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Delmore Fast-track Application

Ecological Impact Assessment

Prepared for: Vineway Limited

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Cover photo: The Site looking southeast towards the dwelling on 53B Russell Road.

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1 INTRODUCTION

Vineway Limited (Vineway) engaged Viridis Limited (Viridis) to undertake an ecological impact assessment (EcIA) of the proposed development of approximately 109 ha of land in six contiguous lots (88, 130 and 132 Upper Ōrewa Road and 53A, 53B and 55 Russell Road, 'the Site') under the Fast-track Approvals Act 2024 (FTAA). The location of the Site is shown in Figure 1 and the site extent in Figure 2. The Site is zoned as 'Future Urban Zone' under the Auckland Unitary Plan Operative in Part (AUP-OP).

The development involves subdivision of the Site and construction of a master-planned urban, residential development of approximately 1,213 dwellings. The subdivision and construction will occur in two stages, comprising a total of six substages. Preparatory earthworks across the Site comprises cut of 1,220,000 m^3 and fill of 1,220,000 m^3 over an area of approximately 61 ha.

The designated two lane urban arterial road, running from SH1 and Grand Drive in the east along the Site's northern side and then down its western side to the southern boundary of the subject Site in Stage 1, will be constructed as part of the project. There will be walking and cycling infrastructure along the side of this road.

Walkways will be provided throughout the Site, with some routes provided from the Site towards the Scenic Reserve to the north. Two neighbourhood parks are proposed: one within the centre of Stage 1 and the other in the centre of Stage 2. Existing riparian native vegetation will be restored and further enhancement planting will be undertaken. Existing areas of vegetation subject to consent notices will also be restored and enhanced with planting in places. These green spaces will be supported by on-street planting. This will see 26.9 ha of existing natural environment remain across the Site, and 31.8[1] ha of revegetation and replanting. These areas are to be maintained, protected and enhanced, and comprises a significant proportion of the total Site area.

This report has been prepared to support a substantive application under the FTAA and discusses the ecological effects of the proposal[2]. Where appropriate, recommendations have been provided to aid in the avoidance, minimisation and remediation of adverse effects that could arise as a result of the proposed works.

An ecological assessment of the Site and neighbouring environment identified the presence of 39 intermittent and permanent streams and 36 natural wetlands. Terrestrial features identified included pine plantations, exotic dominant vegetation, mature native dominant vegetation, planted native vegetation and gorse scrub. The Site provides potential habitat for threatened native species, including bats, lizards, birds and fish. No threatened plant species were identified. The proposal is expected to have an overall low level of effect on the ecological values of the area. The proposed mitigation and planting measures will ensure the adverse effects on the ecological values of the Site are minimised and in fact provide for a large net biodiversity gain. The assessment has been informed by relevant regulations, including 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, amended in October 2024 (NPS-IB).

[1] Excludes planting associated with slope stabilisation, stormwater ponds and wetlands

[2] Effects of the proposed wastewater discharge is assessed separately (Viridis 2025).

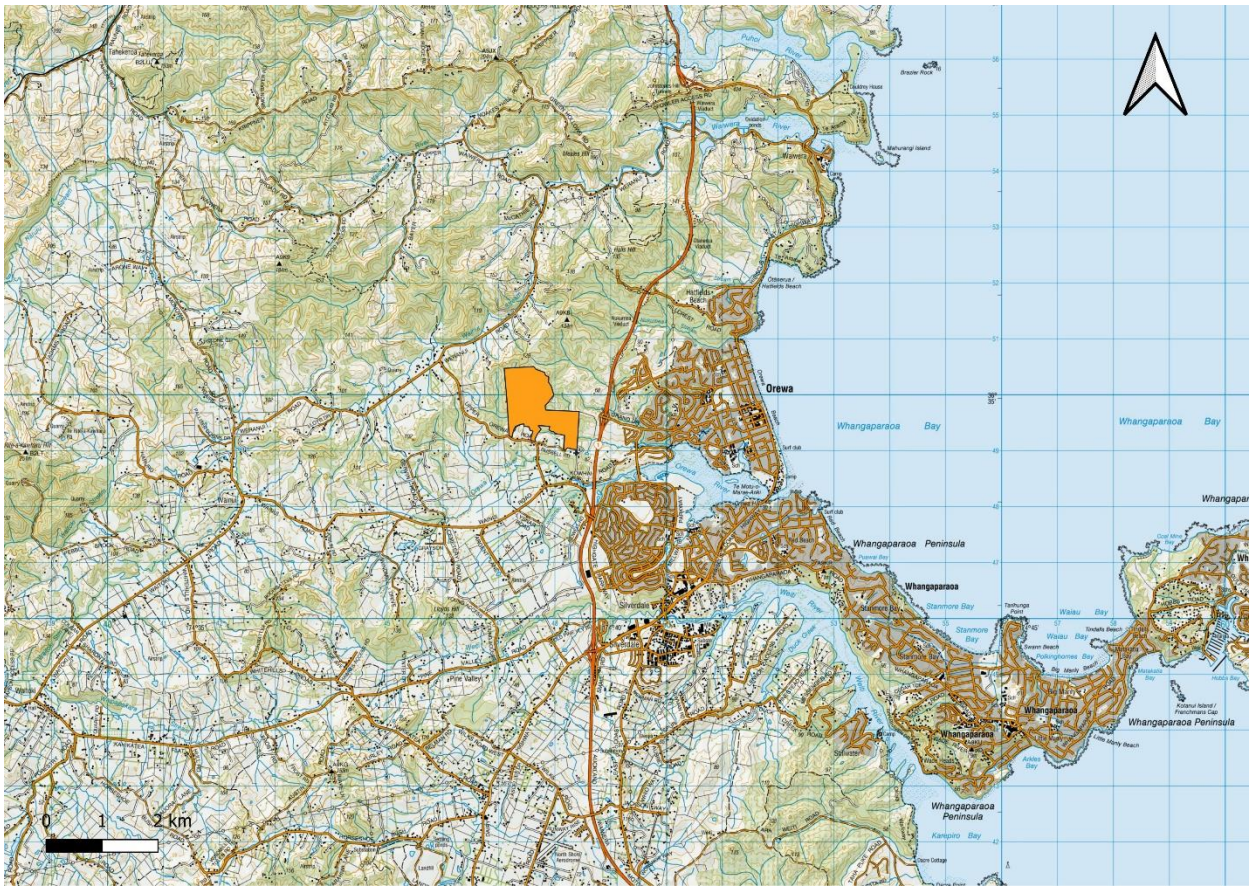

Figure 1. Site location as indicated by orange polygon (map source: LINZ NZ Topo 50).

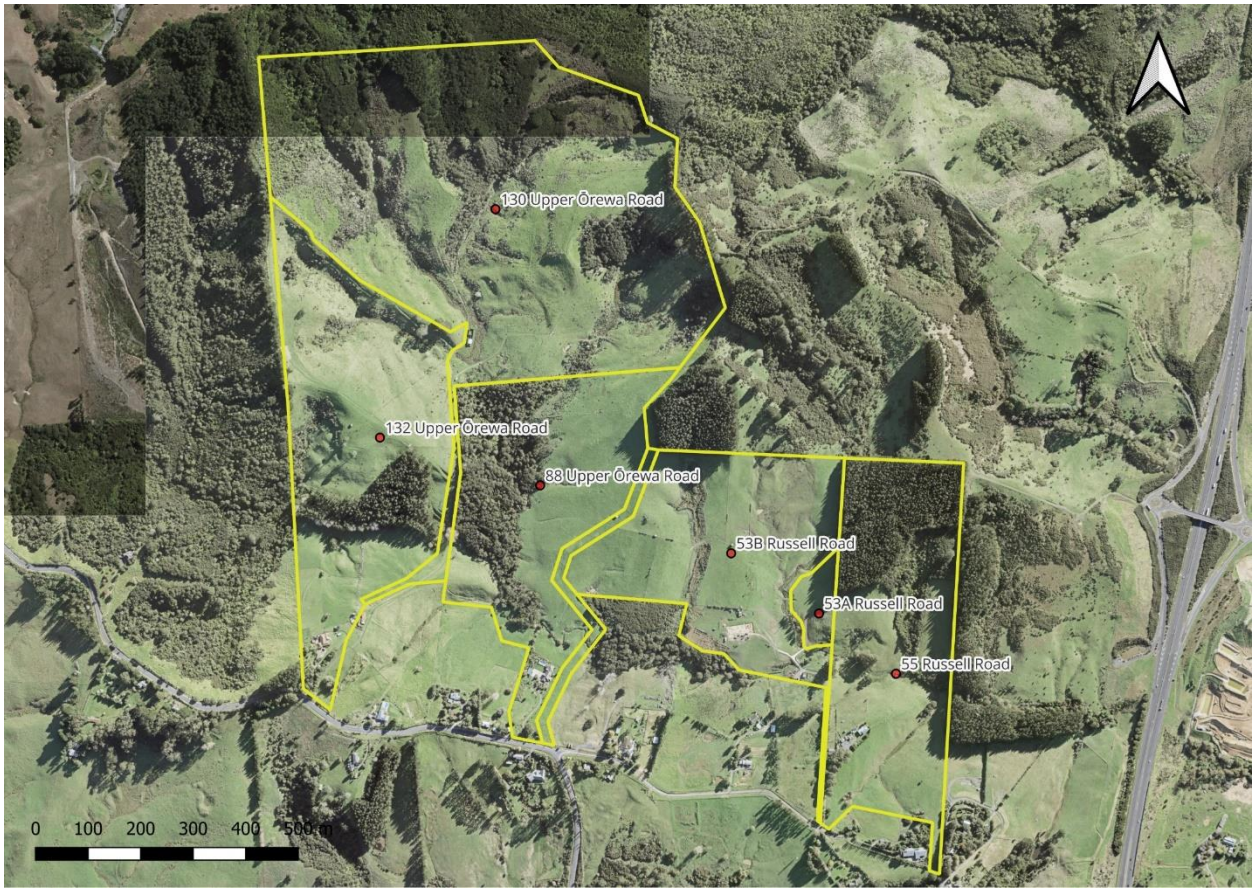

Figure 2. Site extent (aerial source: LINZ Auckland 0.075 m Urban Aerial Photos (2017) & Auckland 0.075 m Rural Aerial Photos (2020)).

2 METHODOLOGY

2.1 Overview

The assessment included a desktop review and site visits, undertaken by a suitably qualified ecologist. The desktop review involved an examination of current and historical aerial imagery of the Site, during which factors such as changes in vegetation and surface water were noted. A review of data on Auckland Council's Geomaps (such as current biodiversity layers, predicted watercourses and Site topography) was also undertaken.

Multiple site assessments were completed in 2023, 2024, and 2025, with the most recent undertaken in December 2025. During site assessments the presence and extent of freshwater and terrestrial features within the property and surrounding area were recorded and the quality of associated habitat (if any) was visually assessed, in accordance with the methodology detailed in Sections 2.2 through 2.3, below.

2.2 Terrestrial Ecology

The ecological values of terrestrial features were determined in accordance with the methodology prescribed in the Environment Institute of Australia and New Zealand (EIANZ) guidelines (refer Section 2.4). This approach was applied across all site assessments to ensure consistency in evaluating habitat presence, extent, condition, and ecological value.

2.2.1 Vegetation

The botanical value of both exotic and native vegetation was recorded during the 2023, 2024, and early 2025 site assessments. These assessments considered vegetation quality, extent, and connectivity, with attention given to how vegetation patterns contribute to habitat function across the Site and its wider context.

A detailed botanical survey commenced in November 2025, with further work currently ongoing. To date, representative 10 m by 10 m plots have been established within vegetation proposed for removal (Figure 1). Within each plot, data were collected for woody plant species on native canopy cover, species richness, native dominance, diameter at breast height (DBH), and basal area (Appendix A).

Additional botanical surveys are planned for late December 2025. These will include systematic identification of all vascular plant species encountered, with particular focus on Threatened or At Risk taxa and any regionally uncommon or notable species. Once these data are available, results will be analysed and a report addendum will be prepared.

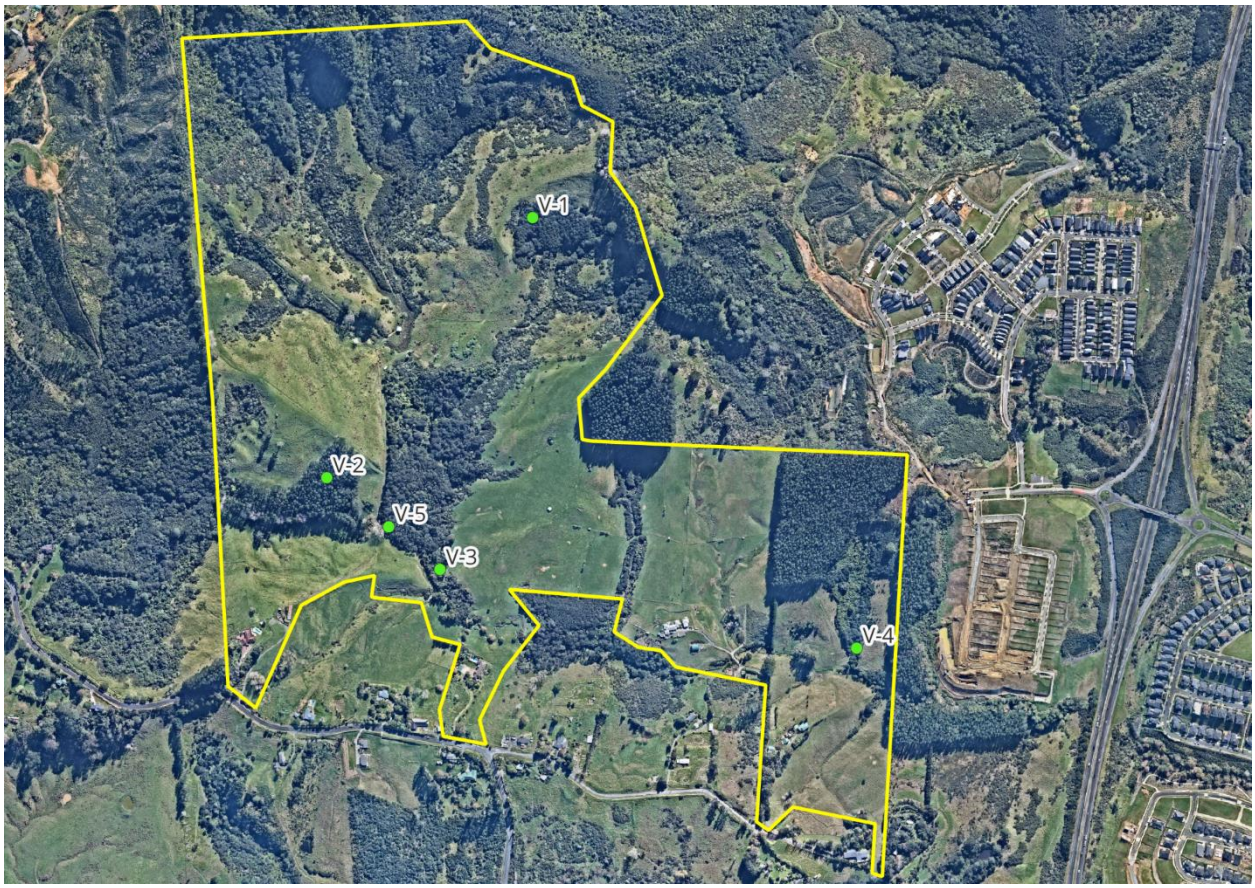

Figure 3. Vegetation plot locations.

2.2.2 Avifauna (birds)

Avifauna habitat was assessed qualitatively during the 2023, 2024, and early 2025 site assessments, supported by a review of relevant records from databases (e.g., eBird and iNaturalist). Opportunistic sightings of avifauna were recorded, and the conservation status of the species, as defined in Robertson et. al. (2021), was noted.

Dedicated avifauna surveys are currently underway and are expected to conclude in late December 2025. Surveys include seven standardised five-minute bird counts at key locations across the Site, supplemented by two dawn surveys at two locations using call playback to target cryptic wetland species (Figure 4). A six replicate eDNA survey scheduled for late December 2025 within the middle catchment of the Site will complement field observations, particularly for cryptic or low detectability species. When survey data are available, findings will be analysed and incorporated into a report addendum.

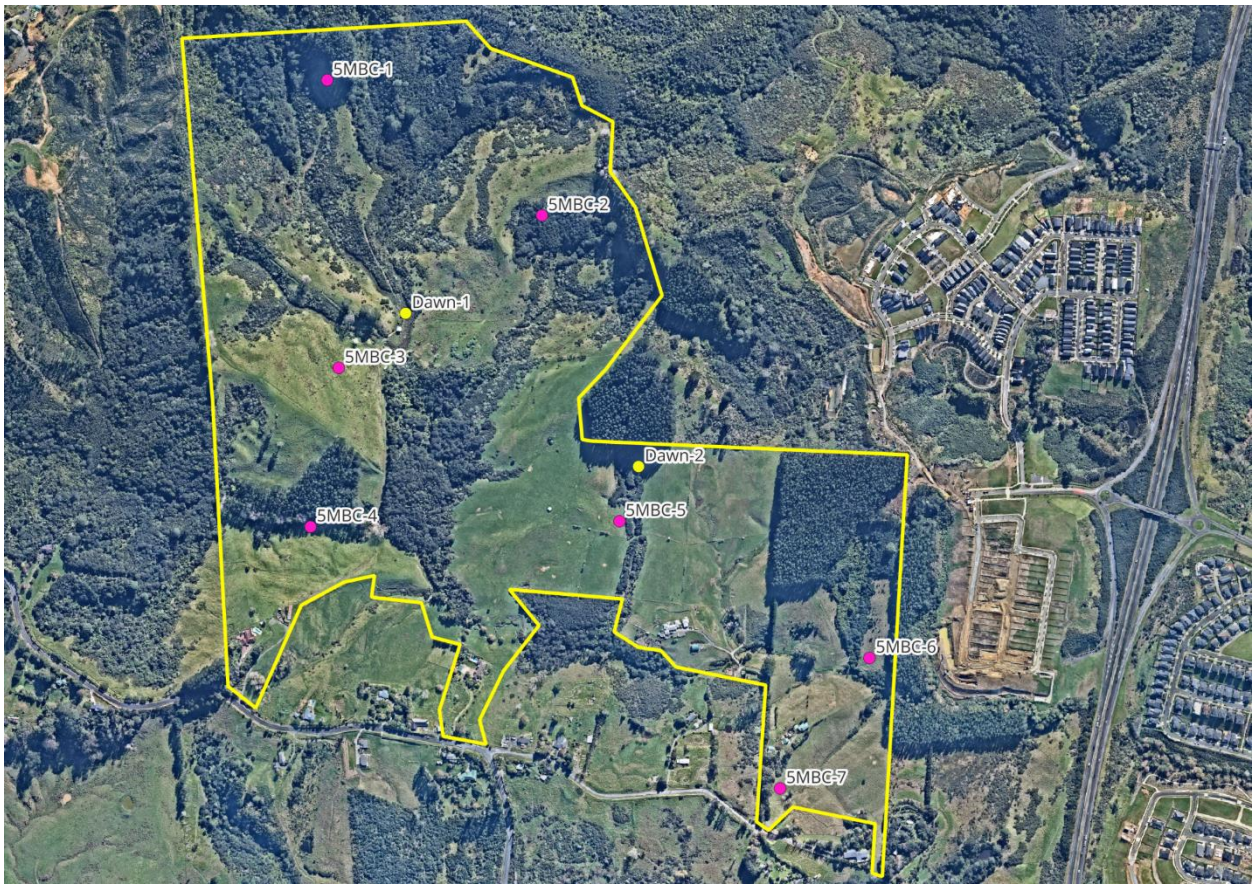

Figure 4. Avifauna survey locations.

2.2.3 Herpetofauna (lizards)

Herpetofauna habitat was assessed qualitatively during the 2023, 2024, and early 2025 site assessments, supported by database reviews (e.g., Department of Conservation (DoC) ARDs and Bioweb). A review of relatively recent lizard surveys undertaken in the local area in 2017-2022 was also completed (Bioresearches 2025).

Dedicated herpetofauna surveys are currently underway and are expected to conclude in late December 2025. Survey methods include deployment of 120 Artificial Cover Objects (ACOs) and 24 pitfall traps across key habitat locations. Traps and ACOs will be checked over multiple survey rounds to account for variable activity patterns and weather conditions. Two nocturnal spotlighting surveys will also be undertaken. A six replicate eDNA survey scheduled for late December 2025 within the middle catchment of the Site will further support detection of cryptic or hard to observe species. Once complete, results will be analysed and presented in a report addendum.

2.2.4 Chiroptera (bats)

Bat habitat was assessed qualitatively during the 2023, 2024, and early 2025 site assessments, supported by database reviews (e.g., DoC Bat Observations Map). Recent survey information from the local area, including surveys completed in 2017 and 2022 to 2023, was also reviewed to provide additional context on potential species presence and activity (Bioresearches 2025, Cullen 2023).

Dedicated bat surveys are currently underway and are expected to conclude in late December 2025. Ten Acoustic Bat Monitors (ABMs) were installed at key locations across the Site, including likely flyways, riparian margins, vegetation edges, and open pasture interfaces. ABMs will remain in place for a minimum of three weeks to ensure at least two weeks of valid survey nights are captured under suitable

weather conditions. A six replicate eDNA survey scheduled late December 2025 within the middle catchment of the site will complement the acoustic monitoring. Once data is available, results will be analysed and summarised in a report addendum.

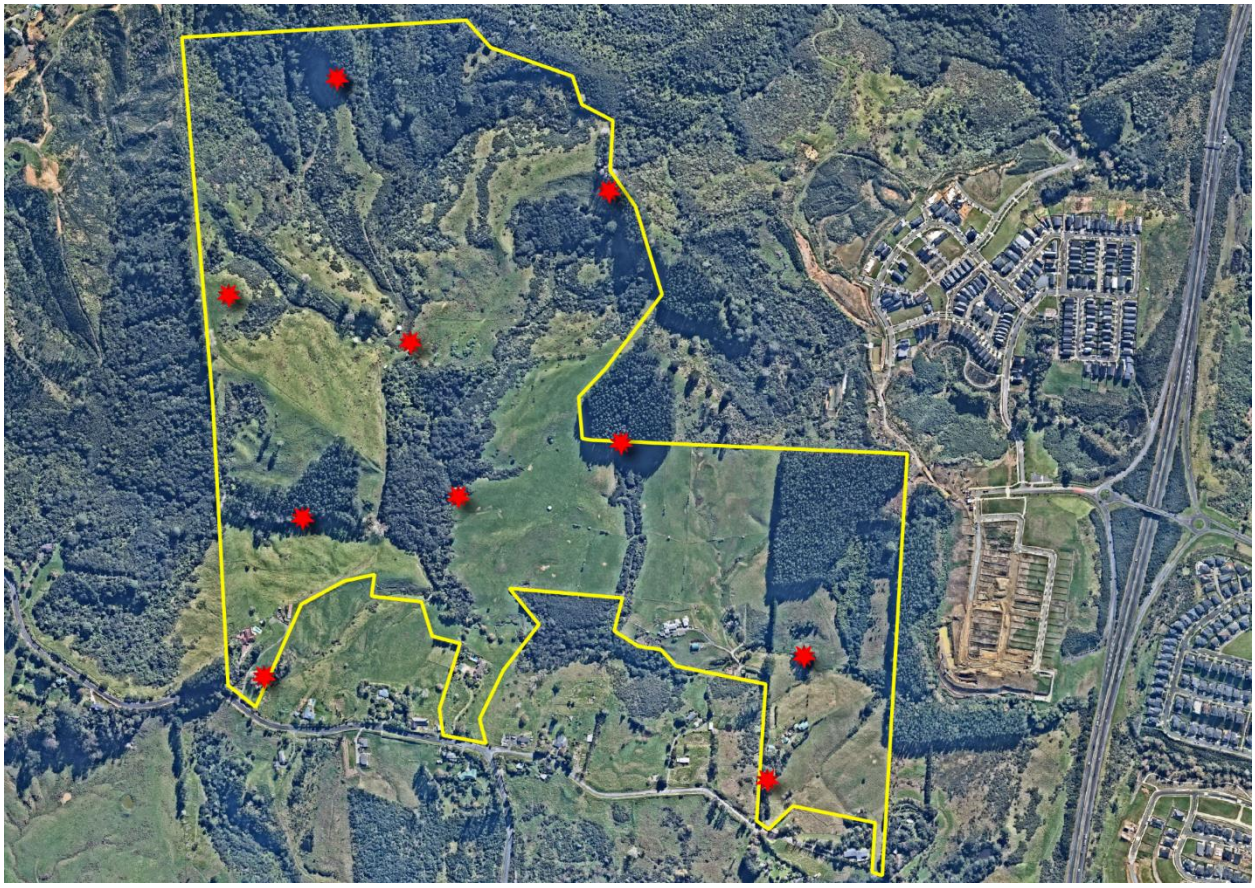

Figure 5. Approximate ABM locations.

2.3 Freshwater Ecology

The ecological values of freshwater features were determined in accordance with the methodology prescribed in the EIANZ guidelines (refer Section 2.4). This approach was applied across all site assessments to ensure consistency in evaluating habitat presence, extent, condition, and ecological value.

2.3.1 Streams

During the site assessments, the presence and extent of streams within the Site were noted and the quality of any freshwater habitat was visually assessed. Watercourses were classified as per the AUP-OP definitions to determine the ephemeral, intermittent or permanent status of the watercourse. Freshwater habitat was assessed, noting ecological aspects such as channel modification, hydrological heterogeneity, riparian vegetation extent, substrate type and any fish or macroinvertebrate habitat observed. Riparian and catchment information was also reviewed.

2.3.2 Wetlands

Where appropriate, potential wetland areas were assessed in accordance with wetland delineation protocols (MfE 2022, Clarkson 2014) to determine if an area met the regulatory definition of 'natural inland wetland' (NPS-FM 2020). Potential wetland areas were assessed based on the prevalence of certain vegetation species and their indicator status ratings, as defined in Clarkson et. al. (2021):

- Obligate wetland (OBL) vegetation, which almost always is a hydrophyte (a plant which only grows in wet environments), rarely found in uplands (non-wetland areas).
- Facultative wetland (FACW) vegetation, which usually is a hydrophyte but can occasionally be found in uplands.
- Facultative (FAC) vegetation, which is commonly either a hydrophyte or non-hydrophyte.
- Facultative upland (FACU) vegetation, which is occasionally a hydrophyte but is usually found in uplands.
- Upland (UPL) vegetation, which is rarely a hydrophyte and is almost always found in uplands.

Where the dominance or prevalence tests showed unclear results, hydric soils and hydrology tests were undertaken in accordance with methodology outlined in MfE (2022) and Clarkson (2014).

Wetland assessments also 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.

2.3.3 Macroinvertebrate

Sampling

Protocol 'C2: soft-bottomed, semi-quantitative' was applied for macroinvertebrate sampling (NEMS 2022) within three sampling sites of a main tributary of the Ōrewa River (Figure 6). 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 survey reach (100 m), to give a total sampling area of 3 m^2. All samples were preserved in 70% isopropyl alcohol for later identification and inventory.

Analysis

Benthic macroinvertebrates were identified and counted to a level suitable for calculating taxa richness, abundance, EPT taxa richness and % EPT, macroinvertebrate community index (MCI) and quantitative MCI (QMCI) following protocols outlined in NEMS (2022) and Stark *et al.* (2001). EPT is the number of taxa that belong to the Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) taxonomic groups.

Taxa richness is a measure of the number of invertebrate taxa in a sample. In general, watercourses that support a high number of invertebrate taxa are more likely to be of a higher environmental quality than watercourses with few taxa present. However, interpretation of taxa number data as an environmental indicator is dependent on the pollution sensitivity or tolerance of taxa present.

Abundance is a measure of the total number of invertebrates in a sample. Invertebrate abundance tends to increase in the presence of organic or nutrient enrichment and decreases in the presence of toxic contaminants.

EPT taxa are generally sensitive to changes in water and habitat quality. Percent EPT (%EPT) is a measure of the proportion of EPT taxa making up the community. EPT and % EPT values can provide a

good indication of stream health, with high values indicating good water/habitat quality and low values indicating poor water/habitat quality.

The MCI and QMCI are biological indices that are based on species indicator scores between 1 and 10, which are assigned to each taxon based on their sensitivity to organic enrichment. Although developed to assess nutrient enrichment, these scores are now used to assess the general health of New Zealand streams. MCI scores are based on presence/absence data, while the QMCI incorporates abundance data. Higher 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.

Figure 6. Sampling site locations.

Table 1. Estimates of stream health using MCI and QMCI indices.

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

2.3.4 Fish Survey

To provide an indication of the fish communities present within the stream environments on site, a single fyke net and three Gee's minnow traps were baited with marmite and set across each of the same reaches assessed for macroinvertebrates. Only fine meshed fykes with separator grills were used. All nets and traps were set with an airspace to provide trapped fish access to atmospheric oxygen. The traps were left overnight and checked the following day. All fish captured were identified, measured and counted before being returned to their habitats.

A fish index of biotic integrity (F-IBI) was calculated for each site based on fish species present, altitude and distance inland to estimate fish community integrity (Joy 2007). The relevant NPS-FM attribute bands are reproduced in Table 2. A six replicate eDNA survey scheduled for late December 2025 within the middle catchment of the site will complement the fish survey, particularly for species that are cryptic or otherwise difficult to detect using traps alone. These findings will be incorporated into the report addendum.

Table 2. Estimates of fish community integrity using F-IBI.

NPS-FM (2020)		
Attribute band	**Description**	**F-IBI**
A	High integrity of fish community. Habitat and migratory access have minimal degradation.	≥34
B	Moderate integrity of fish community. Habitat and/or migratory access are reduced and show some signs of stress.	<34 and ≥28
C	Low integrity of fish community. Habitat and/or migratory access is considerably impairing and stressing the community.	<28 and ≥18
D	Severe loss of fish community integrity. There is substantial loss of habitat and/or migratory access, causing a high level of stress on the community.	<18

2.4 Ecological Impact Assessment

The overarching approach of this analysis and reporting is to ascertain the existing ecological values on the Site and determine the impact of the proposed works on those values.

