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Ecological Impact Assessment

Milldale North Stages 14-17

Prepared for: Fulton Hogan Land Development Limited

August 2026

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Author(s)		
	Mark Delaney, MSc.(Hons.), MEIANZ	Brittany Pearce, BSc., CEnvP, MEIANZ
	Director & Lead Ecologist	Senior Ecologist
Reviewer(s)		
	Annabelle Coates, MSc., CEnvP, MEIANZ	
	Senior Ecologist	

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Cover photo: Ōrewa River and associated wetland margins within the site at Milldale, Auckland (photo source: Viridis 2026).

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STATEMENT OF QUALIFICATIONS AND EXPERIENCE

Mark Delaney (Co-author)

My full name is Mark Pierre Delaney. I am a Director and Lead Ecologist at Viridis Limited (Viridis). I hold the qualifications of Master of Science in Ecology and Conservation (Hons.) from Massey University and have more than 15 years' professional experience in the field of ecology, specialising in terrestrial and freshwater ecology. I am a member of the New Zealand Ecological Society, New Zealand Freshwater Sciences Society, and Full Member of the Environment Institute of Australia and New Zealand (EIANZ).

My experience includes freshwater and terrestrial ecological impact assessment, ecological restoration, ecological monitoring, and ecological management planning for urban and rural developments throughout New Zealand. I have led and peer reviewed ecological assessments for a wide range of residential, infrastructure, and fast-track projects, including Milldale Stages 7-13, Beachlands South Fast Track and Stage 1 earthworks, Auckland Surf Park Community, Botanic Riverhead, Brickfields Scott Road, Melia Place, Unitec Residential Development – Wairaka Stage 1, Te Whenua Haa Ora, Wellsford North, and Verran Mews. I have also provided ecological input into projects progressed under both the COVID-19 Recovery (Fast-track Consenting) Act 2020 and the Fast-track Approvals Act 2024 (FTAA).

I have been engaged by Fulton Hogan Land Development Limited (FHLD) (the Applicant) to undertake an assessment of ecological effects associated with the Milldale Stages 14-17 project and to prepare this report in support of the substantive application under the FTAA.

While this is not an Environment Court proceeding, I confirm that I have prepared this assessment in accordance with the applicable professional and ethical obligations of my profession and that the opinions expressed are within my area of expertise.

Brittany Pearce (Co-author)

My full name is Brittany May Pearce. I am a Senior Ecologist at Viridis. I have seven years' professional experience in ecological consulting, specialising in terrestrial and freshwater ecology. I hold a Bachelor of Science in Biological Sciences from the University of Auckland and am a full member of the EIANZ. I am also a Certified Environmental Practitioner (CEnvP) under EIANZ's accreditation scheme.

My experience includes ecological impact assessment, ecological restoration, ecological monitoring, and ecological management planning for urban and rural developments. I have undertaken ecological field investigations, reporting, and peer review for a range of residential and infrastructure projects throughout New Zealand, including developments progressed under the COVID-19 Recovery (Fast-track Consenting) Act 2020 and the FTAA. Relevant experience includes ecological input into the Milldale Stages 10-13 Fast Track project, Beachlands South Fast Track and Stage 1 Earthworks, quarterly wetland vegetation monitoring for Milldale Stage 7, and ecological investigations associated with the Auckland Surf Park Community development.

I have been engaged by FHLD to undertake an assessment of ecological effects associated with the Milldale Stages 14-17 project and to prepare this report in support of the substantive application under the FTAA.

While this is not an Environment Court proceeding, I confirm that I have prepared this assessment in accordance with the applicable professional and ethical obligations of my profession and that the opinions expressed are within my area of expertise.

Annabelle Coates (Reviewer)

My name is Annabelle Julia Coates. I am a Senior Ecologist at Viridis. I have more than 12 years' professional experience in ecological consulting, specialising in terrestrial and freshwater ecology. I hold both a Bachelor and Master of Environmental Science and am a full member of the EIANZ. I am also a Certified Environmental Practitioner (CEnvP) under EIANZ's accreditation scheme.

My experience includes freshwater, terrestrial, and coastal ecological impact assessment, ecological restoration, ecological monitoring, and technical peer review for urban and rural developments. I have provided ecological advice and reporting for projects approved under the COVID-19 Recovery (Fast-track Consenting) Act 2020 and projects currently progressing under the FTAA, including the Ridgeburn mixed-use urban development, Parkburn mixed-use urban development, and the Delmore residential subdivision. I have also been involved in a wide range of land development projects throughout Otago, the West Coast, Canterbury, Wellington, Hawke's Bay, Waikato, Auckland, and Northland.

I have been engaged by FHLD to undertake technical oversight and quality assurance of the ecological assessment prepared for the Milldale Stages 14-17 project in support of the substantive application under the FTAA.

While this is not an Environment Court proceeding, I confirm that I have prepared this assessment in accordance with the applicable professional and ethical obligations of my profession and that the opinions expressed are within my area of expertise.

1 INTRODUCTION

1.1 Overview

This report has been prepared in support of the substantive application for the Milldale Stages 14-17 Project under the Fast-track Approvals Act 2024 (FTAA).

The Project relates to approximately 231 ha of land centred around Wainui Road in Wainui, Auckland. The proposal provides for the next stages of Milldale, which is a comprehensively planned urban development including residential neighbourhoods, a supporting commercial node, transport and servicing infrastructure, open space, wetland restoration, an ecological restoration area and associated enabling works.

The application seeks approvals necessary to facilitate the staged development of the Project, including a suite of resource consents required under the FTAA framework.

The substantive application is supported by a comprehensive set of technical assessments and plans addressing the environmental, servicing and infrastructure matters associated with the proposal. This report should be read alongside the Planning Report (AEE; Barker & Associates 2026a) and the appended technical reports and drawings lodged in support of the substantive application.

1.2 Purpose and Scope of this Report

This report addresses matters relating to ecology associated with the Project proposal. It includes an Ecological Impact Assessment (EcIA) to accompany and inform the application under the FTAA.

The EcIA identifies and discusses the existing terrestrial and freshwater ecological values present within the site and surrounding environment and determines the impact of the proposed development and associated activities on those values. Recommended measures to avoid, remedy, or mitigate adverse effects on terrestrial and freshwater ecology are provided as necessary. Recommendations for addressing anticipated residual adverse effects on the ecological values of the site through enhancement are also made where applicable.

The design of the development has sought to avoid and minimise adverse effects on ecological values through the iterative masterplanning process undertaken for the Project, in which ecological constraints, including the location and value of terrestrial and freshwater features, have informed the development layout. This process is described further in the AEE (Barker & Associates 2026a).

This EcIA should be read alongside the Assessment of Surface Water Quality Effects report, also prepared by Viridis (2026), which outlines the potential surface water quality effects associated with the Project's proposed water take and treated wastewater discharges.

This report has been prepared having regard to the relevant statutory and technical framework applicable to the proposal, including the Auckland Unitary Plan (AUP), the National Policy Statement for Freshwater Management 2020 (NPS-FM), the National Environmental Standards for Freshwater 2020 (NES-F) and the National Policy Statement for Indigenous Biodiversity 2023 (NPS-IB).

1.3 Site Description

The site comprises approximately 231ha of land held across various records of title at Milldale, Wainui ('the site'). The site comprises two distinct areas:

- Residential subdivision area to the south of the Ōrewa River ('development site'; shown in red in Figure 1); and
- Te Korowai o Maraeariki to the north of the Ōrewa River (shown in orange in Figure 1), a site which will be dedicated largely to ecological restoration, recreation, water and wastewater infrastructure.

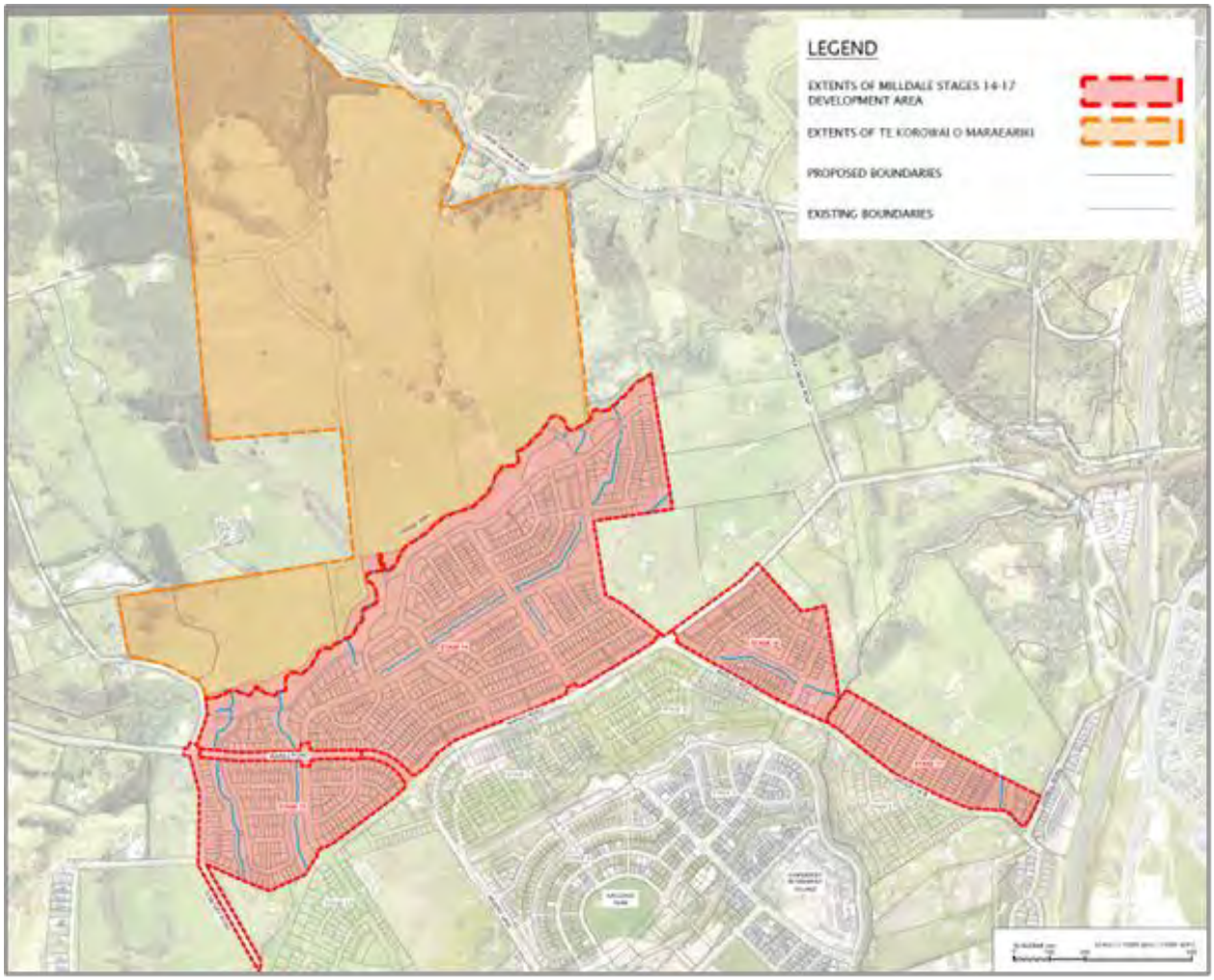

Figure 1. Map of the Project site, showing the extents of the Milldale Stages 14-17 development area in red, and extents of Te Korowai O Maraeariki restoration site in orange.

The proposed residential subdivision area is located within the Future Urban Zone under the Auckland Unitary Plan (AUP; Figure 2). This part of the site is characterised by gently undulating to rolling pasture, with several streams, natural wetlands, constructed ponds and artificial drains traversing the area.

Te Korowai o Maraeariki is located to the north of the Ōrewa River and is zoned Rural Production under the AUP (Figure 2). This area is characterised by more undulating to steep terrain, with a series of ridgelines separated by incised gullies extending from the Ōrewa River. The land is predominantly managed pasture interspersed with streams and natural wetlands, together with pine plantations, exotic vegetation and gorse scrub. Relatively large areas of indigenous vegetation are also present, including a Significant Ecological Area (SEA) – Terrestrial Overlay in the north-western portion of the site.

There is existing water, stormwater and wastewater infrastructure surrounding the site as a result of the extensive development within previous Milldale Stages. However, the site itself is not currently serviced in terms of supply and infrastructure. The surrounding roading network has been progressively developed in accordance with the staging of the Milldale development.

The surrounding area is now substantially developed. The Milldale Local Centre has also been constructed, together with associated roads, accessways and drainage reserves. Community infrastructure within the surrounding area includes Ahutoetoe Primary School, two early childhood education centres and the Summerset retirement village. Beyond the urban extent of Milldale, the site adjoins a number of rural residential properties.

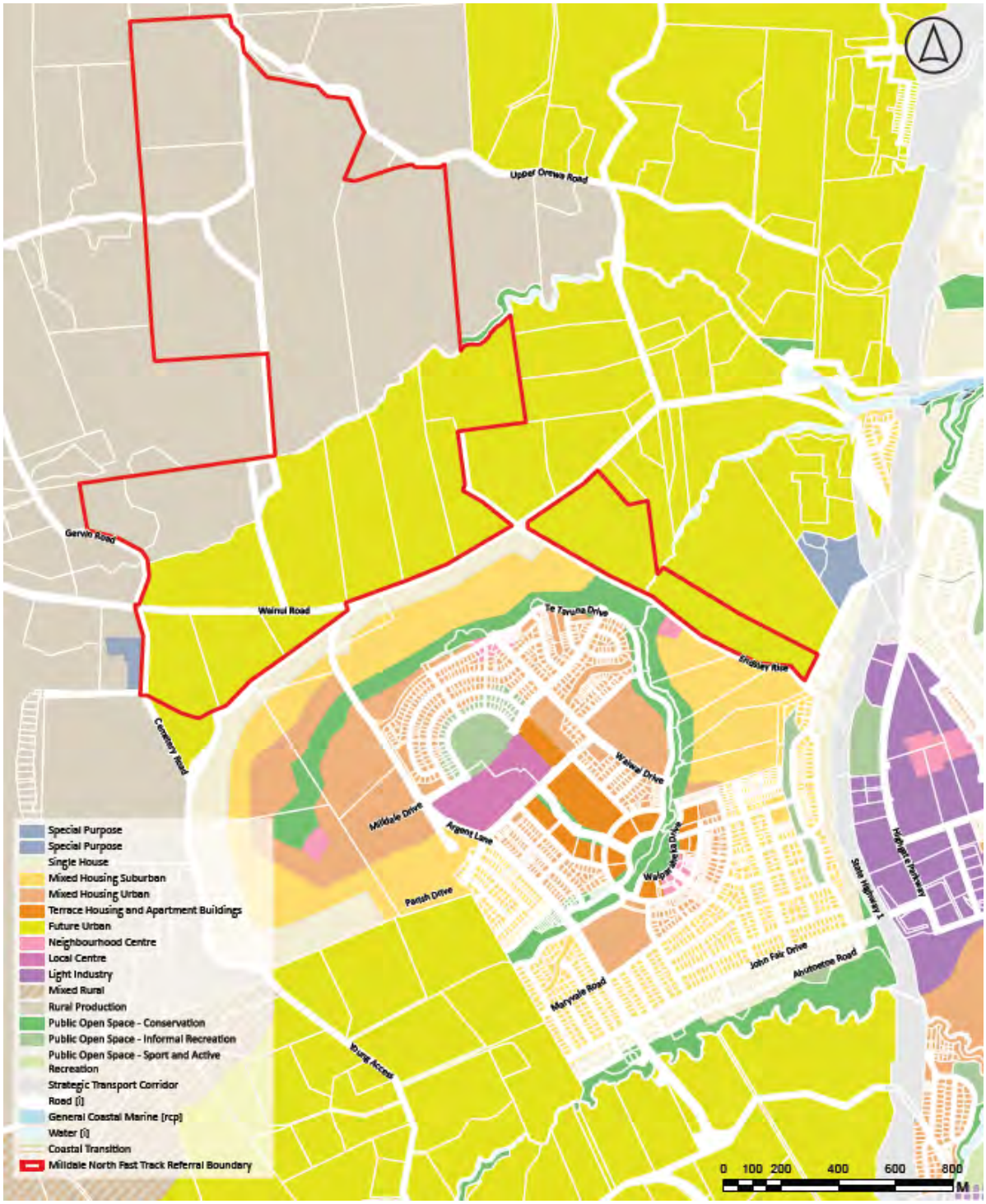

Figure 2. Project boundaries and current AUP zoning.

1.4 Proposal Description

The Milldale Stages 14-17 project seeks approvals for an urban development on the FUZ portion of the site. The proposal provides for up to 1,401 dwellings across a range of housing typologies and densities, although for the purposes of the infrastructure assessments a yield of 1,425 dwellings is assumed. In addition, the proposal includes provision for a small commercial area, transport infrastructure, servicing and stormwater infrastructure, subdivision, earthworks, stream works, and neighbourhood parks.

To the north of the Ōrewa River within Te Korowai o Maraeariki, the project includes private water and wastewater infrastructure, ecological restoration, as well as walking and cycling trails to enhance recreation and amenity.

Development of the Project will require a suite of approvals under the FTAA, including resource consents associated with subdivision, land use activities, bulk earthworks, infrastructure works, stream works, water take, diversion and discharge; along with NES for contamination and freshwater.

A full description of the proposal is provided in the Planning Report and technical reports and drawings appended to the substantive application, and should be read in conjunction with this report.

2 METHODOLOGY

2.1 Overview

The ecological assessment comprised a combination of desktop review, field investigations, targeted ecological surveys, and review of previous ecological investigations undertaken within the Site and surrounding area. Survey methodologies varied depending on the ecological feature or taxa being assessed and are described further in Sections 2.2 and 2.3 below.

Field investigations were undertaken by Viridis across several site visit between August 2023 to July 2026 to assess terrestrial and freshwater ecological values associated with the site and surrounding environment. In preparation for on-site assessments, recent and historical aerial imagery was reviewed, alongside available information regarding hydrology, topography, and mapped ecosystem types. Previous ecological reporting undertaken by consultants for the Milldale area have been drawn upon where applicable. These previous assessments have been reviewed extensively by Auckland Council through the consenting of earlier Milldale stages. In addition, several site meetings have been held with Council during the preparation of this assessment, including in relation to the stream and wetland classifications.

Unless otherwise stated, descriptions of ecological features reflect conditions observed during the site surveys.

2.2 Terrestrial Ecology

Terrestrial ecological investigations comprised a desktop review and field-based assessments of vegetation, flora and terrestrial fauna habitat undertaken between 2023 and 2026, most recently in January 2026.

The desktop review included an assessment of current and historical aerial imagery; Auckland Council GeoMaps layers (including SEAs, ecosystem mapping, hydrology and topography); and a review of relevant ecological databases and previous technical reporting. Databases reviewed included the Department of Conservation (DoC) BioWeb Herpetofauna database, the DoC bat database, eBird and iNaturalist NZ.

The ecological values of terrestrial habitats and fauna were assessed in general accordance with the Environment Institute of Australia and New Zealand (EIANZ) Ecological Impact Assessment Guidelines (EcIAG; Roper-Lindsay *et al*. 2018) (refer Section 2.4).

2.2.1 Vegetation and flora

Vegetation and habitat assessments were undertaken by Viridis during site investigations, mostly recently in January and June 2026. The extent, composition, condition and connectivity of both indigenous and exotic vegetation communities within the site and surrounding environment were recorded qualitatively, based on field observations and review of aerial imagery, and their botanical value assessed.

Certain areas within the site were not accessed during field surveys, including the SEA in the north of the site. As these areas lie outside the works footprint and are not affected by the proposed development, a detailed ground-level assessment was not undertaken. Vegetation within these areas was instead assessed using desktop methods, comprising review of aerial imagery, Auckland Council SEA and ecosystem mapping, Google Street View, and knowledge of indigenous vegetation in the wider area.

Vegetation communities were broadly mapped and categorised according to dominant vegetation composition and structure, and maps are provided in Appendix A. The assessment considered vegetation condition, indigenous biodiversity values, habitat connectivity, pest plant presence, and the relationship of each community to surrounding ecological features, including waterways, wetlands and SEAs.

The flora assessment focused on identifying indigenous vegetation communities and recording the presence of any species listed as 'Threatened' or 'At Risk' under the New Zealand Threat Classification System (NZTCS), together with any regionally uncommon or otherwise notable flora species observed during field investigations (de Lange *et al.* 2024; Simpkins *et al.* 2025).

2.2.2 Indigenous fauna

Terrestrial fauna habitat was assessed qualitatively, with consideration given to indigenous lizards, birds and bats[1]. This assessment was informed by the desktop database review described above and by the results of previous fauna surveys undertaken by Viridis and other specialist consultancies, where available. Opportunistic sightings of avifauna were recorded during field investigations, and the conservation status of each species noted in accordance with Robertson *et al.* (2021).

2.3 Freshwater Ecology

Freshwater ecological investigations comprised desktop review, field assessment of stream and wetland features, Stream Ecological Valuation (SEV) assessments, and review of previous freshwater ecological investigations undertaken within the site and surrounding catchments.

The level of assessment applied to freshwater features was proportionate to the potential for effects. Watercourses and wetlands within the development area, which may be affected by the proposed works, were assessed individually. Freshwater features within Te Korowai o Maraeariki, which are located within the retained restoration area and are not subject to development works, were assessed at a higher level.

Desktop review included assessment of current and historical aerial imagery, Auckland Council GeoMaps layers, topographical and hydrological information, and review of available freshwater ecological datasets and previous technical reporting for the Milldale area.

The ecological values of freshwater features and habitats were assessed generally in accordance with the EcIAG (Roper-Lindsay *et al.* 2018) (Section 2.4).

2.3.1 Watercourses

During site investigations, the presence, extent and condition of streams within the site were assessed. All watercourses within the site were classified and mapped according to definitions within the AUP as either permanent, intermittent, ephemeral, or artificial. Watercourse classifications were recently undertaken during several site visits between January and June 2026, but have also been assessed by Viridis across multiple site visits between 2023-2026. Where there was uncertainty regarding classification, a conservative approach has been taken for all watercourses. Watercourses that have

[1] The authors have been certified by the Department of Conservation Bat Recovery Group to assess high risk roost trees (competency 3.3).

been modified for farm drainage, but were once natural upon review of historic aerials, have been conservatively mapped as natural streams.

Ecological characteristics including hydrological regime, aquatic habitat quality, riparian condition, substrate composition, channel modification and surrounding land use were qualitatively assessed. Modifications to natural flow paths and the presence of artificial drainage features were also recorded.

2.3.2 Stream Ecological Valuation (SEV)

The SEV methodology (Storey *et al.* 2011) was used to assess and compare stream ecological function across representative reaches within the site and proposed offset areas.

The SEV methodology assesses 16 stream functions grouped into four categories:

- Hydraulic function;
- Biogeochemical function;
- Habitat provision; and
- Biodiversity function.

Each function is scored and combined to generate an overall SEV score ranging between 0 (highly degraded stream function) and 1 (pristine stream function).

SEV assessments were undertaken across six representative reaches within tributaries of the Ōrewa River on 29 June 2026 (Figure 3). Field data collected for SEV assessments included parameters such as stream width and depth, substrate composition, riparian condition, shading, habitat complexity and surrounding land use. Desktop information including catchment imperviousness, riparian vegetation extent, and available fish and macroinvertebrate survey data were also considered where relevant. SEV data were entered into the Auckland Council SEV calculator to generate overall stream function scores.

For each reach, SEV scores were calculated for current, potential and, where relevant, realignment conditions:

- **Current** – the existing condition of the reach.
- **Potential** – the condition expected 5+ years after implementing best-practice stream management and restoration in Auckland, including a minimum 10 m riparian buffer on both banks and appropriate fencing, but no in-stream enhancements.
- **Realignment** – the condition expected 5+ years after stream realignment, incorporating both in-stream habitat enhancements and riparian planting.

Due to the similar character of the streams within the site (refer Section 5.1), a representative-reach approach was applied, with assessed reaches used to represent the current value of comparable unassessed reaches.

Where stream reclamation results in a residual loss of stream value, the offset required to achieve no net loss was determined using the Environmental Compensation Ratio (ECR) method (Storey *et al.* 2011):

$$ECR = \left[\frac{(SEVi - P) - (SEVi - I)}{(SEVm - P) - (SEVm - C)}\right] \times 1.5$$

where SEV-P(i) and SEV-I are the realignment-potential and post-impact SEV scores of the impact stream, SEV-P(m) and SEV-C(m) are the realignment-potential and current SEV scores of the offset stream, and 1.5 is a multiplier to account for delay and uncertainty. In accordance with Storey *et al.* (2011), the biotic function components (IFI and FFI) are excluded from the SEV scores when applying the ECR. The resulting ratio is applied to the impacted streambed area to determine the area (and length) of stream to be enhanced at the offset site to achieve no net loss of stream value.

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Figure 3. Freshwater sampling locations - Milldale North

Fulton Hogan Land Development

Legend

- Fast-track Boundary
- Predicted streams (AUP)
- eDNA
- Macroinvertebrates
- SEV reaches

SOURCES

LINZ Urban 2024 Aerial

SCALE **1:13,200** **@ A4**

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026

2.3.3 Fish

Potential fish habitat and connectivity were assessed qualitatively in conjunction with review of the NIWA New Zealand Freshwater Fish Database (NZFFD) and current and previous fish survey results for the Milldale development.

Electric fishing

Electric fishing was undertaken to survey the freshwater fish community within the streams draining the site and to inform the ecological valuation of the affected watercourses.

The survey was undertaken by suitably qualified Viridis ecologists, licensed to operate the electric fishing machine under a DoC Special Permit. A NIWA electric fishing machine (EFM) was used on 8 July 2026. Of the six representative SEV catchments assessed, five were electric fished. One reach was not fished, as insufficient water was present to support the method at the time of survey. Where possible, a fishing reach length of approximately 100 m was established, with two passes undertaken where suitable habitat was present. One reach comprised a watercourse only approximately 27 m in total length and was therefore fished over its full extent. At the time of survey, many of the reaches exhibited very low to no flow and were narrow in places. Any fish captured were identified to species level, counted and released at the point of capture. Any observations of larger invertebrates were also made where applicable.

An index of biotic integrity (IBI) was calculated for each stream based on fish species present, altitude and distance inland.

The survey confirms the capture (detection) of a species but cannot reliably confirm absence; non-capture does not necessarily mean a species is absent from the catchment. The effectiveness of electric fishing is reduced under very low or no flow and in shallow, narrow channels, which lowers capture probability. Intermittent streams naturally support variable and often transient fish communities, and a low or nil catch may reflect the flow conditions and longitudinal connectivity present at the time of survey rather than the permanent absence of fish; fish may be present under different flow or connectivity conditions.

2.3.4 Macroinvertebrates

Sampling

Macroinvertebrate samples were collected from two locations within the Ōrewa River and one from the main permanent stream in Te Korowai o Maraeariki (17 March and 25 May 2026), as well as the six SEV reaches (8 July 2026) where sufficient aquatic habitat persisted (locations shown in Figure 3). Samples were collected using a D-net and followed the protocol ‘C2: soft-bottomed, semi-quantitative’ for macroinvertebrate sampling (NEMS 2022). A composite sample was collected by sweeping a net (with an aperture of 400 mm and mesh size of 0.5 mm) through the stream substrate for a distance of one metre, and/or woody debris brushed to dislodge organisms, followed by three cleaning sweeps to collect organisms in the water column. The substrates were sampled in proportion to their prevalence along the reach. Each sample unit was approximately 0.3 m^2. This was repeated at 10 different locations within the 100 m stream reach, to give a total sampling area of 3 m^2 at each site.

All samples were preserved in 70% ethanol for later identification and inventory.

Analysis

Benthic macroinvertebrates were identified by Viridis and counted to a level suitable for calculating taxa richness, abundance, EPT[2] taxa richness and % EPT, macroinvertebrate community index (MCI) and quantitative MCI (QMCI) following protocols outlined in NEMS (2022). Due to their sensitivity to poor water quality and habitat, an increased proportion of EPT taxa within the overall community can indicate higher stream health and water quality. MCI and QMCI indicate better habitat and water quality. Scores were compared to the attribute bands and national bottom line (NBL) defined in the NPS-FM. The relevant NPS-FM attribute bands and NBLs are reproduced in Table 1.

Table 1. Estimates of stream health using MCI and QMCI indices as per the NPS-FM (2020).

Attribute band	Description	Numeric attribute states	
		MCI	QMCI
A	Pristine conditions	>130	≥6.5
B	Mild pollution	≥110 and <130	≥5.5 and <6.5
C	Moderate pollution	≥90 and <110	≥4.5 and <5.5
National bottom line		90	4.5
D	Severe pollution	<90	<4.5

2.3.5 Environmental DNA (eDNA)

Environmental DNA (eDNA) sampling was undertaken to survey freshwater fauna (including fish and invertebrates).

Sampling was undertaken within the downstream reach of the Ōrewa River (location shown in Figure 3). Six replicate samples were collected from a single representative location on 29 June 2026, following the Wilderlab sampling protocol which involved drawing water from the stream through the supplied filters. Samples were submitted to Wilderlab NZ Limited for laboratory processing and biodiversity analysis by metabarcoding. The full eDNA laboratory output is held on file by Viridis and Wilderlab NZ Limited and can be provided on request.

The results of the eDNA analysis confirms the presence (detection) of a taxon but cannot reliably confirm absence, and a non-detection does not necessarily mean a species is absent. Equally, a detection confirms that a taxon's genetic material was present in the sample but not necessarily that the taxon was present at that exact location or time, as eDNA can persist in the environment for a period after an organism has moved on or died, depending on factors such as temperature, flow and UV exposure. The method does not provide information on abundance, population size, life stage or breeding status. Because genetic material is transported downstream, a detection at the sampled location may originate from anywhere within the upstream catchment rather than from the immediate reach or the site itself; sampling the downstream reach therefore integrates a signal from across the wider catchment. Detection is further influenced by flow, season, DNA shedding and degradation rates, and the completeness of reference databases, so some taxa may be under-represented or resolved only

[2] Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) taxonomic groups that are typically sensitive to poor quality water and habitat. Caddisflies belonging to the genera *Oxyethira* and *Paroxyethira* are not sensitive to nutrient enrichment so are excluded from EPT calculations, as per guidance in NEMS (2022).

to a coarser taxonomic level. The survey represents a single location and point in time and should be considered alongside, rather than as a replacement for, the other freshwater survey methods described above. The full eDNA analysis results are available from Viridis upon request.

2.3.6 Wetlands

The Ministry for the Environment (MfE) wetland delineation protocols (MfE 2022) were used to determine whether an area met the definition of a 'natural inland wetland' under the National Policy Statement for Freshwater Management 2020 (NPS-FM). Assessments were carried out within the 'growing season' for the Auckland region (MfE 2021). As per the Clarkson (2014) vegetation tool methods, plant species within putative wetlands were identified, and each species was assigned one of the below wetland indicator status ratings (Clarkson *et al.*, 2021):

- Obligate (OBL) – almost always in wetlands, rarely in drylands;
- Facultative wetland (FACW) – usually in wetlands but occasionally found in drylands;
- Facultative (FAC) – commonly occurs in both wetlands and drylands;
- Facultative upland (FACU) – occasionally in wetlands but usually in drylands; or
- Upland (UPL) – rarely in wetlands, almost always in drylands.

Based on the dominance and prevalence of hydrophytic (wetland) species, natural inland wetland presence/absence was determined. Where results of the vegetation assessment remained uncertain or conditions were modified or atypical, hydric soils and hydrological assessments were undertaken.

Value assessments included identifying native and exotic vegetation species, examining the structural tiers within wetland areas, and assessing the quality and abundance of aquatic habitats. Signs of wetland degradation such as pugging and grazing from stock access, structures such as culverts impeding hydrological function, and weed infestation were also noted.

2.3.7 Wetland Ecological Valuation (WEV)

Wetland Ecological Valuation (WEV) assessments were undertaken to quantify the ecological value and condition of wetlands within the site. The WEV method was developed by RMA Ecology Limited in conjunction with Auckland Council and provides a structured framework for assessing wetland condition and comparing ecological values between impact and offset sites.

The WEV assesses 29 components across 20 wetland attributes grouped within three broad ecological categories: catchment, wetland and buffer. These components are used to generate a WEV score ranging from 0 to 1, where 0 represents a highly degraded wetland with negligible ecological value and 1 represents a wetland in very high ecological condition.

For each wetland, WEV scores were calculated for both its current condition and its potential condition. The current score reflects the existing state of the wetland, while the potential score reflects the condition expected following implementation of best-practice enhancement and protection measures (a 10 m planted buffer, stock exclusion, and weed and pest control) once established. For an area of created wetland, the current score reflects the pre-works state of the land (a score of 0 where the area is pasture supporting no existing wetland values), and the potential score reflects the created and enhanced wetland once established.

Where wetland reclamation results in a residual loss of wetland extent or value, WEV scores are used to determine the offset required to achieve no net loss of wetland value, applying the ECR method set out in Auckland Council technical report TR2011/009.

The ECR is calculated as:

$$ECR = \left[\frac{(WEVi - P) - (WEVi - I)}{(WEVm - P) - (WEVm - C)}\right] \times 1.5$$

where WEV-P(i) and WEV-I are the potential and post-impact WEV scores of the impact wetland, WEV-P(m) and WEV-C(m) are the potential and current WEV scores of the offset (created) wetland, and 1.5 is a multiplier applied to account for time lag, and the risk and uncertainty associated with achieving the offset. The resulting ECR is applied to the impacted wetland area to determine the area of wetland to be created or enhanced at the offset site to achieve no net loss of wetland value.

WEV scores and the ECR were used to provide a quantitative measure of wetland ecological value, to inform the comparison of affected and offset wetlands, and to determine the extent of offset required.

