Ararimu Road managed fill, Papakura, Auckland

Ecological Effects Assessment

Report prepared for

SAL Land Ltd

Prepared by

RMA Ecology Ltd

Report number and date

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BETTER ECOLOGICAL OUTCOMES

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BETTER ECOLOGICAL OUTCOMES

Contents

Executive summary

This report provides an assessment of the ecological values and potential ecological effects of managed fill activities and associated earthworks proposed for a property at Ararimu Road, Papakura, Auckland, legal description Lot 2 DP 77813 and part of Lot 1 DP 166299, Lot 8 DP 369781.

The proposed development will result in the filling of three adjacent gullies at the southern end of the site with managed fill, realignment of the access track at the northern end of the site and upgrades to the existing access track, removal of two existing culverts and the installation of two new culverts on the two permanent streams on the site. This report is for the purpose of applying for resource consents under the Resource Management Act 1991.

The site supports a network of streams and wetlands, and an area that has been recently cleared of planted pine trees. The remainder of the site supports pasture grass that has been used for grazing until recently.

There are three permanent streams, one intermittent stream, and one ephemeral stream (overland flow path) in the upper reaches of the central gully in the area recently cleared of pines. The streams are all in a poor to moderate ecological condition, due to a limited level of riparian cover and past channel modification works carried out to increase flood capacity.

There are eight wetlands on the site, the majority of which support mostly a limited diversity of exotic wetland vegetation and are in poor ecological condition as a result of drainage, and pugging and grazing by livestock. The two wetlands towards the centre of the site are of moderate ecological quality as they support a greater diversity of native and exotic wetland species, and have received less impact from stock.

The site supports habitat for a limited diversity of common native and exotic bird species, none of which are classified as 'At Risk' or 'Threatened'. There is no habitat within the development footprint that is suitable for native lizards.

The proposed development will have a number of actual and potential adverse effects on the ecological values of the site. The fill area will result in the loss of 2,108 m² of wetland, and 35 m of intermittent stream.

Proposals to mitigate the adverse effects of the development, and to offset the residual effects, include re-creating former wetlands, planting wetland margins, planting stream riparian margins, and extensive planting of native shrub and tree species. The mitigation and offset package will reduce all actual and potential adverse effects to Nil or Low, or will result in a Net Gain for biodiversity.

1.0 Introduction

1.1 Background

This report provides an assessment of the ecological values and potential ecological effects of managed fill activities and associated earthworks proposed for a property at Ararimu Road, Papakura, Auckland, legal description Lot 2 DP 77813 and part of Lot 1 DP 166299, Lot 8 DP 369781 (hereafter, 'the site') (**Figure 1**).

The central gully towards the southern end of the site is proposed for a managed fill facility, along with the gully on the adjacent property. This report is for the purpose of applying for resource consents under the Resource Management Act 1991.

1.2 Purpose and scope

SAL Land Ltd has engaged RMA Ecology Ltd to undertake an assessment of the values of the site in terms of aquatic and terrestrial ecology[1] and an assessment of potential adverse effects arising from the proposed managed fill activities and associated earthworks.

The approach includes survey of freshwater and terrestrial values and provides the following:

- Review of databases to identify the likelihood of species of conservation significance being present, with an emphasis on bats, freshwater fish, lizards, birds, and plants;
- Walkover survey to identify or validate the presence of native vegetation, especially areas that meet the criteria for wetland under the National Policy Statement – Freshwater Management (NPS-FM).
- Walkover and wetland-specific assessments to:
  - Determine wetland values, using qualitative scoring methods;
  - Map the boundaries of wetlands.
- Walkover and stream-specific sampling to:
  - Determine stream values, using qualitative scoring methods along multiple reaches of all accessible, flowing streams;
  - Map the boundaries of stream types (permanent, intermittent, and ephemeral).

This report contains the following:

- An overview of the methods used to assess the ecological values of areas potentially affected by the development;
- A description of ecological values within the development footprint and immediate surrounds;
- An assessment of the potential effects associated with the development, construction, and operational activities; and
- Recommendations to address adverse effects.

The report has been prepared with regard to the ecological provisions of the Auckland Unitary Plan, 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 (NPS-IB).

[1] This report has been prepared in accordance with our letter of engagement dated 02 February 2023.

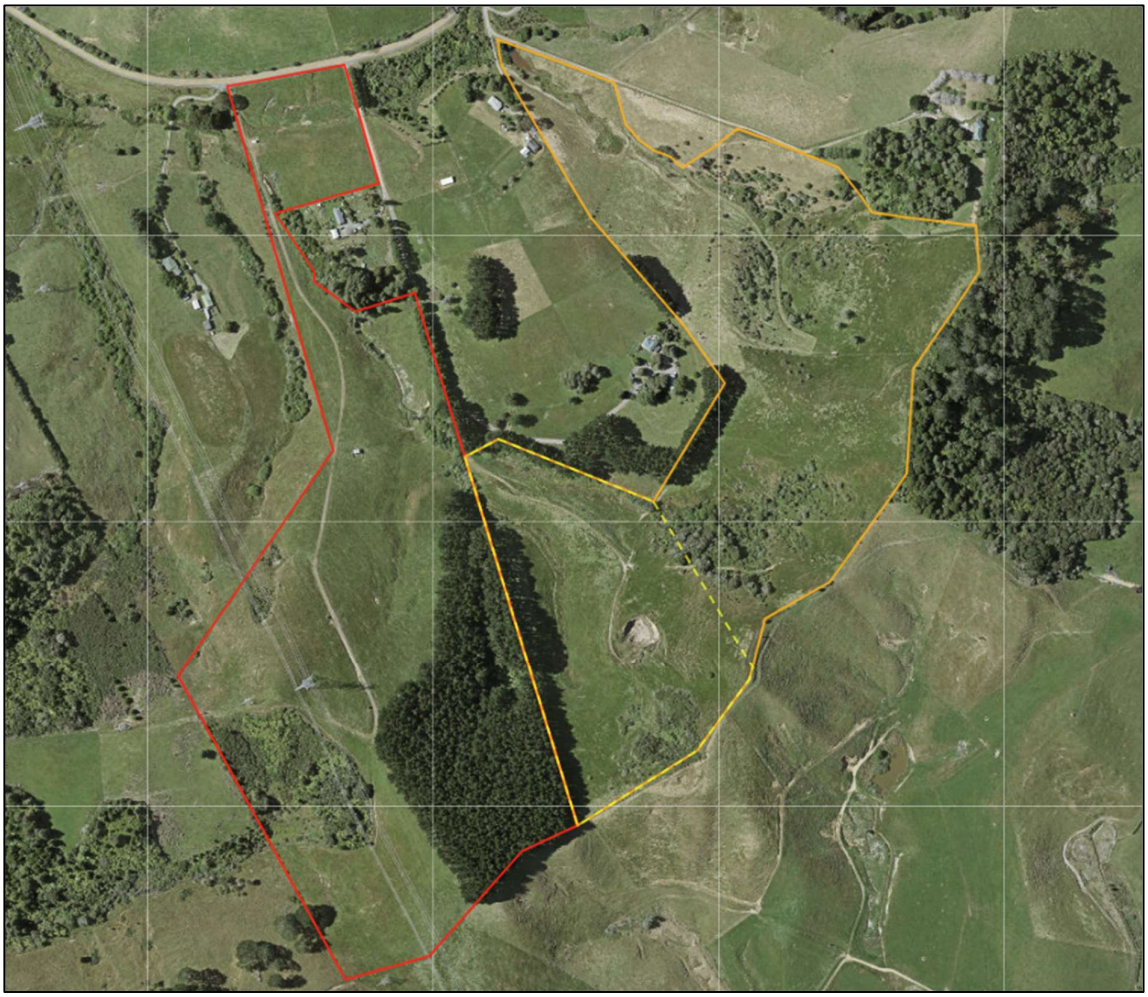


Figure 1. The site, including Lot 2 DP 77813, Ararimu Road, Auckland (red line), and the adjacent property, Lot 1 DP 166299, Lot 8 DP 369781 (yellow dashed line). The remainder of the adjacent property is marked with an orange line and is not part of the site.

2.0 Methods

Desktop analyses and several site visits were undertaken to assess the ecological values of aquatic and terrestrial areas within and surrounding the development footprint. This section describes the methods used for desktop and field investigations.

2.1 Desktop assessment

A desktop assessment of the development footprint and surrounding area was undertaken to identify areas of the site that had potential for supporting ecological values. The following databases and documents were reviewed:

- Land Environments New Zealand (LENZ) and the Threatened Environment Classification (TEC)
- Historic aerial photographs (Retrolens)
- Auckland Unitary Plan (AUP), including maps via GeoMaps and Tiaki Tāmaki Makaurau maps
- NIWA New Zealand Freshwater Fish Database
- Department of Conservation National Amphibian and Reptile Database System
- Department of Conservation bat records database

The AUP maps were reviewed to identify existing vegetation, streams, and overland flow paths present on the site and to establish an understanding of these features' ecological status. Streams, wetlands and terrestrial vegetation identified from the maps were then surveyed and assessed on site.

Data from national fauna databases was analysed to assess the likelihood of their presence on the site, or nearby, and their threat status checked against the relevant national threatened species classification lists (Hitchmough *et al.* 2021, Robertson *et al.* 2021 and Dunn *et al.* 2017).

2.2 Field assessment

A site visit was undertaken on 22 February 2023 to assess the ecological values present within the development footprint. A second site visit was undertaken on 30 May 2023 to assess the ecological values present on the adjacent property, which was added to the site at a later date.

2.3 Streams

During the site visits in February and May 2023, all streams at the site were assessed and mapped. All waterways and flow paths were assessed as being either permanent, intermittent, or ephemeral based on the definitions in the Auckland Unitary Plan (see below).

Stream Ecological Valuations (SEVs) were undertaken to quantify the ecological value of the streams on site. The data collected using the SEV method (Storey *et al*. 2001) has been used to generate a baseline picture of stream health, which will help inform future management of streams, particularly with respect to any restoration work carried out as mitigation or offset for any adverse effects caused by the proposed managed fill operations.

The definitions of stream types within the AUP are listed below in italics.

Permanent river or stream

The continually flowing reaches of any river or stream.

Intermittent stream

Stream reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definition of permanent river or stream and meet at least three of the following criteria:

a) it has natural pools;
b) it has a well-defined channel, such that the bed and banks can be distinguished;
c) it contains surface water more than 48 hours after a rain event which results in stream flow;
d) rooted terrestrial vegetation is not established across the entire cross-sectional width of the
e) channel;
f) organic debris resulting from flood can be seen on the floodplain; or
g) there is evidence of substrate sorting process, including scour and deposition.

Ephemeral stream

Stream reaches with a bed above the water table at all times, with water only flowing during and shortly after rain events. This category is defined as those stream reaches that do not meet the definition of permanent river or stream or intermittent stream.

2.4 Wetlands

During the site visits in February and May 2023, all wetlands were assessed, firstly, on the definition of a 'wetland' in the Resource Management Act 1991 (RMA), and secondly, on the definition of a 'natural inland wetland' within the National Policy Statement for Freshwater Management 2020 (NPS-FM) (last amended January 2023).

The Resource Management Act 1991 defines a wetland as:

- ***Wetland****: permanently or intermittently wet areas, shallow water, and land/water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions, including within the coastal marine area.*

The National Policy Statement for Freshwater Management (NPS-FM) (as amended 5 January 2023) defines a natural inland wetland as:

- ***Natural inland wetland*** *means a wetland (as defined in the Act) that is not:*

a) in the coastal marine area; or
b) a deliberately constructed wetland, other than a wetland constructed to offset impacts on, or to restore, an existing or former natural inland wetland; or
c) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body; or
d) a geothermal wetland; or
e) a wetland that:
    i. is within an area of pasture used for grazing; and
    ii. has vegetation cover comprising more than 50% exotic pasture species (as identified in the National List of Exotic Pasture Species using the Pasture Exclusion Assessment Methodology (see clause 1.8)); unless
    iii. the wetland is a location of a habitat of a threatened species identified under clause 3.8 of this National Policy Statement, in which case the exclusion in (e) does not apply

The updated NPS-FM technical support documents regarding wetland classification and delineation require that a step-wise assessment is undertaken based on vegetation, soils, and hydrology.

Exclusions are then applied based on factors that include the percentage abundance of pasture species, whether the wetland has developed in or around a deliberately constructed water body, an assessment of threatened species habitat use, and then application of three separate vegetation tests (Rapid Test, Dominance Test, and Prevalence Index). Wetland soils and hydrology information can be applied if the results of vegetation community and exotic pasture grass exclusion are inconclusive.

We understand that the National Environmental Standards for Freshwater 2020 (NES-F) and NPS-FM require Councils to ensure that the loss of values and extent of 'natural inland wetlands' is avoided in most instances (excluding some activities, including urban development). The NPS-FM/ NES-F also restricts activities within a 10 m buffer around 'natural inland wetlands', and places controls on the level of potential adverse effects (from, for example, discharge of water or diversion of water) within 100 m from a 'natural inland wetland'.