The ecological value of the Site, relating to species, communities and systems, were determined in general accordance with the EIANZ Ecological Impact Assessment guidelines (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 1). 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 3. 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 SITE DESCRIPTION

3.1 Historical Context

The Site is located within the Rodney Ecological District of the Auckland region. Auckland Council's Geomaps Ecosystem potential extent layer indicates that historically (pre-human), the Site would have likely been comprised of the kauri, podocarp, broadleaved forest ecosystem type (WF11) and would have supported a diverse range of invertebrates, amphibians, reptiles, birds and bats (Singers et al. 2017a). However, historical aerials available for the area (dating back as far as 1940) indicate that the Site and much of the surrounding landscape has been progressively cleared over the years to make way for agricultural and horticultural land use (Figure 7).

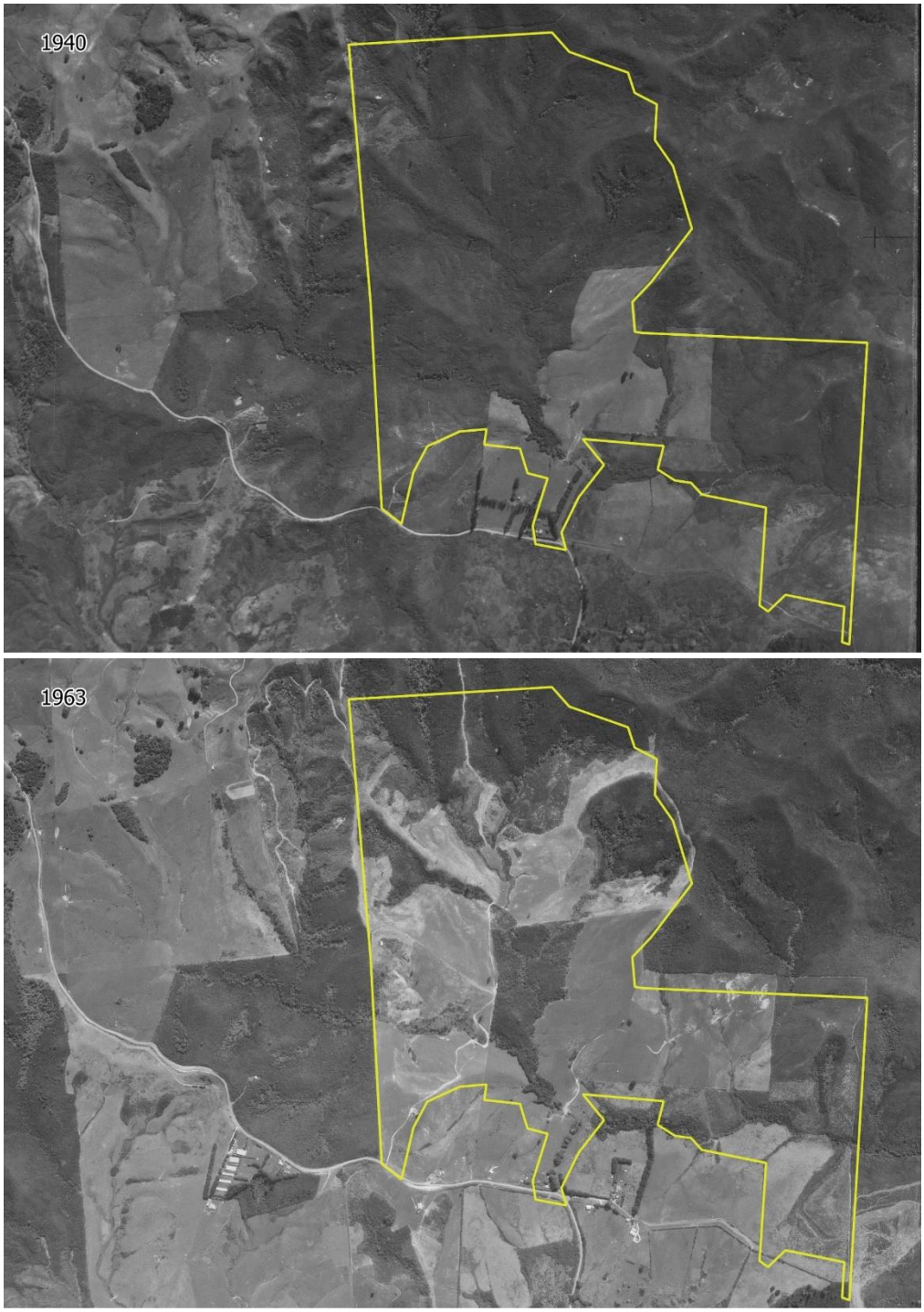

Figure 7. 1940 and 1963 historical aerial imagery of the Site (yellow polygon).

3.2 Local Context

Currently, the Site consists of predominantly farmland and rural residential life-style blocks, with bush fragments present, largely associated with the Nukumea Scenic Reserve, which the Site connects to. The Site is bordered by similar rural residential and farming land uses to the west and south, with various residential developments present to the east. Auckland Council's Geomaps Ecosystem current extent layer indicates several recognised ecosystems are present within the Site boundaries; kānuka scrub forest (VS2), mānuka, kānuka scrub (VS3), a few unclassified areas of vegetation (UC), and remaining fragments of the historic kauri, podocarp, broadleaved forest (WF11) (Figure 8).

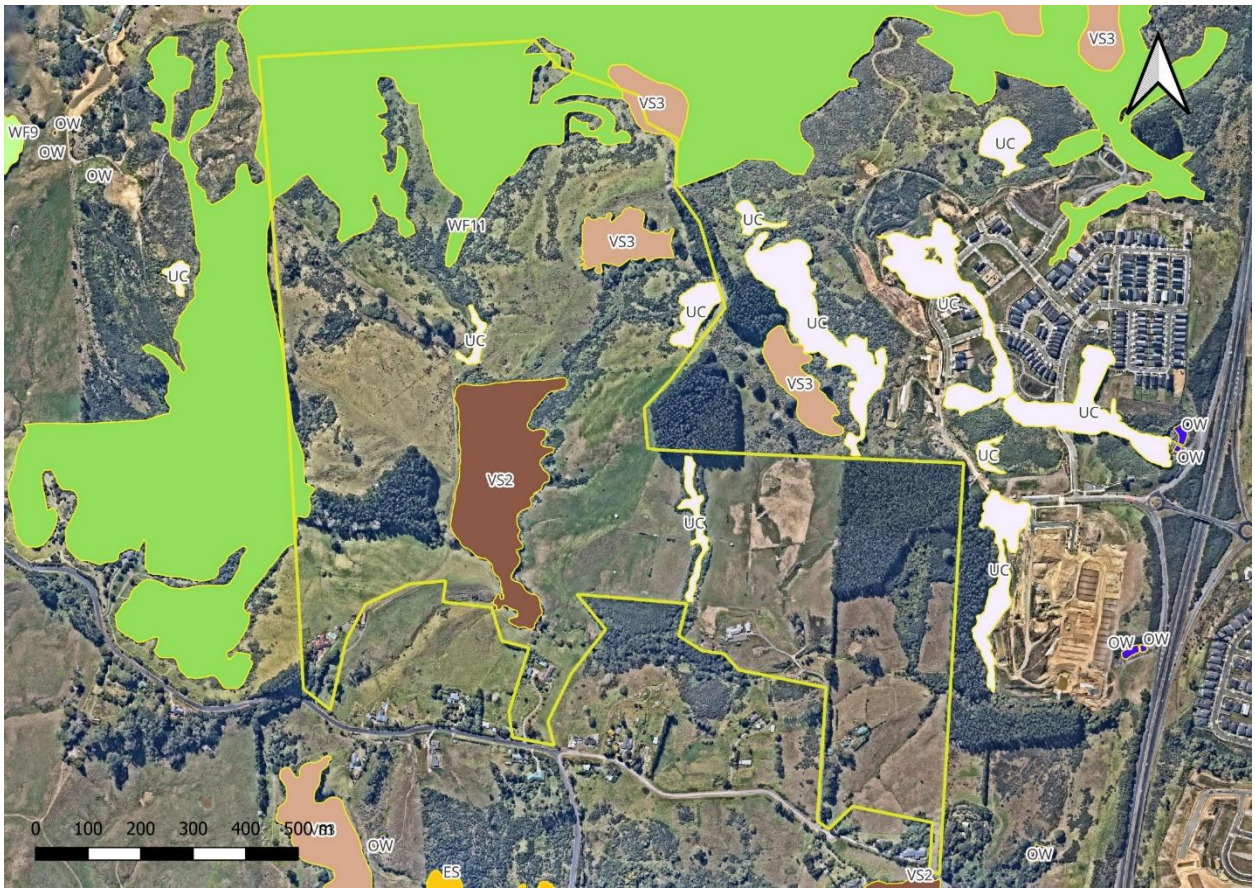

Figure 8. Current ecosystems within the Site as per Auckland Council's Geomaps. VS2 = kānuka scrub forest, VS3 = mānuka, kānuka scrub, UC = unclassified, WF11 = kauri, podocarp, broadleaved forest (WF11) and OW = open water.

Auckland Council's Geomaps indicates that the Site is subject to a Significant Ecological Area (SEA) overlay. SEA_T_6652, which covers the Nukumea Scenic Reserve to the north of the Site, extends into the northern portion of 130 Upper Ōrewa Road and borders 132 Upper Ōrewa Road (Figure 9). SEA_T_6652 was designated an SEA based on the AUP-OP factors:

1.a. Representative of <10% natural extent within Eco District - VS3 (333.08 ha), WF11 (40.37 ha)

2.b. Threatened Species - *Anguilla dieffenbachii, Galaxias maculatus, Gobiomorphus huttoni, Paranephrops*

3.a. Habitat Diversity - VS3, WF11

4.b. Buffer – Buffers a protected area

The Site is also subject to six environmental protection consent notices (Figure 9).

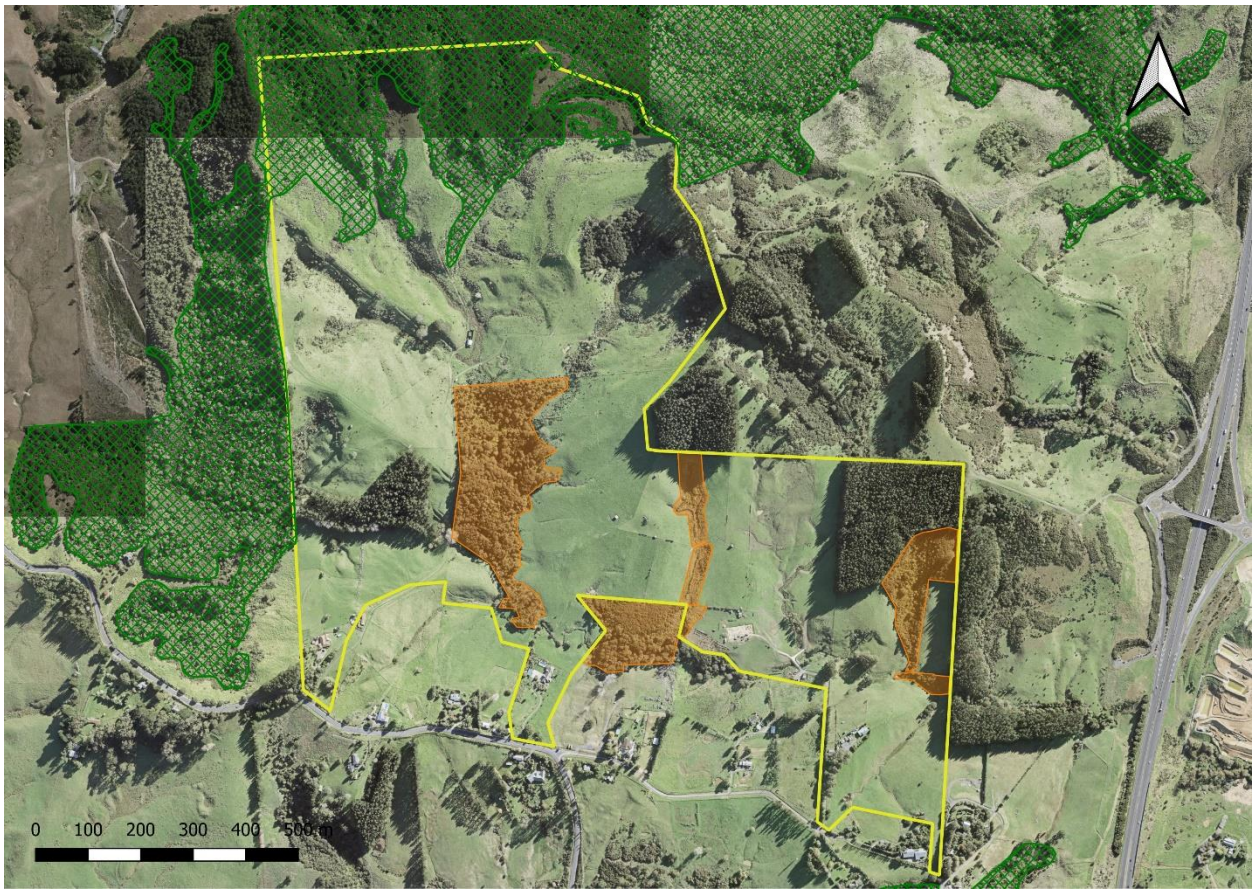

Figure 9. SEAs (green hatch polygons) and consent notice areas (orange polygons) within and adjacent to the Site.

4 TERRESTRIAL ECOLOGY

4.1 Vegetation

Utilising observations from the Site visit and aerial images, the vegetation within the Site has been classified and mapped (Figure 11). Most of the Site was covered in managed pasture. Outside of the managed pasture the main vegetation types included, pine plantations, exotic dominant vegetation, native dominant vegetation and gorse scrub were also present. Outside of these vegetation types scattered individual native and exotic trees were present. The identified vegetation types are described further below in Sections 4.1.1 to 4.1.4.

4.1.1 Pine plantations

Two pine plantations were located within the Site, with a third plantation located on the eastern boundary having been recently felled. The canopy within the pine plantations was dominated by a monoculture of mature *Pinus radiata*, however a few other mature exotic species were present on some edges of the plantations. These included poplar (*Populus spp*.) and willows (*Salix spp*.). The understory consisted of a mix of low stature native and exotic species, including ponga (*Cyathea dealbata*), whekī (*Dicksonia squarrosa*), putaputawētā (*Carpodetus serratus*), māpou (*Myrsine australis*), māhoe (*Melicytus ramiflorus*), hangehange (*Geniostoma ligustrifolium*), patē (*Schefflera digitata*), gorse (*Ulex europaeus*), woolly nightshade (*Solanum mauritianum*), pampas (*Cortaderia selloana*) and blackberry (*Rubus fruticosus*). A representative vegetation plot was established within the easternmost pine plantation notice area (V-2, Figure 3) with the resulting data provided in Appendix A. The understory is representative of a broadleaved species scrub ecosystem (VS5, Singers et al. 2017a). VS5 ecosystems have a regional International Union for Conservation of Nature (IUCN) threat status of 'Least Concern'.

The ecological value of the pine plantations was considered to be low, given the low native diversity, monoculture canopy and high presence of pest plant species[3]. It is possible that some of the pines may provide habitat for bats, as discussed in Section 4.3.3. The pine plantations are not expected to provide important habitat for native birds or lizards, due to its managed state (i.e., uniform nature, lack of habitat features (e.g., old limbs), lack of diversity (i.e., largely a monoculture), lack of connecting canopy structure.

a) **b)**

Figure 10. a) The western most pine plantation and b) the typical understorey within the pine plantations.

[3] Identified as a plant pest in the Auckland Regional Pest Management Plan 2020-2030 (Auckland Council, 2020a).

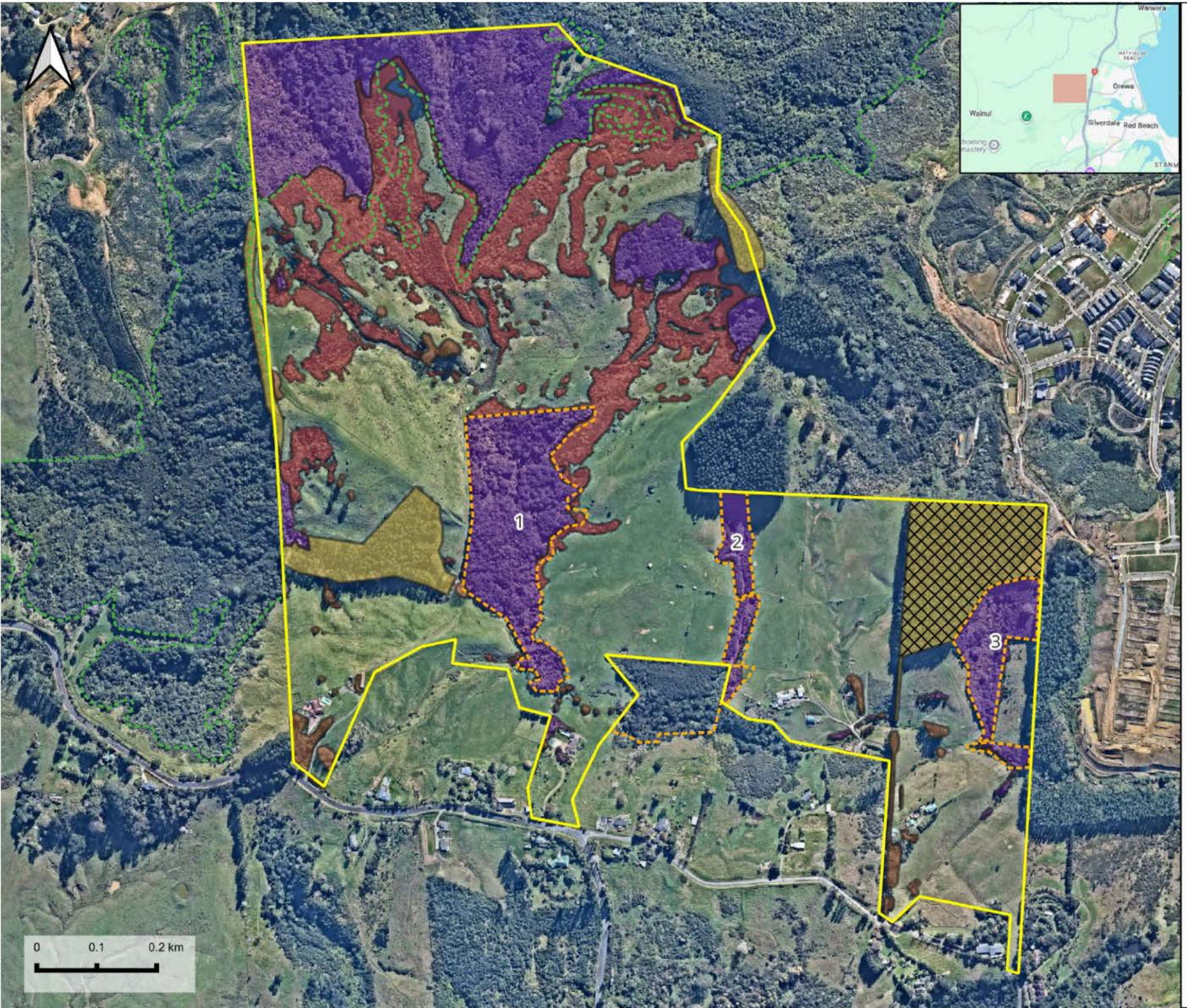

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Figure 11

Vegetation Types

Delmore Project

Legend

- Site
- Consent notice area
- SEA_T_6652
- Pine plantation
- Felled pine plantation
- Native dominant vegetation
- Exotic dominant vegetation
- Gorse scrub

SOURCES
Nearmap 2025

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 **1:8,000** @ A4

PROJECT NO.	10122
DRAWN BY:	MD
DATE:	9 December 2025

4.1.2 Exotic dominant vegetation

Outside of the pine plantations, a few relatively small pockets of mixed exotic vegetation were present. Species within these pockets included poplar, pine, gum (*Eucalyptus spp*.), blackwood (*Acacia melanoxylon*), bottlebrush (*Callistemon sp*.), she-oak (*Casuarina cunninghamiana*) and willows. Little to no understorey was present, however a few native species such as red mapou, māhoe, cabbage tree (*Cordyline australis*), and tōtara (*Podocarpus totara*) were present. Pest plant species were also present and included gorse, woolly nightshade, pampas, blackberry, tree privet (*Ligustrum lucidum*) and Chinese privet (*Ligustrum sinense*). Single isolated exotic trees were also scattered throughout the Site (Figure 13).

The ecological value of the exotic trees present on the Site was considered to be low, given the high edge effects and exotic species. It is possible that some of the larger trees may provide habitat for bats, as discussed in Section 4.3.3. The areas of exotic trees are not expected to provide important habitat for native birds or lizards.

a) **b)**

Figure 12. Examples of exotic dominant vegetation within the Site.

a) **b)**

Figure 13. Examples of large isolated exotic trees scattered throughout the Site.

4.1.3 Native dominant vegetation

Relatively large areas of native vegetation were present within the Site. These areas were largely associated with the consent notice areas and the SEA. However, two other fairly large areas of non-protected (i.e., not within a SEA or consent notice area) native vegetation were located within the

northeastern section of the Site and a number of small pockets of non-protected native vegetation were also present.

Eastern Consent Notice Areas

The two eastern most consent notice areas (areas 2 and 3, Figure 11) consisted of young planted native vegetation (Figure 14). Species present within these areas consisted predominantly of mass plantings and native regeneration of common natives such as, mānuka (*Leptospermum scoparium*), kānuka (*Kunzea ericoides*), cabbage trees, tānekaha (*Phyllocladus trichomanoides*), with a mixture of understorey and edge species including harakeke *(Phormium tenax*), putaputawētā, hangehange, karamū (*Coprosma robusta*), māpou and māhoe. Pest plant species such as arum lily (*Zantedeschia aethiopica*), climbing asparagus (*Asparagus scandens*), gorse, woolly nightshade, pampas, willow and blackberry were present. A representative vegetation plot was established within the easternmost consent notice area (V-4, Figure 3) with the resulting data provided in Appendix A. The species assemblage is typical of ecosystem type VS3 (mānuka, kānuka scrub, Singers et al. 2017a) and reflects early successional stages of WF11 (kauri, podocarp, broadleaved forest). This aligns with Auckland Council's Geomaps Ecosystem Potential Extent layer, remaining local fragments of historic WF11 forest, and the underlying East Coast Bays Formations geology (Riley 2025). VS3 ecosystems have a regional IUCN threat status of 'Least Concern'.

These areas were considered to have a moderate current ecological value, as although they were dominated by native vegetation and function as potential ecological corridors, native diversity was low, the vegetation is young, and they were subject to edge effects as they were narrow relative to their width. Edge effects reduce ecological values through increased risk of weed invasion, increased light levels, and a higher risk of damage caused by inclement weather.

SEA and Western Consent Notice Area

The native vegetation within the SEA and the western most consent notice area (area 1, Figure 11) consisted of a diverse range of regenerating native species. Although the canopy of these areas was often dominated by kānuka, other native species were present including tānekaha , kauri (*Agathis australis*), rimu (*Dacrydium cupressinum*), tōtara, rewarewa (*Knightia excelsa*) and kahikatea (*Dacrycarpus dacrydioides*). The understorey was dominated by natives such as māhoe, *Coprosma* spp. and tree ferns. Pest plant species such as arum lily, gorse, blackberry, pampas and wild ginger (*Hedychium gardnerianum*) were also present, particularly around the edges. These two areas represent kānuka forest and scrub (VS2, Singers et al. 2017a) transitioning into kauri, podocarp, broadleaved forest (WF11). This aligns with Auckland Council's Geomaps Ecosystem Potential Extent layer, remaining local fragments of historic WF11 forest, and the underlying East Coast Bays and Pakiri Formations geology (Riley 2025). VS2 ecosystems have a regional IUCN threat status of 'Least Concern'.

These two areas were considered to have a high current ecological value, as they were dominated by a native canopy and understory, they function as ecological corridors and buffers and were only subject to edge effects around their perimeter.

Native Dominant Vegetation Area

The other native dominant vegetation identified within the Site outside of the consent notice areas and SEA, typically consisted of pockets of mature kānuka scrub (VS2, Singers et al. 2017a). These areas were considered to have a moderate current ecological value, as although they were dominated by native vegetation and function as potential ecological stepping stones, native diversity was low and the areas

were subject to edge effects. The best and largest example of this type of vegetation was located in the northeast of the Site (Figure 45).

a) **b)**

Figure 14. Examples of young planted native vegetation within the consent notice areas located a) in the middle of the Site and b) the eastern part of the Site.

a) **b)**

Figure 15. Examples of more mature native vegetation within a) the western consent notice area and b) the SEA.

a) **b)**

Figure 16. Northeast native dominant vegetation area.

4.1.4 Gorse scrub

Extensive areas of gorse scrub was present throughout the Site, particularly in the northern section of the Site. While gorse was the dominant species, woolly nightshade was also prevalent. Other species present included blackberry and pampas with the occasional regenerating māhoe or cabbage tree. The ecological value of the gorse scrub present on the Site was considered to be low, given the high edge effects and exotic species. It is possible that some of the gorse scrub may provide habitat for lizards, as discussed in Section 4.3.2. The areas of gorse scrub are not expected to provide important habitat for native birds or bats, due to the lack of preferred feeding and nesting habitat.

a) **b)**

Figure 17. Examples of the gorse scrub throughout the Site.

4.2 Terrestrial Connectivity and Ecological Function

Forest edge communities increase fragmentation of native vegetation within a landscape, and are heavily influenced by increased exposure to sunlight, wind and competition from pest plants. These factors restrict establishment of some native flora and fauna to forest interiors. Fragmentation of native vegetation increases the edge effect and decreases the availability of habitat for species that would normally occur in the interior of vegetated areas. Connectivity between areas of vegetation is important to facilitate ecological function, and loss of connectivity can impair reproductive function for both flora and fauna communities.

Aside from the small pockets of native vegetation, the identified native vegetation within the Site provides ecological connectivity and buffering function to the wider environment, particularly to the adjacent Nukumea Scenic Reserve, the extended SEA_T_6652 and other SEAs in close proximity (Figure 18). However, the fragmented nature of these areas reduces the quality of the connectivity and ecological functioning values. Their relatively large sizes also reduce adverse edge effects. Overall, the larger areas of native vegetation (i.e., the SEA, the consent notice areas and the two areas of non-protected vegetation within the northeast section of the Site) were considered to have moderate-high connectivity and ecological functioning values.

The other identified areas of vegetation within the Site (Figure 11) were typically smaller, fragmented, dominated by exotics, irregular shaped and narrow. As a result, this vegetation is subject to very high edge effects and as such the functioning of the vegetated areas and their ability to persist and resist the effects of adverse weather and weed invasion are significantly reduced. This is clearly demonstrated on the Site by the abundance of weed species. Despite this degradation, the vegetated margins of waterways on the Site provide some ecological functions. These include some shading, bank stability,

erosion protection, surface water filtration, habitat, and potential habitat for native birds and. Overall, the connectivity and ecological functioning values of the rest of the Site are considered to be low.

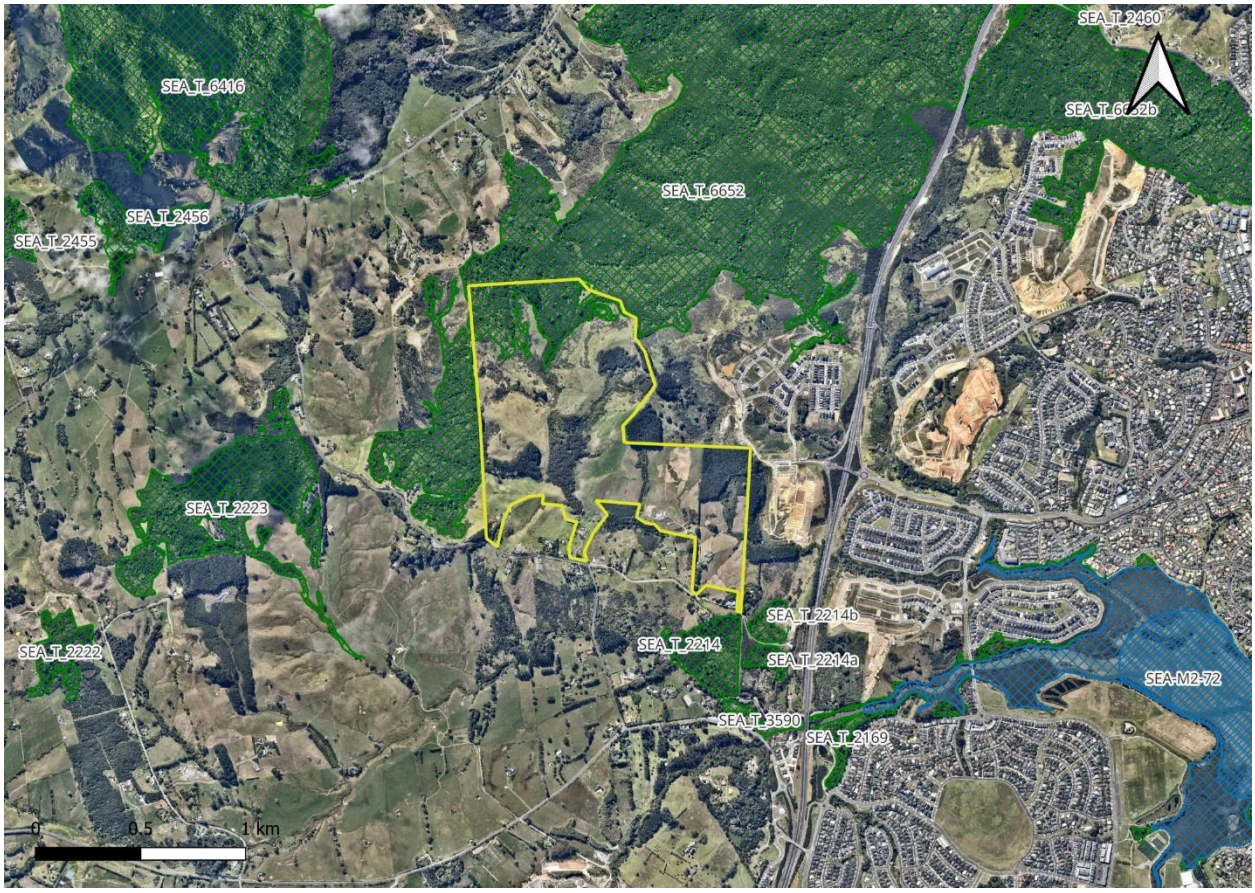


Figure 18. SEAs in close proximity to the Site.