2.4 Ecological Impact Assessment

The ecological values of the site, relating to species, communities and systems, were determined as per the EIANZ EcIAG for use in New Zealand (Roper-Lindsay *et al.* 2018). This report also identifies statutory guidelines and regulation with respect to ecology (such as watercourses, wetlands, high value vegetation and habitats) where relevant to the proposed development. Using this framework, the EcIAG describes a simple ranking system to assign value to species as well as other matters of ecological importance such as species assemblages and levels of organisation. The overall ecological value is then determined on a scale from '*Negligible*' to '*Very High*'.

Criteria for describing the magnitude of effects are given in Chapter 6 of the EcIAG. The level of effect can then be determined through combining the value of the ecological feature/attribute with the score or rating for magnitude of effect to create a criterion for describing level of effects (Table 2). A moderate level of effect requires careful assessment and analysis of the individual case. For moderate levels of effects or above, measures need to be introduced to avoid through design, or appropriate mitigation needs to be addressed (Roper-Lindsay *et al.* 2018).

Table 2. Criteria for describing the level of effects (from Roper-Lindsay et al. 2018).

Magnitude of Effect	Ecological Value				
	Very High	**High**	**Moderate**	**Low**	**Negligible**
Very High	*Very High*	*Very High*	*High*	*Moderate*	Low
High	*Very High*	*Very High*	*Moderate*	Low	Very Low
Moderate	*High*	*High*	*Moderate*	Low	Very Low
Low	*Moderate*	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low
Positive	Net Gain	Net Gain	Net Gain	Net Gain	Net Gain

Notes: Where text is italicised, it indicates 'significant effects' where mitigation is required.

3 ECOLOGICAL CONTEXT

3.1 Historical and Current Context

The site is within the Rodney Ecological District. The district is characterised by hill country, ranging from steep to rolling, indented on the eastern coastline by sand dunes in the northeast. Parts of the district remain relatively unmodified and retain some extensive areas of bush. However, many of these areas are fragmented and isolated, with bush, wetlands, dunes, coastal environments and scrub no longer directly connected to each other. The rest of the district has been heavily modified, with large amounts of vegetation cleared to accommodate pasture for agricultural practices. The district also contains several urban and semi-urban areas, including Warkworth, Wellsford, and the Ōrewa-Silverdale-Whangaparāoa area.

The Rodney Ecological District would likely have been heavily forested prior to human settlement. Vegetated remnants within the district include mixed podocarp-hardwood forest with tānekaha (*Phyllocladus trichomanoides*) and some areas of kauri (*Agathis australis*). Regenerating areas generally consist of conifers, including kauri, rimu (*Dacrydium cupressinum*), tānekaha, tōtara (*Podocarpus totara*) and kahikatea (*Dacrycarpus dacrydioides*), with kānuka (*Kunzea ericoides*), mānuka (*Leptospermum scoparium*) and tree ferns interspersing. Coastal forest contains pōhutukawa (*Metrosideros excelsa*) and broadleaved species such as pūriri (*Vitex lucens*), with areas of mangroves (*Avicennia marina*) and saltmarsh where habitat is suitable. Wetland habitat has been greatly reduced over time.

Fauna habitat would likely have degraded and reduced over time as vegetation clearance and conversion to farmland occurred. Currently, the district contains a number of important breeding areas for birds, generally concentrated around the coast. Existing wetlands are known to support pāteke (*Anas chlorotis*) and banded rails (*Gallirallus philippensis*), however fernbird (*Poodytes punctatus*) habitat has been significantly reduced through land modification. North Island kākā (*Nestor meridionalis*) are known to occur in areas of remnant forest, however they are generally present in low numbers on the mainland in Auckland.

At a local scale, the site lies within one of the most heavily modified parts of the Ecological District, having been highly modified for farming and, more recently, for urban development. It sits within the wider Ōrewa River catchment, which flows in a generally easterly direction to the coast, and most of the land remains in agricultural use. A review of historical aerial imagery indicates that the site, and much of the surrounding landscape, was cleared more than 80 years ago for agricultural purposes (Figure 4).

3.2 Existing and Consented Ecological Works

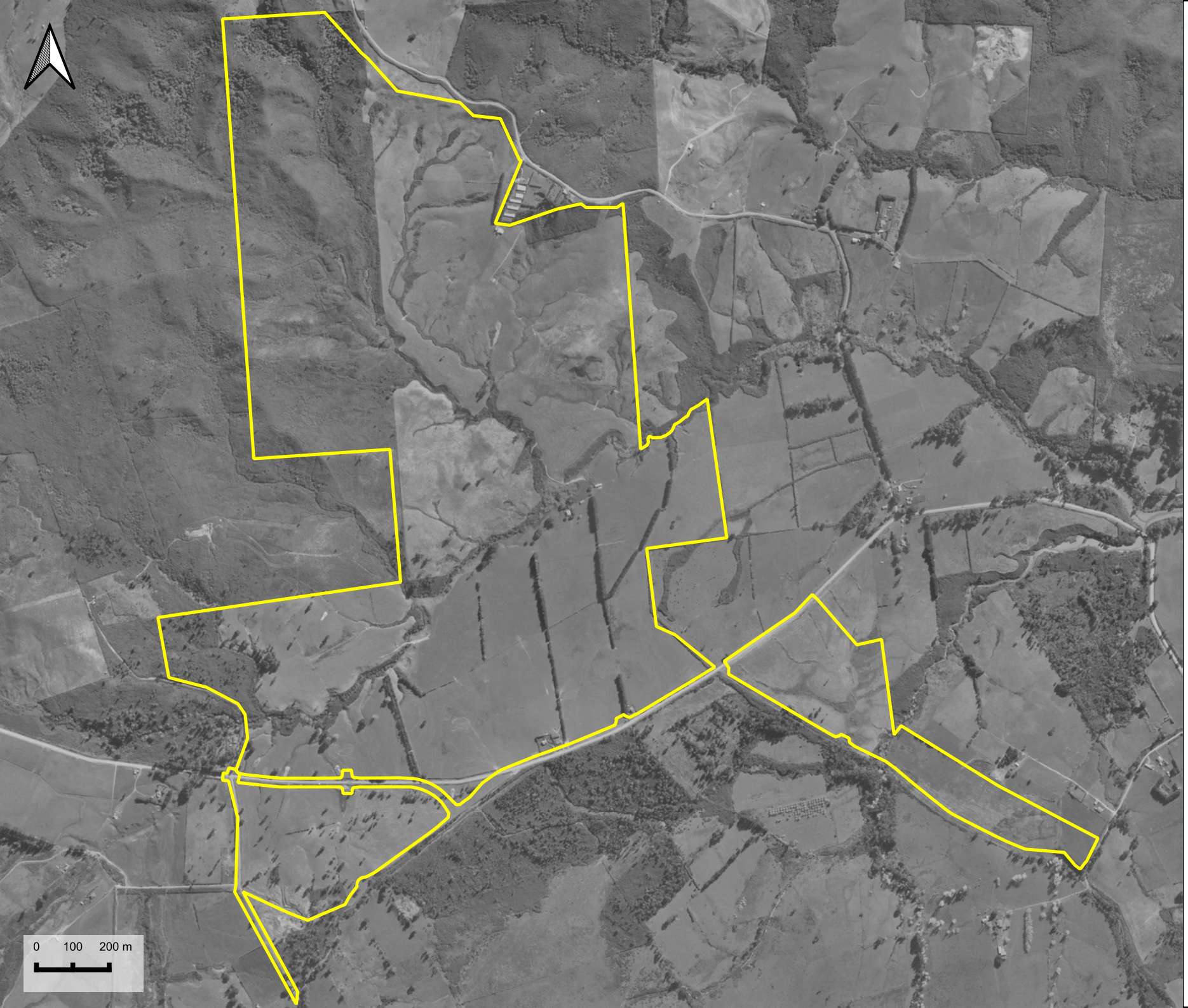
Ecological offsetting works have already been undertaken, or are consented under earlier Milldale resource consents in the Ōrewa River catchment, within the Milldale rural block that now forms Te Korowai o Maraeariki,:

- Under the Stage 9 consent, approximately 0.35 ha of new wetland was created (extending and joining existing degraded wetlands) to offset the loss of approximately 0.34 ha of low-value wetland within the Stage 9 development area.
- Under the Stages 10-13 consent, an integrated offsetting and compensation package was undertaken within the offset site (Te Korowai o Maraeariki) to address residual freshwater effects from those stages. This comprised the creation of approximately 2.81 ha of new wetland (to offset reclaimed wetland), approximately 1,988 m of stream enhancement and restoration (to offset and

compensate for stream value and extent effects), and the restoration of approximately 2.7 ha of degraded wetland associated with the offset streams. Associated measures included buffer and riparian planting, stock fencing, weed and pest control, and legal protection by covenant.

In each case, the offset wetlands were designed to induce a wetland hydrological regime supporting indigenous hydrophytic vegetation, and were secured through wetland planting and management plans as conditions of consent. The offsetting in both cases applied the WEV and ECR method, which has been applied to, and accepted by, Auckland Council across multiple earlier Milldale stages.

These works form part of the existing and consented baseline environment within Te Korowai o Maraeariki. The offsetting, compensation and enhancement measures proposed for the current Project (refer Section 7.2.2 and Sections 7.4.2-7.4.5) are additional to, and distinct from, these existing consented works, and have been assessed separately.



VIRIDIS
Environmental Consultants

Figure 4. 1950's Historical aerial imagery of the Milldale Stages 14-17 site

Fulton Hogan Land Development

Legend

Fast-track Boundary

SOURCES

Auckland 0.3 SN577 (1951-1960)

DISCLAIMER:
This map/plan is not an engineering draft. This map/plan is illustrative only and all information should be independently verified on site before taking any action.

SCALE **1:13,200** **@ A4**

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026

4 TERRESTRIAL ECOLOGY

4.1 Vegetation

4.1.1 Exotic tree and scrub vegetation

Exotic vegetation across the site was visually assessed and mapped (Appendix A). It occurs as shelterbelts and small stands throughout the site, comprising species such as pine (*Pinus* sp.), macrocarpa (*Hesperocyparis macrocarpa*), gum (*Eucalyptus* sp.), she-oak (*Casuarina* sp.), redwood (*Sequoia sempervirens*), American sweetgum (*Liquidambar styraciflua*), magnolia (*Magnolia grandiflora*), blackwood (*Acacia melanoxylon*) and poplar (*Populus* sp.), generally with little understorey (Figure 5 & Figure 6). Isolated mature trees, such as pine and macrocarpa, are also present within pasture across the site.

Larger stands of exotic trees (0.9-3.3 ha), predominantly poplar and pine, are also present, particularly within the south-eastern part of the development area and within the northern part of Te Korowai o Maraeariki. The stands assessed within the development area have no indigenous understorey, forest floor vegetation or natural regeneration. The Te Korowai o Maraeariki exotic stands have not been assessed at ground level but are expected to be of similarly low botanical value based on their exotic plantation origin.

Within the riparian and wetland margins of the development area to the south of the Ōrewa River, exotic vegetation is dominated by mature poplar with some pine and blackwood, planted during the 1990s for stream and wetland stabilisation and stormwater management (Greenscene Limited 2026). These stands lack a native understory, forest floor vegetation and natural regeneration, and several contain aging trees exhibiting structural decline. Exotic scrub, primarily gorse[3] (*Ulex europaeus*), is also present in small patches scattered across the site, frequently within riparian margins.

The exotic tree and scrub vegetation comprises entirely exotic species, is largely isolated with limited terrestrial connectivity, and lacks indigenous understorey and regeneration. Its botanical value is therefore assessed as **low**.

a) **b)**

Figure 5. a) Redwoods, poplar and other exotic trees within the eastern part of the development area, and b) pines along the true left bank of the Orewa River.

[3] Listed in the Auckland Regional Pest Management Plan 2020-2030.

a)

b)

Figure 6. a) Small magnolia stand in the northeast of the site, and b) poplar stands in the eastern of the development area.

4.1.2 Pasture

The majority of the development and Te Korowai o Maraeariki sites comprise a cover of managed pasture currently used for grazing. The pasture is dominated by common exotic pasture species typical of the Milldale and wider Auckland area, including kikuyu (*Cenchrus clandestinus*), perennial ryegrass (*Lolium perenne*), clover (*Trifolium* spp.), creeping bent/browntop (*Agrostis* spp.), narrow-leaved plantain (*Plantago lanceolata*) and dallis grass (*Paspalum dilatatum*) (Figure 7). Scattered mature exotic trees are also present within the pasture (refer above). The pasture has been assessed as having **negligible–low** botanical value.

Figure 7. Examples of grazed pasture areas within the development site.

4.1.3 SEA and native vegetation

Across the site, native-dominant vegetation was generally sparse (maps provided in Appendix A). The most significant area of indigenous vegetation within the site is located in the north, within an SEA – Terrestrial Overlay identified by Auckland Council (SEA_T_2223). The SEA is listed as meeting the 'Representativeness' and 'Stepping-Stones, Migration Pathways and Buffers' criteria under Schedule 3 of the AUP. It is located entirely outside the works footprint and is not affected by the proposed development. As noted in Section 2.2.1, areas not accessed during field survey, including the SEA, were assessed using desktop methods; the following description should be read accordingly.

Based on this assessment, the SEA appears to comprise predominantly kānuka (*Kunzea* sp.) scrub with tree ferns, indicative of early-successional or regenerating indigenous vegetation transitioning to kauri, podocarp, broadleaved forest (WF11) ecosystem type, historically characteristic of the area (Singers *et al*. 2017). Scattered emergent canopy species likely include kauri (At Risk – Declining nationally and regionally), rimu, tōtara, kahikatea, and tānekaha (de Lange *et al.* 2024; Simpkins *et al*. 2025). The understorey is likely to include common (non-threatened) species such as māhoe (*Melicytus ramiflorus*), māpou (*Myrsine australis*), *Coprosma* spp., nīkau (*Rhopalostylis sapida*), and tree ferns such as silver fern (*Alsophila dealbata*) and mamaku (*Sphaeropteris medullaris*).

The SEA also provides a greater degree of terrestrial connectivity than elsewhere within the site, forming part of a larger, more contiguous area of indigenous vegetation/SEA that links to native vegetation in the surrounding landscape. By contrast, the indigenous vegetation elsewhere within the site is largely fragmented and isolated.

The SEA is assessed as having **high** botanical value, reflecting its SEA – Terrestrial Overlay status, the anticipated trajectory of the forest towards an 'endangered' regional IUCN status of WF11 forest (Singers *et al*. 2017), its indigenous and regenerating character, and the scarcity of indigenous vegetation within the wider, heavily modified landscape.

Outside the SEA, indigenous vegetation within the site is largely limited to small, patchy regenerating areas, predominantly mānuka and kānuka, in places interspersed with common species such as māpou, tree ferns and cabbage tree (*Cordyline australis*) (Figure 8). Occasional isolated native trees were also observed, including kahikatea in the low-lying northern area near the Ōrewa River. This vegetation is patchy, lacks ecological integrity and comprises only very common indigenous species, and is assessed as having **low** botanical value. Its existing low value and regenerating character nonetheless indicates strong potential to be improved through ecological enhancement, discussed further in Section 7.2.2.

a) **b)**

Figure 8. a) Native and pest plants within the riparian margin of the Ōrewa River in the north-western end of the site, and b) sparse kānuka on the true right bank of the Ōrewa River with occasional kahikatea.

4.1.4 Mixed native-exotic vegetation

Mixed native-exotic scrub was mapped in one area, along the riparian margin of the Waterloo Creek within the southeastern portion of the site (Appendix A; Figure 9). This vegetation comprised kānuka and cabbage tree, with emergent mature pine, eucalyptus and silver wattle (*Acacia dealbata*). Early-

successional native species were also present, including māhoe, māpou, hangehange (*Geniostoma ligustrifolium*) and silver fern. Pest plant[3] abundance was high, particularly along the vegetation edges, and included Chinese privet (*Ligustrum sinense*), crack willow (*Salix* × *fragilis*), hawthorn (*Crataegus monogyna*) and patches of gorse.

The botanical value of this vegetation is reduced by the dominance of common indigenous species only, together with a high abundance of listed pest plants and other exotic and weed species. On this basis, it is assessed as having **low** botanical value.

Figure 9. Photos showing examples of the mixed native-exotic vegetation within the riparian margin of Waterloo Creek.

4.2 Fauna Habitat

4.2.1 Avifauna (birds)

Birds seen/heard across the site and general surroundings were opportunistically recorded during multiple site visits. Records were retrieved from eBird.org for nearby sites, and observations made during site visits in the general Milldale area by Viridis ecologists and various other ecologists in recent years were drawn upon. Appendix B provides a list of species that are expected to be present within the site, at least periodically.

The avifauna community within the Milldale area is relatively diverse, albeit consisting largely of a combination of common exotic and native species that are abundant in the wider Auckland region including urban, urban fringe, and rural areas. New Zealand pipit (*Anthus novaeseelandiae;* At Risk – Declining) may occasionally use pasture areas, though given its naturally low abundance any use is expected to be infrequent.

The site does not currently provide habitat for NZ dotterel (*Charadrius obscurus aquilonius*; Threatened – Nationally Increasing; Robertson *et al.* 2021). In Auckland they tend to favour open areas and bare ground. They are known to be present in the wider Milldale and Silverdale area, with eBird.org records showing them in various urban areas, though mostly around the fringes. As urban expansion in the area progresses, it is expected that open areas will be generated by earthworks, and the clearance of pasture within the site. It is possible that dotterels may utilise these open areas as they become available, and dotterels are known to establish nests on construction sites where habitat conditions are suitable.

Avifauna habitat throughout much of the site was largely limited to isolated exotic trees and shelterbelts, and mixed riparian scrub along Waterloo Creek. The highest quality habitat within the site is associated with the SEA vegetation in the north, which provides indigenous vegetation for activities

such as nesting and foraging. However, the rest of the site contains only occasional tree/shrub habitat that is isolated from larger areas of dense indigenous forest. The small artificial ponds present (refer Section 5.4) provide some limited surface water habitat for waterfowl.

Overall, the avifauna ecological values of the site were considered to be **high** within the SEA vegetation, but **low** elsewhere on site.

4.2.2 Herpetofauna (lizards)

Herpetofauna comprise a significant component of New Zealand's terrestrial biodiversity. There are currently 159 recognised endemic reptile and amphibian taxa in New Zealand, 129 of which are classified as 'Threatened' or 'At Risk' (Hitchmough *et al.* 2026). All indigenous reptiles and amphibians are legally protected under the Wildlife Act 1953.

A review of DoC's herpetofauna database identified four indigenous lizard species recorded within 10 km of the site (accessed June 2026). These included copper skink (*Oligosoma aeneum;* At Risk – Declining), ornate skink (*Oligosoma ornatum;* At Risk – Declining), forest gecko (*Mokopirirakau granulatus;* At Risk – Declining), elegant gecko (*Naultinus elegans;* At Risk – Declining) (Hitchmough *et al.*, 2026).

Within the development area, potential lizard habitat is largely limited to isolated patches of rank grass and scattered debris of poor quality and low connectivity. Recent intensive salvage on the adjacent Milldale Stages 10-13 site, across comparable rank grass, scrub and garden vegetation, recorded no native lizards despite thorough effort (RMA Ecology 2025), indicating a low likelihood of native lizard occupancy in these habitats, which are assessed as being of **low** value.

The mixed native-exotic scrub along the riparian margin of Waterloo Creek presents more suitable lizard habitat, with denser cover and leaf litter that may support copper skink and, less likely, ornate skink. This habitat was not covered by the adjacent salvage. On a precautionary basis, and reflecting the potential presence of 'At Risk' skinks, the Waterloo Creek riparian habitat is assessed as being of **moderate** ecological value.

By contrast, the SEA in the north of the site provides the highest-quality herpetofauna habitat present. Its indigenous and regenerating vegetation, better vegetative connectivity, expected greater structural complexity and presence of leaf litter offer more suitable conditions for indigenous lizards than the modified pastoral areas. The kānuka scrub, developing understorey and emergent canopy may provide habitat for both terrestrial skinks (such as copper and ornate skink) and, potentially, arboreal gecko species (such as forest and elegant gecko), which require indigenous forest and shrubland and are unlikely to persist elsewhere on site. The SEA is retained and unaffected by the proposed works, and is assessed as being of **high** value for herpetofauna.

4.2.3 Chiroptera (bats)

New Zealand has two species of endemic bats on the mainland. The most widespread is the long-tailed bat (*Chalinolobus tuberculatus*; Threatened – Nationally Critical), although colonies are assumed to be small and their health is largely unknown (O'Donnell *et al.* 2023).

The lesser short-tailed bat has three described subspecies; the northern lesser short-tailed bat (*Mystacina tuberculata aupourica;* Threatened – Nationally Vulnerable), the central lesser short-tailed bat (*Mystacina tuberculata rhyacobia;* At Risk – Declining) and the southern lesser short-tailed bat (*Mystacina tuberculata tuberculata;* Threatened – Nationally Increasing) (O'Donnell *et al.* 2023). There are no known populations of the short-tailed bat on the mainland in the Auckland region, with the

closest known population being the northern lesser short-tailed bat population on Te Hauturu-o-Toi/Little Barrier Island.

Bats typically roost in tree features such as hollows, under split or flaking bark, or within dense epiphytes, and may also use rocky overhangs. During the warmer breeding season, long-tailed bats often form large communal roosts in similar features. They are highly mobile, with extensive home ranges (>5,000 ha) and can travel large distances (up to ~25 km) each night while foraging. Long-tailed bats are known to utilise forest edges and linear landscape features such as vegetated gullies, stream corridors, and road edges as transit routes between roosts and feeding areas.

Multiple bat surveys have been undertaken within the Milldale area in recent years, none of which detected bats. Most recently, bat management undertaken on the adjacent Milldale Stages 10-13 site (immediately to the south) by The Ecology Studio with support from Viridis in September-November 2025 recorded no bats. This included a preliminary bio-acoustic survey (six automatic bat monitors deployed 25 September to 10 October 2025) and pre-felling bio-acoustic monitoring across 21 detector locations, with no bats detected at any location (The Ecology Studio 2025). Earlier automatic bat monitor surveys targeting suitable habitat features including old trees, mature exotic shelterbelts, streams and vegetation edges within the Milldale area in 2015 and 2020 similarly detected no bat activity (Opus 2015; RMA Ecology 2020).

The closest long-tailed bat records are approximately 3.7 km to the north-east (2015), within 6 km to the south-east on and adjacent to the Whangaparāoa Peninsula in SEA vegetation (2022/2023), and approximately 5.5 km to the east near Kings Quarry (2023) (DoC database, accessed June 2026). Extensive earthworks and residential development have occurred to the south of the site since the earlier surveys, and the associated urban influences (lighting, noise and disturbance) are likely to have further reduced the favourability of the area for bats. On the basis of consistently low detection across repeated survey effort, the Milldale area is not considered a high bat-use area.

Mature trees within the site, including shelterbelts and isolated specimens (e.g. pine, she-oak, crack willow), provide potential roosting habitat through features such as cavities, but this habitat is of low value given its exposed and isolated nature. The SEA in the north of the site provides higher-quality habitat, expected to offer more suitable foraging and roosting conditions for long-tailed bats than the habitat elsewhere on site.

The mature trees within the development area provide only limited, low-quality potential roosting habitat, being exposed, isolated and poorly connected, and repeated survey effort across the wider Milldale area has consistently detected no bats. The bat habitat within the development area is therefore assessed as being of low value. Despite this, given the mobility of long-tailed bats, occasional transient use of the site cannot be entirely discounted (refer Section 7.3.3 for management recommendations). The SEA in the north likely provides higher-quality habitat and has been conservatively assessed as being of **moderate-high** value for bats.

5 FRESHWATER ECOLOGY

5.1 Watercourses

Mapped watercourses are described in this section. Maps with labelled watercourses and a table showing the criteria met for intermittent and permanent watercourses are provided in Appendices C and D, respectively.

5.1.1 Permanent streams

Permanent watercourses within the site comprise the Ōrewa River (P1) main stem, and its tributaries within the residential development area, including Waterloo Creek (P2) in the southeast. A permanent stream and associated short tributaries are also present within Te Korowai o Maraeariki. A table summarising the watercourse details for the development site is provided in Appendix D.

The Ōrewa River catchment is located on Auckland's north-east coast and drains from the rural uplands south of Wainui to the Ōrewa Estuary, before entering Whangaparāoa Bay. The Project is located within the upper reaches of the catchment, where the Ōrewa River traverses the site from west to east, fed by several small headwater tributaries draining retired pastoral land. Although classified as a permanent stream due to its average width and large catchment size (approx. 856 ha), the Ōrewa River is known to occasionally cease flowing during prolonged summer dry periods (Lorrey *et al.* 2025), reflecting the well-draining limestone geology of the catchment (LAWA 2026).

The permanent streams have generally been degraded through historical and ongoing agricultural land use. Habitat is generally characterised by low flows, limited hydrological diversity and run-dominated conditions, with predominantly soft-bottomed (silt and sand) substrates and some gravel and cobble. Riparian condition varies across the watercourses: the Ōrewa River is largely open, with limited shading and margins dominated by pasture grasses, overgrown reed sweet grass (*Glyceria maxima*) and abundant aquatic macrophytes (Figure 10); the unnamed tributary of the Ōrewa River (P3) in the southeast of the site has been heavily modified as a farm drain, being straightened and deepened, with mature poplar lining one bank only; while Waterloo Creek supports comparatively better-developed riparian vegetation, albeit largely exotic-dominated with a high proportion of pest species. Recent macroinvertebrate sampling recorded tolerant communities indicative of degraded habitat and elevated sediment and nutrient loading (Viridis 2026).

Notwithstanding the generally degraded habitat and modified riparian condition, the permanent streams provide habitat and passage for a diadromous native fish community, including species of elevated conservation status (refer Section 2.3.3). On this basis, and applying a precautionary approach given the potential presence of 'At Risk' species, the permanent streams are assessed as being of **moderate** ecological value.

a) b)

Figure 10. a) Ōrewa River and floodplain looking to the east, showing general lack of riparian vegetation, and b) Ōrewa River showing abundance of periphyton.

5.1.2 Intermittent streams

Several watercourses within the site have been identified as intermittent streams (mapped in Appendix C), with the intermittent criteria met by each provided in Appendix D. All drain to the Ōrewa River, either directly or via Waterloo Creek and its tributaries.

The intermittent streams have been highly modified through historical artificial deepening, straightening, realignment and channel clearance for farm drainage (Figure 11 & Figure 12). Most reaches have little riparian vegetation, the margins typically comprising managed pasture that provides very limited shading, organic matter input and filtration, though some reaches have scattered shading from exotic tree stands or mixed native-exotic vegetation. During all site visits, flow was very low across all site visits, substrates were almost entirely silt and soft sediment (with occasional cobble), and hydrological heterogeneity was low, with run habitat dominant and occasional pools induced downstream of culverts. Stock had access to the streams in most areas. Some reaches, primarily functioning as farm drains, contained slow-flowing water with dense macrophytes such as water pepper (*Persicaria hydropiper*) and budding club-rush (*Isolepis prolifera*).

In-stream habitat is generally limited to slow-flowing or stagnant water of poor quality. These reaches may intermittently support highly-mobile eel species (*Anguilla* spp.) but the poor water and habitat quality and intermittent flow mean other indigenous species are unlikely to be present (refer Section 5.2.1).

On the basis of their highly modified nature, general lack of riparian vegetation, and limited aquatic habitat, the intermittent streams within the site are assessed as being of **low** ecological value.

a) b)

Figure 11. a) Intermittent stream (I10) under poplar canopy in the southeast of the site, and b) soft-bottomed modified stream channel containing low flow during March (early autumn).

a) b)

Figure 12. a) Stream I2 in the southwest of the site, and b) stream I7-B showing a modified channel amongst grazed pasture.

5.1.3 SEV assessments

Six representative SEVs were undertaken within watercourses I2-A, I7, I7-A, and I8 (SEVs 1-4) within the development site, and within two representative reaches within Te Korowai o Maraeariki (SEVs 5 & 6) (Section 2.3.2, Figure 3). Current SEV results are presented in full in Appendix E (Table E1).

The six SEVs within the Project site scored between 0.20 and 0.33 (out of a maximum of 1), indicating **low** ecological and functional values. Low SEV function scores generally reflect the poor-quality habitat for aquatic fauna and the poor macroinvertebrate diversity (Section 5.2.2), and the highly modified and degraded nature of the channels and riparian margins.

5.1.4 Ephemeral flow paths

Natural ephemeral channels identified have been mapped as per Appendix C. Ephemeral channels had very small catchments, typically contained rooted terrestrial vegetation across their channel width, showed no evidence of substrate sorting and did not contain natural pools or easily identifiable channels/banks (Figure 13). They contained no significant riparian vegetation and no instream

freshwater habitat. Some appeared to have been modified for farm drainage, however, these have been considered natural where they aligned with the site's topography.

The ecological value of the ephemeral watercourses within the site was considered to be **negligible**.


Figure 13. Examples of ephemeral reaches within the southwest of the development site.

5.1.5 Artificial drainage channels

Multiple artificial watercourses are present within the site (maps provided in Appendix C). These features have been constructed for farm drainage purposes on land that did not previously support a natural watercourse. Drains have been identified based on attributes including alignment with natural topography, presence or absence of a historic natural channel, catchment size, and artificial characteristics such as deepening and straightening (Figure 14). Within the site, they are typically characterised by uniform, straightened profiles, soft sediment beds, intermittent flow and limited habitat diversity, and support only common, disturbance-tolerant aquatic species, if any. Artificial drainage channels are excluded from the relevant stream provisions of the AUP and from the definition of 'river' under the NPS-FM.

On the basis of their artificial origin, poor-quality aquatic habitat and lack of natural channel form and hydrology, the ecological value of the artificial watercourses within the site is assessed as **negligible – low**.


Figure 14. Examples of drainage channels within the development site, showing artificially created watercourses that sat below the water table and were unnaturally aligned, straightened and deepened.

5.2 Aquatic Fauna

5.2.1 Fish

The fish community of the site was characterised through eDNA sampling, electric fishing, and a review of NZFFD records. All watercourses within the site ultimately drain to the Ōrewa River, which traverses the site from west to east and provides the connection to the Ōrewa Estuary and the coast required by the predominantly diadromous native fish community.

Records from the NZFFD, together with the eDNA results, indicate a mixed community of indigenous and introduced fish. Indigenous species recorded within the catchment, or detected by eDNA within the Ōrewa River adjacent to the site (Section 2.3.5), include longfin eel (*Anguilla dieffenbachii*; At Risk – Declining), shortfin eel (*Anguilla australis*; Not Threatened), banded kōkopu (*Galaxias fasciatus*; At Risk – Naturally Uncommon), īnanga (*Galaxias maculatus*; Threatened – Nationally Vulnerable), giant bully (*Gobiomorphus gobioides*; At Risk – Naturally Uncommon) and redfin bully (*Gobiomorphus huttoni*; At Risk – Naturally Uncommon). Kōura (*Paranephrops planifrons*; Not Threatened) and freshwater shrimp (*Paratya curvirostris*; Not Threatened) have also been recorded in the wider catchment. Introduced pest fish, gambusia (*Gambusia affinis*; listed unwanted organism) and goldfish (*Carassius auratus*; Introduced and Naturalised), were also recorded. NZFFD for the Waterloo Creek have recorded only shortfin eel, banded kōkopu and freshwater shrimp; these records include the results of recent fish salvages undertaken during 2023-2025 as a part of previously consented Milldale development activities.

Electric fishing across the six representative SEV reaches did not capture or observe any fish, consistent with the very low to no flow and poor in-stream habitat present at the time of the July 2026 survey. The survey was undertaken in winter, when lower water temperatures reduce fish activity and detectability, and when many diadromous species are less likely to be present or actively moving. Consistent with the limitations of the method and the timing of the survey, this result does not confirm that fish are absent, particularly for diadromous species that may use these reaches intermittently under suitable flow, temperature and connectivity conditions.

The permanent watercourses provide the most valuable fish habitat within the site. The main stem of the Ōrewa River, although ecologically degraded (limited riparian shading, fine bed substrate, and a macroinvertebrate community indicative of degraded habitat; Section 5.2.2; Viridis 2026), is a permanent watercourse supporting the diadromous community described above, including species of elevated conservation status, and its densely vegetated margins may provide īnanga spawning habitat. Waterloo Creek, a permanent tributary, supports shortfin eel, banded kōkopu (At Risk – Naturally Uncommon) and freshwater shrimp. By contrast, the intermittent tributaries draining the site are largely modified through historical channel straightening and farm drainage, resulting in poor in-stream habitat, but remain hydrologically connected to the main stem and may provide intermittent habitat and passage for diadromous species.

On this basis, the permanent streams are assessed as being of **moderate** value for fish, reflecting their role as permanent habitat for a diadromous fish community that includes 'Threatened' and 'At Risk' species, and the potential īnanga spawning habitat, notwithstanding their degraded condition. The intermittent tributaries are assessed as being of **low** value for fish, reflecting their intermittent, highly modified character, tempered by their connectivity to the permanent network and potential intermittent use by diadromous species.

5.2.2 Macroinvertebrates

The macroinvertebrate community of the site was characterised through sampling undertaken within the main stem of the Ōrewa River and within the six intermittent SEV reaches on the site. The full macroinvertebrate survey results are provided in Appendix F.

Sampling within the main stem of the Ōrewa River similarly recorded a community dominated by pollution-tolerant taxa, particularly mud snails (*Potamopyrgus* sp.) and crustaceans (ostracods and *Paracalliope* sp.), with EPT taxa absent from all sites.

Macroinvertebrate sampling within the six SEV reaches recorded communities dominated by pollution-tolerant taxa, particularly crustaceans (ostracods, copepods and *Paraleptamphopus* sp.) and oligochaetes. EPT taxa were rare across all SEV reaches: an individual *Triplectides* sp. caddisfly was recorded at SEV1, a *Polyplectropus* sp. caddisfly at SEV4, and three *Psilochorema* sp. caddisflies at SEV5.