The complete methodology applied for the identification of wetlands at this site is set out in **Appendix A**.

2.5 Terrestrial ecology

Vegetation was assessed across the site with a focus on the areas proposed for the footprint of the managed fill and managed fill operations. Birds identified visually and audibly were recorded across the site, including native and introduced species. Potential food sources and nesting habitat were noted for the purpose of estimating the potential loss of resources associated with the planned development. The field survey included identification of habitats potentially occupied by native lizards and native bats.

Terrestrial vegetation and habitats were assessed against the AUP Significant Ecological Area (SEA) criteria (Sawyer & Stanley, 2012) and against the Significant Natural Area (SNA) criteria within the NPS-IB, to assess the significance of ecology values recorded from the site.

3.0 Results

3.1 Ecological context

The site is located within a typical Auckland rural environment. Although the original natural ecology has been heavily modified or removed through past farming activities, the site still supports freshwater ecosystems which are of ecological value. Historic photographs indicate that the land has been cleared for many decades for farming purposes (**Plate 1**).

The site is situated within the Hunua Ecological District, which is characterised has having supported a diversity of podocarp/ broadleaf/ kauri forest in pre-human times on lowland and coastal hills (Lindsay *et al*. 2009). The lowland areas of the district are now highly modified with original ecosystems cleared or drained and converted to farmland. The upland areas include the largest single block of continuous forest left in the Auckland region – the Hunua Ranges. Currently 36 % of all indigenous ecosystems remain in the district, which is mostly represented by the remaining forest of the Hunua Ranges. Of the other ecosystems, only 1 % of freshwater wetlands and wetland forest, 1 % of coastal forest and 0.5 % of kauri forest remain (Lindsay *et al.* 2009).

The Threatened Environment Classification (Walker *et al*. 2015) shows how much native (indigenous) vegetation remains within land environments, and how past vegetation loss and legal protection are distributed across New Zealand's landscape. The site lies within two Threatened Environment classes. The northern half of the site is within an area classified as having less than 10 % indigenous cover left. In these environments, the loss of habitats for indigenous species has been greatest in the past. Little indigenous biodiversity remains in these environments. This area covers tracts of land that are typically clear of any vegetation other than pasture grass.

The southern half of the site, including Stream P3 and the upper reaches of Stream P2, and Wetlands W5, W6 and W7, lies within an area classified as having 20-30 % indigenous cover left. Indigenous biodiversity in these environments has been much reduced and habitats are seriously fragmented. This area includes the patches of native bush and stream gullies to the east and west of the site.

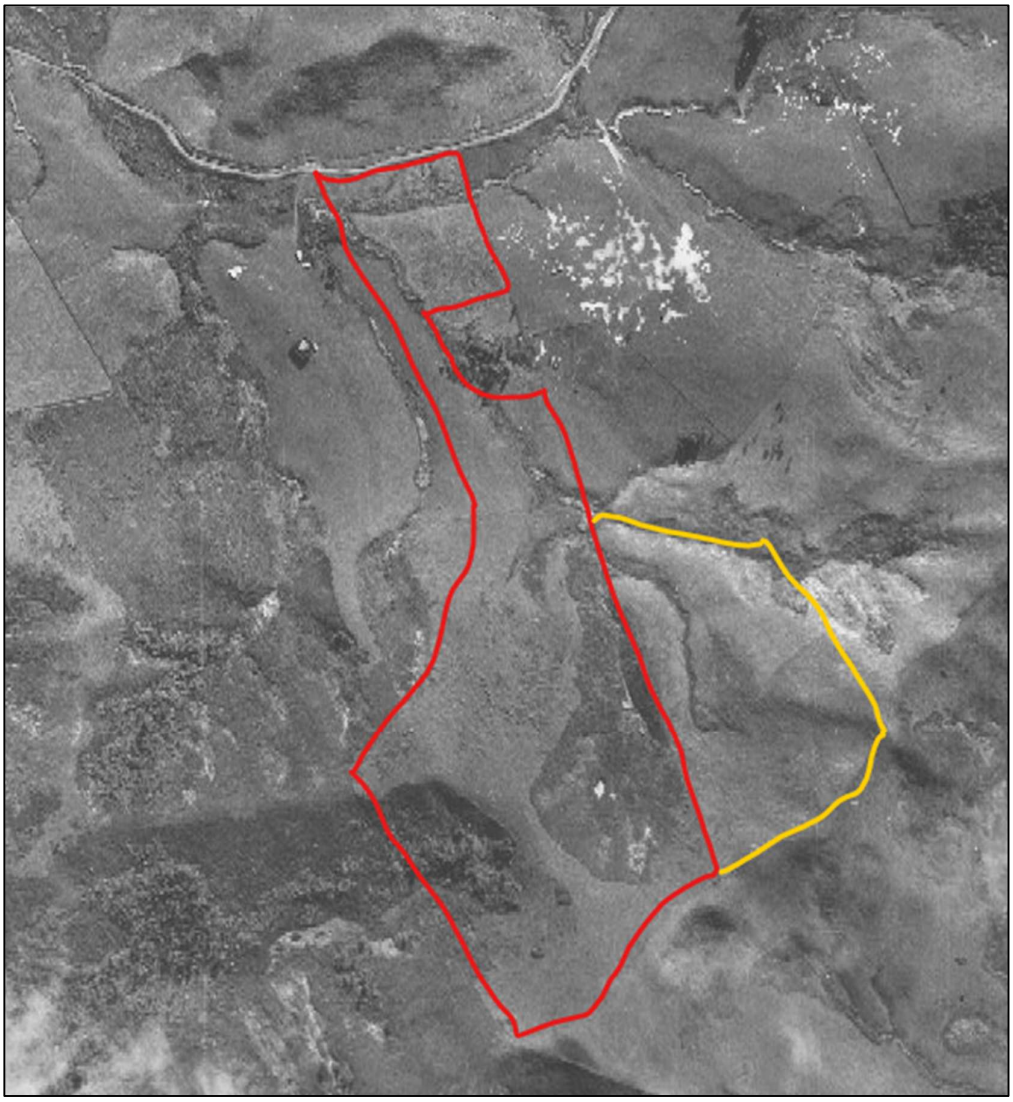


Plate 1: Historic aerial photograph of the site from 1944, demonstrating that the land has been cleared of forest and used for farming purposes for many decades. Streams and an established network of wetlands are visible as lines of darker grey within the lighter grey colour of pasture. Approximate boundaries of the site (red line) and of the neighbouring leased land (yellow line) are marked. Retrolens: www.retrolens.co.nz

Land Environments of New Zealand (LENZ) is a quantitatively-based classification of New Zealand's terrestrial environment developed by Landcare Research[2], which has resulted in a number of datasets including the Land Cover Database (LCDB). LCDB v5.0 indicates that parts of the site have been used for pine plantation since at least 1996. Pines in the south western sector of the site have subsequently been felled and this area now supports pasture. The central area of pines was cleared in March-April 2024. A small area of kanuka/ manuka scrub has been present at the head of the gully in the south western end of the site since at least 1996.

There are no scheduled Significant Ecological Areas (SEA), as identified by the AUP, present on the site. Adjacent and other nearby properties support areas of native gully and/ or streamside forest that are identified as SEAs in the AUP. No other areas of protection, such as covenants, are present on the site.

[2] https://www.landcareresearch.co.nz/tools-and-resources/mapping/lenz/

3.2 Streams

The site contains three gullies in the southern half of the site, through which three headwater streams/ overland flow paths flow south to north where they join another tributary that flows east to west across the northern end of the site (**Figures 2a, 2b and 2c**).

There are two permanent streams on site, Streams P1 and P2, both un-named tributaries of the Wairoa River that flows north towards its mouth at the Tamaki Strait. Permanent Stream P3, as mapped in **Figure 3**, is on the leased land on the neighbouring property and is not within the development footprint. There is one intermittent stream, Stream I1, that is located at the foot of the western gully and flows into an area of wetland (Wetlands W5 and W6) and on into Stream P2. This intermittent stream is modelled in the Auckland Council GeoMaps as an overland flow path, however, the section mapped in **Figure 3** meets the following three criteria[3] for an intermittent stream:

- *It has a well-defined channel, such that the bed and banks can be distinguished;*
- *Rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel, and;*
- *There is evidence of substrate sorting process, including scour and deposition.*

There are overland flow paths through the central gully that join to form permanent Stream P2 at the northern end of the gully. These ephemeral streams are modelled in the Auckland Council GeoMaps as overland flow paths and they meet the criteria for an ephemeral stream:

- *Stream bed above the water table at all times; and*
- *Water present only during and shortly after rain fall.*

3.2.1 Permanent Stream P1

Permanent Stream P1 flows east to west through pasture that has been grazed in the recent past; there is no woody riparian vegetation along this section (**Plate 2**). The immediate upstream section of the stream, on the adjacent property to the east, flows through dense vegetation which comprises a mix of planted natives and exotic species, including willow and pine. The immediate downstream section, on the adjacent property to the west, flows through a mix of exotic wetland vegetation with a few trees, and grazed pasture. The length of Stream P1 on the site is 128 m and its average width is 0.96 m.

The dominant substrate making up the stream banks and channel bottom is clay. The channel of P1 contains a small amount of small- to medium-sized gravel. Habitat for native fish is limited to sections of undercut banks and small areas of in-channel or overhanging bank-side vegetation. The New Zealand Freshwater Fish Database records a number of native fish species within the wider Wairoa River catchment – these are listed in **Table 1** below. As Stream P1 only supports limited habitat for native fish, it is unlikely that many of these species are present. Shortfin eel (*Anguilla australis* – Not Threatened) is the most likely species to be found as it can tolerate higher water temperatures and lower dissolved oxygen content than most other native fish species. The NIWA River Map has predicted records for fish in all streams, and shortfin eel is the one species predicted to be present in this stream.[4]

[3] Auckland Unitary Plan: Practice and Guidance Note – River/ Stream Classification

[4] https://shiny.niwa.co.nz/nzrivermaps/

3.2.2 Permanent Stream P2

Permanent Stream P2 begins at the northern end of the central gully and flows north through the site before crossing the site boundary into the neighbouring property (302.6 m in length). Upstream of Stream P2 the channel becomes braided, indistinct and ephemeral; these braided channels do not meet the criteria for intermittent or permanent streams (see section **3.2.5**). There is a narrow band of vegetation remaining following clearance of the pine trees, which includes tree fern and exotic shrub species including Chinese privet (*Ligustrum sinense*) (**Plate 3**). Beyond this band of vegetation, the stream flows through an area of wetland (Wetland W6) with willow (*Salix* sp.) dominating the canopy and mostly native wetland species, including sedges, rushes and ferns, in the understorey (**Plate 4**).

The central section of P2 flows through pasture that has been grazed in the recent past (**Plate 5**). Woody riparian vegetation along this section is limited to scattered willow along the true left bank at the downstream end. The average width of this section of Stream P2 is 1.77 m. Beyond this reach the stream crosses the site boundary into a neighbouring property where it flows beneath a mixed canopy of native and exotic trees and shrubs. There is a short section (55.8 m long) of P2 that re-enters the site towards the northern end – this section flows through pasture that has been grazed until recently; there is a short line of shrubs that line the true left bank at the downstream end.

The dominant substrate making up the stream banks and channel bottom is clay. The sections of the stream that flow beneath the pine and willow canopies also contain root and leaf mats and woody debris. These sections provide a greater range of habitat for native fish and aquatic invertebrates than the sections passing through pasture. It is likely however, that due to the lack of suitable habitat in the downstream reaches, shortfin eel is the only native fish species that may be present in Stream P2.

3.2.3 Permanent Stream P3

Permanent Stream P3 flows east to west though a shallow gully at the edge of the site boundary, and is 283.3 m in length (**Plate 6**). It flows off the site into the neighbouring property before re-entering the site 4 m upstream of its confluence with Stream P2. The stream flows though Wetland W8. Its banks are vegetated with grazed pasture grass. A line of pine trees grows along the upper true right bank, and mark the boundary between the site and the neighbouring property.

The dominant substrate making up the stream banks and channel bottom is clay. Fish habitat is limited to in-channel vegetation. Shortfin eel is the only native fish species that may be present in Stream P3.

3.2.4 Intermittent Stream I1

Intermittent Stream I1 is a short, 47.7 m section of stream that drains the western gully, leading into wetland (Wetlands W5 and W6) and on into Stream P2. It is a narrow (average width 0.2 m), deeply incised natural channel that flows through pasture until it reaches the wetland (**Plate 7**). There is no woody riparian vegetation along this short stream, although long grasses on the margins provide some shade for the stream bed. Its bed and banks are formed of clay and it supports only very limited habitat for aquatic invertebrates. Fish habitat is very restricted as undercut banks, debris, leaf packs, and roots are absent – the stream is effectively only a chute channelling water.

3.2.5 Ephemeral Stream E1

Ephemeral Stream E1 is an overland flow path through the central gully, in the area recently cleared of pine trees (**Plate 8**). The surrounding gully slopes are now bare of vegetation – once the remaining pine slash has

been removed, the gully and slopes will be seeded with pasture species to ensure slope stability and reduce erosion of sediment from surface water flow.