4.3 Fauna habitat

4.3.1 Avifauna (birds)

Avifauna habitat within the Site was relatively diverse and included mature native vegetation, young native vegetation, exotic vegetation, scrub, pine plantations and wetland habitat. The larger patches of native vegetation and the wetland habitat provide the highest quality nesting and roosting habitat.

Birds seen/heard during the 2023, 2024, and early 2025 site assessments were opportunistically recorded. Dedicated avifauna surveys are currently underway and are expected to conclude in late December 2025 (refer to Section 2.2.2). However, based on the initial findings from the 5-minute bird counts and a dawn survey, no Threatened or At Risk species have been observed. Table 4 provides a list of species that could potentially be present, even if only periodically, within the Site. Records retrieved from eBird.org and iNaturalist for nearby sites were used to indicate what other species may be present but were not observed during the Site visits.

The dominant avifauna community within the Site is expected to contain a combination of common exotic and native species that are abundant in the wider Auckland region including urban, urban fringe, and rural areas, such as the introduced magpie, skylark, black bird, finches, starling, thrush and myna and the native spur winged plover, paradise shelduck, fantail, tūī, kererū, white faced heron, Australasian harrier, kingfisher, silver eye, grey warbler, welcome swallow, shining cuckoo and ruru. It is possible that kākā (At-Risk, Recovering) may visit the area, although they would be expected to be present only fleetingly if at all. It is also possible that the Australasian bittern (Threatened – Nationally

Critical) and the North Island fernbird (At Risk - Declining) may utilise the wetland habitat. Banded rail (*Gallirallus philippensis assimilis* - At Risk – Declining) and spotless crake (*Zapornia tabuensis* - At Risk - Declining) are not expected to utilise the Site due to the lack of suitable habitat (i.e., densely vegetated wetlands and/or mangrove/estuarine habitat).

Pipits (*Anthus novaeseelandiae*, At-Risk, Declining) can occur in areas of rough pasture with patches of fern, marshes or bogs and nest on the ground under clumps of tussock or long grass (NZbirdsonline, 2023). There are very few records of this species in the surrounding area and as most of the Site is highly managed for rural production activities, their preferred habitat type is very limited, so it is unlikely that they would use this Site for nesting and would likely only visit occasionally in low numbers if at all.

The ecological value of the larger patches of native vegetation and wetlands for avifauna was considered to be high, with the rest of the vegetation within the Site considered to be low.

Table 4. Birds known to be present in the wider area.

Common name	Species name	Conservation status	Observed on Site
Australian magpie	*Gymnorhina tibicen*	Introduced and Naturalised	
Australasian harrier	*Circus approximans*	Not Threatened	
Australasian bittern	*Botaurus poiciloptilus*	Threatened – Nationally Critical	
Blackbird	*Turdus merula*	Introduced and Naturalised	
Black backed gull	*Larus dominicanus*	Not Threatened	
Canada goose	*Branta canadensis*	Introduced and Naturalised	
Californian quail	*Callipepla californica*	Introduced and Naturalised	
Chaffinch	*Fringilla coelebs*	Introduced and Naturalised	
Eastern rosella	*Platycercus eximius*	Introduced and Naturalised	
Fantail	*Rhipidura fuliginosa placabilis*	Not Threatened	
Goldfinch	*Carduelis carduelis*	Introduced and Naturalised	
Greenfinch	*Chloris chloris*	Introduced and Naturalised	
Grey teal	*Anas gracilis*	Not threatened	
Grey warbler	*Gerygone igata*	Not Threatened	
Kākā	*Nestor meridionalis*	At-Risk, Recovering	
Kererū	*Hemiphaga novaeseelandiae*	Not Threatened	✓
Kingfisher	*Todiramphus sanctus vagans*	Not Threatened	
Mallard duck	*Anas platyrhynchos*	Introduced and Naturalised	✓
Morepork / ruru	*Ninox novaeseelandiae*	Not Threatened	
Myna	*Acridotheres tristis*	Introduced and Naturalised	✓
North Island Fernbird	*Poodytes punctatus vealeae*	At Risk - Declining	
Paradise shelduck	*Tadorna variegata*	Not Threatened	✓
Pheasant	*Phasianus colchicus*	Introduced and Naturalised	✓

Common name	Species name	Conservation status	Observed on Site
Pipit / Pīhoihoi	*Anthus novaeseelandiae*	At Risk, Declining	
Pūkeko	*Porphyrio melanotus melanotus*	Not Threatened	✓
Rock pigeon	*Columba livia*	Introduced and Naturalised	
Red-billed gull / Tarāpunga	*Chroicocephalus novaehollandiae*	At Risk, Declining	
Silvereye	*Zosterops lateralis lateralis*	Not Threatened	
Shining cuckoo	*Chrysococcyx lucidus*	Not Threatened	
Skylark	*Alauda arvensis*	Introduced and Naturalised	✓
Song thrush	*Turdus philomelos*	Introduced and Naturalised	✓
Sparrow	*Passer domesticus*	Introduced and Naturalised	✓
Spotted dove	*Spilopelia chinensis*	Introduced and Naturalised	
Spurwinged plover	*Vanellus miles novaehollandiae*	Not Threatened	✓
Starling	*Sturnus vulgaris*	Introduced and Naturalised	✓
Tūī	*Prosthemadera novaeseelandiae novaeseelandiae*	Not Threatened	
Turkey	*Meleagris gallopavo*	Introduced and Naturalised	
Welcome swallow	*Hirundo neoxena neoxena*	Not Threatened	✓
White faced heron	*Egretta novaehollandiae*	Not Threatened	
Yellowhammer	*Emberiza citrinella*	Introduced and Naturalised	

4.3.2 Herpetofauna (lizards)

Herpetofauna (reptiles and amphibians) comprise a significant component of New Zealand's terrestrial fauna. There are currently 135 endemic herpetofauna taxa recognised in New Zealand (Hitchmough *et al.*, 2021), 85.9% of which are considered 'Threatened' or 'At-Risk'. All indigenous reptiles and amphibians are legally protected under the Wildlife Act 1953, and vegetation and landscape features that provide significant habitat for native herpetofauna are protected by the Resource Management Act 1991 (RMA). Statutory obligations require management of resident reptile and amphibian populations if they are threatened by a disturbance i.e., land development.

A review of the DoC's herpetofauna database (accessed 6 November 2024) identified a relatively high number of records for lizard species within 10 km of the Site. The most frequently recorded species was the introduced plague skink (*Lampropholis delicata*, 49). The next most common was forest gecko (*Mokopirirakau granulatus* – At-Risk, declining, 46). Other native species recorded in the wider area included copper skink (*Oligosoma aeneum* - At Risk, declining, 20 records), ornate skink (*Oligosoma ornatum* - At Risk, declining, 11 records), and elegant gecko (*Naultinus elegans* - At Risk, declining, four records).

Relatively recent surveys undertaken between 2017 and 2022 in the neighbouring Ara Hills site and within the contiguous Nukumea Scenic Reserve (not captured in the DoC database) recorded one ornate skink, one copper skink, three forest geckos, and one Pacific gecko. These results suggest that native lizards are present locally, but at low observed densities.

During site visits, opportunistic observations of potential lizard habitat were also made. The most suitable habitat is associated with areas of native vegetation, where ground cover, woody debris, and canopy structure can provide refuge and foraging opportunities. Skinks may also occur within gorse scrub and areas of dense rank grass. Given the number of records in the surrounding landscape and the site's connectivity to nearby suitable habitat (including the Nukumea Scenic Reserve), native lizards, including geckos, are considered likely to be present on site.

Dedicated lizard surveys are currently underway and are expected to conclude in late December 2025 (refer to Section 2.2.3). Based on initial results from ACO checks and nocturnal spotlighting, no native lizards have been detected to date.

The ecological value of the larger patches of native vegetation for herpetofauna was considered to be high, and the ecological value of the rest of the vegetation, outside of the managed pasture within the Site was considered to be moderate. Native lizards are not expected to be present within the managed pasture as it is not suitable habitat, as such the managed pasture was considered to be of negligible value for herpetofauna.

4.3.3 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, regionally critical), although colonies are assumed to be small and their health is largely unknown (O'Donnell *et al.,* 2023; Woolly *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 tailed bat population on Te Hauturu-o-Toi/Little Barrier Island.

Bats roost in tree hollows and under split bark of native and exotic trees, and also in rocky overhangs. Over the breeding season, large communal roosts occur in similar habitat. Bats tend to utilise linear features in the landscape, including vegetation edges, gullies, waterways, and road corridors as they transit between roosts and foraging sites. Long-tailed bats in particular are known to be highly mobile, with large home ranges (>5,000 ha) and can travel large distances (~25 km) each night during foraging. Short-tailed bats require specific habitat consisting of good-quality forest vegetation, so are highly unlikely to be present on the Site.

A review of the DoC bat database (accessed May 2025), together with a recent bat survey undertaken in the area in 2022 to 2023 for the NOR (Cullen 2023), indicates that bat detections are uncommon in the local landscape. Of 93 bat surveys completed within 10 km of the site, a total of 16 bats were recorded, with the closest detection approximately 2.5 km to the south (Figure 19). These records are generally associated with remaining fragments of native forest, and all recorded within the last 15 years.

An additional bat survey undertaken in 2017 along the site boundary and adjacent to the Nukumea Scenic Reserve (Bioresearches 2025), which is not captured in the DoC database, was also reviewed. This survey used four Acoustic Bat Monitors (ABMs) and did not detect any bats (Figure 19).

A dedicated bat survey within the Site is currently underway and is expected to conclude in late December 2025 (refer to Section 2.2.4).

Potential bat habitat within the Site was limited to the more mature vegetation within the Site, namely the native SEA vegetation, the westernmost consent notice area, the pine plantation and the larger isolated exotic trees (Figure 13). The permanent stream corridors and the larger wetlands within the Site could also provide foraging and / or commuting habitat for bats. However, the lack of detection from previous surveys indicates that the area is not a high bat activity area.

It is therefore considered possible that long tailed bats may periodically be present within the Site, however the habitat is not expected to support regular visits or large communal roosts. As such, the ecological value of the Site for bats is considered to be moderate, as a small amount of vegetation may provide suitable habitat, and their presence cannot be ruled out.

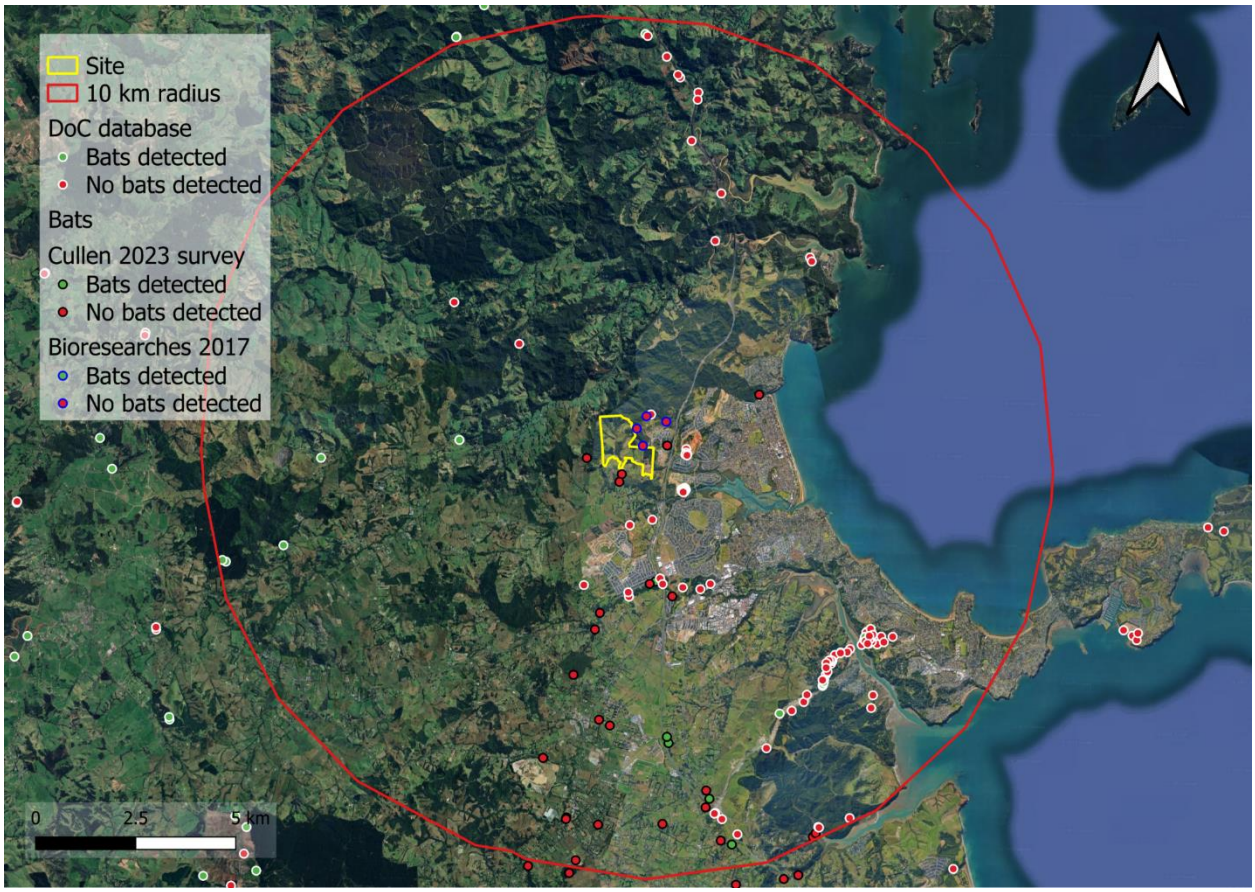


Figure 19. Bat records within the wider environment.

5 FRESHWATER ECOLOGY

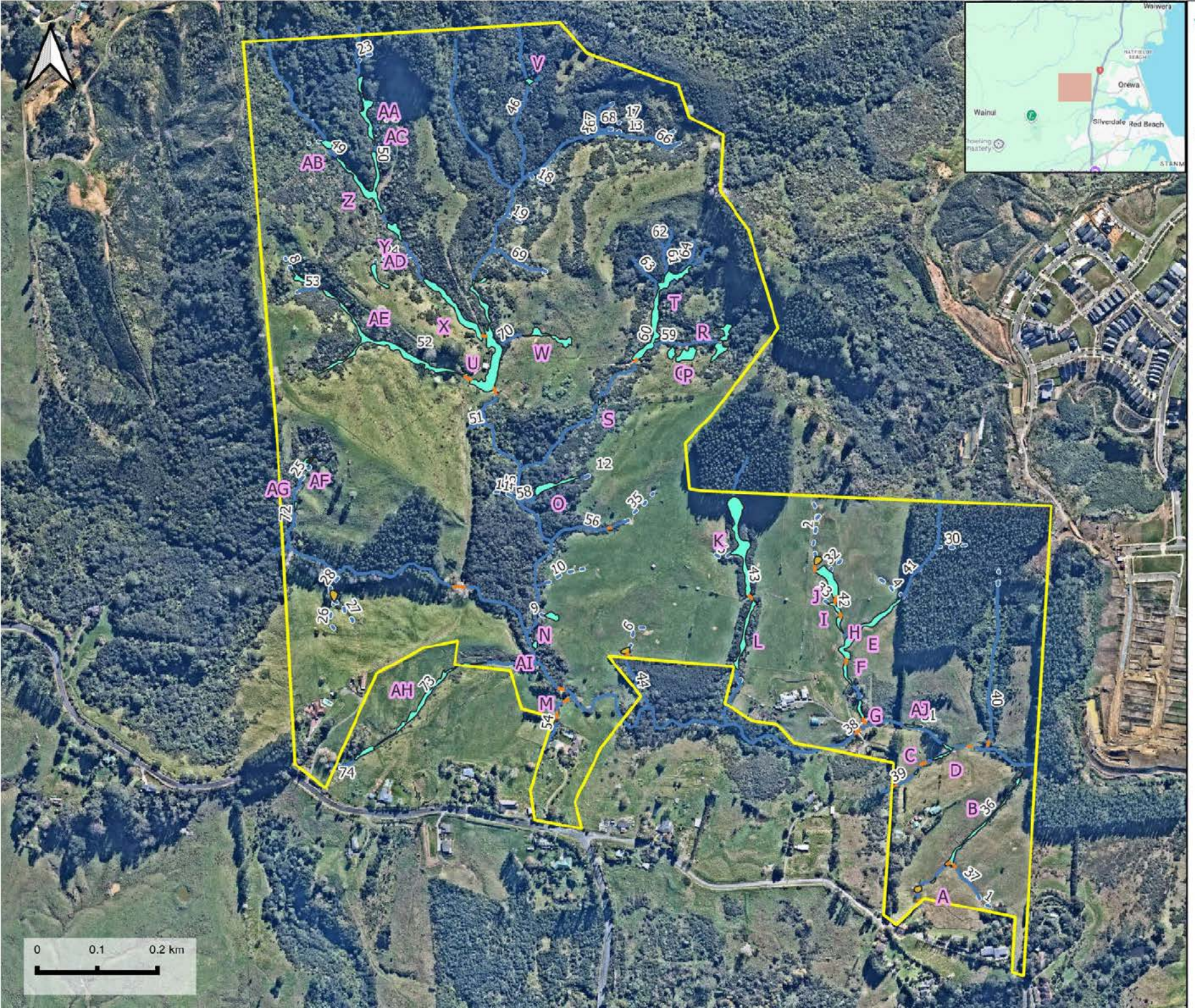
5.1 Streams

All watercourses within the Site were classified and mapped according to the definitions within the AUP-OP as either permanent, intermittent, ephemeral, or artificial drains. Each modelled overland flow path (OLFP) shown in Auckland Council's Geomaps was investigated, and its status assessed.

The watercourse classification types are described in this section. A map with labelled watercourses and a table showing the criteria met for each watercourse are provided in Figure 20 and Appendix A respectively.

5.1.1 Modelled overland flow paths / ephemeral reaches

Many of the OLFPs investigated had no discernible channel and did not meet at least four of the six intermittent stream criteria (Appendix A). Therefore, they did not meet the definition of intermittent or permanent stream. Due to the lack of aquatic habitat, the ecological values of the OLFPs were considered negligible. Photos of some of the larger modelled OLFPs are provided in Figures 17 to 20.



VIRIDIS
Environmental Consultants

Figure 19

Freshwater Features

Delmore Project

Legend

- Site
- Intermittent and permanent streams
- OFLPs / ephemeral reaches
- Crossing / culverts
- Natural wetlands
- Constructed ponds

SOURCES

Nearmap 2025

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 **1:8,000** **@ A4**

PROJECT NO.	10122
DRAWN BY:	MD
DATE:	10 December 2025

a)

b)

Figure 21. a) OLFP 1 and b) OLFP 2.

a)

b)

Figure 22. a) OLFP 4 and b) OLFP 32.

a)

b)

Figure 23. a) OLFP 6 and b) OLFP 10.

a)

b)

Figure 24. a) OLFP 35 and b) OLFP 27.

5.1.2 Intermittent and permanent streams

Thirty-nine intermittent and permanent streams were identified within the Site. A permanent stream (stream 38) runs from west to east along the southern section of the Site to which all the other streams within the Site drain to. This stream is a tributary of the Ōrewa River and drains directly to the Ōrewa River estuary. From the downstream extent within the Site, this stream has a contributing catchment of approximately 330 ha. Streams 41 and 45 are two other main permanent streams, which run north to south within the Site. These streams have approximate contributing catchments of 262 and 72 ha, respectively. Other permanent streams include streams 36, 43, 48, 49, 52, 59 and 73, which have contributing catchments ranging from approximately 6 to 13 ha. All other streams identified are considered likely to be intermittent in nature.

All streams were soft bottomed, often with a high loading of fine sediment. Where stock had access, which was for the majority of the streams, pugging and stream bank erosion was evident. Wetland margins were common along stream edges.

Riparian vegetation, and therefore shading levels, varied considerably between streams, ranging from very high shading from native canopy cover to no effective shading where streams were unfenced and located within managed pasture.

Farm crossings and culverts were present throughout the Site (Figure 20). Some of these culverts were perched and formed partial or complete fish passage barriers.

The current ecological values of the streams ranged from low to high (Appendix B). The range in value was predominately dependent on the amount of effective riparian vegetation present along the stream banks, whether stock had access to the stream, and the abundance of instream habitat.

Photos of some of the intermittent and permanent streams are provided in Figure 25, Figure 26 and Figure 27 below.

a)

b)

Figure 25. Streams a) 31 and b) 36.

a)

b)

Figure 26. Streams a) 41 and b) 43.

a)

b)

Figure 27. Streams a) 49 and b) 72.

5.2 Natural Inland Wetlands

Thirty-six natural inland wetlands were identified within the Site. Both palustrine and riverine wetland hydrosystems were present, creating both marsh and seepage wetlands. Wetlands ranged in size from 16 m^2 (wetland M) to 2,533 m^2 (wetland AE).

With the exception of wetland AJ, all identified natural wetlands were clearly dominated by FACW and OBL species, namely Mercer grass (*Paspalum distichum*, FACW), *Isolepis prolifera* (OBL), *I. reticularis* (FACW), soft rush (*Juncus effusus*, FACW), jointed rush (*J. articulatus*, FACW), Māori sedge (*Carex maorica*, OBL), broom rush (*J. sarophorus*, FACW), umbrella sedge (*Cyperus eragrostis*, FACW) and grass-leaved rush (*J. planifolius*, FACW). As such, all of these areas were classified as natural inland wetlands based on the rapid test and in accordance with the wetland delineation protocols (MfE 2022). All wetland extents were clearly and easily defined as a result of a clear transition between FACW and OBL species to FACU and UPL species such as kikuyu (*Cenchrus clandestinus*, FACU), rye grass (*Lolium perenne*, FACU), cocksfoot (*Dactylis glomerata*, FACU), sweet vernal (*Anthoxanthum odoratum*, FACU), paspalum (*Paspalum dilatatum*, FACU), gorse (FACU) and woolly nightshade[4]. Clear changes in topography and hydrology also aided in the delineation of wetland extents.

Some wetlands such as wetland C, AF, and AG appear to have been recently formed as a result of recent land slippages.

Wetland AJ also appeared to have been formed by recent slope instability and the vegetation was ambiguous, as such a site visit was undertaken on 6 June 2025 to carry out further assessments. In the three weeks preceding the visit, the area experienced significant rainfall, with more than 30 mm falling within a 24-hour period each week. April 2025 also saw several high rainfall events. Notably, over 50 mm of rain fell within 24 hours prior to the site visit, and an additional 2 mm fell on the day itself.

Given these conditions, the assessment was undertaken during abnormally wet conditions, following a prolonged period of elevated rainfall. As a result, the ground across the site was saturated. Due to this excessive surface water and ground saturation, hydrology was not considered a reliable wetland indicator for this site visit, and a formal hydrology assessment was not carried out.

Three vegetation and soil assessments were undertaken within the potential wetland area in accordance with the wetland delineation protocols (MfE 2022; Fraser 2018; MfE 2021) to assess the presence and extent of any potential natural inland wetland (Figure 28). The vegetation data for the three plots (Plots I, J, and K) are presented in Tables 1–3.

Plots I and J did not meet either the dominance test or the prevalence index test. In contrast, Plot K passed both tests.

Due to the recent slippage and the presence of early colonising species, the area is likely recently disturbed. As such, vegetation alone may not be a reliable indicator of wetland status under current conditions. Therefore, soils were assessed for hydric indicators in each plot.

Within Plot I, no peaty material was present. The soil throughout the top 400 mm was uniformly coloured 10YR 5/3, with no pale or dark low-chroma colours or mottling observed. The soil was therefore not considered hydric.

[4] A wetland rating has not been assigned to woolly nightshade, but is a commonly accepted FACU or UPL species.

Within Plot J, no peaty material was observed. The top ~150 mm had a colour of 2.5YR 8/4, with the soil below (~150–400 mm) coloured 10YR 5/3. No pale or dark low-chroma colours or mottling were identified. These soils were also not considered hydric.

Within Plot K, no peaty material was present. The upper ~100 mm was 10YR 5/4, while the 100–400 mm layer was 10YR 5/2 when broken apart, showing pale low-chroma characteristics. Extensive mottling was also observed. These features are consistent with hydric soils.

The soil assessment results align with the vegetation assessments with Plots I and J are not being considered natural inland wetlands, while Plot K meets both vegetation and soil criteria for classification as a natural inland wetland.

Plot K is situated on a flatter area within the stream floodplain, unlike the other two plots. It is likely that hydrology in this location is primarily influenced by stream and groundwater connectivity, rather than surface runoff.

Figure 28. Wetland AJ with associated plots I-K (2025 aerial imagery).

Table 5. Vegetation Plot I Data

Binomial name	Common name	Rating	Biostatus	Cover (%)	Dominant
Holcus lanatus	Yorkshire fog	FAC	Exotic	40	Yes
Ranunculus repens	Creeping buttercup	FAC	Exotic	15	Yes
Plantago lanceolata	Narrow-leaved plantain	FACU	Exotic	15	Yes
Cenchrus clandestinus	Kikuyu	FACU	Exotic	15	Yes
Lolium perenne	Perennial ryegrass	FACU	Exotic	10	
Paspalum dilatatum	Paspalum	FACU	Exotic	10	
Agrostis stolonifera	Creeping bent	FACW	Exotic	10	
Juncus effusus	Soft rush	FACW	Exotic	5	
Ulex europaeus	Gorse	FACU	Exotic	3	
Lotus pedunculatus	Lotus	FAC	Exotic	2	
Hypochaeris radicata	Catsear	FACU	Exotic	2	
Solanum nigrum	Black nightshade	FACU	Exotic	1	
% of dominant species that are FAC/FACW/OBL					**50%**
Prevalence value					**3.3**

Table 6. Vegetation Plot J Data

Binomial name	Common name	Rating	Biostatus	Cover (%)	Dominant
Holcus lanatus	Yorkshire fog	FAC	Exotic	45	Yes
Ranunculus repens	Creeping buttercup	FAC	Exotic	20	Yes
Plantago lanceolata	Narrow-leaved plantain	FACU	Exotic	10	Yes
Paspalum dilatatum	Paspalum	FACU	Exotic	10	Yes
Agrostis stolonifera	Creeping bent	FACW	Exotic	8	
Cenchrus clandestinus	Kikuyu	FACU	Exotic	3	
Lolium perenne	Perennial ryegrass	FACU	Exotic	3	
Juncus effusus	Soft rush	FACW	Exotic	3	
Lotus pedunculatus	Lotus	FAC	Exotic	3	
Juncus articulatus	Jointed rush	FACW	Exotic	2	
Cyperus eragrostis	Umbrella sedge	FACW	Exotic	2	
% of dominant species that are FAC/FACW/OBL					**50%**
Prevalence value					**3.1**

Table 7. Vegetation Plot K Data

Binomial name	Common name	Rating	Biostatus	Cover (%)	Dominant
Agrostis stolonifera	Creeping bent	FACW	Exotic	40	Yes
Holcus lanatus	Yorkshire fog	FAC	Exotic	20	Yes
Ranunculus repens	Creeping buttercup	FAC	Exotic	15	
Isolepis prolifera	N/A	OBL	Native	15	
Plantago lanceolata	Narrow-leaved plantain	FACU	Exotic	5	
Juncus articulatus	Jointed rush	FACW	Exotic	3	
Paspalum dilatatum	Paspalum	FACU	Exotic	2	
Cenchrus clandestinus	Kikuyu	FACU	Native	2	
Juncus effusus	Soft rush	FACW	Exotic	2	
Cyperus eragrostis	Umbrella sedge	FACW	Exotic	2	
% of dominant species that are FAC/FACW/OBL					**100%**
Prevalence value					**2.4**

All wetlands within the Site have been degraded through historical and current agricultural practices. With the exception of the wetlands located within the SEA or consent notice areas, stock had access to the majority of wetlands and damage, such as grazing, pugging and erosion, was evident. All wetlands had a high abundance of exotic species such as Mercer grass, *I. prolifera*, soft rush, jointed rush and umbrella sedge.

As a threatened ecosystem, wetlands have inherent ecological value. However, notwithstanding the above, the current ecological values of the wetlands (and associated habitat) were assessed as ranging from low to high (Appendix C).

Photos of some of the wetlands identified within the Site are provided in Figure 29, Figure 30 and Figure 31 below.

a) **b)**

Figure 29. Wetlands a) B and b) E & F.

a) **b)**

Figure 30. Wetlands a) H, I & J and b) N.

a)

b)

Figure 31. Wetlands a) T and b) X.

5.3 Uncertain areas

Four additional areas (Figure 32) were identified for further wetland assessments due to a higher presence of scattered or clumped soft rush and/or broom rush compared to the rest of the managed pasture within the Site (Figure 33 and Figure 34).