Macroinvertebrate Community Index (MCI-sb) and quantitative MCI (QMCI-sb) scores fell within NPS-FM attribute band D across all SEV and Ōrewa River sites, below the relevant national bottom line. For the Ōrewa River main stem, and as discussed in Viridis (2026), these low scores are considered to reflect degraded in-stream habitat, being limited riparian shading, low habitat diversity and the influence of historical channel modification, rather than nutrient or organic enrichment, given the otherwise good physicochemical water quality recorded in the main stem. The intermittent SEV reaches are similarly highly modified through historical channel straightening and farm drainage, with intermittent flow and poor in-stream habitat, which is considered the primary driver of their low macroinvertebrate scores.

In accordance with the EcIAG, the macroinvertebrate communities of both the Ōrewa River main stem and the intermittent tributaries draining the site are assessed as being of **low** value, reflecting communities dominated by pollution-tolerant taxa, few EPT taxa, and biotic index scores below the national bottom line, consistent with the degraded habitat condition of the reaches.

5.3 Natural Inland Wetlands

5.3.1 Floodplain wetlands

Areas along the banks of the Ōrewa River and the lower reach of Waterloo Creek support wetland vegetation, and the associated floodplains have been conservatively mapped as natural inland wetlands (Appendix C; Figure 15). Along the Ōrewa River, bank vegetation includes water pepper (FACW), with wider sections dominated by dense reed sweet grass (OBL). Vegetation along Waterloo Creek is of better quality, comprising indigenous species including swamp twig rush (*Machaerina juncea*; FACW), *Carex* spp. (FACW) and saltmarsh ribbonwood (*Plagianthus divaricatus*; FACW).

The floodplain wetlands are assessed as being of **moderate** ecological value. While the botanical value of the Ōrewa River floodplain is low, owing to the dominance of exotic and invasive species, these wetlands form part of a high-order stream system, contribute to floodplain hydrological function, and provide potential spawning habitat for 'At Risk' īnanga (refer Section 5.2.1).

a) b)

Figure 15. Exotic floodplain wetlands adjacent to the Ōrewa River, showing a) reed sweet grass wetland margins and b) wetland 6 adjacent to the river on the low-lying floodplain.

5.3.2 Induced and seepage wetlands

The remaining natural inland wetlands within the site comprise small induced and seepage wetlands. The induced wetlands occur within intermittent stream areas, where stock pugging of clay soils and grazing have produced surface water and saturated soils dominated by hydrophytic species such as mercer grass (*Paspalum distichum*; FACW), water pepper (FACW), and scattered soft rush (*Juncus effusus*; FACW) and wīwī (*Juncus edgariae*; FACW) (Figure 16).

The seepage wetlands occur within exotic tree (poplar) stands and pasture, and are dominated by species including mercer grass (FACW), wīwī (FACW), sharp spike sedge (*Eleocharis acuta*; OBL), creeping buttercup (*Ranunculus repens*; FAC) and lotus (*Lotus pedunculatus*; FAC), with pugging and grazing damage evident from stock access (Figure 17). Induced and seepage wetlands are included within the definition of 'natural inland wetland' under the NPS-FM.

Two vegetation plots were assessed at Wetland 15 to confirm the wetland boundary: Plot A within the putative wetland and Plot B in the adjacent upland area. Plot A did not meet the dominance test (50%) but returned a prevalence index of 2.88 (≤3.0), thereby meeting the wetland vegetation criterion. Based on this result and the presence of wetland hydrology, indicated by saturated soils, the area was confirmed as a natural inland wetland. Plot B met neither the dominance test (0% hydrophytic dominants) nor the prevalence index criterion (3.8), confirming that the plot was located outside the wetland boundary. Full plot results and Figure G1, showing the locations of Plots A and B, are provided in Appendix G.

These induced and seepage wetlands are assessed as being of **low** ecological value, reflecting their small size, dominance of exotic species, lack of structural vegetation tiers, stock modification and limited habitat for indigenous fauna.

a) b)

Figure 16. Examples of degraded intermittent stream environments within the development site, that have formed into induced wetlands with historical and on-going stock access.

Figure 17. Wetland 20 fed by seepage, showing exotic rushes under mature poplar canopy.

5.3.3 Indigenous SEA wetlands

A contiguous 0.35 ha area of natural inland wetland dominated by indigenous vegetation occurs in the upper catchment of the main gully system, within the SEA overlay at Te Korowai o Maraeariki (mapped in Appendix C).

The wetland predominantly comprises raupō (*Typha orientalis*) reedland, corresponding to the WL19 ecosystem type, which has a regional threat status of 'Endangered' (Singers *et al.* 2017). Its extent was delineated using the rapid delineation test for dominance of hydrophytic vegetation (refer Section 2.3.6). The remaining wetlands within the SEA overlay and wider Te Korowai o Maraeariki are dominated by exotic vegetation and are similar in composition to those within the development area, having been highly degraded by long-term stock access.

The raupō wetland is of higher ecological value than the exotic-dominated wetlands within the site due to its indigenous vegetation, location within the SEA and position in the upper catchment. While the associated ecosystem type is classified as Endangered, its ecological value is moderated by its small size and narrow, linear form, the general absence of a vegetated buffer and the modified surrounding land use. On this basis, the wetland is assessed as having **moderate** ecological value.

5.3.4 Potential wetlands (neighbouring land)

During the desktop assessment, a number of areas of potential natural wetland were identified on land adjoining the site, based on a review of aerial imagery and topography (Appendix C). These areas were not able to be accessed or ground-truthed as part of this assessment, and their status as natural inland wetlands has not been confirmed. As they are located on adjoining land, outside the site and the proposed works footprint, they are not directly affected by the proposed development.

5.3.5 WEV Assessments

WEV assessments were undertaken for the wetlands proposed for reclamation, and a summary of results is provided in Appendix H. Details regarding the wetlands to be reclaimed are discussed in Section 7.4.5 shown in Woods 2026 (drawing series P25-609-01-1450–1456). The wetlands proposed for reclamation were of a similar low-value nature, sharing a composition of common exotic rushes, sedges and grasses, and generally lacking indigenous floral diversity, structural tiers and aquatic habitat (refer Section 5.3). For this reason, they were assessed together as a single 'impact wetland' for valuation and offsetting purposes. A conservative approach was taken and the highest valued wetland was used for each WEV attribute.

The impact wetland achieved a current WEV score of 0.55 and a potential WEV score of 0.718, indicating moderate current and moderate-high potential ecological condition, respectively. Due to the conservative approach, these scores are typically higher than other small, seepage- or margin-associated wetlands that have been modified by surrounding agricultural land use.

The WEV provides a measure of wetland condition rather than ecological value in terms of the EcIAG; a mid-range condition score does not in itself denote moderate or high ecological value. Assessed against the EcIAG ecological value matters, the impacted wetlands are considered to be of low ecological value, reflecting their small size, dominance of common exotic rush, sedge and grass species, absence of 'Threatened' or 'At Risk' species, limited habitat value, and modified condition within a heavily modified pastoral landscape.

5.4 Constructed Ponds

Several constructed ponds are present across the site (mapped in Appendix C, Figure 18). All except one are isolated with no freshwater connectivity; a small online pond is present between watercourse I4 and wetland 11 (Appendix C). The isolated ponds are expected to support only highly mobile, tolerant fish species, such as shortfin and longfin eel.

The ponds are typically small, stagnant and unshaded, with generally poor-quality aquatic habitat and an absence of buffering riparian vegetation, and would not be expected to support sensitive indigenous fish species.

Under the NPS-FM, deliberately constructed ponds meet the definition of a constructed wetland and are excluded from the definition of a natural inland wetland; accordingly, the NES-F wetland regulations do not apply. This exclusion also extends to any incidental wetlands that have formed in association with these constructed waterbodies.

On the basis of their artificial and isolated nature, poor habitat quality, and likely low-diversity fish communities, the constructed ponds within the site are assessed as being of **low** ecological value.

Figure 18. Examples of small constructed offline ponds within the development site.

6 SUMMARY OF ECOLOGICAL VALUES

The ecological values identified within the site range from negligible to high, reflecting the highly modified nature of the landscape, which has been subject to extensive historical vegetation clearance and agricultural use. The majority of the site comprises pasture and exotic-dominated vegetation and modified watercourses of low ecological value. The highest ecological values are concentrated within the SEA-T overlay in Te Korowai o Maraeariki, where indigenous vegetation and associated fauna habitat are assessed as being of high value, and, in the freshwater environment, within the permanent watercourses, where the diadromous native fish community supported by the Ōrewa River elevates the value of the main stem. A summary of the ecological values identified within the site is provided in Table 3 (terrestrial) and Table 4 (freshwater).

Detailed assessments of terrestrial vegetation, terrestrial fauna and freshwater ecological values against the EcIAG ecological value matters are provided in Appendix I.

Table 3. Summary of the terrestrial ecological values within the site.

Ecological Feature	Ecological Value	
	Residential Development Area	SEA-T overlay* (Te Korowai o Maraeariki)
Exotic tree/scrub vegetation	Low	-
Pasture	Negligible–Low	-
SEA vegetation	-	High
Non-SEA native vegetation	Low	-
Mixed native-exotic vegetation	Low	-
Terrestrial avifauna (birds)	Low	High
Herpetofauna (lizards)	Low–Moderate	High
Chiroptera (bats)	Low	Moderate–High

*Values shown for the SEA-T overlay relate to the significant indigenous vegetation and associated habitat that meet the SEA criteria, and not the small areas of exotic vegetation that also occur within the overlay.

Table 4. Summary of the freshwater ecological values within the site.

Ecological Feature	Ecological Value
Permanent streams	Moderate
Intermittent streams	Low
Ephemeral flow paths	Negligible
Artificial drainage channels	Negligible–Low
Natural inland wetlands	Low (exotic)–Moderate (native)
Constructed ponds	Low
Freshwater fish	Low–Moderate
Macroinvertebrate communities	Low

7 ASSESSMENT OF ECOLOGICAL EFFECTS

7.1 Proposal Overview

The proposed development involves the residential subdivision of the site, together with associated earthworks, roading, infrastructure and stormwater management. To enable the development, the works include large-scale bulk earthworks, vegetation clearance, and works within and adjacent to watercourses and wetlands. Ecological restoration, offsetting and compensation are also proposed within Te Korowai o Maraeariki.

The proposed works with the potential to affect ecological values comprise:

- **Vegetation clearance** across the development area, including pasture, exotic vegetation, a small area of mixed native-exotic scrub, and vegetation within riparian and wetland margins;
- **Earthworks**, including works interfacing with the margins of some freshwater features;
- **Streamworks**, comprising the retention, realignment, naturalisation and reclamation of intermittent streams within the development area;
- **Wetland reclamation** of small, low-value induced and seepage wetlands;
- **Culvert installation and upgrades** within the development footprint;
- **Water-supply and wastewater infrastructure** within Te Korowai o Maraeariki, including a surface water intake, reservoir and treatment wetland; and
- **Construction-phase activities**, including dewatering and in-stream works.

These works have the potential to affect terrestrial vegetation, terrestrial fauna (birds, lizards and bats), freshwater habitats (streams and wetlands) and freshwater fauna (fish and macroinvertebrates). The potential effects on each of these values, and the measures proposed to avoid, minimise, remedy, offset and compensate for them, are assessed in the following sections. The design has sought to avoid and minimise adverse ecological effects through an iterative masterplanning process, with residual effects addressed through the restoration, offsetting and compensation measures.

7.2 Effects on Terrestrial Vegetation

7.2.1 Vegetation removal

Vegetation across the site currently comprises predominantly managed pasture, with scattered exotic tree stands, shelterbelts and isolated specimens, small patches of exotic scrub (largely gorse), and limited areas of indigenous and mixed native-exotic vegetation (Appendix A, Section 4.1). Very little indigenous vegetation is present within the development area, and all vegetation within the development area is considered to be of low ecological value.

To facilitate bulk earthworks, roading and infrastructure, all tree and shrub vegetation within the development area will be removed, including vegetation within 10 m riparian margins and 20 m of natural wetlands. The existing riparian and wetland buffer vegetation is dominated by planted mature exotic trees, predominantly poplar, with some pine and blackwood (Greenscene 2026).

Greenscene (2026) has assessed the trees proposed for removal within these buffers. In total, less than 1 ha of canopy cover is proposed for removal within riparian and wetland margins, comprising approximately 0.03 ha, 0.3 ha and 0.6 ha across three stands of mature exotic trees, together with a

number of individual exotic trees within 10 m of streams required for road layouts, stream realignments and culverts. Some poplars established within natural wetlands are also proposed for removal (refer Section 7.4.5). Two bridges are also proposed across the Ōrewa River; the vegetation removal within these areas will be minor and localised, and limited to pasture and a small number of exotic trees (namely pines).

A small area of low-value mixed native-exotic scrub (Section 4.1.4) located within the earthworks footprint adjacent to Waterloo Creek will also be removed. This vegetation is dominated by exotic and pest plant species with a minor component of common native species, and was assessed as being of low botanical value. This cleared area will be available to revegetate with native planting following earthworks completion (Section 7.2.2).

Within Te Korowai o Maraeariki, vegetation removal will be limited to pasture and weeds only, with works avoiding riparian margins and natural wetlands.

Extensive riparian planting along the streams to be retained and realigned will provide significantly more, and higher quality, riparian vegetation than is currently present. Once established, this planting is expected to improve terrestrial connectivity and habitat for fauna, as well as provide high levels of shade, organic matter input, bank stability, and filtration of overland flow (refer Section 7.3).

Further, as part of the offset package for the proposed wetland reclamation, buffer planting will occur around the created wetland, along with riparian and wetland planting around existing stream and wetland systems, and the large-scale ecological restoration within Te Korowai o Maraeariki described in the following section.

The majority of the existing vegetation within the development area will be removed, comprising predominantly managed pasture, exotic shelterbelts and tree stands. At a site scale, the magnitude of vegetation removal is **high**. However, given the low ecological value and predominantly exotic and pastoral composition of this vegetation, and the small proportion it represents of the extensive, broadly similar modified rural landscape within which the site sits, the magnitude of effect at a wider landscape scale is **low**. Notwithstanding the initial vegetation loss, the proposed revegetation and restoration planting (Section 7.2.2) will substantially exceed the extent and ecological quality of the vegetation removed and is expected to result in a net positive vegetation outcome over time.

7.2.2 Te Korowai o Maraeariki and Ecological Enhancement

Te Korowai o Maraeariki encompasses approximately 132 ha of rural land north of the Ōrewa River and provides for a combination of existing and proposed ecological restoration, offsetting, compensation and broader enhancement measures. The proposed restoration and enhancement includes approximately 77 ha of native revegetation, upper bank and riparian planting (Figure 19; Barker & Associates 2026b), in addition to the approximately 4.88 ha of stream offset and compensation measures and 2.67 ha of wetland offset measures described in Section 7.4. Te Korowai o Maraeariki will also incorporate a network of walking tracks (utilising existing culverts/crossings) and areas of open space for passive recreation.

The ecological measures within Te Korowai o Maraeariki comprise three distinct components:

- Existing offsetting and compensation works being implemented under approved resource consents for Stages 9-13;

- Additional offsetting and compensation proposed to address the residual ecological effects of the current development; and
- Broader restoration and enhancement measures that are not required to address a specific residual effect.

Together, these components will contribute to a larger and better-connected ecological network. The restoration concept has been developed through consultation between the applicant and iwi. To avoid double-counting ecological benefits, the positive effects attributable to the current proposal have been assessed separately from the outcomes of existing consented works.

The measures associated with the current proposal form a substantive, landscape-scale restoration initiative integrating terrestrial, riparian and wetland restoration across a large, connected area. The overarching objective is to progressively restore indigenous vegetation appropriate to the underlying ecosystem types and environmental gradients. This includes vegetation characteristic of the WF11 kauri, podocarp, broadleaved forest ecosystem type, which is classified as Endangered under the IUCN ecosystem threat-status criteria (Singers *et al.*, 2017).

Te Korowai o Maraeariki adjoins SEA_T_2223 in the north-western part of the site and connects, via the Ōrewa River corridor and associated gully systems, with the wider network of indigenous vegetation and SEAs across the surrounding landscape. Restoration across stream margins, wetlands, gullies, slopes and ridgelines will strengthen connections between terrestrial and freshwater habitats and reduce the isolation and fragmentation associated with the existing pastoral landscape.

The restoration will also establish a range of environmental gradients and ecotones, including transitions between streams, wetlands, riparian vegetation, shrubland and regenerating forest. These transitional habitats will increase structural and habitat diversity and provide feeding, shelter, breeding and movement opportunities for indigenous fauna.

The restoration, offsetting, compensation and enhancement measures associated with the current proposal will be coordinated and implemented through a Biodiversity and Restoration Management Plan (BRMP), recommended to be secured through conditions of consent. The BRMP will provide an integrated framework for the detailed design, implementation, maintenance and monitoring of these measures, while clearly distinguishing them from works implemented under existing resource consents. It will identify the purpose, location and extent of each measure, together with the applicable performance targets, monitoring requirements and provisions for corrective or adaptive management.

The measures associated with the current proposal comprise the following key components:

- **Restoration planting:** Riparian and wetland margins, gullies and areas of existing pasture will be planted with indigenous species appropriate to the site's ecosystem types, environmental conditions and restoration objectives (Figure 19; Barker & Associates 2026b). Planting will progressively establish indigenous forest, shrubland, riparian and wetland habitats, strengthen ecological corridors and connect areas of habitat that would otherwise remain isolated. The planting shown in the landscape plan is indicative; final species selection, densities and planting design will be confirmed through the BRMP, with ecological input to ensure consistency with the site's ecosystem types and restoration objectives.
- **Lizard habitat enhancement:** Habitat suitability for indigenous lizards will be enhanced through the establishment of features such as rock piles and rock gardens for basking and refuge, log piles and

coarse woody debris to increase structural complexity, and dense, low-growing indigenous vegetation providing shelter and opportunities for thermoregulation and foraging. Planting will incorporate suitable native food resources and provide a layered vegetation structure. These measures will be located within areas subject to long-term pest management, thereby improving the availability and quality of habitat for indigenous lizards.

- **Bat habitat enhancement:** Habitat suitability and landscape connectivity for indigenous bats will be enhanced through the retention of large trees, including selected non-invasive exotic trees, where practicable and appropriate. Retained trees will maintain potential existing and future roosting opportunities while planted native canopy species develop over the longer term. Where appropriate, additional measures may include the creation of roost features within suitable standing trees and the installation of artificial bat roost boxes. Vegetated corridors along streams, gullies and ridgelines will also improve potential bat movement and foraging habitat.
- **Predator and pest control:** An integrated predator and pest control programme will be implemented across the Te Korowai o Maraeariki enhancement areas. The programme will target key introduced mammals affecting indigenous vegetation and fauna, including rats, mustelids and possums, and is anticipated to include a network of bait stations and/or traps installed at appropriate densities. Ongoing servicing, pest monitoring and adaptive management will maintain the programme's effectiveness over time. The detailed methodology, target species, device types and densities, monitoring regime and performance targets will be specified in the BRMP.

Wastewater and water-supply infrastructure, including treatment plants, a dispersal wetland and a reservoir, is proposed within Te Korowai o Maraeariki to service the development if connection to the public network is unavailable. If this infrastructure is ultimately not required, the areas set aside for it are intended to be incorporated into the ecological restoration area, further increasing its extent. This potential future restoration is described for contextual purposes only and has not been relied upon in assessing the ecological effects or anticipated restoration outcomes presented in this EcIA.

Outside of the enhancement proposed within Te Korowai o Maraeariki, additional restoration/riparian planting is also proposed within the development site, including along the Ōrewa River, Waterloo Creek and retained stream corridors (Barker & Associates 2026b; Section 7.4.3). This planting will substantially improve the currently degraded, predominantly pasture-dominated riparian environments by increasing indigenous vegetation cover, habitat quality and shading; improving bank stability and the buffering of freshwater environments; and strengthening ecological connectivity throughout the development site and with Te Korowai o Maraeariki.

Overall, the proposed enhancement within the site will establish an extensive and integrated network of indigenous forest, shrubland, riparian, wetland and freshwater habitats within the Ōrewa River catchment. Subject to the measures being appropriately designed, secured, implemented, maintained and monitored, it is expected to improve habitat quality and diversity, strengthen aquatic–terrestrial connections, facilitate indigenous fauna movement and support ecological processes and natural regeneration over time. The programme is therefore expected to result in **positive** ecological effects at site, landscape and catchment scales, while also providing a platform for cultural outcomes to be developed and led by Te Kawerau ā Maki and Ngāti Manuhiri.

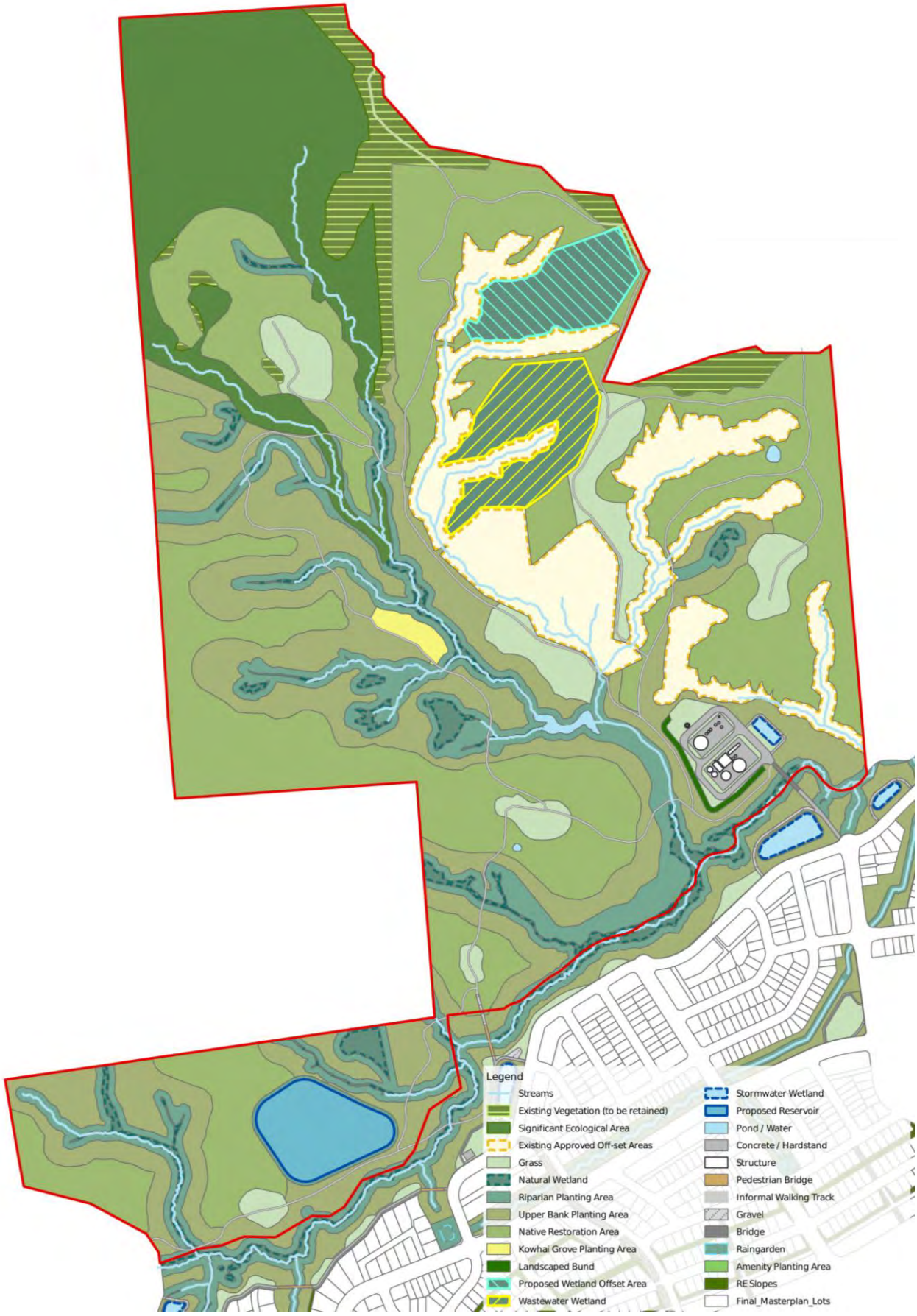


Figure 19. Proposed restoration and enhancement areas within Te Korowai o Maraeariki and its connections with the SEA overlay. Plan reproduced from Barker & Associates 2026b.

7.3 Effects on Terrestrial Fauna

7.3.1 Avifauna (birds)

Vegetation clearance and construction activities have the potential to result in direct adverse effects on indigenous birds, including the disturbance, injury or mortality of nesting adults, eggs and chicks. These effects are most likely to occur where vegetation is removed during the breeding season, when nests may be present within trees, shrubs or rank grass. Nesting birds, eggs and chicks are particularly vulnerable as they are unable to readily relocate from active nests.

While these direct effects may occur at a local scale, bird species recorded within the site are highly mobile and able to utilise alternative habitat within the wider landscape. The site is connected/in proximity to a range of surrounding terrestrial and freshwater habitats, allowing birds to relocate to nearby suitable habitat where required.

New Zealand dotterel has been recorded within the vicinity of the site and are known to utilise open, sparsely vegetated areas for nesting. While the site does not currently provide extensive suitable nesting habitat, earthworks activities may temporarily create areas of bare ground that could attract nesting dotterels during the breeding season. Consequently, there is a potential risk of nest establishment within active earthworks areas if suitable habitat develops during construction.

In addition to the direct effects of habitat removal, construction activities have the potential to result in indirect effects on birds through noise, vibration, human presence, artificial lighting and general disturbance. These effects may temporarily displace birds from habitat adjacent to the works or deter use of nearby areas during construction. Given the modified, largely pastoral nature of the site and its existing exposure to rural and adjacent urban activity, the resident bird community is dominated by common, disturbance-tolerant indigenous and exotic species that are generally habituated to such activity. Disturbance effects are also temporary and localised, and will diminish once construction is complete.

The loss of, and disturbance to, habitat within the site will not permanently displace the bird community. There is unaffected habitat of both similar and significantly higher quality to be retained in the Te Korowai o Maraeariki site and immediate surroundings for birds to utilise. The following measures will be implemented through the Fauna Management Plan (FMP) provided in Appendix J to minimise the potential effects of vegetation removal on indigenous avifauna:

- Removal of any tree/shrub vegetation occurs outside of the main terrestrial bird nesting season (September to February, inclusive). If tree clearance is unable to occur outside of breeding season, it is recommended that a condition of consent requires an ecologist to inspect the affected vegetation within 24 hours of clearance. If active native bird nests are identified, a minimum 10 m buffer must be maintained around the nesting site until an ecologist deems it to be inactive; and
- Earthworks areas should be managed in accordance with the FMP to minimise the risk of New Zealand dotterels establishing nests within active construction areas. Where suitable nesting habitat develops during the breeding season, appropriate deterrence measures and monitoring should be implemented, and any nests identified should be managed in consultation with a suitably qualified ecologist.

The magnitude of effect of the proposed works on birds is considered to be low, reducing to **very low** following implementation of the avifauna management measures outlined in the FMP.

Further, the proposal will deliver long-term benefits for indigenous birds through the large-scale restoration and enhancement of Te Korowai o Maraeariki (Section 7.2.2). Extensive native revegetation of currently pastoral land, the restoration of riparian and wetland habitats, and improved habitat connectivity across gullies, ridgelines and the Ōrewa River corridor will substantially increase the extent and quality of foraging and nesting habitat available to native birds. Sustained landscape-scale predator control will further support the recovery of indigenous bird populations by reducing predation pressure. These measures are expected to result in a net increase in the availability and quality of indigenous bird habitat across the site over time, representing a **positive** ecological outcome relative to the existing modified pastoral environment.

7.3.2 Herpetofauna (lizards)

Vegetation removal, earthworks and associated construction activities within the site have the potential to result in direct mortality and/or injury to indigenous lizards, should they be present within areas proposed for disturbance. As indigenous lizards are generally small and relatively cryptic with limited dispersal ability, they are vulnerable to injury or mortality during vegetation clearance, earthworks and machinery movement. Indirect effects may also occur through disturbance, and removal or degradation of habitat features such as rank grassland, woody debris and scrub vegetation.

The majority of grassed areas within the site are regularly grazed and generally provide limited habitat suitability for indigenous lizards due to frequent disturbance and consistently short grass length. Continued management of regularly maintained grass areas during pre-construction phases will assist in discouraging establishment of suitable skink habitat within these areas prior to works commencing.

Despite recent lizard survey efforts adjacent to the site detecting no indigenous lizards, localised habitat potentially suitable for indigenous skinks was present within areas of unmanaged vegetation margins containing rank grassland and exotic scrub vegetation, and these areas will be affected by the proposed works. However, the majority of affected habitat is highly modified with reduced terrestrial connectivity, reducing the suitability for indigenous lizards. Accordingly, the proposal is not expected to adversely affect any significant indigenous lizard populations should they occur within the site.

An FMP which outlines lizard management recommendations is provided in Appendix J which incorporates the recommended lizard management measures. Vegetation clearance within identified potential lizard habitat areas should be supervised by a suitably qualified and experienced herpetologist/ecologist.

Given the absence of indigenous lizard detections during targeted surveys and associated vegetation clearance activities, together with the generally low suitability and highly modified nature of habitat present across much of the site, the magnitude of effect on indigenous lizards is considered to be low. With implementation of appropriate lizard management measures where applicable, residual effects are considered to reduce to **very low**.

The proposal will provide long-term benefits for indigenous lizards through targeted habitat creation and enhancement within Te Korowai o Maraeariki (Section 7.2.2). A network of lizard habitat features, including rock piles, log piles and coarse woody debris, will be established to provide basking, refuge and foraging habitat, complemented by native planting incorporating food resources. These features will be located within areas to be managed under a restoration plan, with sustained predator control reducing the predation pressure that currently limits native lizard populations in the area. Together, these measures will create additional, higher-quality lizard habitat and terrestrial connectivity where little

currently exists, supporting the persistence and natural establishment of indigenous lizard populations over time.

7.3.3 Chiroptera (bats)

Tree felling when bats are utilising them for roosts or refugia has the potential to result in mortality and/or injury to any bats present. An FMP is provided in Appendix J, which incorporates the required bat management measures. It is recommended that pre-clearance monitoring of potential roost trees as per DoC's Bat Roost Protocols (DoC 2024) is undertaken to minimise the risk of trees being felled that contain bats.

The minor proposed tree clearance will not result in significant habitat loss or population displacement of a potential bat population, as the affected habitat within the site is of low quality and has poor terrestrial connectivity. Additionally, no bats have been detected on-site or in the immediate surrounding area. However, the occasional presence of bats within the site cannot be ruled out. The level of effect on bats is considered to be low, mitigated to **very low**.

The proposal will enhance habitat for indigenous bats over the long term. The retention of mature trees (including selected non-invasive exotics) will maintain existing and future roosting opportunities, while the creation of additional roost features within standing trees and the installation of artificial bat roosts will supplement natural roosting habitat. Long-term planting of native canopy species will provide future roosting habitat, and vegetated corridors along streams, ridgelines and planted areas will support bat movement across the landscape. Combined with landscape-scale predator control, these measures are expected to improve the availability and quality of roosting and foraging habitat for indigenous bats over time.

7.4 Effects on Watercourses and Wetlands

7.4.1 Erosion and sedimentation

Bulk earthworks are proposed to occur across approximately 108 ha across the site across three earthworks seasons (October to April), with no more than 30 ha open at any given time (Woods 2026). Within the Stages 14-17 development area, this includes approximately 610,072 m^3 of cut and 788,629 m^3 of fill. This will include a total of 62,876 m^2 of earthworks within 10 m riparian margins, as well as works within 10 m of all natural inland wetlands within the development site (Woods 2026, drawing P25-609-01-1250 to 1258). Works within/reclamation of natural inland wetlands are discussed in Section 7.4.5.

A further 116,464 m^2 of earthworks will be undertaken in the Te Korowai o Maraeariki site to facilitate the construction of the wastewater dispersal wetland (35,522 m^2), the ecological offset wetland (26,704 m^2, refer Section 7.4.5), the wastewater and water supply treatment plants (23,297 m^2), and the water reservoir (30,311 m^2) (Woods 2026; drawing set no. P25-609-02-1220-EW). While these works fall within Te Korowai o Maraeariki, they are confined to the footprints of the proposed infrastructure and offset wetland, and have been located and designed to avoid natural inland wetlands and 10 m riparian margins, such that the earthworks do not compromise the wider ecological restoration proposed for the area (refer Section 7.2.2).

Earthworks have the potential to generate elevated sediment discharges to downstream freshwater environments if not appropriately managed. Increased suspended sediment concentrations can adversely affect freshwater ecosystems through reduced water clarity, smothering of stream substrates

and aquatic habitat, and effects on fish and macroinvertebrate communities. Freshwater features potentially affected by sediment discharge include streams, natural inland wetlands and constructed ponds within and downstream of the site.

An Erosion and Sediment Control Plan (ESCP) has been prepared by Woods in accordance with Auckland Council's GD05 (Woods 2026). Primary sediment control is provided by sediment retention ponds, supported by decanting earth bunds, silt and super silt fences, clean and dirty water diversion, stabilised construction entrances, and chemical treatment of sediment control devices, with a strong emphasis on erosion prevention ahead of rain events and progressive stabilisation of completed areas prior to winter. An adaptive management programme, including monitoring of sediment control performance and independent oversight, is proposed to enable ongoing assessment and response throughout construction (Woods 2026).

Operational stormwater from the development will discharge to receiving watercourses via controlled outlet structures designed to minimise scour and erosion, with final outlet types, discharge velocities, energy dissipation and scour protection to be confirmed at detailed design (Woods 2026). Provided these measures are implemented, the potential for erosion and scour effects on receiving streams is expected to be low.

Overall, the magnitude of effect associated with erosion and sedimentation is considered to be **high** prior to mitigation, reducing to **low** following implementation of the proposed erosion and sediment control measures.