There is no well-defined channel, evidence of natural pools, or other indicators of an intermittent or permanent stream.

Table 1: Recent fish records for the Wairoa River catchment – NIWA Freshwater Fish Database.

Date	Waterbody name	Species	Common name
2018	Wairoa River tributary	*Anguilla dieffenbachia*	Longfin eel
		Anguilla australis	Shortfin eel
		Gobiomorphus cotidianus	Common bully
		Gobiomorphus basalis	Crans bully
		Galaxias fasciatus	Banded kokopu
2008	Wairoa River	*Anguilla dieffenbachia*	Longfin eel
		Anguilla australis	Shortfin eel
		Gobiomorphus cotidianus	Common bully
		Gobiomorphus basalis	Crans bully
		Galaxias fasciatus	Banded kokopu
		Galaxias brevipinnis	Koaro
		Paranephrops sp.	Koura

Figure 2a. Location of Streams P1 and P2 (turquoise lines) at the northern end of the site. Wetlands are marked in green. Drains are marked with a pink line.

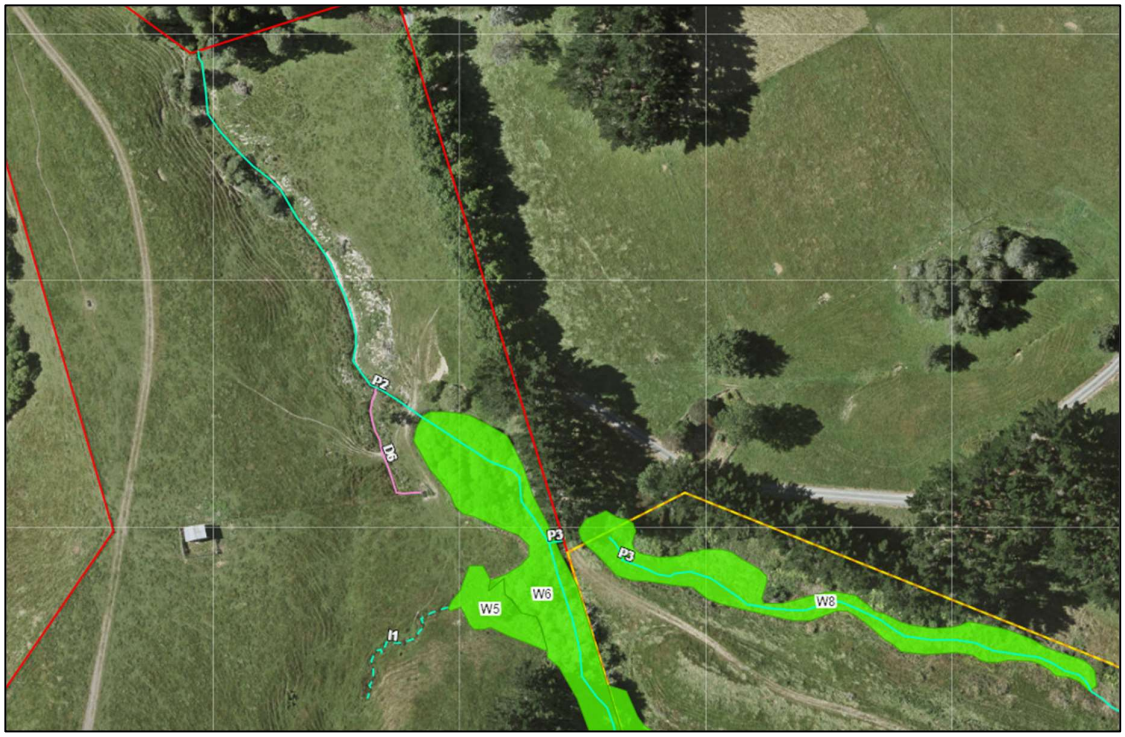


Figure 2b. Location of Streams P2 and P3 (turquoise lines) and I1 (dashed turquoise line) at the centre of the site. Wetlands are marked in green. Drains are marked with a pink line.

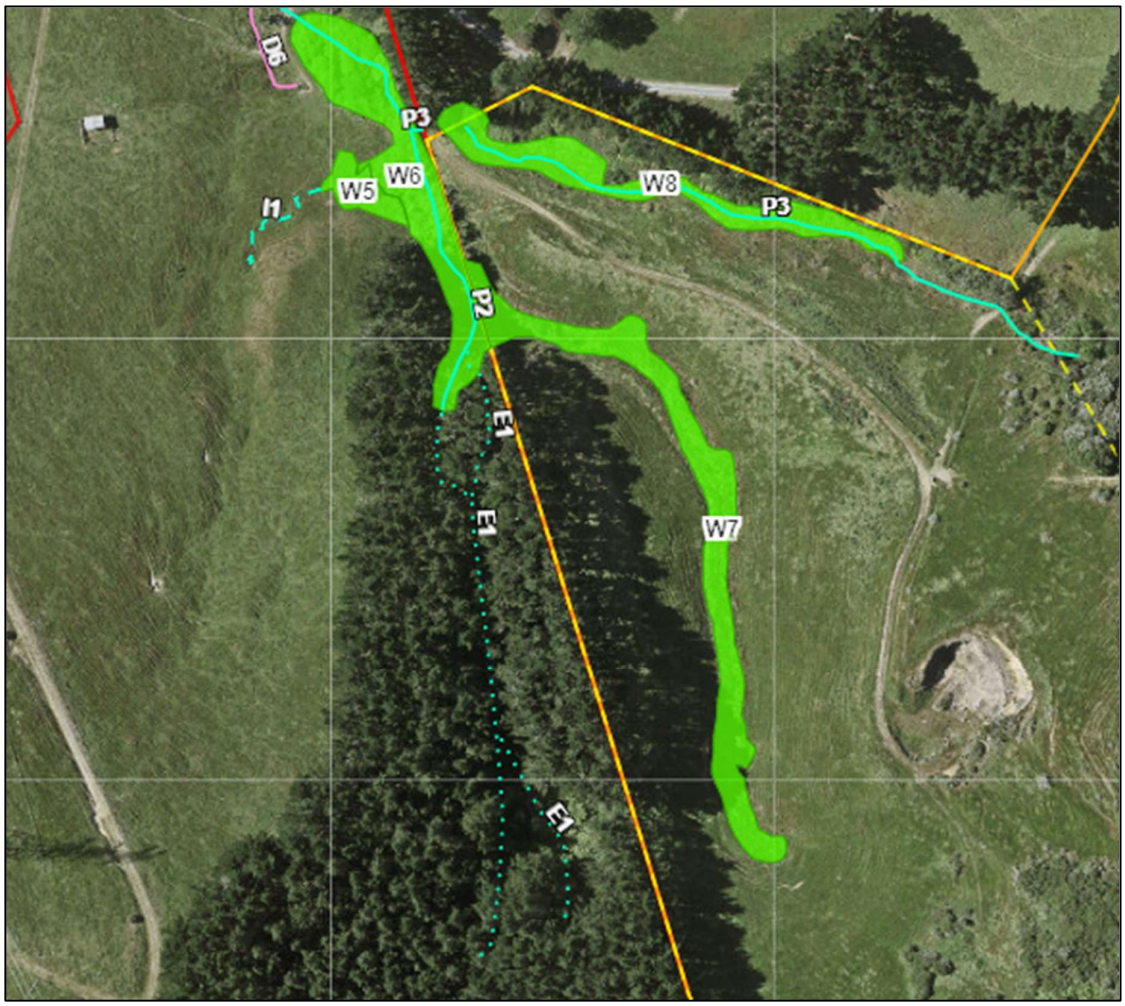


Figure 2c. Location of Streams P2 and P3 (turquoise lines) and Stream I1 (dashed turquoise line) at the southern end of the site. Ephemeral Stream E1 (braided) is shown in dotted turquoise lines. Wetlands are marked in green. Drains are marked with a pink line.

Plate 2: Permanent Stream P1 – flows east to west across the northern end of the site.

Plate 3: Permanent Stream P2 – upstream end within fringe of remaining vegetation at the edge of the recently cleared pine plantation area. This patch of vegetation comprises a mix of native and exotic understorey including tree fern and Chinese privet, and wetland species ground cover including rushes and ferns.

Plate 4: Permanent Stream P2 – northern section flowing through Wetland 6 beneath a canopy of mature willow and ground cover of sedges, rushes, and ferns.

Plate 5. Permanent Stream P2 – central section flowing through pasture with scattered willow shrubs along the true left bank at the downstream end.

Plate 6. Permanent Stream P3 lies in a shallow gully and flows east to west, joining Stream P2.

Plate 7. Intermittent stream I1 – a short section of incised stream that flows through pasture and drains the western gully.

Plate 8. Ephemeral stream/ overland flow path E1 within the central gully. Pine slash has been removed out of the bottom of the gully but has yet to be cleared from surrounding slopes. Photo taken after recent rain.

The table below (**Table 2**) provides a summary of the characteristics and condition for the permanent and intermittent streams within the site. See footnotes for an explanation of the qualitative assessments.

A Stream Ecological Valuation (SEV) for Streams P1 and P2 was undertaken on site, following the methodology outline in Storey *et al.* (2001). This provides baseline data about stream characteristics including shading, suitable fish habitat and water quality, and gives a stream an overall score based on ecological functionality. The SEV score is used for developing a model for mitigation or offsets that may be required if a stream is to be adversely affected by a development. The current SEV scores for Streams P1 and P2 are listed below in **Table 2**. The full results of the SEV scoring can be seen in **Appendix B.**

An SEV was not undertaken for Stream P3 as it is not within the development footprint, and is not expected to be adversely affected by the development. In addition, this stream will not be available for any mitigation or offset enhancement proposals that may be required as a result of adverse effects elsewhere on the site.

A formal SEV was not undertaken on site for Stream I1 because it is so short in length. Instead, an SEV score has been estimated, based on the scores for the other streams on site, the characteristics noted for Stream I1, including average width and bed substrate, and the reach scale measures that were noted at the time of the site visit (see **Appendix B** for further details).

Table 2. Summary of characteristics and condition of permanent Streams P1, P2 and P3, and intermittent Stream I1

Stream	Type	Riparian diversity[1]	Channel shade[2]	In stream habitat[3]	Bed characteristics[4]	Overall condition[5]	SEV score
P1	Permanent	Poor	Very poor	Poor	Poor	Poor	0.338
P2	Permanent	Moderate	Good	Moderate	Moderate	Moderate	0.366
P3	Permanent	Poor	Moderate	Poor	Poor	Poor	-
I1	Intermittent	Poor	Moderate	Very poor	Poor	Poor	0.337

Notes:

1. Riparian diversity assessed as: no vegetation (very poor), pasture or grass or monoculture of low weeds (poor), several woody plant species either native or exotic (moderate), many woody plant species; mixed exotic/ native/ successional species (good); highly diverse range of native plant species forming a mature or maturing canopy with understorey and ground tiers (very good).
2. Channel shade assessed as: fully open; lack of canopy cover (very poor); <20 % water surface shaded (poor); 20 – 60 % water surface shaded; mostly open with shaded patches (moderate); 60 – 80 % water surface shaded; mostly shaded with some open patches (good); > 80 % water surface shaded; full canopy (very good).
3. In stream habitat assessed as: favourable habitats (woody debris, rooted aquatic vegetation, leaf packs, undercut banks, root mats, stable habitat) limited and coverage <10 % channel (very poor); favourable habitat diversity limited to 1-2 types; woody debris rare, coverage 10 – 30 % of channel (poor); moderate variety of habitat types (3-4 types) covering 30 – 50 % channel (moderate); most habitat types present, covering 50 – 75 % channel (good); all habitat types present covering >75 % of channel (very good).
4. Bed characteristics assessed as: Very high loading of un-natural silt and uniform hydrologic conditions (very poor); un-natural siltation with limited variety of hydrological conditions (poor); mostly natural bed substrates with moderate variety of hydrologic conditions (moderate); natural bed substrates with a good variety of pools, runs, riffles (good); natural bed substrates with the full range of hydrologic conditions present (deep and shallow pools, chutes, runs, riffles) (very good).
5. Overall condition assessed as a combination of the four key characteristics with scores all or predominately of 'poor' returning an overall poor condition or very poor, scores predominantly or mostly of 'moderate' returning an overall moderate condition, and scores all or predominately of 'good' returning an overall good condition.

3.3 Wetlands

During the site visits in February and May 2023, the Wetland Delineation Protocols[5] were applied to assess areas of potential wetlands on site.

