lowland ribbonwood and tītoki indicate remnants of former lowland podocarp–broadleaved riparian forest.
- Indigenous regeneration, epiphytes, lianes and the presence of mokimoki demonstrate considerable ecological integrity despite historical modification.
- Represents modified expressions of the **WF7 Pūriri Forest complex**, **WF8 Kahikatea–pūkatea Forest**, and locally **WF9 Taraire–tawa–podocarp Forest**.
- These remnants represent some of the last surviving indigenous riparian forests along the Ahuroa and Waihoihoi catchments.
- Their ecological significance extends beyond floristics through maintenance of riparian connectivity, indigenous seed sources, freshwater habitat, ecological resilience and restoration potential.

EXOTIC PINE FOREST/NATIVE BROADLEAF SCRUB

- Combines plantation forest with indigenous regeneration within a single vegetation type.
- Frequent occurrences of pūriri together with kānuka, māhoe, kawakawa, karaka, kohekohe and other indigenous pioneer species indicate active indigenous succession beneath the plantation canopy.
- Indigenous regeneration is particularly evident within gullies, drainage lines and riparian margins where it provides riparian shading, bank stability, freshwater habitat and ecological connectivity.
- These areas represent developing indigenous forest rather than simply modified plantation forest.
- Native regeneration is better interpreted as ecological recovery towards the underlying potential ecosystem than as a separate vegetation type.
- Depending upon landform and soils, many stands are likely to be developing towards **WF7**, **WF8** or **WF9** ecosystems.
- These riparian areas are also recognised through the management requirements of the National Environmental Standards for Commercial Forestry, including Forestry Earthworks Management Plans and Harvest Plans, which require protection of waterways, fish habitat, mapped spawning areas, Hochstetter's frog habitat and associated indigenous ecological values during harvesting and earthworks.

KOHEKOHE–TARAIRE–TAWA–PODOCARP/BROADLEAF FOREST

- Closely corresponds with **WF9 Taraire–tawa–podocarp Forest**.
- Represents an important remnant of Northland's warm fertile lowland forest.
- Greater emphasis should be placed on historical ecosystem extent, regional depletion and ecological representation within the Waipū Ecological District.

TŌTARA–KAURI/BROADLEAF SCRUB

- Better interpreted as regenerating indigenous forest rather than a separate vegetation type.

TŌTARA–KĀNUKA FOREST/MIXED NATIVE AND EXOTIC SCRUB/RANKED GRASSLAND

- Combines canopy composition, shrub layer, pasture and ecological condition.
- Variation reflects disturbance history rather than ecosystem identity.
- Likely represents modified expressions of **WF7**, **WF8** or **WF9** depending upon environmental setting.
- Reference to ranked grassland throughout is confusing - rank grassland? Ranked implies value – wetland?

KĀNUKA FOREST

- Classified principally by dominant canopy species despite frequently supporting diverse associated indigenous canopy species.
- Under Singers & Rogers (2014), kānuka commonly represents a persistent or successional canopy within several ecosystem types rather than defining the ecosystem itself.
- Many stands are likely to represent recovering expressions of **WF7**, **WF9** or locally **WF11**, depending upon soils, topography and associated canopy composition.
- Greater emphasis should be placed on associated canopy species, environmental setting and successional trajectory rather than canopy dominance alone.

3.1.2 APPENDIX E – FIELD SURVEYS AND OBSERVATIONS

GENERAL

- Vegetation mapping generally reflects field observations and provides good spatial representation of vegetation communities.
- Ecological interpretation would be strengthened through greater reference to the Northland Potential Ecosystems framework, Leathwick (2018) and the Waipū Ecological District PNAP.
- Mapping generally reflects present vegetation composition rather than the underlying ecosystem represented.

SHEET 1

- Kahikatea forest remnants correspond closely with **WF8 Kahikatea–pūkatea Forest**.
- Greater recognition should be given to these remnants as some of the last remaining examples of this highly depleted ecosystem within the Waipū Ecological District.

SHEET 2

- Kahikatea–pūkatea forest/native scrub represents a modified expression of **WF8** rather than a separate vegetation type.

- Crack willow corridors provide continuous riparian cover to Robertson's Stream and associated tributaries.
- Indigenous canopy components indicate remnants of former alluvial riparian forest.
- Continue to provide important freshwater fish habitat, riparian shading, bank stability and ecological connectivity.

SHEET 4

- Crack willow vegetation should be interpreted as modified riparian forest rather than simply willow vegetation.
- The indigenous canopy component reflects the former riparian forest composition and contributes significantly to ecological value.
- Extensive areas mapped as Planted Native Vegetation should not be considered to have inherently lower ecological value solely because they are planted.
- These areas were established as mitigation to restore and protect waterways and indigenous riparian vegetation and now contribute to ecological connectivity, riparian buffering and long-term catchment restoration.
- Anthropic tōtara forest provides important indigenous riparian cover protecting waterways and adjacent catchments.

SHEET 5

- Anthropic tōtara forest provides important indigenous vegetation protecting upper catchments, wetlands, streams and headwater drainage systems.
- Ecological significance extends beyond floristic composition through maintenance of indigenous catchment processes, water quality and landscape connectivity.

WAIPŪ NORTH AND WAIPŪ SOUTH

- The subdivision of the Waipū North and Waipū South vegetation into numerous discrete vegetation units places undue emphasis on differences in grazing intensity, weed invasion and vegetation condition.
- These areas function as a largely contiguous indigenous vegetation complex exhibiting varying degrees of historical modification rather than discrete ecosystem types.
- Much of the vegetation represents modified structural or successional expressions of the same underlying **WF7**, **WF8** and **WF9** ecosystems.
- Fragmentation into multiple vegetation units obscures common ecosystem identity, ecological connectivity and catchment function.
- Collectively these remnants protect upper catchments, wetlands, seepages and headwater streams throughout the Ahuroa and Waihoihoi catchments.
- The Kohekohe–taraire–tawa–podocarp forest components represent **WF9 Taraire–tawa–podocarp Forest**, a warm lowland forest ecosystem that has been extensively reduced within the Waipū Ecological District. Their significance is not adequately conveyed by subdivision into separate vegetation units based principally on local modification.
- These vegetation complexes represent one of the largest remaining indigenous vegetation networks within the Waipū lowlands and should be assessed collectively rather than as numerous isolated vegetation units.

RIPARIAN SIGNIFICANCE

- Throughout Appendix E greater recognition should be given to the ecological significance of riparian vegetation.
- Wetlands, streams and riparian corridors should be consistently recognised as contributing to ecological significance through:
    - ecological connectivity;

    - freshwater fish habitat;
    - bank stability;
    - water quality protection;
    - floodplain processes;
    - indigenous seed sources;
    - restoration opportunity; and
    - representation of highly depleted lowland ecosystems.
- Within the Waipū Ecological District these riparian corridors represent some of the last surviving elements of historically extensive lowland indigenous forest and should be recognised accordingly within the significance assessment.

APPENDIX F – VEGETATION SIGNIFICANCE ASSESSMENT

- Appendix F presents the vegetation significance assessment; however, the information cannot be adequately interpreted or independently verified.
- Vegetation assessment codes presented within Appendix F are not spatially referenced to vegetation polygons shown within Appendix E or elsewhere in the TER.
- Consequently, it is not possible to determine which mapped vegetation units correspond to individual significance assessments.
- The significance ratings cannot therefore be reconciled with the mapped vegetation, vegetation descriptions presented in Appendix D or the ecological context described within the assessment.
- This omission prevents independent verification of the ecological values assigned to individual vegetation units and substantially limits review of the significance assessment methodology.
- This issue was identified during review of earlier draft reporting but has not been addressed in the final TER.
- The absence of clear cross-referencing between vegetation mapping and significance assessment reduces transparency and prevents the assessment from being independently reproduced, audited or technically reviewed.
- As presented, Appendix F functions as an isolated tabulated assessment rather than an integrated component of the vegetation assessment.
- Cross-referencing each vegetation assessment code to the corresponding mapped vegetation polygon(s) within Appendix E would provide a transparent, reproducible and technically reviewable assessment consistent with accepted ecological reporting practice.

CONCLUSION – SECTIONS 3.1 AND 3.2

- The vegetation assessment is supported by comprehensive field survey and generally robust botanical descriptions; however, ecological interpretation is limited by insufficient consideration of regional ecosystem context, historical ecosystem extent and the ecological significance of Northland's highly depleted lowland ecosystems.
- Much of the indigenous vegetation within the Project area was identified by the Waipū Ecological District PNAP as Best of the Last Remaining indigenous vegetation and habitat. These remnants were recognised as significant almost two decades ago because they represented the remaining indigenous vegetation following widespread historical clearance, drainage and agricultural development across the Waipū lowlands.
- Despite ongoing ecological succession and local changes in vegetation composition, these same remnants continue to comprise the principal indigenous vegetation resource within the Project area and surrounding landscape. Their continued persistence demonstrates that they remain the best representative examples of the

original lowland ecosystems of the Waipū Ecological District and reinforces their enduring ecological significance.

- This regional context provides additional support for recognising many of the remaining vegetation remnants as representative examples of the highly depleted WF7 Pūriri Forest complex, WF8 Kahikatea–pūkatea Forest and locally significant WF9 Taraire–tawa–podocarp Forest, irrespective of varying degrees of historical modification, grazing or weed invasion.
- Greater application of the Northland Potential Ecosystems framework, Leathwick (2018), the Waipū Ecological District PNAP and associated Northland vegetation classifications would provide a more representative assessment of ecosystem rarity, representativeness, ecological significance and restoration potential.
- Several vegetation types are classified according to present vegetation structure, disturbance history or dominant canopy species rather than the underlying ecosystem they represent, resulting in reduced recognition of regionally depleted ecosystems, riparian forest remnants and contiguous indigenous vegetation complexes.
- The ecological importance of riparian remnants, regenerating indigenous forest, wetlands and the contiguous Waipū North and Waipū South vegetation complexes is not fully reflected within the vegetation classification, mapping or significance assessment, despite their important contribution to ecosystem representation, ecological connectivity, freshwater habitat, catchment processes and long-term restoration.
- The absence of spatial linkage between the vegetation assessment codes presented in Appendix F and the mapped vegetation polygons in Appendix E substantially limits transparency, reproducibility and independent technical review. Without clear cross-referencing between mapped vegetation units and their assigned significance ratings, the assessment cannot be readily audited or independently verified.
- Overall, the vegetation inventory and field assessment are considered technically robust; however, greater emphasis on regional ecosystem context, long-term ecosystem representation, Northland ecological classification frameworks, riparian function and improved integration between vegetation descriptions, mapping and significance assessment would provide a more robust, transparent and regionally representative evaluation of terrestrial ecological values.

4. ASSESSMENT OF EFFECTS

4.2.1 ASSESSMENT OF ECOLOGICAL VALUES & 4.3.1 Assessment OF ACTUAL & POTENTIAL EFFECTS: VEGETATION

- Application of the EIANZ Table 4 / Northland Regional Policy Statement (2018) Appendix 5 criteria for assessing significance are not demonstrated:
    - Representativeness
    - Rarity / Distinctiveness
    - Diversity and Pattern
    - Ecological Context.
- The vegetation effects assessment is founded on the ecological values assigned in Section 4.2. As discussed previously, Appendix F does not transparently link vegetation assessment codes with mapped vegetation units in Appendix E. Consequently, the basis for assigning vegetation significance, ecological value and effect magnitude cannot be independently verified.
- The absence of transparent cross-referencing also prevents independent verification of the vegetation areas reported as affected in Table 16. It is not possible to determine which mapped vegetation communities contribute to the reported areas of permanent loss, temporary disturbance or fragmentation.
- Consequently, it cannot be determined whether effects on representative examples of WF7 Pūriri associations, WF8 Kahikatea associations and WF9 Taraire associations have been appropriately recognised.
- Likewise, it cannot be determined whether vegetation identified by the Waipū Ecological District PNAP as *best of the last* in 2007, or vegetation within Class 1 & 2 Threatened Environment Classification landscapes (<20% indigenous cover), has been appropriately recognised within the assessment.
- The assessment appropriately recognises the importance of kauri but gives comparatively little emphasis to the broader mature indigenous canopy. A kauri tree does not make a forest. Mature pūriri, taraire, kohekohe, tōtara, kahikatea, rimu, northern rātā and rewarewa provide irreplaceable structural habitat, seasonal food resources, seed sources, perching and nesting habitat, ecological connectivity and long-term ecosystem resilience that cannot be replaced by mitigation planting.
- Mature indigenous canopy trees within plantation forest and modified indigenous vegetation are not consistently identified or assessed individually, despite their importance as structural habitat and resources for indigenous avifauna.
- The TER does not consistently apply the species value criteria in EIANZ Table 2. Regionally uncommon or locally distinctive flora are not consistently recognised and therefore do not appear to receive the Moderate species value provided for under the adopted framework.
- Examples include lowland ribbonwood, *Veronica macrocarpa var. macrocarpa, Coprosma rigida* and kawaka, kotukutuku *(Fuchsia excorticata); Coprosma rigida* was also recorded from the Braigh Road kahikatea remnants (Q08/233) in the PNAP survey.
- Failure to recognise these species in accordance with EIANZ Table 2 has the potential to reduce the ecological value assigned to vegetation communities and, consequently, the resulting assessment of ecological effects.
- Several kahikatea-dominated vegetation associations representing WF8 Kahikatea–pūkatea Forest are assigned only *Moderate* ecological value in Appendix F. Owing to the lack of linkage between Appendix F and Appendix E, the basis for these ratings cannot be independently verified.

Consequently, the vegetation effects assessment is therefore not independently reproducible or auditable. Ecological values appear to place greater emphasis on inventory and condition than on ecosystem representation and function, regional rarity, historical depletion, ecological connectivity and restoration potential, resulting in a conservative assessment of many modified indigenous vegetation remnants within the Waipū Ecological District.

In regard to Table 17

- Habitat fragmentation as one of several vegetation effects but gives little consideration to the existing landscape context. The Waipū lowlands are already highly fragmented following extensive historical clearance, with the remaining indigenous vegetation largely confined to isolated forest remnants, riparian corridors and wetlands identified through the PNAP as Best of the Last Remaining indigenous vegetation.
- In landscapes where indigenous vegetation has already been reduced to less than 20% cover under the Threatened Environment Classification, further fragmentation cannot be considered equivalent to fragmentation within a largely intact indigenous landscape. Each additional loss or severance of remnant vegetation has a disproportionately greater effect on ecological integrity, connectivity and long-term resilience.
- The assessment does not clearly distinguish between fragmentation of extensive indigenous forest and fragmentation of isolated remnant vegetation. This is an important distinction because many of the affected vegetation communities represent the last remaining examples of highly depleted WF7, WF8 and locally WF9 ecosystems within the Waipū Ecological District.
- Consequently, the application of the fragmentation criteria in Table 17 appears to normalise incremental loss within an already highly fragmented landscape. This risks understating the ecological consequences of further dissection of remnant indigenous vegetation and riparian corridors.

KAURI DIEBACK BIOSECURITY

- The TER identifies implementation of the Kauri Hygiene Standard Operating Procedures as the principal biosecurity measure for managing kauri dieback risk.
- The Kauri Hygiene Standard Operating Procedures were developed by Auckland Council for activities undertaken on land owned or managed by Auckland Council and its Council-Controlled Organisations. They provide operational hygiene procedures for reducing the spread of *Phytophthora agathidicida* but do not constitute the primary statutory framework governing earthworks associated with this Project.
- Under the Biosecurity Act 1993, protection of kauri from *Phytophthora agathidicida* is regulated through the National PA Pest Management Plan administered by Tiakina Kauri within Biosecurity New Zealand, Ministry for Primary Industries. The National PA Pest Management Plan provides the statutory framework for preventing the spread of the pathogen across kauri lands.
- Rule 5 of the National PA Pest Management Plan requires an occupier proposing earthworks within a Kauri Hygiene Zone to prepare and implement an approved Earthworks PA Risk Management Plan. The purpose of the Plan is to identify, assess and manage the risk of spreading *Phytophthora agathidicida* through earthworks, machinery, vehicles, equipment and the movement of soil.
- As this Project traverses public land containing indigenous kauri, compliance with the statutory requirements of the National PA Pest Management Plan should form the primary biosecurity framework for construction activities, with the Auckland Council

Kauri Hygiene Standard Operating Procedures providing supporting operational guidance where applicable.

- A direct construction effect not specifically considered within the TER is the potential spread of *Phytophthora agathidicida* both within catchments and between catchments during vegetation clearance, bulk earthworks, spoil handling and construction activities.
- Construction activities involving vegetation clearance, bulk earthworks, spoil handling and movement of machinery across catchments have the potential to redistribute contaminated soil where the pathogen is present. Particular care is therefore required where soil is transferred across drainage divides, through the Mūtū corridor, or into areas where sediment may enter waterways and be transported downstream.
- The terrestrial field investigations provided an opportunity to undertake targeted baseline sampling for *Phytophthora agathidicida* within indigenous kauri stands proposed to be disturbed. In our opinion, this represented a missed opportunity to establish the current distribution of the pathogen before construction activities commence and before preparation of the required Earthworks PA Risk Management Plan.
- The absence of visible canopy symptoms should not be interpreted as confirmation that *Phytophthora agathidicida* is absent. Infected kauri may remain asymptomatic for many years before external symptoms become evident, and pathogen distribution cannot therefore be reliably inferred from visual assessment alone.
- We understand previous surveillance undertaken within the Project area by the Northland Regional Council is now approximately seven years old (pers. comm. Candace Rameka, Biosecurity Officer – Kauri Protection, Northland Regional Council). Given the elapsed time, historic surveillance information alone is unlikely to provide an adequate baseline immediately prior to construction.
- During this period, opportunities for pathogen spread may have occurred through recognised vectors. Stock continue to have access to portions of the Waipū South indigenous vegetation complex from the southern boundary despite historical Northland Regional Council-funded fencing to exclude livestock from parts of the site. Livestock movement is recognised as a potential mechanism for transporting contaminated soil.
- We also understand from the owner of the Murray property that feral pigs occur within the Project area. Wild pigs are recognised as an important vector for the spread of *Phytophthora agathidicida* through soil disturbance and movement of contaminated soil adhering to their feet and snouts, while rooting activity may facilitate transfer of the pathogen between infected and previously uninfected areas.
- Consequently, the distribution of *Phytophthora agathidicida* within the Brynderwyn catchments may have changed since previous surveillance was undertaken. Establishing a contemporary baseline prior to construction would provide greater confidence in biosecurity management and assist in minimising the risk of pathogen spread within and between catchments during construction.

5. RECOMMENDED MITIGATION

TABLE 23

- The proposed mitigation package is founded on the ecological significance assessments developed in Section 4. As discussed throughout this review, the methodology used to assign Very High, High and Moderate ecological significance (including Appendix F) lacks transparency and cannot be independently reproduced or verified. Consequently, there is insufficient confidence that the extent of vegetation requiring mitigation has been correctly identified, and the resulting offset calculations

may underestimate the mitigation required to adequately offset terrestrial vegetation loss.

- Table 23 identifies standard mitigation measures including planting, vegetation enhancement, pest control and ecological management. While these represent recognised restoration practices, the assessment does not demonstrate that they will achieve ecological equivalence with the indigenous vegetation communities being lost.
- The proposed mitigation relies primarily on replacement of habitat area rather than demonstrating replacement of vegetation composition, forest structure, ecological processes, habitat connectivity or long-term ecosystem resilience.
- The assessment assumes restoration success rather than demonstrating that residual adverse effects will be offset and that **no overall loss** of indigenous biodiversity will be achieved.

5.1.1 NORTHERN MITIGATION SITE / CENTRAL MITIGATION SITE

- The proposed mitigation sites are described principally in terms of hectares available for planting and enhancement rather than their capacity to replace the ecological values of the affected indigenous vegetation communities.
- Enhancement of existing indigenous vegetation should not be regarded as biodiversity offsetting, as these areas already contribute to indigenous biodiversity values and ecological function.
- Conversion of pasture or plantation forestry to indigenous vegetation represents ecological restoration, not replacement of mature indigenous forest. Newly established vegetation cannot replace mature forest composition, structural complexity, ecological processes or habitat values within ecologically meaningful timeframes.
- The proposal assumes ecological succession will recreate equivalent indigenous forest but provides no evidence that mature forest structure, ecosystem function or long-term ecological resilience will be achieved.
- **Offset planting is specifically identified for kauri; however, no equivalent commitment is provided for the broader assemblage of canopy species that characterise the affected indigenous forest communities. There is no assurance that tōtara, kahikatea, taraire, pūriri, northern rātā, kohekohe, rimu, rewarewa or other characteristic canopy species will be established in appropriate proportions to recreate the floristic composition, structural diversity and ecological function of the vegetation being removed. Restoration of indigenous forest cannot be demonstrated through establishment of a single iconic species.**
- Recruitment of many late-successional canopy species cannot be assumed and depends upon sustained pest and browser control, successful seed dispersal, natural regeneration and long-term ecological processes extending well beyond the proposed management period.
- The proposal therefore demonstrates establishment of indigenous planting rather than replacement of the indigenous forest ecosystem.

5.1.5 VEGETATION MANAGEMENT

- Vegetation management is limited to standard NZTA monitoring during the first five years following construction.
- Five years is insufficient to demonstrate restoration of self-sustaining indigenous forest ecosystems or replacement of mature forest composition, structure, ecological function and ecosystem resilience. Particularly in the absence of pest control.
- No measurable ecological performance criteria are provided for canopy composition, species recruitment, structural development, natural regeneration, ecological function or long-term restoration success.
- No long-term commitments are identified for ecological monitoring, pest management, browser control or adaptive management beyond the initial establishment period, despite restoration success depending upon these measures over many decades.
- Restoration success is assumed with no technical basis even in landscaping terms let alone demonstrating that ecological equivalence will be achieved.