7.4.2 Streamworks

Three permanent streams, including the Ōrewa River (P1) and Waterloo Creek (P2), and 13 intermittent streams were identified within the residential subdivision area (Appendix C). Together, these watercourses comprise approximately 5,400 m of existing stream channel.

No realignment or reclamation of permanent streams is proposed, and enhancement of these is proposed through riparian planting etc as outlined in Section 7.2.2. Eight of the 13 intermittent streams within the development footprint will be affected by reclamation, realignment and naturalisation, in-corridor naturalisation, or a combination of these works, as summarised in Table 5 (Sections 7.4.3 through 7.4.5).

For the purposes of this assessment, in-corridor naturalisation refers to the reconstruction and ecological enhancement of a stream generally within its existing channel corridor. Stream realignment and naturalisation involve relocating the stream outside its existing channel corridor and constructing a new naturalised channel. Both treatments incorporate riparian planting and naturalised channel design, including increased sinuosity, floodplain connectivity and in-stream habitat features. The key distinction is therefore whether the channel remains within its existing general corridor or is relocated onto a new alignment.

Where realignment results in the replacement channel being shorter than the existing channel, the resulting net loss of stream length is treated as stream reclamation for effects assessment and offsetting purposes. This generally occurs where a stream must be straightened locally to enable an effective culvert crossing.

Table 5. Proposed streamworks across the Stages 14-17 residential subdivision area.

Stream	Proposed streamworks
I2	350.3 m retained; 75.9 m of realigned and naturalised channel; 29.5 m of associated culverting
I2-A	38.8 m reclaimed
I3	310.3 m recorded as retained, including 29.8 m of new culvert; 18.3 m reclaimed; 142.1 m of open realigned and naturalised channel, including underground watercourse to be daylighted; 29.5 m of associated culverting
I7	No reclamation; 404.9 m retained; 489.4 m of open in-corridor naturalisation; 96.6 m of open realigned and naturalised channel; 131.4 m of associated culverting
I7-A	232.3 m reclaimed
I7-B	200 m reclaimed
I8	121.3 m reclaimed; 137.5 m of realigned and naturalised channel; 29.7 m of associated culverting
I10	326.9 m retained; 24.3 m reclaimed; 14.1 m of realigned and naturalised channel; 29.8 m of associated culverting
Total	**635.0 m reclaimed; 489.4 m of in-corridor naturalisation; 466.2 m of realigned and naturalised channel; and 249.9 m of associated culverting**

7.4.3 Stream realignment and naturalisation

Five intermittent streams, comprising I2, I3, I7, I8 and I10, will be subject to realignment and naturalisation, in-corridor naturalisation, or a combination of these works. A total of 489.4 m of intermittent stream will be naturalised within its existing general corridor, while 466.2 m will be realigned and naturalised. These lengths exclude proposed culverts, which comply with the AUP permitted standards.

The locations and extents of the proposed works are shown on drawing series P25-609-01-1450–1456, prepared by Woods (2026). All affected reaches are highly modified and were assessed as having low current ecological value.

The principal potential adverse effects associated with the works are:

- temporary loss or disturbance of low-value aquatic habitat;
- alteration or interruption of stream flows during construction;
- erosion and the release of fine sediment;
- injury or mortality of indigenous fish; and
- permanent loss of stream length where the replacement channel is shorter than the existing channel.

Before mitigation, the magnitude of effects on freshwater ecological values is assessed as moderate–high. When considered against the low ecological value of the affected reaches, the overall level of effect is assessed as low–moderate. The measures proposed to avoid, minimise, remedy and offset these effects are described below.

Stream flows and hydrological function

The stormwater and underfill drainage systems have been designed to maintain flows to the retained and naturalised stream network. An appropriate proportion of treated stormwater will be directed to the retained and realigned streams, with the stormwater network designed to replicate pre-development flows as closely as practicable (Woods 2026).

Underfill drainage will also return intercepted groundwater to the heads of retained and naturalised streams, supplementing flows received from the stormwater network (Gibb Ritchie 2026). Together, these measures are intended to maintain sufficient flow to support the intermittent hydrological character of the affected streams.

All affected reaches will be realigned horizontally. In addition, approximately 45.3 m of I2 will be lowered vertically. As this work involves lowering rather than raising the channel, it is expected to improve or maintain connection with shallow groundwater and is not expected to reduce baseflow contributions.

Stream-channel naturalisation

The affected reaches have been extensively modified by historic land-use practices, including channel deepening and straightening, stock access and the removal of riparian vegetation. Consequently, they generally provide limited habitat diversity, low in-stream cover and little hydrological heterogeneity.

The proposed naturalisation works provide an opportunity to remedy these existing deficiencies. The replacement channels will comprise a defined low-flow channel meandering through a varied floodplain. The channels will incorporate:

- increased sinuosity;
- pools;
- floodplain and bank features;
- root wads and embedded cross logs;

At least one in-stream habitat feature or feature cluster will be provided per 50 m of open naturalised channel. The location, form and orientation of these features will be confirmed during detailed design in consultation with a suitably qualified freshwater ecologist.

The replacement channels will be designed to be at least as wide as the corresponding existing channels to prevent an unintended net loss of streambed area. The proposed channel design is shown on drawing series P25-609-01-1460–1461, prepared by Woods (2026).

Existing culverts will also be removed from affected reaches where practicable and the channel naturalised through these locations. This will improve channel continuity and provide additional ecological gains. Where a realigned replacement channel is shorter than the existing channel, including where local straightening is required for an effective culvert crossing, the resulting net loss of stream length has been treated as stream reclamation. These losses are included in the stream offsetting calculations discussed in Section 7.4.4.

Riparian restoration

Native riparian planting will be established along the naturalised stream margins, generally extending a minimum of 10 m from each bank.

The planting is expected to:

- increase shading and organic matter inputs;
- improve bank stability;
- reduce ongoing fine-sediment inputs;
- improve terrestrial and aquatic habitat connectivity; and
- increase the ecological integrity of the retained and naturalised stream network.

Stream Ecological Valuation

To inform the assessment of the proposed streamworks, four representative SEV assessments were undertaken within the development area, with a further two assessments undertaken within Te Korowai o Maraeariki (Figure 3). The SEV results are presented in full in Appendix E. Current SEV scores ranged from 0.203 to 0.330. These relatively low scores reflect the modified condition of the assessed reaches and their generally low current ecological value.

It was not practicable or necessary to assess every affected reach individually; therefore, representative SEVs were assigned to each stream based on stream type, channel condition, surrounding land use, proximity and overall ecological similarity (Table 6).

Reach-specific SEVs were applied where an assessment was undertaken within the affected stream. The main I7 channel was represented by SEV 3 and I8 by SEV 4. The remaining affected reaches, comprising the main stem of I2 and I10, were assigned SEV 4. This represents a conservative approach because SEV 4 had the higher current score of the surveyed reaches available for representative application after excluding streams with dedicated reach-specific assessments.

Stream I3 currently flows underground and could not be assessed directly using the SEV methodology. A current SEV value of 0.2 was therefore assigned to I3, consistent with the value commonly accepted by Auckland Council for existing culverted stream reaches. Its potential scores were based on the future-condition assumptions for SEV 4, because the proposed daylighted and realigned channel will have comparable naturalised-channel and riparian treatments.

Table 6. Representative SEV allocation for streams subject to realignment and naturalisation.

Affected stream	Proposed works	Current-condition basis	Potential-condition basis	Reason for allocation
I2	Realignment and naturalisation, including vertical lowering	SEV 4	SEV 4	Conservative representative assessment for an open affected reach without a dedicated SEV
I3	Daylighting and realignment/naturalisation	Assigned value of 0.200	SEV 4	Existing reach is underground and cannot be directly assessed; future channel will receive comparable naturalisation and riparian treatment to SEV 4
I7	In-corridor naturalisation and realignment/naturalisation	SEV 3	SEV 3	Dedicated SEV assessment undertaken on the main I7 channel

Affected stream	Proposed works	Current-condition basis	Potential-condition basis	Reason for allocation
I8	Realignment and naturalisation	SEV 4	SEV 4	Dedicated SEV assessment undertaken within I8
I10	Realignment and naturalisation	SEV 4	SEV 4	Conservative representative assessment for an open affected reach without a dedicated SEV

Three SEV scenarios were considered; current SEV (SEV-C), typical-practice potential SEV (SEV-TP) and realignment potential SEV (SEV-RP) (refer to Section 2.3.2 for further information). The resulting scores are presented in Table 7, with the complete assessments provided in Appendix E.

Table 7. Current and potential SEV scores for streams subject to realignment and naturalisation.

Affected stream	Representative SEV	SEV-C	SEV-TP	SEV-RP
I2	SEV 4	0.251	0.348	0.46
I3 (partial)	SEV 4 potential	0.2	0.348	0.46
I7	SEV 3	0.244	0.361	0.454
I8	SEV 4	0.251	0.348	0.46
I10	SEV 4	0.251	0.348	0.46

Notes: Scores are rounded to three decimal places. SEV-TP provides a benchmark representing typical riparian management without in-stream enhancement. SEV-RP represents the proposed naturalized channel outcome.

The SEV results predict that the proposed naturalised channels will achieve appreciably higher ecological values than both their current condition and the typical-practice scenario. This reflects the additional benefits of naturalised channel form, floodplain connectivity and in-stream habitat enhancement.

Accordingly, the naturalisation works are expected to remedy the temporary loss of low-value habitat and provide a reach-scale ecological improvement once planting and channel habitats have established. However, any residual loss of stream length is addressed separately through the stream offsetting measures described in Section 7.4.4.

Native fish management

Given the intermittent hydrology and poor habitat quality of the affected reaches, shortfin eel are considered the indigenous fish species most likely to be present. Nevertheless, indigenous fish could be injured or killed during dewatering, channel excavation or diversion of flows.

A Native Fish Capture and Relocation Plan (NFCRP) will therefore be prepared and implemented by a suitably qualified freshwater ecologist before works commence within existing stream channels. The proposed requirements are discussed further in Section 7.4.9.

Erosion and sedimentation

Earthworks within and adjacent to the streams could release sediment to downstream receiving environments. These effects will be minimised through implementation of an approved erosion and sediment control plan and the controls described in Section 7.4.1.

Construction sequencing

Each replacement channel will be formed and stabilised before flows are diverted from the existing channel. In-stream habitat features will be installed before the new channel is commissioned. The

existing channel will not be removed or infilled until the replacement channel is operational and the required fish capture and relocation has been completed.

Mitigation Hierarchy

- **Avoidance** – Stream reclamation has been avoided where practicable by retaining streams within the development and using realignment and naturalisation where existing channels cannot be accommodated. The avoidance and minimisation of effects on freshwater features have been considered in the iterative design and masterplanning process for the development (refer to planning AEE; Barker & Associates 2026a).
- **Minimisation** – Effects will be minimised through construction sequencing, maintenance of stream flows, erosion and sediment controls, appropriate fish capture and relocation, and detailed ecological input into channel design.
- **Remediation** – Existing degraded channels will be reconstructed as naturalised streams incorporating riparian planting, increased sinuosity, floodplain connectivity and in-stream habitat features.
- **Offset & Compensation** – Where realignment results in a net reduction in stream length, the residual loss is treated as stream reclamation and addressed through the stream offsetting and compensation measures described in Section 7.4.4.

Stream Management Plan

The design, construction, riparian planting and post-construction monitoring of the stream works within the development site will be provided for through a Stream Management Plan (SMP), recommended to be secured as a condition of consent. The SMP should provide a framework for the establishment, in-stream habitat enhancement, and ongoing management and monitoring of riparian vegetation within the development site.

7.4.4 Stream reclamation

Despite the retention, realignment and naturalisation measures described above, some intermittent stream reaches cannot be accommodated within the proposed development layout and will be permanently reclaimed. This includes the net loss of stream length where a realigned channel is shorter than the corresponding existing channel, typically where local straightening is required to provide an effective culvert crossing.

A total of 635 m of intermittent stream is proposed for reclamation (Table 8). Based on the average wetted width of the representative SEV reach assigned to each affected stream, this equates to an estimated streambed area of 525.7 m². Existing culverted sections within the affected reaches have been included in the reclamation accounting. The locations and extents of the proposed reclamation are shown on Woods (2026) drawing series P25-609-01-1450–1456.

All intermittent stream reaches proposed for reclamation have low current ecological value. The affected streams have been modified through channel straightening and deepening, stock access, removal of riparian vegetation and, in places, culverting. They consequently provide limited aquatic habitat diversity, hydrological heterogeneity, riparian cover and ecological connectivity.

Table 8. Intermittent stream reaches proposed for reclamation.

Stream reach	Reclamation length (m)	Representative SEV reach	Representative average wetted width (m)	Streambed area (m²)
I2-A	38.8	SEV 1	1.052	40.8
I3	18.3	SEV 4	0.49	9
I7-A	232.3	SEV 2	0.936	217.4
I7-B	200	SEV 2	0.936	187.2
I8	121.3	SEV 4	0.49	59.4
I10	24.3	SEV 4	0.49	11.9
Total	**635**			**525.7**

Notes: Streambed area has been calculated by multiplying the reclamation length by the average wetted width of the representative SEV reach. Average widths are based on 10 width measurements recorded at each representative SEV reach.

The unmitigated magnitude of effect is assessed as very high because the affected stream reaches will be permanently removed. When considered against their low ecological value, the overall unmitigated level of effect is assessed as moderate.

The proposed streamworks give rise to two distinct residual effects, which are addressed through separate mechanisms in the remainder of this section. The first is the loss of stream ecological value and function resulting from stream reclamation. Consistent with the mitigation hierarchy, biodiversity offsetting must be considered before environmental compensation. In this instance, there is a practicable opportunity to address this effect through biodiversity offsetting, whereby existing streams elsewhere are enhanced to achieve a measurable ecological gain sufficient to counterbalance the value lost. The required extent of enhancement is calculated using the ECR methodology, with the objective of achieving no net loss of stream ecological value.

The second residual effect is the physical loss of stream extent, expressed as stream length and streambed area. Although enhancement can improve the ecological condition and function of existing streams, it does not create new stream extent. Consequently, a residual loss of physical extent remains even after the required value offset has been provided. As like-for-like replacement through the creation of an equivalent length and area of new stream is not practicable, this effect is addressed through environmental compensation that provides additional ecological benefits commensurate with the residual loss, rather than directly replacing the stream extent lost.

Although the compensation measures will themselves provide ecological benefits and could, in principle, contribute towards addressing the loss of ecological value, reliance on compensation for that purpose would bypass the preceding offsetting step in the mitigation hierarchy. The proposed strategy therefore uses biodiversity offsetting where the loss of ecological value and function can be demonstrably counterbalanced, and reserves environmental compensation for the residual loss of physical stream extent that cannot practicably be offset. The benefits attributed to each mechanism are conservatively accounted for separately to avoid double counting.

Stream Value

The ECR method (Storey *et al*., 2011; Section 2.3.2) was used to determine the amount of stream enhancement required to address the residual loss of stream ecological value.

Stream value offsetting will be undertaken within Te Korowai o Maraeariki. This offset location was chosen because it is within the same wider Ōrewa River catchment as the development area, contributes to a broader catchment-scale enhancement plan, and provides comparable stream habitat and functions to those being lost. Enhancement measures at the offset site will include 10 m of riparian planting along both banks, stock fencing to exclude livestock, weed and pest control, connection to other restored watercourses within the catchment, and legal protection (e.g., covenant).

Two representative SEV assessments, SEV 5 and SEV 6, were undertaken within Te Korowai o Maraeariki (Figure 3). The assessed reaches are intermittent, soft-bottomed streams affected by agricultural land use, including stock access, channel modification and the removal of riparian vegetation. They currently provide limited aquatic habitat diversity, riparian cover and hydrological heterogeneity. Given the similar characteristics of other stream reaches within Te Korowai o Maraeariki, these SEV scores are considered representative of the current condition of all reaches to be enhanced under the offset plan.

The SEV assessments were applied to the wider stream network within Te Korowai o Maraeariki as representative SEVs as follows:

- SEV 5 was applied to the three northern intermittent stream reaches identified in Figure 20. These reaches are close to SEV 5 and have comparable catchment position, channel form, hydrology and surrounding land use.
- SEV 6 was applied to the remaining stream reaches proposed for enhancement. These reaches have characteristics comparable to SEV 6. SEV 6 also produced the lower potential SEV score and higher ECR requirement and is therefore the more conservative representative assessment for these reaches.

Current and potential SEV scores for SEV 5 and SEV 6 are summarised in Table 9, with the complete assessments provided in Appendix E. Overall, the offset site also has a low diversity of aquatic habitat and hydrologic heterogeneity, with low current SEV scores, making these reaches appropriate for enhancement. The potential scores assume that all proposed enhancement measures are successfully implemented and established. Current, potential and impact SEV scores for the affected reaches are provided in Table 10.

Table 9. Current and potential SEV scores for representative reaches within Te Korowai o Maraeariki.

Representative reach	Stream length available (m)	Current SEV	Potential SEV	Predicted SEV gain
SEV 5	477	0.330	0.496	0.166
SEV 6	923	0.304	0.477	0.173

Table 10. Current, potential and impacted SEV scores for the impacted streams.

Stream	Representative SEV reach	Current SEV Score	Potential SEV Score	Impact SEV Score
I2-A	SEV 1	0.271	0.374	0.0
I3 (partial)	SEV 4	0.251	0.348	0.0
I7-A	SEV 2	0.203	0.321	0.0
I7-B	SEV 2	0.203	0.321	0.0

Stream	Representative SEV reach	Current SEV Score	Potential SEV Score	Impact SEV Score
I8	SEV 4	0.251	0.348	0.0
I10	SEV 4	0.251	0.348	0.0

Offsetting for loss of value

Table 11 presents the ECR calculations used to determine the required amount of offsetting. The ECR calculations determine that at least 1,481.6 m² of streambed, equivalent to approximately 1,361.1 m of stream length, must be enhanced within Te Korowai o Maraeariki to address the loss of 525.7 m² of streambed within the development area. The proposed enhancement of 1530.34 m², comprising 1,400 m of stream length, exceeds this requirement by 48.74 m².

Figure 20 shows the stream reaches to be enhanced for both offset (addressing loss of value) and compensation (addressing loss of extent, refer below), together with the proposed offset wetland (refer Section 7.4.5) and the existing restoration areas already committed under the approved Stages 10-13 and Stage 9 consents. The previously consented restoration areas are shown for context only and are not relied upon as part of this project's offset.

The enhancement of the stream reaches will comprise riparian planting to a minimum width of 10 m along both banks, stock exclusion fencing, weed and pest plant control, and long-term protection. These measures will be detailed and secured through the BRMP proposed as a condition of consent.

On this basis, the proposed stream enhancement is expected to address the residual loss of stream ecological value resulting from the proposed reclamation, subject to the offset works being appropriately implemented and protected.

Table 11. Stream ECR calculations.

Impact Stream	Impact Length (m)	Impact Stream Width (m)	Impacted Streambed (m^2)	Impact SEV Reach	Offset SEV Reach	ECR	ECR Area (m^2)	Offset Stream Width (m)	Offset Length Required (m)	Offset Length Available (m)	Remaining Offset Stream Length (m)
I7-A	232.3	0.936	217.4	SEV 2	SEV 5	2.83	614.7	1.37	448.7	477	28.3
I2-A	38.8	1.052	40.8	SEV 1	SEV 6	3.09	126.2	0.95	132.8	923	790.2
I3	18.3	0.49	9	SEV 4	SEV 6	2.89	26	0.95	27.3		762.9
I7-B	200	0.936	187.2	SEV 2	SEV 6	2.71	508.2	0.95	535		227.9
I8	121.3	0.49	59.4	SEV 4	SEV 6	2.89	172	0.95	181.1		46.8
I10	24.3	0.49	11.9	SEV 4	SEV 6	2.89	34.5	0.95	36.2		10.6
Total	**635**		**525**.7				**1,481.6**		**1,361.1**	**1,400**	**38.9**

Notes: *. Remaining Offset Stream Length Total is calculated by adding the total the remaining stream length available represented by SEV 5 (28.3 m) and total remaining stream length available represented by SEV 6 (10.6 m). Total offset area available across SEV 5 and SEV 6 reaches is 1,530.34 m² (1,400 m), exceeding the 1,481.6 m² (1,361.1 m) required by 48.74 m² (38.9 m).

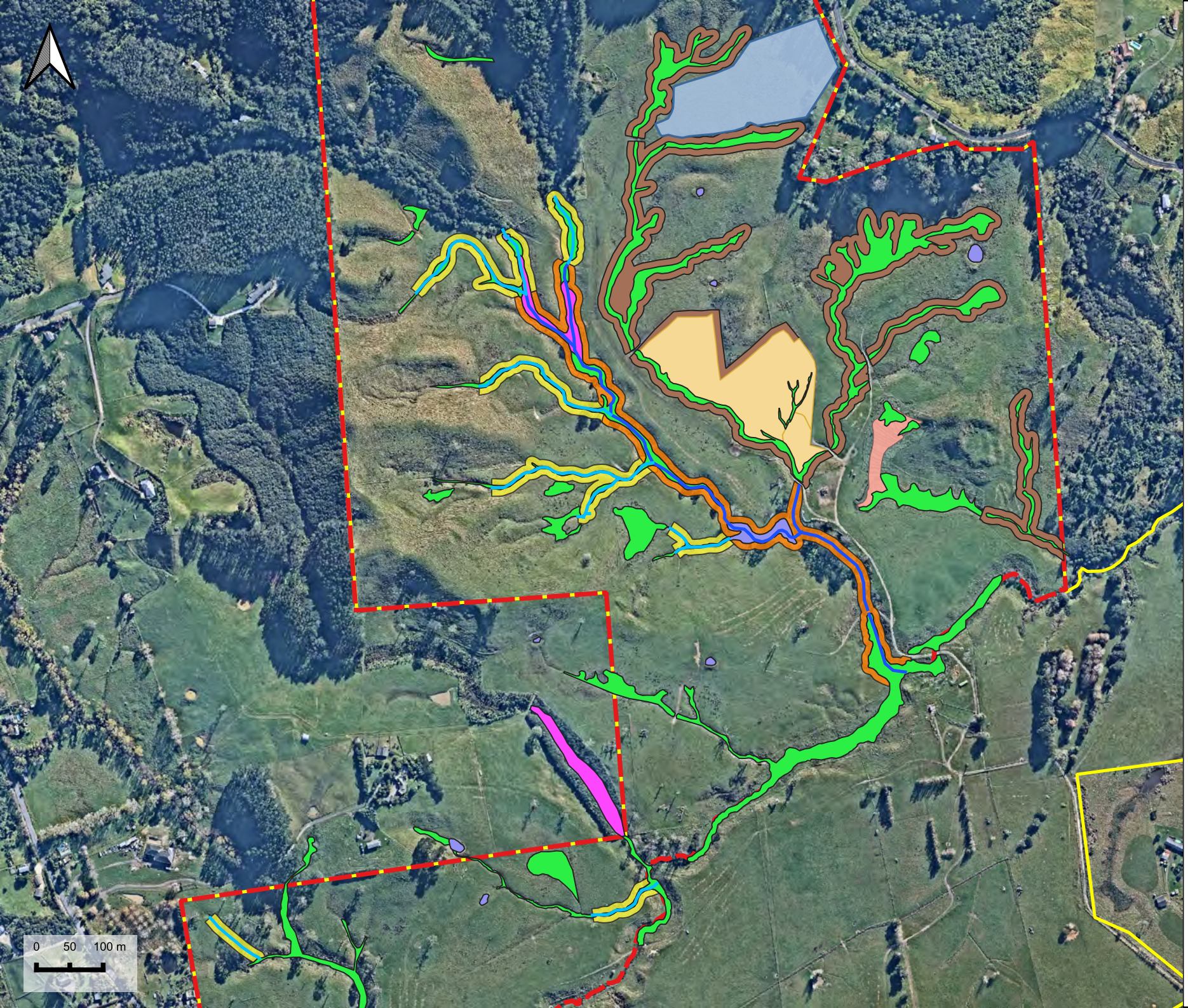


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Figure 20. Existing and proposed offset and compensation areas in Te Korowai o Maraeariki.

Legend

- Fast-track Boundary
- Te Korowai o Maraeariki

Consented offset and compensation

- Stg 9 Offset Wetland
- Stg 10-13 Offset Wetland
- Consented Planting

Existing wetlands/ponds

- Exotic Wetland
- Artificial Pond
- Native Wetland

Proposed offset & compensation

- Proposed Offset Wetland
- Streams for Compensation
- Streams for Offsetting
- Compensation Planting
- Offset Planting

SOURCES

Nearmaps 2026 Aerial

DISCLAIMER:
This map/plan is not an engineering draft. This map/plan is illustrative only and all information should be independently verified on site before taking any action.

SCALE **1:7,200** **@ A4**

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026

Stream Extent

The ECR assessment described above addresses the residual loss of stream ecological value. However, enhancement of existing streams does not replace the 635 m of intermittent stream extent that will be permanently lost.

Addressing this loss through biodiversity offsetting would require the creation of new open stream channel, such as through construction of a new stream or daylighting an existing piped or culverted watercourse. Creating an entirely new stream was investigated but is not considered practicable. A new stream would require a reliable source of water and the diversion of flows from another part of the catchment. This could adversely affect the hydrology and ecological functioning of an existing watercourse or receiving environment. In addition, insufficient piped or culverted stream length is available within the Stages 14–17 development area, the wider Milldale development or Te Korowai o Maraeariki to replace the proposed loss.

Compensating for loss of extent

A like-for-like offset for the loss of stream extent is not available. Environmental compensation is proposed to address this residual effect.

To compensate for the loss of stream extent, the following measures are proposed:

- Restoration of approximately 1,100 m of permanent stream extent. Restoration will entail a minimum 10 m of riparian planting along both banks, as well as stock exclusion fencing, weed and pest plant control, and long-term protection. These measures will be detailed and secured through the BRMP proposed as a condition of consent.
- Restoration of the degraded wetlands associated with the offset streams.

A catchment-scale approach has been adopted by integrating the stream compensation measures with the stream-value offsetting, and the wetland creation and restoration measures described in Section 7.4.5 (Figure 20).

Concentrating these measures within Te Korowai o Maraeariki will provide a connected freshwater restoration area rather than a series of small and isolated interventions. This integrated approach is expected to improve connections between stream, wetland and terrestrial habitats and provide greater resilience and habitat diversity. It will also allow sources of degradation, including livestock access, limited riparian cover, weed infestation, fine-sediment inputs and artificial barriers, to be addressed across the receiving stream network.

The remaining streams and wetlands within Te Korowai o Maraeariki will also be retained, protected or restored as part of the wider restoration programme (refer Section 7.2.2). These measures will provide further freshwater ecological benefits but are not relied upon as part of the quantified stream offset or the specific compensation package.

Although the compensation package will not replace the lost intermittent stream length on a like-for-like basis, it will provide substantial and enduring improvements to stream condition, riparian habitat, aquatic connectivity and associated wetland habitat within the same wider catchment. These benefits are considered an appropriate environmental compensation response to the residual loss of stream extent, subject to the measures being secured, implemented and maintained through conditions of consent.

Native fish

The potential for native fish injury or mortality during stream reclamation will be addressed through an NFCRP, as described in Section 7.4.9. This is a minimisation measure rather than part of the environmental compensation package.

Consistency with NPS-FM aquatic offsetting and compensation principles

The proposed management of residual stream effects comprises two components, each assessed against the relevant NPS-FM principles: the residual loss of stream value is addressed through offsetting (assessed against the aquatic offsetting principles, NPS-FM Appendix 6), and the residual loss of stream extent, for which a like-for-like offset is not available, is addressed through environmental compensation (assessed against the aquatic compensation principles, NPS-FM Appendix 7).

- **Mitigation Hierarchy** –
    - Avoidance – As a result of the proposed scheme plan and bulk earthworks proposal, there are unavoidable impacts on the existing low value intermittent streams. Reclamation has been avoided where stream realignment is appropriate.
    - Minimisation – Adverse effects on in-stream fauna will be minimised by salvaging and relocating native fish and implementing appropriate sediment and erosion controls to prevent sediment discharge to the downstream receiving environment. The loss of the reclaimed streams' functional roles of water conveyance has been mitigated through stormwater design. Retained reaches will be enhanced.
    - Remedy – Retained and realigned streams will be naturalised and restored, including through riparian planting and in-stream habitat enhancement.
    - Offset – Offsetting options, such as daylighting and creation of new streams were considered unfeasible.
    - Compensation – Since other effects management options, such as minimisation and offsetting, have been sequentially explored and exhausted, environmental compensation was considered as a last alternative. Compensation has been used to address the significant residual effects of the stream reclamations.
- **Additionality** (Appendices 6 & 7) – Apart from this application, there are no requirements or other plans relating to the compensation measures proposed.
- **Landscape Context (Proximity)** (Appendices 6 & 7) – All retained stream reaches within the residential subdivision area proposed to be enhanced and as such additional sites were required to create a viable compensation package. A suitable offset site at Upper Ōrewa Road was located within Te Korowai o Maraeariki. Both the impact and offset sites are located within the Ōrewa River catchment.
- **"Like for Like"** – For the value offset (Appendix 6), the enhanced offset reaches provide comparable stream habitat and functions, achieving no net loss of value on a like-for-like basis. For the extent compensation (Appendix 7), a like-for-like replacement of stream extent is not available; compensation instead provides equivalent or greater ecosystem processes within the same catchment.

- **No net loss and preferably a net gain** – The value offset achieves no net loss of stream value (Appendix 6). For the loss of 635 m of intermittent stream, a total of 1,400 m of intermittent stream and 1,100 m of permanent stream will be restored or enhanced, as well as additional gains through a catchment-based restoration. For extent, an overall net loss of intermittent stream length remains; the compensation package (Appendix 7) provides equivalent or greater ecosystem processes and enduring catchment-scale gains, considered an appropriate compensation response.

7.4.5 Wetland reclamation

Two wetlands are proposed for partial reclamation and 13 are proposed for full reclamation, resulting in a combined loss of 1.3 ha of wetland extent. The locations and extents of the proposed works are shown on drawing series P25-609-01-1450–1456, prepared by Woods (2026). The wetlands range in size from 10.2 m² (WL23) to 7,481 m² (WL20), and all were assessed as being of low ecological value (Section 5.3).

The wetlands' functional roles of flood attenuation and nutrient capture will be appropriately addressed through the proposed stormwater management (Woods 2026). Notwithstanding this, the reclamation will result in the permanent loss of wetland extent and value, which is a significant residual effect requiring offset.

The magnitude of effect prior to offsetting is assessed as very high in a localised site context and moderate in a wider catchment context. Given the low ecological value of the wetlands and this magnitude, the overall level of effect of the wetland reclamation is assessed as low to moderate. The residual loss of 1.3 ha of wetland extent and value is proposed to be offset through the creation of 2.67 ha of new wetland within Te Korowai o Maraeariki, in the Ōrewa River catchment.

Wetland offset

Impact wetlands (development site)

The wetlands proposed for reclamation were of a very similar nature, sharing a plant composition of common exotic rushes, sedges and grasses (Section 5.3). All were either seepage-fed or associated with intermittent or permanent stream margins, generally lacked indigenous floristic diversity, structural tiers and aquatic habitat, and sit within the wider Ōrewa River catchment. All were assessed as being of low ecological value. Given their similar nature, the wetlands have been treated together for offsetting purposes and are referred to collectively as the 'impact wetland', with a total area of 1.3 ha.

The impact wetland has a current WEV score of 0.55 and a potential WEV score of 0.718. As the wetland areas are to be reclaimed, the post-impact WEV score is 0. WEV scores for the impact wetland are summarised in Appendix H.

Offset site (Te Korowai o Maraeariki)

The offset wetland will be created within the rural land in the north of the site, in the same Ōrewa River catchment as the impact wetland (Figure 21). This location was selected because it lies within the same catchment as the impact site, avoids streamworks, utilises natural overland flow paths as a collection point for surface runoff, and contributes to a broader catchment-focused enhancement of the northern land. There are no natural wetlands in this area at present, the plant community being dominated by upland pasture species; the current WEV score for the area is therefore 0.

The offset wetland will be constructed as a bunded, cascading wetland on the eastern side of the Te Korowai o Maraeariki main gully, designed around natural overland flow paths and existing patches of wetland vegetation to induce a hydrological regime capable of supporting hydrophytic vegetation (WWLA 2026a). The design provides a range of saturation zones (deep marsh, shallow marsh, and

intermittent and ephemeral saturation zones) to support a diverse wetland plant community. The target wetland ecosystem type for the offset wetland is *Machaerina* sedgeland (WL11, Singers *et al*. 2017), This approach follows that of two offset wetlands already constructed within the development, one of which has established wetland vegetation, demonstrating the method's feasibility on this site. To confirm that wetland hydrology is achieved and maintained, monitoring piezometers are recommended to verify saturation against the wetland hydrology standard (MfE 2024), to be secured through the wetland monitoring and management plan.

Once created and subject to the proposed enhancement actions, the offset wetland has a potential WEV score of 0.818. The enhancement actions comprise planting of the wetland and a 10 m buffer with appropriate native species, weed and pest control, stock fencing and legal protection (e.g. covenant). It is recommended that a wetland planting and management plan be required as a condition of consent to secure successful establishment of a native wetland ecosystem.

Extent offset

A total of 1.3 ha of wetland is proposed to be reclaimed at the impact site, and 2.67 ha of new wetland is proposed to be created at the offset site (Figure 21). The created wetland will offset the loss of wetland area, achieving at least no net loss of wetland extent, and a net gain of 1.37 ha of wetland extent.