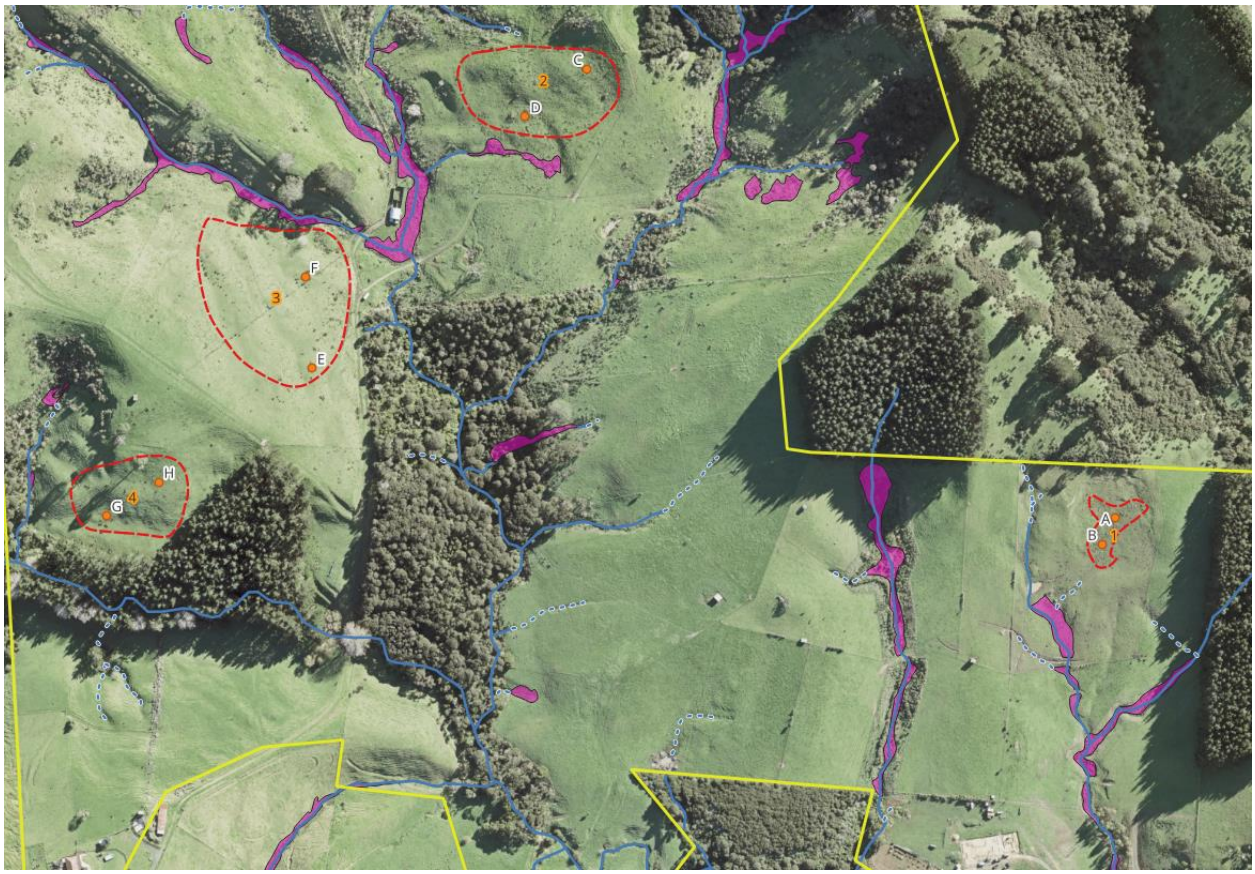


Figure 32. Location of uncertain areas within the Site.

a)

b)

Figure 33. Uncertain areas a) 1 and b) 2.

a)

b)

Figure 34. Uncertain areas a) 3 and b) 4.

Within areas 1 and 2, two representative vegetation plots were established for each area (Figure 32) and were assessed in accordance with the wetland delineation protocols (MfE 2022, Clarkson 2014).

All four vegetation plots failed both the dominance test and the prevalence index test (Table 8, Table 9, Table 10 and Table 11). As such, these areas are not considered to be a natural inland wetland as per the definitions within the NPS-FM.

Table 8. Vegetation Plot A Data

Binomial name	Common name	Rating	Biostatus	Cover (%)	Dominant
Lolium perenne	Perennial ryegrass	FACU	Exotic	40	Yes
Ranunculus repens	Creeping buttercup	FAC	Exotic	20	Yes
Juncus effusus	Soft rush	FACW	Exotic	10	
Lotus pedunculatus	Lotus	FAC	Exotic	10	
Paspalum dilatatum	Paspalum	FACU	Exotic	5	
Holcus lanatus	Yorkshire fog	FAC	Exotic	3	
Trifolium repens	White clover	FACU	Exotic	2	
% of dominant species that are FAC/FACW/OBL					**50%**
Prevalence value					**3.4**

Table 9. Vegetation Plot B Data

Binomial name	Common name	Rating	Biostatus	Cover (%)	Dominant
Lolium perenne	Perennial ryegrass	FACU	Exotic	40	Yes
Lotus pedunculatus	Lotus	FAC	Exotic	20	Yes
Juncus effusus	Soft rush	FACW	Exotic	10	
Ranunculus repens	Creeping buttercup	FAC	Exotic	10	
Paspalum dilatatum	Paspalum	FACU	Exotic	5	
Plantago lanceolata	Narrow-leaved plantain	FACU	Exotic	3	
Trifolium repens	White clover	FACU	Exotic	2	
Hypochaeris radicata	Catsear	FACU	Exotic		
% of dominant species that are FAC/FACW/OBL					**0%**
Prevalence value					**3.4**

Table 10. Vegetation Plot C Data

Binomial name	Common name	Rating	Biostatus	Cover (%)	Dominant
Cenchrus clandestinus	Kikuyu	FACU	Exotic	60	Yes
Juncus effusus	Soft rush	FACW	Exotic	20	
Lolium perenne	Perennial ryegrass	FACU	Exotic	10	
Holcus lanatus	Yorkshire fog	FAC	Exotic	5	
Lotus pedunculatus	Lotus	FAC	Exotic	3	
Paspalum dilatatum	Paspalum	FACU	Exotic	3	
Ranunculus repens	Creeping buttercup	FAC	Exotic	2	
Juncus sarophorus	Broom rush	FACW	Native	2	
Trifolium repens	White clover	FACU	Exotic	2	
% of dominant species that are FAC/FACW/OBL					**0%**
Prevalence value					**3.5**

Table 11. Vegetation Plot D Data

Binomial name	Common name	Rating	Biostatus	Cover (%)	Dominant
Cenchrus clandestinus	Kikuyu	FACU	Exotic	55	Yes
Juncus effusus	Soft rush	FACW	Exotic	25	Yes
Lolium perenne	Perennial ryegrass	FACU	Exotic	15	
Ranunculus repens	Creeping buttercup	FAC	Exotic	5	
Trifolium repens	White clover	FAC	Exotic	3	
Lotus pedunculatus	Lotus	FACU	Exotic	2	
% of dominant species that are FAC/FACW/OBL					**50%**
Prevalence value					**3.5**

Within areas 3 and 4, clumps of soft rush and broom rush were scattered throughout the managed pasture. These clumps ranged in size from approximately 1 m^2 to 3 m^2. Outside of the clumps, the vegetation was clearly dominated (i.e., > 80%) by FACU pasture grasses, such as ryegrass and kikuyu. Since the rushes have a wetland rating of FACW, these clumps would pass both the vegetation dominance test and the prevalence index test. However, due to the scattered nature of the rushes, the overall dominance of FACU pasture species outside of the clumps and the fact that these rush species are considered hardy and to be pasture weeds, it was considered that vegetation alone was not a good

indicator for wetland presence. As such, wetland hydrology and hydric soil assessments were undertaken within two representative plots for each area (Figure 32. Location of uncertain areas within the Site.) and were assessed in accordance with the wetland delineation protocols (MfE 2022, Fraser 2018, MfE 2021).

All four test pits had similar characteristics. No peaty material was present. There were no pale low or dark low chroma colours observed within the top 300 mm of the samples. The top approximately 200 mm had a soil colour of 10YR 4/3, and between approximately 200 – 400 mm the soil colour was 10YR 6/6. No mottling was observed. Therefore, soils were not considered to be hydric (i.e., soils did not indicate wetland presence).

For wetland hydrology to be considered present, one primary indicator or two secondary indicators need to be present. No saturated soils were evident when soil samples were undertaken, and no water was present within the holes. No primary hydrological indicators were observed. The only secondary hydrological indicator evident was the facultative neutral test. As such, wetland hydrology was not considered present.

Since these areas did not contain hydric soils or wetland hydrology, these areas are not considered to be natural inland wetlands.

a) **b)**

Figure 35. a) Wetland assessment plot E and b) soil profile.

a) **b)**

Figure 36. a) Wetland assessment plot F and b) soil profile.

a) b)

Figure 37. a) Wetland assessment plot G and b) soil profile.

a) b)

Figure 38. a) Wetland assessment plot H and b) soil profile.

5.4 Constructed ponds

Five constructed ponds were identified within the Site. All five ponds have been deliberately constructed for agricultural purposes. The four most southern ponds were formed in the upper ephemeral reaches of watercourses. As such, they are not considered natural inland wetlands as per the NPS-FM. The northernmost pond has been constructed within a permanent stream and natural wetland complex. As such, this pond is considered a natural modification of a natural stream/wetland complex.

a)

b)

Figure 39. a) Southeastern pond and b) northeastern pond.

a)

b)

Figure 40. a) Southern middle pond and b) northernmost pond.

a)

Figure 41. Westernmost pond.

5.5 Macroinvertebrates

The results of the macroinvertebrate survey from within the mainstream tributary (stream 38) are presented in Table 12. Raw macroinvertebrate results are included in Appendix D.

All three sites had macroinvertebrate communities that largely composed of taxa insensitive to inorganic pollution and nutrient enrichment. All sites had MCI-sb and QMCI-sb scores within the NPS-FM (2020) attribute band D, below the NBL. This indicates that the mainstream tributary (stream 38) is in degraded state. The other streams within the site are expected to have similar low MCI-sb and QMCI-sb scores, except within the forested headwaters, such as streams 40, and they upper reaches of 45, 46, 49 and 50. These forested headwaters are expected to have higher MCI-sb and QMCI-sb scores due to the lack of upstream agricultural inputs and higher degree of shading.

Table 12. Macroinvertebrate results.

	Sampling Site		
Parameter	**Up-North**	**DS1**	**DS2**
Abundance	3035	139	763
Taxa richness	18	17	22
EPT taxa richness	3	2	4
% EPT	17	18	12
MCI-sb	88	82	84
QMCI-sb	4.1	4.3	4.2
NPS-FM (2020) Attribute band	D	D	D

5.6 Freshwater Fish

A review of the NZFFD, showed that no previous fish surveys have been undertaken within the entire catchment of stream 38, a main tributary of the Ōrewa River. However, in a similar catchment to the north (a main tributary of the Ōrewa River), shortfin eel (*Anguilla australis*), banded kōkopu (*Galaxias fasciatus*), longfin eel (*Anguilla dieffenbachii*), redfin bully (*Gobiomorphus huttoni*) and kōura (*Paranephrops planifrons*) were identified.

The number and species of fish caught in the overnight trapping survey at each monitoring site are presented in Table 13. Freshwater shrimp (*Paratya* sp.) were also abundant throughout. A six replicate eDNA survey scheduled for late December 2025 within the middle catchment of the site will provide additional fish survey data for the Site (refer to Section 2.3.4).

All three sites had a F-IBI score within the NPS-FM attribute band A. This indicates that the mainstream tributary (stream 38) has a high fish community integrity community. The other permanent streams within the site are expected to have similar F-IBI scores, however the intermittent streams within the site are not expected to have as high F-IBI scores due to the general lower abundance and quality of aquatic habitat within these streams and periods of time when the streams are dry, presenting no fish habitat.

Table 13. Fish species and abundance caught at Orewa River tributary monitoring sites.

Fish	Latin name	Threat status	UP	DS-1	DS-2
Longfin eel	*Anguilla dieffenbachii*	At Risk - Declining	1	2	1
Common bully	*Gobiomorphus cotidianus*	Not threatened	4	45	12
Redfin bully	*Gobiomorphus huttoni*	Not threatened	14	29	35
unID juvenile bully	*Gobiomorphus* sp.	NA	-	-	11
Banded kōkopu	*Galaxias fasciatus*	Not threatened	2	82	12
Species richness			**4**	**4**	**4**
Total abundance			**56**	**311**	**105**
Fish IBI			**38**	**38**	**42**
NPS-FM (2020) attribute band			**A**	**A**	**A**

6 ASSESSMENT OF ECOLOGICAL EFFECTS

6.1 Impact on Terrestrial Ecology

6.1.1 Vegetation removal

In assessing ecological effects on vegetation, this report focuses on vegetation removal that has the potential to result in a material loss of indigenous plant communities, habitat function, or legally protected ecological values. The assessment therefore considers removal of vegetation within 20 m of streams and wetlands (excluding pasture and pest plant species), vegetation within covenant areas, contiguous native vegetation greater than 250 m², and vegetation located within areas mapped as SEA. These components represent the parts of the proposed works most likely to influence vegetation values, riparian function, and ecological connectivity. All remaining vegetation removal across the site is treated as permitted activity under the AUP OP and/or is of negligible ecological value, for example pest plant species, standalone native trees, or small isolated pockets of exotic trees, and has not been considered for offsetting. Potential effects on fauna are addressed separately in the relevant sections of this report.

Riparian and wetland buffer vegetation

Excluding pasture, Table 14 and Figure 42 present the vegetation areas proposed for removal within the 20 m riparian and wetland buffer zones. Vegetation removal areas were based on the earthworks clearing drawing series 3725-1-2200-L by McKenzie & Co (dated December 2025).

Table 14. 20 m riparian and wetland buffer vegetation areas (ha).

		Vegetation Type				
Stage	**Attribute**	**Gorse scrub**	**Exotic dominant**	**Native dominant**	**Pine plantation**	**Total**
1	Existing	0	0.25	2.47	0.01	2.73
	Removed for earthworks	0	0.06	0.15	0.05	0.22
	Removed for revegetation	0	0.19	0	0	0.19
	Total removed	0	0.25	0.15	0.01	0.41
2	Existing	7.34	0.16	9.25	1.12	17.87
	Removed for earthworks	0.96	0.07	0.23	0.28	1.54
	Removed for revegetation	6.38	0.09	0.0	0.84	7.31
	Total Removed	7.34	0.16	0.23	1.13	8.85
Combined	**Total Existing**	**7.34**	**0.41**	**11.72**	**1.13**	**20.6**
	Total Removed for earthworks	**0.96**	**0.13**	**0.38**	**0.29**	**1.76**
	Total Removed revegetation	**6.38**	**0.28**	**0**	**0.84**	**7.5**
	Total Removed	**7.34**	**0.41**	**0.38**	**1.13**	**9.26**

The key points from this table are:

- Currently there is 20.69 ha of existing vegetation within the 20m riparian and wetland buffer areas across the site. Of this area, 9.26 ha is proposed to be removed.
- Of the 9.26 ha vegetation removal:
    - 7.34 ha is gorse scrub. Under the AUP-OP the removal of gorse and other pest plant species is a permitted activity.
    - Only 0.38 is native dominant vegetation, which equates to 2% of the total existing vegetation and 4% of the total removal.
    - 7.5 ha of vegetation removal is specifically for revegetation purposes (i.e. the removal of exotic species to plant natives). As such only 1.76 ha of vegetation removal is required to facilitate earthworks.

It should also be noted that while 7.5 ha of vegetation removal is specifically for revegetation purposes (i.e. the removal of exotic species to plant natives), much of the removal required for earthworks is proposed to be revegetated as well (and addressed through additional revegetation as later discussed). Approximately only 0.69 ha of the total 20 m riparian and wetland buffer vegetation removal will be permanently removed within these areas. This equates a total of 3% permanent vegetation removal within the 20 m riparian and wetland buffer zones. This permanent vegetation removal is largely associated with the proposed road crossings and is proposed to be offset. The remainder of the 20 m riparian and wetland buffer vegetation removal will be revegetated with appropriate native species (drawing series 2535 prepared by Greenwood Associates dated December 2025).

As such, the magnitude of effects are considered low and the overall effects of the 20 m riparian and wetland buffer vegetation removal very low - low. Despite the very low - low effect, offset planting is proposed and offset calculations are set out further below. Overall, there will be a net gain in native riparian and wetland planting across the Site.

SEA vegetation

The only vegetation proposed for removal with the SEA is the removal of pest plant species (e.g., gorse) to facilitate revegetation planting, which is a permitted activity under the AUP-OP.

The proposed revegetation planting will provide a high degree of ecological connectivity and buffering from edge effects, providing for a net gain in SEA value and ecological functioning.

Consent notice vegetation

Four areas (1-4, Figures 37 & 38) of vegetation removal are proposed within consent notice areas. Areas 1 and 2 are located within Stage 1, while areas 3 and 4 are located within Stage 2.

Area 1 comprises of young, common, planted natives. Mānuka, kānuka, mapou hangehange and māhoe are the predominant species (Figure 45a). Approximately 200 m^2 of vegetation removal is required to accommodate a new road crossing at this location. This road crossing has been kept to a minimum width to minimise the impact on the vegetation.

Area 2 comprises of young, common, planted natives. Mānuka, cabbage tree and karamū are the predominant species, with a mixture of native wetland species such as *Carex* spp. And *Juncus* spp. (Figure 45b). Approximately 1,300 m^2 of vegetation removal is required to accommodate a new road crossing at this location. This road crossing is associated with the construction of Auckland Transport's (AT) Notice of Requirement (NoR6) that comprise the North Project.

Area 3 comprises of a predominant exotic canopy cover, including black poplar (*Populus nigra*), with a mixture of exotic and native understorey species such as cabbage tree, mapou, kānuka, tree privet and agapanthus (*Agapanthus praecox*) (Figure 45c). Approximately 280 m^2 of vegetation removal is required to accommodate a new road crossing at this location. This road crossing has utilised the location of an existing crossing and has been kept to a minimum width practical to minimise the impact on the vegetation.

Area 4 comprises of regenerating indigenous bush area. Kānuka, tōtara and mapou are the predominant species (Figure 45d). Approximately 110 m^2 of vegetation removal is required to enable the construction of a pedestrian bridge. The narrowest section of the area was selected for the crossing to minimise the amount of vegetation removal.

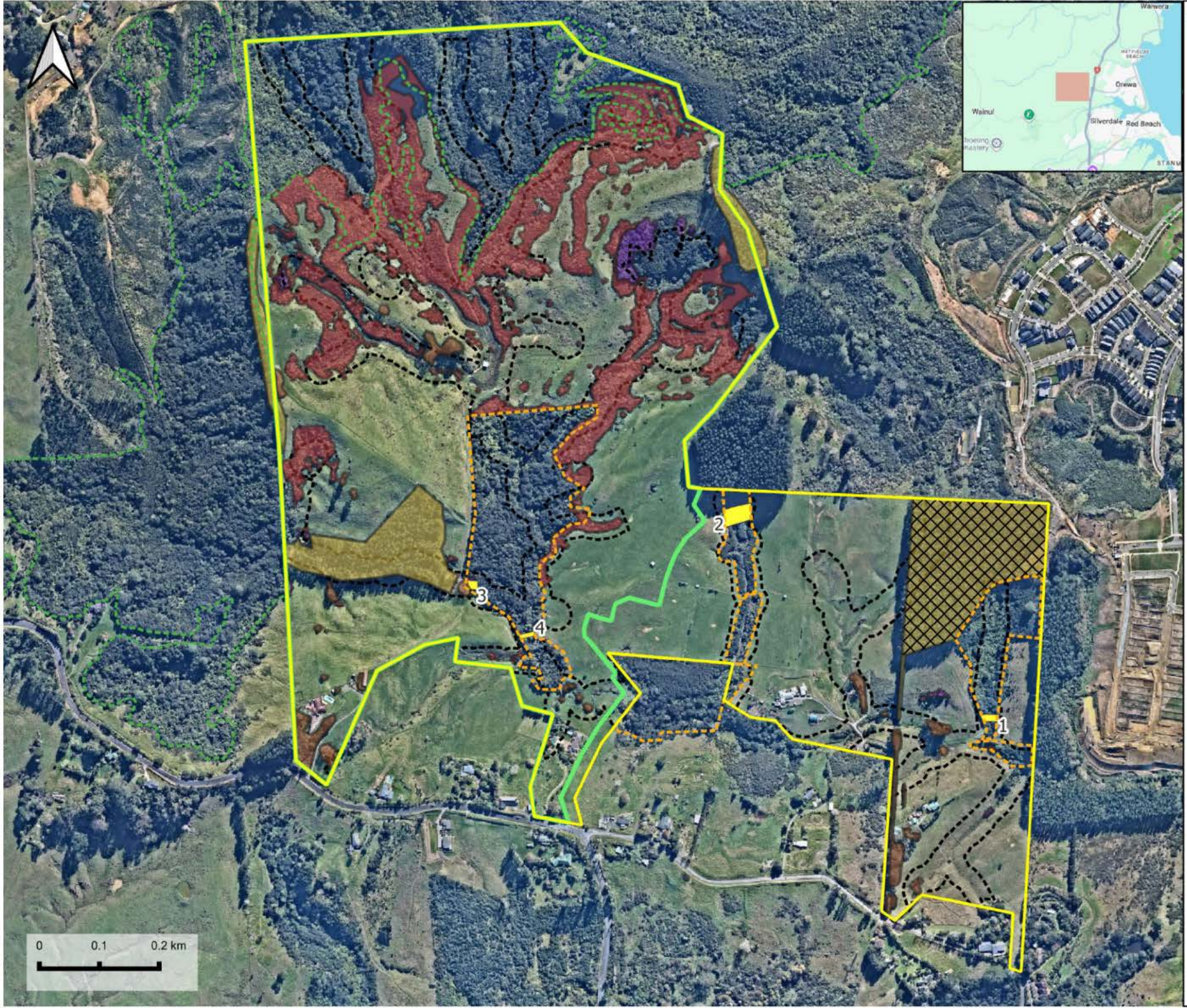


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Figure 42

Vegetation Removal

Delmore Project

Legend

- Site
- Stage 1 & 2 boundary
- Covenants
- SEA_T_6652
- 20m riparian & wetland buffer

Areas proposed for removal

- Felled pine plantation
- Pine plantation
- Native dominant vegetation
- Exotic dominant vegetation
- Gorse scrub
- Native covenant removal

SOURCES

Nearmap 2025

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.

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a)

b)

c)

d)

Figure 43. Approximate locations of the required vegetation removal in consent notice areas a) 1 (photo provided by Peers Brown Miller Ltd), b) 2 (photo provided by Peers Brown Miller Ltd) c) 3 and d) 4 (Figure 42).

While the above is considered an accurate reflection of the amount of vegetation removal required within the consent notice areas, a conservative approach has been taken and it is assumed that up to 2,345 m^2 and 683 m^2 of earthworks will be undertaken within Stages 1 and 2, respectively, as shown on drawing number A003 by Terra Studio. This represents 7% and 1% of the total consent notice areas within Stages 1 and 2, respectively (4% average). All areas of vegetation removal within consent notice areas also fall within the 20 m riparian and wetland margins and have been included in the riparian and wetland vegetation removal calculations.

Offset planting is proposed to mitigate vegetation loss within the consent notice areas, and the offset calculations are set out in Section 6.1.2 below. The planting is planned adjacent to the existing consent notice areas and will be protected through new consent notices, so the integrity of the existing consent notice areas is maintained and potential edge effects are minimised.

The existing consent notices for these areas of removal require that the health, ecological value, long term viability and sustainability of these areas is not prejudiced. While there will be a loss of native vegetation in the short term, it is in our opinion that, provided the offset measures and recommendations are undertaken, there will be no loss of health or ecological values in the long term within the consent notice areas and that their long-term viability and sustainability will not be

compromised. In fact, we consider that there will be a net gain in ecological value due to the increased buffering and connectivity the proposed planting and new consent notice areas provides.

Native dominant vegetation

Outside of SEA, consent notice areas, and 20 m riparian and wetland margins, an additional 0.46 ha of native domain vegetation is proposed to be removed (Figure 42). This equates to 6% of the remaining native domain vegetation outside of the consent notice areas and 20 m riparian and wetland margins.

The magnitude of effect is considered low and the overall effect is considered very low – low. Despite the very low - low effect, offset planting is proposed and offset calculations are set out further below. Overall, the proposed revegetation and amenity planting within the Site is anticipated to greatly enhance the native vegetation values across the Site by creating a greater abundance and diversity of native vegetation as well as more sustainable and connected ecosystems.

Other vegetation

All gorse scrub, pine plantation and exotic dominant vegetation is proposed for removal. The removal of this vegetation is a permitted activity under the AUP-OP and the overall level of effect of this vegetation removal is considered low. Furthermore, the proposed revegetation and amenity planting within the Site is anticipated to greatly enhance the native vegetation values across the Site by creating a greater abundance and diversity of native vegetation as well as more sustainable and connected ecosystems.

Vegetation removal summary

The assessment considers removal of vegetation within 20 m of streams and wetlands (excluding pasture and pest plant species), vegetation within covenant areas, contiguous native vegetation greater than 250 m², and vegetation located within areas mapped as SEA. Table 15 below presents a summary of these vegetation removal areas.

Table 15. Vegetation removal summary.

Vegetation		Area (ha)
20 m riparian and wetland buffer	Native dominant	0.38
	Exotic dominant	0.41
	Pine plantation	1.13
Consent notice		0.3*
Native >250 m²		0.41†
Total vegetation removal		**2.38‡**

Notes:

* All vegetation removal within the consent notice areas also falls within the 20 m riparian and wetland margins.

† Excludes vegetation that also falls within the 20 m riparian and wetland margins.

‡ Excludes the consent notice area as they have been accounted for in the 20 m riparian and wetland margins.

6.1.2 Vegetation removal offset proposal

Offsetting principles

The purpose of this offset proposal is to determine the quantum of mitigation actions, namely revegetation, required to offset effects on terrestrial ecological values associated with vegetation removal within the site. The objective is to demonstrate an overall net positive outcome for ecological values. The required actions are quantified against predicted losses and modelled using a Biodiversity Offset Accounting Model (BOAM), developed by Maseyk and others (Maseyk et al. 2015, 2018), which

provides a transparent approach for calculating net present biodiversity values and testing whether proposed gains are commensurate with losses over time. Biodiversity offsetting is a recognised tool for counterbalancing significant residual ecological effects in New Zealand, provided it is applied in accordance with the effects management hierarchy outlined in the NPS IB.

This proposal is consistent with the principles of biodiversity compensation in the NPS IB, and is structured to show how each step of the effects management hierarchy has been applied. Avoidance has been incorporated through early design adjustments that reduced unnecessary vegetation clearance, and further avoidance will occur during construction through physical delineation of the final footprint boundary. Minimisation of species specific effects (particularly for fauna) will be achieved through implementation of a site specific fauna management plans, which is addressed separately in this report. Remediation will occur through replanting in some areas of removal, however as a conservative measure these remediated areas have still been included within the offset calculations. Residual adverse effects are offset through revegetation modelled in BOAM to demonstrate measurable, like for like gains that result in a net gain outcome at the project scale.

Offset design follows current good practice guidance from DOC (2014) and Local Government New Zealand (Maseyk et al. 2018). The offset package is designed to be demonstrably additional to what would otherwise occur, including being additional to any avoidance, minimisation, mitigation, or remediation required as part of the works. All offset actions are proposed in situ within the site and immediate landscape, so gains accrue to the same broad flora and fauna communities affected by clearance. The proposed offset areas are currently pasture, dominated by pest plant species, scheduled for clearance, or otherwise unprotected, and there are no existing plans to carry out revegetation or enhancement in these locations, which supports the additionality requirement. Where revegetation or enhancement areas currently lack legal protection, they are proposed to be protected in perpetuity (for example through covenanting or equivalent mechanisms). The BOAM framework also explicitly accounts for uncertainty and time lags between impact and maturity of restoration, ensuring a conservative evaluation of net outcomes.

The biodiversity values being removed are relatively young, planted, exotic, or regenerating ecosystems that are structurally simple and generally support low native species richness. These values are therefore well understood, measurable, and suitable for offsetting, with a high level of certainty in predicted restoration outcomes based on established methods. It is acknowledged that some attributes cannot be fully replaced within the modelling timeframe, for example habitat capacity provided by mature tree cavities (particularly those in exotic pines). While these attributes are not directly modelled, restoration actions are located in the same landscape where such features occur, and are intended to enhance these areas through buffering and improved connectivity.

In addition to counterbalancing the loss in extent of protected vegetation, a key biodiversity objective of the BOAM actions is to facilitate succession of revegetation towards its historic vegetation state (WF11, kauri, podocarp, broadleaved forest). Because naturally occurring regenerating ecosystems in Auckland are often highly fragmented, isolated, and in variable condition, a directly comparable local benchmark for some vegetation types was difficult to identify. A conservative benchmark was therefore adopted, using a very good condition example of broadleaved species scrub that supports high native species richness and includes future WF11 canopy species already present within the understorey.

Vegetation loss, classification, and BOAM currencies

A total of 2.38 hectares of vegetation is proposed for removal (Table 15). For BOAM modelling purposes, the vegetation to be offset has been classified into the following vegetation types, reflecting their representative ecosystem types (after Singers et al. 2017a), vegetation characteristics, and management context (for example fenced or consent notice protected versus unprotected):

- Exotic forest (EF), pine plantation
- Kānuka scrub or forest (VS2), protected (consent notice)
- Kānuka scrub or forest (VS2), not protected
- Mānuka, kānuka scrub (VS3), established native planting
- Exotic forest (EF), riparian or consent notice edge

Representative 10 m by 10 m plots were established within each vegetation type (Figure 44). Within each plot, data were collected for woody plant species on native canopy cover, native species dominance, native species richness, diameter at breast height (DBH), and basal area. Plot data are provided in Appendix A and form the quantitative inputs to BOAM.

Each vegetation type being removed was considered a separate Biodiversity Component. Four biodiversity attributes (currencies) were selected for vegetation and habitat modelling, as they collectively capture the key ecological values relevant to these vegetation types and to successional restoration trajectories. These currencies are native canopy cover, native species dominance, native species richness, and tree basal area.

BOAM results and offset requirement

The vegetation BOAM outputs are presented in Appendix E. The BOAM impact and offset models demonstrate that, for each biodiversity component and currency, net present biodiversity values are predicted to be positive at 20 years as the restoration matures. Using the BOAM, the area of revegetation planting required to achieve a net gain for each Biodiversity Attribute was calculated. For each component, the highest required offset area across its attributes (so one conservative requirement per component) was used. The offset area requirements for each component was summed to get the total revegetation planting area needed to offset all accounted vegetation losses.