OVERALL ASSESSMENT AGAINST BIODIVERSITY OFFSETTING BEST PRACTICE

In our opinion, the proposed mitigation package does not demonstrate alignment with recognised New Zealand biodiversity offsetting principles contained within:

- Northland Regional Policy Statement (2018), Section 4.4.2 – Biodiversity Offsets and Environmental Compensation**;**
- National Policy Statement for Indigenous Biodiversity (2023), Appendix 3 – Principles for Biodiversity Offsetting**; and**
- Department of Conservation, ***Guidance on Good Practice Biodiversity Offsetting in New Zealand*** (2014).

In particular, the assessment does not adequately demonstrate:

- application of the effects management hierarchy;
- landscape and local ecological context;
- like-for-like replacement of indigenous vegetation communities;
- ecological equivalence between affected and replacement ecosystems;
- replacement of vegetation composition, ecosystem structure and ecological function;
- maintenance of habitat connectivity and ecosystem resilience;
- accounting for temporal loss during ecological succession;
- accounting for implementation uncertainty and stochastic risk;
- measurable ecological performance criteria and adaptive management should restoration objectives not be achieved; or
- achievement of **no overall loss** of indigenous biodiversity.

CONCLUSION SECTIONS 6 & 7

The conclusion does not adequately address the uncertainties identified throughout this review regarding the ecological significance assessment, vegetation mapping, mitigation effectiveness and residual effects.

While the report acknowledges that **Moderate and Very High residual effects** remain for High and Very High value indigenous vegetation following mitigation, it subsequently concludes that these effects *may be acceptable* in light of the enabling benefits of the Project under the Fast-track Approvals Act.

Whether significant residual ecological effects are acceptable is ultimately a matter for the consent decision-maker, not the ecological assessment. The role of the assessment is to objectively evaluate ecological effects and demonstrate that proposed mitigation is capable of achieving its intended outcomes.

As discussed throughout this review, the ecological significance methodology, offset calculations and proposed mitigation remain insufficiently substantiated. Consequently, the conclusion places undue reliance on assumed restoration success while understating the uncertainty associated with the permanent loss and fragmentation of High and Very High value indigenous vegetation and the long-term replacement of ecosystem function.

FRESHWATER FISH TECHNICAL REVIEW

COMPANION DOCUMENT TO THE FRESHWATER ECOLOGICAL REVIEW (FER REVIEW)

TABLE OF CONTENTS

- Executive Summary
- 1. Introduction
- 2. Fish Survey Methodology (FER Review Section 2)
- 3. Fish Habitat Values and Ecological Function (FER Review Section 3)
- 4. Assessment of Effects on Freshwater Fish (FER Review Section 4)
- 5. Fish Passage, Mitigation and Management (FER Review Section 5)
- 6. Overall Scientific Opinion

EXECUTIVE SUMMARY

This review summarises the freshwater fish-related findings of the Freshwater Ecological Review (FER Review) and should be read alongside Sections 2–5 of the main report.

The review concludes that the freshwater fish assessment is founded on a series of non-standard methodological approaches that collectively underestimate indigenous fish habitat values, ecological connectivity, project effects and management requirements.

- The freshwater mapping is incomplete, with headwater, intermittent and ephemeral streams under-represented.
- Fish surveys do not provide a sufficiently robust ecological baseline.
- Headwater streams are systematically undervalued despite their role in spawning, recruitment, refuge and connectivity.
- Ecological condition is repeatedly substituted for ecological value.
- Fish habitat values rely on surrogate measures rather than ecological function and life-history requirements.
- Threatened and At Risk species are repeatedly assigned reduced significance based on presumed low abundance rather than conservation status or demonstrated population assessment.
- Fish populations are assessed as isolated reaches rather than connected catchment-scale populations.
- Table 11 underpins fish values, effect magnitude, fish passage and mitigation but lacks sufficient transparency and reproducibility.
- Fish effects are systematically underestimated through reduced habitat values, catchment-scale averaging and proportional stream-loss assessments.
- Fish passage requirements are reduced through simplified upstream habitat assumptions.
- Culvert design focuses on engineering compliance rather than maintenance of ecological function.
- Stream reclamation and realignment are assumed to achieve ecological equivalence despite substantial uncertainty.

- Residual effects remain low because habitat values and effect magnitudes have already been reduced.
- Management, mitigation and monitoring are founded on the same reduced assessment framework.
- These methodologies risk establishing an ecologically unsound precedent for future Northland Corridor stages and NZTA infrastructure projects.

OVERALL SCIENTIFIC OPINION

Freshwater fish populations are sustained by connected habitat networks and complete life-history processes rather than individual stream reaches. Assessment methodologies that underestimate headwater streams, simplify fish passage, rely on catchment-scale averaging or substitute ecological function with surrogate measures will systematically underestimate effects on indigenous fish populations.

1. INTRODUCTION

PURPOSE

This report provides a technical review of the freshwater fish components of the Freshwater Ecological Review (FER). It consolidates the fish-related findings from Sections 2–5 of the FER Review into a single document and should be read in conjunction with the main report.

The review evaluates whether the methodologies applied within the FER provide a robust basis for identifying freshwater fish habitat, assigning ecological value, assessing project effects and developing appropriate mitigation and management responses.

SCIENTIFIC FRAMEWORK

This review is based on established principles of contemporary freshwater fish ecology and ecological assessment.

- Indigenous fish populations are sustained by connected habitat networks rather than isolated stream reaches.
- Ecological function is a more reliable measure of fish habitat value than stream size, fish abundance or proportional stream length.
- Headwater, intermittent and ephemeral streams are integral components of river networks, supporting spawning, recruitment, refuge, dispersal and downstream ecosystem processes.
- Fish habitat should be assessed according to complete life-history requirements, including spawning, migration, larval dispersal, juvenile recruitment and adult habitat.
- Fish passage is one component of ecological connectivity and should not be considered in isolation from broader stream ecosystem function.
- Ecological effects should be assessed according to habitat function, connectivity, conservation significance and cumulative effects rather than proportional habitat loss alone.

SCOPE OF REVIEW

This review focuses on the freshwater fish components of the FER, including:

- Fish survey methodology and ecological baseline.
- Fish habitat values and ecological function.
- Fish passage and ecological connectivity.
- Assessment of effects on indigenous fish populations.
- Culverting, stream reclamation and habitat replacement.
- Mitigation, monitoring and adaptive management.

Where relevant, reference is made to the corresponding sections of the FER Review to avoid duplication of detailed discussion.

CENTRAL FINDING

The review concludes that the assessment repeatedly substitutes ecological function with simplified surrogate measures, including stream size, fish abundance, Fish IBI, upstream habitat assumptions, proportional stream loss and catchment-scale averaging. Collectively, these methodological decisions reduce assigned fish habitat values, predicted project effects and subsequent management requirements, reducing confidence that the FER adequately represents the ecological values of indigenous freshwater fish habitats or the effects of the Project.



2. FISH SURVEY METHODOLOGY

(Refer to FER Review Section 2)

OVERVIEW

A robust freshwater fish assessment depends on a complete ecological baseline. Accurate stream mapping, appropriate survey design and correct interpretation of fish data are fundamental to assessing fish habitat values, ecological connectivity and project effects. Deficiencies identified at this stage propagate throughout the subsequent assessment.

STREAM MAPPING

• Headwater streams are incompletely mapped, reducing the ecological baseline for fish habitat, stream loss, fish passage and cumulative effects.
• Intermittent and ephemeral streams are under-represented despite providing seasonal habitat, spawning opportunities, juvenile refuge and ecological connectivity.
• Stream permanence is not a surrogate for ecological significance. Small and intermittent streams contribute to spawning, recruitment, refuge and downstream ecosystem function.
• Incomplete stream mapping propagates through fish habitat valuation, culvert assessment, fish passage, offset calculations and cumulative effects.

WHY IT MATTERS

An incomplete stream network underpins every subsequent stage of the freshwater fish assessment.

FISH SURVEYS

• Survey effort is insufficient to comprehensively characterise indigenous fish communities across the Project area.
• Survey timing does not adequately capture seasonal migration, spawning and juvenile recruitment.
• Detection probability is inadequately considered, particularly for nocturnal, cryptic and naturally uncommon species.
• Species absence should not be inferred from limited survey effort where suitable habitat remains.

WHY IT MATTERS

Fish distribution, habitat utilisation and ecological values are likely to be underestimated.

ENVIRONMENTAL DNA (EDNA)

• eDNA is interpreted beyond current NIWA guidance.
• NIWA recognises eDNA as a powerful species detection tool that complements, but does not replace, conventional fish surveys.
• eDNA cannot determine abundance, biomass, habitat quality, ecological condition, spawning habitat, life-history function or ecological value.
• Downstream transport and persistence of eDNA limit interpretation of habitat occupancy and life-stage use.
• Conventional fish surveys and habitat assessment remain necessary to interpret eDNA results.

WHY IT MATTERS

Over-reliance on eDNA reduces confidence in fish habitat valuation and subsequent effects assessment.

FISH IBI AND NZFFD

• Fish IBI is applied beyond its intended purpose as an indicator of fish community condition.
• Fish IBI should not be used as a surrogate for ecological value, fish habitat significance or fish passage requirements.
• NZFFD records are interpreted without sufficient recognition of survey bias and detection limitations.
• Record frequency reflects survey effort rather than ecological importance.
• Naturally uncommon, nocturnal and cryptic species are likely to be under-represented.

WHY IT MATTERS

Fish habitat significance is likely to be underestimated.

LAMPREY

• Lamprey receive insufficient species-specific assessment.
• Adult lamprey are nocturnal and cryptic, resulting in inherently low detection probability.
• Ammocoete habitat within fine sediment deposits is not systematically identified or assessed.
• Conventional survey techniques have limited effectiveness for detecting ammocoetes.
• Lamprey occurrence is better predicted by habitat suitability and catchment connectivity than opportunistic survey records.

• Absence of records should not be interpreted as absence where suitable habitat and migration pathways remain.

WHY IT MATTERS

Lamprey habitat and passage requirements are likely to be underestimated.

FISH HABITAT SIGNIFICANCE

• Regional significance criteria for indigenous fish habitat are not consistently applied.
• Fish habitat values should recognise spawning habitat, recruitment, migration corridors, refuge habitat and ecological connectivity.
• Threatened and At Risk species should be assessed according to conservation status rather than local abundance.
• Fish populations should be assessed as connected catchment-scale populations rather than isolated stream reaches.

WHY IT MATTERS

The ecological baseline places greater emphasis on fish abundance and stream size than ecological function and life-history requirements.

KEY TECHNICAL CRITICISMS

• Headwater and intermittent streams are incompletely mapped.
• Fish survey effort is insufficient.
• Survey timing does not adequately capture seasonal fish ecology.
• eDNA is interpreted beyond current NIWA guidance.
• Fish IBI is applied beyond its intended purpose.
• NZFFD records are over-interpreted without sufficient recognition of survey bias.
• Lamprey survey methodology is inadequate.
• Regional significance criteria are incompletely applied.
• The ecological baseline underestimates freshwater fish habitat, ecological connectivity and fish values, reducing confidence in all subsequent stages of the assessment.

3. FISH HABITAT VALUES AND ECOLOGICAL FUNCTION

(Refer to FER Review Section 3)

OVERVIEW

Fish habitat values underpin the assessment of effects, fish passage requirements, mitigation and residual effects. Where habitat values are underestimated, subsequent project effects are similarly underestimated.

FISH HABITAT VALUATION

• Fish habitat values are derived using bespoke unrepeatable opaque modified assessment methodologies.
• Ecological condition is repeatedly substituted for ecological value.
• Fish abundance is used as a surrogate for habitat significance.
• Fish IBI is applied beyond its intended purpose.
• Schedule 9 significance criteria are incompletely applied.
• Regional significance criteria for indigenous fish habitat are not consistently recognised.
• Modified and grazed streams are assigned reduced values despite retaining important ecological functions.
• Table 11 systematically assigns low values to streams proposed for culverting and reclamation.

KEY FINDING

Fish habitat values are systematically reduced before project effects are assessed.

HEADWATER STREAMS

• Headwater streams are consistently undervalued.
• Intermittent streams are treated as low-value habitats.
• Small streams are assessed according to size rather than ecological function.
• Headwaters support spawning, juvenile recruitment, refuge habitat and food-web production.
• Headwaters maintain downstream ecosystem processes and longitudinal connectivity.
• Connectivity and landscape passage principles are not reflected in habitat valuation.
• Incomplete stream mapping further reduces apparent habitat extent and value.

KEY FINDING

Headwater habitats are systematically undervalued despite their fundamental ecological role

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FISH COMMUNITIES

- Threatened and At Risk species require greater weighting.
- Conservation status is repeatedly overridden by presumed low abundance.
- Species abundance is inferred without surveys capable of estimating abundance or population size.
- Banded kōkopu (and other Naturally Uncommon) occur naturally at low densities and should not be assessed by abundance alone.
- Longfin eel habitat is assigned reduced significance despite the species' Threatened status.
- Fish communities are assessed by species richness rather than ecological function.
- Catchment-scale populations are treated as isolated stream reaches.

KEY FINDING

Fish values do not adequately reflect conservation significance or population ecology.

SPAWNING AND RECRUITMENT

- Adult fish presence is emphasised over life-history requirements.
- Spawning habitat receives insufficient assessment.
- Banded kōkopu spawn within freshwater riparian margins.
- Larvae require downstream migration to the marine environment.
- Juveniles require upstream migration as whitebait.
- Recruitment depends on uninterrupted catchment connectivity.
- Species-specific spawning surveys are lacking.

KEY FINDING

Life-history processes are inadequately represented in fish habitat valuation.

LAMPREY

• Lamprey ecology receives little consideration.

• Ammocoete habitat is not systematically assessed.
• Detection probability is inherently unlikely in the FER methods
• Migration requirements differ from swimming fish.
• Standard fish passage criteria may not provide for lamprey.

KEY FINDING

Lamprey habitat values and presence is inadequately assessed/ underestimated.

ECOLOGICAL CONNECTIVITY

• Fish populations function as connected catchment-scale metapopulations.
• Connectivity underpins spawning, recruitment, dispersal and recolonisation.
• Dendritic river network including wetlands processes receive limited recognition.
• Fish passage requirement is assessed using highly flawed upstream habitat assumptions.
• Upstream habitat length is not a surrogate for ecological significance.
• Downstream migration receives limited consideration.
• Cumulative fragmentation is inadequately assessed.

KEY FINDING

Connectivity values are systematically underestimated.

CULVERTING

• **Table 11 habitat values** directly determine the significance of culvert effects.
• **Streams assigned Negligible–Low values** receive correspondingly lower predicted culvert effects.
• **Headwater streams** are repeatedly assessed as having low culvert effects because of reduced habitat values rather than ecological function.
• **Fish passage** is treated as the principal ecological effect of culverting despite permanent modification of stream habitat.
• **Culvert effects** are assessed primarily through engineering performance rather than maintenance of ecological processes.

• **Hydraulic compliance** is assumed to maintain ecological function without demonstration.
• **Natural channel morphology, substrate diversity, hydraulic variability and habitat complexity** are permanently altered within culverted reaches.
• **Spawning habitat, nursery habitat, refuge habitat and feeding habitat** cannot be maintained solely through fish passage provision.
• **Riparian-stream interactions, groundwater exchange, sediment transport and organic matter processing** are altered by culverting but receive limited consideration in the effects assessment.
• **Fish habitat extends beyond the culvert footprint**, yet ecological effects are largely assessed within the engineered channel.
• **Multiple culverts** are assessed individually despite progressively fragmenting habitat and ecological connectivity across the catchment.
• **Cumulative effects** of multiple culverts on fish populations, dispersal and recolonisation are underestimated.
• **Post-construction ecological performance** is assumed rather than demonstrated.
• **Uncertainty regarding culvert performance** does not materially alter effect significance or residual effects because habitat values have already been reduced.
• **Failure of culverts to maintain ecological function** would have limited influence on the final assessment because effect magnitude has already been determined by reduced habitat values.

KEY FINDING

The assessment assumes that maintaining fish passage through engineered culverts is equivalent to maintaining natural stream ecosystem function. Culvert effects are therefore systematically underestimated because ecological function, cumulative fragmentation and long-term fish population outcomes are not fully incorporated into the assessment.

STREAM RECLAMATION AND REALIGNMENT

Stream Realignment

• **Stream realignment effects** are assessed using habitat values and effect magnitudes already reduced through the Section 4 assessment.
• **Replacement channels** are assumed to restore ecological function despite acknowledged uncertainty.
• **Ecological equivalence** is inferred rather than demonstrated.
• **Replacement stream length** is substituted for habitat quality, ecological function and life-history value.
• **Natural channel evolution** is replaced by engineered channel design.
• **Geomorphic processes**, including sediment transport, channel adjustment and floodplain interaction, require prolonged recovery and cannot be immediately recreated.

• **Habitat complexity**, including pools, riffles, undercut banks, woody debris and natural substrate diversity, develops over extended timeframes and cannot be assumed following construction.
• **Riparian vegetation** requires many years to provide shading, bank stability, organic matter inputs and spawning habitat comparable to natural channels.
• **Groundwater–surface water interactions** and natural flow permanence may differ from the original stream.
• **Spawning habitat, nursery habitat, refuge habitat and feeding habitat** are assumed to recover despite limited supporting evidence.
• **Species-specific habitat requirements** for banded kōkopu, longfin eel, lamprey and juvenile galaxiids are not explicitly demonstrated.
• **Fish passage through a replacement channel** does not demonstrate restoration of ecological function.
• **Monitoring** is primarily directed towards channel establishment rather than long-term ecological function or fish population persistence.
• **Uncertainty regarding habitat recovery** does not materially alter effect significance because habitat values and effect magnitudes have already been reduced.
• **Failure of replacement channels to achieve ecological function** would have limited influence on residual effects because the assessment has already concluded that effects are less than minor.

KEY FINDING

The assessment assumes that engineered stream realignments will achieve ecological equivalence with natural channels.
This assumption is not demonstrated, yet it underpins the conclusion that residual effects on freshwater fish remain low.
The assessment assumes successful mitigation rather than evaluating the consequences if mitigation fails to achieve the intended ecological outcome.
Because habitat values and effect magnitudes have already been reduced, uncertainty regarding mitigation success has little influence on the final assessment of residual effects.

TABLE 11

• **Table 11** is the primary framework determining fish habitat values, effect magnitude, fish passage requirements, mitigation and residual effects.
• **Ecological values assigned in Table 11** are derived from modified assessment methodologies rather than recognised freshwater ecological assessment practice.
• **Value derivation** is insufficiently transparent and cannot be independently reproduced.
• **Numerous streams proposed for culverting and realignment** are assigned Negligible–Low or Low ecological values despite supporting indigenous fish habitat, ecological connectivity and life-history functions.

• **Headwater streams** are consistently assigned reduced values because of stream size, intermittent flow or naturally low fish abundance.
• **Fish abundance** is repeatedly substituted for ecological value.
• **Ecological condition** is repeatedly substituted for ecological value.
• **Threatened and At Risk species** are assigned reduced significance based on presumed low abundance rather than recognised conservation status.
• **Species abundance** is inferred without surveys capable of estimating abundance or population size.
• **Spawning habitat, recruitment habitat and migration corridors** receive limited weighting within ecological value assessments.
• **Ecological connectivity** is inadequately reflected within stream value assignments.
• **Species-specific habitat requirements** for banded kōkopu, longfin eel, lamprey and juvenile galaxiids are incompletely represented.
• **Fish habitat function** is substituted by surrogate measures including stream size, fish abundance, Fish IBI, upstream habitat assumptions and proportional stream length.
• **Catchment-scale averaging** reduces the apparent significance of local habitat loss.
• **Local ecological effects** are diluted by proportional stream-loss calculations despite permanent loss of natural habitat.
• **Modified stream values** directly reduce predicted effect magnitude.
• **Reduced effect magnitude** directly reduces fish passage requirements, mitigation and residual effects.
• **Ecological uncertainty** associated with stream mapping, fish surveys and habitat assessment is not reflected in Table 11 value assignments.
• **The methodology** progressively reduces ecological values before project effects are assessed.

KEY FINDING

Table 11 is the critical mechanism through which modified habitat values are translated into reduced ecological effects, fish passage requirements, mitigation and residual effects. Consequently, confidence in the freshwater fish assessment is fundamentally dependent upon the robustness of the value assignments within Table 11.

KEY TECHNICAL CRITICISMS

• Fish effects are founded on ecological values derived from modified assessment methodologies rather than recognised freshwater ecological assessment practice.
• Table 11 is the critical mechanism through which modified habitat values are translated into reduced effect magnitude, fish passage requirements, mitigation and residual effects.
• Fish habitat values assigned to streams proposed for culverting and realignment are systematically reduced despite supporting indigenous fish habitat, ecological connectivity and life-history functions.