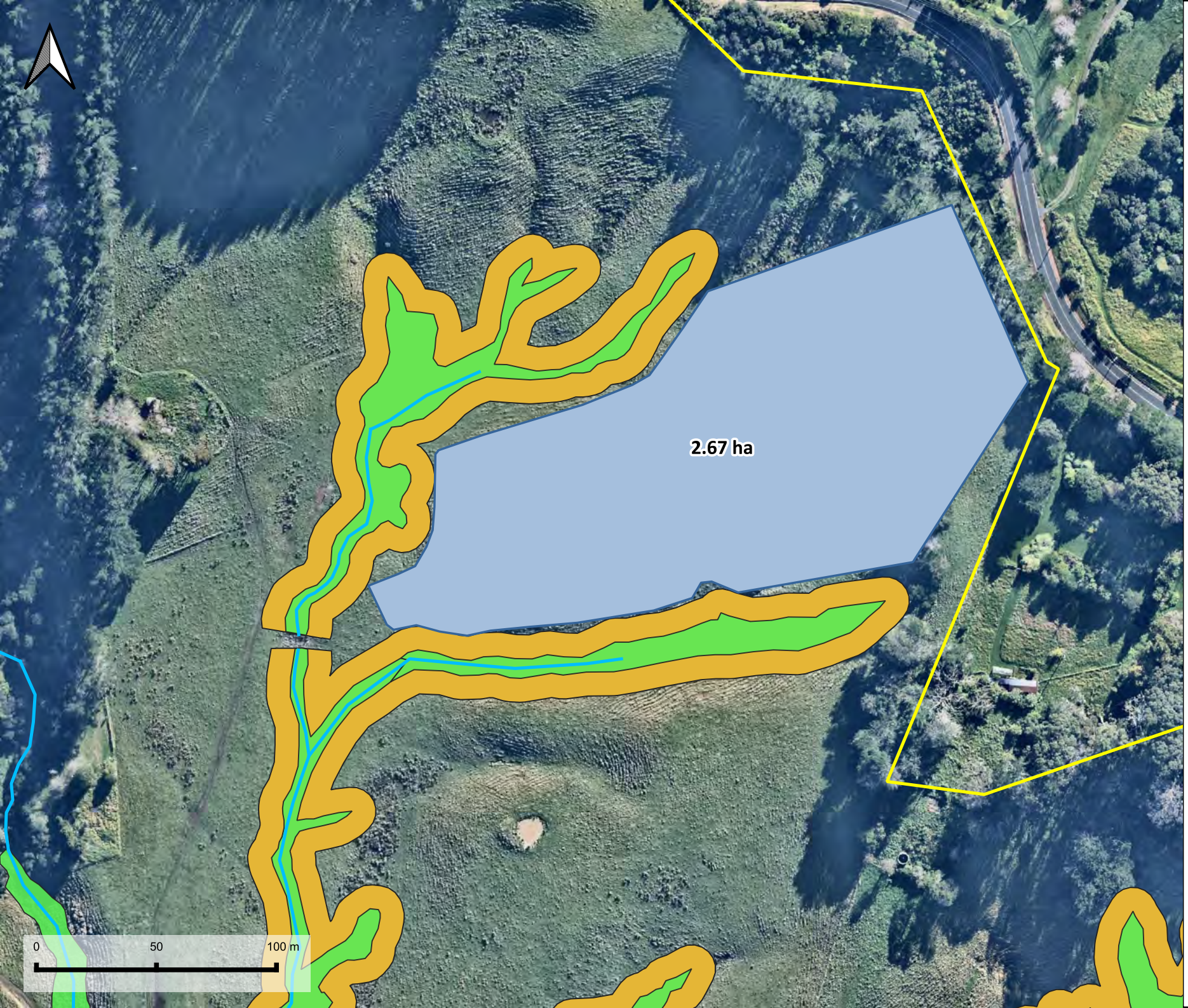

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Figure 21. Proposed offset wetland, with existing freshwater features and consented restoration planting.

Legend

- Fast-track Boundary
- Proposed offset wetland
- Existing natural wetlands
- Consented restoration areas
- Intermittent streams

SOURCES

Nearmaps 2026 Aerial

DISCLAIMER:
This map/plan is not an engineering draft. This map/plan is illustrative only and all information should be independently verified on site before taking any action.

SCALE **1:2,000** **@ A4**

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DRAWN BY:	B.P
DATE:	31 July 2026

Value Offset

The offset required to address the residual loss of wetland value has been determined using the ECR applied through the WEV method (refer Section 2.3.7). Applying the ECR to the impact and offset WEV scores, 1.72 ha of created wetland is required to achieve no net loss of wetland value. As 2.67 ha is proposed, a net gain in wetland value is achieved. The WEV and ECR inputs and results are provided in Table 12. Once established, the native wetland vegetation will also provide higher ecological value to native fauna than the exotic-dominated wetlands being lost.

Table 12. WEV/ECR calculations for the impact wetland and the created offset wetland.

Variable/calculation	Impact wetland	Offset wetland
Wetland area (m^2)	13,000	26,700
Existing WEV state	0.55	0
Potential WEV state	0.718	0.818
State after impact	0	N/A
WEV ECR	1.32	
Wetland area required (m^2)	**17,160**	

Consistency with NPS-FM aquatic offsetting principles

The proposed wetland offset has been assessed against the aquatic offsetting principles of the NPS-FM (Appendix 6). In summary:

- **Mitigation Hierarchy** – the scheme plan and bulk earthworks result in unavoidable effects on the low-value wetlands. The functional roles of flood attenuation and nutrient capture are addressed through stormwater design, but a significant residual loss of wetland extent and value remains, which the offset addresses to at least a no-net-loss standard.
- **Additionality** – there are no other requirements or existing plans to create wetland within the proposed offset area, and the offset area is distinct from the other restoration and infrastructure works on the northern land. The offset therefore satisfies the additionality test.
- **Landscape Context (Proximity)** – there are no suitable areas within the development footprint to create or enhance wetland, so an off-site offset within the same catchment was required. Both the impact and offset sites lie within the wider Ōrewa River catchment.
- **"Like for Like"** – once established, the offset wetland will be of a comparable nature to the impact wetland: within the same catchment, with similar structural tiers, associated with stream habitat, and of a comparable hydrological regime, while achieving a higher ecological value.
- **No net loss and preferably a net gain** – the offset achieves no net loss of both wetland extent and value, with a further net gain in extent (0.95 ha) and a net gain in value. The ECR incorporates a multiplier to account for time lag, risk and uncertainty.

Wetland monitoring

It is recommended as a condition of consent that a wetland monitoring plan be developed to confirm successful establishment of the wetland and buffer planting, implemented for a minimum of five years following completion of the initial planting.

7.4.6 Stream and wetland hydrology re-charge

Several intermittent tributaries and associated natural wetlands are proposed to be retained or realigned and enhanced within the development. Maintaining appropriate baseflows and hydrological support to these features following development is therefore important to sustaining their ecological function.

Stream baseflows will be maintained by directing an appropriate proportion of treated stormwater from the primary network to the upper reaches of the retained and realigned streams, supplemented by groundwater collected through the proposed underfill drainage network (Woods 2026). Post-development recharge catchments have been assigned to the relevant stream heads having regard to their pre-development contributing areas and the proposed realignments, and the stormwater network has been designed to replicate pre-development flows as closely as practicable.

All natural wetlands proposed to be retained are associated with riparian margins of intermittent/permanent stream corridors, and their hydrology is therefore fed primarily by these gully systems. Wetlands 5 and 6 are located within the Ōrewa River floodplain and are likely primarily groundwater-fed, and are therefore unlikely to be materially affected by the development. For the remaining retained wetlands, hydrological support is maintained through the stream-recharge and underfill drainage system described above, together with earthworks setbacks applied around retained wetlands where practicable (Woods 2026). All other wetlands within the development area are proposed for reclamation and offset (refer Sections 7.4.4 & 7.4.5).

On this basis, the residual effect of the development on the hydrology of retained streams and wetlands within the Stages 14-17 development area is assessed as low, subject to detailed design of the recharge and underfill systems.

7.4.7 Surface water intake and reservoir works

The Project includes construction of a surface water intake structure on the main stem of the Ōrewa River, and an associated storage reservoir on the northern bank, to supply the development. The intake is located approximately 100 m downstream of the Gervin Road culvert, near the western boundary of the site. The intake structure and its associated bank armouring are described in full in WWLA (2026b); the aspects relevant to this assessment are the physical works within and adjacent to the bed and banks of the Ōrewa River, and their effects on freshwater habitat and fauna. Effects on river flows, flushing flows, instream habitat availability and water quality associated with operation of the surface water take and reservoir are assessed in the water takes and discharges assessment (Viridis 2026).

Construction of the intake will be undertaken from the river bank rather than within the active stream channel, avoiding the need for stream diversion or dewatering. A section of river bank will be left in place until the intake structure and pump chamber are installed, and then removed to allow stream water to flow into the inlet. Bank removal will be undertaken in a staged manner, with erosion and sediment controls in place, to minimise the extent and duration of any downstream sediment discharge plume during construction.

Because the works are undertaken within the bank rather than the channel, and no stream diversion or in-channel dewatering is required, the potential for construction-related effects on the stream is substantially reduced. The principal construction risk is localised sediment discharge during the final bank removal, which is managed through staged removal and the erosion and sediment controls described in Section 7.4.1.

It is recommended that the following be secured at detailed design:

- staged removal of the retaining bank section to limit any downstream sediment discharge;
- erosion and sediment controls for the bank and riparian works; and
- reinstatement and, where practicable, enhancement of disturbed riparian margins on completion.

On a permanent basis, the intake structure and its bank armouring will result in the loss and modification of a small area of streambed and bank habitat at the intake location. Given the limited spatial extent of the works, the modified condition of the existing habitat within this reach (refer Section 5.1.1), and the retention of the wider main stem, this permanent habitat effect is assessed as low. The armouring is also expected to provide a degree of bank stability and habitat complexity at the structure margins.

7.4.8 Treated wastewater wetland

A constructed treatment wetland (approx. 3.5 ha) is proposed within Te Korowai o Maraeariki to provide additional treatment of treated wastewater prior to its discharge to the Ōrewa River (WWLA 2026c). The treated wastewater wetland will be separate from the ecological offset wetland discussed in Section 7.4.5. The wetland will comprise a series of contour bunds forming a cascading, surface-flow system with ephemeral, intermittent, shallow marsh and deep marsh zones, incorporating wetland planting. It is sited to work around existing natural wetland and stream features, which will be avoided and retained. Treated wastewater is proposed to be discharged into the constructed wetland daily, year-round (WWLA 2026).

While the treatment wetland is proposed primarily for wastewater management rather than as an ecological offset or habitat-creation measure, it is expected to provide incidental ecological benefits. These include the establishment of native vegetated wetland habitat across a substantial area that will form part of the revegetation of the Te Korowai o Maraeariki site, and the provision of baseflow support to the downstream reach of the Ōrewa River, particularly over summer, which may benefit instream habitat and fish communities.

The construction of the treatment wetland will involve earthworks, the effects of which are addressed in Section 7.3.1. The water quality effects of the treated wastewater discharge are assessed in the surface water quality report (Viridis 2026), and the associated hydrology and water balance in WWLA (2026c). No existing natural wetlands or streams are proposed to be reclaimed or removed to construct the treatment wetland.

7.4.9 Effects on freshwater fish

Indigenous freshwater fish habitat within the site is associated with the permanent main stem of the Ōrewa River, the intermittent and modified natural streams, and the constructed ponds and artificial drainage channels where surface water or wetted sediment persists. As described in Section 5.2.1, the freshwater fish community is dominated by highly mobile diadromous species, in particular shortfin and longfin eel, which are expected to occur across the available aquatic habitats.

Without mitigation, stream realignment, reclamation, culvert works and, where applicable, pond removal, could result in the injury or mortality of indigenous fish. To address this, a NFCRP will be prepared and implemented prior to works occurring within any affected freshwater habitat. The NFCRP will provide for the rescue and relocation of indigenous fish from streams, ponds, drains and channels

where fish may be present, with fish salvage undertaken by a suitably experienced freshwater ecologist ahead of any dewatering.

The magnitude of effect on indigenous freshwater fish is considered moderate prior to mitigation, reducing to **low** following implementation of the NFCRP and associated construction management measures. The residual effect on freshwater fish is considered **low**.

Beyond the management of construction effects, the proposal is expected to deliver positive long-term outcomes for indigenous freshwater fish. The naturalisation and enhancement of retained and realigned streams within the development site, together with extensive riparian planting, will improve instream and riparian habitat quality, providing greater shading, organic matter input, habitat complexity and cover than the existing modified channels. Improved fish passage through the upgrading of culverts within the development site (refer below) will enhance connectivity for indigenous species. Within the Ōrewa River, riparian restoration is expected to improve the quality of habitat available to the diadromous fish community, including potential īnanga spawning habitat within densely vegetated margins. Collectively, these measures are expected to improve the extent and quality of habitat available to indigenous fish across the site over time.

7.4.10 Culvert works and fish passage

The proposal involves the installation of new culverts and the upgrade of existing culverts at approximately nine locations within the main development footprint, primarily to provide road and access crossings.

Many of the affected watercourses provide, or are connected to, upstream fish habitat. Without appropriate design, the installation of new culverts and upgrading of existing culverts on watercourses connected to upstream fish habitat could impede fish passage. Maintaining fish passage has therefore been a key consideration in the design of the culvert crossings. All new and upgraded culverts within the development site will be designed to maintain fish passage in accordance with the relevant NPS-FM and AUP requirements.

Each culvert will comprise an embedded pipe set approximately 25% below the streambed level, allowing natural streambed substrate to be retained or established through the culvert and providing continuity of the streambed for aquatic species. Where required, environmental flexible baffles may also be installed to assist with substrate retention, provide hydraulic diversity and facilitate fish passage, in consultation with a suitably qualified and experienced freshwater ecologist. Rock riprap scour protection will be installed at culvert inlets and outlets where required to prevent scour and erosion. Detailed design will confirm the final substrate, baffle, scour-protection and stream-transition details while retaining these fish-passage outcomes.

Potential adverse effects resulting from culvert installation/upgrade works will be avoided or minimised through the embedded and baffled designs described above. The new culverts are therefore expected to maintain fish passage, while the upgrading of any existing structures that currently constrain passage has the potential to improve connectivity for freshwater fauna.

Construction of the culverts will be undertaken in accordance with the typical installation methodology prepared by Woods (drawings P25-609-01-3075-DR and 3076-DR), which sets out separate sequences for online and offline culverts. The methodology provides for approved erosion and sediment controls, and fish capture and relocation will be completed before dewatering. In-stream works and

enhancement features will be undertaken in accordance with a SMP, recommended to be prepared as a condition of consent.

Taking account of the fish passage provisions incorporated into the culvert designs, the magnitude of effect on streams and fish passage is considered low before the application of construction-phase mitigation. Following implementation of the construction methodology, fish capture and relocation, riparian planting and post-construction monitoring described above, the residual magnitude of effect is assessed as **very low**.

Overall, the culvert works are expected to maintain fish passage and hydrological connectivity at the affected crossings. Where existing structures that currently constrain fish passage are upgraded, the works may also improve connectivity for freshwater fauna.

7.5 Summary of Level of Effects

The overall level of effect for the proposed works is generated using Table 2, taking the ecological value and expected magnitude of the effect on that value. Expected levels of effect for the proposal are given in Table 13. Generally, mitigation is only required when the level of effect is expected to be moderate or higher. However, in line with best practice, a number of mitigation measures are recommended to ensure the level of effect of the proposal remains **low**.

Table 13. Overall level of effect of the Project on ecological values within the development site.

Effect	Ecological value	Magnitude of effect before mitigation/offset	Magnitude of effect after mitigation/offset	Level of effect
Effect on botanical and habitat values	Low	High (site scale), Low (wider environment)	Low	Positive/net gain – extensive revegetation planting, enhancement and long-term management proposed
Effect on birds	Low	Low	Low	Very Low – fauna management proposed
Effect on lizards	Low	Low	Low	Very Low – fauna management proposed
Effect on bats	Low	Low	Low	Very Low – fauna management proposed
Effects of erosion/sedimentation	Moderate	High	Low	Low – ESCP proposed
Effects on stream value	Low	Very High	Low	Positive – net gain based on stream offset package
Effects on stream extent	Low	Very High	Low	Residual loss addressed through environmental compensation
Effects on wetland value and extent	Low	High	Low	Positive – offset wetland provides net gain
Effects on fish	Moderate	Moderate	Low	Low – NFCRP proposed
Effects on fish passage	Low	Low	Very low	Very low – fish passage improvements within development site

8 ASSESSMENT AGAINST RELEVANT NATIONAL POLICY STATEMENTS

8.1 NPS for Freshwater Management 2020 (NPS-FM)

The proposal's consistency with the relevant objectives and policies of the NPS-FM is summarised in Table 14. Overall, while the proposal will result in adverse effects on some freshwater values, these effects have been avoided, minimised and mitigated through a combination of design measures, restoration, freshwater compensation measures and long-term management. Subject to implementation of the proposed mitigation and offset/compensation measures, the proposal is considered to be generally consistent with the relevant objectives and policies of the NPS-FM.

Table 14. Assessment of the proposal against the NPS-FM objectives and policies relevant to the Project.

NPS-FM Provision	Summary	Assessment
Objective 2.1	Prioritises the health and wellbeing of freshwater ecosystems, followed by human health needs and community wellbeing.	The proposal will result in some stream and wetland loss; however, freshwater values have been identified and assessed, effects have been avoided or minimised where practicable, and residual effects addressed through restoration, enhancement, offset and compensation. Collectively, these measures are intended to maintain and improve freshwater ecosystem function while enabling urban development and associated community outcomes.
Policy 1	Gives effect to Te Mana o te Wai.	The proposal recognises freshwater ecosystems as a key ecological value and incorporates measures to avoid, minimise and manage adverse effects on streams and wetlands where practicable. While some stream and wetland loss is proposed, the assessment has considered effects on freshwater ecosystems throughout the wider catchment and includes restoration, enhancement and compensation measures intended to maintain and improve freshwater ecosystem function and condition.
Policy 3	Requires integrated management of freshwater effects at a catchment scale, including receiving environments.	The assessment has considered stream realignment, reclamation and wetland reclamation, wetland hydrology, stormwater management, wastewater disposal and downstream receiving environments across the wider catchment.
Policy 5	Requires maintenance or improvement of freshwater ecosystem health and wellbeing.	The proposal includes extensive freshwater restoration, stream naturalisation, riparian planting, wetland creation and enhancement and long-term management measures that will improve the condition of retained freshwater habitats.
Policy 6	Seeks no further loss of natural inland wetlands and promotes wetland restoration.	The proposal will result in permanent wetland loss. These effects have been quantified and addressed through avoidance, minimisation and an offset package comprising the creation of 2.67 ha of new wetland habitat.
Policy 7	Seeks to avoid loss of river extent and values to the extent practicable.	Some stream reclamation is proposed and has been minimised where practicable. Adverse effects have been assessed and

NPS-FM Provision	Summary	Assessment
		addressed through freshwater compensation and restoration measures.
Policy 9	Protects the habitats of indigenous freshwater species.	Freshwater fish habitat has been assessed, fish salvage is proposed for all wetted habitats, and restoration and enhancement measures will improve habitat quality within retained freshwater ecosystems.

8.2 National Policy Statement for Indigenous Biodiversity 2023 (NPS-IB)

The proposal's consistency with the relevant objectives and policies of the NPS-IB is summarised in Table 15. Overall, while the proposal will result in some very small-scale loss and modification of indigenous scrub vegetation, this vegetation is not of SEA/SNA quality. Further, the extensive scale of ecological restoration, enhancement, protection and long-term management proposed within Te Korowai o Maraeariki is expected to maintain and enhance indigenous biodiversity values across the site over the long term. Accordingly, the proposal is considered to be generally consistent with the relevant objectives and policies of the NPS-IB.

Table 15. Assessment of the proposal against the NPS-IB objectives and policies relevant to the Project.

NPS-IB Provision	Summary	Assessment
Objective 2.1	Maintain indigenous biodiversity and achieve an overall no net loss whilst enabling social, economic and cultural wellbeing.	The proposal results in some very small-scale indigenous vegetation and habitat loss; however, extensive restoration, enhancement and long-term protection measures are proposed. The Te Korowai o Maraeariki restoration proposal results in a significant net increase in land subject to ecological restoration and management.
Policy 3	Adopt a precautionary approach when considering adverse effects on indigenous biodiversity.	Potential effects have been assessed conservatively, including use of representative SEV/WEV assessments and precautionary offset and compensation accounting.
Policy 4	Indigenous biodiversity is managed to promote resilience to the effects of climate change.	The proposal incorporates substantial ecological restoration and enhancement measures that will increase indigenous vegetation cover, improve habitat connectivity and habitat diversity, and contribute to the resilience of indigenous biodiversity to the effects of climate change over time.
Policy 5	Manage indigenous biodiversity in an integrated way.	The proposal integrates terrestrial and freshwater ecological management through the proposed ecological enhancement and long-term protection of Te Korowai o Maraeariki to the north of the Ōrewa River, through significant revegetation planting to create bush and restore riparian/wetland buffers, alongside the creation of new indigenous wetland.
Policy 6	Significant indigenous vegetation and significant habitats of indigenous	Significant indigenous biodiversity and habitats of indigenous fauna within and adjoining the Site has been identified through the AUP SEA overlay and supporting ecological investigations.

NPS-IB Provision	Summary	Assessment
	fauna are identified as SNAs using a consistent approach.	
Policy 7	Significant indigenous biodiversity is protected by avoiding or managing adverse effects from development.	Areas of highest indigenous biodiversity value within the site have been retained within Te Korowai o Maraeariki, which will be ecologically enhanced. Residual effects on indigenous biodiversity have been assessed and addressed through avoidance, minimisation, restoration, enhancement and long-term management measures.
Policy 8	Indigenous biodiversity outside SNAs is recognised and provided for.	Vegetation affected by the proposal occurs outside SNA/SEA-quality areas and comprises predominantly of modified exotic-dominated habitats. Notwithstanding this, these habitats have been assessed, and the proposal incorporates extensive restoration, enhancement and management measures throughout the wider site.
Policy 10	Recognise activities contributing to social, economic, cultural and environmental wellbeing.	The proposal provides for urban development while incorporating substantial biodiversity restoration, enhancement and management measures.
Policy 13	Promote restoration of indigenous biodiversity.	The proposal incorporates extensive restoration planting, riparian enhancement, wetland creation, weed control and pest animal management in areas that are currently degraded by exotic species dominance and a history of modification.
Policy 14	Promote increased indigenous vegetation cover.	Extensive restoration planting across is proposed to restore exotic/pasture-dominated areas, which will adjoin SEA bush in the north of the site. Indigenous planting will also be incorporated throughout parks and public open spaces.
Policy 15	Areas supporting specified highly mobile fauna are identified and managed to maintain their populations across their natural range.	The site and surrounding coastal environment provide potential habitat for a number of highly mobile fauna listed in Appendix 2 of the NPS-IB, including northern NZ dotterel and long-tailed bat. These values have been assessed through targeted ecological investigations and are addressed through habitat retention, ecological restoration, pest management, freshwater enhancement measures and species-specific management where required. The proposal is not anticipated to adversely affect the ability of these species to utilise habitats across their wider natural range.

9 ASSESSMENT SUMMARY

9.1 Recommendations

Based on the assessment undertaken in this report, the following recommendations are made to avoid, remedy or mitigate potential adverse effects associated with the proposal and to support the appropriate implementation of the development:

- A final FMP (draft in Appendix J) should be submitted to Auckland Council for approval, and implemented prior to and during vegetation clearance works to minimise potential adverse effects on indigenous fauna, including management measures for indigenous birds, lizards and bats;
- Prior to commencement of stream, wetland or pond works, a NFCRP should be prepared and implemented by a suitably qualified and experienced freshwater ecologist to minimise adverse effects on indigenous freshwater fish;
- A BRMP for the offset site should be prepared and submitted to Auckland Council for approval as a condition of consent. The BRMP should be implemented prior to and during development works to ensure proposed ecological restoration, enhancement planting, pest management and protection measures are appropriately undertaken;
- Erosion and sediment control measures should be implemented in accordance with the ESCP prepared by Woods (2026) and GD05 (or any subsequent replacement document), including implementation of the proposed monitoring and adaptive management measures;
- Construction activities should be managed to ensure that sediment, concrete wash water, fuels, chemicals, rubbish and other contaminants do not enter streams, wetlands, ponds or other freshwater environments;
- A SMP should be prepared and implemented to provide a framework for establishment, enhancement, management, and monitoring of riparian vegetation and in-stream habitat features within the development site; and
- A Wetland Management Plan should be prepared and implemented to assess the establishment and monitor performance of the proposed offset wetland and inform adaptive management where required.

In addition to the above, freshwater monitoring recommended in Viridis (2026) will also allowing for downstream effects on Orewa River water quality and ecology to be verified and/or adaptively managed.

9.2 Conclusion

This assessment has characterised the terrestrial and freshwater ecological values of the site and assessed the effects of the proposed development on those values. The site is located within a heavily modified pastoral landscape, and the majority of the terrestrial vegetation, watercourses and wetlands within the development area are of low ecological value. The main areas of higher value, being the SEA in the north of the site and the permanent Ōrewa River fish habitat, are retained and are not significantly affected by the proposal.

The proposal will result in the reclamation of intermittent streams and low-value wetlands, the loss of low-value vegetation, and construction-phase effects on freshwater environments. These effects have

been avoided and minimised through the scheme design, and residual effects are addressed and mitigated through a comprehensive freshwater offset and compensation package, including stream enhancement, wetland creation and the large-scale ecological restoration of Te Korowai o Maraeariki. Effects on terrestrial and freshwater fauna are managed through the recommended management plans and construction measures.

Following implementation of the recommended avoidance, minimisation, offset, compensation and management measures, the residual level of ecological effect is assessed as low.

Overall, the proposal is expected to deliver a net positive ecological outcome over the long term through the enhancement, restoration and protection of indigenous biodiversity values across the site, subject to the recommendations made in Section 9.1 above.

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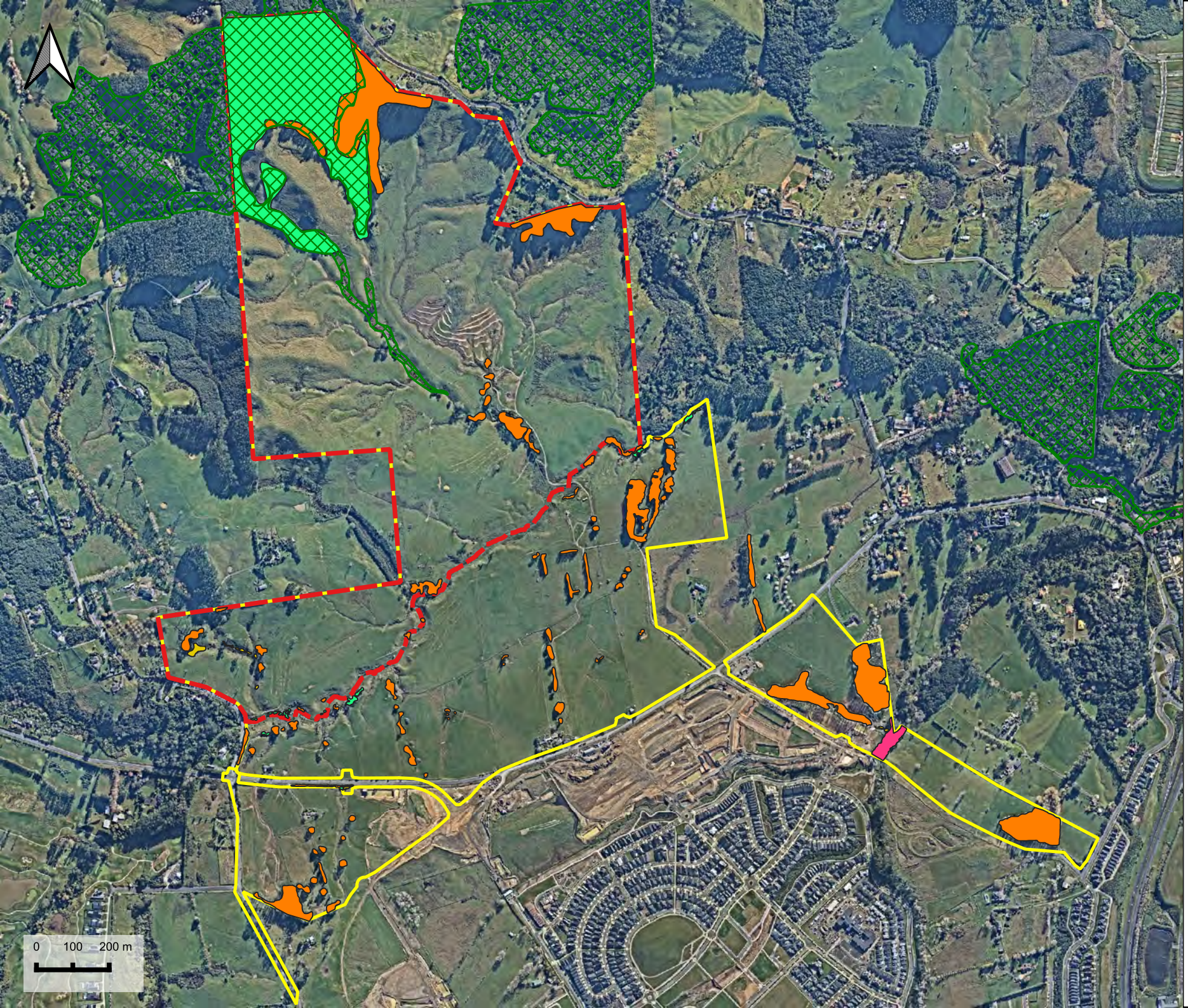
Appendix A
Terrestrial Vegetation Maps



VIRIDIS
Environmental Consultants

Key Vegetation Types - Overall site

Fulton Hogan Land Development

Legend

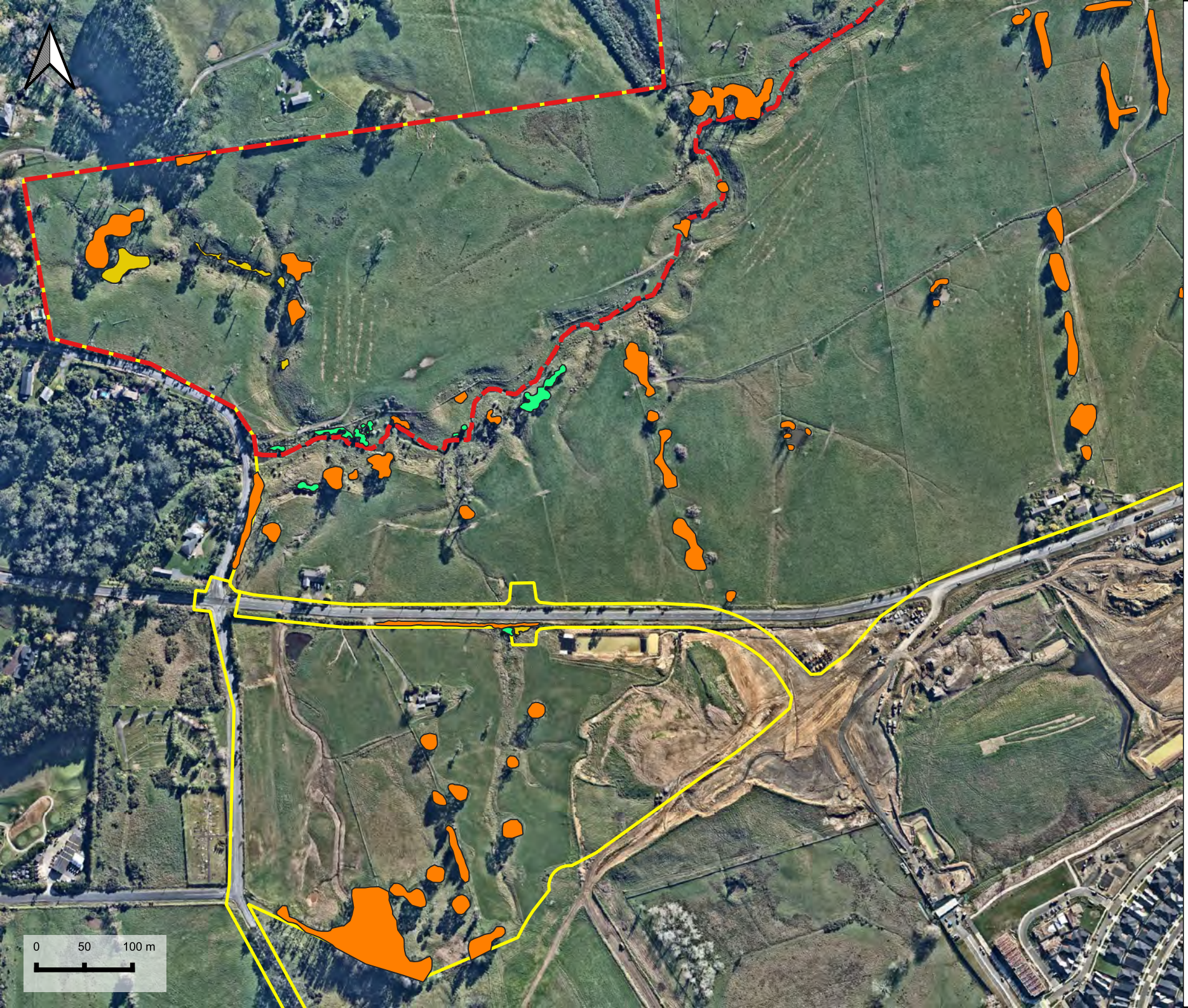
- Fast-track Boundary
- Te Korowai o Maraeariki
- Exotic Trees
- Mixed Native-Exotic
- Native Vegetation
- Exotic Scrub
- SEA - Terrestrial Overlay

SOURCES

Nearmaps 2026 Aerial

SCALE **1:13,200** **@ A4**

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026



VIRIDIS
Environmental Consultants

Key Vegetation Types - west

Legend

- Project boundary
- Te Korowai o Maraeariki
- Exotic Trees
- Native Vegetation
- Exotic Scrub