Eight areas on site have been assessed as meeting the criteria of a "wetland" under the RMA 1991 and the definition of a "natural inland wetland" under the NPS-FM (**Table 3**). Wetlands W1, W2 and W3 are three small remnants of wetland at the northern end of the site. All three have been modified through drainage and grazing by stock. Wetland W4 is a small riparian wetland alongside Stream P2. Wetland W5 is a small area of wetland at the downstream end of Stream I1, that leads directly into Wetland W6. Wetland W6 is a larger area of wetland that has been fenced from stock and supports a diverse range of native wetland

[5] MfE, 2022

species, as well as a canopy of exotic willow. Wetlands W7 and W8 are both on the neighbouring property and are linear wetlands along gully bottoms; both are grazed and trampled by stock. Wetland W8 lies alongside Stream P3 which is a tributary of Stream P2.

All eight wetlands are in poor to moderate ecological condition, but will all provide moderate ecological functions, contributing towards the retention of storm water and water filtration for the wider catchment. The wetlands are likely to provide some limited foraging and roosting habitat for common native bird species such as pukeko and welcome swallow.

Table 3. Classification and area of the eight wetlands at Ararimu Road.

Label	Classification	Area (m^2)
W1	Natural inland wetland: NPS-FM	214
W2	Natural inland wetland: NPS-FM	46
W3	Natural inland wetland: NPS-FM	248
W4	Natural inland wetland: NPS-FM	135
W5	Natural inland wetland: NPS-FM	347
W6	Natural inland wetland: NPS-FM	2,261
W7	Natural inland wetland: NPS-FM	2,392
W8	Natural inland wetland: NPS-FM	1,510

3.3.1 Wetland W1

Wetland W1 is located at the northern end of the site, alongside Stream P1. It is part of a wider area of historic wetland that has been drained; a drainage ditch runs south into Stream P1 through the western part of W1.

Wetland W1 supports an assemblage of plant species that meets the Dominance Test, and therefore qualifies the area as a natural inland wetland under the NPS-FM 2022. A representative wetland vegetation plot (wetland plot WP1 – details in **Appendix C**) found that the dominant wetland species within W1 are the facultative wetland species soft rush (*Juncus effusus*) and creeping bent (*Agrostis stolonifera*). Wetland W1 also supports obligate wetland species blue sweetgrass (*Glyceria declinata*), gypsywort (*Lycopus europaeus*) and sharp-fruited rush (*Juncus acuminatus*) (**Plate 9**).

The overall ecological condition of the wetland is poor as it supports only exotic species, is drained, and has been grazed by stock in the recent past.

The wetland extent was delineated primarily on the basis of dominant wetland plant species. The southern extent of the wetland is demarcated by the steep bank of Stream P1. Vegetation surrounding the rest of the wetland boundary is characterised by pasture species and dryland grass species.

3.3.2 Wetland W2

Wetland W2 is located at the northern end of the site, close to Wetland W1. It is part of the same remnant of historic wetland as Wetland W1.

Wetland W2 supports a similar assemblage of plant species as Wetland W1. A representative wetland vegetation plot (wetland plot WP2) found that the dominant wetland species are soft rush and creeping bent, which means the wetland passes the Dominance Test and it qualifies as a natural inland wetland under the NPS-FM (**Plate 10**).

The overall ecological condition of the wetland is poor as it supports only exotic plant species, is drained, and has been grazed by stock in the recent past.

The wetland extent was delineated on the basis of dominant wetland plant species. Vegetation surrounding the rest of the wetland boundary is characterised by a dominance of pasture species and dryland grass species.

3.3.3 Wetland W3

Wetland W3 is located at the northern end of the site. It is part of the same remnant of historic wetland as Wetlands W1 and W2. Wetland W3 has a drainage ditch running along its length, east to west, draining into Stream P1.

A representative wetland vegetation plot (wetland plot WP3) found that Wetland W3 supports an assemblage of plant species that pass the Dominance Test and therefore qualify the area as a natural inland wetland under the NPS-FM. Wetland W3 supports facultative wetland species creeping bent and soft rush, and facultative species Yorkshire Fog (*Holcus lanatus*). The wetland also supports a small proportion of the obligate wetland species sharp-fruited rush and blue sweetgrass (**Plate 11**).

The overall ecological condition of the wetland is poor as it supports only exotic plant species, is partially drained, and has been grazed by stock in the recent past.

3.3.4 Wetland W4

Wetland W4 is a linear patch of wetland located along the northern section of Stream P2 (**Plate 12**). Wetland W4 exhibits an assemblage of plant species that meet the Rapid Test and therefore qualify the area as a natural inland wetland under the NPS-FM. Obligate wetland species reed sweetgrass (*Glyceria maxima*), and facultative wetland species soft rush, jointed rush (*Juncus articulatus*), fan-flowered rush (*Juncus sarophorus*) and water pepper (*Persicaria hydropiper*) are the dominant species.

The ecological condition of the wetland is moderate as it supports a mix of exotic and native species and has not been trampled and grazed to the extent that Wetlands W1, W2 and W3 have been.

3.3.5 Wetland W5

This small area of wetland is located at the downstream end of intermittent Stream I1 and is immediately adjacent to Wetland W6 (**Plate 13**). It has been described as a separate wetland to W6 as it supports a different suite of species, but both wetlands are part of the same wetland system.

Wetland W5 supports an assemblage of plants that meet the Rapid Test and therefore qualify the area as a natural inland wetland under the NPS-FM. Obligate wetland species blue sweetgrass, and facultative wetland species soft rush, spearwort, and Mercer grass (*Paspalum distichum*) are the dominant species.

The ecological condition of the wetland is poor as it supports only exotic species and has been subject to trampling and grazing by stock in the recent past.

3.3.6 Wetland W6

Wetland W6 is located at the eastern boundary of the site along Stream P2 (**Plate 14**). It extends into the neighbouring property, merging with Wetland P7. Wetland P7 has different characteristics and is therefore described as a separate wetland (**Section 3.3.7**).

Wetland W6 supports an assemblage of plants that meet the Rapid Test and therefore qualify the area as a natural inland wetland under the NPS-FM. Much of W6 has a canopy and/ or sub-canopy of willow (*Salix* sp.), a facultative wetland species, and a ground layer of obligate wetland species including purei (*Carex secta*) and sharp spike sedge (*Eleocharis acuta*), and facultative wetland species including swamp kiokio (*Blenchnum minus*). Where Wetland W6 extends into the pine plantation, there is a gap in the pine canopy and the same suite of wetland species is present as in the rest of the wetland.

The ecological condition of the wetland is moderate as it has been fenced from grazing stock and supports a mix of native and exotic species.

3.3.7 Wetland W7

Wetland W7 is a linear wetland situated in the bottom of a gully on the leased land on the neighbouring property, to the east of the central gully (**Plates 15 and 16**). It supports an assemblage of plants that meet the Rapid Test and therefore qualify the area as a natural inland wetland under the NPS-FM. Dominant species include obligate wetland species blue sweetgrass, and raupō (*Typha orientalis*) and facultative wetland species soft rush, fan-flowered rush, and spearwort.

The ecological condition of the wetland is poor as it is trampled and grazed by stock, and supports mostly exotic species of rush and grass. There have been recent influxes of sediment into the wetland, which are likely to be the result of trampling of surrounding slopes by livestock, exacerbated by the multiple storm events in the Auckland region in 2023. Increased erosion of the upstream historic quarry during storm events may also have contributed towards sediment inputs.

3.3.8 Wetland W8

Wetland W8 is a linear wetland along-side permanent Stream P3 on the neighbouring property (**Plate 17**). It supports an assemblage of plants that meet the Rapid Test and therefore qualify the area as a natural inland wetland. Dominant species include facultative wetland species soft rush, jointed rush, giant rush (*Juncus pallidus*), giant umbrella sedge (*Cyperus ustulatus*) and spearwort, with clumps of the obligate wetland species purei.

The ecological condition of the wetland is moderate as it supports a mix of native and exotic species, but it is also subject to trampling and grazing by stock where access is possible. The wetland is not fenced but is protected to some degree from stock by the steep side of the gully.

Plate 9. Wetland W1 comprising a mix of facultative and obligate wetland species.

Plate 10. Wetland W2 supports facultative wetland species soft rush, creeping bent and spearwort.

Plate 11. Wetland W3 showing the line of the drainage ditch and uneven ground caused by historic ditch works and grazing activity.

Plate 12: Wetland W4 alongside Stream P2 supporting obligate wetland species reed sweetgrass and a range of facultative wetland species including soft rush and water pepper.

Plate 13: Wetland W5 – obligate wetland species blue sweetgrass, and facultative wetland species Mercer grass and spearwort are the dominant plants.

Plate 14: Wetland W6 supports a canopy and sub-canopy of willow species, and ground cover of purei, and swamp kiokio.

Plate 15: Wetland W7 – the downstream end supports a stand of raupō as well as soft rush and fan-flowered rush. This wetland is accessible to stock throughout and shows signs of trampling and grazing damage as well damage from large inputs of sediment.

Plate 16: Wetland W7 – the upper and middle reaches support a mix of *Juncus* rushes, blue sweetgrass and spearwort.

Plate 17: Wetland W8 – view downstream to the west and the confluence with Stream P2.

3.4 Terrestrial ecology

3.4.1 Vegetation

The majority of the site comprises grazed pasture grasses, that have been grazed up until recently (and we understand will continue to be grazed over spring and summer as part of ongoing livestock use of the site).

The central gully supported a stand of planted pine trees up until clearance under an authorised felling permit in March-April 2024. This area is now clear of vegetation, apart from a line of pine trees along the western edge of the gully that has been retained to create a visual screen for neighbouring properties. Once the remaining pine slash has been cleared from the gully slopes, the area will be seeded with pasture species to maintain slope stability and control erosion.

There is an area of regenerating native bush and wetland at the south western edge of the site, that lies in the head of another gully that runs downstream into the neighbouring property to the west. This area was not formally surveyed during the site visit as it lies outside of the area proposed for the managed fill operations.

No ‘At Risk’ or ‘Threatened’ terrestrial plant species are expected to be present on the site.

No ‘At Risk’ or ‘Threatened’ fauna species are expected to be present within any of the terrestrial vegetation on the site.

3.4.1 Avifauna

Six species of birds were recorded during the site visits, including five native species, none of which are listed as 'At Risk' or 'Threatened'. A list of bird species observed is provided in **Table 5** below.

The area of native bush at the south western edge of the site was not surveyed for birds, but is likely to support a similar suite of species as noted for the rest of the site.

The area of regenerating native bush at the south western edge of the site provides habitat for common native and exotic bird species, and the areas of wetland provide foraging and possibly nesting habitat for pukeko. Welcome swallows were observed to be feeding in the air above the site; the areas of wetland will provide suitable habitat for the flying insects which the welcome swallow predates.

There are no species of birds listed as 'At Risk' or 'Threatened' that are expected to utilise the site.

Table 5: Birds recorded at the site during the site surveys on 22 February 2023 and 30 May 2023

Scientific name	Common name	Threat Status (Robertson *et al.* 2016)
Gerygone igata	Grey warbler	Endemic – Not Threatened
Rhipidura fuliginosa	Fantail	Endemic – Not Threatened
Circus approximans	Australasian harrier	Native – Not Threatened
Porphyrio melanotus	Pukeko	Native – Not Threatened
Hirundo neoxena	Welcome swallow	Native – Not Threatened
Anas platyrhynchos	Mallard duck	Exotic – Introduced and naturalised

3.4.2 Lizards

The national Herpetofauna (lizard, frog and tuatara) database managed by the Department of Conservation confirms records of copper skink (*Oligosoma aeneum*: At Risk – Declining) from approximately 11 km to the north-west of the site, and records of elegant gecko (*Naultinus elegans*: At Risk - Declining) from approximately 12 km to the north west of the site.

The area of regenerating bush at the south west edge of the site supports habitat that may be used by lizards such as copper skink and elegant gecko. The rest of the site does not support habitat suitable for lizards other than for the exotic species, the rainbow or plague skink (*Lampropholis delicata*).

No lizards, or sign of lizards e.g. scat or slough, were seen during the site surveys. The area of regenerating native bush was not formally surveyed for lizards as it is outside of the footprint of the proposed managed fill activity. Any lizards that may be present in the area of native bush are very unlikely to use the rest of the site due to the lack of suitable habitat.

The lack of lizard records close to the site along with the absence of suitable habitat indicate that it is very unlikely that native lizards are present within the footprint of the managed fill development.

3.4.3 Long-tailed bats

Long-tailed bats/ pekapeka (*Chalinolobus tuberculatus*), are currently classified 'Threatened – Nationally Critical' (O'Donnell *et al.*, 2022).

Long-tailed bats require large trees (including standing dead trees) with cavities (e.g. deep knot holes), epiphytes, or loose bark for roosting. They typically use linear landscape features such as bush edges, gullies, water courses, and roadways to transit between roosting and feeding sites (Borkin and Parsons, 2009).

The closest record of long-tailed bats is approximately 2.5 km to the south west of the site, recorded adjacent to a small pine plantation. There are also records of bats from 4.5 km to the east, 5 km to the north west, and 5.5 km to the south east.

Potential habitat for roosting bats is limited to the area of native bush in the gully at the south western edge of the site, which may support trees large enough to provide bat habitat. This area was not surveyed during the site visits as it is beyond the extent of the proposed development footprint.