• Habitat extent and proportional stream loss are repeatedly substituted for habitat function, ecological connectivity and conservation significance.
• Headwater and intermittent streams are consistently assigned reduced effects because of stream size and presumed low fish abundance rather than ecological function.
• Threatened and At Risk species are assigned reduced significance based on presumed abundance rather than recognised conservation status or demonstrated population assessment.
• Fish abundance is repeatedly substituted for ecological value despite the absence of surveys capable of estimating abundance or population size.
• Fish effects on spawning habitat, recruitment habitat, migration corridors and population resilience are incompletely assessed.
• Species-specific habitat requirements for banded kōkopu, longfin eel, lamprey and juvenile galaxiids are insufficiently incorporated into the effects assessment.
• Fish passage requirements are reduced through simplified upstream habitat assumptions rather than species ecology and catchment connectivity.
• Culvert effects are assessed primarily through engineering performance and fish passage rather than maintenance of natural stream ecosystem function.
• Stream realignment assumes ecological equivalence without demonstrating restoration of habitat quality, ecological processes or life-history functions.
• Catchment-scale averaging systematically dilutes local ecological effects and cumulative habitat loss.
• Cumulative fragmentation arising from multiple culverts and stream modifications is underestimated.
• Ecological uncertainty associated with incomplete stream mapping, fish surveys and habitat valuation is not reflected in effect significance.
• Residual effects remain low largely because habitat values and effect magnitudes have already been reduced before mitigation is evaluated.
• The assessment framework is largely insensitive to the success or failure of mitigation because predicted effects have been reduced at earlier stages of the assessment.
• Confidence in the assessment of freshwater fish effects is therefore substantially reduced.

BANDED KŌKOPU LIFE CYCLE

A CONNECTED CATCHMENT FROM HEADWATERS TO SEA



HEADWATERS

- Cool, clean, well-oxygenated streams in forested upland catchments
- Stable flows and natural habitats
- Critical for population resilience



TRIBUTARIES & WETLANDS

- Feeding and refuge
- Seasonal habitat
- High productivity
- Supports growth and condition

MAIN STEM – CORRIDOR

- Migration pathway
- Connects habitats
- Movement of juveniles and adults
- Maintains gene flow and population resilience



BANDED KŌKOPU

Galaxias fasciatus

- At Risk – Naturally Uncommon
- Native to New Zealand
- Adults live and breed in freshwater
- **Spawn in upland riparian margin habitat**
- Larvae drift to sea when they hatch
- Juveniles (whitebait) return to freshwater to grow to adulthood
- Requires connectivity across its entire life cycle



ESTUARY

- Transition habitat
- Tidal influence
- Feeding and growth
- Preparation for upstream migration



RIPARIAN MARGINS – SPAWNING HABITAT

- Banded kōkopu spawn in upland riparian vegetation above the high tide line
- Eggs laid above water level
- Requires cool, stable flows and dense vegetation
- Critical for successful recruitment



SEA

- Larvae drift to sea when they hatch
- Larval development in marine waters
- Disperse and grow before returning as juveniles (whitebait)



WHY CONNECTIVITY MATTERS

Banded kōkopu rely on a network of connected habitats from the mountains to the sea. Barriers, culverts and habitat loss at any point in this network can disrupt movement, reduce recruitment and threaten long-term population persistence.

4. ASSESSMENT OF EFFECTS ON FRESHWATER FISH

(Refer to FER Review Section 4)

OVERVIEW

The assessment of freshwater fish effects is dependent upon the ecological values assigned in Table 11. Where habitat values are underestimated, the magnitude, significance and residual effects of the Project are similarly underestimated. This section evaluates how modified habitat values are translated into the assessment of effects on freshwater fish.

EFFECTS ASSESSMENT

- Fish effects are assessed using habitat values derived from modified assessment methodologies.
- Reduced habitat values directly reduce effect magnitude and significance.
- Local habitat effects are diluted through catchment-scale averaging.
- Habitat extent is repeatedly substituted for ecological function.
- Uncertainty is generally resolved by assigning lower ecological values and lower effect ratings rather than applying a precautionary approach.

Key Finding

The assessment framework reduces predicted effects before mitigation is considered.

TABLE 11

- Table 11 is the primary framework determining fish habitat values, effect magnitude, fish passage requirements, mitigation and residual effects.
- Ecological values are derived from modified assessment methodologies rather than recognised freshwater ecological assessment practice.
- Value derivation is insufficiently transparent and cannot be independently reproduced.
- Streams proposed for culverting and realignment are commonly assigned Negligible–Low or Low values despite supporting indigenous fish habitat and ecological connectivity.
- Headwater streams are repeatedly assigned reduced values because of stream size, intermittent flow or naturally low fish abundance.
- Fish abundance and ecological condition are substituted for ecological value.
- Threatened and At Risk species are assigned reduced significance based on presumed abundance rather than conservation status.
- Spawning habitat, recruitment habitat and migration corridors receive limited weighting.
- Ecological connectivity is inadequately reflected within stream value assignments.
- Catchment-scale averaging reduces the apparent significance of local habitat loss.
- Modified habitat values directly reduce effect magnitude, fish passage requirements, mitigation and residual effects.

Key Finding

Table 11 is the principal mechanism through which modified habitat values are translated into reduced ecological effects.

FISH HABITAT EFFECTS

• Headwater streams are assigned low effects because of stream size and presumed low fish abundance rather than ecological function.
• Intermittent streams are assigned reduced significance despite recognised seasonal habitat values.
• Threatened and At Risk species are assigned reduced significance based on presumed abundance rather than conservation status.
• Species abundance is inferred without surveys capable of estimating population size.
• Longfin eel habitat is assigned reduced significance despite the species' Threatened status.
• Fish habitat effects are assessed by habitat extent rather than habitat function.
• Spawning habitat, recruitment habitat and migration corridors receive limited assessment.
• Population processes, including recruitment, recolonisation and resilience, are incompletely assessed.
• Incomplete stream mapping and survey uncertainty are not reflected in the assessment of effects.

KEY FINDING

Fish habitat effects are systematically underestimated through reduced habitat values and emphasis on habitat extent rather than ecological function.

4.4 FISH PASSAGE EFFECTS

• Fish passage requirements are determined by habitat values assigned in Table 11.
• Reduced habitat values directly reduce fish passage requirements.
• Upstream habitat assumptions are substituted for ecological function.
• Species-specific passage requirements receive limited consideration.
• Lamprey passage is not explicitly assessed.
• Downstream migration and juvenile recruitment receive limited consideration.
• Multiple barriers are assessed individually rather than cumulatively.
• Life-history connectivity linking spawning, recruitment and adult habitat is incompletely assessed.

KEY FINDING

Fish passage effects are systematically underestimated through simplified decision frameworks and reduced habitat values.

4.5 CULVERTING

• Table 11 habitat values directly determine the significance of culvert effects.

• Streams assigned Negligible–Low values receive correspondingly lower predicted culvert effects.
• Fish passage is treated as the principal ecological effect despite permanent modification of stream habitat.
• Hydraulic compliance is assumed to maintain ecological function without demonstration.
• Natural channel morphology, substrate diversity, hydraulic variability and habitat complexity are permanently altered.
• Spawning, nursery, refuge and feeding habitats cannot be maintained solely through fish passage provision.
• Riparian-stream interactions, groundwater exchange, sediment transport and organic matter processing receive limited consideration.
• Fish habitat extends beyond the culvert footprint.
• Multiple culverts progressively fragment ecological connectivity.
• Post-construction ecological performance is assumed rather than demonstrated.
• Failure of culverts to maintain ecological function would have limited influence on residual effects because habitat values and effect magnitudes have already been reduced.

KEY FINDING

Maintaining fish passage does not demonstrate maintenance of natural stream ecosystem function.

STREAM REALIGNMENT

• Stream realignment effects are assessed using habitat values already reduced through the assessment methodology.
• Replacement channels are assumed to restore ecological function despite acknowledged uncertainty.
• Ecological equivalence is inferred rather than demonstrated.
• Replacement stream length is substituted for habitat quality, ecological function and life-history value.
• Geomorphic processes, habitat complexity and riparian maturity require prolonged recovery.
• Species-specific habitat requirements are not explicitly demonstrated.
• Fish passage through replacement channels does not demonstrate restoration of ecological function.
• Uncertainty regarding habitat recovery does not materially alter effect significance.
• Failure of replacement channels to achieve ecological function would have limited influence on residual effects.

KEY FINDING

Replacement habitat is assumed to achieve ecological equivalence without sufficient supporting evidence.

RESIDUAL EFFECTS

• Residual effects remain low because habitat values and effect magnitudes have already been reduced.
• Mitigation success has limited influence on final significance ratings.
• Failure of mitigation would have limited influence on reported residual effects.
• Catchment-scale averaging further reduces residual effects.

KEY FINDING

Residual effects reflect the assessment methodology more than ecological outcomes.

KEY TECHNICAL CRITICISMS

• Modified habitat values reduce predicted fish effects.
• Table 11 is the principal mechanism reducing effect significance.
• Habitat extent is substituted for ecological function.
• Conservation status is overridden by presumed abundance.
• Fish abundance is substituted for ecological value.
• Fish passage relies on simplified habitat assumptions.
• Culvert effects focus on engineering compliance rather than ecological function.
• Stream realignment assumes ecological equivalence.
• Catchment-scale averaging dilutes local ecological effects.
• Residual effects are reduced by methodology rather than demonstrated ecological outcomes.
• The assessment framework is largely insensitive to the success or failure of mitigation because predicted effects have already been reduced.
• Confidence in the assessment of freshwater fish effects is therefore substantially reduced.

5. FISH PASSAGE, MITIGATION AND MANAGEMENT

OVERVIEW

The management recommendations presented in the FER are founded on the ecological values and effects assessment developed in previous sections. Consequently, where habitat values and effect significance have been reduced through modified assessment methodologies, the proposed avoidance, mitigation, monitoring and offsetting requirements are similarly reduced. Rather than independently managing ecological risk, the recommendations largely reinforce conclusions already reached through the assessment framework.

EFFECTS MANAGEMENT

• Effects management recommendations inherit the methodological deficiencies identified throughout Sections 3 and 4.
• Modified ecological values, bespoke value classifications, catchment-scale magnitude thresholds and reduced effect ratings directly determine management responses.
• The recommendations assume residual effects remain less than minor even where stream realignment objectives are not achieved, culvert performance is poor or fish passage is interrupted.
• Mitigation measures become discretionary rather than ecologically necessary because acceptable outcomes have already been concluded.
• The effects management hierarchy is weakened because habitat values are reduced before avoidance is considered.
• Ecological uncertainty is not reflected through a precautionary management response.

KEY FINDING

Management recommendations reinforce predetermined assessment outcomes rather than independently managing ecological risk.

AVOIDANCE OF FRESHWATER EFFECTS

• Habitat loss is accepted where effects have already been reduced through catchment-scale averaging and modified magnitude thresholds.
• Avoidance is subordinated to predetermined low effect ratings rather than ecological significance.
• The assessment progressively transfers modified ecological assumptions into detailed design, construction management and environmental management plans.
• Reduced ecological values underpin subsequent decisions regarding avoidance, mitigation, monitoring and offsetting.

• Acceptance of these methodologies risks embedding modified assessment approaches throughout subsequent stages of the Project.

• Wider adoption within future NZTA projects risks normalising departures from recognised freshwater ecological assessment practice.

KEY FINDING

Modified ecological assumptions progressively influence all subsequent project design and management decisions.

WATERWAYS AS HABITAT

STREAM RECLAMATION

• Stream reclamation assumes ecological function can be maintained through replication of channel form, flow, velocity, substrate and riparian condition.

• Ecological equivalence is assumed despite limited supporting evidence.

• Published restoration science demonstrates that engineered channels typically retain lower ecological value than natural streams.

• Residual effects remain less than minor even where stream realignment objectives are not achieved.

• Mitigation success has little influence on final effect significance.

• Catchment-scale averaging removes the ecological imperative for successful implementation, monitoring and adaptive management.

KEY FINDING

Stream reclamation assumes ecological equivalence while the assessment remains largely insensitive to mitigation success.

CULVERT DESIGN

• Recommended design measures largely reflect minimum regulatory requirements rather than ecological mitigation.

• Compliance with baseline fish passage standards is presented as evidence that stream values are maintained.

• Engineering compliance is substituted for ecological function.

• Successful fish passage does not demonstrate maintenance of natural stream ecosystem processes.

• Residual effects remain less than minor even where culvert performance or fish passage objectives are not achieved.

• Poor culvert performance is effectively accepted where affected stream length represents a small proportion of the catchment.

KEY FINDING

Baseline engineering standards should not be presented as evidence of ecological equivalence or successful mitigation.

STREAM REALIGNMENT

• Design recommendations assume physical channel form equates to ecological function.

• Natural geomorphic, hydrological and groundwater processes cannot be recreated through engineered channel dimensions alone.

• Rapid ecological recovery following stream realignment is assumed without supporting monitoring evidence.

• Recommendations rely upon ecological equivalence that has not been demonstrated.

• Residual effects remain less than minor regardless of uncertainty regarding habitat recovery.

KEY FINDING

Successful channel construction does not demonstrate restoration of natural stream ecosystem function.

STREAM REALIGNMENT AT SPOIL SITES

• Stream establishment on engineered spoil material remains highly uncertain.

• Stream permanence, groundwater interaction and aquatic habitat development cannot be assumed.

• A “trial-and-error” approach to stream establishment is inconsistent with the effects management hierarchy.

• Compensation is proposed should mitigation fail, rather than demonstrating mitigation effectiveness before implementation.

• Ecological function on engineered spoil is assumed rather than demonstrated.

• Long-term monitoring evidence supporting ecological equivalence is absent.

KEY FINDING

Mitigation should be demonstrated to be effective before being relied upon to offset permanent habitat loss.

NATURAL INLAND WETLANDS

• Wetland management recommendations inherit modified value assessments developed earlier in the FER.

• Ecological condition is repeatedly substituted for ecological value.

• Supposedly exotic-dominated wetlands are assigned reduced significance despite remaining natural inland wetlands.

• Wetland hydrology, ecological processes and restoration potential receive insufficient weighting.

• Vegetation composition is given greater emphasis than hydrological function and ecosystem processes.

• Hydrological connectivity, fish passage and landscape context are inadequately incorporated into management decisions.

• Subjective wetland value assessments directly reduce management requirements.

• The NPS-FM values framework is applied as though it were a quantitative scoring methodology rather than as a framework to identify values for protection as was intended.

KEY FINDING

Management recommendations underestimate the ecological significance of natural inland wetlands because they are founded on modified value assessments rather than recognised wetland assessment practice.

5.5 GROUNDWATER DRAWDOWN

• Groundwater management recommendations inherit the uncertainties identified in the ecological interpretation of the groundwater assessment.

• The Groundwater Effects Report (EGW) defers the assessment of ecological consequences for streams, wetlands and freshwater ecosystems to the Freshwater Ecology Report (FER), meaning the acceptability of groundwater effects is fundamentally dependent on the FER ecological assessment.

• Consequently, any deficiencies in stream mapping, habitat valuation, fish habitat assessment or wetland assessment within the FER are propagated into the groundwater assessment and its conclusions regarding acceptable environmental effects.

• The assessment accepts that groundwater drawdown may convert perennial streams to intermittent systems, intermittent streams to ephemeral channels and reduce wetland extent, yet these changes are repeatedly assessed as less than minor because affected habitats are considered small or of low value.

• Fundamental changes to hydrological regime, habitat permanence, water temperature, dissolved oxygen, refuge availability, fish access and ecosystem processes are understated despite representing ecosystem-scale changes.

• Headwater streams and wetlands continue to be discounted because they are assumed, through flawed mapping, to be intermittent, ephemeral or support few fish without any assessment of population abundance, rather than being evaluated according to their hydrological and ecological function.

• Field surveys recorded banded kōkopu within upper headwater systems, demonstrating that these habitats support At Risk – Naturally Uncommon species despite naturally low abundance. Low abundance should not be interpreted as low ecological significance.

• The ecological interpretation gives limited weight to project-specific groundwater model uncertainty, despite the groundwater assessment acknowledging that stream-flow reductions cannot be quantified for individual realigned streams without detailed design.

• Groundwater monitoring is limited and does not adequately address the Waihoihoi and Ahuroa catchments where uncertainty regarding stream depletion and wetland hydrology remains greatest.

• Management recommendations do not incorporate a precautionary response proportionate to the uncertainty surrounding groundwater drawdown effects on streams, wetlands and freshwater fish habitat.

KEY FINDING

Because the Groundwater Effects Report defers the ecological acceptability of groundwater drawdown to the Freshwater Ecology Report, confidence in the groundwater management recommendations is fundamentally dependent on the robustness of the FER ecological assessment. Where ecological values and effects have been underestimated within the FER, the groundwater assessment similarly underestimates the potential ecological consequences of altered stream permanence, wetland hydrology and freshwater fish habitat.

KEY TECHNICAL CRITICISMS

• Management recommendations are founded on modified ecological values and reduced effect significance.

• The effects management hierarchy is weakened because avoidance follows predetermined low ecological values.

• Stream reclamation assumes ecological equivalence despite acknowledged uncertainty.

• Culvert design relies on minimum engineering standards rather than demonstrated ecological outcomes.

• Stream realignment recommendations assume successful habitat recovery without supporting evidence.

• Trial-and-error stream establishment at spoil sites is inconsistent with the effects management hierarchy.

• Wetland management inherits modified ecological value assessments that under-recognise hydrological function and ecosystem processes.

• Groundwater management remains constrained by uncertainties identified in the Freshwater report

• The assessment framework is largely insensitive to mitigation success because habitat values and effects have already been reduced.

• Acceptance of these methodologies risks establishing a precedent for future Northland Corridor stages and NZTA infrastructure projects whereby non-standard assessment approaches systematically reduce freshwater ecological values, effects and management requirements.

6. OVERALL OPINION

This review concludes that the assessment of freshwater fish values, project effects and management presented in the freshwater ecology report (fer) is founded on a series of interconnected methodological decisions that collectively underestimate the ecological significance of indigenous freshwater fish habitats and the potential effects of the project. The review identifies a consistent progression of errors throughout the assessment.

• the ecological baseline is incomplete because headwater, intermittent and ephemeral streams are incompletely mapped, fish survey effort is insufficient for several species, and limitations associated with edna interpretation, fish ibi application and lamprey detection reduce confidence in the characterisation of freshwater fish communities.
• headwater streams are systematically undervalued despite their recognised role in spawning, juvenile recruitment, refuge habitat, food-web production, ecological connectivity and downstream ecosystem processes. Stream size, fish abundance and ecological condition are repeatedly substituted for ecological function.
• fish habitat values are derived using modified assessment methodologies that rely on surrogate measures including stream size, fish ibi, upstream habitat assumptions, proportional stream length and catchment-scale averaging, rather than recognised freshwater ecological assessment practice.
• threatened and at risk species, including longfin eel and banded kōkopu, are repeatedly assigned reduced significance based on presumed low abundance rather than recognised conservation status, habitat function or demonstrated population assessment.
• table 11 forms the critical decision-making framework underpinning habitat values, effect magnitude, fish passage requirements, mitigation and residual effects. However, the methodology used to derive these ecological values is insufficiently transparent and not independently reproducible.
• fish effects are consequently underestimated through reduced habitat values, catchment-scale averaging, proportional stream-loss assessments and limited consideration of spawning habitat, recruitment, ecological connectivity and complete life-history processes.
• fish passage requirements are simplified through upstream habitat assumptions and reduced habitat values, while culvert performance is primarily assessed against engineering criteria rather than demonstrated maintenance of natural stream ecosystem function.
• stream reclamation and realignment assume ecological equivalence despite acknowledged uncertainty regarding habitat recovery, geomorphic development, groundwater interactions and restoration of ecological processes.
• groundwater drawdown has the potential to alter stream permanence, wetland hydrology and freshwater fish habitat. However, the groundwater effects report defers assessment of ecological acceptability to the fer, meaning that deficiencies in the freshwater ecological assessment directly influence confidence in the groundwater conclusions and associated management recommendations.

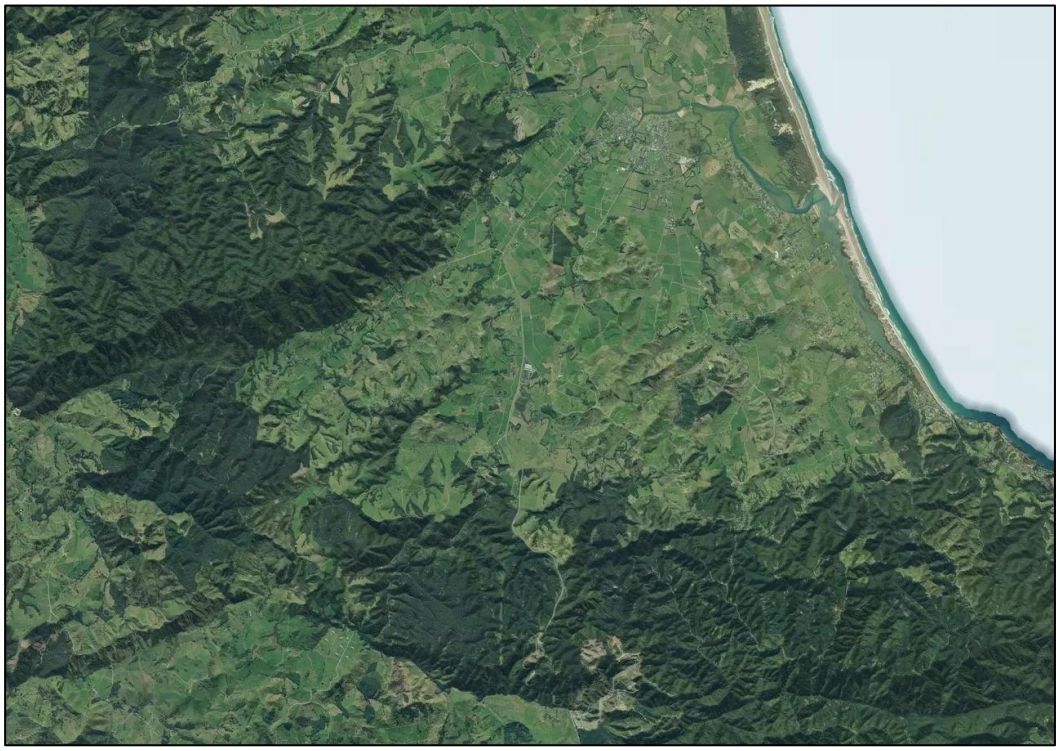
• management, mitigation, monitoring and adaptive management recommendations inherit the reduced habitat values and effect assessments established earlier in the fer. Consequently, the assessment framework is largely insensitive to whether mitigation succeeds in maintaining ecological function because residual effects have already been assessed as low.
Collectively, these methodological decisions reduce confidence that the fer accurately characterises freshwater fish habitat values, ecological connectivity, project effects or the effectiveness of the proposed management framework.