SOURCES

Nearmaps 2026 Aerial

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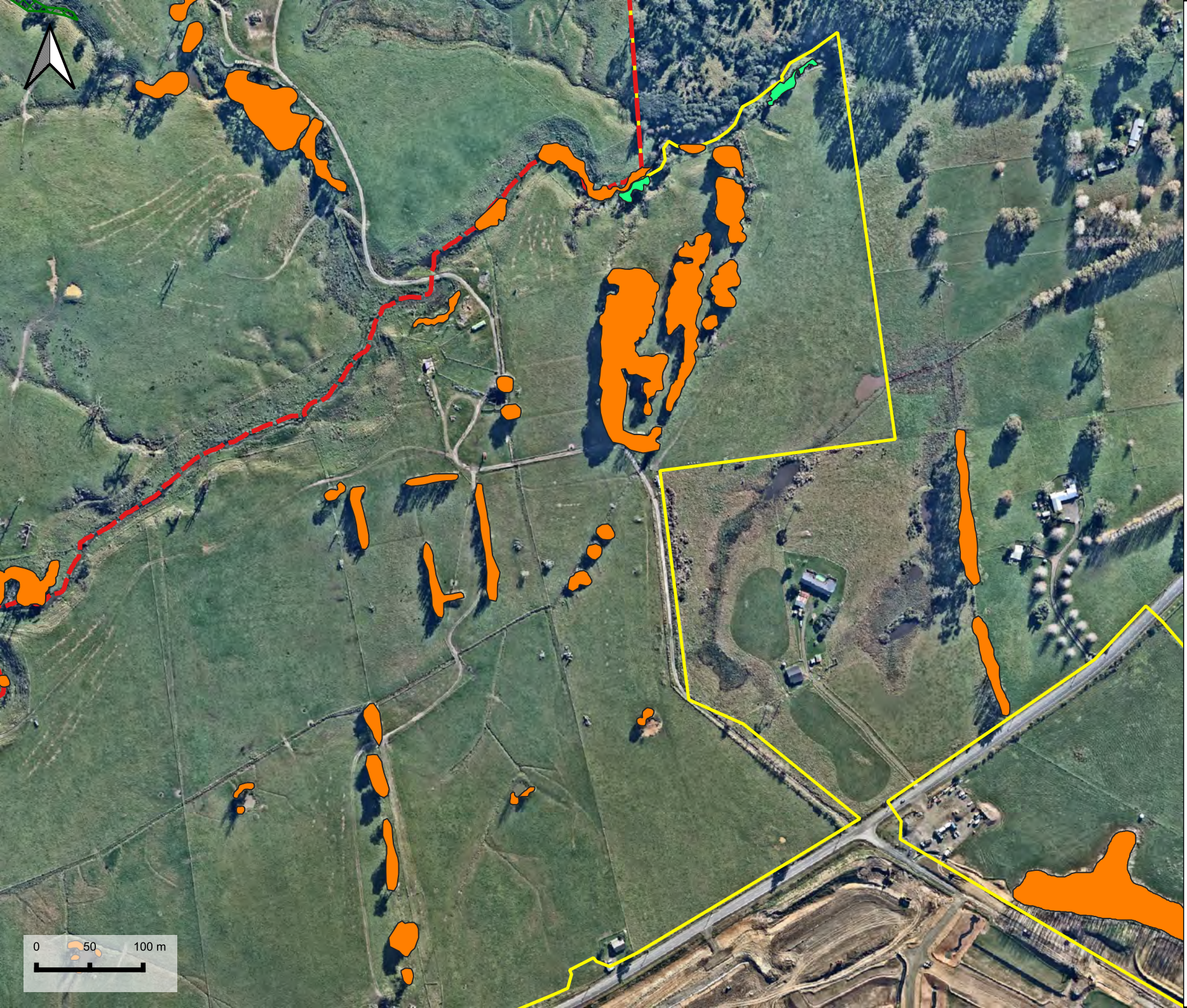
SCALE **1:5,000** **@ A4**

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026



VIRIDIS
Environmental Consultants

Key Vegetation Types - east

Legend

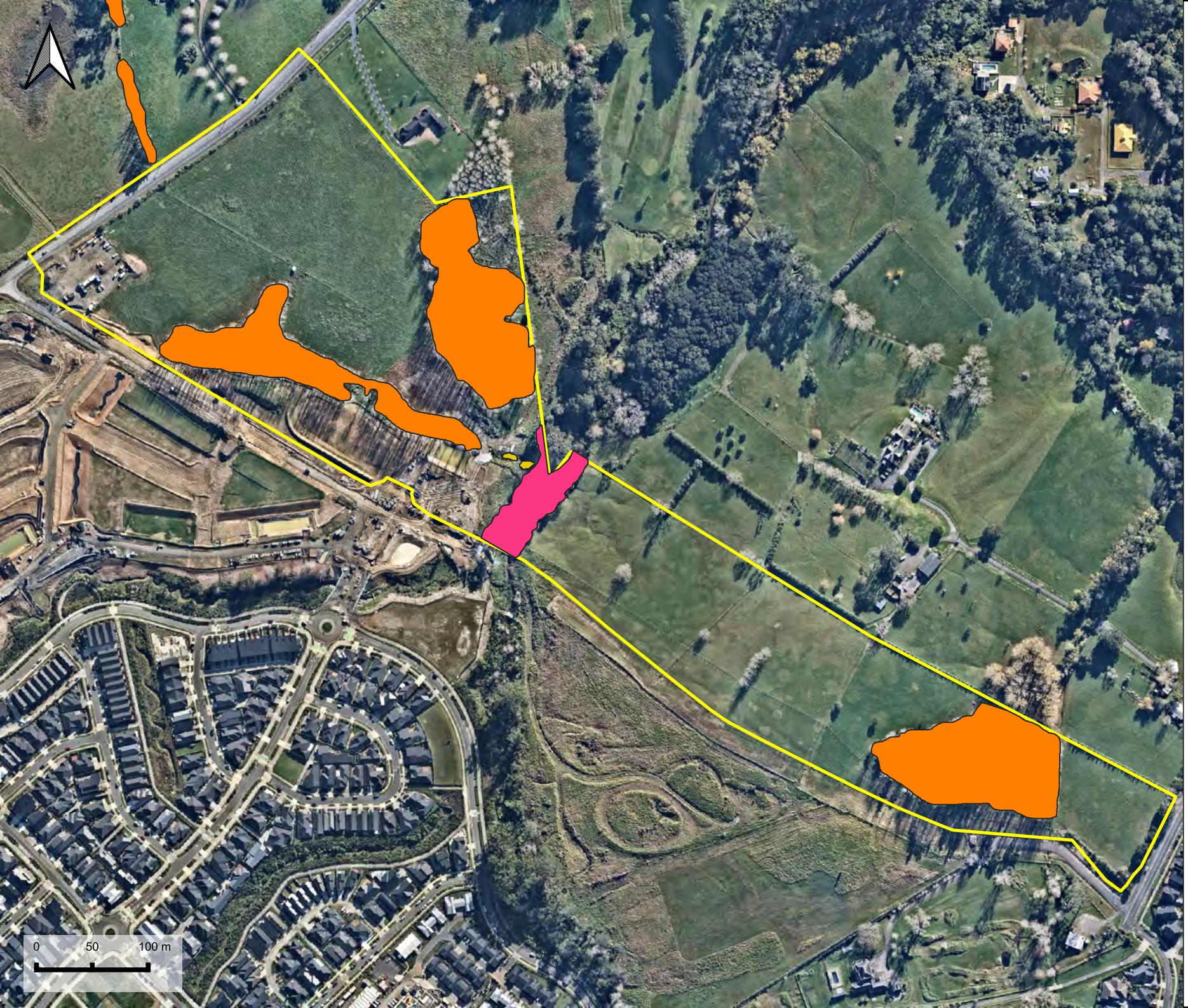
- Project boundary
- Te Korowai o Maraeariki
- Exotic Trees
- Native Vegetation

SOURCES

Nearmaps 2026 Aerial

SCALE **1:4,500** **@ A4**

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026



VIRIDIS
Environmental Consultants

Key Vegetation Types - southeast

Legend

- Project boundary
- Exotic Trees
- Mixed Native-Exotic Scrub
- Exotic Scrub

SOURCES

Nearmaps 2026 Aerial

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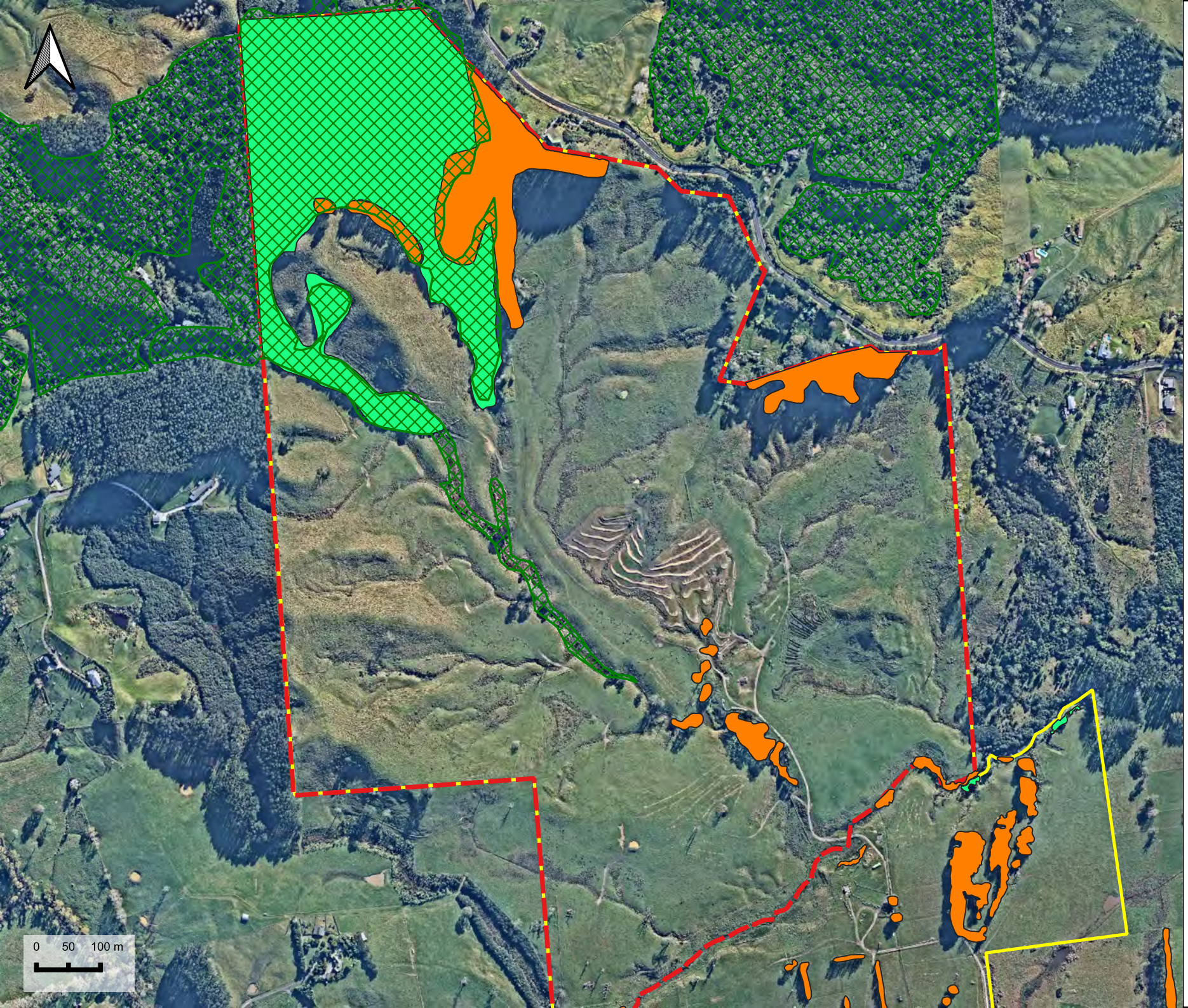
SCALE **1:4,300** @ A4

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026



VIRIDIS
Environmental Consultants

Key Vegetation Types - Te Korowai o Maraeariki (north)

Legend

- Project boundary
- Te Korowai o Maraeariki
- Exotic Trees
- Native Vegetation
- SEA - Terrestrial Overlay

SOURCES

Nearmaps 2026 Aerial

DISCLAIMER:
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SCALE **1:7,500** **@ A4**

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026

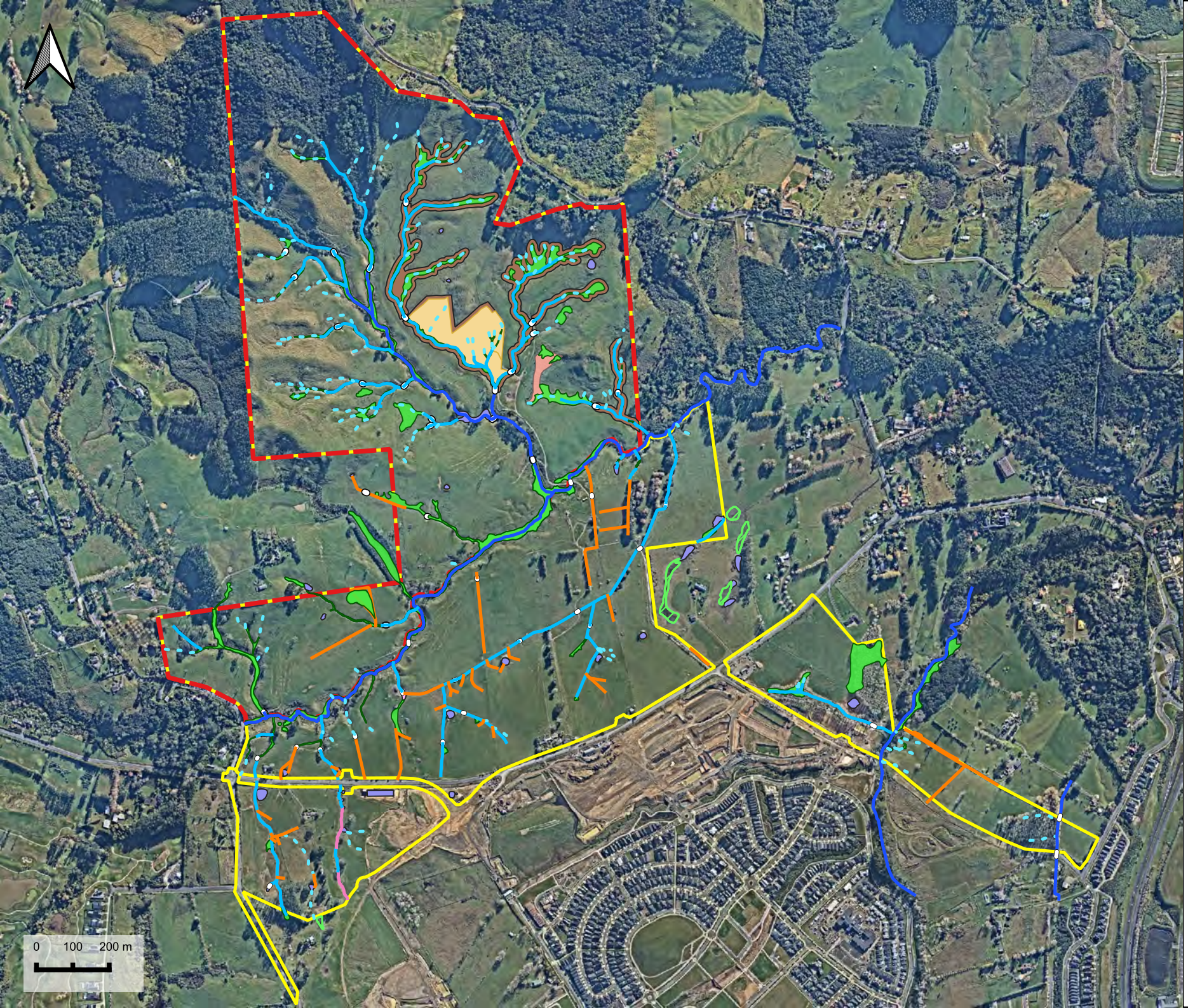
Appendix B
Avifauna Records

Table B1. Terrestrial avifauna that have been observed within the site and wider Milldale area on a permanent or intermittent basis.

Common name	Species name	NZTCS* conservation status (Robertson et al. 2021)
Australian magpie	*Gymnorhina tibicen*	Introduced and Naturalised
Australasian harrier	*Circus approximans*	Not Threatened
Blackbird	*Turdus merula*	Introduced and Naturalised
Canada goose	*Branta canadensis*	Introduced and Naturalised
Eurasian skylark	*Alauda arvensis*	Introduced and Naturalised
Goldfinch	*Carduelis carduelis*	Introduced and Naturalised
Grey warbler	*Gerygone igata*	Not Threatened
House sparrow	*Passer domesticus*	Introduced and Naturalised
Indian myna	*Acridotheres tristis*	Introduced and Naturalised
Kererū	*Hemiphaga novaeseelandiae*	Not Threatened
Kingfisher	*Todiramphus sanctus vagans*	Not Threatened
Mallard	*Anas platyrhynchos*	Introduced and Naturalised
North Island fantail	*Rhipidura fuliginosa placabilis*	Not Threatened
Northern New Zealand dotterel	*Charadrius obscurus aquilonius*	Threatened – Nationally Increasing
Paradise shelduck	*Tadorna variegata*	Not Threatened
Pied stilt	*Himantopus himantopus*	Not Threatened
Pūkeko	*Porphyrio melanotus melanotus*	Not Threatened
Ring-necked pheasant	*Phasianus colchicus*	Introduced and Naturalised
Silvereye	*Zosterops lateralis lateralis*	Not Threatened
Shining cuckoo	*Chrysococcyx lucidus*	Not Threatened
Song thrush	*Turdus philomelos*	Introduced and Naturalised
Southern black-backed gull	*Larus dominicanus dominicanus*	Not Threatened
Spur-winged plover	*Vanellus miles novaehollandiae*	Not Threatened
Tūī	*Prosthemadera novaeseelandiae novaeseelandiae*	Not Threatened
Welcome swallow	*Hirundo neoxena neoxena*	Not Threatened
White-faced heron	*Egretta novaehollandiae*	Not Threatened
Yellowhammer	*Emberiza citrinella*	Introduced and Naturalised

Notes: *New Zealand Threat Classification System.

Appendix C
Freshwater Features Maps



VIRIDIS
Environmental Consultants

Freshwater Features - Overall site

Fulton Hogan Land Development

Legend

- Fast-track boundary
- Te Korowai o Maraeariki

Wetlands

- Natural Wetland
- Potential Wetland
- Constructed pond
- Online pond
- Stg 10-13 Offset Wetland
- Stg 9 Offset Wetland

Watercourses

- Permanent
- Intermittent
- Underground stream
- Ephemeral
- Artificial
- Culvert
- Stg 10-13 planting

SOURCES

LINZ 2024 Urban Aerial

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SCALE **1:13,200** **@ A4**

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026

VIRIDIS
Environmental Consultants

Freshwater Features - Stages 14-17 west

Legend

- Project boundary
- Te Korowai o Maraeariki

Watercourse features

- Permanent
- Intermittent
- Ephemeral
- Artificial
- Culvert
- Underground stream
- Tomo

Wetlands/pond features

- Constructed pond
- Potential Wetland
- Natural Wetland
- Online pond

SOURCES

Nearmaps 2026 Aerial

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SCALE **1:4,500** **@ A4**

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026

VIRIDIS
Environmental Consultants

Freshwater Features - Stages 14-17 east

Legend

- Project boundary
- Te Korowai o Maraeariki

Watercourse features

- Permanent
- Intermittent
- Ephemeral
- Artificial
- Culvert

Wetland/pond features

- Natural wetland
- Potential wetland
- Constructed pond

SOURCES

Nearmaps 2026 Aerial

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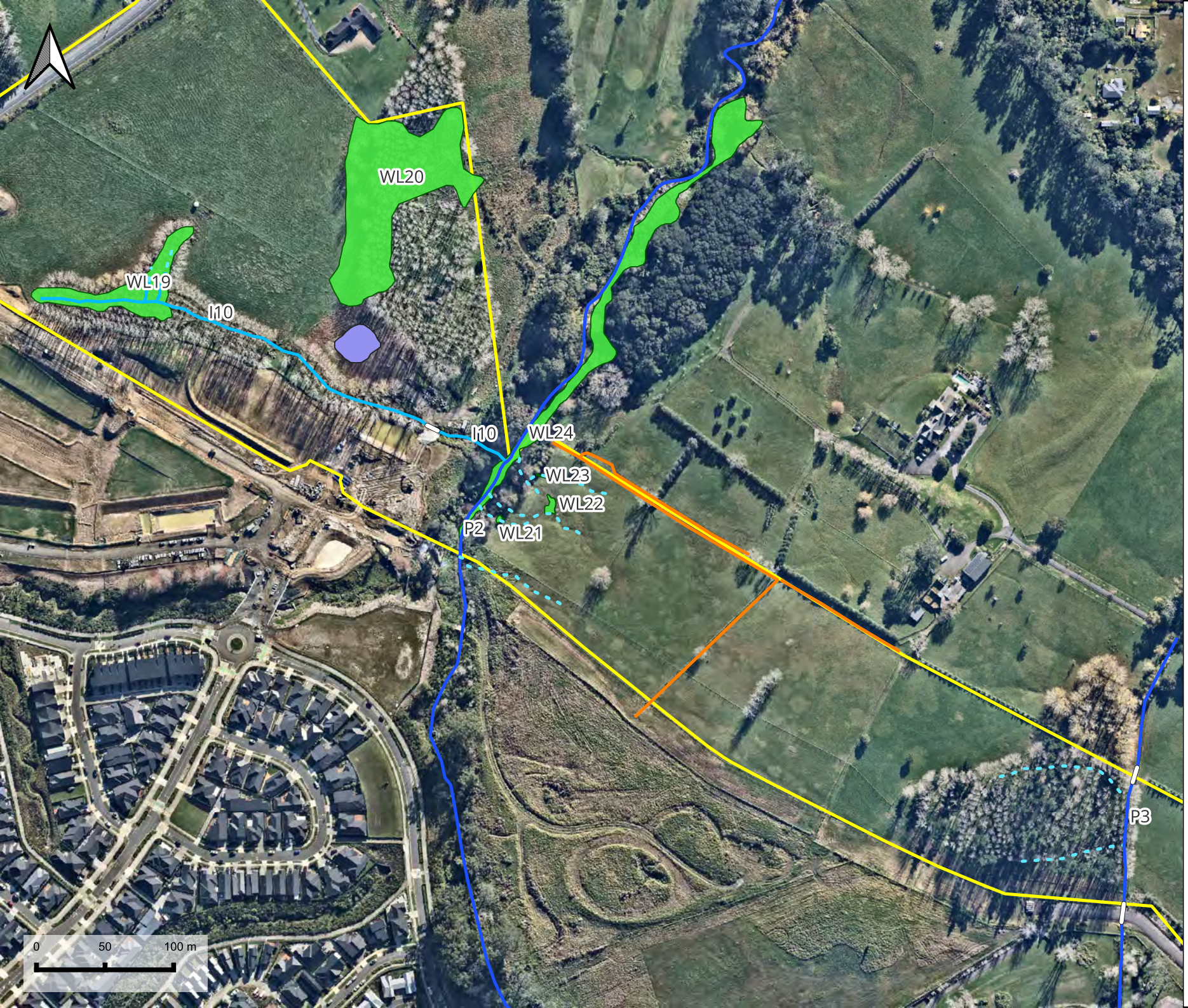
SCALE **1:4,000** @ A4

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026



VIRIDIS
Environmental Consultants

Freshwater Features - Stages 14-17 southeast

Legend

Project boundary

Watercourse features

- Permanent
- Intermittent
- Ephemeral
- Artificial
- Culvert

Wetland/pond features

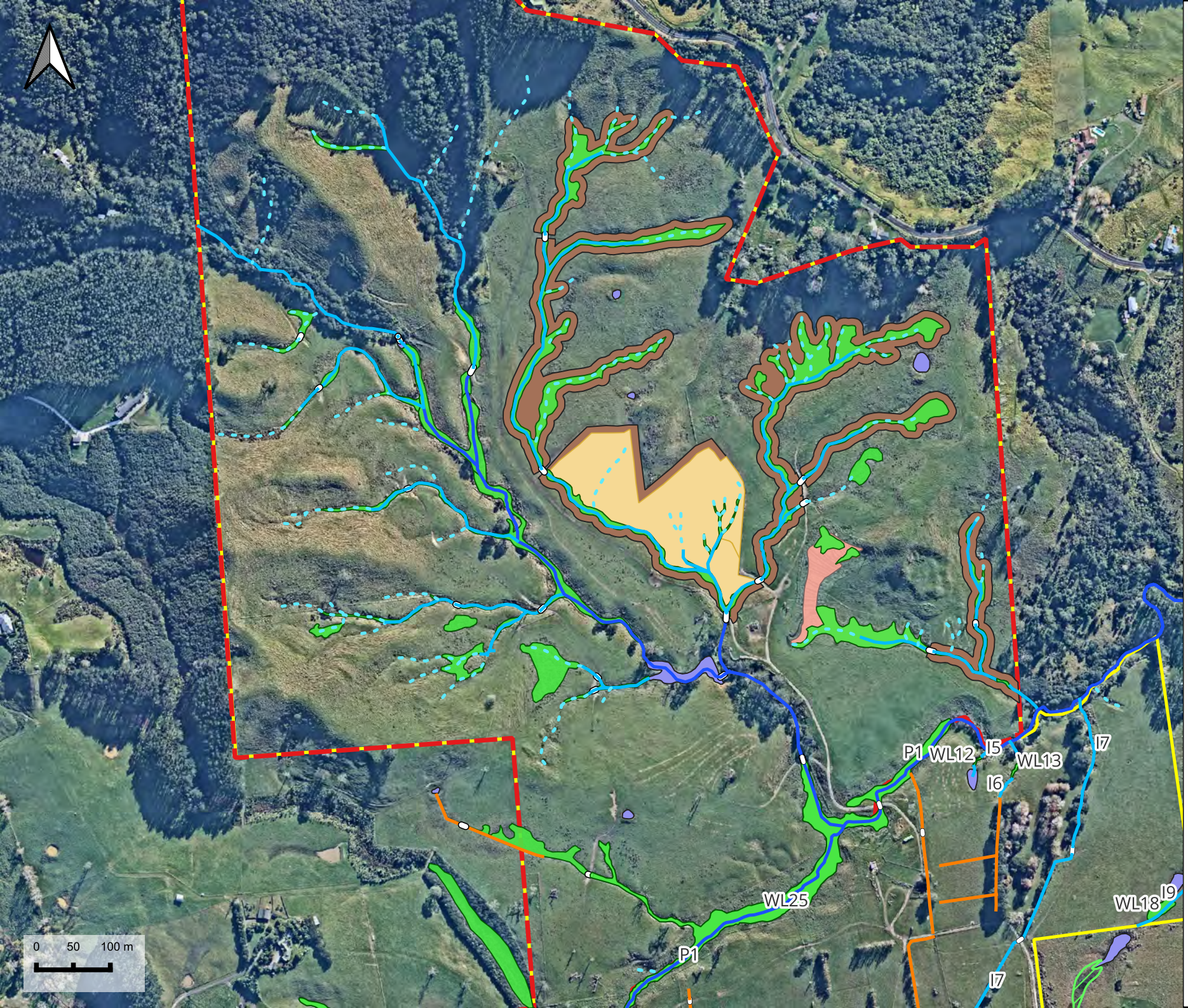
- Natural wetland
- Constructed pond

SOURCES

Nearmaps 2026 Aerial

SCALE **1:3,500** @ A4

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026



VIRIDIS
Environmental Consultants

Freshwater Features and Consented Restoration - Te Korowai o Maraeariki

Legend

- Project boundary
- Te Korowai o Maraeariki

Watercourse features

- Permanent
- Intermittent
- Ephemeral
- Artificial
- Culvert

Wetland/pond features

- Natural wetland
- Constructed pond
- Potential wetland
- Stg 9 offset wetland
- Stg 10-13 offset wetland
- Stg 10-13 restoration

SOURCES

Nearmaps 2026 Aerial

DISCLAIMER:
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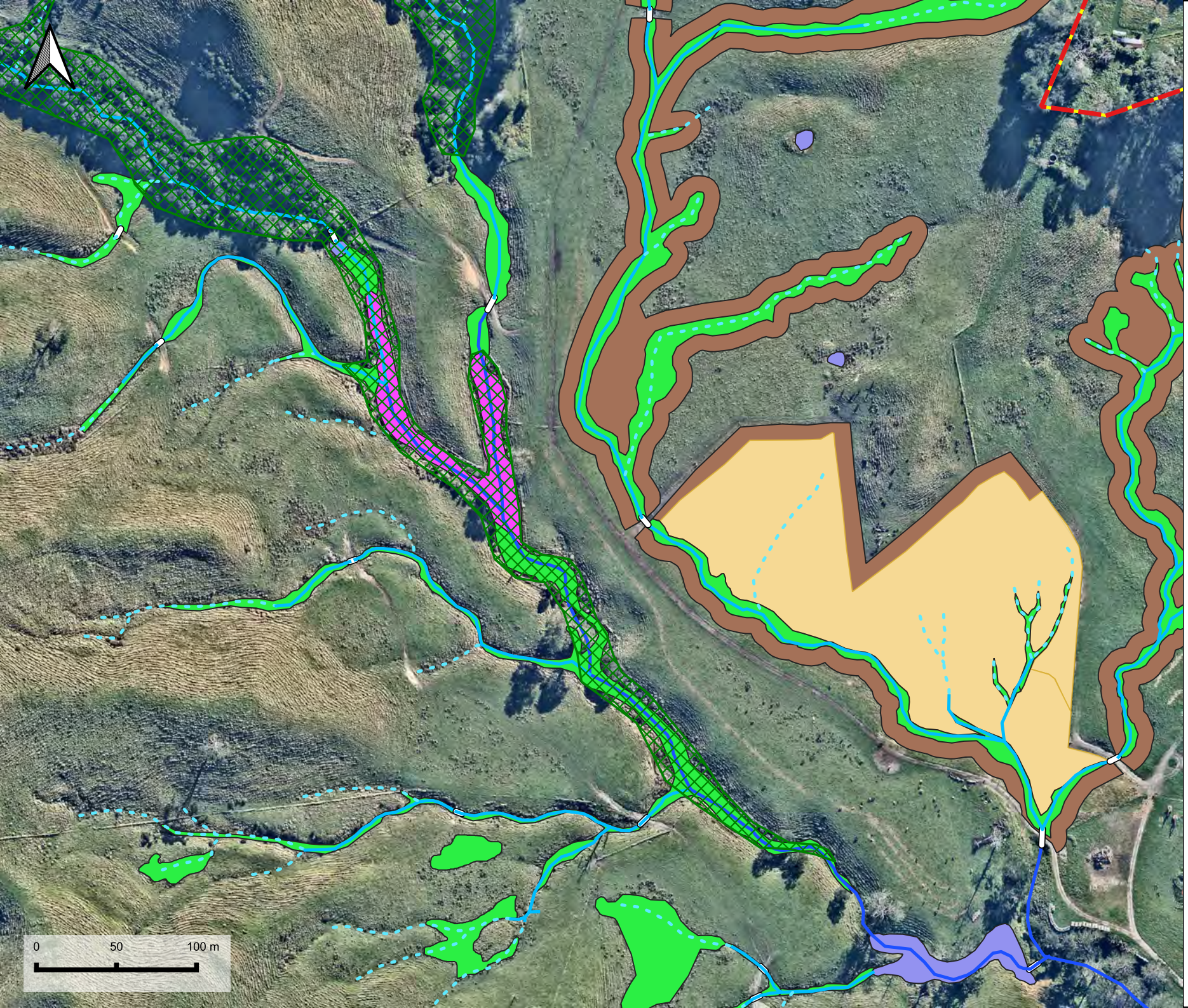
SCALE **1:6,500** @ A4

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026



VIRIDIS
Environmental Consultants

Native and exotic wetland within SEA overlay - Te Korowai o Maraeariki

Legend

- Project boundary
- Te Korowai o Maraeariki
- Stg 10-13 offset wetland
- Native Wetland
- Exotic Wetland
- Artificial Pond
- Culvert
- Ephemeral
- Permanent streams
- Intermittent streams

SOURCES

Nearmaps 2026 Aerial

DISCLAIMER:
This map/plan is not an engineering draft. This map/plan is illustrative only and all information should be independently verified on site before taking any action.

SCALE **1:3,000** **@ A4**

PROJECT NO.	10015
DRAWN BY:	B.P
DATE:	31 July 2026

Appendix D
Freshwater Classifications Summary Tables

Table D1. Summary of permanent and intermittent watercourse classifications within the development area, with consideration of AUP-OP intermittent stream criteria. ✓= Present ✗= Absent

Watercourse ID	Classification	Natural pools	Well-defined channel	Surface water more than 48 hours after rain	Rooted terrestrial vegetation NOT established across the entire cross-sectional width	Organic debris resulting from flooding can be seen on the floodplain	Evidence of substrate sorting, including scour and deposition	Comments
P1 (Ōrewa River)	Permanent	✓	✓	✓	✓	✓	✓	No realignment or reclamation proposed; enhancement through riparian planting. Natural permanent watercourse traversing the site from west to east; the highest-order stream on site. Soft-bottomed (silt/sand) with some cobble, run-dominated, low flow, limited riparian shading (pasture and reed sweet grass wetland margins). Highly modified through historical and ongoing agricultural land use. Known to cease flow during prolonged summer dry periods despite a large catchment of approx. 856 ha. Supports a diadromous native fish community including 'At Risk' and 'Threatened' species. High restoration potential.
P2 (Waterloo Creek)	Permanent	✓	✓	✓	✓	✓	✓	No realignment or reclamation proposed. Natural permanent tributary of the Ōrewa River. Predominantly soft-bottomed with some gravel. Established riparian vegetation, although largely exotic and pest plants are abundant. Supports banded kōkopu ('At Risk – Naturally Uncommon').
P3	Permanent	✗	✓	✓	✓	✓	✓	Modified natural watercourse that is a tributary of the Ōrewa River. Has been highly modified for drainage of pastoral land. Riparian vegetation on true left bank consists of mature poplar trees, whilst the true right bank contains grazed pasture.