The wetlands on site will provide habitat for flying insects which in turn provide a food source for bats, and the linear features on site e.g. streams, gullies, and forest edges may provide routes along which bats transit between roosting and feeding sites.

A bat survey has not been undertaken on this site however, given the proximity of long-tailed bat records to the site and potential habitat on site, it is possible that bats use the site for feeding and/ or transiting across between roosting sites. There is no habitat within the development footprint that is suitable as roosting habitat for bats.

4.0 Summary of ecological values

- There are three permanent streams, one intermittent stream, and an overland flow path (ephemeral stream) on site, which range from poor to moderate condition.

- Records from the national fish database indicate that shortfin eel are the one native species that is likely to inhabit the streams.

- Eight areas of wetland have been identified on site, which support a mix of native and exotic wetland plant species. The wetlands are of poor to moderate ecological quality, depending on the proportion of exotic plant species present and the degree to which livestock have access.

- All plant species found on the site are 'Not Threatened' or are exotic. No 'At Risk' or 'Threatened' plant species are expected to be present.

- The site supports common native and exotic bird species, in low abundance. No 'At Risk' or 'Threatened' bird species are expected to be present.

- Native lizards are unlikely to be present within the development footprint due to the lack of suitable habitat. The area of native bush at the far south western end of the site may provide habitat for native lizards, but it is not within the development footprint. Records from the national database indicate that the closest records of native lizards are some distance from the site.

- The site may provide foraging habitat and transit routes for long-tailed bat, as suggested by the proximity to the site of a number of long-tailed bat records. There is no suitable habitat for bat roosting within the proposed development footprint.

- There are no scheduled Significant Ecological Areas on the site.

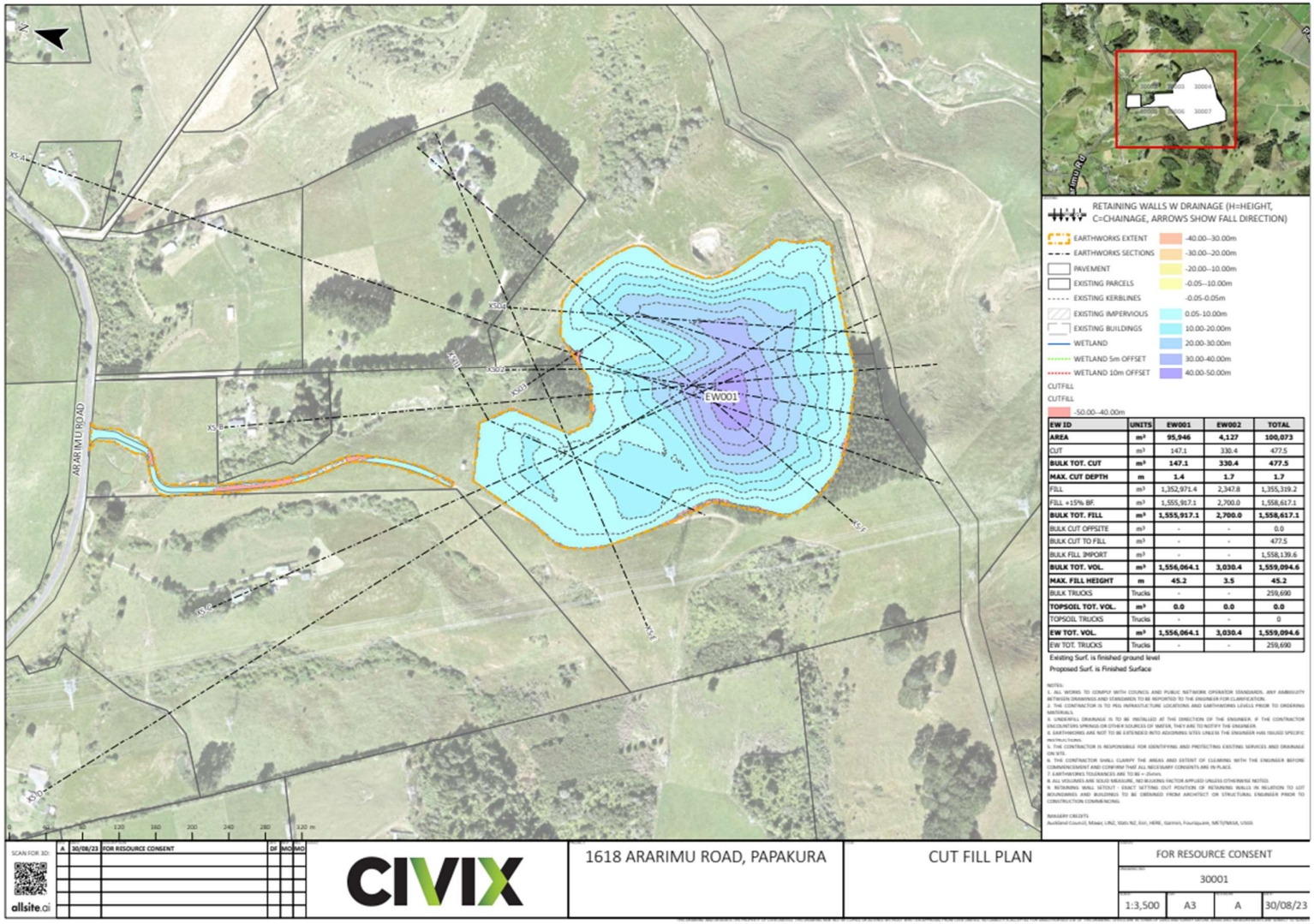
5.0 Development proposal

A managed fill facility is proposed for the site, which will result in the filling of the main gully at the southern end of the site, the central gully and the gully to the west of the former pine plantation on the neighbouring property. See **Figure 3** for the cut-fill plan and earthworks extent.

The existing access track through the site will be maintained with alterations to the northern section and the point at which the track enters the site. The existing entry point in the north western corner of the site is proposed to be removed, and a new entry created at the centre of the site's road frontage. A new track will be constructed to run south before turning west to join the existing track at the site's western boundary (**Figure 4**).

As part of the alterations to the access track, the existing culvert in the north west corner of the site will be removed, and a new culvert created to carry the track in its new location over Stream P1. A new culvert will also be installed to replace the existing pipe, at the point the access track crosses Stream P2 (**Figure 5**).

The managed fill facility will be in operation during daylight hours only, and no artificial lighting will be used outside of daylight hours.



EW ID	UNITS	EW001	EW002	TOTAL
AREA	m²	95,946	4,127	100,073
CUT	m³	147.1	330.4	477.5
BULK TOT. CUT	m³	147.1	330.4	477.5
MAX. CUT DEPTH	m	1.4	1.7	1.7
FILL	m³	1,352,971.4	2,347.8	1,355,319.2
FILL +15% BF.	m³	1,555,917.1	2,700.0	1,558,617.1
BULK TOT. FILL	m³	1,555,917.1	2,700.0	1,558,617.1
BULK CUT OFFSITE	m³	-	-	0.0
BULK CUT TO FILL	m³	-	-	477.5
BULK FILL IMPORT	m³	-	-	1,558,139.6
BULK TOT. VOL.	m³	1,556,064.1	3,030.4	1,559,094.6
MAX. FILL HEIGHT	m	45.2	3.5	45.2
BULK TRUCKS	Trucks	-	-	259,690
TOPSOIL TOT. VOL.	m³	0.0	0.0	0.0
TOPSOIL TRUCKS	Trucks	-	-	0
EW TOT. VOL.	m³	1,556,064.1	3,030.4	1,559,094.6
EW TOT. TRUCKS	Trucks	-	-	259,690

Figure 3. Development footprint showing the total extent of earthworks for the managed fill area and the access track (turquoise/ blue shaded polygon). The existing access track through the site will be maintained, with some maintenance and modification required for the operation of the managed fill.

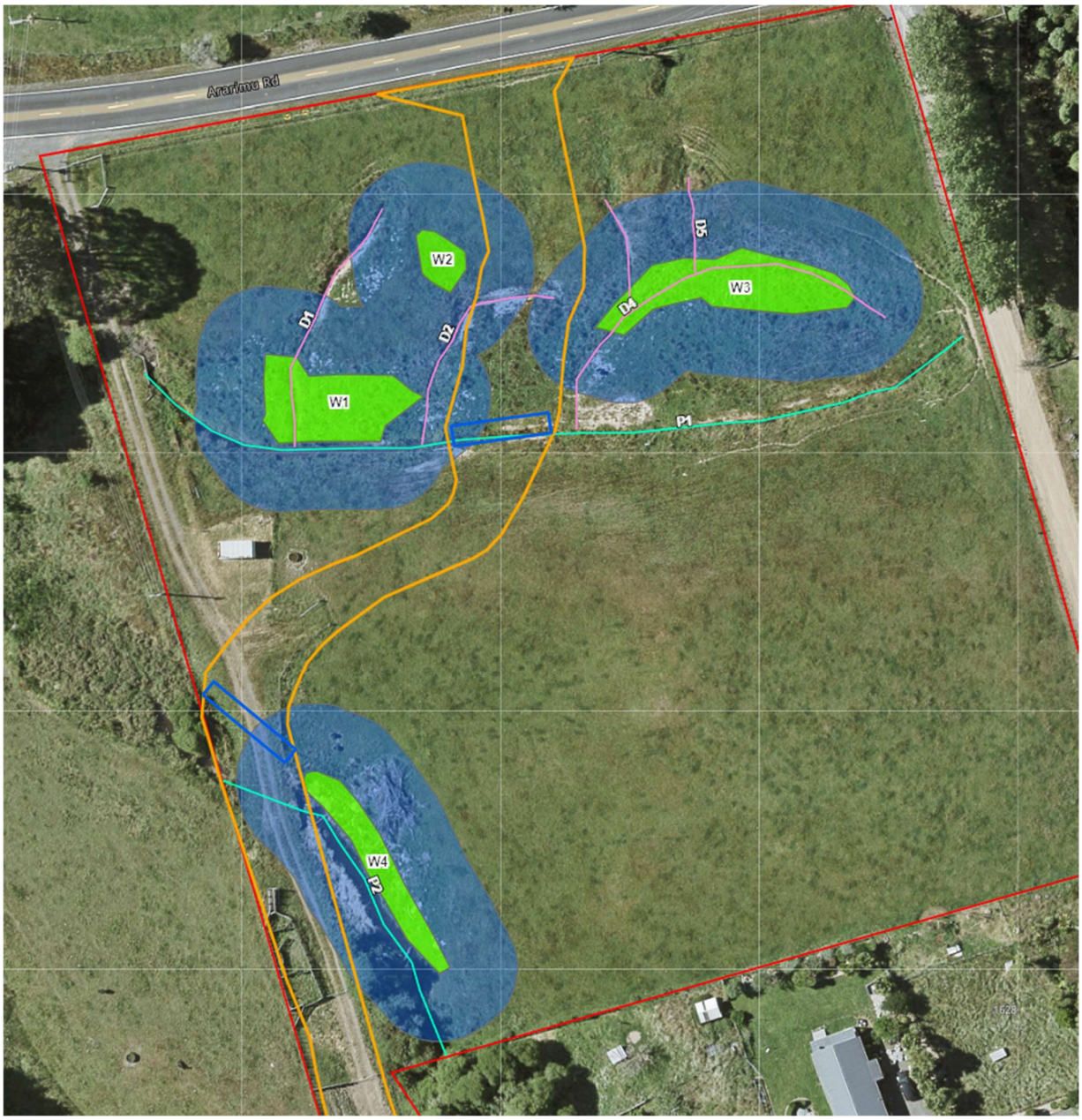


Figure 4. Plan of the altered route of the access track, showing the existing track (aerial photograph basemap) and the proposed route of the new track with a new entry point from Ararimu Road (orange line – earthworks extent for the new track). The new route will require vehicle crossings over Stream P1 and Stream P2 – proposed new culvert positions are shown with dark blue lines. Wetlands – shaded in green, with a 10 m set back shaded in blue. Streams – turquoise line; drains – pink line.