A primary concern extends beyond the current Project. If adopted during future stages of the Northland Corridor, or more broadly within future NZTA infrastructure projects, these methodologies risk establishing a precedent whereby non-standard ecological assessment approaches progressively replace recognised New Zealand freshwater ecological assessment practice. Such an outcome has the potential to systematically underestimate freshwater fish habitat values, ecological connectivity, project effects and management requirements across future infrastructure projects.

Freshwater fish populations are sustained by connected habitat networks and complete life-history processes rather than isolated stream reaches. Robust ecological assessment should therefore evaluate ecological function, species-specific habitat requirements, population resilience and catchment connectivity rather than relying on surrogate measures such as stream size, fish abundance & upstream habitat assumptions or proportional stream loss.

The central issue identified by this review is the flawed assessment framework cascade through which those effects are identified, valued and managed and it's use to underpin the wider project's construction and technical reporting . Until the freshwater ecological assessment is revisited using recognised, transparent and repeatable methodologies consistent with contemporary freshwater science, confidence in the freshwater fish conclusions presented in the FER remains substantially reduced.

Technical Review of Ecological Reporting prepared for the Northern Corridor Section 2B for Waka Kōtahi NZTA



Prepared for:
Te Pouwhenua o Tiakiriri Kukupa Trust
June 2026

Document Quality Assurance

Document Version	Action	Name	Signed	Date
1.0	Prepared by	Jacqui Wairepo Director|Principal Fauna Ecologist Kūkūwai Consulting Ltd		12 June 2026

Cover image:Arial image of Brynderwyn to Waipu and landscape within Section 2B of the Northern Corridor. Image Sourced from Whangārei District Council GIS Viewer.

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1. INTRODUCTION

This report presents an independent peer review of the following four separate documents prepared for the proposed 'Alternative to Brynderwyn Section 2B' project by Waka Kōtahi, NZTA:

i) Assessment of Effects on Terrestrial Ecology
ii) Assessment of Effects on Avifauna Ecology
iii) Wildlife Approval Application
iv) Proposed Designation Conditions

The purpose of this review is to evaluate the information, methods, analyses, and conclusions provided in these assessments as they relate to terrestrial wildlife of conservation and cultural significance and to inform a Cultural Impact Assessment prepared by Te Parawhau Hapū on behalf of Te Pouwhenua o Tiakiriri Kukupa Trust.

The intention of this review is not to replicate the original ecological assessment, but to independently evaluate whether the information presented provides a sufficiently robust basis for understanding the magnitude and level of effects on indigenous wildlife values within the Section 2B Project Designation (hereafter referred to as 'PD). Particular consideration is given to:

- the adequacy of survey methodologies and survey effort;
- the identification of species presence, distribution, abundance, and habitat use;
- the identification and evaluation of actual and potential effects;
- the treatment of uncertainty and information gaps;
- the appropriateness of proposed avoidance, mitigation and management of residual effects measures; and
- whether the overall assessments, conclusions and recommendations are supported by the available evidence, current local ecological knowledge and best practice management of effects.

This review has been prepared to assist in understanding the potential implications of the proposal for terrestrial wildlife species and ecosystems that hold ecological significance and may also contribute to the cultural values associated with indigenous biodiversity. The review therefore considers not only the technical ecological findings presented in the assessment, but also the degree to which uncertainty, risk, and potential adverse effects have been appropriately recognised and addressed.

Field surveys underpinning the ecological assessments vary in scope and intensity. Some species such as long-tailed bats (*Chalinolobus tuberculatus;* Threatened-Nationally Critical), kauri snails (*Paryphanta busbyi busbyi;* At-Risk Declining*)* and lizards were surveyed fairly intensively across representative habitat types; however, survey durations were limited to relatively short periods when considering the scale of the project and the known low detection probabilities for each taxa. Avifauna surveys combined opportunistic counts with desktop records, providing reasonable species lists but limited field effort with

an assumed ‘presence’ status in-place of dedicated surveys. These differences in survey intensity inform the confidence and uncertainty associated with the effects assessments described within each report.

All ecological assessments have applied the Ecological Institute of Australia and New Zealand (‘EIANZ’) Ecological Impact Assessment (‘EcIA’) framework to classify ecological value, magnitude and level of potential effects. Where mitigation has been proposed, the effectiveness is critically assessed against documented evidence and best-practice ecological understanding, with a strong-focus on ecosystem and species value within the local and regional context. This review identifies areas where assumptions may overstate the likely success of mitigation efforts, particularly for translocation or habitat restoration measures.

The following sections provide a species-specific review of the assessments as they relates to each group of terrestrial fauna (lizards, kauri snails, Hochstetter's frogs, and long-tailed bats) in the following structure:

i) **Assessment of Framework:** This section provides an overview of the taxa and methods being assessed.
ii) **Assessment of Effects:** This section discusses the reported actual and potential effects associated with the PD. Magnitude, level and residual effects are evaluated and critically assessed for appropriateness.
iii) **Management of Effects:** This section discusses the proposed management for each taxa based on the level of effects that have been assessed in the earlier section. A critical assessment has been made to determine whether or not residual effects assessments are adequate.
iv) **Reliability of Assessment:** This section discusses assumptions that have been made that underpin assessments of value and impact. Where there are flawed assumptions or assumptions based on a high level of uncertainty, an overall assessment is provided on whether or not the information received to-date is reliable enough to adequately inform various decision-making processes.

The Wildlife Approval and proposed Designation Conditions documents were also reviewed alongside the technical reports submitted as part of the Substantive Application for this project. Critical assessment of those activities being proposed and omitted from the Wildlife Approval application are provided. Proposed conditions associated with the PD have also been reviewed with commentary provided on overall suitability and suggested additions or alternatives.

This report is written as a standalone document to be reviewed alongside a similar report prepared by Bay Ecological Consultancy for Freshwater, Fish and Botanical (Vegetation) values and effects for the project.

2. EXECUTIVE SUMMARY

This Technical Review evaluates ecological assessments for terrestrial fauna and avifauna within the overall PD, with particular attention to the robustness of baseline data (where available), the validity of effects assessments, and the appropriateness of the proposed mitigation package.

Vegetation and habitat values within the PD are dominated by modified pasture and plantation forest, with areas of indigenous forest and wetland habitat supporting higher ecological values. Significant Natural Areas (SNAs) and smaller remnant forest patches provide habitat for several 'Threatened' and 'At-Risk' wildlife species including lizards, kauri snails, and long-tailed bats, which appear to generally be present at low densities and in a patchy distribution across the landscape. Long-tailed bats are highly mobile, and survey effort is considered as relatively limited from a duration perspective, when considering their large home-range and detectability challenges. Adverse effects to indigenous fauna include injury, mortality and displacement together with habitat loss and fragmentation, with post-mitigation effects generally assessed as 'Low' to 'Very Low' in most cases. However, confidence in these assessments is lacking due to an overall limited survey duration, challenges associated with detecting highly cryptic species, and an over-reliance on the uncertain management outcomes of animal salvage, relocation and habitat enhancement as the main mitigation tools. Additional proposed mitigation measures including the restoration of grazed pasture and pre-harvested forestry landscapes together with limited duration pest and weed control have been proposed to reduce residual effects associated with habitat loss. However, the confidence in the effectiveness of these measures is moderate at best, with uncertainties arising from the significant time lag for restored vegetation to achieve sufficient complexity at the 'micro-level' required by lizards, frogs and invertebrates and at the 'maturity-level' required by bats and birds. The overall time it will take for newly restored landscapes to reach ecological functionality and equivalence likely exceeds the accepted timeframes that would adequately offset the residual effects associated with the scale and intensity of this project.

Freshwater ecosystems support the most significant quantified ecological effects, particularly for Hochstetter's frog (*Leiopelma hochstetteri;* At-Risk Declining*)*, which occurs in relatively high densities in forested streams and lower densities in modified systems within the plantation forestry area. Impacts include substantial stream habitat loss and fragmentation with potentially up to 35,000 frogs to be impacted by the project.

Although mitigation includes habitat enhancement and relocation of frogs to multiple sites, including a suggestion to try and retain riparian habitats within harvested plantation environments, there is no certainty or evidence to support either the short or long-term viability of these measures. There is a distinct lack of research and knowledge around how to successfully translocate and monitor Hochstetter's frogs in general. This means that any and all proposed mitigation measures are un-tested and cannot automatically be assumed to succeed. A conservative assessment that residual effects associated with the loss of both salvaged and un-salvaged frogs should assume that a high proportion of frogs will die as a direct or indirect result of salvage and that residual effects are likely to be significant, particularly where mitigation sites may not yet provide equivalent ecological function or carrying capacity to support thousands (or tens of thousands) of additional frogs.

Avifauna assessments identify a range of Threatened and At-Risk species associated primarily with wetland and indigenous vegetation habitats. High unmitigated effects are identified for several cryptic marshbird species including the Threatened Australasian bittern| Matuku-hūrepo (*Botaurus poiciloptilus)*, and Moderate effects for North Island kākā (*Nestor meridionalis)*. Very limited emphasis has been placed on the presence of North Island kiwi (*Apteryx mantelli;* Not Threatened), likely due to its 'Not Threatened' status and the limited records available for their distribution throughout the area. There is, however, abundant local knowledge and substantial community involvement with protecting and preserving this species and its habitat. General mitigation measures proposed for avifauna include seasonal constraints on vegetation clearance, nesting protection protocols, habitat replacement, and lighting controls. These measures are expected to reduce residual effects to Low–Very Low. The reliability of this outcome is dependent on effective implementation and detection of cryptic breeding species during pre-clearance surveys. Dedicated management for kiwi should be included in a manner that is consistent with other similar roading projects. Measures should involve specialised kiwi handlers using detection dogs and radio-tracking activities to ensure resident kiwi are not impacted by construction activities.

Overall, while the assessments provide a structured and generally consistent application of the EIANZ EcIA framework, they rely heavily on mitigation effectiveness assumptions and limited field data for several key taxa. This consistently results in a final post-mitigation 'level of effects' assessment that falls beneath the 'Moderate' threshold that has been set for the requirement of any Offsetting or Compensation measures to be applied. The greatest areas of uncertainty relate to Hochstetter's frog, cryptic wetland birds, and poorly detected, low-mobility terrestrial fauna. The key risk of assuming mitigation success is that mitigation measures beyond avoidance protocols (i.e., bat and bird-focussed protocols) and salvage (i.e., lizard and invertebrate-focussed protocols) will be inadequate and result in short, medium and long-term losses of biodiversity values within the local landscape.

Key Concerns:

- **Terrestrial fauna:** Detection of cryptic species (lizards, kauri snails) is limited; population densities and distributions are uncertain. Survey duration offers a snapshot within a subset of single field season only and therefore the assessment for bats does not provide a high level of confidence in absence and/or low-pass rate data. Mitigation effectiveness for lizards and kauri snails remains largely unknown while Hochstetter's frog salvage outcomes remain completely un-tested.
- **Avifauna:** Seasonal and cryptic nesting species may be missed despite the records and observations of several species making use of scattered wetlands throughout areas of local pasture. The effectiveness of management measures depends on timing, thoroughness of surveys, and habitat replacement success. Confidence in Low–Very Low residual effect estimates is moderate and will likely only be achieved in the medium-long term once created wetlands achieve ecological functionality, resulting in much higher initial residual effects for many years, potentially decades.
- **Overall:** Desktop and baseline field survey data are generally robust for more detectable species, but less so for some of the most ecologically sensitive taxa (i.e., those that are cryptic, low-density and/or of low-mobility). All assessments assume mitigation will be successfully implemented

despite a well-known lack of evidence to support the success of mitigation salvage for kauri snails, lizards and frogs. Cumulative effects on At-Risk and Threatened fauna are unaddressed in the context of an already highly modified landscape and the wider project impacts associated with subsequent sections of the Northern Corridor. Other than mentioning bat 'hop-overs', there is a lack of discussion or emphasis on providing immediate habitat replacement features for them. There is no discussion around the potential long-term genetic impacts of creating significant fragmentation within the forest and rural areas for species such as kauri snails or lizards that will become locked within a central island between the old and new SH1 roads within the Brynderwyns.

- **Recommendations**: Further targeted surveys for long-tailed bats, kiwi and bittern should be implemented over several seasons well in advance of construction to ensure that the alignment avoids areas of critical roosting, breeding and foraging habitat. Restoration activities should be staged to commence immediately following Fast Track Approval (if approved). Targeted trials on how to salvage, relocate and monitor Hochstetter's frogs should be prioritised in co-ordination with DOC's Frog Recovery Group experts to address key information gaps around their biological and ecological requirements. A quantified approach should be taken quickly to ensure that adequate stream restoration lengths will be provided to take thousands, if not tens of thousands of frogs. These should be prepared and tested with urgency.

3. LIZARDS

3.1 Assessment framework

The lizard assessment is based on a combination of desktop reviews, field surveys and habitat assessments undertaken across a range of habitats throughout the PD. Survey methods included Manual Habitat Searches (MHS, 52-person search hours), Artificial Cover Object (ACO, 165 double-layered stacks, clustered within 14 sites) deployment and nocturnal spotlighting (49-person search hours), supported by opportunistic observations during site walkovers. These methods are appropriate for detecting terrestrial and arboreal lizard species and are consistent with the accepted range of methods used in New Zealand. The distribution of survey effort covered a range of representative habitat types within the project designation; however, only very limited survey effort was undertaken within the central plantation forestry area and ACOs were typically checked during the hours that skinks would have been out foraging.

The report identifies copper skink (*Oligosoma aeneum*) as the only indigenous lizard species detected by the surveys (15 individuals found), with multiple skinks detected across the northern portion of the alignment. Both Pacific gecko (*Dactylocnemis pacificus*) and elegant gecko (*Naultinus elegans*) are known to be present within the Brynderwyn Forest Complex based on limited desktop records and anecdotal landowner observations. It is unknown how much survey effort has occurred within various parts of the Brynderwyns however, and therefore low records and observations cannot be assumed as representative of low density. Other At-Risk lizards including ornate skink (*O. ornatum)* and forest gecko (*Mokopirirakau granulatus)* are also likely to be present; however, remain unconfirmed. The ecological value assigned to

confirmed and potential species is generally appropriate under EIANZ EcIA guidance, with At-Risk taxa appropriately treated as being of 'High' ecological value.

Habitat assessments within the report are reasonably detailed, describing a mosaic of pasture, exotic plantation, native forest fragments, wetlands, and modified edge habitats. Copper skinks were found to use a wide range of these habitats, particularly those areas with structural cover such as large rotting logs, while gecko species are suggested to occupy higher quality native forest fragments. These findings and suggestions are supported, as evidenced by several other projects within the local landscape in recent years that have come to the same conclusions.

3.2 Assessment of Effects

The assessment of overall 'Low' mortality to lizards post-mitigation appears to place weight on the absence or low abundance of both skinks and geckos despite relatively limited survey effort due to timing constraints. Skink surveys relied mostly on transects of Artificial Cover Objects (ACOs) while geckos were surveyed over six nights of nocturnal spotlighting. Both survey techniques were limited to areas with adequate access which in-part limited the range of habitats that could be effectively searched. While the total survey effort is reported as multiple observers over six nights totalling 49-person search hours, the actual spatial coverage of the surveys appears more limited than the reported survey effort suggests, and maps of spotlighting transects have not been provided to confirm this. It is likely that amongst the team undertaking the survey work, experience in spotlighting surveys and detecting nocturnal geckos may have been quite variable which further adds to the uncertainty of survey results. The adequacy of the survey effort is critical to determining the overall magnitude and level of effects both before and after mitigation activities are applied. Assumptions of low-density populations can lead to an under-assessment of the true suite of actual and potential effects which can result in losses of lizards, local population impacts and residual habitat loss.

The assessment of unmitigated effects identifies habitat loss, fragmentation, displacement, injury and mortality during vegetation clearance, as well as indirect disturbance effects associated with noise, vibration, lighting, and dust (Figure 1). The range of potential effects identified is consistent with those typically associated with large-scale infrastructure and roading projects.

However, there are several aspects of the assessment that appear to underestimate the potential magnitude of effects on lizards, particularly copper skinks and other species that utilise edge habitats and structurally complex vegetation. The assessment relies heavily on the low number of lizard detections to conclude low population densities across much of the PD. While low detection rates are common for lizard surveys in dense and complex habitats, low detectability should not automatically be interpreted as evidence of low abundance. This is especially relevant where important habitat features such as edge habitats and key refugia for copper skinks will be disproportionately affected by the project footprint.

Table 25: Unmitigated and mitigated level of effects on native lizards confirmed on site (copper skink). Effects in bold warrant further measures to offset or compensate for these effects

Potential Effects on native lizards	Species	Ecological Value	Unmitigated magnitude of effect	Unmitigated level of effect	Mitigation	Mitigated magnitude of effect	Mitigated overall level of effect
Permanent Effects							
Habitat loss	Copper skink	High	Moderate	High	• Minimisation through detailed design and construction methodology • Mitigation planting and enhancement of existing native vegetation at the three Mitigation Sites	Low	Low
Habitat fragmentation	Copper skink	High	Moderate	High	• Reduce fragmentation and edge effects at North and South Mitigation Sites through stock exclusion, pest control and infill and remediation planting. • Creation of habitat at the Central Mitigation site, providing higher quality connectivity between other habitat within the landscape.	Low	Low
Temporary - Construction Phase / Short to Medium term							
Injury or death during habitat removal and displacement.	At Risk – Declining species	High	Moderate	High	• Salvage and relocation within appropriate seasonal constraints.	Low	Low
	Not Threatened species	Moderate	Moderate	Moderate		Low	Low

Figure 1: Table 25 of the EcIA identifying unmitigated and mitigated magnitude and level of effects on lizards.

Habitat Fragmentation: Habitat fragmentation is appropriately identified as one of the key adverse effects associated with the project. The report recognises that the proposed motorway will create a barrier to movement and connectivity; however, the significance of this effect is subsequently reduced on the basis that only a small proportion of available habitat will be affected relative to the wider landscape.

The key risk to this approach is that it oversimplifies the ecological consequences of fragmentation and potentially underestimates the cumulative effects on lizard populations in an already highly fragmented landscape. Habitat use by copper skinks is likely to occur throughout varying habitat types across the PD, including forest margins, riparian areas, regenerating vegetation and other edge habitats. The ecological function of these habitats is influenced not only by their extent but also by their connectivity.

Of particular concern are the areas that will remain isolated between the existing SH1 corridor and the proposed new alignment. Over time, habitat isolation within these areas has the potential to result in reduced dispersal opportunities, genetic isolation and breeding recruitment limitations. These effects are likely to be cumulative throughout much of the PD and the ongoing additional sections of the Northern Corridor, rather than being confined to a single project section or designation. Given the acknowledged uncertainty surrounding lizard distribution and abundance, a more precautionary assessment is both appropriate and consistent with the EcIA framework being used. Where data is lacking, low detection rates should not be used to automatically assume low population densities, especially where lizard detection probabilities have not been quantified. The risk of this approach is that it automatically supports a conclusion of 'Low' residual effects, despite the uncertainty surrounding those assumptions.

The assessment also provides only limited consideration of how movement between forest fragments, riparian corridors, and edge habitats may be disrupted over the long term. These connectivity effects are likely to be an important determinant of population persistence and resilience, particularly for species that do actually occur at low densities such as elegant gecko and Pacific gecko that are known to be present within Brynderwyn forest.

Injury and Mortality Risk: The risks associated with injury and/or mortality during construction activities are identified within the assessment; however, the significance of these risks is reduced in-part on the basis of perceived low abundance and an assumption that all (or a high proportion of) salvaged lizards will survive the relocation process. While this is a common assumption, it is inherently flawed due to a distinct lack of evidence to support the overall outcome (successful or otherwise) of lizard mitigation-

translocations. It is a general 'rule of thumb' that herpetologists will only ever salvage an unknown proportion of a population, and that an unknown proportion of those salvaged will survive and recruit into the existing resident population of the relevant species. This concept is not acknowledged within the effects assessment.

Post-Mitigation Effects: Following mitigation, the assessment concludes that residual effects for all lizard species will be reduced to Low. This conclusion is based on a suite of standard mitigation measures including habitat enhancement, pest control, connectivity planting, salvage and relocation, and implementation of broader ecological management measures that will be prepared as an Ecological Management Plan (yet to be prepared and submitted, but likely requested as a condition of consent).

While these mitigation measures are generally appropriate, the assumption of low-density lizard populations and a high proportion of post-salvage survivorship is further compounded by the assumption that restoration and enhancement measures will provide suitably complex and functional replacement habitat within an ecologically meaningful timeframe. However, little evidence is provided to demonstrate when restored habitats are expected to achieve the structural complexity, refuge availability, and ecological functionality required to support self-sustaining lizard populations. In many cases, restored habitats may require decades to develop characteristics comparable to those being lost.

The report further concludes that residual effects on lizards will remain as 'Low' and therefore do not warrant consideration within offsetting or compensation frameworks (which require a residual effects assessment of 'Moderate' or higher to justify being carried into the offsets and compensation framework). This conclusion may underestimate the cumulative effects arising from habitat fragmentation, mortality, displacement, and uncertainty regarding mitigation outcomes across the full extent of the project.