Overall modelling indicates, with high confidence, that removal of 2.38 hectares of vegetation is offset with 10.5 ha of revegetation within the site. The offset package therefore achieves a net gain outcome within the BOAM accounting period.

To ensure modelled outcomes are achieved in practice, revegetation planting should be undertaken in accordance with Landscape Drawing Series 2535 prepared by Greenwood Associates (dated December 2025). A planting implementation and maintenance plan is proposed as a condition of consent, to ensure establishment success, ongoing maintenance, and long term protection. The revegetation programme is intended to buffer existing ecological features and habitat, improve site and landscape scale connectivity, increase native species diversity and abundance, increase habitat extent, and include enrichment planting that supports succession toward a future WF11 forest type consistent with historic vegetation patterns.

A total of 31.8[5] ha of revegetation planting is proposed within the site. As detailed in Landscape Drawing Series 2535 prepared by Greenwood Associates (dated December 2025), this includes native bush revegetation planting, upper riparian planting, lower riparian planting, and lot revegetation planting. While slope stabilisation planting, stormwater pond edge planting, and wetland planting provide some ecological benefit, they are not counted as revegetation planting for the purposes of this offset assessment, as the slope stabilisation and pond edge mixes deliver relatively limited biodiversity gains, and the wetland planting is addressed separately as part of the wetland offset package.

As 10.5 ha of revegetation planting is required to offset the proposed vegetation removal and achieve a net ecological gain, the proposal provides an additional 21 ha beyond the offset requirement. This surplus planting mitigates urbanisation effects of the proposal, including increased lighting, noise, and human disturbance, and delivers a substantial net gain in biodiversity and ecological value by buffering existing ecological features and habitat, strengthening site and landscape scale connectivity, increasing native species diversity and abundance, and expanding overall habitat extent.

[5] Excludes planting associated with slope stabilisation, stormwater ponds and wetlands

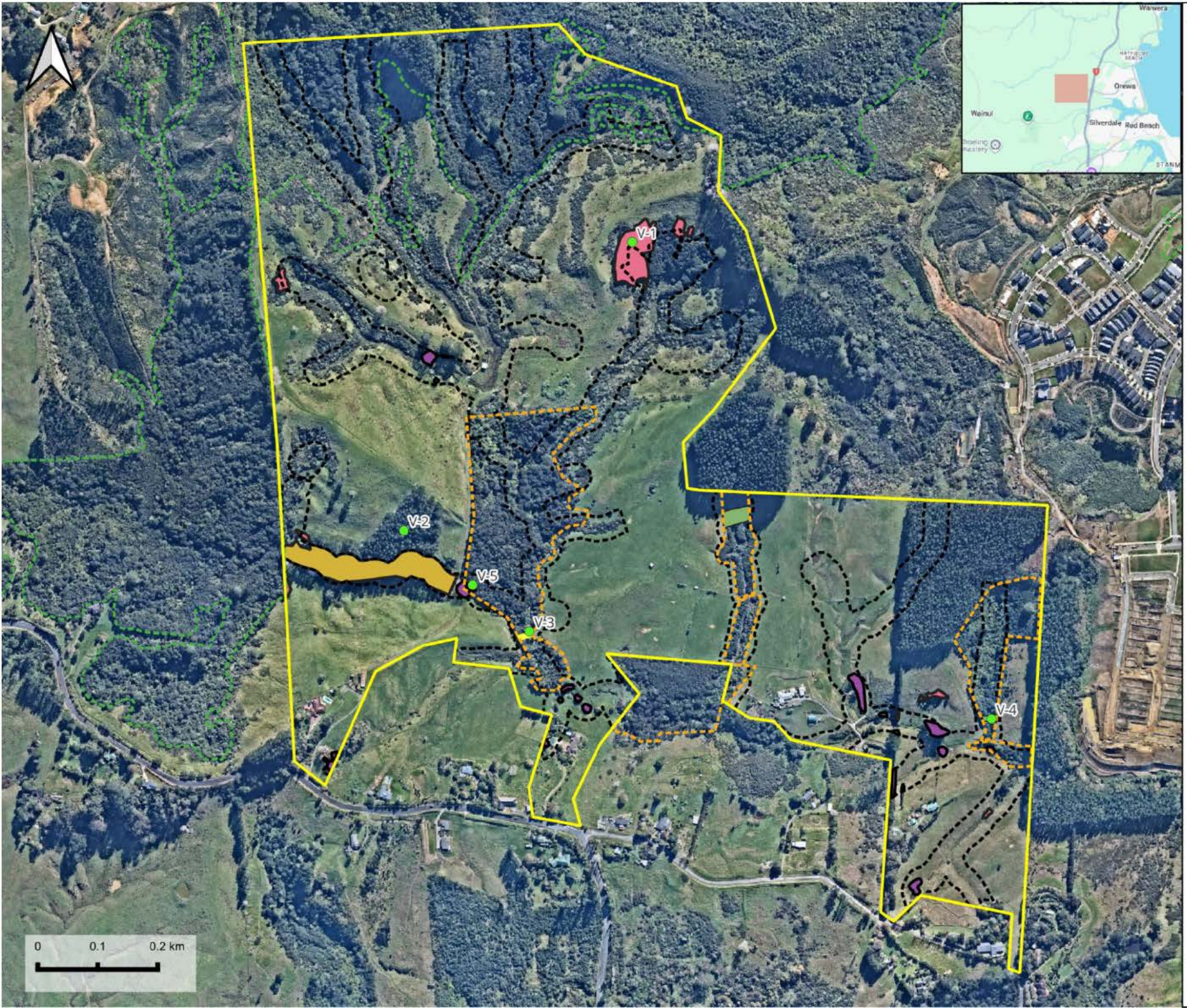

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Figure 43

Vegetation Types

Delmore Project

Legend

- Site
- Covenants
- SEA_T_6652
- 20m riparian & wetland buffer
- Vegetation plot locations
- Exotic forest (EF) - pine plantation
- Kānuka scrub or forest (VS2) - protected (consent notice)
- Kānuka scrub or forest (VS2) - not protected
- Mānuka, kānuka scrub (VS3) - established native planting
- Exotic forest (EF) - riparian or consent notice edge

SOURCES

Nearmap 2025

SCALE **1:8,000** @ A4

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6.1.3 Wastewater disposal field Wastewater disposal field

The proposed wastewater irrigation areas are located within the easternmost consent notice area (area 3, Figure 11), which covers approximately 1.8 ha as well as within private lots with 1:3 batter slopes where planting will occur (Terra Studio drawing A-RFI-1-20). The consent notice area comprises young, planted native vegetation with additional indigenous regeneration. The vegetation is dominated by common early successional species, including mānuka, kānuka, cabbage trees, māhoe, māpou, and tree ferns (*Cyathea* sp) (Figure 45). Beyond the edges of the consent notice area, groundcover becomes sparse and is largely made up of common weed species, with scattered ferns and pasture grasses. A representative vegetation plot was established within the consent notice area (V 4, Figure 3), and the resulting data are provided in Appendix A.

a) **b)**

Figure 45. Example of the understorey within the easternmost consent notice area (area 3). Photos taken in close proximity to vegetation plot 4 (Figure 3).

The plant community is typical of ecosystem type VS3 (mānuka, kānuka scrub, Singers et al. 2017a) and reflects the early successional stages of WF11 (kauri, podocarp, broadleaved forest). This is consistent with Auckland Council's Geomaps Ecosystem Potential Extent layer, remaining local fragments of historic WF11 forest, and the underlying East Coast Bays Formations geology (Riley 2025). VS3 ecosystems have a regional IUCN threat status of Least Concern, however they remain important as a successional pathway toward higher value WF11 forest over time.

Adjustments to private lot batter slopes have been made to pull them back further from the existing consent notice areas. The increased offset has provided additional space for revegetation planting and for driplines. The nature of the site means there is not sufficient area for driplines to be located solely in revegetation areas. The placement of the irrigation field is subject to land availability, topography, soil suitability, and proximity to the wastewater infrastructure, all of which limit viable locations. As such, some irrigation within the consent notice area (area 3, Figure 11) is required. Irrigation in this area has been minimised as far as possible.

To establish the wastewater disposal field, surface irrigation lines (on grade pressure drippers) will be installed by hand at approximately one metre intervals. This approach minimises disturbance, and the spacing can be adjusted locally to accommodate obstacles while still achieving required disposal volumes. No canopy or substantial vegetation removal is proposed. Short term effects during installation are expected to be limited to light clearance of low-lying understorey vegetation, which is dominated by weeds with some common ferns and grasses.

The hand laid installation method avoids significant disturbance to vegetation or wildlife habitat. No clearance is required for installation or ongoing maintenance beyond what would normally occur as part of routine manual weed and pest plant control expected within the consent notice area, irrespective of the irrigation proposal. Any understorey clearance is therefore expected to be minor and comparable to standard pest management activities, with no loss of significant indigenous habitat or mature native vegetation. These works are consistent with the intent of the covenant, as they are not expected to compromise ecological health, vegetation values, or the long term viability of the consent notice area.

The effluent will be treated to a high standard, with reverse osmosis included as part of the treatment train, ensuring minimal nutrient and contaminant load and real-time soil moisture monitoring will be implemented to adjust irrigation rates and prevent overloading of the disposal field (Apex 2025).

There is limited New Zealand based research on the effects of treated wastewater irrigation within native forest systems. Available studies in young native restoration forests, which are analogous to the vegetation present here, indicate that treated effluent irrigation can increase plant survival and growth rates, with negligible effects on foliage elemental composition (Meister et al. 2022). Auckland Council guidance also generally supports land-based wastewater disposal to vegetated areas due to higher evapotranspiration, improved soil filtration, and nutrient uptake within root zones. The established native vegetation within the disposal field is expected to facilitate these processes and, based on the current evidence, is unlikely to experience adverse effects provided treatment performance and application rates remain within proposed limits.

In addition, the development proposal includes 21.5 ha of revegetation planting beyond the area required to offset vegetation removal. This surplus planting provides a substantial net gain in indigenous vegetation values across the site, and would mitigate any unforeseen or minor adverse effects associated with locating the wastewater disposal system within the consent notice area.

6.1.4 Avifauna (birds)

The ecological value of the larger patches of native vegetation and wetlands for avifauna was considered to be high, with the rest of the vegetation within the Site considered to be low.

The magnitude of effect of the proposed works on birds is considered to be temporary and low, mitigated to very low.

Birds are highly mobile, unless they are nesting, or have eggs or chicks in the nest. They can move over relatively large distances, depending on the species, to find suitable habitat as required.

Clearance of trees during the bird breeding season has the potential to result in direct mortality of birds, eggs and chicks. It is proposed as a condition of consent, that any vegetation removal (other than pasture and gorse scrub) or works within wetlands, occurs outside of the bird nesting season (September to February, inclusive). If vegetation clearance is unavoidable during the main indigenous bird nesting season, an experienced ecologist or ornithologist should visually inspect all trees and shrubs proposed for removal before, and no more than 24 hours prior to, felling or removal, to identify any active nests of indigenous birds. This includes checking cavities and hollows for nesting birds (e.g. morepork, kingfisher). Should any nesting of indigenous birds be observed, a 10 m buffer of vegetation should be required to remain around the nest site until an experienced ecologist or ornithologist has confirmed that the nest has failed or the chicks have hatched and naturally left the nest site. The native bird management recommendations can form part of a broader fauna management plan.

Provided that the above recommendations are adhered to, it is expected that no indigenous birds will be handled or harmed and as such a Wildlife Act Authority (WAA) is not considered required for this activity.

The loss of, and disturbance to, habitat within the Site is not expected to permanently displace the bird community. There is significant unaffected similar habitat, as well as higher quality habitat, in the immediate surrounds and wider landscape. It is expected any birds present within the site will move away from the disturbed habitat while works are occurring and will recolonise the Site once works have been completed.

The proposed revegetation and amenity planting within the Site is anticipated to greatly enhance its value for native birds by providing increased habitat connectivity and resources such as food, nesting opportunities, and shelter as the vegetation becomes established.

6.1.5 Herpetofauna (lizards)

The ecological value of the larger patches of native vegetation for herpetofauna was considered to be high, and the ecological value of the rest of the vegetation, outside of the managed pasture within the Site was considered to be moderate. The managed pasture was considered to be of negligible value for herpetofauna.

The magnitude of effect on lizards is considered to be moderate and temporary, mitigated to low.

Works within the Site have the potential to result in direct mortality and/or injury of any lizards present, through activities such as earthworks, vegetation removal and the movement of machinery. As lizards are not considered to be highly mobile, they have limited ability to move quickly to safety. Indirect effects on lizards include the loss of habitat as a result of vegetation clearance and associated construction activities. However, the proposed revegetation within the Site is anticipated to enhance its value for lizards by providing increased habitat connectivity and resources such as food, and shelter as the vegetation becomes established.

As works in their habitat cannot be avoided during construction, it is proposed as a condition of consent, that a lizard management plan (LMP) (which could form part of a broader fauna management plan) is prepared outlining how lizards will be managed during works. The LMP will include measures to capture native lizards from any suitable habitat within the Site, locations where they will be released and the details of the organisation who will undertake the work. The organisation who will undertake the work should have a current Auckland wide lizard salvage WAA. Additional information such as habitat enhancement at the release site and any ongoing monitoring should be provided as necessary. Provided that the above recommendations are adhered to, then it is expected the no indigenous lizards will be harmed and a specific project WAA is not considered required.

6.1.6 Chiroptera (bats)

It was considered possible that long tailed bats may periodically be present within the Site. As such, the ecological value of the Site for bats was considered to be moderate, as a small amount of vegetation may provide suitable habitat, and their presence cannot be ruled out.

The magnitude of effects on bats is considered to be moderate, mitigated to low.

Clearance of trees is not expected to result in any significant habitat loss or population displacement of a potential bat population. The wider area is not known to be a high use area for bats, which has been reflected in previous ABM survey data. The potential habitat proposed for removal is of low quality with

poor connectivity and is heavily influenced by human activities. There is unaffected habitat in the immediate vicinity, and significant higher quality habitat in the wider area which will be unimpacted by the proposed works.

It is recommended, as a condition of consent, that pre-clearance monitoring of potential roost trees as per DOC's Bat Roost Protocols (DOC 2024) is undertaken. This could be required through the preparation of a bat management plan, or a resource consent condition requiring application of the DOC standards to be undertaken by a competent bat worker. In summary, the DOC protocols state; prior to felling, a suitably qualified and experienced ecologist should assess any tree greater than 15 cm diameter at breast height for potential bat roost habitat, and if there is potential roost habitat then further assessment (e.g., using ABMs) can be undertaken following the protocols to ensure that there are no bats roosting in the tree. Provided that the above recommendations are adhered to, then it is expected the no bats will be handled or harmed and as such a WAA is not considered required for this activity. The bat management plan can form part of a broader fauna management plan.

6.1.7 Urbanisation

Urban development can introduce indirect pressures on terrestrial ecological values, particularly through increased lighting, noise, and human activity. These effects can alter habitat conditions at edges, influence fauna behaviour, and reduce the functional integrity of nearby indigenous vegetation. At this site, the extent and layout of proposed revegetation and riparian buffering are intended to substantially reduce these urbanisation related effects.

The development includes 16.1 ha of riparian and buffer planting within 20 m of streams and wetlands, including 10.5 ha within 10 m. Beyond the riparian zone, a further 15.4 ha of revegetation planting is proposed. Together, these revegetation plantings, totalling 31.8[6] ha, strengthen ecological connectivity and provide a continuous buffer between SEAs, areas protected by consent notices, and riparian margins. This results in widespread 20 m riparian buffers, with some locations exceeding this width, which helps dampen light spill, reduce noise penetration, and limit edge effects on indigenous habitats.

Where development is closest to Nukumea Reserve and adjacent SEA T, a minimum 40 m planted setback is proposed to the nearest rear lawn. In other parts of the site, planted setbacks to Nukumea Reserve and adjacent SEA T typically range from 100 m to 300 m. The lots adjoining Nukumea Reserve are also positioned well below natural ground level and are separated from the reserve by planted batters along the boundary. These combined measures create strong physical and visual separation from sensitive habitats, further reducing the potential for lighting and noise to affect ecological values within the reserve, SEA T, and riparian areas.

Overall, the scale of planted buffers, setbacks, and lowered lot elevations is expected to provide effective mitigation of urbanisation effects. This is considered appropriate given the site is not identified as a high use bat area or a significant seabird nesting area, and it is further supported by the net gain in indigenous vegetation values achieved through the broader revegetation programme.

[6] Excludes planting associated with slope stabilisation, stormwater ponds and wetlands

6.2 Impact on Freshwater Ecology

6.2.1 Streams

Culverts/crossings

Aside from culverts, no other streamworks are proposed. The magnitude of effect on the streams as a result of the removal of existing farm culverts, and installation of new culverts is considered to be moderate, mitigated to low through appropriate design and the implementation of fish management.

A total of 17 existing farm culverts across the Site will be removed. Many of these restrict hydrological connectivity and inhibit fish passage. Their removal is expected to improve stream hydrology and reduce localised flow disruptions.

A total of 12 new culverts are proposed (Figure 46). With the exception of culverts 7, 9 and 10, all culverts are less than 30 m in length, 1.3 x the stream width and either embedded by 25% for circular culverts or embedded by 350 mm for box culverts (drawing series 3725-1-4800 prepared by McKenzie and Co.). These characteristics help maintain continuity of stream habitat and a natural stream bed and provide for appropriate fish passage.

Culvert 9 has not been embedded by 25% or by the minimum 350 mm for box culverts, as inlet invert matches the upstream wetland level to avoid wetland drainage. Culverts 7, 9 and 10 have also not been designed to be 1.3 x the stream width, as these culverts are located in wide flat areas which are impractical to span by a culvert. These culverts are located relatively high up in the catchment, and it is expected that the fish community is represented by strong climbing species such as eels (*Anguilla* spp.) and banded kōkopu. Fish passage will only be impacted during periods of high flow when flow velocities through the culverts increase, decreasing the suitability of the structure in providing fish passage. However, under normal or low flow conditions, due to the culverts short lengths, the embeddedness and the expected upstream fish community, it is considered that these culverts will provide adequate fish passage. During construction of culverts, fish passage can be maintained through clean water diversion channels.

Due to the removal of the existing farm culverts and the design of the new culverts, it is expected the fish passage within the Site's catchment will be improved.

Progressive encasement

Auckland Council's interpretation of the progressive encasement standard under the AUP-OP considers the site as a whole, rather than assessing effects at the level of individual stream reaches, regardless of the number or length of streams present within the site. While the requirement for consent has been addressed in the Assessment of Environmental Effects, an assessment of effects in relation to progressive encasement is provided below for completeness.

There are approximately 7,800 m of stream length within the site, and 24 existing culverts. A total of 17 culverts are proposed for removal. The removal of these 17 culverts will restore a combined length of 133.12 m of stream.

A total of 12 new culverts are proposed. To minimise adverse effects, all new culverts have been designed to be less than 30 m in length. The combined length of these new culverts is 263.04 m, resulting in a net increase of 129.92 m of culvert length compared to the existing situation.

When expressed as a proportion of the total stream length within the site, the proposed total new culvert length represents just 3.4%, which is considered a low magnitude of effect.

The removal of existing farm culverts and the improved design of the new culverts are expected to enhance fish passage across the site. In addition, riparian revegetation planting is proposed along all stream reaches. This will improve water quality, stabilise stream banks, regulate water temperature through shading, enhance native habitat, increase biodiversity, and strengthen resilience to both floods and droughts.

Overall, the residual adverse effects associated with progressive encasement are considered to be low, given the proportion of stream affected, the removal of existing culverts, the fish-friendly culvert design, and the comprehensive riparian restoration proposed.

6.2.2 Wetlands

Under the NES-F, the following regulations have been considered for proposed works within the Site:

- Vegetation clearance within, or within a 10 m setback from a natural inland
- Earthworks or land disturbance outside a 10 m, but within a 100 m, setback from a natural inland wetland if it results in, or is likely to result in, the complete or partial drainage of all or part of the wetland
- Earthworks or land disturbance within, or within a 10 m setback from a natural inland
- The diversion of water within, or within a 100 m setback from, a natural inland wetland if (there is a hydrological connection between the taking, use, damming, or diversion and the wetland; and if the taking, use, damming, or diversion will change, or is likely to change, the water level range or hydrological function of the wetland
- The discharge of water into water within, or within a 100 m setback from, a natural inland wetland if there is a hydrological connection between the discharge and the wetland; and if the discharge will enter the wetland; and if the discharge will change, or is likely to change, the water level range or hydrological function of the wetland

Thirty six natural inland wetlands, as per the NPS-FM definitions, were identified within 100 m of the proposed activities.

Vegetation clearance

Vegetation clearance within 20 m of wetlands has been addressed in Section 6.1.1 of this report.

Earthworks, diversion of water and discharge of water to water within 100 m of a wetland

Earthworks will occur within 100 m of all identified wetlands. While earthworks will occur within the wetland catchments, earthworks are not expected to alter the size of the catchment significantly. Additionally, the wetlands within the Site are associated with the stream network, the stormwater approach for the Site mimics, as far as practicable, the existing catchments (McKenzie & Co., 2025a). Where lots are directly adjacent to watercourses, treated stormwater will be discharged toward the watercourses through a T bar energy dissipation device, to maintain flows and minimise flows entering the public system where possible (McKenzie & Co., 2025a).

Riley Consultants Limited (Riley) have provided an assessment of potential groundwater drawdown and its impact on wetland hydrology (Riley, 2025). They note that although groundwater drawdown will occur in the cut slopes above the wetlands, groundwater will continue to flow to the site's gullies throughout the year, ensuring no reduction in water reaching the wetlands. The development will not change the size of the water catchments, and all pre-development surface and groundwater will still be

directed to the wetlands and gullies. Groundwater intercepted upslope by excavations and drainage systems will be discharged back into the wetlands at nearby points, using energy dissipation measures to minimise erosion. While some localised concentration of water may occur at these discharge points, the overall groundwater flow to the wetlands will be maintained.

A relatively large-scale catchment revegetation plan is proposed (see Section 6.5 of this report). This catchment wide approach has increased benefits of small, isolated revegetation programs. The revegetation of the catchment will reduce sedimentation, erosion and flood risks as well as improve water flow regimes.

Based on the above, it is not expected that there will be complete or partial drainage of all or part of a wetland or that there will be a change to the water level range or hydrological function of the wetland.

Earthworks within 10 m of a wetland

Some earthworks will be required directly adjacent to wetlands. Earthworks are not expected to significantly alter the size of the wider catchment, rather it will smooth out the contours allowing for development and avoiding the need for retaining walls, but also for enhancement planting around the wetlands. Effect of sedimentation as a result of the earthworks will be appropriately mitigated through the erosion and sediment controls. Effects of sedimentation on freshwater features are discussed in more detail in Section 6.2.5 of this report.

Geomorphic risk assessment

A geomorphic risk assessment has been prepared by Morphum which relates to the for the proposed culverts affecting wetlands, and a hydrological assessment has also been prepared by WWLA on this matter.

Earthworks within a wetland

Earthworks within wetlands are required to install five of the thirteen proposed culverts, namely culverts 1, 5, 7, 9, and 10 (Figure 46). Consistent with the effects management hierarchy, these culverts have been designed to minimise wetland reclamation as far as practicable by embedding the structures and sizing them appropriately. Each culvert is less than 30 m long, wide, and embedded, including rip rap, so that a natural bed can be reinstated through the culvert footprint.

Wetlands comprise three key components, vegetation, soil, and hydrology. While vegetation is typical of most wetlands, its absence does not necessarily preclude an area from functioning as wetland, provided soils and hydrological conditions are retained. Within the culvert footprints, substrates and wetland hydrology will be maintained through the embedded design, but wetland vegetation is not expected to re-establish within the enclosed sections away from the margins due to limited light availability. Vegetation may persist at culvert edges where light and propagule sources remain, but internal culvert sections will be largely devoid of vegetation despite continued wetland soil and hydrological function.

Modification of wetlands associated with culverts 1, 5, 9, and 10 will be temporary, with wetland soils retained and the areas remaining part of the functioning wetland system following reinstatement, although vegetation will be absent within the culvert footprints. Culvert 7 differs in that it is associated with NoR6 and, due to its width, will result in some permanent wetland removal. Culvert 9 has also been positioned to enable retention of upstream induced wetland habitat, with wetland soils and hydrology remaining in place through the structure.

The total area of permanent wetland removal will be 277 m², while the total area of temporary wetland removal associated with earthworks will be 809 m^2, giving a combined total area of 1,086 m^2 of wetland

disturbance. Within Stage 1 748 m^2 of disturbance will occur (including the 277 m^2 of permanent reclamation), while in Stage 2 338 m^2 of disturbance will occur. The magnitude of effect prior to mitigation is considered moderate. For the purposes of wetland offset calculations, Viridis has applied a conservative assumption by treating all wetland features within the culvert footprints, including substrate and hydrology, as reclaimed.

There is a total of 22,166 m^2 of identified wetland habitat within the Site. The wetland disturbance area represents 5% of the total wetland habitat within the Site.

All wetlands to be disturbed were of a very similar nature, having a similar plant species composition of predominately common rushes, sedges and grass species. All wetlands were either seepage fed and/or associated with intermittent or permanent stream margins. The wetlands also had similar habitat features, generally lacking indigenous flora biodiversity, structural tiers, and aquatic habitat, and all were in the same contributing catchment of the Ōrewa River. All wetlands were assessed as having a low (wetland B and G) or moderate (wetlands K, U and AE) ecological value.

The loss of the wetlands' functional roles of flood attenuation and nutrient capture will be appropriately mitigated through stormwater management. However, there will still be a loss of wetland extent and value, which is considered a significant residual effect. As such, a wetland offset proposal has been developed.

6.2.3 Wetland offset

The Wetland Ecological Valuation (WEV) method was used for the wetland BOAM. WEV is a simplified equivalent of the Stream Ecological Valuation (SEV) tool and was developed by RMA Ecology in collaboration with Auckland Council. It provides a framework for quantifying the ecological value of wetlands and allows for comparisons between wetland sites within a region.

The WEV assesses 29 components across 20 wetland attributes, grouped into three main categories: catchment, wetland, and buffer. These components are processed using a series of formulas to produce a score ranging from 0 (severely degraded with no ecological value) to 1 (pristine wetland with very high ecological value). The WEV BOAM outputs are presented in Appendix E.

This methodology has previously been applied to a project in Drury West involving wetland reclamation of a similar scale and condition, and was also accepted by Auckland Council for two other Milldale stages in 2021 (BUN60366520) and 2024 (BUN60427756). Based on this precedent, the WEV method was considered appropriate and applicable for this project. Summarised WEV scores are attached to this memorandum.

Impact Sites

Due to their similar characteristics, all affected wetlands were treated collectively for offsetting purposes and are hereafter referred to as the 'impact wetland'. When assigning values to components within the WEV for this collective area, a conservative approach was taken by either using the highest value recorded among the individual wetlands. Although 809 m^2 of the disturbance is considered temporary and only 277 m^2 permanent, a conservative approach was adopted and the total disturbed area of 1,085 m^2 was treated as reclamation to account for and potential loss of wetland value and extent.

The impacted wetland had a current WEV score of 0.543 and a potential score of 0.708. The potential score was also calculated, assuming current wetland enhancement and protection best practice

measures which includes a 10 m planted riparian buffer, stock fencing and pest plant control. The development proposes to reclaim the wetland areas, therefore the impact WEV score for the impacted wetlands is 0.

Offset Sites

The offset sites are located in the same catchment as the impact sites; the Ōrewa river catchment (Figure 47). The proposed offset wetlands will be created within low lying areas or within ephemeral overland flow paths and adjacent to existing degraded wetlands and a stream network. The suitability of these areas in terms of hydrological conditions sufficient to sustain wetland conditions, have been confirmed by WWLA (2025), with minor earthworks (bunds to further trap stormwater) in some locations. Similar to the impact wetland, the adjacent wetlands have been highly modified through agricultural practices, there is a lack of structural tiers, a very high dominance of exotic species and lack of aquatic habitat. Historical agricultural practices have severely impacted these wetlands through pugging and grazing.

The locations of the offset areas were selected because they lie within the same catchment as the impact site, avoids streamworks, and utilises the natural overland flow paths or natural low points as a collection point for surface runoff. Additionally, they will contribute to a broader catchment-focused enhancement plan and offer wetland habitat and functions comparable to those of the impact site.

Due to their similar characteristics, all offset wetlands were treated collectively for offsetting purposes and are hereafter referred to as the 'offset wetland'. When assigning values to components within the WEV for this collective area, a conservative approach was taken by using the lowest value considered among the individual wetlands.

The proposed offset wetland will be formed to create 3,258 m^2 of new wetland habitat. There are no natural wetlands in these areas at present, and the plant community is dominated by pasture and weed species. As such, the current WEV score for this area was 0 (i.e., no wetland values currently present).

The new offset wetland has a potential WEV score of 0.670. The potential score was calculated, assuming the proposed enhancement actions are undertaken. These enhancement actions include extending/joining the adjacent wetlands, planting of the wetlands with appropriate native species, planting a 10 m buffer with appropriate native species, weed and pest control, fencing and legal protection (e.g., covenant).

Extent offset

A total of 1,085 m^2 of wetland is proposed to be reclaimed at the impact site, while 3,258 m^2 of new wetland is proposed to be created at the offset site. To support the growth of native hydrophytic vegetation, the offset wetlands have been designed to establish or enhance wetland hydrology, either through minor interventions such as bund construction, or by situating them in areas where natural wetland hydrology already exists (WWLA 2025b).

The newly created wetland will offset for the loss of wetland area at the impact site, ensuring at least no net loss of wetland extent. Moreover, it will result in a net gain of 2,173 m^2 of wetland habitat.

Value Offset

As part of the BOAM, the Auckland Council's technical report TR009 guidelines for calculating an Environmental Compensation Ratio (ECR) were incorporated using the WEV scores. This ensures that adverse effects are mitigated, achieving a 'no-net-loss' of biodiversity values.