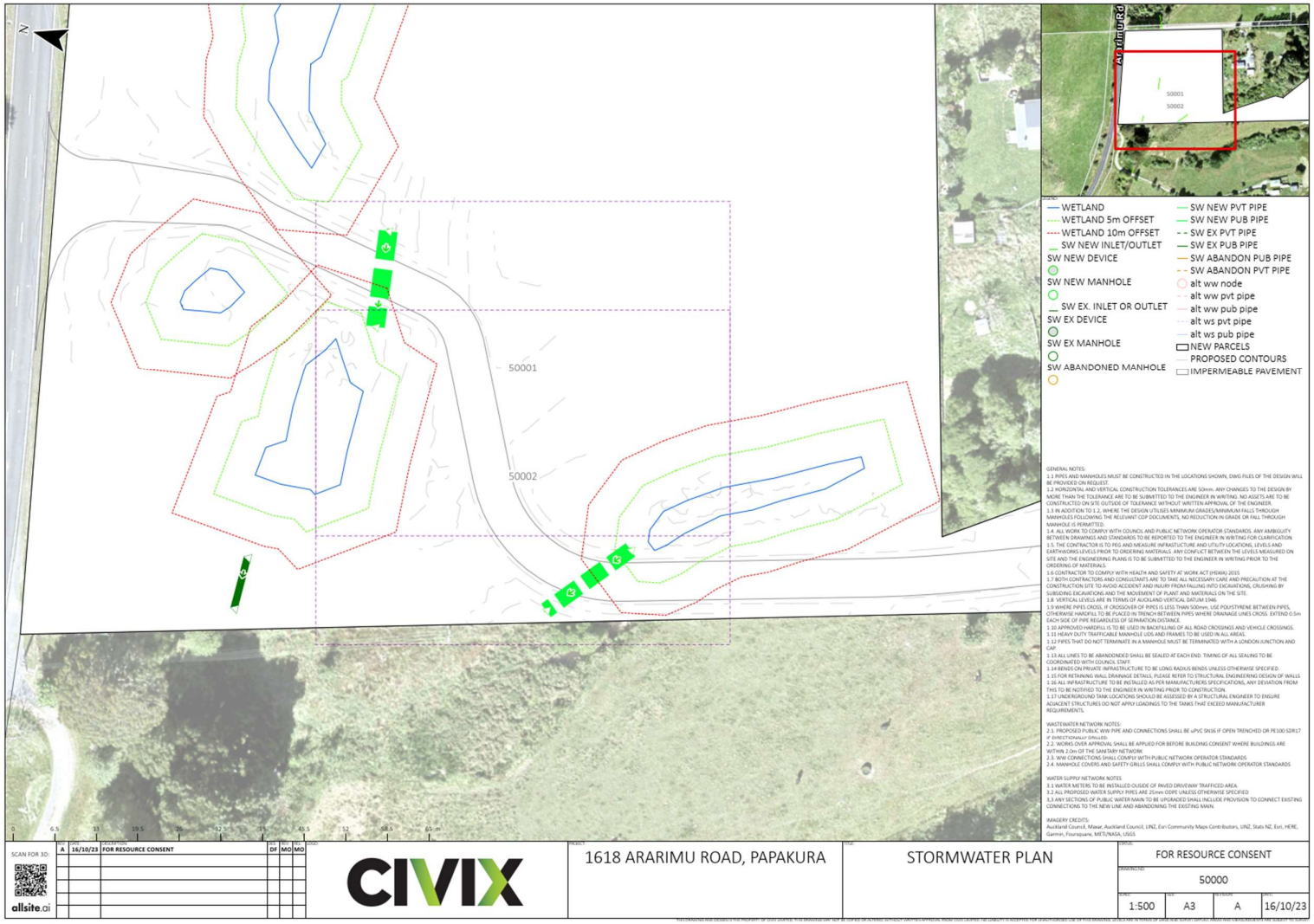


Figure 5. Location of two new culverts required for the realigned access track, crossing Stream P1 and Stream P2. Culverts are marked as green dotted lines. Wetlands are outlined with a blue line, with a 5 m buffer marked with a green line and a 10 m buffer marked with a red line. Culvert installation will require works within 10 m of a wetland, but are not within wetlands themselves.

6.0 Auckland Unitary Plan – Vegetation Management and Biodiversity

Chapter E15 of the Auckland Unitary Plan (AUP) sets out policies and rules regarding the management of terrestrial vegetation and biodiversity values outside of scheduled ecological areas. **Table 6** below provides comment regarding the relevant rules pertaining to vegetation alteration or removal within 10 m of rural streams and within 20 m of a natural wetland.

Table 6: Comment regarding the relevant rules in Chapter E15 of the AUP.

Rule number	Rule	Activity status	Comment
All zones outside the RUB			
E15.4.1 (A10)	Vegetation alteration or removal, including cumulative removal on a site over a 10-year period, of greater than 250 m² of indigenous vegetation that: (a) Is contiguous vegetation on a site or sites existing on 20 September 2013; and (b) Is outside the rural urban boundary	Restricted Discretionary	Vegetation is proposed to be removed to allow for earthworks and development for the re-location and upgrade to the access track, and for the area proposed for managed fill. Vegetation that will be removed: Pine trees (not indigenous) within the managed fill area. Already cleared (March-April 2024) under authority of a harvesting permit. Mixed exotic-native scrub (partially indigenous) comprising *Berberis glaucocarpa*, *Ulex europeaus, Sphaeropteris medullaris*, *Kunzea ericoides*, *Leptospermum scoparium*. 1,996 m^2 to be cleared – approximately half the area of an isolated patch of scrub in the south west corner of the proposed managed fill area (**Figure 6a** below). The area to be cleared is primarily comprised of exotic *B. glaucocarpa* and *U. europeaus*. Exotic scrub (not indigenous) comprising patches of *B. glaucocarpa* amongst pasture grasses – 401 m^2 in total.

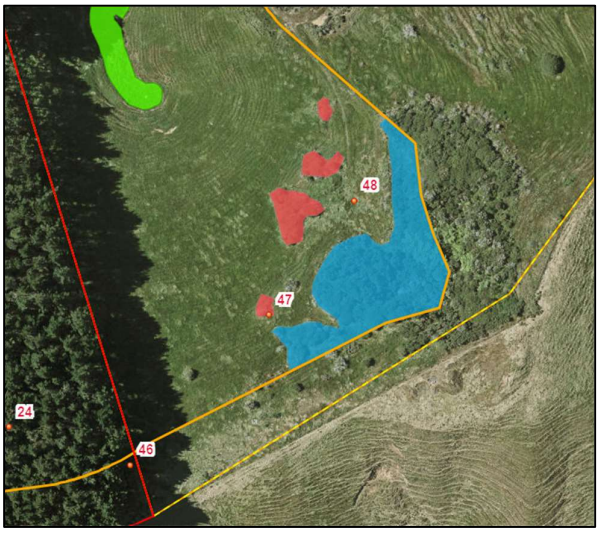


Figure 6a: Approximately 1,996 m^2 of mixed exotic native scrub is proposed for clearance (blue polygon). The scrub forms an isolated patch at the head of a shallow gully amongst surrounding pasture. Small patches (401 m^2 in total) of *Berberis glaucocarpa* will also be cleared (red polygons). Photo points are numbered and marked by a red dot. The proposed managed fill boundary is marked with an orange line and the site boundary with a red line (main site) and an orange-yellow dashed line (additional site). The green polygon marks the southern end of Wetland W7.

Rule number	Rule	Activity status	Comment
Riparian areas (as described below)			
E15.4.1 (A17)	Vegetation alteration or removal within 10 m of rural streams in the Rural – Rural Production Zone and Rural – Mixed Rural Zone	Restricted Discretionary	Vegetation will be removed within 10 m of Stream P1 (**Figures 6b and 6c**) for the development of the new access track, construction of a culvert, and for the excavation of material for wetland re-creation – approximately 930 m^2 of exotic pasture species. Vegetation will be removed within 10 m of the downstream section of Stream P2 for the earthworks required for development of the new access track and construction of a culvert – approximately 60 m^2 of exotic pasture species. Vegetation will be removed within 10 m of the central section of Stream P2 during the excavation required for wetland re-creation – approximately 2,300 m^2 of exotic pasture and other herbaceous species, a small number of the common native rush *Juncus sarophorus*, and 4-5 exotic willow trees (*Salix* sp.). Vegetation will be removed within 10 m of Stream I1 within the managed fill footprint – approximately 800 m^2 of exotic pasture species. The vegetation proposed for clearance is predominantly exotic and of very low ecological value. The areas that are to be cleared are all to be re-planted with native riparian/ wetland species, to a minimum width of 10 m on both banks of the streams, under the mitigation and offsetting proposals.

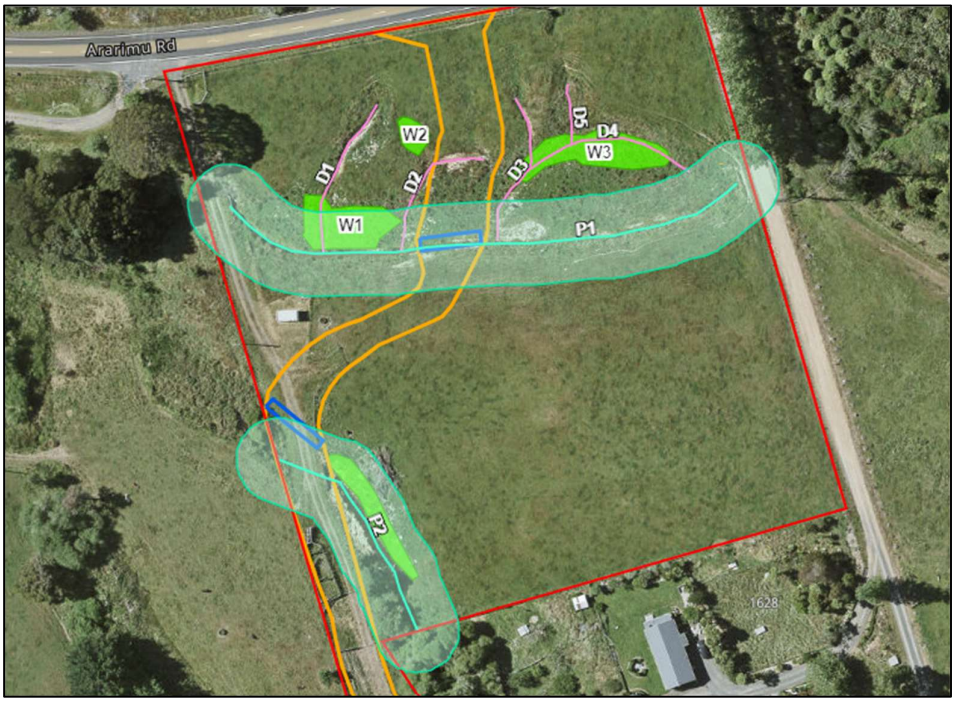
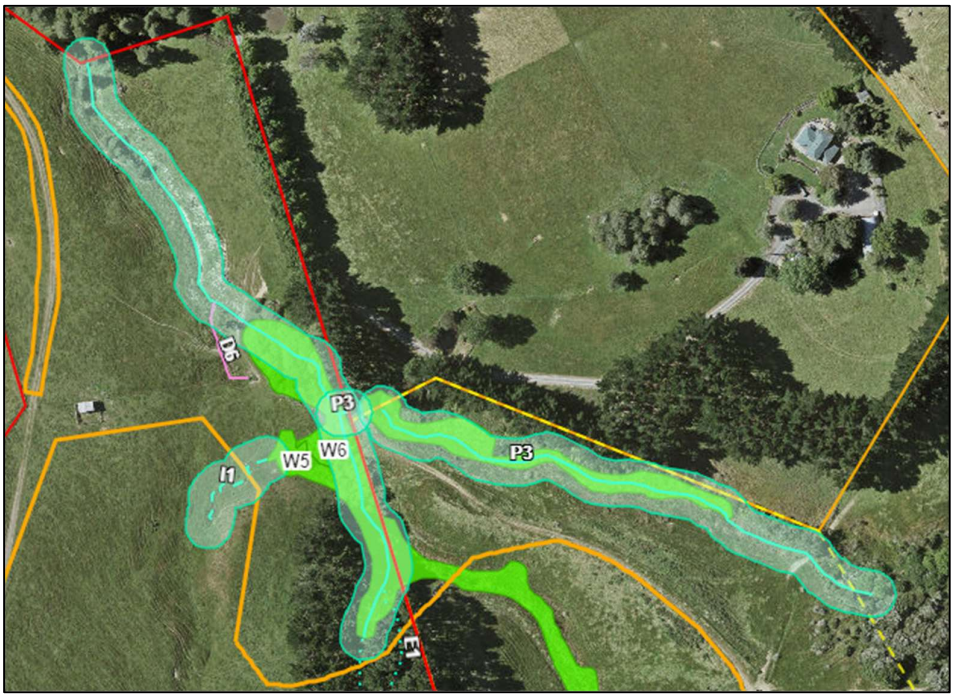


Figure 6b: 10 m setbacks from Streams P1 and P2 at the northern end of the site (turquoise polygons). Streams are shown with a turquoise line, wetlands with a green polygon, drains with pink lines. The extent of earthworks for the new access track is shown with an orange line, and the extent of the culverts with blue lines.