A further limitation is the apparent absence of any commitment to long-term monitoring of salvage and relocation outcomes. Without post-relocation monitoring, it will not be possible to determine whether salvaged individuals survive, establish and recruit into existing resident populations at the release sites. If post-salvage survivorship is lower than assumed, residual effects could be substantially greater than those currently predicted, potentially resulting in an overall net-loss in local lizard values. It may be that these details will be provided within the Lizard Management Plan (yet to be prepared); however, in the absence of these details we cannot have confidence in the assessment of Low residual effects.

Finally, the assessment only gives limited consideration to the potential long-term effects of indirect disturbances, including noise, vibration, lighting, and dust, on lizard populations occupying habitats adjacent to the motorway corridor once completed. While these effects are acknowledged during construction, their potential influence on long-term habitat quality, lizard behaviour, survival, and reproductive success is not considered. As a result, residual effects associated with these ongoing disturbances may be underestimated.

The report acknowledges that there may be unconfirmed potential effects but that they can be managed by the Ecological Management Plan and Wildlife Approval Conditions. Neither of these reports have been submitted and therefore their adequacy in dealing with unexpected impacts cannot be assessed.

3.3 Management of effects

Habitat restoration will take time to develop structural complexity that is suitable for lizards, particularly for arboreal geckos requiring mature canopy and refuge features within trees. Connectivity plantings are also unlikely to provide functional dispersal corridors for many years. The delayed benefits of habitat creation and enhancement may mean actual effects following mitigation are greater than 'Low', but unaccounted for within the Residual Effects management package and Wildlife Approval Conditions.

The effectiveness of the salvage and relocation of lizards is a key tool that remains unqualified as a successful one due to a lack of quality post-salvage monitoring throughout the country. For cryptic or arboreal species, capture probability is inherently limited (and rarely quantified in lizard mitigation planning), and relocation outcomes are variable depending on the quality of the release site and existing resident population density. Indirect effects associated with newly formed edges, noise, and vibration are also likely to persist beyond the construction footprint, particularly in fragmented forest remnants and within the central mitigation area.

3.4 Reliability of assessment

Overall, while the survey effort and general lizard management proposal is consistent with standard practice, the assessment consistently over-assumes the effectiveness of mitigation in reducing residual effects to uniformly Low levels, particularly for low-density At-Risk lizard populations and in the short-to-medium term. A precautionary approach would retain at least Moderate residual effects for the loss of lizards through clearance activities, habitat fragmentation and displacement impacts, in acknowledgement that non-detection is not evidence of low-impact and plantings will take many years to become suitably complex habitats. Over assumptions around the effectiveness of mitigation is further used to justify the exclusion of lizard values within the residual effects management package, which remains unprovided.

4. HOCHSTETTER'S FROGS

4.1 Assessment framework

Hochstetter's frogs are a highly sensitive species that are extremely vulnerable to a range of development-related impacts. Their distribution within Northland is limited to the Brynderwyn and Waipu forests, with the Northland sub-species (*Leiopelma* aff. *hochstetteri* "Northland" sensu) only recently re-established as genetically distinct from the nine other sub-species of Hochsetter's frogs in other parts of the country (Burns *et al.*, 2024). Their low reproductive and mobility rates together with very specific habitat requirements (cool, shaded streams with low sediment levels) make them highly vulnerable to direct and indirect impacts associated with land-use inside and outside of riparian areas.

The Hochstetter's frog assessment is informed by a fairly extensive search effort in a variety of stream habitats ranging between low and high in quality and value. A total of 55 transects were surveyed over approximately 2.8 km of stream habitat, supported by 48.8 hours of double-observer effort and additional

incidental observations. This resulted in 318 frogs recorded during formal surveys, with a further 15 individuals recorded opportunistically. Surveys covered both indigenous forest and plantation stream environments, with markedly higher frog densities observed in native forest streams, although plantation habitats also supported populations at lower density. Overall, the survey effort was intensive and robust and covered a range of habitats likely to support this species.

4.2 Assessment of Effects

The report provides a clear quantification of habitat loss, including approximately 3.85 km of high-quality indigenous stream habitat and 10.3 km of plantation stream habitat. Density-based extrapolation has been used to estimate population-level impacts, suggesting numbers of individuals between *c.*35,000 and 40,000 frogs potentially affected by both direct habitat loss and fragmentation processes (Table 1). This represents a population-scale impact upon what is now understood to be a regionally distinct species that is only present within Brynderwyn and Waipu forests.

The assessment appropriately assigns High magnitude of effects to habitat loss and fragmentation, reflecting the scale of inferred population-level impact. However, it doesn't reflect the genetic distinction of the Northland taxon which potentially represents a very high proportion of the known population range for this species. This could suggest that a higher magnitude classification (potentially 'Very High') may be justified under the EcIA framework for addressing the magnitude of effects.

In contrast, indirect effects such as noise, vibration, sedimentation, and dust are classified as Low magnitude of effects and Low level of effects post-mitigation, which seems optimistic and is not supported by the evidence presented (Figure 2). As Hochstetter's frogs are strongly dependent on stable stream microhabitats where sedimentation can directly alter substrate suitability and food availability, a high level of uncertainty remains regarding cumulative sedimentation and edge effects in highly modified catchments. Due to the relative lack of precedent for large infrastructure projects to impact sites containing stronghold populations of Hochstetter's frogs, significant uncertainties remain about the cumulative effects of prolonged construction vibration on Hochstetter's frog habitat. These uncertainties are neither acknowledged nor discussed in-depth and consequently it is unclear how these impacts have been assessed as 'Low'. Given the prevalence of seepages, tributaries and permanently moist habitats throughout Brynderwyn forest, the possibility of significant indirect disturbance effects cannot be discounted.

As with lizards, there is very little discussion around the potential genetic consequences to this species associated with the creation of fragmented and isolated 'islands'. The largest of these is represented by the proposed Central Mitigation Area that will be located between the existing SH1 and future SH1 within Brynderwyn forest. Over time, this could increase the risk of genetic isolation between resident frog populations from those in the wider forest complex, potentially reducing resilience in the context of ongoing natural disturbance events associated with the storms, sedimentation and landslides that have become prevalent in this area.

Table 1: Modified version of Table 19 of the EcIA Terrestrial Ecology report that includes the calculation for the number of frogs to be impacted in association with different habitat types.

Habitat Classification	Length of stream habitat loss to construction (km)	Relative surveyed frog density (per 100m)	Adjusted frog density (per 100m) after 90% lost to harvesting	Estimated number of frogs present within streams being lost.
Exotic forest (plantation forestry) stream habitat	10.3	6.7	55 pre-harvesting 5.5 post-harvesting	5,658.85 pre-harvesting 566.5 post-harvesting
Fragmentation of exotic forest stream habitat	3.2	6.7	55 pre-harvesting 5.5 post-harvesting	1,758.08 pre-harvesting 214.5 post-harvesting
Indigenous vegetation stream habitat	3.9	50.8	416.6	16,243.5
Fragmentation of indigenous vegetation stream habitat	3.7	50.8	416.6	15,414.2
Total frog stream habitat lost	14.2			
Total fragmentation of stream habitat	6.8			
Total # frogs to be impacted if plantation forestry within PD doesn't get harvested				**39,074.63**
Total # frogs to be impacted after plantation forest harvested within PD, after 90% of frogs lost				**32,438.7**

Indirect construction disturbance such as sedimentation, concrete, noise, dust, blasting and vibration.	High	High – Sedimentation: adverse effects of clogging of refuges and interstitial space, shifts in suitability of prey and displacement. Streams particularly vulnerable in locations of low flows where generally higher abundance of frogs recorded. Concrete: cement can rapidly alter pH levels to become highly alkaline and can suffocate and cause severe burns to frogs. Streams particularly vulnerable in locations of low flows where generally higher abundance of frogs recorded. Noise: vibration, lighting and dust could also adversely affect native frogs in nearby habitat resulting in some level of avoidance/displacement with reduced habitat quality. However, this is likely to be a Low magnitude of effect.	**High**

Figure 2: Snip from Table 20 of the EcIA Terrestrial Ecology identifying risk to Hochstetter's frogs associated with indirect construction disturbances.

4.3 Management of effects

Proposed mitigation measures include the salvage and relocation of Hochstetter's frogs, enhancement of approximately 16km of stream habitat, riparian restoration, stock exclusion, pest control, and establishment of three mitigation sites, including one plantation-based site that will be harvested prior to construction (aside from a potentially retained 10m of riparian buffer). Post-mitigation, direct habitat loss and fragmentation effects remain classified as High within the report, while injury, mortality, displacement, and indirect construction effects are reduced to Low.

While the retention of High residual effects for habitat loss and fragmentation is appropriate given the scale of impact, the extent to which injury, mortality, displacement, and indirect effects could be reduced to Low is not demonstrated by the report and remains highly uncertain given the limited understanding of species response to salvage activities. There is no proven methodology for the successful translocation of Hochstetter's frog at the population level, and outcomes are likely to be highly variable depending on recipient site conditions and resident population density. The fact that all mitigation sites already contain frog populations increases uncertainty due to carrying capacity constraints (which are poorly understood for herpetofauna in general). Additional risks include establishment failure, reduced or failed recruitment, and dispersal into suboptimal habitats that may not support long-term survival. The suitability of the Central Mitigation Area is limited by prior plantation harvesting, which will substantially reduce habitat quality for an extended period (potentially in the order of decades) despite the proposal to retain a 10m buffer. It has been suggested that this site represents a key frog release site; however, its suitability is unlikely unless harvesting is avoided or restoration is undertaken many years in advance of any translocation activities. It is unclear how the proposed staging of this is to occur and there are some key concerns around its suitability to receive thousands of salvaged frogs that could be isolated to riparian margins only. Within in-tact forests, frogs have been found on spurs and ridgelines and while it remains unknown how frequently they disperse between catchments, these observations suggest that frogs habitat use may not be restricted to riparian margins alone and that they do disperse beyond them to enter new catchments.

In addition, habitat enhancement through riparian planting and restoration will take considerable time to develop the microclimatic conditions required for optimal frog habitat, meaning that functional equivalence will be subject to an unknown lag phase that varies significantly between mitigation sites. Indirect effects such as sedimentation and hydrological change may persist well beyond construction, particularly in fragmented catchments of both mitigation and frog release sites.

4.4 Reliability of assessment

Overall, the assessment is transparent in its quantification of population-level impacts. However, the conclusion that mitigation reduces injury, mortality, displacement, and indirect effects to uniformly Low levels is not sufficiently demonstrated in the report. This is likely because there is no demonstrated or successful precedent for this scale of mitigation translocation for Hochstetter's frogs. There is potential for residual effects associated with these impacts to be much higher, particularly given the uncertainties in translocation success, habitat development-to-maturity timeframes, and the ecological constraints of receiving environments. This is further exacerbated by the cumulative effects associated with harvesting, associated time delays before mitigation work can even commence in what will be the largest mitigation area, the resulting 'island' effect that arises due to being positioned between the old and new SH1 sections and associated genetic issues. A more precautionary interpretation may support High residual effects associated with all impacts, not just direct habitat loss and fragmentation effects.

5. KAURI SNAILS AND OTHER INVERTEBRATES

5.1 Assessment framework

Invertebrate surveys were undertaken both by desktop assessment and field survey. The key species that are focussed on are kauri snails, *Amborhytida dunniae* (another, much smaller land snails that is also (At Risk-Declining) and velvet worms (*Peripatoides sympatrica,* Not Threatened). These species were identified during the Brynderwyn road recovery project which informed the priority invertebrate species for this project. Field surveys were undertaken between October and November 2025. The searches for kauri snails focused on targeted manual-hand searches (MHS, 36-person search hours, 16 combined with lizard searches) within suitable forest habitats in the PD, including native forest remnants, gullies and areas of plantation forestry. Survey methods for all invertebrates consisted of 39 search plots (10m x 10m for half an hour allocated to search each plot), with hand-searching and nocturnal spotlighting surveys (eight-person search hours that were limited to the southern half of the Brynderwyns only). Surveys appropriately targeted the microhabitats that kauri snails are typically found within (i.e., areas with thick leaf litter and abundant debris). Other species detected included glowworms (*Arachnocampa luminosa*).

The report acknowledges that kauri snails are patchily distributed across the landscape, occurring at low densities in many areas but forming higher-density sub-populations in some locations. This is unsurprising given the limited mobility of kauri snails and recognised high local genetic structuring that which may increase vulnerability to localised population decline or extirpation (Spencer *et al*. 2006). The report notes that each of the species will inhabit pine forest and that *A. dunniae* shells were also found in a range of exotic treeland types (frequently shelterbelt species). These characteristics highlight the importance of

maintaining habitat connectivity with careful consideration of salvage and release site selection to minimise the risk of population isolation, unintended genetic effects and other ecological consequences.

The report identifies the ecological value of kauri snails as High, reflecting their At Risk-Declining status, with life-history traits including slow growth, low reproductive rates, and reliance on intact forest ecosystems (Stringer *et. al,* 2002). Velvet worms and glowworms are both classified as being of 'Low' ecological value in accordance with their Not Threatened in accordance with the EcIA framework. It also recognizes the potential impacts of the Project, including direct habitat loss through vegetation clearance, mortality during construction, habitat fragmentation, and indirect edge effects such as microclimate changes and predator access. These impacts are appropriately identified and consistent with the known ecological sensitivities of land snails and terrestrial invertebrates in general.

However, there are several key limitations in the assessment. Detection probability for kauri snails is inherently low and strongly influenced by weather, moisture and seasonality. Non-detection during surveys, particularly in structurally complex forest patches, cannot be reliably interpreted as absence, meaning the potential for undetected higher-density patches remains. Kauri snails are highly microhabitat-specific and while the assessment sites have targeted a range of representative habitat types, survey effort represented only a small proportion of the potentially suitable habitat available within the wider Brynderwyn landscape. Accordingly, non-detection within one survey location cannot be used to infer absence, or even relative abundance, within other areas of seemingly similar habitat. Consequently, the loss of even relatively small areas of high-quality microhabitat may result in disproportionately large effects on local populations where individuals are concentrated within discrete habitat patches.

5.2 Assessment of Effects

The report identifies the usual suite of impacts to terrestrial invertebrates associated with habitat removal including direct habitat loss, indirect effects (associated with edges and fragmentation) and injury and mortality.

Habitat loss is identified as having an overall 'Low' impact on invertebrates following mitigation activities (Figure 3). The assessment states that the large area of local landscape to be removed is offset by the low-density of snails present in most of the designation is unsupported given the significant quantum of habitats that were not searched, and the propensity for dense, patchily distributed clusters of land snails.

Similarly, an overall assignment of 'Low' level of effect associated with all other impacts to invertebrates acknowledges the high effect pre-mitigation but assumes low-density populations and successful mitigation outcomes, yet fails to acknowledge the time-scale associated with lag-effects and potential for unintended perverse consequences associated with genetic impacts. Additionally, given the sensitivity of land snails to desiccation, temperature fluctuations, and predator access, fragmentation is likely to extend projects impacts well beyond the direct footprint of habitat clearance. The patchy distribution and reliance on microhabitats further amplify this risk, suggesting that some high-value areas could experience disproportionately severe impacts.

Table 28: Unmitigated and mitigated level of effects on invertebrates.

Potential Effects on invertebrates	Species	Ecological Value	Unmitigated magnitude of effect	Unmitigated level of effect	Mitigation	Mitigated magnitude of effect	Mitigated overall level of effect
Permanent Effects							
Habitat loss	At Risk – Declining species (Kauri snail and *A. dunniale*)	High	Moderate	High	▪ Minimisation through detailed design and construction methodology ▪ Mitigation planting and enhancement of existing native vegetation at the North and South Mitigation Sites (totalling 56 ha)	Low	Low
Indirect habitat loss and degradation via habitat fragmentation and edge effects	At Risk – Declining species	High	Moderate	High	▪ Reduce fragmentation and edge effects at the North and South Mitigation Sites through stock exclusion, pest control and infill and remediation planting	Low	Low
Temporary - Construction Phase / Short to Medium term							
Injury or death during habitat removal and displacement	At Risk – Declining species	High	Moderate	High	▪ Salvage and relocation within appropriate seasonal constraints	Low	Low

Figure 3: Snip from Table 28 of the EcIA Terrestrial Effects report showing unmitigated and mitigated level of effects on invertebrates.

5.3 Management of effects

Regarding mitigation, the report proposes salvage and relocation prior to vegetation clearance, enhancement of existing habitats, pest control, and the retention or creation of buffer vegetation and ecological corridors. While these measures are generally appropriate and consistent with best-practice guidance for other species, there are significant assumptions underlying their effectiveness for invertebrates. Salvage is inherently limited by the cryptic nature of kauri snails and is unlikely to capture all individuals, particularly those in deeper litter or under complex debris structures. Similarly, habitat restoration and offset planting, while valuable in the long term, will take decades to develop the structural and microclimatic complexity necessary to function as high-quality snail habitat. As a result, the assumption that mitigation will reduce effects to "Low" relies on salvage as being a well-established mitigation technique resulting in successful outcomes and this simply hasn't been evaluated at large-scale.

5.4 Reliability of assessment

In conclusion, while the report correctly identifies key drivers of adverse impacts to invertebrates, it proposes a mitigation package that assumes a high level of effectiveness in reducing residual effects to Low, but doesn't suggest any monitoring framework or performance measures to determine success or otherwise. The patchy distribution of kauri snails, low detectability, limitations of salvage, and long lag-phase of restoration of complex, suitable habitat all suggest that Moderate-level residual effects could remain for an extended period following construction. Pre-mitigation impacts are appropriately assessed as Moderate–High in hotspot areas and Low–Moderate elsewhere, but the overall assessment may not adequately reflect the precautionary approach that should be applied where uncertainty is high.

For species with clustered distribution and strong microhabitat associations, the area of habitat lost may not be a reliable proxy for population-level effects. Small habitat losses may affect a disproportionately large component of the local population where high-density refugia are present. Given the long timeframe between now and project commencement, it is highly recommended that this is used to undertake further surveys to improve the understanding of population distribution prior to impact.

6. Long-Tailed Bats

6.1 Assessment framework

The assessment on the values and impacts to long-tailed bats involved both desktop and field-based surveys using acoustic analysis and identification of roosting habitat availability. The survey methods were appropriate and used standard passive acoustic detectors (ABMs) to record echolocation calls across targeted habitats throughout the Proposed Designation. Surveys were conducted between September and November 2025 and again between January and February 2026, comprising 19-42 valid survey nights for Survey 1 and 13-21 valid nights for Survey 2, and resulting in 122 passes (106 passes Survey 1, 16 survey 2) at 15 out of 48 sites. While the survey effort is substantial, it represents only a limited period of sampling relative to the seasonal and annual variability of long-tailed bat activity. Given that bats can traverse large areas nightly (up to 25km) and may regularly switch between a wide range of foraging corridors, commuting routes and potential roosts within their home range, the available data provides only partial insight into habitat use and occupancy around Brynderwyn and Waipu.

The report divides habitat types into four representative Zones, with values ranging between high and very high, and habitat types characterised as roosting, foraging, indigenous, exotic, pasture, wetland and stream riparian areas. The overall value of habitat is assessed as 'Very High'.

Zone 1: 'High Value: Pasture dominated with scattered indigenous forest remnants, riparian corridors and exotic shelterbelts. Survey results indicate this zone is primarily used for foraging and commuting, with possible roosting occurring nearby.

Zone 2: 'Very High Value': Large contiguous tracts of indigenous and exotic vegetation within the Brynderwyn Hills Forest Complex. Despite the abundant high quality habitat survey results indicated low-activity and suggested use as foraging and commuting landscape in this Zone.

Zone 3: 'Very High Value': Pasture dominated as per Zone 1 but with several permanent streams, wetlands and a pond. Bats use waterbodies as foraging pathways where streams provide networks of connectivity and 'flyway' corridors. Despite this, survey results also indicated low-activity and suggest primary use of foraging and commuting with roosting possibly in nearby trees.

Zone 4: 'High Value': Scattered vegetation amongst open pasture that provide connectivity between forest landscapes. Low activity in this Zone is suggestive of foraging and commuting use only.

A lot of emphasis has been placed on the survey results and while they do suggest the above descriptions of habitat use, it also only represents a snapshot in time and lacks acknowledgement of the seasonal shifts in habitat use within a large home range. In summary, while the survey duration is good for a single season, the interpretation of the data is constrained by relatively low levels of recorded activity and limited temporal coverage. Additional surveys undertaken across multiple seasons and years would substantially improve confidence in understanding habitat use, occupancy patterns, and the relative importance of the landscape to the local bat population.

6.2 Assessment of Effects

The identified potential impacts include habitat loss, fragmentation of foraging or commuting corridors, and disturbance from lighting and construction noise. There will be a direct loss of 163ha of high-value potential bat habitat, of which 49ha comprises commercial forestry. This has resulted in an assessment of impacts ranging between Moderate and High prior to mitigation activities being undertaken, and an overall assessment of Low impact post mitigation (Figure 4).

If the survey results are representative of consistent land use of habitats throughout the Project Designation, then the magnitude of direct habitat loss may be Low as assessed. However, the compounding impacts of loss and fragmentation (which has been assessed as having a Very High effect) could disrupt movement patterns resulting in avoidance behaviours that could consequently reduce access to key resources within the landscape. The report appropriately identifies these risks together with suggesting that fragmentation could have significant impacts on the local long-tailed bat population, particularly in consideration of the cumulative effects associated with the existing level of land modification.

Other impacts including potential mortality by vehicle collision and the operational disturbance of construction and post-construction activities are well-described, with an overall assignment of unmitigated impacts ranging between Moderate and Very High, but then being scaled down to 'Low' post-mitigation.