Watercourse ID	Classification	Natural pools	Well-defined channel	Surface water more than 48 hours after rain	Rooted terrestrial vegetation NOT established across the entire cross-sectional width	Organic debris resulting from flooding can be seen on the floodplain	Evidence of substrate sorting, including scour and deposition	Comments
I1	Intermittent	✗	✓	✓	✓	✗	✓	Short reach located between WL3 and WL4 (degraded historical stream channels). Small amount of native riparian scrub vegetation, with the remaining riparian area in grazed pasture.
I2	Intermittent	✗	✓	✓	✓	✗	✓	Tributary to Ōrewa River that flows from the southwestern corner of the site northwards via a culvert under Wainui Road. Upper reach on the southern side of Wainui Road was planted in 2026 with native riparian seedlings. Flows into WL4.
I2-A	Intermittent	✗	✓	✓	✓	✗	✓	Short ~27 m reach located directly downstream of an artificial pond, and tributary to stream I2.
I3	Intermittent	✗	✓	✓	✓	✗	✓	Tributary to Ōrewa River that flows from the southwestern corner of the site northwards via a culvert under Wainui Road. Two sections of the upper reach of the stream flow entirely underground with no channel present, and a series of tomos are present along these areas (indicating instability). Riparian vegetation largely pasture with isolated pines.
I4	Intermittent	✗	✓	✓	✓	✗	✓	Reach that flows to the Ōrewa River, located downstream of a small online pond and natural inland wetland. Riparian vegetation in pasture with scattered exotic scrub.

Watercourse ID	Classification	Natural pools	Well-defined channel	Surface water more than 48 hours after rain	Rooted terrestrial vegetation NOT established across the entire cross-sectional width	Organic debris resulting from flooding can be seen on the floodplain	Evidence of substrate sorting, including scour and deposition	Comments
I5	Intermittent	✗	✓	✓	✓	✗	✓	Two short reaches that flow to Ōrewa River, associated with WL12 and located downstream of a constructed pond. Riparian vegetation in pasture.
I6	Intermittent	✗	✓	✓	✓	✗	✓	Two short reaches that flow to Ōrewa River, associated with WL13. Located downstream of a series of artificial drains. Riparian vegetation in pasture.
I7	Intermittent	✓	✓	✓	✓	✗	✓	Highly modified, particularly in the upper reaches, where the channel has been straightened and deepened and the streambed lies below the water table. The lower reach has a more natural channel and discharges to the Ōrewa River. Macrophytes are prevalent throughout, particularly in the upper reaches. Riparian vegetation comprises pasture in the upper reaches and scattered exotic trees (e.g. macrocarpa), along the lower reaches.
I7-A	Intermittent	✓	✓	✓	✓	✗	✓	Highly modified tributary to Stream I7. Associated with WL14 located on the true right margin. Riparian margin in pasture.
I7-B	Intermittent	✓	✓	✓	✓	✗	✓	Highly modified tributary to Stream I7. Associated with WL15 located on the true left bank. Riparian margin in pasture.
I8	Intermittent	✗	✓	✓	✓	✗	✓	Tributary to stream I7 that has a highly modified channel and alignment. Riparian margin in pasture.

Watercourse ID	Classification	Natural pools	Well-defined channel	Surface water more than 48 hours after rain	Rooted terrestrial vegetation NOT established across the entire cross-sectional width	Organic debris resulting from flooding can be seen on the floodplain	Evidence of substrate sorting, including scour and deposition	Comments
I9	Intermittent	✗	✓	✓	✓	✗	✓	Short reach that traverses a corner of the site in the east. Channel degraded by stock access. Located downstream of a constructed pond on neighbouring site. Wetland present along the majority of the margins (W18). Flows into modified channel on eastern neighbouring site.
I10	Intermittent	✗	✓	✓	✓	✗	✓	Tributary to Waterloo Creek. Largely located under mature poplar canopy within site. Channel modified (deepened) for drainage.

Table D2. Summary of natural inland wetlands within the development area.

Wetland ID	Size (m^2)	Dominant vegetation type	Key hydrological indicator	Comments
WL1	384	Exotic rushes/grasses/herbaceous species with partial pine canopy	Saturated soils	Partly under pine canopy on site that is providing shading. Partly within southern neighbouring site.
WL2	607	Native planted rushes and sedges (recently planted)	Saturated soils, patches of shallow surface water	Restored with native planting under the requirements of a Remediation Action Plan prepared for abatement notice ABT21751078, following unauthorised earthworks. Restoration planting was undertaken in 2026 and is currently establishing well. Buffer

Wetland ID	Size (m^2)	Dominant vegetation type	Key hydrological indicator	Comments
				vegetation limited but buffer planted has also been planted recently, consisting of common native early successional revegetation species.
WL3	130	Exotic grasses	Saturated soils	Narrow strip of wetland, likely an intermittent stream historically, now degraded by stock access. Buffer vegetation limited to grazed pasture and a couple of isolated exotic trees.
WL4	519	Exotic rushes/sedges/grasses	Saturated soils	Narrow strip of wetland, likely an intermittent stream historically, now degraded by stock access. Flows directly into Ōrewa River. Buffer vegetation limited to grazed pasture and one isolated exotic tree.
WL5	67	Exotic grasses and herbaceous species	Saturated soils	Located in floodplain of Ōrewa River, not directly connected to river itself. Buffer vegetation limited to grazed pasture.
WL6	353	Exotic grasses and herbaceous species	Saturated soils	Located in floodplain of Ōrewa River, not directly connected to river itself but adjoins the reed sweet grass wetland margins. Buffer vegetation limited to grazed pasture.
WL7	82	Exotic grasses	Saturated soils	Narrow wetland strip associated with the margins of intermittent stream I3. Buffer vegetation limited to grazed pasture and one isolated exotic tree.
WL8	219	Exotic grasses	Saturated soils	Narrow wetland strip downstream of constructed pond and artificial channels. Likely an intermittent stream historically, degraded by stock access. Buffer vegetation limited to grazed pasture.
WL9	76	Exotic grasses	Saturated soils	Narrow wetland strip associated with intermittent stream I3's lower reach. Likely an intermittent stream historically, degraded by stock access. Buffer vegetation limited to grazed pasture and an isolated exotic tree.
WL10	438	Exotic grasses	Saturated soils	Narrow wetland strip associated with intermittent stream I3's lower reach. Likely an intermittent stream historically, degraded by stock access.

Wetland ID	Size (m^2)	Dominant vegetation type	Key hydrological indicator	Comments
WL11	1,179	Exotic grasses	Saturated soils	Wetland upstream of small online pond. Artificial drainage features upstream. Buffer vegetation limited to grazed pasture and a couple of isolated exotic trees.
WL12	45	Exotic grasses	Saturated soils, shallow surface water	Small wetland associated with intermittent stream I5. Downstream of constructed pond. Directly adjacent to Ōrewa River riparian margin. Buffer vegetation limited to grazed pasture.
WL13	117	Exotic grasses	Saturated soils	Wetland associated with intermittent stream I6. Downstream of constructed pond. Directly adjacent to Ōrewa River riparian margin. Buffer vegetation limited to grazed pasture.
WL14	208	Exotic grasses and rushes	Saturated soils	Wetland associated with the margins of intermittent stream I7-A. Buffer vegetation limited to grazed pasture.
WL15	142	Exotic grasses and herbaceous species	Saturated soils	Wetland associated with the margins of intermittent stream I7-B. Buffer vegetation limited to grazed pasture.
WL16	100	Exotic grasses and sedges	Saturated soils	Wetland feeds into intermittent stream I8. Buffer vegetation limited to grazed pasture.
WL17	424	Exotic grasses and sedges	Saturated soils	Seepage-fed wetland upstream of intermittent stream I8. Buffer vegetation limited to grazed pasture.
WL18	559	Exotic grasses	Saturated soils	Wetland associated with intermittent stream I9. Buffer vegetation limited to grazed pasture. Wetland will be reclaimed, stream retained.
WL19	2,159	Exotic rushes with mature poplar canopy	Saturated soils	Wetland associated with intermittent stream I10 and small tributaries. Poplars provide high shading.
WL20	7,480	Exotic rushes, grasses and herbaceous species, with mature poplar canopy	Saturated soils, some areas of shallow/pooling surface water	Largest wetland present on the site. Seepage fed, no hydrological connectivity to other freshwater features. Poplars provide shading, but many were observed to be dying and had fallen, causing light gaps.

Wetland ID	Size (m^2)	Dominant vegetation type	Key hydrological indicator	Comments
WL21	17	Exotic rushes and grasses	Saturated soils	Small wetland within grazed pasture, associated with overland flow path. Buffer vegetation limited to grazed pasture.
WL22	73	Exotic rushes and grasses	Saturated soils	Small wetland within grazed pasture, associated with overland flow path. Buffer vegetation limited to grazed pasture.
WL23	10	Exotic rushes and grasses	Saturated soils	Small wetland within grazed pasture, associated with overland flow path. Buffer vegetation limited to grazed pasture.
WL24	491	Native sedges	Floodplain/stream edges	Will be retained. Wetland margins associated with the permanent Waterloo Creek (P2). Approx. 491 m^2 is located within the site, but the wetland totals approx. 3,800 m^2 which extends along Waterloo Creek margins downstream. Mixed native exotic scrub vegetation provides buffer vegetation.
WL25	~20,000	Exotic grasses	Floodplain/stream edges	Floodplain wetlands associated with the edges of the Ōrewa River along the northern edge of the development area. Reed sweet grass (highly invasive pest plant) dominant throughout. Buffer vegetation limited to grazed and rank pasture, and scattered isolated exotic trees. Will be retained and Ōrewa River margins restored.

Appendix E
Current, Potential & Realignment SEV Results

Table E1. Current Stream Ecological Valuation (SEV) data for each assessment reach.

Function category	Function	Variable	Current					
			SEV1	SEV2	SEV3	SEV4	SEV5	SEV6
Hydraulic		Vchann	0.10	0.10	0.10	0.10	0.48	0.48
		Vlining	0.80	0.80	0.80	0.80	0.80	0.80
		Vpipe	1.00	1.00	1.00	0.70	1.00	1.00
	NFR	=	0.33	0.33	0.33	0.23	0.59	0.59
		Vbank	0.60	0.20	0.20	0.20	0.36	0.20
		Vrough	0.30	0.23	0.20	0.20	0.35	0.26
	FLE	=	0.18	0.05	0.04	0.04	0.13	0.05
		Vbarr	1.00	0.00	1.00	1.00	1.00	1.00
	CSM	=	1.00	0.00	1.00	1.00	1.00	1.00
		Vchanshape	0.20	0.20	0.20	0.20	0.80	0.80
		Vlining	0.80	0.80	0.80	0.80	0.80	0.80
	CGW	=	0.60	0.60	0.60	0.60	0.80	0.80
Hydraulic function mean score			**0.53**	**0.24**	**0.49**	**0.47**	**0.63**	**0.61**
Biogeochemical		Vshade	0.00	0.00	0.00	0.00	0.00	0.06
	WTC	=	0.00	0.00	0.00	0.00	0.00	0.06
		Vdod	0.40	0.68	0.40	0.45	0.45	0.45
	DOM	=	0.40	0.68	0.40	0.45	0.45	0.45
		Vripar	0.00	0.05	0.00	0.00	0.15	0.00
		Vdecid	1.00	1.00	1.00	1.00	1.00	1.00
	OMI	=	0.00	0.05	0.00	0.00	0.15	0.00
		Vmacro	0.54	0.30	0.02	0.42	0.26	0.57
		Vretain	0.20	0.20	0.20	0.20	0.28	0.28
	IPR	=	0.20	0.20	0.02	0.20	0.26	0.28
		Vsurf	0.43	0.59	0.78	0.57	0.62	0.41
		Vripfilt	0.24	0.24	0.24	0.24	0.24	0.24
	DOP	=	0.34	0.42	0.51	0.41	0.43	0.33

Function category	Function	Variable	Current					
			SEV1	SEV2	SEV3	SEV4	SEV5	SEV6
Biogeochemical function mean score			0.19	0.27	0.19	0.21	0.26	0.22
Habitat provision		Vgalspwn	0.00	0.00	1.00	0.00	0.55	0.00
		Vgalqual	0.00	0.00	0.00	0.00	0.00	0.00
		Vgobspwn	0.10	0.10	0.10	0.10	0.10	0.10
	FSH	=	0.05	0.05	0.05	0.05	0.05	0.05
		Vphyshab	0.14	0.12	0.11	0.14	0.36	0.34
		Vwatqual	0.02	0.03	0.02	0.02	0.02	0.04
		Vimperv	1.00	0.70	1.00	1.00	1.00	1.00
	HAF	=	0.33	0.24	0.31	0.33	0.44	0.43
Habitat provision function mean score			**0.19**	**0.15**	**0.18**	**0.19**	**0.24**	**0.24**
Biodiversity		Vfish	0.00	0.00	0.00	0.00	0.00	0.00
	FFI	=	0.00	0.00	0.00	0.00	0.00	0.00
		Vmci	0.33	0.20	0.18	0.29	0.30	0.26
		Vept	0.17	0.00	0.00	0.17	0.17	0.00
		Vinvert	0.23	0.12	0.00	0.12	0.23	0.23
	IFI	=	0.24	0.10	0.06	0.19	0.23	0.16
		Vripcond	0.13	0.13	0.10	0.10	0.20	0.12
		Vripconn	1.00	1.00	1.00	0.17	0.50	0.50
	RVI	=	0.13	0.13	0.10	0.02	0.10	0.06
Biodiversity function mean score			**0.12**	**0.08**	**0.05**	**0.07**	**0.11**	**0.07**
Overall mean SEV score (maximum value 1)			**0.271**	**0.203**	**0.244**	**0.251**	**0.330**	**0.304**

Notes: NFR is natural flow regime; FLE is floodplain effectiveness; CSM is connectivity for species migration; CGW is natural connectivity to groundwater; WTC is water temperature control; DOM is dissolved oxygen levels maintained; OMI is organic matter input; IPR is in-stream particle retention; DOP is decontamination of pollutants; FSH is fish spawning habitat; HAF is habitat for aquatic fauna; FFI is fish fauna intact; IFI is invertebrate fauna intact; RVI is riparian vegetation intact.

Table E2. Typical Practice Potential Stream Ecological Valuation (SEV) data for each assessment reach.

Function category	Function	Variable	Typical Practice Potential					
			SEV1	SEV2	SEV3	SEV4	SEV5	SEV6
Hydraulic		Vchann	0.10	0.10	0.10	0.10	0.48	0.48
		Vlining	0.80	0.90	0.90	0.90	0.90	0.90
		Vpipe	1.00	1.00	1.00	0.70	1.00	1.00
	NFR	=	0.33	0.37	0.37	0.26	0.62	0.62
		Vbank	0.60	0.20	0.20	0.20	0.36	0.20
		Vrough	0.44	0.44	0.44	0.44	0.82	0.82
	FLE	=	0.26	0.09	0.09	0.09	0.30	0.16
		Vbarr	1.00	0.00	1.00	1.00	1.00	1.00
	CSM	=	1.00	0.00	1.00	1.00	1.00	1.00
		Vchanshape	0.20	0.20	0.20	0.20	0.80	0.80
		Vlining	0.80	0.90	0.90	0.90	0.90	0.90
	CGW	=	0.60	0.67	0.67	0.67	0.87	0.87
Hydraulic function mean score			**0.55**	**0.28**	**0.53**	**0.50**	**0.70**	**0.66**
Biogeochemical		Vshade	0.52	0.52	0.52	0.52	0.52	0.52
	WTC	=	0.52	0.52	0.52	0.52	0.52	0.52
		Vdod	0.60	1.00	0.60	0.68	0.68	0.68
	DOM	=	0.60	1.00	0.60	0.68	0.68	0.68
		Vripar	0.50	0.50	0.50	0.50	1.00	1.00
		Vdecid	1.00	1.00	1.00	1.00	1.00	1.00
	OMI	=	0.50	0.50	0.50	0.50	1.00	1.00
		Vmacro	0.74	0.62	0.50	0.72	0.61	0.79
		Vretain	0.20	0.20	0.20	0.20	0.28	0.28
	IPR	=	0.20	0.20	0.20	0.20	0.28	0.28
		Vsurf	0.31	0.40	0.48	0.37	0.41	0.29
		Vripfilt	0.32	0.32	0.32	0.32	0.50	0.50
	DOP	=	0.32	0.36	0.40	0.34	0.45	0.39

Function category	Function	Variable	Typical Practice Potential					
			SEV1	SEV2	SEV3	SEV4	SEV5	SEV6
Biogeochemical function mean score			**0.43**	**0.52**	**0.44**	**0.45**	**0.59**	**0.57**
Habitat provision		Vgalspwn	0.00	0.00	1.00	0.00	0.55	0.00
		Vgalqual	0.00	0.00	0.00	0.00	0.00	0.00
		Vgobspwn	0.10	0.10	0.10	0.10	0.10	0.10
	FSH	=	0.05	0.05	0.05	0.05	0.05	0.05
		Vphyshab	0.39	0.36	0.35	0.39	0.56	0.56
		Vwatqual	0.22	0.36	0.22	0.24	0.51	0.51
		Vimperv	0.30	0.30	0.30	0.30	1.00	1.00
	HAF	=	0.32	0.35	0.31	0.33	0.66	0.66
Habitat provision function mean score			**0.19**	**0.20**	**0.18**	**0.19**	**0.36**	**0.36**
Biodiversity		Vfish	0.00	0.00	0.00	0.00	0.00	0.00
	FFI	=	0.00	0.00	0.00	0.00	0.00	0.00
		Vmci	0.33	0.20	0.18	0.29	0.30	0.26
		Vept	0.17	0.00	0.00	0.17	0.17	0.00
		Vinvert	0.23	0.12	0.00	0.12	0.23	0.23
	IFI	=	0.24	0.10	0.06	0.19	0.23	0.16
		Vripcond	0.29	0.29	0.29	0.29	0.58	0.58
		Vripconn	1.00	1.00	1.00	0.17	0.50	0.50
	RVI	=	0.29	0.29	0.29	0.05	0.29	0.29
Biodiversity function mean score			**0.18**	**0.13**	**0.12**	**0.08**	**0.17**	**0.15**
Overall mean SEV score (maximum value 1)			**0.374**	**0.321**	**0.361**	**0.348**	**0.496**	**0.477**

Notes: NFR is natural flow regime; FLE is floodplain effectiveness; CSM is connectivity for species migration; CGW is natural connectivity to groundwater; WTC is water temperature control; DOM is dissolved oxygen levels maintained; OMI is organic matter input; IPR is in-stream particle retention; DOP is decontamination of pollutants; FSH is fish spawning habitat; HAF is habitat for aquatic fauna; FFI is fish fauna intact; IFI is invertebrate fauna intact; RVI is riparian vegetation intact.

Table E3. Realignment Potential Stream Ecological Valuation (SEV) data for each assessment reach.

Function category	Function	Variable	Realignment Potential		
			SEV2	SEV3	SEV4
Hydraulic		Vchann	0.75	0.75	0.75
		Vlining	0.94	0.94	0.94
		Vpipe	1.00	1.00	0.70
	NFR	=	0.81	0.81	0.57
		Vbank	0.68	0.68	0.68
		Vrough	0.44	0.44	0.44
	FLE	=	0.30	0.30	0.30
		Vbarr	1.00	1.00	1.00
	CSM	=	1.00	1.00	1.00
		Vchanshape	0.80	0.80	0.80
		Vlining	0.94	0.94	0.94
	CGW	=	0.89	0.89	0.89
Hydraulic function mean score			**0.75**	**0.75**	**0.69**
Biogeochemical		Vshade	0.52	0.52	0.52
	WTC	=	0.52	0.52	0.52
		Vdod	1.00	0.60	0.68
	DOM	=	1.00	0.60	0.68
		Vripar	0.50	0.50	0.50
		Vdecid	1.00	1.00	1.00
	OMI	=	0.50	0.50	0.50
		Vmacro	0.62	0.50	0.72
		Vretain	0.80	0.80	0.80
	IPR	=	0.62	0.50	0.72
		Vsurf	0.40	0.48	0.37
		Vripfilt	0.32	0.32	0.32
	DOP	=	0.36	0.40	0.34
Biogeochemical function mean score			**0.60**	**0.50**	**0.55**
Habitat provision		Vgalspwn	1.00	1.00	1.00
		Vgalqual	0.00	0.00	0.00

		Vgobspwn	0.10	0.10	0.10
	FSH	=	0.05	0.05	0.05
		Vphyshab	0.59	0.59	0.59
		Vwatqual	0.36	0.22	0.24
		Vimperv	0.30	0.30	0.30
	HAF	=	0.46	0.42	0.43
Habitat provision function mean score			**0.25**	**0.24**	**0.24**
Biodiversity		Vfish	0.00	0.00	0.00
	FFI	=	0.00	0.00	0.00
		Vmci	0.20	0.18	0.29
		Vept	0.00	0.00	0.17
		Vinvert	0.12	0.00	0.12
	IFI	=	0.10	0.06	0.19
		Vripcond	0.29	0.29	0.29
		Vripconn	1.00	1.00	0.85
	RVI	=	0.29	0.29	0.25
Biodiversity function mean score			**0.13**	**0.12**	**0.15**
Overall mean SEV score (maximum value 1)			**0.494**	**0.454**	**0.460**

Notes: NFR is natural flow regime; FLE is floodplain effectiveness; CSM is connectivity for species migration; CGW is natural connectivity to groundwater; WTC is water temperature control; DOM is dissolved oxygen levels maintained; OMI is organic matter input; IPR is in-stream particle retention; DOP is decontamination of pollutants; FSH is fish spawning habitat; HAF is habitat for aquatic fauna; FFI is fish fauna intact; IFI is invertebrate fauna intact; RVI is riparian vegetation intact.

Appendix F
Macroinvertebrate Sampling Results

Table F1. Raw macroinvertebrate data for SEV reaches and Ōrewa River and tributary.

Taxa	MCI-SB	SEV1	SEV2	SEV3	SEV4	SEV5	SEV6	Upstream	Trib	Downstream
Oxyethira	1.2	1	1	6	9	2		31	1	3
Paroxyethira	3.7							2		
Polyplectropus	8.1				1					
Psilochorema	7.8					3				
Triplectides	5.7	1								
Xanthocnemis	1.2	2	9	5	7			1	4	1
Anisops	2.2	1								
Microvelia	4.6	1	5	1	2		1		1	1
Sigara	2.4							2	1	
Enochrus	2.6	1	12	1	1			1		
Liodessus	4.9	1	11	1	2		1			
Rhantus	1.0	1								
Austrosimulium	3.9				1	3	2	8		
Chironomus	3.4		1							
Culicidae	1.2	3	3							
Empididae	5.4				1					
Mischoderus	5.9			2						
Muscidae	1.6		1						1	
Orthocladiinae	3.2			15	2	4		2	2	
Paralimnophila	7.4	2	27		3	1	1			
Polypedilum	8.0								1	
Tanypodinae	6.5	2	1							
Tanytarsini	4.5					1				
Collembola	5.3	2	1	5		1				1
Cladocera	0.7			7						
Copepoda	2.4	3	16	113	7		1		1	
Isopoda	4.5	1					1	1		
Ostracoda	1.9	167	1	2	17	81	9	1	46	
Paracalliope	5.5			1	17			1	2	27
Paraleptamphopus	5.5					12	126			
Acarina	5.2	5		4	10				3	
Ferrissia	2.4								1	
Gyraulus	1.7		1						1	
Lymnaeidae	1.2		4	1	3				8	
Physella (Physa)	0.1					1	1		2	2
Potamopyrgus	2.1					8	55	145	113	174
Sphaeriidae	2.9					3	9			
Oligochaeta	3.8	17	79	31	68	44	8	1		
Hirudinea	1.2		5	1	1			1	5	
Platyhelminthes	0.9	6	20	6	19	31	6		6	8
Nemertea	1.8		2	1	24	5	1		1	
Hydra	1.6				7					
Number of taxa		18	19	18	20	15	14	13	19	8
Number of EPT taxa		1	0	0	1	1	0	0	0	0
Total individuals		217	200	203	202	200	222	197	200	217
%EPT abundance		0	0	0	0	2	0	0	0	0
%EPT taxa		6	0	0	5	7	0	0	0	0
MCI-sb		69.4	57.7	59.4	68.0	69.7	66.7	57.2	51.2	52.3
QMCi-sb		2.3	3.6	2.7	3.1	2.6	4.1	2.1	2.0	2.5

Appendix G
Wetland Delineation Vegetation Plot Results

Figure G1. Locations of Plots A and B used to assist with the delineation of Wetland 15 (WL15).

Table G1. Plot A vegetation assessment results.

Binomial name	Common name	Rating	Biostatus	Cover (%)	Dominant
Agrostis stolonifera	Creeping bent	FACW	Exotic	40	Y
Paspalum dilatatum	Dallis grass	FACU	Exotic	35	Y
Isolepis prolifera	Budding club-rush	OBL	Indigenous	7	
Axonopus fissifolius	Narrow-leaved carpet grass	FACU	Exotic	7	
Cyperus brevifolius	Shortleaf spike sedge	FACW	Exotic	5	
Lolium perenne	Perennial ryegrass	FACU	Exotic	5	
Bare ground	—	—	—	6	—
Total cover				**105**	
% of dominant species that are FAC/FACW/OBL					**50**
Prevalence value					**2.88**

Note: Dominance test not met (50% of dominant species hydrophytic; threshold is >50%). Prevalence value 2.88 (≤3.0) meets the wetland vegetation criterion. Combined with wetland hydrology (saturated soils present), the area is confirmed as a natural inland wetland under the NPS-FM.

Table G2. Plot B vegetation assessment results.

Binomial name	Common name	Rating	Biostatus	Cover (%)	Dominant
Lolium perenne	Perennial ryegrass	FACU	Exotic	40	Y
Paspalum dilatatum	Dallis grass	FACU	Exotic	30	Y
Ranunculus repens	Creeping buttercup	FAC	Exotic	15	
Axonopus fissifolius	Narrow-leaved carpet grass	FACU	Exotic	15	
Agrostis stolonifera	Creeping bent	FACW	Exotic	5	
Trifolium pratense	Red clover	FACU	Exotic	5	
Total cover				**110**	
% of dominant species that are FAC/FACW/OBL					**0**
Prevalence value					**3.77**

Note: Neither the dominance test (0% of dominant species hydrophytic) nor the prevalence value (3.77; >3.0) is met. The area does not meet the wetland vegetation criterion and is confirmed as upland, defining the wetland boundary.

Appendix H
WEV Results

Table H1. Wetland Ecological Valuation (WEV) summary data.

Component	Attribute	Attribute Score				
		WEVi-C	WEVi-P	WEVi-I	WEVm-C	WEVm-P
Catchment	Land use affecting catchment hydrology	1.00	0.95	0.00	0.00	5.00
Catchment	Diversion of flows	5.00	5.00	0.00	0.00	5.00
Catchment	Water quality in catchment	3.00	4.00	0.00	0.00	4.00
Catchment	Mammalian predators in catchment	2.00	2.00	0.00	0.00	2.00
Catchment	Key undesirable plants in catchment	2.00	4.00	0.00	0.00	3.00
Catchment	% impervious surfaces in catchment	4.00	1.00	0.00	0.00	5.00
Catchment	% catchment in vegetation of any sort	5.00	2.00	0.00	0.00	5.00
Catchment	Degree of runoff control – flood and first flush	0.00	5.00	0.00	0.00	0.00
Catchment	Wetland connections	5.00	5.00	0.00	0.00	4.00
Wetland	Size and shape	2.00	2.00	0.00	0.00	3.50
Wetland	Change in hydrology	4.00	4.00	0.00	0.00	4.00
Wetland	Change in water/ soil quality or state (physico-chemical parameters)	3.00	4.00	0.00	0.00	4.00
Wetland	Change in ecosystem intactness	4.67	4.67	0.00	0.00	4.67
Wetland	Change in amount of animal damage and harvest by humans	2.33	3.67	0.00	0.00	3.67
Wetland	Change in dominance of native plants	2.00	2.00	0.00	0.00	4.00
Buffer	Animal damage	0.00	5.00	0.00	0.00	5.00
Buffer	Weeds	0.00	5.00	0.00	0.00	5.00
Buffer	Canopy dieback	5.00	5.00	0.00	0.00	5.00
Buffer	Buffer	0.00	2.50	0.00	0.00	5.00
Buffer	Drains	5.00	5.00	0.00	0.00	5.00
Overall mean score		2.75	3.59	0.00	0.00	4.09
Maximum attainable score		5.00	5.00	5.00	5.00	5.00
Wetland condition (WEV score)		**0.550**	**0.718**	**0.000**	**0.000**	**0.818**

Appendix I
EcIAG Assessment Tables for Ecological Values

The following tables assess the ecological values identified within the site against the EcIAG ecological value matters (Roper-Lindsay et al. 2018), providing the detailed basis for the value determinations summarised in Section 6 of the report. Terrestrial vegetation, terrestrial fauna and freshwater values are assessed separately, recognising that fauna may use habitats of relatively low botanical value, and that freshwater value varies with naturalness, habitat quality, connectivity and indigenous fauna use.

Table I1. Assessment of terrestrial vegetation types within the site against the EcIAG ecological value matters.

Vegetation values were assessed based on representativeness, rarity and distinctiveness, diversity and pattern, ecological context, and overall ecological value.

Vegetation type / feature	Representativeness	Rarity / distinctiveness	Diversity and pattern	Ecological context	Overall ecological value
Exotic tree and scrub vegetation	Very Low–Low. Dominated by planted exotic species (poplar, pine, macrocarpa, eucalyptus, blackwood and others), shelterbelts and isolated specimens. Not representative of indigenous ecosystem types.	Low. No rare or distinctive vegetation values. Includes mature exotic tree structures, but these are exotic and common in the landscape. Gorse and other pest plants present.	Low. Generally lacks indigenous understorey, forest floor vegetation and natural regeneration; several stands contain ageing, structurally declining trees.	Low. Largely isolated with limited terrestrial connectivity within a heavily modified pastoral landscape.	Low
Pasture	Very Low. Regularly grazed exotic pasture; not representative of indigenous vegetation.	Very Low–Low. Common exotic pasture species that are regularly grazed/maintained; no botanical rarity.	Very Low. Low structural and compositional complexity.	Low. Poor ecological context due to grazing and ongoing disturbance; dominant land cover across the site.	Negligible–Low
SEA vegetation (indigenous, Te Korowai o Maraeariki)	Moderate–High. Indigenous, regenerating vegetation within a scheduled SEA (SEA_T_2223), expected to meet the Representativeness criterion under AUP Schedule 3.	Moderate–High. Regenerating indigenous vegetation transitioning toward WF11 (kauri, podocarp, broadleaved forest), a regionally Endangered ecosystem type (Singers et al. 2017); scarce	Moderate. Kānuka scrub with tree ferns and developing understorey; scattered emergent canopy species including kauri. Structural diversity developing with succession.	High. Provides the most significant indigenous vegetation on site, with greater terrestrial connectivity, and listed under the Stepping-Stones, Migration Pathways and Buffers criterion.	High

Vegetation type / feature	Representativeness	Rarity / distinctiveness	Diversity and pattern	Ecological context	Overall ecological value
		within the wider modified landscape.			
Non-SEA indigenous vegetation	Low. Small, patchy regenerating native areas (predominantly mānuka) and isolated native trees; limited representativeness.	Low. Common indigenous species only; no Threatened or At Risk flora recorded.	Low. Patchy, lacking ecological integrity and structural tiers.	Low. Fragmented and isolated within the modified landscape.	Low
Mixed native-exotic scrub	Very Low–Low. Kānuka and cabbage tree with emergent exotic trees and early-successional natives; mixed origin, not a representative indigenous community.	Low. Common indigenous species with a high abundance of listed pest and exotic species.	Low. Structure present but indigenous composition limited and pest-dominated.	Low. Associated with the Waterloo Creek riparian margin only; connectivity value constrained by pest dominance, modification and limited ecological integrity.	Low

Table I2. Assessment of terrestrial fauna values within the site against the EcIAG ecological value matters.

Fauna values were assessed separately from vegetation values, considering species records, survey results, habitat suitability, conservation status and ecological context.

Fauna value	Survey / information basis	Conservation status / rarity-distinctiveness	Diversity and habitat use	Ecological context	Key limitations / uncertainty	Overall ecological value
Avifauna / birds	Opportunistic observations during site visits; review of eBird records and observations by Viridis and other ecologists in the wider Milldale area.	Low–Moderate. Community largely comprises common indigenous and exotic species. NZ pipit (At Risk – Declining) may occasionally use pasture; NZ dotterel (Threatened – Nationally Increasing) is known in the wider area and may use	Low–Moderate. Moderate diversity of common indigenous and exotic birds across pasture, exotic trees and freshwater margins; highest-quality habitat associated with the SEA.	Low (development area); High (SEA). The site is heavily modified; the SEA in the north provides the main indigenous nesting and foraging habitat.	Some species may use the site intermittently; potential dotterel nesting on bare ground to be managed through the FMP.	Low (development area); High (SEA)

Fauna value	Survey / information basis	Conservation status / rarity-distinctiveness	Diversity and habitat use	Ecological context	Key limitations / uncertainty	Overall ecological value
		bare ground generated by earthworks.				
Herpetofauna / lizards	Opportunistic habitat assessment; DOC herpetofauna database review; intensive lizard salvage on the adjacent Milldale Stages 10-13 site (RMA Ecology 2025) recorded no native lizards.	Moderate. Records within 10 km include copper skink, ornate skink, forest gecko and elegant gecko (At Risk – Declining). Plague skink observed and abundant. All indigenous reptiles are protected.	Low–Moderate. Development-area habitat limited to rank grass and debris of poor quality and low connectivity; the Waterloo Creek riparian scrub provides more suitable habitat; the SEA provides the highest-quality habitat.	Low–Moderate. Modified, fragmented landscape with high predator pressure. The Waterloo Creek riparian margin provides comparatively better-connected habitat than the surrounding pasture.	The likelihood of native lizard occupancy is low in the modified pastoral areas, though the Waterloo Creek riparian scrub is assessed precautionarily as moderate given its higher habitat suitability.	Low (development area); Moderate (Waterloo Creek riparian); High (SEA)
Chiroptera / bats	No bats detected in 2015, 2020 or the 2025 acoustic surveys (adjacent Stages 10-13; The Ecology Studio 2025). Nearest records 3.7 km from site.	Moderate–High. Long-tailed bat is Threatened – Nationally Critical. No short-tailed bat populations on mainland Auckland.	Low. Mature trees, shelterbelts and riparian/vegetation edges may provide limited roosting and commuting habitat; on-site habitat exposed, isolated and low value. The SEA provides higher-quality habitat.	Low. Site within potential movement range, but repeated non-detections and low habitat suitability reduce the likelihood of regular use.	Occasional transient use cannot be ruled out given bat mobility; tree removal managed precautionarily via roost assessment and the FMP.	Low (development area); Moderate–High (SEA)

Table I3. Assessment of freshwater habitat types within the site against the EcIAG ecological value matters.