Rule number	Rule	Activity status	Comment
			
			Figure 6c: 10 m setbacks from the southern section of Stream P2, Stream P3 on the neighbouring property, and Stream I1.
E15.4.1 (A18)	Vegetation alteration or removal within 20 m of a natural wetland, in the bed of a river or stream (permanent or intermittent), or lake	Restricted Discretionary	Vegetation will be removed within 20 m of natural inland wetlands (**Figures 6d and 6e**). Vegetation will be removed for the development of the new access track – approximately 680 m^2 of exotic pasture species within 20 m of Wetlands W1, W2, and W3 (this figure does not include the area overlapping with the 10 m setback from Stream P1, which is accounted for above), and approximately 130 m^2 of exotic pasture species within 20 m of Wetland W4. Vegetation will be removed for wetland re-creation around Stream P2 – approximately 550 m^2 of exotic pasture species within 20 m of Wetland W6. Vegetation will be removed within the footprint of the managed fill – approximately 215 m^2 of exotic pasture species within 20 m of Wetland W5, and approximately 9,150 m^2 of exotic pasture species within 20 m of Wetland W7. Approximately 400 m^2 of pine plantation was removed under permit within 20 m of Wetland W6 in March-April 2024. The vegetation proposed for removal has very low ecological value. Extensive native planting is proposed within 10 m setbacks of streams and wetlands on the site, as part of mitigation and offset proposals. There is little or no vegetation growing on the beds of Stream P1 or P2. Example photographs are shown in **Plates 6a and 6b** below. Earthworks required to re-create wetland will not involve changes to the stream beds or removal of vegetation.

Rule number	Rule	Activity status	Comment

Plate 6a: Central section of Stream P2 showing minimal vegetation growing on the bed of the stream.

Plate 6b: Stream P1 with minimal vegetation growing on the stream bed.

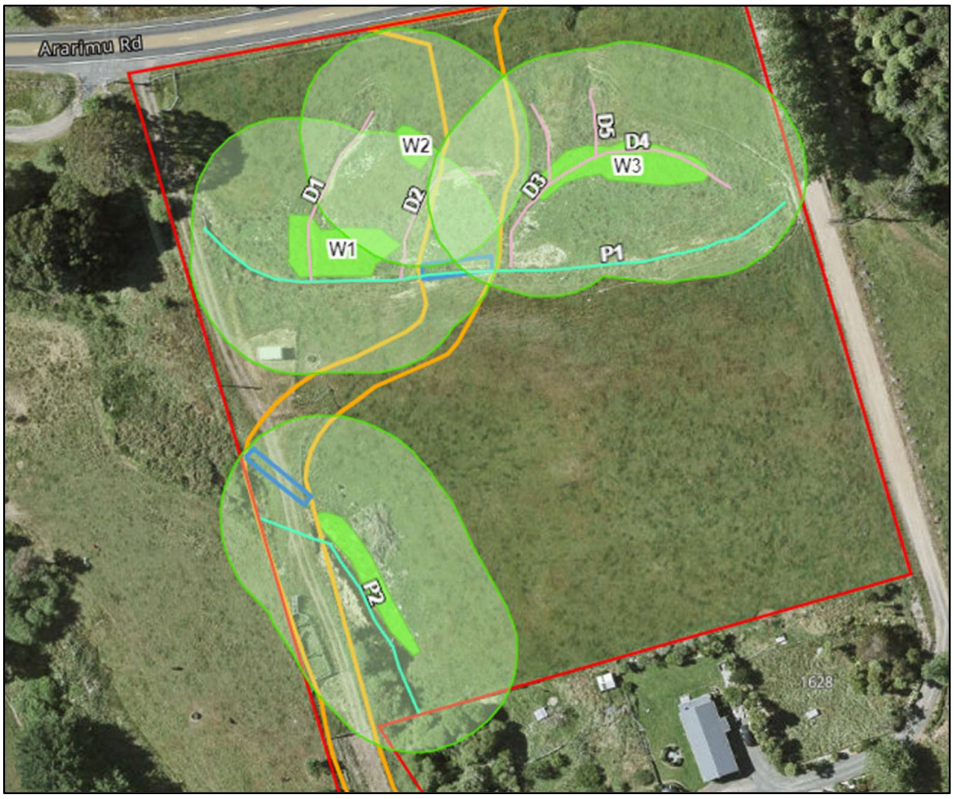


Figure 6d: 20 m setbacks from Wetlands W1, W2, W3, and W4 (light green polygons). Wetlands are shown in green polygons, streams with turquoise lines, drains with pink lines, and the outline of the earthworks extent for the new access track is marked with an orange line. The dark blue lines mark the location of proposed culverts.

Rule number	Rule	Activity status	Comment

Figure 6e: 20 m setbacks (light green polygons) from Wetlands W5 and W6, also W7 (to be mostly removed), and W8 (on the neighbouring property). Wetlands are shown in green polygons, streams with turquoise lines (permanent streams with a solid line, intermittent streams with a dashed line, and ephemeral streams with a dotted line), drains with pink lines, and the outline of the managed fill extent is marked with an orange line.

7.0 Actual and potential adverse effects on ecology values

The actual and potential adverse effects on the ecology values on the site are described in **Table 7** below.

Figures 4 and 6 illustrate the development footprint in relation to the ecological values.

Table 7. Actual and potential adverse effects of the proposed development on ecology values.

Fill area		
Ecology value	**Development impact**	**Adverse effect**
Wetland W7	Removal of 2,108 m² of wetland	Actual effect: Loss of wetland value and extent
Wetland W7	Creation of temporary stormwater pond and decant outflow for Stage 1 of the managed fill	Actual effect: Temporary loss of wetland value and extent

Stream I1	Removal of 35 m of stream	Actual effect: Loss of stream value and extent
Stream I1	Creation of temporary stormwater pond and decant outflow for Stage 1 of the managed fill	Actual effect: Temporary loss of stream value and extent
Stream E1	Removal of ephemeral stream E1 – overland flow paths within the central gully	Actual effect: Loss of route for stormwater flow
Stream P2, Wetlands W5 and W6	Sediment discharge during earthworks and during operation of the managed fill	Potential effect: Loss of stream and wetland value
Access track realignment		
Ecology value	**Development impact**	**Adverse/ Positive effect**
Wetlands W1, W2 and W3	Earthworks within 10 m of the wetlands	Potential effect: Sediment discharge into the wetlands
Stream P1	Removal of existing culvert	Potential effect: Disturbance to fish and fish habitat & restoration of natural stream bed
Streams P1 and P2	Installation of new culverts (14.9 m and 24.4 m)	Potential effect: Disturbance to fish and fish habitat; loss of stream bed value; potential barrier to fish passage

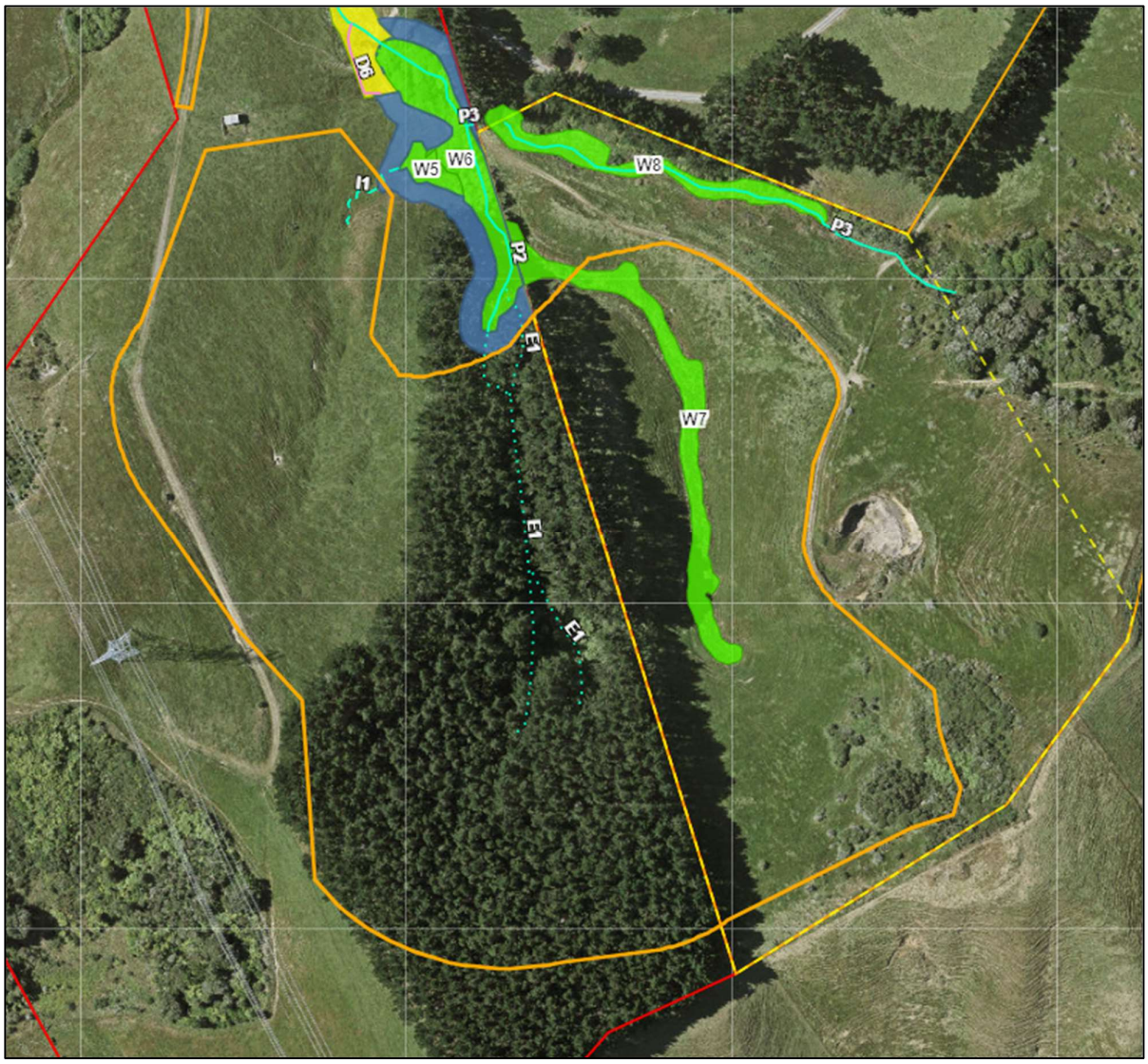


Figure 6. Southern end of the site showing the extent of the managed fill footprint (orange line) in relation to wetlands (green polygons), a 10 m wetland buffer (blue polygons), streams (solid turquoise line for permanent streams, dashed turquoise line for the intermittent stream and dotted turquoise line for overland flow paths), and drains (pink line). The yellow polygon represents the former wetland around Stream P2.

The potential adverse effects have been assessed for their level of significance, firstly, **prior** to the application of any mitigation proposals, and secondly, **after** the application of mitigation proposals, using the EIANZ effects matrix analysis. The values considered in the significance assessment are those that are indigenous in nature, or which provide habitat and resources to support indigenous species. **Table 8** below summarises the results of the EIANZ effects matrix analysis.

In relation to the **Table 8** scoring:

- The wetlands have been scored as having a moderate value as natural wetlands are an ecosystem that has been greatly reduced regionally (and nationally). All of these wetlands, apart from Wetland W6, support mostly exotic species and have been highly impacted by livestock in the recent past, or are still being impacted by livestock.

- Wetland W6 has been scored as having moderate value as it supports a range of native wetland species as well as exotic, has a diversity of vegetation tiers and has been fenced from livestock.

- Stream I1 has been scored as having moderate ecological value as although it is a short length of intermittent stream that is very incised, grazed, and supports little in the way of fish habitat, the stream supports a natural bed and retains functionality.

Table 8. Assessment of significance of ecological effects using the EIANZ matrix method[6], **prior** to the application of mitigation actions, **and after** mitigation is applied.

[a] *EIANZ matrix tables 5 and 6.*

[b] *EIANZ matrix table 8; measured in the context of the catchment (streams) or District (terrestrial values).*

[c] *EIANZ matrix table 10.*

Factor	Value of resource[a]	Magnitude of effect[b]	Level of effect[c] (without mitigation)	Mitigation that will be applied	Level of effect[c] (after mitigation)
Stream P1 – culvert installation	Low	Moderate (24.4 m bed disturbance)	Low	Ensure fish passage Fish salvage ESC controls	Low (loss of natural bed)
Stream P2 – culvert installation	Low	Low (14.9 m bed disturbance)	Very low	Ensure fish passage Fish salvage ESC controls	Very low (loss of natural bed)
Stream P1 and P2 existing culvert removals (2 sites)	Low	Positive	Net Benefit	Fish salvage ESC controls	Net Gain
Stream P2 – sedimentation	Low	Moderate	Low	ESC controls	Nil
Stream I1	Moderate	High (loss of 35 m of stream)	Moderate	Fish salvage (if any)	Moderate (loss of stream extent and values)
Stream I1	Moderate	Moderate	Moderate	Fish salvage (if any) Restoration of stream channel ESC controls	Net Gain (restoration of channel and riparian planting)
Stream E1	Negligible	High (loss to managed fill)	Very low	Nil	Very low (loss of flow path)

[6] As contained within the EIANZ EciA guidelines: 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

Factor	Value of resource[a]	Magnitude of effect[b]	Level of effect[c] (without mitigation)	Mitigation that will be applied	Level of effect[c] (after mitigation)
Wetland W1	Moderate	Low (works within 10 m of wetland)	Low	ESC controls	Nil
Wetland W2	Moderate	Low (works within 10 m of wetland)	Low	ESC controls	Nil
Wetland W3	Moderate	Low (works within 10 m of wetland)	Low	ESC controls	Nil
Wetland W4	Moderate	Nil	Nil	Nil	Nil
Wetland W5	Moderate	Low	Low	ESC controls	Nil
Wetland W6	Moderate	Low	Low	ESC controls Maintain up-catchment hydrology	Nil
Wetland W7 – loss to managed fill	Moderate	Very high	High	Fish salvage ESC controls	High (loss of wetland extent and values)
Wetland W7 – temporary sediment control pond	Moderate	High	High	Fish salvage Restoration of wetland ESC controls	Nil
Wetland W8	Moderate	Nil	Nil	Nil	Nil

The assessment of effects indicates that there will be a range of actual and potential effects of the development, and that the level of effects without mitigation ranges from very low to high.