Despite the assessment identifying the potential for Very High effects associated with fragmentation, the overall ranking for post-mitigation impact has been assigned as 'Low' for all impacts, including habitat loss and mortality. This relies heavily upon successful mitigation outcomes that don't appear to account for the significant time lags associated with the proposed mitigation package that relies on restoration planting to re-connect fragmented landscapes and 'grow' new forests that are currently in pasture. While the application of DOC's standard tree-felling protocols are likely to successfully ensure that bats are not injured or killed during tee-felling activities, the conclusion that long-term habitat loss and associated behavioural responses will result in Low residual effects is not clearly supported in the report presented.

Table 27: Unmitigated and mitigated level of effects on bats. Effects in bold warrant further measures to offset or compensate for these effects

Potential Effects on bats	Ecological Value	Unmitigated magnitude of effect	Unmitigated level of effect	Mitigation	Mitigated magnitude of effect	Mitigated overall level of effect
Permanent Effects						
Habitat loss	Very High	Low	Moderate	▪ Minimisation through detailed design and construction methodology ▪ Mitigation planting and enhancement of existing native vegetation at the three Mitigation and Release Sites allowed for under vegetation and frog mitigation	Negligible	Low
Habitat fragmentation	Very High	Moderate	High	▪ Reduce fragmentation and edge effects at the North and South Mitigation Sites through infill and remediation planting ▪ Vegetation and foraging habitat allowed for under vegetation and frog mitigation ▪ Retain/install bat hop-overs	Negligible	Low
Mortality by vehicle collision	Very High	Low	Moderate	▪ Retain/install bat hop-overs	Negligible	Low
Operational disturbance (noise and lighting)	Very High	Moderate	High	▪ Restrictions on lighting in proximity to bat roost habitat	Negligible	Low
Temporary - Construction Phase / Short to Medium term						
Injury or death during vegetation removal	Very High	High	Very High	▪ Implementation of DOC's BRP	Negligible	Low
Indirect construction disturbance (noise, lighting, and vibration)	Very High	Low	Moderate	▪ Where active roosts are identified, protocols should be implemented until the roost is no longer occupied to reduce the risk of disturbance of roosts and be detailed within the vegetation removal protocols prepared for the Project. These should include (but not be limited to): A 50 m setback area for construction activities around the active roost/s until monitoring can determine that the roost/s are no longer occupied, and prohibiting or limiting construction activities within 50 m from an active roost/s two hours before sunset until one hour after sunrise.	Negligible	Low

Figure 4: Snip from Table 27 of the EcIA Terrestrial Ecology identifying unmitigated and mitigated level of effects on long-tailed bats.

6.3 Management of effects

Bat management relies on an avoidance protocol to ensure that bats are not present within roosts on the day that trees are felled. When implemented correctly, this is an effective and well-established approach for avoiding direct injury or mortality to bats. This protocol is supported and should be applied to all identified potential and confirmed roost trees, together with trees within an appropriate precautionary buffer (at least 5–10 m depending on canopy height and structure).

Mitigation measures proposed to address indirect effects include retaining vegetation corridors, installing bat "hop-overs", restricting temporary and permanent lighting, and applying 50 m buffers around occupied roosts. These are generally appropriate measures and are consistent with standard practice for bat management in infrastructure projects. However, the effectiveness of these measures depends heavily on the wider landscape remaining connected and providing alternative commuting routes. Where surrounding habitat is fragmented, localised features such as planting or structures are unlikely to fully offset the need for bats to cross open or high-risk areas.

Bat "hop-overs" are a relatively recent mitigation tool designed to encourage bats to increase flight height when crossing roads, typically through linear planting or vertical structures. There is some evidence they can influence bat flight behaviour, particularly on smaller roads or where they are integrated with continuous vegetation. However, the evidence for effectiveness on wide, high-speed, multi-lane roads is limited, and most guidance treats them as supplementary rather than stand-alone mitigation in motorway projects (Berthinussen & Altringham, 2015; Limpens *et al.,* 2005; National Highways, 2019).

For long-tailed bats, there remains uncertainty as to whether hop-overs consistently achieve sufficient vertical separation from traffic under variable environmental conditions, or whether they reliably influence crossing behaviour at the scale of large infrastructure corridors. As such, hop-overs should be regarded as a supplementary mitigation measure rather than a primary mechanism for reducing collision risk.

These measures do not fully address the potential for long-term behavioural and habitat-use changes associated with the extended timeframes required for habitat restoration and the establishment of functional connectivity. The Central Mitigation Area is of particular concern, where post-harvest conditions are likely to result in a prolonged period of reduced habitat quality and connectivity between the eastern and western parts of the Brynderwyn Forest Complex, effectively creating a temporary fragmentation barrier until indigenous restoration planting matures. Additional measures to address interim habitat replacement would typically be presented within a dedicated Bat Management Plan; however, this has not been proposed within the suggested Conditions framework (see Section 8 for further discussion on this).

6.4 Reliability of assessment

Overall, the existing survey represents an initial baseline for what would ideally be extended into a multi-season survey that seeks to gain higher confidence in the suggested habitat use of the PD than is currently held. While impacts are all addressed, discussed and ranked appropriately, there is a tendency to rely on mitigation to reduce those very high impacts down to 'Low'. This doesn't seem to consider important

factors around time-lags for habitat restoration and the potential for long-term avoidance of the landscape. A precautionary approach would retain at least moderate uncertainty regarding residual impacts to ensure they are appropriately included within the Residual Effects Management Plan.

Overall, it is strongly recommended that a multi-season survey be conducted to include seasonal activity patterns that include spring, summer and autumn over multiple additional years. Surveys should repeat what has been done and expand upon it to include as many riparian corridors, forest fragments and forest ridgelines with commuting corridors (i.e., within the plantation forest) as possible. A further recommendation is that this be incorporated into a radio-tracking programme to identify potential key roosting sites (particularly possible maternity roost sites) and high-use corridors within the PD for automatic avoidance (i.e,. a 'no-go' zone).

7. AVIFAUNA

7.1 Assessment Framework

The assessment framework is generally comprehensive and well-structured, drawing on a broad range of habitat and species information. A desktop assessment was undertaken to compile existing records and datasets, which were then linked to vegetation and habitat types to inform the overall assessment of avifauna values (Figure 5). These were supported by field-based habitat assessments and a limited number of five-minute bird counts at 12 sites within the PD.

However, a key limitation of the assessment is the relatively limited field survey effort and the lack of inclusion of local ecological knowledge, particularly in relation to cryptic and regionally significant species such as North Island brown kiwi (*Apteryx mantelli*). While desktop records and habitat suitability are useful, they are not a substitute for targeted field verification in a landscape where kiwi presence is widely understood and locally well-documented through community observation, predator control programmes, and long-term Landcare activity. In the Brynderwyn context, this includes active involvement and knowledge held by the Brynderwyn Piroa Landcare Trust, which is not recognised in the assessment.

As a result, the treatment of kiwi appears to rely heavily on historical records and generalised habitat assumptions rather than recent survey data or systematic local engagement. Given the detectability challenges associated with kiwi, the absence of targeted nocturnal call count surveys, dog-assisted detection, or communication with the community to gain local knowledge represents a significant gap in the assessment approach. This limits confidence in conclusions regarding their current distribution within and adjacent to the PD.

A similar issue arises for other highly mobile or sparsely recorded species. For example, the presence and use of North Island kākā (*Nestor meridionalis*) is inferred largely from scattered regional records and general assumptions about landscape connectivity. While kākā are known to occur in the broader Brynderwyn and Northland landscape, their actual frequency of use within fragmented or modified habitats is likely to vary considerably depending on seasonal resource availability. They are frequently observed in Mangawhai, suggesting that their use of habitats in Brynderwyn forest may be more common than currently documented.

Wetland habitats are also potentially undervalued in parts of the assessment, with several features characterised as exotic-dominated and of limited value for Threatened or At-Risk species. This interpretation is not fully consistent with recorded field observations, including North Island fernbird / mātātā (*Poodytes punctatus*) within multiple wetland areas around Waipu. This indicates that even modified wetlands can provide functional habitat, and highlights the importance of field verification rather than reliance on broad habitat categorisation alone.

Similarly, while small freshwater habitats are identified as supporting occasional records of species such as New Zealand dabchick (*Poliocephalus rufopectus*), grey duck (*Anas superciliosa*), black shag (*Phalacrocorax carbo*), brown teal / pāteke (*Anas chlorotis*), and Australasian little grebe (*Tachybaptus novaehollandiae*), the limited field effort and lack of repeated seasonal surveys reduces confidence that these habitats have been fully characterised in terms of their avifaunal value and use.

Overall, the assessment would have benefited from a more substantial field programme, including repeated seasonal surveys across key habitat types, and a more structured incorporation of local ecological knowledge sources, particularly given the well-established presence of kiwi within the Brynderwyn landscape. Given the size and presence of multiple habitat types including farmland, indigenous forest, exotic forest and wetlands, the level of effort to adequately inform a regionally significant infrastructure project such as this is relatively limited. In its current form, reliance on this limited survey effort, combined with inferred distributions from older desktop records, reduces confidence in conclusions regarding species presence, habitat use, and the ecological significance of the PD area.

Table 12: Habitat located under the project footprint and species that may be associated with that habitat. (Underlined species indicate a primary habitat association)

	FARMLAND	EXOTIC PINE FOREST	NATIVE FOREST & SCRUB / SHRUBLAND	FRESHWATER WETLANDS / RIPARIAN MARGINS
POTENTIAL SPECIES IMPACTED	• NZ pipit / Pīhoihoi • Harrier / Kāhu • Pūkeko • Spur-wing plover • Paradise shelduck / Pūtangitangi • Pied stilt / Poaka • SIPO / Tōrea	• Silvereye / Tauhou • Tomtit / Miromiro • Grey warbler / Rirorio • Shining cuckoo / Pīpīwharauroa • Fantail / Pīwakawaka • North Island brown kiwi / Kiwi-nui • Ruru	• Tūī • Bellbird / Korimako • Silvereye / Tauhou • Tomtit / Miromiro • Grey warbler / Rirorio • Kererū • Shining cuckoo / Pīpīwharauroa • Fantail / Pīwakawaka • North Island brown kiwi / Kiwi-nui • North Island Kākā • Ruru • Fernbird / Mātātā	• Australasian bittern / Matuku-hūrepo (wetland 26) • Fernbird / Mātātā • Marsh crake / Kotoreke • Spotless crake / Pūweto • Pūkeko • Paradise shelduck / Pūtangitangi • Silvereye / Tauhou • Fantail / Pīwakawaka • Kingfisher / Kōtare • Welcome swallow / Warou • Little shag / Kawaupaka • Little black shag / Kawau tūī • Black shag / Māpunga
AREA UNDER FOOTPRINT[8]	~318 ha (Table 4)	~140 ha (Table 4)	~55 ha (Table 7)	~4.2 ha (Table 9)

Figure 5: Snip from Table 12 of the EcIA on Avifauna Ecology displaying species that may be associated with various habitat types within the PD.

7.2 Assessment of Effects

The effects assessment focuses on species whose primary habitat may be affected by the project, including kiwi, bittern, kākā and Australasian little grebe. The assessment identifies approximately 370 ha of habitat loss associated with the PD, including 37 ha of native forest, scrub and shrubland and approximately 3 ha of wetland and riparian habitat.

While the overall effects assessment is reasonably comprehensive, several aspects warrant further consideration. The assessment identifies only limited wetland habitat loss; however, approximately 2.4 ha is considered potential habitat for Threatened and At-Risk species, including bittern fernbird. Given the documented use of small and modified wetlands by fernbird, and local records of other wetland-associated species, the ecological value of these areas may be understated, which in turn may influence the overall effects assessment and mitigation requirements.

The assessment also appears to apply a relatively narrow "primary habitat" approach, excluding species not considered to use the PD as primary habitat, including introduced species, coastal/estuarine specialists, and grey duck (*Anas superciliosa*) (on the basis of hybridisation status). This approach may under-represent the functional use of the landscape by a wider range of species that use farmland, wetlands and forest margins opportunistically for foraging, dispersal or seasonal movement, and therefore may still be subject to relevant effects.

The assessment also does not appear to fully account for potential operational effects of the new motorway on wetland-associated species such as pāteke and Australasian little grebe. Both species have been recorded locally and may be vulnerable to collision risk associated with road corridors, bridge structures and artificial lighting, particularly given the low flight height of pāteke and the movement behaviour of grebe species.

Impacts such as collision risk and disturbance effects are described but do not fully address the scale of the new four-lane motorway environment, where traffic volume, lighting, and barrier effects may increase cumulative effects beyond those imposed by the current two-lane SH1 conditions. Fragmentation effects are also largely described in terms of habitat loss, with less emphasis on longer-term landscape connectivity, functional wetland networks, and potential population isolation effects for wetland and forest associated species.

Overall, while the assessment is comprehensive in terms of species assemblages and relevant habitats, there are still some key uncertainties around habitat use and the lack of field survey data risks consistent under assignment of value, impact and residual effects to local avifauna populations. It remains unclear whether collision and fragmentation effects have been fully considered at the scale of a multi-lane motorway in the absence of understanding abundance and distribution of a range of species.

7.3 Management of Effects

The recommended mitigation package, including preparation and implementation of an Avifauna Management Plan (AMP), wetland replacement, and operational lighting controls, provides a reasonable framework for managing adverse effects. However, the proposed mitigation measures appear heavily focused on Threatened and At-Risk species and may not adequately address species of high cultural significance, particularly kiwi.

Despite recognising the potential presence of kiwi within plantation forestry habitats, the report does not include specific management measures commonly applied on major infrastructure projects in kiwi habitat. Additional measures such as pre-construction kiwi surveys, kiwi detection and monitoring programmes, pre-clearance dog detection survey protocols, and construction timing restrictions around the local breeding season should be considered. The breeding season window identified in the report may also underestimate the duration of breeding activity in northern New Zealand, where nesting can extend into March and even April in some parts of Northland.

The proposed wetland replacement ratio of 1:1 is unlikely to fully address temporary habitat loss, lag effects associated with habitat establishment, and ongoing disturbance associated with road operation. Consideration should be given to either advanced wetland creation prior to habitat loss occurring or a higher replacement ratio (e.g. 2:1) to provide a net gain outcome and account for temporal losses in habitat function. The inclusion of hooded and downwards oriented lighting to reduce attraction to seabirds is a useful activity and is supported.

7.4 Reliability of Assessment

The assessment is technically well-prepared and provides a high-level evaluation of likely avifauna effects. However, confidence in several conclusions is constrained by a reliance on older data, notable data gaps and the absence of targeted surveys to confirm species presence, habitat use and breeding activity within areas potentially affected by the project.

Given the likely lead-in time between project approval and construction, robust baseline surveys are recommended as they would strengthen confidence in the assessment better inform the development of the AMP. Priority survey work should include targeted kiwi surveys within plantation forestry and adjacent habitats, broader avifauna inventories across forested areas, and surveys of farm ponds and wetland features that may be affected by the project. Targeted surveys for wetland-associated species during appropriate survey seasons (i.e., surveys for bitterns during 'booming' season) would also help clarify the importance of smaller wetland features and inform more effective mitigation and offset design.

Overall, while the assessment provides a strong desktop assessment of values, additional field surveys and a more precautionary approach to wetland compensation and kiwi management would improve confidence that adverse effects on avifauna are appropriately identified and managed to ensure a no-net-loss in avifauna values in the local area.

8. Mitigation, Offset and Compensation Package

The EcIA indicates that mitigation activities are primarily directed toward species and habitats experiencing Moderate or higher residual effects following application of the mitigation hierarchy (avoid, minimise, mitigate). While not explicitly stated, it is assumed that this threshold relates to post-mitigation effects and therefore determines inclusion within the residual effects management package. Table 2 summarises the key fauna values and their assessed effects before and after mitigation. Several of these post-mitigation outcomes appear optimistic and may overstate the effectiveness of proposed measures, particularly where reliance is placed on salvage, translocation, and future habitat establishment.

Table 2: Summary of effects pre- and post-mitigation. Values in red indicate low-confidence in assessments post-mitigation.

Taxa	Key Observations / Distribution	Unmitigated Effects as per Terrestrial EcIA	Post-Mitigation Effects as per Terrestrial EcIA	Key Uncertainties / Notes
Lizards	Copper skink present at low density across landscape; other species largely unconfirmed within alignment.	Moderate–High: habitat loss, fragmentation, injury/mortality, displacement.	Low (assumes effective habitat enhancement, salvage, relocation)	Pacific and elegant gecko confirmed locally. Potential under-assumption of density and impact.
Kauri Snails	Patchy distribution; low density in most areas, higher in localised patches	Moderate: habitat loss, fragmentation	Low (salvage, habitat creation & enhancement and connectivity)	Lack of documented and proven mitigation management measures for invertebrates.
Hochstetter's Frog	Dense in high-quality indigenous forest streams; lower density in plantation streams	High: loss of 3.85 km high-quality habitat, 10.3 km plantation; habitat fragmentation and loss affecting c.35k frogs.	Low-High (proposed relocation and stream enhancements)	Relocation success unknown; high residual risk likely for decades with cumulative effects of forestry harvesting activities.
Long-tailed Bats	Probable low density; highly mobile; survey window limited to a single season only.	Low: habitat loss, disturbance	Low: assumes limited critical habitat will be useful over time but doesn't address lag-phase.	Limited survey data in absence of multiple seasons worth of data collection. Installation of bat hop-overs proposed to reduce collision risk.
Avifauna	Wetlands and forest vegetation support Threatened/At Risk species	High: Australasian bittern, fernbird, spotless crake; Moderate: North Island kākā	Low–Very Low (with Avifauna Management Plan, habitat replacement, timing of works)	Cryptic species may be missed; success dependent on effective implementation of AMP and habitat replacement.

8.1 Proposed Mitigation Sites

The mitigation package is centred on three sites, of which the Northern and Central Sites have been assessed here. Both provide opportunities for ecological restoration, but they differ significantly in baseline value, feasibility, and the level of additionality of biodiversity values they are likely to deliver.

The **Northern Site** (approximately 54.5 ha) is already a relatively high-value area comprising mature kauri–podocarp–broadleaf forest and associated stream networks. Proposed gains largely relate to the enhancement of around 3.2ha of existing vegetation and conversion of approximately 30ha of pasture to indigenous cover. While these will contribute to meaningful ecological gains eventually, the overall opportunity for additionality within an acceptable timeframe appears very limited given the existing ecological condition of the site. In addition, the extent of proposed stream enhancement (noted as 7.7 km) is not clearly quantified, making it difficult to assess the true scale of freshwater benefit being relied upon.

The **Central Site** (approximately 114 ha) is more uncertain. It is dominated by plantation forestry with scattered indigenous remnants and stream networks supporting frog populations. The proposal relies heavily on future transition to indigenous vegetation following forestry harvesting, with some measures described only as occurring "if required" or subject to future confirmation. This introduces uncertainty around timing, delivery, and ecological trajectory associated with this location as a suitable mitigation site. If harvesting occurs in this area, there will be a significant temporary decline in habitat quality and function, with recovery likely to occur over an extended timeframe of several decades. This does not provide any level of confidence in this site as suitable to receive any salvaged animals, even if 10m riparian buffers are retained.

8.2 Alignment with Ecological Values

The mitigation package includes a mix of restoration planting, pest control, covenant protection, and stream enhancement. However, there is no clear quantitative analysis that connects these activities with the specific residual effects identified for individual species and habitats (i.e., no biodiversity offsets models have been undertaken or provided at this stage in the application).

The Northern Site generally aligns better with forest and freshwater values and provides scope for enhancement of bat, lizard, frog, and forest bird habitat. In contrast, the Central Site contains a number of broadly defined or conditional measures, including unclear expectations around indigenous revegetation and the role of a 10 m riparian buffer. It is not clear whether this buffer functions as a harvest exclusion zone, restoration area, or standard operational setback.

Importantly, the rationale for excluding certain fauna (e.g., bats, lizards, kauri snails) from offset requirements is not well supported given the residual effects assessment and remaining uncertainty around mitigation success.

8.3 Confidence in Outcomes

Overall confidence in the mitigation and offset package is constrained by limited detail on implementation timing, duration, and performance standards.

Pest control is proposed for a five-year period at both sites, although the commencement point is unclear. Given the long development timeframes for restored ecosystems and the vulnerability of many native species to predation, this duration appears limited in the context of achieving durable ecological outcomes.

Similarly, vegetation maintenance is proposed until 80% canopy closure, with little clarity on longer-term management responsibilities if targets are not achieved. More explicit success criteria and adaptive management triggers would improve certainty around delivery.

The Central Site is highly reliant on timing. If plantation harvesting proceeds as proposed, there is likely to be a substantial lag between habitat loss and restoration maturity. This temporal gap reduces the effectiveness of the site as an offset in the short to medium term and raises concerns about its suitability as a fauna release site during that period. Conversely, avoiding harvesting altogether would substantially improve ecological continuity and increase the potential for meaningful offset gain through staged restoration.

8.4 Monitoring and Adaptive Management

The monitoring framework remains high level and in several areas defers detail to future management planning within an Ecological Management Plan. Species-specific monitoring is generally described as occurring “where appropriate” or “if required”, with key elements to be developed later through management plans and conditions of Fast Track Consent or Wildlife Approval.

While some flexibility is appropriate, baseline monitoring requirements involving multiple seasons of data-gathering for key taxa including avifauna, Hochstetter’s frogs and long-tailed bats should be defined with clear objectives, performance measures, and trigger thresholds for alignment alterations. Similar clarity is required for other affected fauna where residual effects remain uncertain, including lizards and terrestrial invertebrates.

8.5 Overall Assessment

The mitigation and offset package has the potential to address a portion of the residual ecological effects of the project but is constrained by uncertainty in delivery, timing, and additionality within meaningful and acceptable timeframes.