The ECR calculation = [(WEVi-P – WEVi-I)/(WEVm-P – WEVm-C)] x 1.5, where:

WEVi-P = Impact wetland potential WEV Score (0.708);

WEVi-I = Impact wetland impact WEV Score (0);

WEVm-P = Offset wetland potential WEV Score (0.670);

WEVm-C = Offset wetland current WEV Score (0); and

The x '1.5' is the multiplier to account for delay and uncertainty.

The creation and planting of the new wetland at the offset site will offset the loss in ecological value at the impact site. The WEV/ECR calculations regarding the impact site and the created offset wetlands are provided below in Table 16.

Table 16. WEV/ECR calculations for the impact wetland and the created offset wetland.

Variable/calculation	**Impact wetland**	**Offset wetland**
Wetland area (m^2)	1,085	3,258
Wetland perimeter (m)	406*	557†
Existing WEV state	0.543	0
Potential WEV state	0.708	0.670
State after impact	0	N/A
WEV ECR (multiplier)	1.59	
Wetland area required (m^2)	**1,719.85**	

* Perimeter based on the highest (i.e., best) perimeter to area ratio for all individual impacted wetlands.

† Perimeter based on the lowest (i.e., worst) perimeter to area ratio for all individual offset wetlands.

Based on the ECR calculations, 1,719.85 m^2 of new wetland habitat would be required to be created to appropriately offset the ecological values lost at the impact site, ensuring at least no net loss of wetland value. Since a total of 3,258 m^2 of new wetland habitat is proposed, a net gain of 1,538.15 m^2 of wetland habitat will be achieved regarding ecological value. While there will be a temporary loss of wetland extent and value, the newly created wetlands will offset for the loss of the total disturbed wetland area at the impact sites, ensuring at least a no net loss of 1,086 m^2 of wetland extent and value in the medium to long term. Additionally, the new wetlands will contribute to a broader catchment-focused revegetation and enhancement plan and offer wetland habitat and functions comparable to those of the disturbance sites.

As a condition of consent, it is proposed that a detailed wetland offset plan is prepared. This wetland offset plan should be prepared in collaboration with a suitably qualified ecologist, hydrologist and engineer, in general accordance with this report and the landscape plans drawing series 2535 prepared by Greenwood Associates (dated February 2025), and include the following minimum details:

- A minimum 1,719.85 m^2 area proposed for wetland creation
- Works to ensure a wetland hydrology is created and maintained

- Planting schedule, including species, density and grade
- Legal protection (e.g., consent notice)
- A five-year maintenance and monitoring plan to ensure the wetland and it's planting is successfully established
- Measure to undertake if the wetland or plantings is not successful

6.2.4 Constructed ponds

Auckland Council's interpretation of a lake under the RMA includes all constructed ponds, regardless of size, purpose, or history. Five constructed ponds have been identified on site (Figure 20), all built for agricultural use. Four of these ponds, located in the upper ephemeral reaches of watercourses, are not considered natural inland wetlands under the NPS-FM. The northernmost pond, constructed within a permanent stream and wetland complex, is considered a natural modification.

Only two ponds (the southwestern most ponds) are proposed for removal (Figure 40a and Figure 41). These ponds are of low ecological value due to their artificial nature, isolation, lack of native vegetation, poor water quality, small size, and limited habitat diversity, which restrict their ability to support diverse native aquatic species. Although they may support resilient native species such as shortfin eels, mitigation measures, including a native fish capture and relocation plan and sediment controls, are proposed to address potential impacts.

Given their small size and shallow depth, these ponds do not function ecologically as lakes. Overall, their removal is expected to result in low ecological effects.

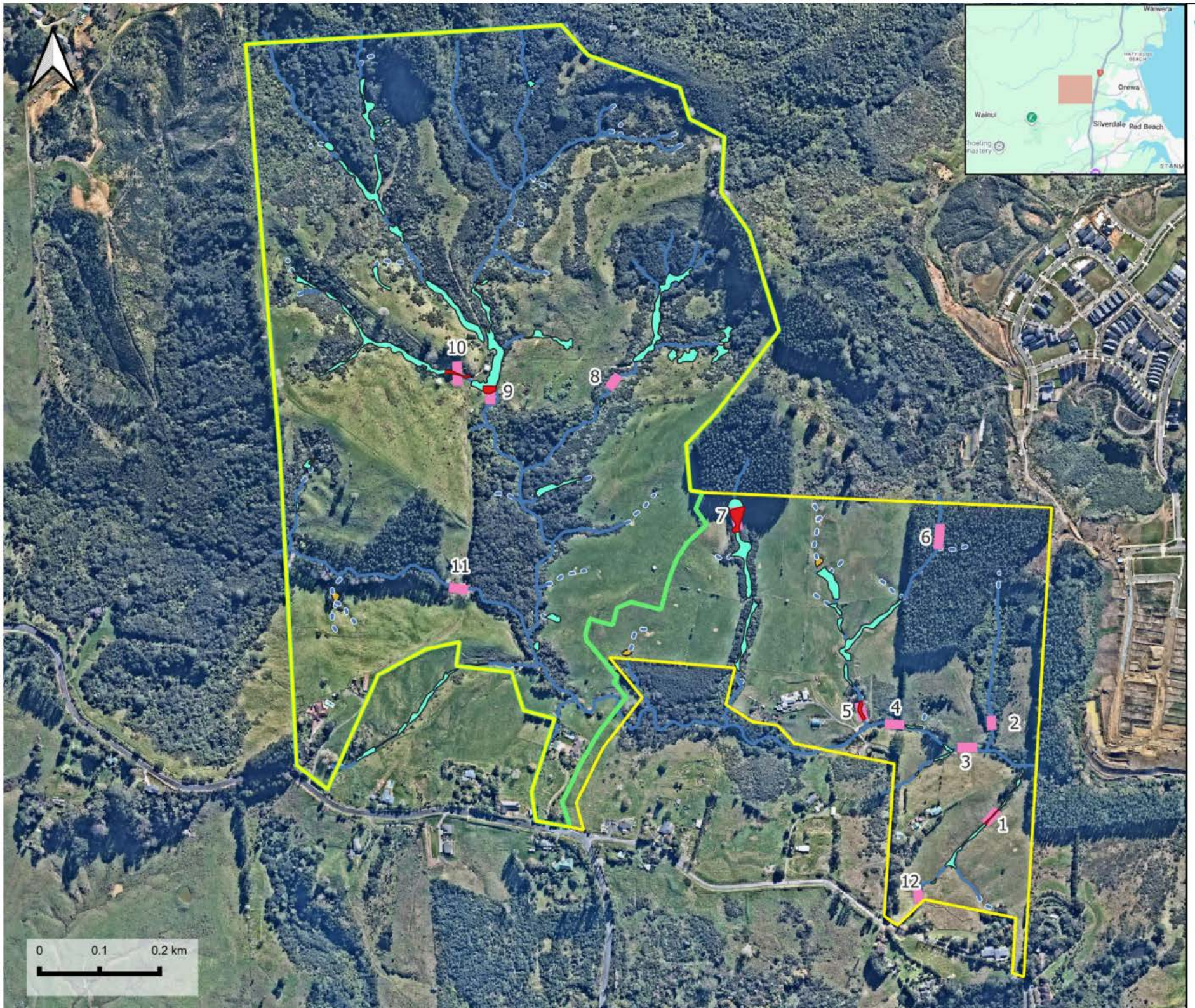

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Figure 43

Works within freshwatr habitats

Delmore Project

Legend

- Site
- Stage 1 & 2 boundary
- Streams
- OFLPs / ephemeral reaches
- Natural wetlands
- Constructed ponds
- Proposed new culverts
- Wetland reclamation

SOURCES

Nearmap 2025

SCALE **1:8,000** @ A4

PROJECT NO.	10122
DRAWN BY:	MD
DATE:	10 December 2025

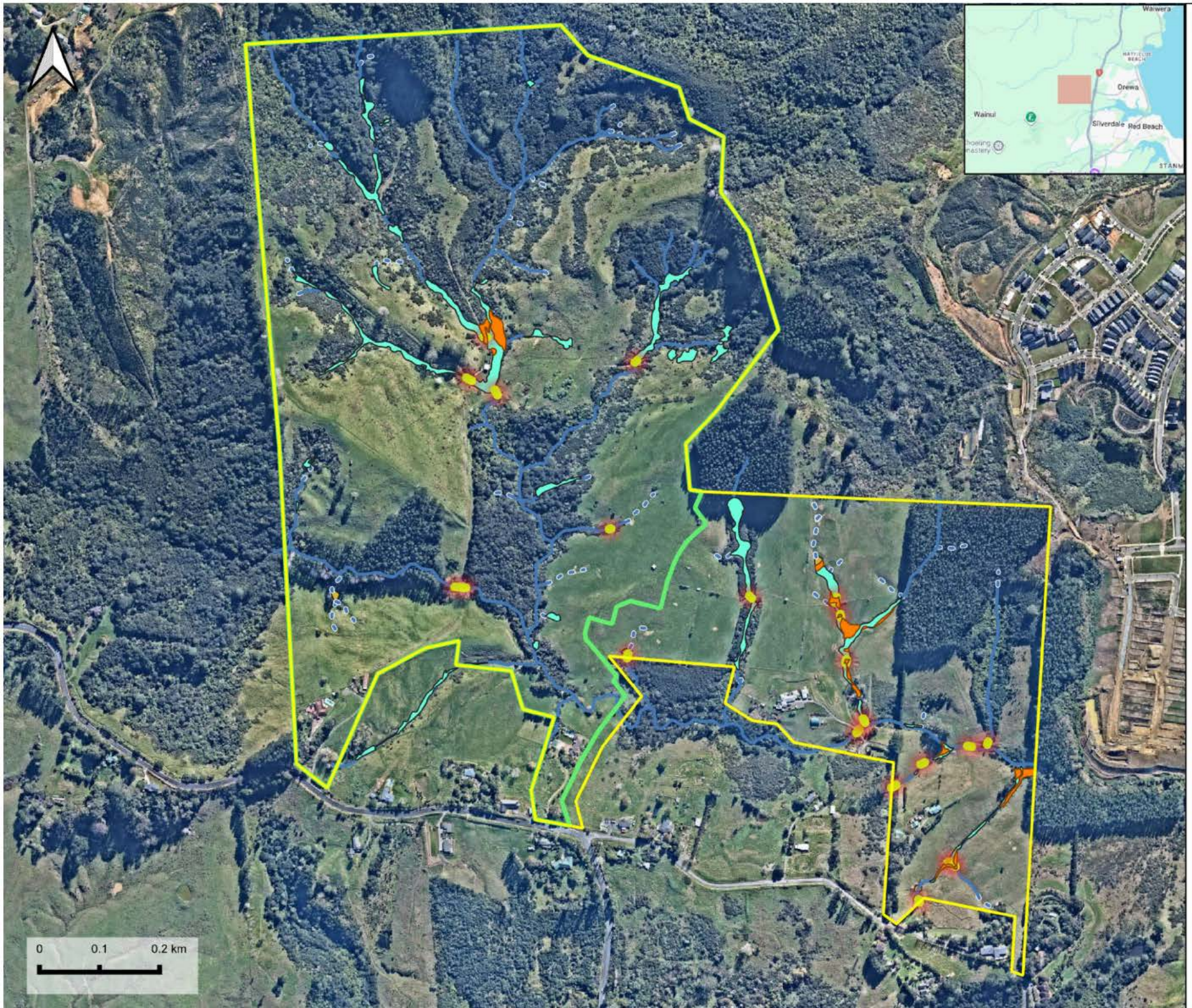

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Figure 44

Wetland Offset

Delmore Project

Legend

- Site
- Stage 1 & 2 boundary
- Streams
- OFLPs / ephemeral reaches
- Natural wetlands
- Constructed ponds
- Farm culverts to be removed
- wetland creation

SOURCES

Nearmap 2025

SCALE **1:8,000** @ A4

PROJECT NO.	10122
DRAWN BY:	MD
DATE:	10 December 2025

6.2.5 Freshwater Fish

The magnitude of effect of the proposed works on indigenous freshwater fish is considered moderate, reducing to low with mitigation.

Aquatic features providing suitable habitat for indigenous freshwater fish are limited to streams, and constructed ponds.

Without mitigation, culvert installation and pond removal could result in native fish injury or mortality. To address this, a native fish management plan is proposed as a consent condition. This plan will ensure the rescue and relocation of indigenous fish from disturbed aquatic habitats.

6.2.6 Stormwater Management

If not appropriately designed and managed, changes to a site's stormwater regime could result in adverse effects on the freshwater environment, such as reduced baseflows to streams and wetlands, altered flow regimes, erosion and sedimentation, and contaminant loading.

McKenzie and Co. have prepared a Stormwater Management Plan (McKenzie and Co., 2025a) to promote sustainable stormwater management and land development on the Site. A water sensitive design has been adopted and incorporated in the stormwater management approach for the development of the Site.

Key features of the stormwater management that have been incorporated to minimise adverse effects on freshwater features, include (McKenzie and Co., 2025a):

- GD01 treatment for all impervious areas
- Equivalent hydrology to pre-development (5mm retention, 95th percentile detention)
- Utilising the existing landform and stream network as far as practicable, by mimicking the existing catchments
- Where lots are directly adjacent to watercourses, treated stormwater discharges towards to the watercourse through a T bar energy dissipation device
- On site tanks will be provided for each lot for treatment and re-use.

6.2.7 Sedimentation

The magnitude of effect of sediment on freshwater environments is considered to be moderate, mitigated to low.

Elevated levels of suspended sediment can have detrimental effects on freshwater environments including reducing light penetration, smothering food and interstitial spaces, and clogging fish and invertebrate gills. Aquatic biota however, are adapted to periods of elevated sediment in the water, as they experience them during times of high river/stream flow. It is chronic exposure to elevated levels of sediment that cause the most detrimental effects on aquatic biota.

It is expected earthworks and vegetation removal will generate sediment, that if not properly managed, could enter and detrimentally affect the freshwater environment. McKenzie & Co. (2025b) have prepared a plan detailing erosion and sediment control measures for the development in line with Auckland Council's GD05 guidelines. Provided that these control measures are adhered to, it is expected the effect of sediment can be mitigated to low.

6.3 NOR

AT has released its decision confirming a designation for the construction of their 'North Project', which includes NoR 6 that traverses the Site. The North Project notice of requirement was supported by an EcIA (T e Tupu Ngātahi, 2023). Ecological features and values, such as wetlands and bat corridors, were determined from a relatively high-level and often solely by desktop assessments. Based on this assessment four potential wetlands, a bat corridor and non-wetland vegetation (a pine plantation) were identified within the Site (Figure 48). These areas were defined as 'Identified Biodiversity Areas' (IBAs).

While works that are part of the North Project will require specific pre-construction surveys, these are separate to what is recommended for the residential development within the site. Various measures specific to the residential development have been discussed above, and will occur regardless of the status of NoR 6.

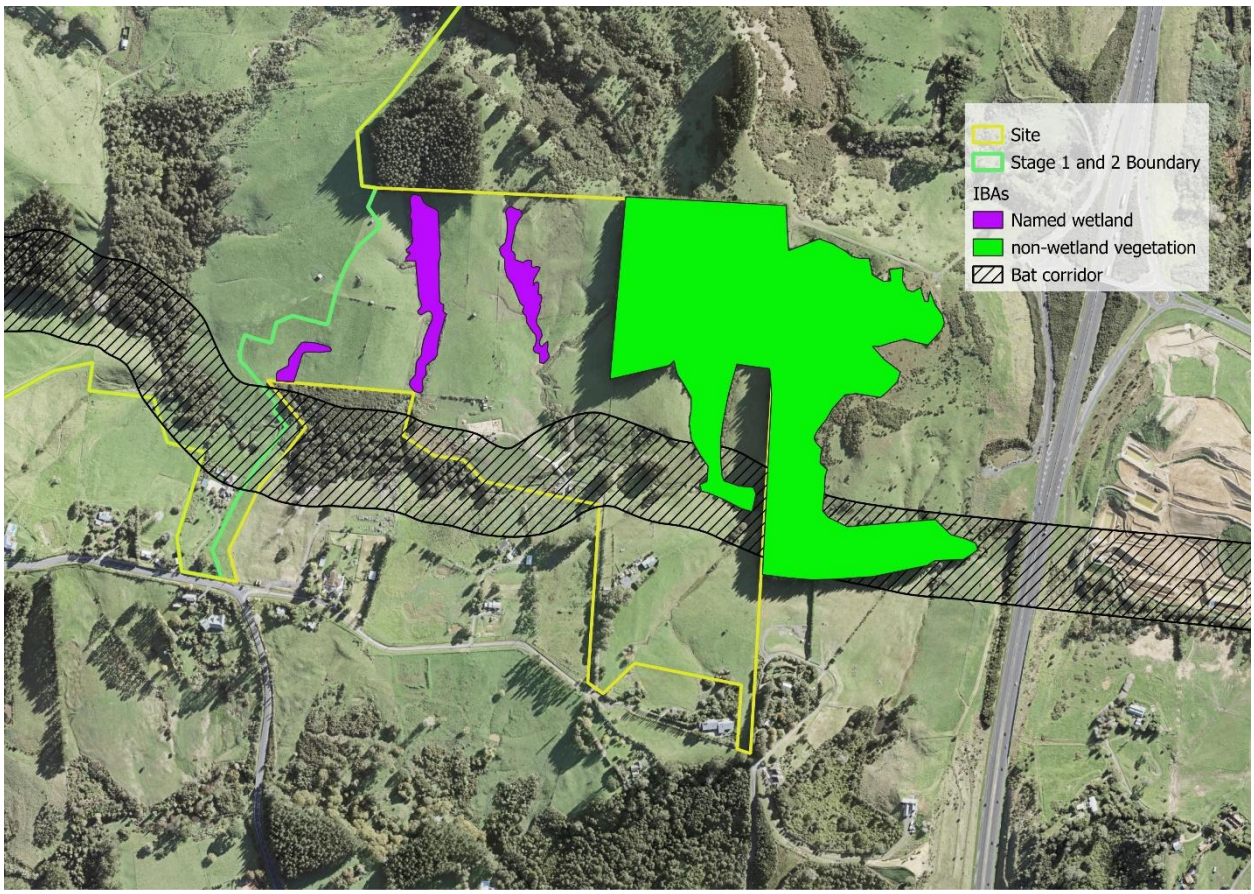

Figure 48. IBAs within the Site.

6.4 Coastal Environment

The Site's freshwater features are part of a contributing catchment to the Ōrewa River, which flows directly into the Ōrewa River estuary, a coastal environment.

The proposed earthworks and vegetation removal will generate the release of sediment. If not carefully managed, this could enter and detrimentally affect this downstream coastal environment through sedimentation. Elevated levels of suspended sediment can have detrimental effects on coastal environments including reducing light penetration, smothering food and interstitial spaces, and clogging fish and invertebrate gills.

McKenzie & Co. (2025b) have prepared a plan detailing erosion and sediment control (ESC) measures for the development in line with Auckland Council's GD05 guidelines. This is proposed as a condition of consent. Furthermore, an Adaptive Management Plan is also proposed as a condition of consent which will monitor sediment discharge in receiving waters.

Provided that these control measures are adhered to, it is expected that the level of effect will be negligible.

6.5 Enhancement and Restoration

The development proposes the following enhancement and restoration measures:

- The removal of 17 existing farm culverts across the Site. Many of these restrict hydrological connectivity and inhibit fish passage. Their removal is expected to improve stream hydrology and reduce localised flow disruptions.
- The creation of 2,170 m^2 of additional wetland habitat, increasing ecological values of connectivity and edge effects for existing wetlands.
- 16.1 ha of riparian and buffer planting within 20 m of streams and wetlands, which includes 10.5 ha of riparian and buffer planting within 10 m of streams and wetlands. This planting will increase the ecological value of the freshwater features, improve water quality and provide ecological connectivity within the Site and to the wider environment.
- Outside of the 20 m riparian and buffer planting, an additional 15.4 ha of revegetation planting that connects and/or buffers the SEA, consent notice areas and riparian margins. This planting will greatly increase the ecological value of the Site through improving plant species diversity and abundance, habitat diversity and abundance, connectivity within the Site and to the wider environment and ecological resilience.

Landscape plans drawing series 2535 prepared by Greenwood Associates (dated December 2025) presents the proposed revegetation planting.

Overall, the development includes 31.8 ha of revegetation planting. Where practicable, existing native vegetation within gorse scrub or exotic dominated areas will be retained, rather than cleared. All revegetation areas will be protected through a consent notice. A key biodiversity objective is to promote succession toward the site's historic WF11 vegetation state (kauri, podocarp, broadleaved forest). The planting programme is expected to deliver a substantial net gain in biodiversity and ecological value by buffering existing ecological features and habitat, improving site and landscape scale connectivity, increasing native species diversity and abundance, and expanding overall habitat extent.

Contribution to addressing significant environmental issues of biodiversity degradation and loss and to supporting development of natural resources

Indigenous biodiversity in Auckland is facing multiple significant environmental issues that have developed over time, including loss and fragmentation of habitat, spread of invasive species and disease, declining water quality, and increasing pressures from climate change (Singers et al. 2017b, Auckland Regional Council 2010). These pressures have driven major reductions in ecosystem extent and condition across the region. Many ecosystem types have been reduced to less than 10 percent of their pre human extent, and only about 30 percent of indigenous vegetation cover remains, with approximately 23 percent of original indigenous forest and scrub ecosystems still intact (Griffiths et al. 2021). WF11 (kauri, podocarp, broadleaved forest) has been particularly affected, with only around 16

percent of its original extent persisting regionally (Griffiths et al. 2021). Freshwater wetlands have declined even more severely, from an estimated pre human area of about 21,000 ha to less than 0.5 percent of the land area today, representing a loss of more than 97 percent (Auckland Council 2017, Auckland Council n.d.). These patterns are reflected in species outcomes, with the Auckland region supporting more than 200 native terrestrial and freshwater species listed as Threatened or At Risk (Auckland Council 2020).

Within this context, the restoration measures proposed for the Delmore project provide a significant benefit by responding directly to these significant environmental issues impacting the Auckland region, and developing the Site's natural vegetation resources. The 31.8[7] ha of indigenous revegetation planting is intended to facilitate succession toward the historic WF11 vegetation state, more than doubling the current native dominant cover on site and increasing representation of a forest type that is now regionally scarce (Griffiths et al. 2021). A further 2.5 ha of additional native planting is proposed for slope stabilisation, stormwater pond edges and new wetland. These additional panting will also provide ecological benefits. The location and structure of planting, together with retention and enhancement of existing native remnants, improves ecological connectivity within the Site and with adjacent natural areas (including the Nukumea Reserve to the north), addressing the significant environmental issue of fragmentation identified across Auckland (Singers et al. 2017b, Auckland Regional Council 2010).

The restoration programme also contributes to regional freshwater recovery priorities by enhancing approximately 2 ha of wetland, creating around 0.2 ha of new wetland, and improving about 6 km of stream habitat. In a region where wetlands have been reduced to a small fraction of their historical extent, these actions support recovery of wetland function and riparian integrity, and help address the significant environmental issue of ongoing wetland decline (Auckland Council 2017, Auckland Council n.d.). By increasing indigenous vegetation extent, diversity, and structural complexity over time, the revegetation measures will support a wider range of native fauna habitats and improve resilience of the local ecological network, while also providing additional buffering and connectivity to Nukumea Reserve. Collectively, these measures represent a significant gain in indigenous biodiversity relative to current regional trends and pressures (Singers et al. 2017b, Auckland Regional Council 2010, Griffiths et al. 2021, Auckland Council 2020, Auckland Council 2017, Auckland Council n.d.).

6.6 Overall Level of Effects

The overall level of effect for the proposed works is generated using Table 3, taking the ecological value and expected magnitude of the effect on that value. Expected levels of effect for the proposal are given in Table 17. 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.

[7] Excludes planting associated with slope stabilisation, stormwater ponds and wetlands

Table 17. Summary of the level of effects for the proposal after mitigation

Ecological Feature	Ecological Value	Magnitude of effect (before mitigation)	Magnitude of effect (after mitigation)	Level of effect
Riparian and wetland vegetation	low- moderate	Low	Low	Very low - low. Positive following revegetation.
SEA Vegetation	Low (gorse)	Low	Low	Very low. Positive following revegetation.
Consent notice vegetation	Moderate	Moderate	Low	Low. Positive following revegetation.
Native dominant	Moderate - high	Low	Low	Low. Positive following revegetation.
Other vegetation	Low	Low	Low	Very low. Positive following revegetation.
Indigenous avifauna	Low-high	low	Low	Very low. Positive following revegetation.
Indigenous herpetofauna	Negligible - high	Moderate	Low	Low. Positive following revegetation.
Bats	Moderate	Moderate	Low	Low. Positive following revegetation.
Streams (i.e. culverts)	Low - high	Moderate	Low	Low
Wetlands	Low -moderate	Moderate	Low	Low. Positive following revegetation and wetland creation.
Freshwater fish	High	Moderate	Low	Low. Positive following improving fish passage
Erosion and sediment	Low - high	High	Low	Low
Coastal environment	High	Moderate	Negligible	Very Low

7 SUMMARY AND RECOMMENDATIONS

Viridis was engaged to undertake an EcIA within the 109 ha site at 88, 130 and 132 Upper Ōrewa Road and 53A, 53B and 55 Russell Road, which is proposed for development under the FTAA.

An ecological assessment of the Site and neighbouring environment identified the presence of 39 intermittent and permanent streams and 36 natural wetlands. Terrestrial features identified included pine plantations, exotic dominant vegetation, mature native dominant vegetation, planted native vegetation and gorse scrub. The Site provides potential habitat for threatened native species, including bats, lizards, birds and fish. No threatened plant species were identified. The proposal is expected to have an overall low level of effect on the ecological values of the area The proposed mitigation and planting measures will ensure the adverse effects on the ecological values of the Site are minimised and in fact provide for a large net biodiversity gain.

The terrestrial ecological values of the Site comprised of pine plantations, exotic dominant vegetation, mature native dominant vegetation, planted native vegetation and gorse scrub. The Site provides potential habitat for threatened native species, including bats, lizards, birds and fish. No threatened plant species were identified. The proposal is expected to have an overall low level of effect on the ecological values of the area.

The project will involve bulk earthworks, the installation of infrastructure, vegetation removal, culvert installation, and the reclamation of natural inland wetlands. Works proposed to offset/compensate for residual effects on freshwater and terrestrial values include extensive riparian and revegetation planting and the creation of new wetland that is anticipated to achieve higher ecological values than the existing features to be affected.

The following recommendations are provided to avoid and minimise any potential adverse effects to the ecological value of the terrestrial and freshwater environments during the undertaking of earthworks, and development activities, on the Site:

- Site management should include ensuring that no rubbish, fuel, solvents, concrete wash-down material or other related materials enter the freshwater environment;
- Any vegetation removal, other than pasture and gorse scrub, or works within wetlands, occurs outside of the bird nesting season (September to February, inclusive). If vegetation clearance is unavoidable during the main indigenous bird nesting season, an experienced ecologist or ornithologist should visually inspect all trees and shrubs proposed for removal before, and no more than 24 hours prior to, felling or removal, to identify any active nests of indigenous birds. This includes checking cavities and hollows for nesting birds (e.g. morepork, kingfisher). Should any nesting of indigenous birds be observed, a 10 m buffer of vegetation should be required to remain around the nest site until an experienced ecologist or ornithologist has confirmed that the nest has failed or the chicks have hatched and naturally left the nest site. The native bird management recommendations can form part of a broader fauna management plan;
- A consent condition to minimise adverse effects on bats that requires the preparation of a bat management plan, or a resource consent condition requiring application of the DOC standards to be undertaken by a competent bat worker The bat management plan can form part of a broader fauna management plan;

- A LMP is required as a condition of consent and is prepared and implemented by a suitably qualified and experienced herpetologist to minimise adverse effects on indigenous lizards. The LMP can form part of a broader fauna management plan;
- Erosion sediment control measures are implemented according to Auckland Council's GD05 guidelines and strictly adhered to;
- A planting maintenance plan is prepared for the revegetation planting to ensure that the plant establishment is successful, and that maintenance is undertaken in perpetuity;
- Prior to commencement of streamwork activities on the subject site, a native fish management plan, produced by a suitably qualified and experienced freshwater ecologist, should be prepared and submitted to Auckland Council for approval to minimise adverse effects on indigenous freshwater fish;
- Prior to commencement of streamwork activities on the subject site, a detailed wetland offset plan is prepared. This wetland offset plan should be prepared in collaboration with a suitably qualified ecologist, hydrologist and engineer, in general accordance with this report and the landscape plans drawing series 2535 prepared by Greenwood Associates (dated December 2025), and include the following minimum details:
    - Area proposed for wetland creation at a minimum 3:1 ratio
    - Works to ensure a wetland hydrology is created and maintained
    - Planting schedule, including species, density and grade
    - Legal protection (e.g., consent notice)
    - A five-year maintenance and monitoring plan to ensure the wetland and it's planting is successfully established
    - Measure to undertake if the wetland or plantings is not successful;

REFERENCES

Apex 2025. Technical Note – Engagement Requests for Additional Information. A memorandum, prepared by Apex Water Limited for Vineway Limited. 12 June 2025. TN04.

Auckland Council 2017. Indigenous terrestrial and wetland ecosystems of Auckland (Technical Report TR2017/015). Auckland Council.

Auckland Regional Council 2010. Biodiversity Strategy for Auckland: Indigenous Biodiversity in Auckland – Challenges and Opportunities. Auckland Regional Council.

Auckland Council 2020a. Auckland Regional Pest Management Plan 2020 – 2030. Auckland Council.Clarkson BR 2014. A vegetation tool for wetland delineation in New Zealand. Landcare Research Contract Report LC1793 for Meridian Energy Limited.

Auckland Council 2020b. State of the Environment 2020 – Natural Environment. Auckland Council.

Auckland Council n.d. Wetlands overview. Auckland Council. Retrieved June 30, 2025, from https://www.aucklandcouncil.govt.nz/environment/plants-animals/plant-for-your-ecosystem/Documents/wetlandsoverview.pdf.

Bioresearches 2025. Orewa 4 Private Plan Change: Ecological Impact Assessment. Prepared for AVJennings Ltd. Dated 25 July 2025.