Freshwater values were assessed separately for each freshwater feature type, recognising that ecological value varies according to naturalness, hydrological function, habitat quality, connectivity, indigenous fauna use and historical modification. While some artificial or modified freshwater features have limited naturalness values, they may still provide habitat for indigenous fauna and contribute to the wider freshwater network.

Freshwater habitat type	Representativeness	Rarity / distinctiveness	Diversity and pattern	Ecological context	Overall ecological value
Permanent streams	Low–Moderate. Natural-origin permanent watercourses within the upper Ōrewa River catchment: the Ōrewa River main stem (a higher-order stream) and Waterloo Creek (a high-order permanent tributary), retaining defined channels and permanent flow, though modified by historical agricultural land use.	Moderate. Support a diadromous native fish community, including species of elevated conservation status (longfin eel, īnanga, giant bully). No rare standing-water or spring features.	Low–Moderate. Run-dominated with limited hydrological heterogeneity; macroinvertebrate diversity metrics (MCI-sb / QMCI-sb) within NPS-FM band D. Waterloo Creek supports better riparian vegetation than the main stem.	Moderate. Higher stream order and permanent flow; provide the connection to the Ōrewa Estuary and coast required by diadromous fish. Value primarily driven by fish and connectivity.	Moderate
Intermittent streams	Low. Natural-origin, low-order intermittent tributaries with small catchments, highly modified through historical straightening, deepening and farm drainage.	Low. Limited indigenous fauna use; may intermittently support shortfin eel. No rare or distinctive features.	Low. Silt / soft-bottomed, low hydrological heterogeneity, very low to no flow at survey; macroinvertebrate metrics within band D.	Low. Poor instream and riparian habitat; remain connected to the Ōrewa River and may provide intermittent habitat and passage for diadromous species.	Low
Ephemeral flow paths	Low. Convey flow only during and immediately after rainfall; minimal natural stream character.	Very low. No rare or distinctive values.	Very low. Little to no persistent aquatic habitat.	Very low. Contribute to catchment hydrology but limited habitat value.	Negligible

Freshwater habitat type	Representativeness	Rarity / distinctiveness	Diversity and pattern	Ecological context	Overall ecological value
Artificial drainage channels	Negligible–Low. Human-made channels for farm drainage on land not previously supporting a natural watercourse; excluded from the AUP stream provisions and NPS-FM 'river' definition.	Low. No rare habitat value or distinctive features.	Negligible–Low. Straightened, soft-bottomed, with limited diversity and habitat complexity.	Low. May provide limited habitat for mobile species (e.g. eels) where wetted habitat persists; connect to the drainage network.	Negligible–Low
Natural inland wetlands (development area – to be largely reclaimed)	Low. Small induced and seepage wetlands meeting the NPS-FM definition, associated with intermittent streams and stock-modified areas; modified condition.	Low. Dominated by common exotic rush, sedge and grass species; no Threatened or At Risk species; not rare or high-quality examples.	Low. Limited indigenous diversity, structural tiers and aquatic habitat.	Low. Small and fragmented within the modified development area, with stock modification present.	Low
Native-dominant wetlands (Te Korowai o Maraeariki – retained)	Moderate. Indigenous-dominant natural inland wetlands within the SEA and upper catchment: raupō reedland and *Machaerina* sedgeland (Singers et al. 2017).	Moderate. Indigenous wetland vegetation, uncommon in the wider modified landscape; a nationally threatened ecosystem type, though not high-quality examples.	Low–Moderate. Native-dominant, but small, narrow and linear, generally without a vegetated buffer.	Moderate. Within the SEA and upper catchment; provide local hydrological function; retained and to be enhanced under the proposed restoration.	Moderate
Constructed ponds	Low. Artificial standing-water features; excluded from natural inland wetland status under the NPS-FM.	Low. May support mobile species (e.g. eels) where connected; no rare values.	Low. Typically small, stagnant and unshaded, with poor-quality aquatic habitat and no buffering vegetation.	Low. Mostly isolated; one online pond connected to the freshwater network.	Low

Freshwater habitat type	Representativeness	Rarity / distinctiveness	Diversity and pattern	Ecological context	Overall ecological value
Freshwater fish and kōura	Moderate (permanent streams); Low (intermittent tributaries). The permanent watercourses (Ōrewa River main stem and Waterloo Creek) provide habitat for a diadromous native fish community; the intermittent tributaries are modified and provide only intermittent habitat and passage.	Moderate. Recorded/likely species include longfin eel, īnanga, giant bully and banded kōkopu (of elevated conservation status), plus kōura; associated primarily with the permanent streams.	Moderate (permanent streams); Low (intermittent tributaries). Best habitat in the permanent streams, including potential īnanga spawning in the main stem; tributaries intermittent and of low habitat value. Electric fishing recorded no fish (winter, low flow).	Moderate (permanent streams); Low (intermittent tributaries). Community reliant on connectivity to the coast; permanent streams provide the most valuable fish habitat, while tributaries provide only intermittent connectivity and habitat.	Moderate (permanent); Low (tributaries)
Macroinvertebrates	Low. Communities of the main stem and six SEV reaches, typical of degraded lowland pastoral streams.	Low. Tolerant-taxa dominated; EPT rare or absent; no rare taxa.	Low. Diversity metrics (MCI-sb / QMCI-sb) within NPS-FM band D at all sites.	Low. Low scores considered to reflect degraded in-stream habitat (main stem) rather than nutrient/organic enrichment.	Low

Appendix J
Fauna Management Plan (DRAFT)

VIRIDIS
Environmental Consultants

Milldale North Stages 14-17

DRAFT Fauna Management Plan

Prepared for: Fulton Hogan Land Development Limited

August 2026

DOCUMENT CONTROL AND REVISION HISTORY

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Author(s)		
	Brittany Pearce, BSc. CEnvP	Mark Delaney, MSc. (Hons)
	Senior Ecologist	Lead Ecologist
Reviewer(s)		
	Annabelle Coates, MSc. CEnvP	
	Senior Ecologist	

Reference: Viridis 2026. Milldale North Stages 14-17 DRAFT Fauna Management Plan. A report prepared for Fulton Hogan Land Development Limited by Viridis Limited. August 2026.

Cover photo: Examples of exotic trees amongst grazed pasture within the site (photo source: Viridis 2026).

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1 INTRODUCTION

This draft Fauna Management Plan (FMP) has been prepared to accompany the substantive application for the Milldale Stages 14-17 Project under the Fast-track Approvals Act 2024 (FTAA) by Fulton Hogan Land Development (FHLD).

It is intended that an updated FMP will be prepared by a suitably qualified ecologist and submitted to Auckland Council for certification before vegetation clearance or earthworks commence, in accordance with the relevant consent condition. The updated FMP will incorporate the final works design, vegetation-clearance extents, construction programme and staging, identified potential roost trees, confirmed lizard release site(s), Wildlife Act Authority requirements, project personnel and contact details, and the final consent conditions.

The approximately 231 ha site is centred around Wainui Road in Wainui, Auckland. The site is located within the Milldale development and is referred to as the Milldale Stages 14-17 subdivision areas ('the site').

This FMP outlines the recommended management measures for indigenous birds, lizards, and bats to mitigate and minimise potential adverse effects resulting from vegetation clearance and earthworks. The FMP has been prepared to address consent condition XX, which states:

[Final consent condition wording will be included once available]

A full description of the site's ecological context and values for indigenous fauna are provided in the Ecological Impact Assessment[1]. The terrestrial ecological values of the site were largely limited to exotic pasture, scattered exotic and pest plants amongst the agricultural setting, small exotic tree stands, and mixed native-exotic scrub, and are considered to be of low botanical value overall. The site provides varying habitat value for indigenous birds, lizards, and bats; a summary of the values relevant to the development area is provided at the start of each management section below (Sections 2, 3 and 4), with the EcIA providing the full assessment.

[1] Viridis 2026. Ecological Impact Assessment Milldale North Stages 14-17. A report prepared for Fulton Hogan Land Development Limited by Viridis Limited. August 2026.

2 AVIFAUNA MANAGEMENT

2.1 Summary of Avifauna Values

The avifauna community recorded within the Milldale area during site visits and via eBird.org records is relatively diverse, though dominated by common exotic and native species typical of urban, urban-fringe, and rural environments across the wider Auckland region. New Zealand pipit (*Anthus novaeseelandiae*; At Risk – Declining[2]) may occasionally use the site's pasture areas, although given the species' naturally low abundance, such use is expected to be infrequent.

Avifauna habitat within the development area is limited to isolated exotic trees, shelterbelts, and mixed riparian scrub along Waterloo Creek, providing only occasional, isolated habitat relative to areas of denser indigenous forest nearby. Small artificial ponds on site (refer EcIA Section 5.4) provide limited additional habitat for waterfowl. The highest-quality avifauna habitat, associated with the Significant Ecological Area (SEA) vegetation in the north of the site, will remain unaffected by works. Overall, avifauna ecological values within the development area are considered low.

The site does not currently provide suitable open, bare-ground habitat for New Zealand dotterel (*Charadrius obscurus aquilonius*; Threatened – Nationally Increasing**Error! Bookmark not defined.**), though as earthworks and pasture clearance progress and open ground becomes available, dotterels from the wider Milldale/Silverdale area may attempt to establish nests on site (refer Section 2.5).

Refer to the EcIA for the full avifauna assessment, including survey methodology and species list.

2.2 Statutory Protections and Management

Wildlife Act (1953) Authority

Most indigenous birds are legally protected under the Wildlife Act (and subsequent amendments). A Wildlife Act Authority (WAA) is required to capture, handle, and relocate native wildlife.

Resource Management Act 1991 (RMA)

Landscape features that provide significant habitat for indigenous species, including birds, are protected under the RMA (Section 6(c)). This includes ostensibly low value exotic vegetation that can support populations of native birds.

2.3 Potential Adverse Effects on Avifauna

The project requires earthworks and vegetation clearance. If indigenous birds are nesting within the affected area, potential adverse effects on birds may include:

Direct effects:

- Adult and chick mortality during physical clearance/construction works
- Injury during physical clearance/construction works

[2] Robertson H A, Baird, KA, Elliott G, Hitchmough R, McArthur N, Makan T, Miskelly C, O'Donnell CF, Sagar PM, Scofield RP, Michel P 2021. Conservation status of birds in Aotearoa New Zealand, 2021. Department of Conservation, Te Papa Atawhai. 2021.

Indirect effects:

- Temporary loss of habitat
- Temporary noise and dust disturbance
- Disruption to nesting and breeding behaviour

Site development cannot be achieved without vegetation removal, and therefore potential adverse effects on native birds cannot be entirely avoided. Adult birds are highly mobile and expected to move to nearby unaffected habitat once disturbance commences. Nesting birds and chicks that have not fledged are unable to move away. Therefore, managing effects on birds requires mitigation through monitoring for nests, signs of nesting activity and displays of breeding behaviour.

To mitigate the effects of direct mortality and indirect disturbance on breeding and nesting birds and their eggs, the following protocol will be followed for all vegetation that will be cleared.

2.4 Avifauna Survey and Management

2.4.1 Timing

In the first instance, vegetation clearance between 1st September and 28th (or 29th) February should be avoided where practicable. This is the main bird breeding season for most species, although some species will nest outside of this period.

If vegetation clearance occurs within this time frame, the nesting bird survey protocols will be adopted, as detailed below.

2.4.2 Nesting survey

- A survey will be undertaken to identify if and/or where native bird nesting behaviour (including courtship, nest building, and active nesting) is occurring.
- The survey will be completed by an appropriately qualified ecologist.
- The survey will include inspections for tree cavities, tree nests and ground nesting species such as pūkeko.
- Where no nesting behaviour or activity is observed, the vegetation may be cleared within 24 hours of the survey being completed. If clearance does not occur within 24 hours, the area must be surveyed again to verify the absence of nesting behaviour prior to clearance.
- If nesting behaviour, or an active nest is located, an exclusion area with a radius of 10 m will be demarcated around the tree (or nest if it is a ground nest) and works shall be avoided within this cordon until it has been confirmed by the appropriately qualified ecologist that all nestlings have fledged. Following this confirmation, the vegetation may be cleared.

2.5 Inadvertent Bird Injury or Mortality

If a native bird is found injured or dead during vegetation clearance, the following steps will be taken:

- Injured native birds will be placed in an appropriate carrying box/cloth bag and immediately transported to a veterinarian for assessment.
- If the species has a conservation status of At Risk or Threatened, the local Department of Conservation (DoC) office will be contacted as soon as practicable, but within 24 hours.

- All deceased birds (including those found dead on site, or any that are ultimately euthanised by a veterinarian) will be transported to the local DoC office as soon as practicable.
- All injuries or mortalities will be accurately recorded and reported to DoC on request.

Native bird management is required in all areas where vegetation clearance will occur, including the grassed paddock areas and fence lines on the site.

2.6 Management of Dotterels

Although New Zealand dotterels are known from the wider area, the site does not currently provide suitable habitat for the species. However, earthworks and vegetation clearance will create areas of open, bare ground that may provide temporary nesting habitat during construction. New Zealand dotterels are known to establish nests within active construction sites where suitable conditions arise.

2.6.1 Dotterel deterrence

From July onwards, New Zealand dotterels begin prospecting for breeding territories. Weekly inspections of the works area should therefore be undertaken to determine whether dotterels are present. Breeding dotterels are territorial and typically display defensive behaviour in response to perceived threats, including people. This may include alarm calls, running ahead of a potential threat to distract and draw it away from the nest or chicks (a 'rat run'), or feigning injury (a 'broken-wing' display). Site inspections should specifically look for these behaviours, as they may indicate that a nest or chicks are present nearby.

The most effective way to manage dotterels within an active construction site is to discourage them from establishing nests in the first instance. From early July onwards, one or more of the deterrence methods outlined in Table 1 should therefore be implemented within areas of suitable nesting habitat.

Table 1. Dotterel deterrence options (adapted from NZTA, 2012[3]).

Method	Description	Likelihood of success	Comments
Long grass	Allow grass to grow long so it is not considered a good place for dotterels to lay eggs	High	Leave grass to grow from at least April to ensure it is long
Machinery*	Park large machinery close to where dotterels are showing an interest. Start the engine from time to time	Moderate	Machinery cannot be left for long periods, or the birds may get used to it
Silt fences	Erect shade cloth at knee height. Place in rows. Space at 5-10 m	High	These fences obscure dotterel vision from nesting sites as they actively seek areas with good sight lines
Metallic or reflective tape	Streamers attached to posts that flutter when there is wind	Moderate	Works for a short time (up to three weeks) and then birds habituate

*To be used in early to mid-July only. If nests establish, movement of machinery increases the risk of nest damage.

The likelihood-of-success ratings in Table 1 are based on known New Zealand dotterel behaviour. However, dotterels may become habituated to construction activities and deterrents over time. For example, machinery left stationary for prolonged periods may cease to act as a deterrent, while

[3] NZTA. 2012. Guidance in Relation to New Zealand Dotterels on NZTA Land. NZ Transport Agency, Wellington.

reflective tape may become ineffective within several weeks. Measures that modify the site to reduce its suitability or attractiveness for nesting are therefore considered the most effective longer-term options.

2.6.2 Eggs found within the construction zone

If a New Zealand dotterel nest or eggs are found within the construction zone despite the implementation of deterrence measures, the following procedure must be followed:

- All works within 50 m of the nest must cease immediately, and all personnel must leave the area.
- The project ecologist must be contacted as soon as practicable.
- If the nest location needs to be marked, markers must be positioned at least 10 m from the nest. Where necessary, two markers may be placed on opposite sides of the nest, each set back by at least 10 m.
- The project ecologist will confirm the appropriate exclusion area and monitor the nest at least weekly until the nesting attempt has concluded. Chicks typically fledge approximately 6-7 weeks after hatching. Works within the exclusion area may recommence only once the project ecologist has confirmed that the nest is no longer active and any chicks have fledged or permanently left the area.

3 HERPETOFAUNA MANAGEMENT

3.1 Summary of Herpetofauna Values

The development footprint supports low-value lizard habitat overall; isolated rank grass and scattered debris of poor quality and connectivity, where no native lizards were recorded during comparable intensive salvage on the adjacent Milldale Stages 10-13 site[1]. The mixed native-exotic riparian scrub along Waterloo Creek, within the development area, is of moderate value and may support copper skink (*Oligosoma aeneum*; At Risk – Declining) and, less likely, ornate skink (*Oligosoma ornatum*; At Risk – Declining)[4].

Arboreal gecko species recorded in the wider area (forest and elegant gecko) require indigenous forest or shrubland habitat that is not present within the development footprint, and are not expected to be encountered during works. Refer to the EcIA for the full herpetofauna assessment, including survey methodology and species list.

3.2 Statutory Protections and Management of Lizards

Wildlife Act (1953) Authority

All indigenous lizards are legally protected under the Wildlife Act (and subsequent amendments). A WAA is required to capture, handle, and relocate native wildlife.

Resource Management Act 1991

Landscape features that provide significant habitat for indigenous species are protected under the RMA (Section 6(c)). This includes ostensibly low value exotic vegetation that can support populations of native lizards.

3.3 Potential Adverse Effects on Lizards

The project requires earthworks and vegetation clearance. If indigenous lizards are present within the affected area, potential adverse effects on lizards may include:

Direct effects:

- Lizard mortality during physical clearance/construction works
- Injury during physical clearance/construction works

Indirect effects:

- Temporary loss of habitat
- Temporary noise and dust disturbance

Site development cannot be achieved without vegetation removal, and therefore potential adverse effects on indigenous herpetofauna cannot be avoided. Managing the effects on lizards requires mitigation through a salvage and relocation programme and potential release site habitat enhancement.

[4] Hitchmough R, Barr B, Knox C, Lettink M, Monks JM, Patterson GB, Reardon JT, van Winkel D, Makan T, Michel P 2026. Conservation status of reptiles in Aotearoa New Zealand, 2025. Wellington: Department of Conservation. New Zealand Threat Classification Series 50.

3.3.1 Project herpetologist

A suitably qualified herpetologist or ecologist ('project herpetologist') is required to implement all herpetofauna management, and a WAA to capture and relocate indigenous lizards is required.

3.4 Search and Capture Methodology

Lizard capture and relocation will be associated with consented vegetation clearance activities through the methods outlined in this section.

3.4.1 Timing of activities

Vegetation clearance should occur between October and April (inclusive); lizard salvage activities are confined to warmer months when lizards are the most active and likely to be detected if present.

All lizard management activities are required to be undertaken during fine, calm, and dry weather.

3.4.2 Destructive searches

Destructive searches will be undertaken by the project herpetologist prior to vegetation removal, in coordination with the appropriate contractor undertaking the clearance works. This will involve systematic manual searches of suitable habitat (e.g. log piles, tree bark) and destruction of habitat where practicable. Leaf litter, ground cover vegetation and small debris may be hand-raked, and larger debris overturned to search for refuging lizards.

3.4.3 Felled trees searches

Destructive searches involve searching through branches and foliage of felled vegetation. The crowns of large trees shall be felled intact as far as practicable. All branches and foliage of felled vegetation will be thoroughly searched. Where practicable, the crowns of any larger trees that cannot be fully searched after felling should be left in any areas of vegetation to remain on site, to allow any undetected lizards to disperse naturally.

3.4.4 Construction (machinery) assisted searches

Suitable ground cover will be searched during machine-assisted clearance. The machine will be fitted with a toothed scraping bucket (or similar) during vegetation clearance to lift habitat such as non-woody vegetation, logs, and debris piles.

Machine-assisted searches will continue until all habitat for lizards has been removed and there is no suitable habitat for native lizards remaining within the affected area, as assessed by the project herpetologist.

3.4.5 Post-clearance search

At the conclusion of the machine-assisted searches and vegetation clearance, the suitably qualified ecologist would undertake a final site walk over to detect any remaining lizards.

3.4.6 Lizard handling and containment

All indigenous lizards found during the destructive searches, machine-assisted searches and post-clearance search, will only be captured and handled by, or under supervision of, the DoC-authorised suitably qualified ecologist. Hands should be sterilised before and after handling lizards, along with all field equipment that indigenous lizards may encounter.

All captured lizards would be placed in a holding container(s) with adequate ventilation and kept at ambient temperature. Vegetation, soil and leaf litter from the capture site will be placed in the box to

provide shelter and protection during containment/transport. Lizards would only be held temporarily for the period of the active searches or trap inspections, before being released at the approved relocation site (refer Section 3.6).

It is not anticipated that lizard taxa with conservation statuses higher than 'At Risk' would be encountered on-site. However, if 'Threatened' lizard species were encountered, the individual(s) would be captured and temporarily contained, and the local DoC office contacted for further instruction.

3.5 Inadvertent Lizard Injury or Mortality

The following steps will be implemented should any injured or dead indigenous lizards be found during the vegetation clearance activities:

- The project herpetologist would notify DoC at soon as possible (within 24 hours);
- Any lizard death of 'Threatened', 'At Risk' or 'Data Deficient' species shall be sent to Massey University Wildlife post-mortem service for necropsy. The body should be chilled if it can be delivered within 24 hours, or frozen if delivery will take longer than 24 hours;
- Where appropriate, measures shall be undertaken to minimise further lizard deaths;
- Injured lizards found during salvage will be taken to a suitably qualified vet as soon as possible for assessment and treatment. Injured lizards will be kept in an appropriate portable enclosure (i.e., a clean, well-ventilated plastic container) under the direction of the project herpetologist to ensure the lizard is handled appropriately until it can be treated;
- Lizards assessed by the vet or alternative specialist as uninjured, or otherwise in suitable condition for release, would be transported to the relocation site in the portable enclosure and released; and
- Euthanasia of an injured lizard is only to be undertaken under direction from DoC.

3.6 Release Site

All salvaged indigenous lizards are required to be released into an approved release site. Factors that should be considered when selecting a release site include ecological appropriateness, long-term security, habitat suitability, and protection from predators and future human disturbance (DoC Lizard Technical Advisory Group, 2019). Key considerations include, but are not limited to, the following:

- It is important that the release site is an appropriate distance from the project footprint to prevent the lizards from re-entering the works area. However, the release site should be located as close as possible to the salvage site to help retain similar microhabitats and environmental conditions.
- The habitat within the release site should be representative to, or of higher ecological value than the salvage site.
- Areas with long-term protection should be favoured, such as reserves managed by DoC or Council, vegetation covenants or areas protected by Auckland Unitary Plan provisions (e.g., SEA overlay, riparian habitat).
- Potential existing species composition and density at the release site should be considered as far as practicable, to limit potential adverse effects of intra- and inter-species competition at the release site.

3.6.1 Proposed release site

It is generally preferred that lizards are relocated within or adjacent to the project footprint as far as practicable, to maintain local biodiversity and reduce the risk of adverse effects that may occur with longer distance relocations. A key consideration of relocation is ensuring the habitat suitability (quantity and quality) is present to support relocated lizards.

[Details within this section will be included in the final FMP, to be confirmed by the project herpetologist prior to works commencing. Based on current site information, the retained SEA in the north of the site is anticipated to provide a suitable release site option, given its higher habitat value, indigenous vegetation, and long-term protection, subject to confirmation of habitat capacity and the density of any existing resident lizard population. Additional release sites within the surrounding environment may also be recommended, including unaffected vegetation within the Waterloo Creek riparian margin. A figure showing potential release sites will be included.]

3.6.2 Habitat enhancement

Refuge structures (e.g., felled logs, rocks, branches) should be recovered prior to vegetation clearance by the project herpetologist and relocated into the release sites. In addition, if five or more indigenous lizards are captured for relocation, the implementation of supplementary refugia is also recommended prior to lizard release. The provision of permanent refuges, including but not limited to log piles, natural debris (e.g. decaying vegetation), artificial cover objects (e.g., Onduline sheets) and rock piles should be installed to supplement the natural refuges already present. Salvaged skinks would be released beneath these refuge structures to provide immediate protection.

3.7 Capture Trigger

If more than 20 native lizards are captured, then contact should be made with DoC immediately to discuss the next steps. These may include continuation with the current programme, additional habitat enhancement and/or protection, or the requirement of additional permits.

3.8 Completion Reporting

A completion report or Amphibian/Reptile Distribution Scheme (ARDS) Card will be prepared by the project herpetologist and submitted to Auckland Council within 30 days of the completion of all vegetation removal. The information provided should detail the number of lizards captured and the locations they were captured from, and whether any post-release monitoring (and timing) is recommended based on the number of lizards salvaged.

4 BAT MANAGEMENT

4.1 Summary of Bat Values

Multiple bat surveys undertaken within the Milldale area in recent years have not detected bats[1]. The closest long-tailed bat records are approximately 3.7-6 km from the site (DoC database, accessed June 2026), and increasing urban development to the south is likely to have further reduced the area's favourability for bats. On the basis of this consistently low detection across repeated survey effort, the Milldale area is not considered a high bat-use area.

Mature trees within the development area, including shelterbelts and isolated specimens (e.g. pine, she-oak, crack willow), provide only limited, low-quality potential roosting habitat, being exposed, isolated and poorly connected. Bat habitat within the development area is therefore assessed as being of low value. Despite this, given the mobility of long-tailed bats, occasional transient use of the site cannot be discounted, and the precautionary pre-felling procedures in Section 4.5 apply accordingly. The SEA in the north of the site provides higher-quality potential habitat but will remain unaffected by works.

Refer to the EcIA for the full bat assessment, including survey methodology and regional records.

4.2 Management Overview

All tree removal should occur under the following protocols. The protocols are required to minimise the likelihood of adverse effects on potentially occupied bat roosts as vegetation is cleared. They have been written in general accordance with the *Protocols for minimising the risk of felling bat roosts* prepared by the New Zealand Bat Recovery Group[5].

4.3 Statutory protections and management of bats

Wildlife Act (1953) Authority

All bats present in New Zealand are indigenous and are legally protected under the Wildlife Act (and subsequent amendments). A WAA is required to capture, handle, and relocate native wildlife.

Resource Management Act 1991

Landscape features that provide significant habitat for indigenous species are protected under the RMA (Section 6(c)). This includes ostensibly low value exotic vegetation that can support populations of native bats.

4.4 Identification of Potential Roost Habitat

All trees to be removed within the site will be visually assessed prior to vegetation clearance by a Competent Bat Worker[6] (CBW) accredited in Competency 3.3[6]. Each tree will been classified as a 'potential roost tree' (PRT), or low risk.

Low risk trees (trees not identified as PRTs) can be felled at any time, but may still be subject to requirements of other fauna management measures, such as bird nesting checks.

[5] DoC 2024. Protocols for minimising the risk of felling occupied bat roosts (Bat Roost Protocols). Dated October 2024.

[6] A person who has been certified by DoC's Bat Recovery Group as 'competent' to undertake a particular bat management activity.

PRTs typically have a diameter at breast height (DBH) of ≥ 150 mm, and exhibit one or more of the following features that could potentially support roosting bats:

- Holes, cavities, crevices, cracks and/or fractured limbs
- Hollow trunks and/or branches
- Loose, flaking bark, or deep incised bark crevices
- Deadwood (including debris caught in tree forks) or dense epiphyte communities in the canopy or on the trunk
- Evidence of bat droppings, grease marks and/or urine staining around cavities

All PRTs will be clearly identified prior to clearance commencing, and marked out on site (e.g., using brightly coloured spray paint or flagging tape). The locations of all PRTs will be marked using a GPS device and numbered for reference. [A map showing the identified PRTs will be provided in final FMP].

PRTs will be subject to a pre-felling assessment. Pre-felling assessments will be undertaken by a CBW accredited in Competency 3.1.

4.5 Pre-felling Procedures for PRTs

PRTs should only be cleared between 1st October and 30th April to align with the warmer season when bats are most active. A CBW certified in Competency 3.1 will be present to supervise the clearance of all PRTs. They must be available during the vegetation removal stages to respond immediately to any incidental discoveries of bats during felling.

During tree clearance the following procedures must be adhered to:

- All PRTs will be acoustically monitored using ABMs for two consecutive nights during optimal weather conditions[5] (Table 2) immediately prior to vegetation removal. Results will be analysed by the CBW the following morning as early as possible.
- Where a night does not meet optimum conditions[5] (Table 2), monitoring must continue to take place until a total of two consecutive nights of optimum conditions have been monitored.

Table 2. Optimal weather conditions required for bat surveys derived from DoC 2024 guidelines[5].

Component	Conditions
Timing	Begin one hour before sunset and end one hour after official sunrise
Temperature	Temperatures of 8°C or higher for the first four hours after official sunset
Wind	Little to no wind of ≤ 20 km/hr for the first four hours after official sunset
Precipitation	Little to no precipitation (≤ 2.5 mm) in the first four hours after official sunset

If bats are **not** recorded:

- The CBW will notify the site manager immediately after data is reviewed, and permission will be given to clear the monitored vegetation on the same day. If vegetation removal does not take place on the day that the ABM data is checked, monitoring will continue until clearance occurs and the CBW confirms no bats are present.

If bats **are** recorded:

- The site manager shall be notified immediately after reviewing the data and the affected PRTs cannot be cleared until additional investigations have been completed, as follows:
    - The ABM survey will continue until no bat activity has been recorded for two consecutive nights;

      OR

    - The suspected roost(s) will be visually inspected by a climbing arborist with an endoscope who can undertake roost checks under the guidance of the CBW. The arborist will take photos of any signs of bat (or roost) presence observed. At the time of visual inspections, the CBW may also use a thermal camera to inspect potential roost features from the ground;

      OR

    - At least two consecutive emergence and re-entry watches at dusk and dawn will be undertaken immediately prior to the felling, to confirm bats have not entered (or have vacated) the tree/s. Roost watches will be led by a CBW accredited in Competency 3.2.
- The PRT(s) containing potential roosts will be clearly marked and a 10 m radius exclusion zone established whilst assessments are ongoing. The zone will be identified with fencing or other appropriate materials. All relevant site workers will be notified the area must be left undisturbed.
- Representatives from DoC and Auckland Council will be informed by email, of the relevant information, including photos if available.
- If bats are still known to be roosting in the PRT(s) after seven nights, a meeting will be held between the CBW, site manager, DoC and Council (as required) to determine an appropriate way forward.
- Immediately following clearance of PRT(s), trees will be inspected for bats and evidence of bat roosts by the CBW.

4.6 Inadvertent Bat Injury or Mortality

If any live bat is found during or after vegetation clearance and is unable to fly away, it will be placed immediately in a clean, dark cotton bag kept at ambient or slightly warmer temperature. No more than two bats will be housed in a single bag, which will be secured for safe transportation (e.g. within a labelled cardboard box). Handling will be kept to a minimum to reduce stress, and noise levels during transportation will be minimised.

The bat will be taken without delay to a veterinarian for assessment. The site manager and relevant representatives from DoC and Council will be notified as soon as practicable, and within 24 hours of the bat being found. Any bat that is found dead or euthanised by the veterinarian will be sent to DoC. If the veterinarian confirms the bat is uninjured, it will be transported back to the site in the cotton bag and released into a temporary artificial roost box. The roost box will be suspended within a tree outside, but as close as possible to, the location where the bat was found. The box will be installed prior to dusk on the same day to allow the bat to leave at its own discretion.

4.7 Mitigation

If bats are detected on site during the initial comprehensive survey and/or pre-felling surveys, mitigation in the form of habitat enhancement will be required if vegetation to be cleared is identified as suitable for bat nesting/roosting.

To replace roosting habitat following vegetation clearance, artificial bat roost boxes will be installed in an area suitable for roosting, as directed by the CBW. Emphasis should be placed on the established riparian bush areas or Significant Ecological Areas (SEAs) in the immediate surrounding environment, as they will be largely protected from future vegetation clearance.

The number of roost boxes will be installed at a rate of one for every 10 PRTs removed. The boxes should be installed at a minimum height of 4 m, with no clutter within 2 m of the box opening. 'Possum bands' will be wrapped around each tree where a box is installed to deter mammalian predators. Any bat box installed must be checked annually to remove any nesting materials that have been brought in by birds. In recent years, several bat box designs have been installed in New Zealand that may be suitable for use within the site, including:

- A timber 'Kent' bat box design (Auckland Council);
- A timber 'Microbat box' design (Auckland Council);
- A bespoke timber design similar to the 'Kent' (Waikato Regional Council); and
- Four Schwegler 'woodcrete' designs (models 2F, 2FN, 1FF and 1FD; DoC, South Canterbury).

Address | Unit A1, 72 Apollo Drive, Mairangi Bay, Auckland 0632
Post | PO Box 301709, Albany, Auckland 0752
Telephone | 64 9 475 5750
Email | contact-us@viridis.co.nz

www.viridis.co.nz