The Northern Site provides a more suitable option for offset due to its existing composition and quality, although further detail is required regarding stream enhancement and quantification of ecological gains. The Central Site is less certain due to its dependence on plantation harvest timing and delayed restoration outcomes, resulting in a temporal disconnect between impact and mitigation effectiveness.

Further information is required on offset calculations, implementation timeframes, monitoring design, and long-term management commitments. Without this, it is difficult to have confidence that the package will achieve no-net-loss in fauna and wider biodiversity values, and a high level of uncertainty remains around whether the package can deliver a net ecological gain for the values affected or lost.

9. Wildlife Approval Application and Proposed Conditions

9.1 Species Covered by the Approval

The Wildlife Approval application seeks authorisation for the key lizard species that are known to be resident within the local area, together with "any other lizard protected under the Wildlife Act". This approach is unnecessarily broad and effectively requests to include all native lizards that may be encountered while not provisioning for them within the planning documents. This is inappropriate and the application should identify and assess the particular lizard species that are known or reasonably expected to occur within the project area, rather than seeking approval for all protected lizard species irrespective of their likelihood of occurrence.

The application excludes birds and bats from the scope of the Wildlife Approval which isn't unusual as protocols generally involve the 'avoidance' of impacting these fauna and consequently do not trigger requirements associated with the Wildlife Act (1953). However, in the absence of detailed and comprehensive management plans, it is not possible to determine whether all proposed activities can be undertaken without creating a risk of harmful disturbance, injury, or incidental mortality to protected bird or bat species. Consequently, for large infrastructure and roading projects activities including incidental disturbance, injury and mortality have significant potential to occur and consequently it is recommended that these (provisions for avifauna and bats) are included for within a Wildlife Approval application. Further, as there may be requirements around radio-tracking of long-tailed bats and kiwi, or kiwi and egg uplift requirements it is also recommended that these be included within the Wildlife Approval application.

However, without reviewing the draft and final management plans and construction methodologies, there remains uncertainty regarding the extent to which project activities could trigger Wildlife Act requirements. Excluding these taxa from the approval therefore creates a risk that future activities could result in offences without the benefit of legal authorisation. A more precautionary approach would be to assess and address potential effects on all protected wildlife that could reasonably be affected by the proposed works.

A significant omission from the application is the absence of a Complex Freshwater Fisheries Application despite the presence of protected and threatened freshwater species in the vicinity of the proposed works Assessment panels are required to consider the presence of Threatened, At-Risk, or Data-Deficient species under the New Zealand Threat Classification System when assessing complex freshwater fisheries applications. The project area supports, or is likely to support, species that would trigger these considerations, including Hochstetter's frogs and lamprey (*Geotria australis;* Threatened-Nationally Vulnerable). Furthermore, where proposed structures such as culverts, diversions, dams, or stream modifications have the potential to affect protected wildlife and would otherwise constitute an offence

under the Wildlife Act 1953, a concurrent Wildlife Approval is required through Schedule 7 of the Fast-track Approvals Act (Further detail on this aspect of the Wildlife Approval review is to be provided in the Freshwater Technical Review document that has been prepared alongside this report).

9.2 Duration of Approval

The application proposes a Wildlife Approval duration of 20 years despite construction activities being anticipated to occur over approximately six years. In general, this is not supported within wildlife-focussed approvals given the degree of change that can occur to some species populations (i.e., declines in numbers and range) over such a long timeframe. Further, many of the proposed management provisions may become outdated and replaced by superior tools and techniques during this timeframe. Therefore, if a long-term approval is considered appropriate, a mandatory review and update process should be incorporated at regular intervals (e.g. every 10 years) to ensure that approval conditions, mitigation measures, and ecological information remain current and fit for purpose.

9.3 Environmental Management Plan and Best Practice Measures

Section 7 of the application states that an Environmental Management Plan (EMP) will be prepared to demonstrate the application of best practice standards. However, the adequacy of this commitment cannot be assessed until the EMP has been prepared and submitted for review.

Consequently, it is currently not possible to determine whether the requirements of Clause 2(1)(f) of Schedule 7 of the Fast-track Approvals Act have been satisfied. The application relies on future documentation to demonstrate compliance with statutory requirements rather than providing the necessary information at the time of assessment.

In addition, the application asserts that best practice measures will be applied to the management of Hochstetter's frogs. This is challenging to assess given there is currently no widely accepted best practice or standardised methodology for the salvage, translocation, or long-term management of Hochstetter's frogs. As a result, the applicant cannot presently demonstrate that recognised best practice will be implemented for this species.

9.4 Assessment of Residual Effects Associated with Salvage

Section 11 concludes that salvage activities will result in Low residual effects for lizards and frogs. This conclusion is not adequately supported by the available evidence and appears to rely on a number of untested assumptions.

In particular, there is substantial uncertainty regarding the response of Hochstetter's frogs to salvage and translocation. The application cannot provide evidence demonstrating that salvaged individuals will survive, establish, or persist following relocation as such evidence has not yet been demonstrated by any precedent. Furthermore, the proposed recipient habitats are expected to support a higher density of individuals within a smaller area than that from which the animals were removed, creating the potential for increased competition, displacement, and predation pressures.

The application also assumes that overall effects associated with handling, salvage, and incidental mortality will be low for both frogs and lizards. This conclusion is not supported by the current state of knowledge. For Hochstetter's frogs, there is considerable uncertainty regarding survival during and following salvage operations. In the absence of evidence demonstrating successful salvage outcomes, it is plausible that a substantial proportion of individuals may not survive either the salvage process itself or the indirect effects associated with relocation, including displacement, increased predation risk, and habitat limitations.

For lizards and terrestrial invertebrates, residual effects may be lower but are still likely to exceed those presented in the application. A Low to Moderate residual effect rating may be more appropriate given the uncertainties associated with density and distribution. Even if habitat restoration is successful, it may take decades before replacement habitats provide equivalent ecological values. Consequently, assumptions regarding low residual effects are considered overly optimistic and insufficiently supported.

9.5 Proposed Conditions: Long-tailed bats

The proposed bat-related conditions are considered insufficient given the scale, duration, and potential ecological effects associated with the project.

The conditions primarily focus on DOC's standard procedures for vegetation clearance and confirming the absence of bats prior to tree removal. While these measures are necessary, they do not constitute a comprehensive framework for managing the full suite of potential effects on bats throughout the construction and operational phases of the project.

A full Bat Management Plan (BMP) should be required as part of the approval conditions. Such a plan should address a broader range of values and effects, including survey requirements, monitoring protocols, habitat management, vegetation clearance procedures, contingency measures, adaptive management responses, and long-term protection of important roosting habitats where identified. The current conditions do not provide sufficient detail to demonstrate that adverse effects on bats can be adequately avoided, remedied, or mitigated.

The most likely rationale for the limited scope of the conditions is the assumption that the Brynderwyn area does not represent a significant population stronghold and that bat abundance within the project area is likely to be low. However, the available survey information does not provide a sufficient basis for this conclusion. To date, bat survey effort within the wider project area appears inadequate to fully understand how bats use the landscape, the spatial distribution of potential roosting habitat, movement corridors, seasonal habitat use, or the significance of habitats that may be affected by the proposed works.

Of particular concern is the possibility that important roosting habitats, including maternity roosts, may occur within or adjacent to the project designation. The presence, location, and significance of these types of habitats cannot currently be discounted based on the information provided. Until a more comprehensive understanding of bat ecology within the project area has been established, the proposed conditions do not provide sufficient confidence that effects on bats will be appropriately managed.

Accordingly, it is recommended that the Project Designation Conditions require the inclusion of bats within the Wildlife Approval application, both of which require the preparation and implementation of a comprehensive BMP. The BMP should be informed by additional survey effort to the greatest degree possible, with residual effects associated with habitat loss also accounted for within the Residual Effects Management package.

9.6 Proposed Conditions: Avifauna

The proposed bird-related conditions are generally appropriate and provide for the basic avoidance and management measures necessary to reduce the risk of injury, mortality, or disturbance to indigenous bird species during construction activities.

However, a significant omission is the absence of any specific provisions relating to kiwi. Given the known distribution of kiwi within Northland and the scale of the proposed works, reliance on generic bird management measures is unlikely to provide sufficient certainty that effects on kiwi will be appropriately managed.

Kiwi are subject to unique management requirements due to their conservation status, ground-dwelling behaviour, vulnerability to construction activities, and the specialised mitigation and handling procedures that may be required where individuals are encountered. Consequently, generic bird protection measures cannot be assumed to adequately address potential effects on kiwi.

At a minimum, the Avifauna Management Plan (AMP) should contain a dedicated kiwi management section that outlines species-specific survey requirements, pre-construction assessments, construction protocols, monitoring requirements, contingency measures, and procedures for responding to kiwi detections within or adjacent to active work areas. The management framework should also clearly identify requirements for specialist involvement (i.e., pre-clearance sweeps using a trained detector dog) and establish appropriate reporting and compliance requirements.

In addition, kiwi should be included within the Wildlife Approval application with specific conditions imposed to ensure that kiwi are managed in accordance with current best-practice guidance throughout all stages of the project. This would provide greater certainty that potential adverse effects are appropriately identified and managed and would ensure that project personnel are operating under a clearly defined and enforceable management framework.

9.7 Proposed conditions for other fauna

It is anticipated that that conditions relating to lizards and invertebrates will be suggested to DOC as part of the Wildlife Approval application. These may be reviewed and commented on if and when available. In general, conditions will require the full implementation of the relevant fauna management plan together with any additional ones where detail within the plan may be lacking. DOC contain a wide range of standardized conditions relating to lizards and invertebrates.

10. Conclusions and Recommendations

The baseline surveys and desktop assessments that have been provided so far provide a good foundation for understanding the terrestrial wildlife values present within the PD. Survey effort has been substantial for some taxa and habitats, and the assessment identifies the principal ecological effects associated with the proposed designation boundary. However, considerable uncertainty remains regarding the true extent of species distribution (for low-mobility species especially), abundance, habitat use, population connectivity, and the likely effectiveness of the primary mitigation measures proposed. These uncertainties are particularly important given the extended period before construction is likely to commence and the reliance on mitigation activities that have not yet been developed in detail or demonstrated as effective at the scale proposed.

A recurring theme throughout this review is the confidence placed in successful ecological outcomes even when supporting evidence is lacking within the data provided. Conclusions regarding residual effects consistently rely on assumptions relating to species abundance, mitigation effectiveness, habitat recovery timeframes, and long-term population responses that have not yet been adequately tested. This is particularly relevant for Hochstetter's frogs, where significant uncertainty remains regarding translocation success, carrying capacity of recipient sites, long-term survivorship, dispersal behaviour, and population persistence following relocation.

Given these uncertainties, if the designation is approved in the location currently proposed, a staged ecological refinement framework is recommended. This type of approach would make use of the pre-construction period to progressively improve ecological understanding, refine mitigation measures, and test key assumptions before they are relied upon at a project-wide scale. Rather than locking in mitigation approaches based on current, limited information, the framework would allow management strategies to be updated as additional data is collected and values and impacts at the local scale are better informed.

The highest priority information gaps relate to indigenous birds, bats, and Hochstetter's frogs. Current bird surveys rely heavily on desktop information which is not considered adequate for a project of this scale. Dedicated field surveys should be prioritised to establish a clearer and more current understanding of species presence and habitat use, particularly for Threatened species such as bittern and locally significant populations of kiwi. Similarly, additional multi-season bat surveys are required to adequately understand bat activity, roosting behaviour, and habitat utilisation across the project area.

For Hochstetter's frogs, further survey effort should focus on testing mitigation methods at a small-scale and monitoring their response to such activities. The genetically distinct Northland variant of this species raises the risk of applying untested mitigation strategies to tens of thousands of individuals and potentially imposing population-level impacts that result in High to Very High residual effects that cannot be offset or even compensated for within any meaningful timeframe. Therefore, small-scale translocation trials should be considered and co-ordinated with DOC to attempt to assess post-release survivorship, site fidelity, dispersal behaviour, and interactions with resident frog populations. Long-term monitoring of proposed mitigation sites should be used to establish baseline population densities, assess habitat carrying capacity and determine whether proposed habitat enhancement measures are capable of supporting the number of individuals anticipated to be relocated.

A fundamental limitation of the current mitigation strategy is the long temporal lag-phase between impacts and restoration of habitats to maturity. Habitat loss, fragmentation, and population disturbance will occur immediately following construction, whereas habitat restoration and enhancement measures are likely to require many years, and potentially decades, before they provide ecological conditions comparable to those being lost. As a result, there is likely to be a prolonged period during which ecological effects remain elevated while mitigation measures mature and their utility to impacted fauna develops. This potentially significant time-lag effect does not appear to be fully emphasised in the current assessment and contributes a high level of additional uncertainty to the predicted residual effects, the key consequence of which risks an insufficient residual effects management package that is not commensurate with project impacts.

If this designation is approved, ongoing consideration should also be given to opportunities to avoid or reduce impacts at the detailed design stage before the final alignment pathway is confirmed. In particular, retaining and protecting high-value habitat areas where practicable may provide greater certainty of beneficial ecological outcomes than reliance on future restoration and unproven translocation programmes. Where avoidance is not possible, alternative mitigation sites that are already functioning as high-quality habitat (but with opportunities for additionality) should be investigated (i.e., additional sites similar to the Northern Site). Population viability modelling should also be considered to assess the long-term persistence of frog populations and other species of low-mobility and high local genetic structuring (i.e., kauri snails) within isolated habitat areas, including the proposed Central Mitigation Area located between the existing and future SH1 alignments.

While it is acknowledged that additional management plans are intended to provide further detail regarding ecological mitigation and management as conditions of consent, the current level of information provides limited confidence that ecological effects can be managed to the extent assumed within the assessments. Deferring key ecological management measures, monitoring requirements, survey specifications, and mitigation methodologies to future stages further compounds the uncertainty regarding both the feasibility and effectiveness of the proposed approach. In my view, greater certainty around these matters should be established prior to confirmation of the designation, rather than after key project commitments have already been made.

In summary, the current designation location could be viewed as acceptable within the context of being able to successfully manage lizards, long-tailed bats, invertebrates and avifauna. There are enough established avoidance, minimisation and mitigation processes to provide a reasonable level of confidence that with some refinement, an overall mitigation, offset and compensation package could be provided that over the long-term results in no-net-loss of terrestrial biodiversity values. The same conclusion cannot be reached for Hochstetter's frogs. The potential residual effects associated with the loss of significant numbers of frogs, in combination with the cumulative effects of future harvesting activities (which are reported to result in a 90% loss of frogs in the Central Site), the potential genetic effects associated with a high level of habitat fragmentation and the very limited range of this regionally distinct variant that is restricted to Brynderwyn and Waipu forests. Based on the information currently available, no proposal has been identified that would suitably offset or compensate for the very high impacts to this species. The EcIA acknowledges this in its concluding statement and it is suggested on this basis that the current management proposal for this species is inadequate and must be reconsidered.

11. REFERENCES

Berthinussen, A., & Altringham, J. (2012). *The effect of a major road on bat activity and behaviour*. Journal of Applied Ecology, 49(1), 82–90. https://doi.org/10.1111/j.1365-2664.2011.02068.x

Berthinussen, A., & Altringham, J. (2015). *Best practice guidance for bat mitigation*. Bat Conservation Trust.

Burns, R. J., Armstrong, D. P., Bell, B. D., Haigh, A., Germano, J., Rawlence, N. J., Thurley, T., Hitchmough, R. A., Makan, T., & Michel, P. (2025). *Conservation status of amphibians in Aotearoa New Zealand, 2024* (New Zealand Threat Classification Series No. 44). Department of Conservation.

Hitchmough, R., Barr, B., Knox, C., Lettink, M., Monks, J. M., Patterson, G. B., Reardon, J. T., van Winkel, D., Makan, T., & Michel, P. (2026). *Conservation status of reptiles in Aotearoa New Zealand, 2025* (New Zealand Threat Classification Series No. 50). Department of Conservation.

Limpens, H. J. G. A., Twisk, P., & Veenbaas, G. (2005). *With bats on the road*. Ministry of Transport, Public Works and Water Management, Netherlands.

New Zealand Transport Agency Waka Kotahi. (2026, January 23). *Assessment of effects on avifauna ecology: Alternative to the Brynderwyn Hills – Brynderwyn Hills section* (Revision A, Report No. 10722-PTA-2B0-PE-RPT-0009). New Zealand Transport Agency Waka Kotahi.

New Zealand Transport Agency Waka Kotahi. (2026). *Northland Corridor – Brynderwyn Hills section of the Alternative to the Brynderwyn Hills: Proposed designation conditions*. New Zealand Transport Agency Waka Kotahi.

New Zealand Transport Agency Waka Kotahi. (n.d.). *Roads of National Significance: Northland Corridor — Assessment of effects on terrestrial ecology* (Document No. 10722-PTA-2B0-PE-RPT-0011, Rev. A). New Zealand Transport Agency Waka Kotahi.

O'Donnell, C. F. J., Borkin, K. M., Christie, J., Davidson-Watts, I., Dennis, G., Pryde, M., & Michel, P. (2023). *Conservation status of bats in Aotearoa New Zealand, 2022* (New Zealand Threat Classification Series No. 41). Department of Conservation.

Robertson, H. A., Baird, K. A., Elliott, G. P., Hitchmough, R. A., McArthur, N. J., Makan, T., Miskelly, C. M., O'Donnell, C. F. J., Sagar, P. M., Scofield, R. P., Taylor, G. A., & Michel, P. (2021). *Conservation status of birds in Aotearoa New Zealand, 2021* (New Zealand Threat Classification Series No. 36). Department of Conservation.

Spencer, H. G., Brook, F. J., & Kennedy, M. (2006). *Phylogeography of Kauri snails and their allies from Northland, New Zealand (Mollusca: Gastropoda: Rhytididae: Paryphantinae). Molecular Phylogenetics and Evolution, 38*(3), 835–842. https://doi.org/10.1016/j.ympev.2005.10.015

Stringer, I.A.N., et al. (2002). *Population genetics and biogeography of New Zealand's giant land snails (Paryphanta spp.)*. Conservation Genetics, 3, 283–294.

Walker, K., Walton, K., Edwards, E., Hitchmough, R. A., Payton, I., Barker, G., & Michel, P. (2024). *Conservation status of New Zealand indigenous terrestrial Gastropoda (slugs and snails): Part 3. Rhytididae (carnivorous snails), 2022* (New Zealand Threat Classification Series No. 42). Department of Conservation.

Appendix B:
Te Parawhau Hapū Accidental Discovery Kaupapa

Te Parawhau Hapū; Accidental Discovery Kaupapa

In the event of a discovery, of archaeological material and taonga, Accidental Discovery Kaupapa shall be immediately implemented as follows:

- All work on the site will cease immediately. The contractor/works supervisor will shut down all equipment and activity.
- The contractor/works supervisor/owner will take immediate steps to secure the site (tape it off) to ensure the archaeological remains are undisturbed and the site is safe in terms of health and safety requirements and tikanga Māori.
- The contractor/works supervisor/owner will immediately notify the Cultural Monitor on site and the Area Archaeologist of the Heritage New Zealand Pouhere Taonga (Northland Office). The Cultural Monitor will have a direct line of communication with the Heritage New Zealand appointed archaeologist.
- The Cultural Monitor will undertake karakia and any other protocol in accordance with tikanga Māori. If required, the Cultural Monitor will escalate the matter and contact Te Parawhau Hapū Kaumātua for further guidance and support.
- If the material is confirmed as being archaeological, as defined by the Heritage New Zealand Pouhere Taonga Act 2014, an assessment will be carried out before work resumes. If koiwi tāngata are uncovered, the above step is must be taken and the area dealt with according to tikanga Māori and the law.

Works at the site area shall not recommence until an archaeological assessment is made and, the Cultural Monitor together with the on-site archaeologist confirm that all archaeological material has been dealt with appropriately, and statutory requirements met which includes the active Crown protection of Māori interests which includes their culture, taonga and their future generations in accordance with Te Tiriti.

Appendix C:
Mahi Whakaora

Mahi Whakaora

Uara Ahurea	Mahi Whakaora
Mana Atua	**Avoidance and Design Requirements** Adverse effects on Mana Atua shall be avoided wherever practicable through design and construction methodologies that significantly reduce disturbance to the whenua and taiao. This includes preventing irreversible modification of culturally significant landforms, including Te Mano Hiwa Ariki. • NZTA shall undertake further design refinement, including alternative alignments and construction methodologies, in partnership with Te Parawhau Hapū to avoid or significantly reduce the extent of cut and fill earthworks within areas of high cultural and spiritual significance. • Alternative design solutions, including tunnels, viaducts, and bridging, shall be actively considered and implemented where required to retain the integrity of the whenua and uphold Mana Atua. • The designation shall include conditions requiring that where adverse effects on Mana Atua cannot be avoided, works shall not proceed unless agreed by Te Parawhau Hapū through the established governance structure. These requirements shall be given effect to through the Outline Plan and associated management plans. **Partnership and Decision-Making** Te Parawhau Hapū are Te Tiriti o Waitangi partners with NZTA as a Crown entity. Accordingly, partnership and shared decision-making must be embedded within all aspects of the Project.