Clarkson B. 2014. A vegetation tool for wetland delineation in New Zealand. Landcare Research contract report LC1793 for Meridian Energy Limited.

Clarkson BR, Fitzgerald NB, Champion PD, Forester L, Rance BD 2021. New Zealand wetland plant list 2021. Manaaki Whenua - Landcare Research contract report LC3975 for Hawke's Bay Regional Council.

Cullen D 2023. North - Long-Tailed Bat Acoustic Survey Report 2022-2023. Report prepared for Waka Kotahi and Auckland Transport. August 2023.

DOC 2014. Guidance on Good Practice Biodiversity Offsetting in New Zealand. New Zealand Government, Wellington.

DOC 2024. Protocols for minimising the risk of felling occupied bat roosts (Bat Roost Protocols). Dated October 2024.

Fraser, S, Singleton, P, Clarkson, B, 2018. Hydric soils – field identification guide. Prepared for Tasman District Council by Manaaki Whenua Landcare Research.

Griffiths, G., Stewart, G., Park, T., & Tait, A. 2021. Ecological Integrity of Forests in Tāmaki Makaurau / Auckland 2009–2019. Auckland Council Technical Report.

Hitchmough R, Barr B, Knox C, Lettink M, Monks J M, Patterson J B, Reardon J T, van Winkel D, Rolfe J, Michel P 2021. Conservation status of New Zealand reptiles, 2021. Department of Conservation.

Joy MK, David B, & Lake M 2013. New Zealand freshwater fish sampling protocols. Massey University, Palmerston North, New Zealand.

Maseyk, F., Martine, M., Seaton, R., Dutson, G. 2015. A Biodiversity Offsets Accounting Model for New Zealand. The Catalyst Group Contract Report No: 2014-008. Prepared For the New Zealand Department of Conservation.

Maseyk F, Ussher G, Kessels G, Christensen M, & Brown M. 2018. Biodiversity offsetting under the Resource Management Act. A guidance document. Prepared for the Biodiversity Working Group.

McKenzie & Co. 2025a. Stormwater Management Plan – Delmore, Ōrewa. Prepared for Vineway Ltd..

McKenzie & Co. 2025b. Earthworks Report – Delmore. Prepared for Vineway Ltd..

Meister, A., Furong, L., Guitierrez-Gines, M. J., Dickinson, N., Gaw, S., Bourke, M., Robinson, B., 2022. Interactions of treated municipal wastewater with native plant species. *Ecological Engineering 183* (2022) 106741.

MfE, 2021. Wetland delineation hydrology tool for Aotearoa New Zealand. Ministry for the Environment. Wellington.

MfE 2022. Wetland delineation protocols. Wellington: Ministry for the Environment.

NEMS 2022. National Environmental Monitoring Standards Periphyton Sampling and Measuring Periphyton in Wadeable Rivers and Streams, Version 1.0.1. National Environmental Monitoring Standards.

O'Donnell C F J, Borkin K M, Christie J, Davidson-Watts I, Dennis G, Pryde M, Michel P 2023. Conservation status of bats in Aotearoa New Zealand, 2022. Department of Conservation.

Riley Consultants Limited 2025. Geotechnical Report Proposed Residential Development Russell Road and Upper Ōrewa Road, Wainui. Prepared for Vineway Ltd. .

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.

Roper-Lindsay J, Fuller SA, Hooson S, Sanders MD, Ussher GT 2018. Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

Singers N, Osborne B, Lovegrove T, Jamieson A, Boow J, Sawyer J, Hill K, Andrews J, Hill S, Webb C 2017a. Indigenous terrestrial and wetland ecosystems of Auckland. Auckland Council.

Singers, N., Osborne, B., Lovegrove, T., Jamieson, A., Boow, J., Sawyer, J., Hill, K., & Andrews, J. 2017b. Indigenous terrestrial and wetland ecosystems of New Zealand. Department of Conservation.

Stark JD, Maxted JR 2007. A User Guide for the Macroinvertebrate Community Index. Report prepared for the Ministry for the Environment by the Cawthron Institute. Cawthron Report No. 1166. April 2007.

Te Tupu Ngātahi - Supporting Growth 2023. North Assessment of Ecological Effects. August 2023.

Woolly J, Paris B, Borkin K, Davidson-Watts I, Clarke D, Davies F, Burton C, Melzer S, 2023: Conservation Status of Bat Species in Tāmaki Makaurau / Auckland. Auckland Council Technical Report 2023/4.

WWLA, 2025. Delmore Subdivision - Orewa, Wetland and Culvert Assessment. Williamson Water and Land Advisory, prepared for Vineway Limited, December 2025.

Viridis 2025. Delmore Proposed WWTP Discharge: Impact on Water Quality. A memorandum prepared for Myland Partners (NZ) Limited. Dated 10 February 2025.

Appendix A
Vegetation Plot Data

Vegetation Plot 1 (V1)

Table 1. Species composition and counts.

Plot Type	Species	Common name	Class	Count
10 × 10	*Kunzea robusta*	Kānuka	Tree	5
subplot1	*Carpodetus serratus*	Putaputāwētā	Seedling	1
subplot1	*Coprosma rhamnoides*	Twiggy coprosma	Seedling	15
subplot2	*Carpodetus serratus*	Putaputāwētā	Seedling	1
subplot2	*Coprosma rhamnoides*	Twiggy coprosma	Seedling	20
subplot2	*Geniostoma ligustrifolium*	Hangehange	Seedling	1
subplot2	*Phyllocladus trichomanoides*	Tānekaha	Seedling	1
subplot3	*Coprosma rhamnoides*	Twiggy Coprosma	Seedling	24
subplot3	*Kunzea robusta*	Kānuka	Seedling	6
subplot3	*Kunzea robusta*	Kānuka	Tree	1
subplot4	*Carpodetus serratus*	Putaputāwētā	Seedling	1
subplot4	*Coprosma rhamnoides*	Twiggy Coprosma	Seedling	23
subplot4	*Coprosma rhamnoides*	Twiggy Coprosma	Tree	1
subplot4	*Geniostoma ligustrifolium*	Hangehange	Seedling	1
subplot4	*Kunzea robusta*	Kānuka	Tree	1

Table 2. Ecological summary metrics for the surveyed plot.

Species Richness	Native Richness	Abundance total	Mean Indigenous dominance	Native Canopy Cover
5	5	102	100 %	39%

Table 3. Tree basal area within 10 x 10 plot.

Species	DBH (cm)	Basal area (cm^2)
Kunzea robusta	12.5	122.72
Kunzea robusta	37	1075.21
Kunzea robusta	49.5	1924.42
Kunzea robusta	32.3	819.40
Kunzea robusta	33	855.30
Kunzea robusta	16	201.06
Coprosma rhamnoides	21	346.36
Kunzea robusta	32	804.25

Vegetation Plot 2 (V2)

Table 4. Species composition and counts.

Plot Type	Species	Common name	Class	Count
10 × 10	*Carpodetus serratus*	Putaputāwētā	Sapling	1
10 × 10	*Geniostoma ligustrifolium*	Hangehange	Sapling	2
10 × 10	*Geniostoma ligustrifolium*	Hangehange	Tree	1
10 × 10	*Melicytus ramiflorus*	Māhoe	Sapling	1
10 × 10	*Melicytus ramiflorus*	Māhoe	Tree	4
10 × 10	*Pinus radiata*	Monterey pine	Tree	4
subplot1	*Carpodetus serratus*	Putaputāwētā	Sapling	1
subplot1	*Geniostoma ligustrifolium*	Hangehange	Seedling	7
subplot1	*Melicytus ramiflorus*	Māhoe	Sapling	1
subplot1	*Melicytus ramiflorus*	Māhoe	Seedling	7
subplot2	*Geniostoma ligustrifolium*	Hangehange	Seedling	5
subplot2	*Schefflera digitata*	Patē	Seedling	1
subplot2	*Schefflera digitata*	Patē	Tree	2
subplot3	*Coprosma grandifolia*	Kanono	Seedling	5
subplot3	*Coprosma robusta*	Karamū	Seedling	1
subplot3	*Geniostoma ligustrifolium*	Hangehange	Seedling	3
subplot3	*Myrsine australis*	Māpou	Seedling	1
subplot4	*Coprosma grandifolia*	Kanono	Seedling	1
subplot4	*Geniostoma ligustrifolium*	Hangehange	Sapling	1
subplot4	*Geniostoma ligustrifolium*	Hangehange	Seedling	1
subplot4	*Melicytus ramiflorus*	Māhoe	Seedling	3
subplot4	*Melicytus ramiflorus*	Māhoe	Tree	1
subplot4	*Schefflera digitata*	Patē	Tree	1

Table 5. Ecological summary metrics for the surveyed plot.

Species Richness	Native Richness	Abundance total	Mean Indigenous dominance	Native Canopy Cover
8	7	55	93%	0%

Table 6. Tree basal area within 10 x 10 plot.

Species	DBH (cm)	Basal area (cm^2)
Pinus radiata	62	3019.07
Geniostoma ligustrifolium	3.5	9.62
Pinus radiata	51.1	2050.84
Melicytus ramiflorus	34	907.92
Melicytus ramiflorus	10	78.54
Melicytus ramiflorus	12.5	122.72
Pinus radiata	60	2827.43
Pinus radiata	43.3	1472.54
Melicytus ramiflorus	7.6	45.36
Schefflera digitata	4.5	15.90
Schefflera digitata	10	78.54
Melicytus ramiflorus	2.8	6.16
Schefflera digitata	6.2	30.19

Vegetation Plot 3 (V3)

Table 7. Species composition and counts.

Plot Type	Species	Common name	Class	Count
10 × 10	*Kunzea robusta*	Kānuka	Sapling	10
10 × 10	*Kunzea robusta*	Kānuka	Tree	35
10 × 10	*Myrsine australis*	Māpou	Sapling	3
10 × 10	*Myrsine australis*	Māpou	Tree	4
10 × 10	*Podocarpus totara*	Tōtara	Tree	2
subplot1	*Coprosma rhamnoides*	Twiggy coprosma	Seedling	1
subplot1	*Kunzea robusta*	Kānuka	Sapling	2
subplot1	*Kunzea robusta*	Kānuka	Tree	8
subplot1	*Leucopogon fasciculatus*	tall mingimingi	Seedling	1
subplot1	*Myrsine australis*	Māpou	Seedling	2
subplot2	*Coprosma rhamnoides*	Twiggy coprosma	Seedling	1
subplot2	*Coprosma rhamnoides*	Twiggy coprosma	Tree	1
subplot2	*Kunzea robusta*	Kānuka	Sapling	1
subplot2	*Kunzea robusta*	Kānuka	Tree	2
subplot2	*Myrsine australis*	Māpou	Sapling	1
subplot2	*Myrsine australis*	Māpou	Tree	1
subplot2	*Podocarpus totara*	Tōtara	Seedling	2
subplot3	*Geniostoma ligustrifolium*	Hangehange	Seedling	32
subplot3	*Kunzea robusta*	Kānuka	Tree	3
subplot3	*Myrsine australis*	Māpou	Seedling	2
subplot3	*Myrsine australis*	Māpou	Tree	2
subplot4	*Coprosma rhamnoides*	Twiggy coprosma	Seedling	3
subplot4	*Geniostoma ligustrifolium*	Hangehange	Sapling	1
subplot4	*Geniostoma ligustrifolium*	Hangehange	Seedling	7
subplot4	*Myrsine australis*	Māpou	Seedling	5

Table 8. Ecological summary metrics for the surveyed plot.

Species Richness	Native Richness	Abundance total	Mean Indigenous dominance	Native Canopy Cover
6	6	132	100%	48%

Table 9. Tree basal area within 10 x 10 plot.

Species	DBH (cm)	Basal area (cm^2)
Kunzea robusta	14.8	172.03
Myrsine australis	3.1	7.55
Kunzea robusta	3.6	10.18
Kunzea robusta	7.8	47.78
Kunzea robusta	5.4	22.90
Kunzea robusta	4.9	18.86
Kunzea robusta	10.3	83.32
Kunzea robusta	3.3	8.55
Kunzea robusta	4.7	17.35
Kunzea robusta	3.1	7.55
Kunzea robusta	10.7	89.92
Kunzea robusta	8.3	54.11
Kunzea robusta	5.3	22.06
Kunzea robusta	3.2	8.04
Kunzea robusta	4.7	17.35
Kunzea robusta	5.7	25.52
Kunzea robusta	3.1	7.55
Kunzea robusta	8.8	60.82
Myrsine australis	4	12.57
Myrsine australis	3	7.07
Myrsine australis	2.7	5.73
Podocarpus totara	23.3	426.38
Podocarpus totara	26.2	539.13
Kunzea robusta	6	28.27
Kunzea robusta	3.5	9.62
Kunzea robusta	4.4	15.21
Kunzea robusta	3.5	9.62
Kunzea robusta	5.2	21.24
Kunzea robusta	8.6	58.09
Kunzea robusta	8	50.27
Kunzea robusta	3.6	10.18
Kunzea robusta	3.5	9.62

Kunzea robusta	2.9	6.61
Kunzea robusta	3.4	9.08
Kunzea robusta	3.8	11.34
Kunzea robusta	4.5	15.90
Kunzea robusta	5.7	25.52
Kunzea robusta	18.5	268.80
Kunzea robusta	8.2	52.81
Kunzea robusta	4.4	15.21
Kunzea robusta	6.6	34.21
Kunzea robusta	3	7.07
Kunzea robusta	6.5	33.18
Kunzea robusta	11.3	100.29
Kunzea robusta	9.8	75.43
Kunzea robusta	2.9	6.61
Kunzea robusta	3.5	9.62
Kunzea robusta	2.8	6.16
Kunzea robusta	13.2	136.85
Coprosma rhamnoides	50	1963.50
Kunzea robusta	7.7	46.57
Kunzea robusta	5.4	22.90
Myrsine australis	6.2	30.19
Kunzea robusta	7.6	45.36
Kunzea robusta	21.6	366.44
Myrsine australis	2.6	5.31
Myrsine australis	3.3	8.55
Kunzea robusta	5.4	22.90

Vegetation Plot 4 (V4)

Table 10. Species composition and counts.

Plot Type	Species	Common name	Class	Count
10 × 10	*Geniostoma ligustrifolium*	Hangehange	Sapling	3
10 × 10	*Geniostoma ligustrifolium*	Hangehange	Tree	11
10 × 10	*Leptospermum scoparium*	Mānuka	Sapling	1
10 × 10	*Leptospermum scoparium*	Mānuka	Tree	5
10 × 10	*Melicytus ramiflorus*	Māhoe	Sapling	1
10 × 10	*Melicytus ramiflorus*	Māhoe	Tree	9
10 × 10	*Myrsine australis*	Māpou	Tree	2
subplot1	*Coprosma rhamnoides*	Twiggy coprosma	Seedling	2
subplot1	*Coprosma robusta*	Karamū	Sapling	1
subplot1	*Geniostoma ligustrifolium*	Hangehange	Tree	1
subplot1	*Leptospermum scoparium*	Mānuka	Tree	1
subplot1	*Melicytus ramiflorus*	Māhoe	Sapling	1
subplot1	*Melicytus ramiflorus*	Māhoe	Seedling	1
subplot1	*Myrsine australis*	Māpou	Seedling	3
subplot1	*Ulex europaeus*	Gorse	Seedling	1
subplot2	*Carpodetus serratus*	Putaputāwētā	Tree	1
subplot2	*Coprosma rhamnoides*	Twiggy coprosma	Seedling	1
subplot2	*Geniostoma ligustrifolium*	Hangehange	Tree	1
subplot2	*Leptospermum scoparium*	Mānuka	Tree	1
subplot2	*Melicytus ramiflorus*	Māhoe	Seedling	2
subplot2	*Myrsine australis*	Māpou	Seedling	18
subplot2	*Myrsine australis*	Māpou	Tree	2
subplot2	*Phyllocladus trichomanoides*	Tānekaha	Seedling	1
subplot3	*Melicytus ramiflorus*	Māhoe	Seedling	1
subplot4	*Geniostoma ligustrifolium*	Hangehange	Seedling	1
subplot4	*Melicytus ramiflorus*	Māhoe	Seedling	4
subplot4	*Melicytus ramiflorus*	Māhoe	Tree	1

Table 11. Ecological summary metrics for the surveyed plot.

Species Richness	Native Richness	Abundance total	Mean Indigenous dominance	Native Canopy Cover
9	8	77	99%	50%

Table 12. Tree basal area within 10 x 10 plot.

Species	DBH (cm)	Basal area (cm^2)
Melicytus ramiflorus	4.5	15.90
Melicytus ramiflorus	5.6	24.63
Melicytus ramiflorus	3.1	7.55
Melicytus ramiflorus	4	12.57
Geniostoma ligustrifolium	6.5	33.18
Geniostoma ligustrifolium	4.1	13.20
Geniostoma ligustrifolium	13.8	149.57
Geniostoma ligustrifolium	6.3	31.17
Geniostoma ligustrifolium	5.1	20.43
Geniostoma ligustrifolium	6	28.27
Geniostoma ligustrifolium	3.5	9.62
Geniostoma ligustrifolium	12	113.10
Geniostoma ligustrifolium	9.4	69.40
Geniostoma ligustrifolium	6.5	33.18
Geniostoma ligustrifolium	7	38.48
Leptospermum scoparium	35.5	989.80
Leptospermum scoparium	15	176.71
Leptospermum scoparium	16	201.06
Leptospermum scoparium	17	226.98
Leptospermum scoparium	10	78.54

Myrsine australis	6	28.27
Myrsine australis	6	28.27
Melicytus ramiflorus	4.5	15.90
Melicytus ramiflorus	4	12.57
Melicytus ramiflorus	4.5	15.90
Melicytus ramiflorus	8	50.27
Melicytus ramiflorus	11	95.03
Leptospermum scoparium	22.5	397.61
Geniostoma ligustrifolium	10.4	84.95
Geniostoma ligustrifolium	13.2	136.85
Carpodetus serratus	6	28.27
Myrsine australis	2.8	6.16
Myrsine australis	5	19.63
Leptospermum scoparium	9.6	72.38
Melicytus ramiflorus	6.5	33.18

Vegetation Plot 5 (V5)

Table 13. Species composition and counts.

Plot Type	Species	Common name	Class	Count
10 × 10	*Coprosma robusta*	Karamū	Sapling	5
10 × 10	*Cordyline australis*	Cabbage tree	Tree	1
10 × 10	*Ligustrum lucidum*	Tree privet	Sapling	2
10 × 10	*Myrsine australis*	Māpou	Sapling	3
10 × 10	*Myrsine australis*	Māpou	Tree	2
10 × 10	*Populus nigra*	Black poplar	Tree	2
subplot1	*Coprosma robusta*	Karamū	Sapling	1
subplot2	*Carpodetus serratus*	Putaputāwētā	Seedling	1
subplot2	*Kunzea robusta*	Kānuka	Tree	1
subplot2	*Myrsine australis*	Māpou	Seedling	3
subplot2	*Myrsine australis*	Māpou	Tree	1
subplot3	*Myrsine australis*	Māpou	Seedling	1
subplot3	*Populus nigra*	Black poplar	Tree	1

Table 14. Ecological summary metrics for the surveyed plot.

Species Richness	Native Richness	Abundance total	Mean Indigenous dominance	Native Canopy Cover
7	5	24	79%	10%

Table 15. Tree basal area within 10 x 10 plot.

Species	DBH (cm)	Basal area (cm^2)
Cordyline australis	5.9	27.34
Populus nigra	22.9	411.87
Populus nigra	55.2	2393.14
Myrsine australis	10	78.54
Myrsine australis	6.5	33.18
Kunzea robusta	7	38.48
Myrsine australis	10.5	86.59
Populus nigra	166	21642.43

Appendix B
Watercourse Classification Table

Watercourse number	Classification	Natural pools	Well-defined channel, such that the bed and banks can be distinguished	Contains surface water more than 48 hours after rain	Rooted terrestrial vegetation is 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	Current ecological value
1	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
2	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
3	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
4	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
5	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
6	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
7	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
8	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
9	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
10	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
11	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible

Watercourse number	Classification	Natural pools	Well-defined channel, such that the bed and banks can be distinguished	Contains surface water more than 48 hours after rain	Rooted terrestrial vegetation is 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	Current ecological value
12	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
13	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
14	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
15	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
16	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
17	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
18	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
19	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
20	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
21	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
22	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible

Watercourse number	Classification	Natural pools	Well-defined channel, such that the bed and banks can be distinguished	Contains surface water more than 48 hours after rain	Rooted terrestrial vegetation is 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	Current ecological value
23	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
24	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
25	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
26	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
27	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
28	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
29	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
30	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
31	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
32	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
33	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible

Watercourse number	Classification	Natural pools	Well-defined channel, such that the bed and banks can be distinguished	Contains surface water more than 48 hours after rain	Rooted terrestrial vegetation is 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	Current ecological value
34	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
35	Modelled OLFP / Ephemeral	X	X	N/A	X	N/A	X	Negligible
36	Permanent	✓	✓	✓	✓	X	✓	Low
37	Intermittent	X	✓	Likely	✓	N/A	✓	Low
38	Permanent	✓	✓	✓	✓	✓	✓	Moderate - high
39	Intermittent	X	✓	Likely	✓	N/A	✓	Low
40	Intermittent	✓	✓	Likely	✓	✓	✓	High
41	Permanent	✓	✓	✓	✓	X	✓	Moderate - high
42	Intermittent	X	✓	Likely	✓	N/A	✓	Low
43	Permanent	✓	✓	✓	✓	X	✓	Moderate
44	Intermittent	✓	✓	Likely	✓	X	✓	High
45	Permanent	✓	✓	✓	✓	X	✓	High
46	Intermittent	✓	✓	✓	✓	X	✓	High
47	Intermittent	X	✓	Likely	✓	X	✓	High
48	Permanent	✓	✓	✓	✓	X	✓	Low - moderate

Watercourse number	Classification	Natural pools	Well-defined channel, such that the bed and banks can be distinguished	Contains surface water more than 48 hours after rain	Rooted terrestrial vegetation is 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	Current ecological value
49	Permanent	✓	✓	✓	✓	X	✓	Moderate - high
50	Intermittent	✓	✓	✓	✓	X	✓	High
51	Intermittent	X	✓	Likely	✓	N/A	✓	Moderate
52	Permanent	✓	✓	✓	✓	X	✓	Low - moderate
53	Intermittent	X	✓	Likely	✓	N/A	✓	Low
54	Intermittent	X	✓	Likely	✓	N/A	✓	Low
55	Intermittent	X	✓	Likely	✓	N/A	✓	Low
56	Intermittent	X	✓	Likely	✓	X	✓	Low - moderate
57	Intermittent	X	✓	Likely	✓	N/A	✓	Low
58	Intermittent	X	✓	Likely	✓	✓	✓	High
59	Permanent	✓	✓	✓	✓	X	✓	Low - moderate
60	Intermittent	✓	✓	✓	✓	X	✓	Low
61	Intermittent	✓	✓	Likely	✓	X	✓	Moderate
62	Intermittent	X	✓	Likely	✓	X	✓	Moderate
63	Intermittent	✓	✓	Likely	✓	X	✓	Moderate

Watercourse number	Classification	Natural pools	Well-defined channel, such that the bed and banks can be distinguished	Contains surface water more than 48 hours after rain	Rooted terrestrial vegetation is 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	Current ecological value
64	Intermittent	X	✓	Likely	✓	X	✓	Moderate
65	Intermittent	X	✓	Likely	✓	X	✓	Moderate
66	Intermittent	X	✓	Likely	✓	X	✓	Low
67	Intermittent	X	✓	Likely	✓	X	✓	Low
68	Intermittent	X	✓	Likely	✓	X	✓	Low
69	Intermittent	X	✓	Likely	✓	X	✓	Low - moderate
70	Intermittent	X	✓	Likely	✓	N/A	✓	Low
71	Intermittent	X	✓	Likely	✓	X	✓	Moderate
72	Intermittent	X	✓	Likely	✓	X	✓	Low
73	Permanent	✓	✓	✓	✓	X	✓	Low
74	Intermittent	X	✓	Likely	✓	X	✓	Low

Appendix C
Wetland Values Table

Wetland ID	Buffer vegetation	Stock excluded	Freshwater habitat abundance	native plant species dominant	Size*	Current ecological value
A	X	X	Negligible	X	Small	Low
B	X	X	Low	X	Small	Low
C	X	X	Negligible	X	Small	Low
D	X	X	Negligible	X	Small	Low
E	X	✓	Low	X	Small	Low
F	X	✓	Low	X	Small	Low
G	X	✓	Low	X	Small	Low
H	X	X	Negligible	X	Small	Low
I	X	X	Negligible	X	Small	Low
J	X	X	Negligible	X	Small	Low
K	✓	✓	Moderate	✓	Small - Medium	Moderate
L	✓	✓	Moderate	X	Small - Medium	Moderate
M	✓	X	Negligible	X	Small	Low
N	X	X	Negligible	X	Small	Low
O	✓	✓	Low	X	Small	Low
P	X	X	Negligible	X	Small	Low
Q	X	X	Negligible	X	Small	Low
R	X	X	Negligible	X	Small	Low
S	Partial	X	Negligible	X	Small	Low
T	Partial	X	Low	X	Medium	Low
U	X	X	High	X	Small	Moderate
V	✓	✓	Negligible	X	Small	Low
W	X	X	Negligible	X	Small	Low
X	X	X	Low	X	Small	Low
Y	Partial	X	Low	X	Small	Low
Z	✓	✓	Moderate	✓	Small	High
AA	✓	✓	Low	X	Small	Moderate
AB	✓	✓	Low	X	Small	Moderate
AC	✓	✓	Low	X	Small	Moderate
AD	X	X	Negligible	X	Small	Low

AE	Partial	✗	Moderate	✗	Moderate	Moderate
AF	✗	✗	Negligible	✗	Small	Low
AG	✗	✗	Negligible	✗	Small	Low
AH	✗	✗	Low	✗	Small	Low
AI	✓	✓	Low	✓	Small	Moderate
AJ	✗	✗	Negligible	✗	Small	Low

Note: * Size ratings used: small - < 0.25 ha, medium – 0.25 – 0.5 ha, large >0.5 ha.