	• A Te Parawhau Hapū Rōpū Mahi, including kaumātua and kaitiaki, Hapū Subject Matter Expert(s), shall be established in partnership with NZTA and embedded within the Project governance and delivery framework. • The Rōpū Mahi shall have a defined and active decision-making role in relation to: o detailed design; o construction methodology; o staging of works; o identification and management of culturally and spiritually significant areas; and o responses to actual and potential effects on Mana Atua. • All decisions relating to Mana Atua shall be undertaken in partnership with Te Parawhau Hapū through the Rōpū Mahi. • NZTA shall provide appropriate and ongoing resourcing to enable Te Parawhau Hapū participation at all stages of the Project, including design, construction, monitoring, and post-construction phases. **Outline Plan and Management Planning** Uara ahurea-led outcomes for Mana Atua shall be established at the designation stage and incorporated into designation conditions. • The Outline Plan shall demonstrate how these outcomes will be given effect to through detailed design, construction methodologies, staging, and environmental management measures.

	• The Outline Plan and all associated management plans shall be consistent with, and give effect to, the uara ahurea-led outcomes established for Mana Atua. • A Te Parawhau Hapū tikanga and kawa framework shall be developed in partnership with Te Parawhau Hapū and incorporated into all Outline Plan and Project management plans, including the Construction Environmental Management Plan and associated sub-plans. **Tikanga and Te Parawhau Cultural Process** • A pre-construction hui shall be held with Te Parawhau Hapū to confirm tikanga, kawa, and cultural expectations prior to the commencement of works, and to guide all stages of the Project. • Kaumātua and Te Parawhau monitors shall be enabled and appropriately resourced to undertake karakia, whakawātea, and other tikanga at key locations and events within the Project area prior to and during works. • A Te Parawhau Hapū-led cultural induction programme shall be mandatory for all NZTA staff, contractors, and subcontractors prior to site access and maintained throughout the duration of the Project. • A tikanga response framework shall be developed in partnership with Te Parawhau Hapū and embedded within designation conditions, the Outline Plan, and all relevant management plans. This framework shall address events affecting Mana Atua, including: o discovery of koiwi or taonga; o disturbance of wāhi tapu; o serious incidents or fatalities; and

	○ environmental damage affecting mauri. • Te Parawhau Hapū Accidental Discovery Kaupapa (including processes for kōiwi, taonga, and wāhi tapu) shall be adopted and implemented for the Project. This kaupapa shall be embedded within designation conditions, the Outline Plan, and all relevant management plans, and shall take precedence over any standard accidental discovery protocols. • Te Parawhau Hapū tikanga responses, including rāhui, shall be recognised and provided for within designation conditions. **Monitoring, Hold Points and Enforcement** • Te Parawhau Hapū cultural monitoring shall be implemented throughout all stages of the Project. • Hapū monitors shall have the authority to identify activities that pose a risk to tikanga, wairuatanga, or the mauri of the taiao, and to require works to be paused where such risks are identified. • Hold points and decision triggers shall be embedded within designation conditions, the Outline Plan, and all relevant management plans to ensure that works do not proceed where adverse effects on Mana Atua may occur. • Where works are paused due to actual or potential impacts on tikanga, wairuatanga, or the mauri of the taiao, they shall not recommence until: ○ appropriate tikanga responses have been implemented in accordance with the tikanga response framework; and

	○ Te Parawhau Hapū, through the Rōpū Mahi, confirm that it is appropriate for works to resume.
Te Mana o te Wai	**Freshwater System Identification and Protection** • All freshwater systems within the Project area, including headwater streams, intermittent and ephemeral waterways, wetlands (repo), springs (puna), groundwater systems (puna wai), and associated freshwater environments, shall be fully identified, mapped, and assessed, recognising their ecological function, connectivity, and contribution to the health of the wider catchment. • Wetlands (repo), including those within pastoral or modified landscapes, shall be recognised as functionally important ecosystems and shall not be assigned reduced ecological value based on land use context. Their ecological, hydrological, and cultural significance shall be appropriately identified and protected. **Ecological Assessment Methodology and Scale** • The assessment of freshwater effects of the Project shall be undertaken using recognised and accepted ecological methodologies and shall provide a robust, site-specific, and evidence-based assessment of ecological value and function. Modified or non-standard methodologies that reduce ecological value shall not be applied. • The assessment of freshwater effects shall be undertaken at an appropriate ecological scale, including site-specific and reach-scale assessment, and shall not rely on catchment-scale

	averaging or percentage loss calculations that dilute or mask the magnitude and significance of localised effects. • The assessment shall not rely on assumptions or extrapolation in the absence of sufficient field data. Baseline information shall be based on comprehensive, multi-season field survey sufficient to accurately characterise freshwater environments and their ecological values. • A Chemical Treatment Management Plan (CTMP), as recommended in the Construction Water Assessment (Section 5.4.8), addressing the use and management of chemical treatment agents, including acrylamides, and the potential discharge of contaminants such as zinc and copper from runoff shall be prepared and implemented. • The CTMP shall demonstrate how adverse effects on freshwater systems and te mauri o ngā wai are avoided, including controls on dosing, monitoring of receiving environments, and clear limits and response measures where contamination is detected. **Avoidance of Effects Management** • The Project shall avoid adverse effects on freshwater systems. Where adverse effects cannot be avoided, they shall be appropriately remedied or mitigated, recognising that measures such as restoration, channel realignment, or offsetting do not provide certainty of ecological equivalence, particularly at the scale of effects associated with the Project. **Freshwater Connectivity and Fish Passage** • The Project shall maintain and protect ecological and hydrological connectivity, riparian buffers, including

	connections between headwaters, streams, wetlands, groundwater, and downstream receiving environments. • Fish passage shall be designed, implemented, and demonstrated in accordance with the New Zealand Fish Passage Guidelines (NIWA, 2024) from the out-set, rather than relying on alternative remedial measures. Fish passage shall also meet all relevant requirements of the National Policy Statement for Freshwater Management and National Environmental Standards for Freshwater. Fish passage shall provide for all relevant species, and life stages present within the receiving environment. • Monitoring of fish passage performance shall be undertaken following construction, and remedial measures shall be implemented where performance standards are not achieved. • All works affecting freshwater ecosystems demonstrate effective fish passage for all indigenous species, at all life stages, and across all flow conditions, including during construction and operation. • NZTA shall obtain all necessary approvals for works affecting freshwater species, including: o a Complex Freshwater Fisheries approval from the Department of Conservation (DOC) under Schedule 9 of the Fast-track Approvals Act 2024, where required; and o an Aquatic Life Transfer Authorisation from the Ministry for Primary Industries (MPI) to enable the salvage and transfer of indigenous freshwater species. • All fish salvage, relocation, and associated works must be undertaken in partnership with Te Parawhau Hapū, including the involvement of hapū-appointed monitors and subject matter experts. These requirements must be secured as

	enforceable conditions of the designation and associated resource consents, with no reliance on future management plans to determine their necessity, scope, or implementation. **Integrated Catchment Approach (ki uta ki tai)** • The assessment and management of freshwater effects shall recognise the interconnected nature of ngā wai ki uta ki tai, including cumulative and downstream effects arising from modification, fragmentation, or loss of freshwater systems. **Water Quality Monitoring** • Water quality monitoring shall be undertaken to assess the effects of earthworks and construction activities on freshwater systems, including sediment, turbidity, and associated contaminants including but not limited to copper, zinc and acrylamides. Monitoring shall be undertaken upstream and downstream of works and at representative locations across the Project area, including receiving environments. • Water quality monitoring shall be designed to detect changes in water clarity, sediment deposition, and ecological condition, and shall include clearly defined performance standards, trigger thresholds, and response actions. • Where monitoring identifies degradation of water quality or adverse effects on freshwater systems, immediate corrective actions shall be implemented, including modification of works and reinforcement of erosion and sediment control measures to prevent further effects. • Water quality monitoring and response measures shall be developed and carried out in collaboration with Te Parawhau Hapū and included as part of the Outline Plan of Works and

	shall be implemented for the duration of construction and for a sufficient period following completion to demonstrate that effects have been appropriately managed. **Integration and Collaboration with Te Parawhau Hapū** • Freshwater ecological assessment, project design, monitoring, and management responses shall be undertaken in partnership with Te Parawhau Hapū, giving effect to mātauranga Māori and ngā uara ahurea, and shall not separate ecological and cultural values in the assessment of effects. **Mitigation, Offsetting and Ecological Equivalence** • Measures described as mitigation or offsetting shall not be relied upon to justify adverse effects on freshwater systems where those effects are significant, irreversible, or involve the loss or degradation of interconnected freshwater environments. Such measures shall not be assumed to achieve ecological equivalence. • Where mitigation or offsetting is proposed, it shall be supported by robust, site-specific evidence demonstrating that ecological function, connectivity, and values will be maintained or restored. In the absence of such evidence, these measures shall not be relied upon. • A revised and integrated freshwater ecological assessment shall be undertaken to address the deficiencies identified in this CIA and the independent technical reviews. This assessment shall be completed prior to the submission of any Outline Plan of Works and shall directly inform the final design of the Project. • No works shall commence until this assessment has been completed to the satisfaction of the consent authority, in

	partnership with Te Parawhau Hapū, including the involvement of hapū-appointed kaitiaki and subject matter experts. • All freshwater-related design measures, management plans, and mitigation responses shall be prepared and submitted as part of the Outline Plan of Works and shall demonstrate how adverse effects on freshwater systems have been avoided, remedied, or mitigated in accordance with Te Mana o te Wai and ngā uara ahurea o Te Parawhau Hapū.
Mana Whenua	**Landform and Earthworks Management** • The Project shall avoid significant modification of the whenua, including ridgelines, slopes, valleys, and areas of natural character, particularly where such modification would result in permanent alteration to the form, integrity, mauri and functioning of the whenua. • Where earthworks cannot be avoided, they shall be minimised in extent and scale, and designed to maintain, to the greatest extent possible, natural landform, contour, and landscape and topographical patterns. • The extent, location, and design of earthworks shall be reviewed and refined through an iterative design process to avoid or reduce earthworks and resultant effects on the whenua, including the evaluation of alternative alignments, and shall demonstrate that all reasonable alternatives have been evaluated. **Vegetation Retention and Restoration (Kākahu o Papatūānuku)** • Clearance of indigenous vegetation shall be avoided. Where clearance is proposed, it shall be clearly demonstrated, in partnership with Te Parawhau Hapū, that avoidance cannot be achieved through alternative design, alignment, or construction

	methodology, and that all reasonable options to retain indigenous vegetation and the ecological systems that sustain it, including associated freshwater environments, have been exhausted. • Where vegetation removal is demonstrated to be unavoidable, it shall be minimised in extent and restricted to areas essential for construction and shall not result in the loss or degradation of remnant indigenous vegetation communities, including stands of kahikatea, or the freshwater systems that sustain them. This shall be determined in partnership with Te Parawhau Hapū. • Restoration planting shall prioritise indigenous canopy species appropriate to local ecological and cultural contexts and shall be designed to restore the protective functions of vegetation, including erosion control, habitat support, landscape integration and enhancement of mauri. Planting widths shall not be less than 20 metres either side of any waterway. • Remnant riparian vegetation will be buffered to a minimum of 20 metres where they are located within the designation. • Vegetation removal and restoration shall be undertaken in a manner that maintains the integrity and health of the whenua and supports the recovery of mauri over time. • All ecological offset planting shall be undertaken in accordance with the National Policy Statement for Indigenous Biodiversity (Appendix 3: Principles for Biodiversity Offsetting in New Zealand), with reference to the Department of Conservation (2014) Guidance on Good Practice Biodiversity Offsetting in New Zealand. o Ecological offset maintenance shall continue until canopy species reach a minimum height of six (6) metres

	and the offset demonstrably achieves its intended habitat function and replacement purpose. o These outcomes must be confirmed by a suitably qualified ecologist before maintenance obligations cease. **Erosion, Sediment, and Soil Stability** • Erosion and sediment control measures shall be designed and implemented to prevent degradation of the whenua, including the loss of soils, destabilisation of slopes, and downstream sedimentation. • Earthworks shall be staged and managed to minimise exposed surfaces and duration of exposure, and to maintain soil stability at all times. • Performance standards, monitoring, and response measures shall be established to ensure that erosion and sediment control measures are effective and maintained throughout construction. **Spoil Disposal and Earthworks Material Management** • All spoil disposal sites and locations for earthworks material shall be clearly identified, mapped, and assessed prior to any works commencing. No disposal of spoil shall occur outside of approved and assessed locations. • Spoil shall not be disposed of by uncontrolled tipping, including the placement or discharge of material over slopes, ridgelines, cliffs, or into ngāhere, valleys, or watercourses. • The selection, design, and management of spoil disposal sites shall avoid adverse effects on the whenua, including indigenous vegetation, remnant ngāhere, freshwater systems, and natural

	landforms. Disposal sites shall not be located within, or result in the degradation of, ecologically or culturally significant areas, including stands of kahikatea or associated freshwater systems. • The extent and volume of spoil shall be minimised through design refinement, and opportunities for reuse within the Project footprint shall be prioritised over disposal. • The location, design, and management of all spoil disposal sites shall be determined in collaboration with Te Parawhau Hapū and the appointed mahi rōpū. This includes the identification, management, and appropriate containment, treatment, or relocation of: o any soils contaminated with Phytophthora agathidicida (kauri dieback) in accordance with the National Pest Management Plan; and o any contaminated land or material, including that identified within HAIL sites, in accordance with relevant statutory and regulatory requirements. • This also includes involvement in the development, survey, and implementation of the Kauri Earthworks Risk Management Plan required under the Biosecurity Act 1993, including compliance with all Ministry of Primary Industry (MPI) requirements. • All spoil management measures and disposal locations shall be documented and submitted as part of the Outline Plan of Works and shall demonstrate how adverse effects on the whenua have been avoided, and where avoidance cannot be achieved, minimised. • All spoil disposal activities shall be monitored throughout construction to ensure compliance with approved spoil management measures and to prevent adverse effects on the

	whenua, including vegetation, landform stability, and associated freshwater systems. • Monitoring results shall be documented and made available to Te Parawhau Hapū, and where monitoring identifies adverse effects or non-compliance, immediate corrective actions shall be implemented, including modification or cessation of spoil disposal activities until compliance is achieved. **Landscape and Natural Character Protection** • The design and construction of the Project shall recognise and protect landscapes identified as having natural character and outstanding natural landscape values, avoiding modification where such values would be compromised. • Mitigation planting alone shall not be relied upon to address effects on natural character and landscape values. **Integrated Design and Cultural Partnership** • The design, assessment, and management of the Project shall be undertaken in partnership with Te Parawhau Hapū, giving effect to Te Tiriti o Waitangi articles and principles, including active protection, partnership, and rangatiratanga. • Te Parawhau Hapū shall be involved in the development, review, and implementation of all earthworks, landform modification, landscape, and restoration design. This involvement shall be appropriately incorporated in the Outline Plan and associated Designation conditions of consent. • Mātauranga Māori and ngā uara ahurea o Te Parawhau Hapū shall be integrated into all aspects of design and decision-making relating to the whenua, and this integration shall be demonstrated through design outcomes and documentation.

	Monitoring and Adaptive Management • Monitoring shall be undertaken to ensure that adverse effects on the whenua are avoided, and where avoidance cannot be achieved, minimised, and that all conditions of the designation and Outline Plan of Works are complied with. • In accordance with Te Pouwhenua o Tiakiriri Kukupa Trust on behalf of Te Parawhau Hapū Mana Whakahono a Rohe with NRC, Hapū monitors shall be appropriately trained and resourced to carry out this monitoring. Monitoring shall include indicators of soil stability, erosion, vegetation establishment, and broader ecological and cultural health outcomes. • Where monitoring identifies adverse effects or failure to meet performance standards, immediate corrective actions shall be undertaken, including modification of works and design where necessary. **Reassessment and Outline Plan Requirements** • A revised and integrated landform and earthworks assessment shall be undertaken to address the adverse effects and matters identified in this report and shall be completed prior to the submission of any Outline Plan of Works. • The revised assessment shall demonstrate how effects on Papatūānuku and the whenua have been avoided through design, and where avoidance cannot be achieved, substantially reduced, including through consideration of alternative alignments. • No works shall commence until this assessment has been completed in partnership with Te Parawhau Hapū and has informed the final design of the Project.

	• All land disturbance, earthworks, vegetation removal, and landscape management measures shall be documented and submitted as part of the Outline Plan of Works and shall demonstrate how adverse effects on the whenua have been avoided, and where avoidance cannot be achieved, minimised, in accordance with Mana Whenua and ngā uara ahurea o Te Parawhau Hapū.
Mana Ao Tūroa	• The Project shall prioritise avoidance of adverse effects on taonga species and ecological systems, recognising that mitigation measures such as salvage, relocation, and habitat restoration, at the scale of effects arising from this Project, are uncertain and do not provide sufficient certainty of success. • The Project shall not rely on untested or unproven mitigation measures to justify adverse effects on taonga species, particularly where population-level or irreversible effects are likely. • Remnant ngāhere, including kauri-dominated systems, freshwater systems, wetlands (repo), and habitats supporting taonga species shall be protected from loss, fragmentation, and degradation. • The Project shall be redesigned and refined to avoid adverse effects on high-value habitats, while recognising that all habitats within the Project area, including modified and exotic systems, contribute to ecological function, connectivity, and the wellbeing of the wider taiao, and shall be appropriately protected and managed. • Additional multi-season ecological surveys shall be undertaken to confirm species presence, habitat use, and ecological function prior to finalisation of detailed design, including for pekapeka, kiwi, bittern, lizards, and invertebrates.

	• Wildlife approvals shall fully account for all species potentially affected by the Project, including pekapeka and avifauna, and shall not rely on incomplete or undefined management approaches. • Ecological assessments shall adopt a precautionary approach where uncertainty exists and shall not assume low levels of effect in the absence of robust evidence. • Earthworks and spoil disposal locations and methodologies shall be clearly defined and demonstrated to avoid adverse effects on receiving environments, including waterways, wetlands, ngāhere and ecological systems. • Monitoring frameworks shall include measurable performance standards, trigger thresholds, and enforceable responses where outcomes are not achieved. • Adaptive management responses shall be implemented in partnership with Te Parawhau Hapū and shall give effect to ngā uara ahurea o Te Parawhau Hapū. • The ecological and freshwater assessments shall be revised to apply recognised and standard ecological assessment methodologies without modification, and shall provide a transparent, robust, and site-specific assessment of ecological values and effects. The assessment shall not rely on assumptions, averaging, or extrapolation in the absence of supporting field data. • Revision of all ecological reports and subsequent application of the effects management hierarchy to include the Waipū Ecological District and regionally significant species and habitats, including WF9, WF8, and WF7 forest types; remnant riparian vegetation; fish; birds; frogs; bats; all wetlands; headwaters; and ephemeral creeks.

	• The assessment of ecological effects of the Project shall be undertaken at an appropriate ecological scale, including site-specific and reach-scale assessment of freshwater, terrestrial, and avifauna habitats, including streams, wetlands, and associated ecosystems, and shall not rely on catchment-scale averaging or percentage loss calculations that mask the magnitude and significance of localised ecological effects. • Measures presented as mitigation shall demonstrate outcomes beyond baseline regulatory compliance and shall be supported by evidence of effectiveness. Compliance with minimum statutory requirements shall not be relied upon as mitigation of adverse ecological effects. • Ecological and freshwater assessments, design, and management responses shall be undertaken in an integrated manner with Te Parawhau Hapū, giving effect to mātauranga Māori and ngā uara ahurea o Te Parawhau, and shall not separate ecological and cultural values in the assessment of effects or development of responses.
Mana Tāngata	To uphold Mana Tāngata, the following mahi whakaora are required: **Protection of Interconnected Cultural and Environmental Systems** • The Project shall avoid, wherever practicable, adverse effects on Te Mano Hiwa Ariki and interconnected systems of whenua, ngāhere, repo, puna wai, awa, and manga. • The alignment, interchange design, and construction methodology shall be refined to avoid or minimise the destruction, fragmentation, and modification of these systems.

	• The diversion, culverting, or modification of natural waterways shall be avoided wherever practicable, particularly where such systems sustain remnant ecosystems and their mauri. **Recognition of Whānau, Occupation and Livelihoods** • The Project shall recognise and provide for existing whānau, landowners, and residents, including long-standing occupation, land use, and livelihoods within the Project area, including active farming operations and intergenerational land use. • Fragmentation or loss of productive whenua shall be avoided wherever practicable through design refinement. • Where land and livelihoods are directly affected, engagement with affected whānau, landowners, and residents shall be undertaken in partnership with Te Parawhau Hapū. **Access and Relationships with Ancestral Whenua, Wāhi** • Access to whenua, wāhi, and areas of personal, cultural, and ancestral significance shall be maintained, and where access cannot be maintained, alternative arrangements shall be developed in partnership with Te Parawhau Hapū and affected whānau, landowners, and residents prior to the commencement of works. **Hapū Participation and Delivery Opportunities** • NZTA shall ensure that procurement and delivery processes for the Project are structured to enable Te

	Parawhau Hapū, should it choose to do so, to participate in, lead, and undertake the delivery of Project works on a fair and equitable basis. • Such opportunities shall extend across the full range of Project activities, including construction, restoration works, environmental management, and associated infrastructure delivery, where capability exists or can be developed. • NZTA shall engage with Te Parawhau Hapū at an early stage to identify and provide for pathways for participation in Project delivery, including joint venture, partnership, or subcontracting arrangements. • NZTA shall not unreasonably exclude Te Parawhau Hapū from procurement processes and shall take active steps to remove barriers to participation. **Monitoring and Intergenerational Outcomes** • Monitoring and review mechanisms shall be established in partnership with Te Parawhau Hapū to assess ongoing and cumulative effects on Mana Tāngata arising from the Project and shall align with Te Pouwhenua o Tiakiriri Kūkupa Trust's Mana Whakahono a Rohe agreement with NRC. • Adaptive management responses shall be implemented in partnership with Te Parawhau Hapū where adverse effects on Mana Tāngata, whenua, or taiao are identified, and shall be guided by and give effect to ngā uara ahurea o Te Parawhau Hapū.