Appendix D
Macroinvertebrate Data

			Sampling Site		
Taxonomic Group	**Taxa**	**MCI-sb Score**	**UP-North**	**DS-1**	**DS-2**
Leptophlebiidae	Neozephlebia	7.6			16
Leptophlebiidae	Zephlebia	8.8	2		16
Leptoceridae	Hudsonema	6.5		1	20
Hydroptilidae	Oxyethira	1.2	16	3	8
Hydroptilidae	Paroxyethira	3.7	2	1	1
Polycentropodidae	Polyplectropus	8.1	5		
Leptoceridae	Triplectides	5.7	192	15	56
Coenagrionidae	Xanthocnemis	1.2	96	1	
Veliidae	Microvelia	4.6	48		
Hydrophilidae	Hydrophilidae	8		1	
Simuliidae	Austrosimulium	3.9			36
Chironomidae	Corynoneura	1.7		1	
Tipulidae	Limonia	6.3		1	
Muscidae	Muscidae	1.6			1
Chironomidae	Orthocladiinae	3.2	64	2	20
Dixidae	Paradixa	8.5	64	5	8
Tipulidae	Paralimnophila	7.4		1	1
Chironomidae	Polypedilum	8		4	
Sciomyzidae	Sciomyzidae	3			1
Chironomidae	Tanypodinae	6.5	64	4	12
Tipulidae	Zelandotipula	3.6	1		
Collembola	Collembola	5.3			2
Crustacea	Isopoda	4.5	64		
Crustacea	Ostracoda	1.9	80		
Paracalliopiidae	Paracalliope	0	1120	5	48
Atyidae	Paratya	3.6		25	24
Acari	Acari	5.2			1
SPIDERS Dolomedes	Dolomedes	6.2	1		2
Physidae	Physella (Physa)	0.1	944	1	1
Tateidae	Potamopyrgus	2.1	256	68	480
Mollusca	Sphaeriidae	2.9			1
Oligochaetes	Oligochaetes	3.8			8
Hirudinea	Hirudinea	1.2	16		

Appendix E
Vegetation BOAM Outputs

IMPACT MODEL

	BIODIVERSITY TYPE
1	Woody Stem Vegetation

	This section captures which elements of biodiversity, and over what area, will be impacted by the proposal					This section is where the change in measure of each Biodiversity Attribute due to the proposed Impact is quantified, and Attribute Biodiversity Value calculated. Inputs are derived from direct measures, existing data or models where available, or expert estimated predictions			
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Area of Impact (ha)	Benchmark	Measure prior to Impact	Measure after Impact	Biodiversity Value
1.1	EF - Pine plantation	1.1a	Native canopy	Percantage cover (%)	1.13	90	0	0	0.00
		1.1b	Native dominance	Count (#)	1.13	100	93	0	-1.05
		1.1c	Native species richness	Count (#)	1.13	25	7	0	-0.32
		1.1d	Tree basal area	m2/ha	1.13	88	107	0	-1.13
		1.1e							Not calculated

	This section captures which elements of biodiversity, and over what area, will be impacted by the proposal					This section is where the change in measure of each Biodiversity Attribute due to the proposed Impact is quantified, and Attribute Biodiversity Value calculated. Inputs are derived from direct measures, existing data or models where available, or expert estimated predictions			
	Biodiversity Component	**Biodiversity Attribute**		**Measurement Unit**	**Area of Impact (ha)**	**Benchmark**	**Measure prior to Impact**	**Measure after Impact**	**Biodiversity Value**
1.2	V2 - non covenanted	**1.2a**	Native canopy	Percantage cover (%)	0.73	90	39	0	-0.32
		1.2b	Native dominance	Count (#)	0.73	100	100	0	-0.73
		1.2c	Native species richness	Count (#)	0.73	25	5	0	-0.15
		1.2d	Tree basal area	m2/ha	0.73	88	61	0	-0.51
		1.2e							Not calculated

	This section captures which elements of biodiversity, and over what area, will be impacted by the proposal					This section is where the change in measure of each Biodiversity Attribute due to the proposed Impact is quantified, and Attribute Biodiversity Value calculated. Inputs are derived from direct measures, existing data or models where available, or expert estimated predictions			
	Biodiversity Component	**Biodiversity Attribute**		**Measurement Unit**	**Area of Impact (ha)**	**Benchmark**	**Measure prior to Impact**	**Measure after Impact**	**Biodiversity Value**
1.3	V2 - covenanted	**1.3a**	Native canopy	Percantage cover (%)	0.02	90	48	0	-0.01
		1.3b	Native dominance	Count (#)	0.02	100	100	0	-0.02
		1.3c	Native species richness	Count (#)	0.02	25	6	0	0.00
		1.3d	Tree basal area	m2/ha	0.02	88	52	0	-0.01
		1.3e							Not calculated

	This section captures which elements of biodiversity, and over what area, will be impacted by the proposal					This section is where the change in measure of each Biodiversity Attribute due to the proposed Impact is quantified, and Attribute Biodiversity Value calculated. Inputs are derived from direct measures, existing data or models where available, or expert estimated predictions			
	Biodiversity Component	**Biodiversity Attribute**		**Measurement Unit**	**Area of Impact (ha)**	**Benchmark**	**Measure prior to Impact**	**Measure after Impact**	**Biodiversity Value**
1.4	V3 - Planting	**1.4a**	Native canopy	Percantage cover (%)	0.23	90	50	0	-0.13
		1.4b	Native dominance	Count (#)	0.23	100	99	0	-0.23
		1.4c	Native species richness	Count (#)	0.23	25	8	0	-0.07
		1.4d	Tree basal area	m2/ha	0.23	88	85	0	-0.22
		1.4e							Not calculated

	This section captures which elements of biodiversity, and over what area, will be impacted by the proposal					This section is where the change in measure of each Biodiversity Attribute due to the proposed Impact is quantified, and Attribute Biodiversity Value calculated. Inputs are derived from direct measures, existing data or models where available, or expert estimated predictions			
	Biodiversity Component	**Biodiversity Attribute**		**Measurement Unit**	**Area of Impact (ha)**	**Benchmark**	**Measure prior to Impact**	**Measure after Impact**	**Biodiversity Value**
1.5	EF- Riparian edge	**1.5a**	Native canopy	Percantage cover (%)	0.26	90	10	0	-0.03
		1.5b	Native dominance	Count (#)	0.26	100	79	0	-0.21
		1.5c	Native species richness	Count (#)	0.26	25	5	0	-0.05
		1.5d	Tree basal area	m2/ha	0.26	88	247	0	-0.26
		1.5e							Not calculated

OFFSET MODEL

	BIODIVERSITY TYPE
1	Woody Stem Vegetation

DISCOUNT RATE
0.03

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model				These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute					
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value
1.1	EF - Pine plantation	1.1a	Native canopy	Percantage cover (%)	90	Revegtation, animal and plant pest control, legal protection	5	Confident 75-90%	Finite end point	Continue to Column M	0	50	20	1.27	0.00	1.27
		1.1b	Native dominance	Count (#)	100	Revegtation, animal and plant pest control, legal protection	5	Confident 75-90%	Finite end point	Continue to Column M	0	90	20	2.06	-1.05	1.00
		1.1c	Native species richness	Count (#)	25	Revegtation, animal and plant pest control, legal protection	5	Confident 75-90%	Finite end point	Continue to Column M	0	10	20	0.91	-0.32	0.60
		1.1d	Tree basal area	m2/ha	88	Revegtation, animal and plant pest control, legal protection	5	Confident 75-90%	Finite end point	Continue to Column M	0	44	20	1.14	-1.13	0.01
		1.1e						Low confidence >50% <75%	Choose option							Not calculated

This is the average Net Present Biodiversity Value for the Biodiversity Component
Component Net Present Biodiversity Value
0.72

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute					
	Biodiversity Component	**Biodiversity Attribute**		**Measurement Unit**	**Benchmark**	**Proposed Offset Actions**	**Offset area (ha)**	**Confidence in Offset Actions**			**Measure prior to Offset**	**Measure after Offset**	**Time till endpoint (years)**	**Biodiversity Value at Offset Site**	**Biodiversity Value at Impact Site**	**Attribute Net Present Biodiversity Value**
1.2	V2 - non covenanted	**1.2a**	Native canopy	Percantage cover (%)	90	Revegtation, animal and plant pest control, legal protection	2.5	Confident 75-90%	Finite end point	Continue to Column M	0	50	20	0.63	-0.32	0.32
		1.2b	Native dominance	Count (#)	100	Revegtation, animal and plant pest control, legal protection	2.5	Confident 75-90%	Finite end point	Continue to Column M	0	90	20	1.03	-0.73	0.30
		1.2c	Native species richness	Count (#)	25	Revegtation, animal and plant pest control, legal protection	2.5	Confident 75-90%	Finite end point	Continue to Column M	0	10	20	0.46	-0.15	0.31
		1.2d	Tree basal area	m2/ha	88	Revegtation, animal and plant pest control, legal protection	2.5	Confident 75-90%	Finite end point	Continue to Column M	0	44	20	0.57	-0.51	0.06

This is the average Net Present Biodiversity Value for the Biodiversity Component
Component Net Present Biodiversity Value
0.25

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute					
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value
1.3	V2 - covenanted	1.3a	Native canopy	Percantage cover (%)	90	Revegtation, animal and plant pest control, legal protection	0.5	Confident 75-90%	Finite end point	Continue to Column M	0	50	20	0.13	-0.01	0.12
		1.3b	Native dominance	Count (#)	100	Revegtation, animal and plant pest control, legal protection	0.5	Confident 75-90%	Finite end point	Continue to Column M	0	90	20	0.21	-0.02	0.19
		1.3c	Native species richness	Count (#)	25	Revegtation, animal and plant pest control, legal protection	0.5	Confident 75-90%	Finite end point	Continue to Column M	0	10	20	0.09	0.00	0.09
		1.3d	Tree basal area	m2/ha	88	Revegtation, animal and plant pest control, legal protection	0.5	Confident 75-90%	Finite end point	Continue to Column M	0	44	20	0.11	-0.01	0.10

This is the average Net Present Biodiversity Value for the Biodiversity Component
Component Net Present Biodiversity Value
0.12

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute					
	Biodiversity Component	**Biodiversity Attribute**		**Measurement Unit**	**Benchmark**	**Proposed Offset Actions**	**Offset area (ha)**	**Confidence in Offset Actions**			**Measure prior to Offset**	**Measure after Offset**	**Time till endpoint (years)**	**Biodiversity Value at Offset Site**	**Biodiversity Value at Impact Site**	**Attribute Net Present Biodiversity Value**
1.4	V3 - Planting	**1.4a**	Native canopy	Percantage cover (%)	90	Revegtation, animal and plant pest control, legal protection	1	Confident 75-90%	Finite end point	Continue to Column M	0	50	20	0.25	-0.13	0.13
		1.4b	Native dominance	Count (#)	100	Revegtation, animal and plant pest control, legal protection	1	Confident 75-90%	Finite end point	Continue to Column M	0	90	20	0.41	-0.23	0.18
		1.4c	Native species richness	Count (#)	25	Revegtation, animal and plant pest control, legal protection	1	Confident 75-90%	Finite end point	Continue to Column M	0	10	20	0.18	-0.07	0.11
		1.4d	Tree basal area	m2/ha	88	Revegtation, animal and plant pest control, legal protection	1	Confident 75-90%	Finite end point	Continue to Column M	0	44	20	0.23	-0.22	0.01

This is the average Net Present Biodiversity Value for the Biodiversity Component
Component Net Present Biodiversity Value
0.11

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute					
	Biodiversity Component	**Biodiversity Attribute**		**Measurement Unit**	**Benchmark**	**Proposed Offset Actions**	**Offset area (ha)**	**Confidence in Offset Actions**			**Measure prior to Offset**	**Measure after Offset**	**Time till endpoint (years)**	**Biodiversity Value at Offset Site**	**Biodiversity Value at Impact Site**	**Attribute Net Present Biodiversity Value**
1.5	EF- Riparian edge	**1.5a**	Native canopy	Percantage cover (%)	90	Revegtation, animal and plant pest control, legal protection	1.5	Confident 75-90%	Finite end point	Continue to Column M	0	50	20	0.38	-0.03	0.35
		1.5b	Native dominance	Count (#)	100	Revegtation, animal and plant pest control, legal protection	1.5	Confident 75-90%	Finite end point	Continue to Column M	0	90	20	0.62	-0.21	0.41
		1.5c	Native species richness	Count (#)	25	Revegtation, animal and plant pest control, legal protection	1.5	Confident 75-90%	Finite end point	Continue to Column M	0	10	20	0.27	-0.05	0.22
		1.5d	Tree basal area	m2/ha	88	Revegtation, animal and plant pest control, legal protection	1.5	Confident 75-90%	Finite end point	Continue to Column M	0	44	20	0.34	-0.26	0.08

This is the average Net Present Biodiversity Value for the Biodiversity Component
Component Net Present Biodiversity Value
0.27

Appendix F
WEV Outputs

1. Catchment

Component	Identifier	Attribute	Explanation/ Description	Scoring	Weighting	WEVi-C Score	WEVi-P Score	WEVi-I Score	WEVm-C Score	WEVm-P Score
Catchment Descriptors										
Catchment descriptor	*1.1*	Land use affecting catchment hydrology	Upstream contributing sub-catchment linked directly to wetland. All sub-scores for proportion of catchment under land use must add to 1	Urbanised - housing, infrastructure, built developments	*0*		0.3			0.7
				Grazing pasture	*0.2*	0.5	0.1			0.1
				Cropping/ crops/ orchards/ amenity/ shelterbelts/ rank pasture (not grazed)	*0.4*					0.1
				Plantation forest	*0.8*					
				Shrublands or forest - native or exotic (not plantations)	*1*	0.5	0.6			0.1
				1.1 land use score		3	3.1	0	0	0.8
Catchment descriptor	*1.2*	Diversion of flows	Presence of bores, drains, stormwater drains that divert water away from the wetland	0 Catchment heavily drained and flows diverted 3 Some drains diverting flows from wetland 5 No drains diverting flows from wetland		5	5	0	0	5
Catchment descriptor	*1.3*	Water quality in catchment	Signs or odours alluding to inflow of sediments, chemicals, excessive nutrients from e.g. septic tanks, roofs, stock, landfills, quarries, industrial sites	0 Severe pollution 1 Probable severe pollution 2 Probable moderate pollution 3 Possible mild pollution 4 Good water quality 5 Excellent water quality - no sign of sediment, pollutant, algae, or odours		2	4	0	0	4
Catchment descriptor	*1.4*	Mammalian predators in catchment	Suitable habiat is mostly woody vegetation, scrub, hedgelines or urban areas. Open ground, pasture, young pine forest less suitable	1 High numbers of most, little control and a lot of suitable habitat (>50%). 2 Mod - high, little control and little suitable habitat (<50%), or regular control but a lot of suitable habitat (>50%) 3 Mod. numbers, some regular control, very little suitable habitat (<25%) 4 Few in catchment, intensive control, some key pests absent 5 No mammalian predators in catchment		1	2	0	0	2
Catchment descriptor	*1.5*	Key undesirable plants in catchment	Plants listed as invasive species in regional or national plant pest control plans	0 Catchment dominated by weeds 1 5+ in moderate amounts 2 5+ in low amounts 3 1-4 undesirable species in low amounts 4 A few (1-3) 5 None		1	4	0	0	4
Catchment descriptor	*1.6*	% impervious surfaces in catchment	Use topo map or aerial to assess within the subcatchment contributing flow to the wetland	0 >75% of catchment is in impervious surfaces 1 50-75% of catchment is in impervious surfaces 2 25-50% of catchment is in impervious surfaces 3 10-25% of catchment is in impervious surfaces 4 <10% of catchment is in impervious surfaces 5 0% of catchment is in impervious surfaces		5	4	0	0	2
Catchment descriptor	*1.7*	% catchment in vegetation of any sort	Use topo map or aerial to assess land area supporting vegetation vs concrete, bare soil or other non-vegetative surfaces	0 < 5 % vegetation in whole catchment 1 6- 25% vegetation in whole catchment 2 26–49% vegetation in whole catchment 3 50–74% vegetation in whole catchment 4 > 75% vegetation in whole catchment 5 Whole catchment in vegetation		5	3	0	0	1
Catchment descriptor	*1.8*	Degree of runoff control – flood and first flush	Within the sub-catchment contributing to wetland water quality	0 Low (no control) over most of catchment 1 Mix of low and moderate control over most of catchment 2 moderate control over most of catchment 3 moderate control over most of catchment with high over remainder 4 high (much control) over most of catchment with moderate over remainder 5 high (much control) over all of catchment		0	4	0	0	4
Catchment descriptor	*1.9*	Wetland connections	Use topo map or aerial to determine nearest wetland that is greater than 0.5 ha area. Measure from nearest edge of wetland	0 No other wetland >0.5 ha within 5 km radius 1 2.01 – 4.9 km to nearest wetlands >0.5 ha 2 1.01 - 2 km to nearest wetlands >0.5 ha 3 501 m - 1 km to nearest wetlands >0.5 ha 4 101-500 m to nearest wetland >0.5 ha 5 < 100 m from other wetlands >0.5 ha		0	0	0	0	2
				Potential maximum score		5	5	5	5	5
				Average score across catchment component (9 scores)		2.44	3.23	0.00	0.00	2.76

2. Wetland

Component	Identifier	Attribute	Explanation/ Description	Scoring	WEVi-C Score	WEVi-P Score	WEVi-I Score	WEVm-C Score	WEVm-P Score
Wetland Descriptors									
Size and shape	2.10	Size	Size of wetland affects the range or communities and habitats that the wetland can support, and how sustainable those may be in the long term. Larger wetlands support a greater diversity of biodiversity and are, generally, more sustainable.	Size of wetland: 0 < 0.25 ha area; 1 0.25ha-0.5ha area; 2 0.6ha – 1.0ha area; 3 1.1ha- 2.0ha area; 4 2.1ha- 5ha area; 5 > 5 ha area	1	1	0	0	0
Size and shape	2.2	Shape	Shape indicates the vulnerability of a wetland to plant invasion on the edges and the liklihood of environmental edge effects influencing interior communities. Divide wetland perimeter length (m) by area (m2).	Perimeter to area ratio is: 0 greater than 1; 1 between 1 and 0.1; 2 between 0.1 and 0.05; 3 between 0.05 and 0.01; 4 between 0.01 and 0.005; 5 less than 0.005	1	1	0	0	1
Change in hydrology	2.3	Impact of artificial structures	Number/ size/ depth/ effectiveness/ coverage of structures such as dams, drains, stopbanks, tide gates etc within the wetland and in the contributing sub-catchment	Degree of modification caused: 0 extreme - totally dominanted by structures 1 very high - Dominate wetland 2 high - affect 50-75% of wetland 3 medium - affect 25 - 49% of wetland 4 low - affect less than 25% of wetland 5 very low/ none - not affecting wetland's orginal condition	4	4	0	0	4
Change in hydrology	2.4	Water table depth	Water table change based on long-term plot data or hydrological monitoring data or local knowledge – ask the landowner/manager, loss/decline of species requiring high water table e.g., aquatic and semi-aquatic species such as bladderwort.	Degree of modification to expected natural state: 0 extreme; - Unable to be easily measured throughout season. Now a 'dryland' or totally flooded. 1 very high - very low or high for msot of the year, not recharged fully by high rainfall events. Average water table much lower than previously. 2 high - Lowered or raised for long periods during dry/wet spells or has changed noticably over time 3 medium -Noticably higher or lower for short periods during dry/wet spells 4 low - lower or higher only occasionally and temporarily 5 very low/ none - no detectable change from orginal condition	3	3	0	0	3
Change in hydrology	2.5	Dry-land plant invasion	Presence/increase of dryland species/vegetation (e.g. privet, gorse, pampas, mahoe, mapou, wattle, pine, kanuka, koromiko), ponga/mamaku, browntop, sweet vernal, fireweeds, hawksbeard, clover.	Degree of modification to expected natural state: 0 extreme - all species in community are dryland species 1 very high - >75% of wetland has dryland plants present 2 high - 50-75% of wetland has dryland plants present 3 medium - 25-49% of wetland has dryland plants present 4 low - <25% of wetland has dryland plants present 5 very low/ no dryland plants in wetland	4	4	0	0	4

Change in water/ soil quality or state (physico chemical parameters)	2.6	Degree of sedimentation/erosion	Recent earthworks or freshly dug drains in the catchment. Abrupt change in soil colour if you dig a hole. Plants partially buried by sediment or stained/ dirty looking from recent silt-laden floods. Water looks dirty. Soft mud easily disturbed underfoot or gumboots sink readily into deep mud.	0 All wetland character lost due to prolonged extreme turbidity, almost total infilling by sediment, or unchecked erosion and scouring or sedimentation. 1 Water clarity >160 NTU;Or sediment over >75% of wetland; Or widespread erosion, scouring or sedimentation. 2 Water clarity 121–160 NTU; Or sediment in 50–75% of wetland; Or widespread erosion or scouring or sedimentation over > 50% of area. 3 Water clarity 81–120 NTU; Or sediment in 25–49% of wetland; Or erosion spots linked and causing minor structural damage. 4 Water clarity 41–80 NTU; Or visible sediment deposits in <25% of wetland; Or some minor spot erosion visible. 5 None: high water clarity (<40 NTU), no visible sediment, stable banks and soil.	3	4	0	0	4
Change in water/ soil quality or state (physico chemical parameters)	2.7	Nutrient levels	Algal blooms/surface scum, stagnant water. High numbers of waterfowl or stock fouling wetland. Loss/decline of plants typical of low-nutrient (oligotrophic) conditions e.g. tangle fern, wire rush, sundews, Baumea teretifolia – compare with old species lists. Presence of tall and/or dense stands of high nutrient species e.g. most wetland weeds, along with raupo, flax, blue-green algae. Recent fires based on landowner account, charred trunks of woody species, visible ash deposits.	0 All wetland character lost due to nutrients or fire: now just a pond or dryland with no higher wetland plants present. 1 >75% of wetland is almost continuous algal blooms or single species stands of high-nutrient plants. Or recent fires (<2 yr) affected over >75% of wetland. 2 50–75% of area shows algal blooms, increased nutrients or vegetation change to high-nutrient species. Recent fires (<2 yr) affected 50–75% of wetland. 3 25–49% of area shows algal blooms, increased nutrients or vegetation change to high-nutrient species. Recent fires (<2 yr) affected 25–49% of wetland. 4 Localised (<25%) or infrequent signs of algal blooms or changes in nutrient concentrations or veg. composition. Recent fires (<2 years) removed vegetation in <25% of wetland. 5 No evidence of eutrophication/ recent fire.	4	5	0	0	5
Change in ecosystem intactness	2.8	Loss in area of original wetland	Evidence from old maps/aerial photos, areas of developed flat land or damp pasture adjacent to the wetland – particularly with drains through them. Presence of remnants of wetland vegetation. Obvious reclamation.	0 Wetland lost, or almost lost but remnants completely modified. 1 >75% of original area lost, remnants still retain some original character. 2 50–75% of original area lost. 3 25–49% of original area lost. 4 <25% of original area lost. 5 No loss: original wetland area essentially intact.	4	4	0	0	4
Change in ecosystem intactness	2.9	Recent vegetation damage/clearance	Areas of sprayed (brown or yellow) standing native vegetation, piles of slashed or crushed vegetation in or beside the wetland, signs of equipment having been in wetland to haul or bulldoze vegetation, charred or blackened vegetation. Don't confuse seasonal dieback of e.g. raupo or willow with sprayed vegetation.	0 All vegetation recently cleared from the wetland or dead from spraying or burning 1 >75% cleared/dead 2 50–75% cleared/dead 3 25-49% cleared/ dead 4 <25% of wetland vegetation cleared or dead 5 No clearance or spraying of native vegetation	5	5	0	0	5
Change in ecosystem intactness	2.10	Hydrological barriers/ connectivity	Presence of tide gates, stop banks, weirs, perched culverts separating wetland from riverine connections to other wetlands. Ring drains and box culverts around margin isolate wetland from catchment runoff and groundwater. Loss of riparian vegetation and buffer vegetation connecting wetlands to native forests, lakes and rivers	0 Isolated: all former connections to other water bodies lost. 1 >75% of connection lost with some minor links remaining. 2 50–75% of upstream or downstream connection lost. 3 25–49% of upstream or downstream connection lost. 4 <25% of upstream or downstream connection lost. 5 None: All natural upstream and downstream connections retained.	4	4	0	0	4
Change in amount of animal damage and harvest by humans	2.11	Damage by stock or feral hoofed animals	Animals and/or their dung or tracks visible in wetland. Browse damage to foliage, branchlets; soft, herbaceous, palatable plant species absent or greatly reduced in number and stature. Damage to bark, e.g., biting and scratching. Disturbance to substrate, e.g., deer wallows, pig rooting, pugging. Presence and effectiveness of stock fencing.	0 All wetland character lost due to severity of browsing and trampling activity. 1 >75% of wetland heavily damaged. 2 50–75% of wetland medium-heavily damage. 3 25–49% of wetland showing medium-heavy damage. 4 <25% of wetland showing light-medium damage; Or very light or localised browsing/trampling damage throughout wetland, or heavy only at edge 5 No domestic or feral animal damage.	1	5	0	0	5

Change in amount of animal damage and harvest by humans	2.12	Introduced predator impacts on wildlife	Presence of effective pest barriers, e.g. pest-proof fence or wetland on pest-free island. Information from pest and/or native bird monitoring data, or landowner accounts. Indirect evidence from predator tracks, scat counts. Presence of sensitive species such as fernbird, bittern, banded rail indicate low predator impacts.	0 Extreme: most native wildlife species extinct in wetland. Predators/signs highly visible. 1 Severe declines in wildlife population and species number. Or no predator control. Very high reinvasion from catchment Predators/signs visible. 2 High declines in populations and/or loss of 1 or 2 wildlife species; no or ineffective predator control; high reinvasion from catchment. 3 Medium predator impact, decline in numbers of some wildlife species. Or control very intermittent /or of not all predators. Medium reinvasion from catchment. 4 Low levels of predators – susceptible wildlife species still present Or pulsed predator control. Low predator reinvasion from catchment. 5 No/virtually no predator access or impact; or wetland & catchment under long term effective predator control.	1	1	0	0	1
Change in amount of animal damage and harvest by humans	2.13	Harvesting levels	Includes harvest of eels, flax, whitebait, sphagnum moss, etc.Information from landowner, evidence of whitebait stands, tracks through the wetland, clearings where vegetation has been harvested, machinery or evidence of its use to harvest moss. Comparison with past species records and fauna/flora descriptions.	0 All wetland character lost due to harvesting activity, or at least 1 species now locally extinct 1 >3 species regularly taken, or 1-3 species taken in high amounts, or moss harvest >50% of the wetland 2 1-3 species regularly taken in low to moderate amounts, or moss harvest from 25-50 % 3 1-2 occasionally taken in moderate amounts, or > 3 occasionally taken, or moss harvest from <25% of the wetland 4 1-2 species occasionally taken in small amounts 5 No harvesting of native plants, birds, fish from site.	5	5	0	0	5
Change in dominance of native plants	2.14	Introduced plant canopy cover	Based on amount of wetland mapped as exotic vegetation types, e.g. willow forest, Glyceria reedland, or as seen from aerial photos or high vantage points. If exotics dominate a percentage of the wetland and are scattered through the rest, apply the next lowest score.	0 All canopy plants are introduced. 1 As above but for >75% of the wetland 2 As above but for 50–75% of the wetland 3 As above but for 25–49% of the wetland 4 <25% of the wetland has canopy cover dominated by introduced plants, or introduced plants are present in the canopy throughout <25% of the wetland. 5 No introduced plants in canopy i.e., all plants are native.	0	2	0	0	3
Change in dominance of native plants	2.15	Introduced plant understorey cover	If only one tier then score will be the same for canopy and understory. If exotics dominate a percentage of the wetland and are scattered through the rest, apply the next lowest score.	0 All/virtually all (>99%) plants in understorey are introduced. 1 As above but for >75% of the wetland 2 As above but for 50–75% of the wetland 3 As above but for 25–49% of the wetland 4 <25% cover of the understory is dominated by introduced plants, or introduced plants are present throughout <25% of the wetland in the understorey 5 No/ virtually no (<1%) plants in understorey are introduced.	0	2	0	0	3
				Average scores of wetland condition attributes					
				Size and shape	1	1	0	0	0.5
				Change in hydrology	3.67	3.67	0	0	3.67
				Change in water/ soil quality or state (physico chemical parameters)	3.50	4.50	0	0	4.50
				Change in ecosystem intactness	4.33	4.33	0	0	4.33
				Change in amount of animal damage and harvest by humans	2.33	3.67	0	0	3.67
				Change in dominance of native plants	0	2	0	0	3
				Potential maximum score	5	5	5	5	5
				Average score across wetland condition component averages (6 scores)	2.47	3.19	0	0	3.28

3. Buffer

Component	Identifier	Attribute	Explanation/ Description	Scoring	WEVi-C Score	WEVi-P Score	WEVi-I Score	WEVm-C Score	WEVm-P Score
Buffer Descriptors									
Buffer descriptor	***3.1***	Animal damage	Animals and/or their dung or tracks visible in buffer Browse damage to foliage, branchlets; soft, herbaceous, palatable plant species absent or greatly reduced in number and stature. Damage to bark, e.g., biting and scratching. Disturbance to substrate, e.g., deer wallows, pig rooting, pugging. Presence and effectiveness of stock fencing.	0 Animal (e.g. cattle, sheep, horse, deer, pig) trampling and/or grazing is severe around most of the perimeter, in places the actual wetland edge is hard to make out 2.5 A few patches of severe trampling and/or grazing at the edge, or light damage around much of the edge 5 No animal damage (e.g. if because wetland is securely fenced, or surrounded by wide drains, or not in grazing land)	2.5	5	0	0	5
Buffer descriptor	***3.2***	Weeds	Based on amount of buffer mapped as exotic vegetation types, or as seen from aerial photos or high vantage points. If exotics dominate a percentage of the buffer and are scattered through the rest, apply the next lowest score.	0 Most of the edge plants are weeds (non-native species), in any vegetation tier (canopy, shrub layer, ground layer) 2.5 Many exotic species (>3), or extensive patches of weeds, but mostly native plants at the edge 5 No weeds, or a few 2-3 or exotic plants scattered around the edge (ignore weeds in pasture adjacent to the wetland)	2.5	5	0	0	5
Buffer descriptor	***3.3***	Canopy dieback	Based on a walkthrough assessment, aerial photos or high vantage points.	0 Severe dieback, many large patches (> 3 strides long) of dead/ dying native plants, or smaller patches scattered around most of the edge, or no woody vegetation canopy present 2.5 Occasional small patches (< 3 strides long) of dieback, or occasional dead native plants scattered at edge, or many plants with moderate dieback (< half plants are dead) 5 No apparent die-back on edge zone (first 3 m), or occasional native plants showing some dieback	5	5	0	0	5
Buffer descriptor	***3.4***	Buffer	Proportion of the length of the perimeter that has forest or scrub present	0 No buffer, or small portion (<25% of wetland) has forest or scrub buffer 20 m wide 2.5 25-75% of wetland has forest or scrub buffer 20 m wide 5 75-100 % of the wetland has forest or scrub buffer 20 m wide	2.5	2.5	0	0	2.5
Buffer descriptor	***3.5***	Drains	Presence of bores, drains, stormwater drains that divert water away from a wetland	0 Drains around or extending from the wetland with water visibly seeping from the sides and/or flowing along the drain. 2.5 Drains present, and some flow of water but little side seepage. 5 No perimeter drains, or old drains present but mostly filled with sediment and vegetation, or still water.	5	5	0	0	5
				Potential maximum score	5	5	5	5	5
				Average score across catchment component (8 scores)	3.5	4.5	0	0	4.5

Wetland condition scoring method - WEV

Site	Vineway
Location	Vineway
Date	1/07/2025

Component	Attribute	WEVi-C Av Score	WEVi-P Av Score	WEVi-I Av Score	WEVm-C Av Score	WEVm-P Av Score
Catchment	Land use affecting catchment hydrology	3.00	3.10	0.00	0.00	0.80
Catchment	Diversion of flows	5.00	5.00	0.00	0.00	5.00
Catchment	Water quality in catchment	2.00	4.00	0.00	0.00	4.00
Catchment	Mammalian predators in catchment	1.00	2.00	0.00	0.00	2.00
Catchment	Key undesirable plants in catchment	1.00	4.00	0.00	0.00	4.00
Catchment	% impervious surfaces in catchment	5.00	4.00	0.00	0.00	2.00
Catchment	% catchment in vegetation of any sort	5.00	3.00	0.00	0.00	1.00
Catchment	Degree of runoff control – flood and first flush	0.00	4.00	0.00	0.00	4.00
Catchment	Wetland connections	0.00	0.00	0.00	0.00	2.00
Wetland	Size and shape	1.00	1.00	0.00	0.00	0.50
Wetland	Change in hydrology	3.67	3.67	0.00	0.00	3.67
Wetland	Change in water/ soil quality or state (physico chemical parameters)	3.50	4.50	0.00	0.00	4.50
Wetland	Change in ecosystem intactness	4.33	4.33	0.00	0.00	4.33
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	0.00	2.00	0.00	0.00	3.00
Buffer	Animal damage	2.50	5.00	0.00	0.00	5.00
Buffer	Weeds	2.50	5.00	0.00	0.00	5.00
Buffer	Canopy dieback	5.00	5.00	0.00	0.00	5.00
Buffer	Buffer	2.50	2.50	0.00	0.00	2.50
Buffer	Drains	5.00	5.00	0.00	0.00	5.00
Overall Mean Score		**2.72**	**3.54**	**0.00**	**0.00**	**3.35**
Maximum attainable Score		5.00	5.00	5.00	5.00	5.00
Wetland Condition (WEV score)		**0.543**	**0.708**	**0.000**	**0.000**	**0.670**

Address | [redacted]

Post | [redacted]

Telephone | [redacted]

Email | [redacted]

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