As some of the actual and potential effects are more than minor, action should be taken to reduce the level of impact. The effects management hierarchy has been applied and a number of actions proposed to reduce the level of ecological impact. These are addressed in **Section 8.0**.

8.0 Management of adverse effects

The actual and potential effects as described in **Table 7** will be managed according to the effects management hierarchy of avoid, remedy, mitigate, offset, and compensation.

The actions that will be applied in terms of mitigation are shown in **Table 8**, with residual level of effect after avoid, remedy, and mitigate have been applied.

The sub-sections below describe the mitigations that will be applied, and where the residual effects after mitigation are more than minor, the location and type of ecological enhancements that will be applied in the form of biodiversity offsets or compensation.

8.1 Culverts

Stream P1 will be disturbed at two locations for the removal of one culvert (downstream end) and the installation of a new culvert (central section; 14.9 m long at 2.54 % gradient).

Stream P2 will be disturbed in one location for the removal of the existing culvert and the installation of a new culvert (24.4 m long at 1.23 % gradient). **Figure 4** and **Figure 5** illustrate the location of the new culverts in relation to the streams and the adjacent wetlands.

These works will likely result in damage to the stream bed and banks, directly disturbing habitat, as well as resulting in the potential release of sediment downstream.

In order to reduce the impacts of these works, appropriate methods should be employed to divert the stream during the works, in order to maintain fish passage, and to prevent the release of sediment downstream. The new culverts will be designed to allow fish passage following construction, as specified in Section 70 of the NES-F.

The loss of stream bed quality associated with installing culverts will be mostly balanced by the removal of the existing farm culverts at Stream P1 and P2, which will result in the restoration of natural stream bed. Approximately a total of 10 m of stream length will be culverted above that restored by removal of old culverts. This length of stream lost to culverting constitutes a very small portion of Streams P1 and P2 and is also within (Stream P1 culvert) or just over (Stream P2) the allowance for permitted culverting in the AUP.

Overall, the loss to culverting and gain to stream restoration from removing old culverts is, on balance, a less than minor ecological effect. As such our recommendations are that the culvert installations comply with good ecological design practice (e.g. NES-F permitted culvert standards, where feasible), that fish salvage and relocation is required for these works, and that offsetting is not required to address residual effects.

8.2 Sediment discharge

The proposed earthworks have the potential to result in sediment discharge into the streams and wetlands both during construction and following completion of the fill prior to planting. As detailed in the

Infrastructure Report for the project[7], erosion and sediment controls will be undertaken during the construction works in accordance with industry best practice. **Figure 7** illustrates the Erosion and Sediment Control Plan for Stage 1.

For Stage 1 of the development, sediment retention ponds will be constructed at the toe (northern end) of the managed fill area, with the remaining length of Stream I1 and remaining end of Wetland W7. The construction of these ponds will have a temporary effect on both the stream and the wetland, changing their character and function. This temporary effect will be mitigated once the ponds are no longer required through the removal of any hard structures put in place for the retention pond and outlet, including riprap, the restoration of the stream channel, planting of the riparian margin to 10 m, and fencing from stock. The wetland will be restored through the removal of any hard structures put in place for the retention pond and outlet, including riprap, planting, planting of a 10 m set-back, and fencing from stock. Salvage and relocation of fish prior to construction of the sediment retention ponds is required.

Although not required to mitigate or offset adverse effects as part of the project, Wetlands W1, W2 and W3 will be protected (fenced and stock removed) and the margins planted to 10 m wide, where these margins are not already proposed for planting as offset for the loss of Wetland W7 and Stream I1. Where earthworks and parts of the development (the access track) are within 10 m of Wetlands W1, W2, W3 and W4, the planted margin will be extended nearby to make up for the reduced area of planting adjacent to the development. See **Figure 10** for details of the wetlands planting plan.

Implementation of these controls will reduce the level of potential adverse effect to nil. The additional protection and planting of the wetland margins will provide a net gain for biodiversity.

[7] Civix. 24/08/2023. *1618 Ararimu Road, Papakura: Infrastructure Report*.

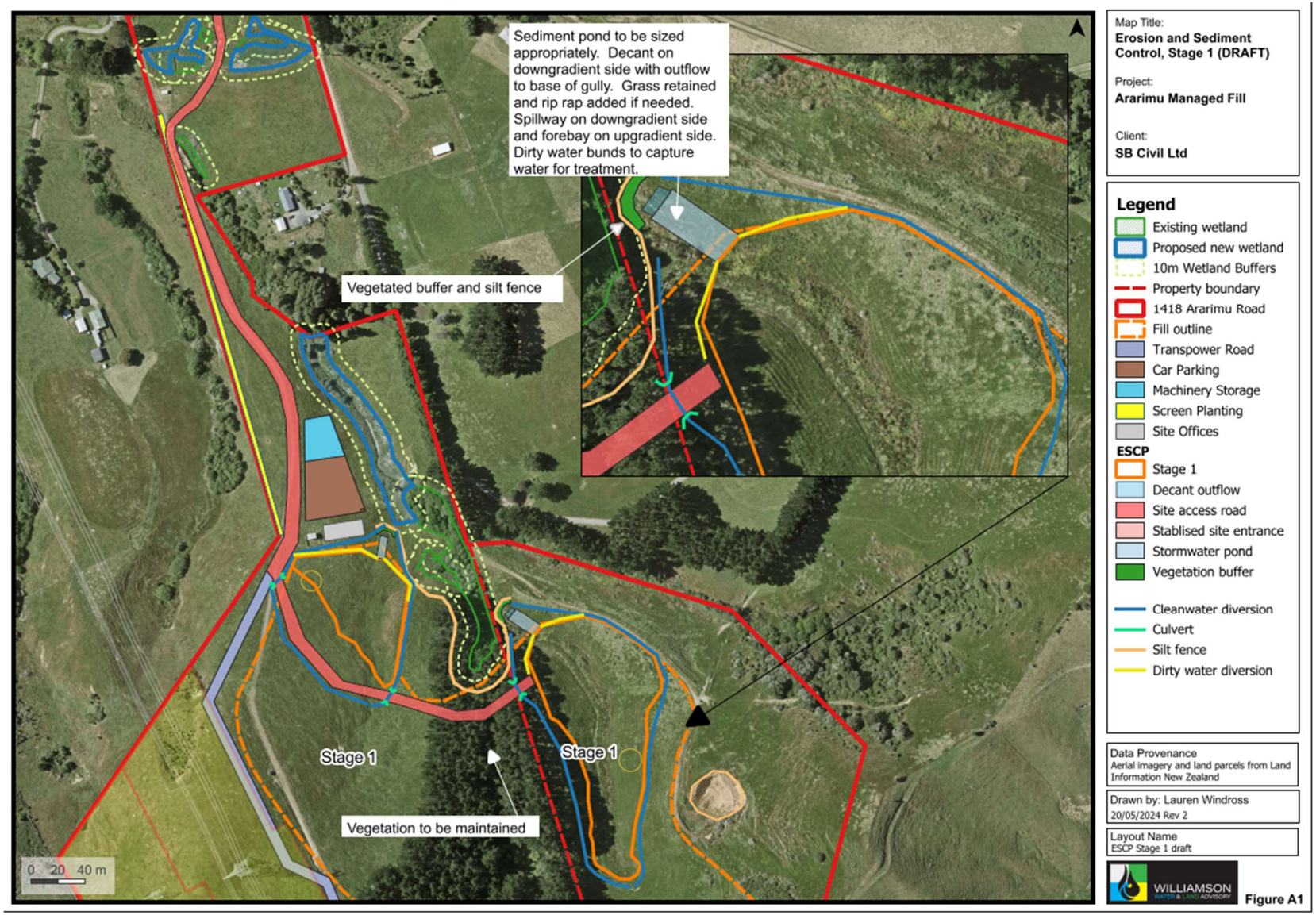


Figure 7. Erosion and Sediment Control Plan for Stage 1 of the proposed development.

8.3 Changes to hydrology

The filling of the three gullies on site has the potential to cause significant changes to the hydrology of the catchment. However, despite the proposed raising of the land surface, the fill will be sloped so that surface water runs off via overland flow and continues to feed the downstream streams and wetlands. The project's hydrology report[8] indicates that the overall surface water catchment area and location will remain the same. Ephemeral flow paths will still be present on site across the surface of the new managed fill.

The fill will result in the removal of the overland flow paths through the central gully, which could potentially affect the level of water reaching the downstream streams and wetlands. Groundwater flows may also be affected by the changes in the landscape. The project's Geotechnical Assessment Report[9] provides details on the management of groundwater which is designed to allow for the collection of groundwater at the upstream end of the wetland (Wetland W6). The hydrology report indicates that the proposed groundwater management designs will maintain groundwater baseflows into the wetland system. The levels of groundwater entering the downstream streams and wetlands has been assessed by the project hydrologist and geotechnical specialist as remaining the same.

Implementation of these surface water and groundwater management designs will ensure that downstream wetlands and streams are not dewatered, and that groundwater and surface water contributions to these features will remain unchanged after the managed fill has been constructed. The level of potential adverse effects with respect to hydrology will be nil.

8.4 Removal of Stream I1

The managed fill footprint covers 35 m of Stream I1, resulting in the complete loss of this section of intermittent stream. The loss of this section of stream cannot be avoided under the current proposals, and stream loss cannot be remedied or mitigated. In order to reduce the magnitude of the effect, this loss of stream value will be **offset** through restoration planting along Stream P1, and the loss of stream extent is to be offset through a 'trade-up' offset, re-creating wetland in place of re-creating stream.

The offset requirements for replacing stream value have been calculated using the Stream Ecological Valuation data calculated for the impacted stream (Stream I1) and the proposed offset stream (Stream P1).

The offset requirements for replacing stream extent have been calculated using the SEV data for the impacted stream and the Wetland Ecological Value (WEV) data for the proposed trade-up offset wetlands. The Wetland Ecological Value method of wetland assessment for offset calculations has been developed by RMA Ecology Ltd in conjunction with Auckland Council and applied in a project in Drury West. That method is detailed and is intended for accounting of values that are in wetland areas of a similar scale as the degraded wetlands at this site, and therefore it is applicable to this project. See **Appendix E** for an explanation of this method.

8.4.1 Offsetting stream value

The SEV method is used here to assess the potential ecological value of undertaking restoration actions on the offset stream (Stream P1) for the offset of unavoidable effects on Stream I1. The method used is as described in Storey *et al.* (2011) for the calculation of change in stream ecological value functions with development or enhancement.

[8] Williamson Water & Land Advisory. 15/09/2023. *Water Management Plan: Ararimu Road Managed Fill.*

[9] Baseline Geotechnical. 2023. *Geotechnical Assessment Report: Ararimu Road – Proposed Managed Fill.* BGL000170. Report prepared for SB Civil Limited.

We have made several assumptions with how ecological values are measured and handled in the calculations. These include:

1. Streams that are infilled have a post-construction SEV score of 0.0.
2. The RMA 1991 requires that an assessment be made of the existing environment for an assessment of environmental effects such as when assessing the value of stream functions that will be removed or modified by development. The RMA definition of existing environment is "*… the environment as it exists at the time of hearing including all operative consents…, overlain by those future activities which are permitted activities and also unimplemented consents (which can be considered at the discretion of the authority)".*

   There are no unimplemented or operative consents for this site that we know of.

   The SEV method includes in its calculations a hypothetical, improved state of the stream that is proposed to be impacted – this is called the 'potential future value', which is essentially defining an appropriate baseline. The site is within a Rural zone so it is reasonable to expect that the impacted stream is unlikely to change from its existing state. Its future potential value can therefore be assumed to be the same as its existing value. The existing state of Stream P1 is also expected to remain constant i.e. not planted or enhanced, and therefore the potential future state is assumed to be the same as the existing state. It is therefore appropriate to use Stream P1 as an offset site and we have assumed that it will receive a planted margin of 20 m wide either side.
3. When calculating the 'future potential value' of the offset stream, we have considered the likely condition of the stream 15 years following planting of the 20 m wide margin either side of the stream.

Using the ECR, and the length and width of the impact and offset streams, the length of stream required to be planted to offset the value of the impacted stream can be calculated. The results show that 21.1 m of Stream P1 need to be planted to a width of 20 m on both sides in order to offset the value of Stream I1.

The SEV method has an underlying set of guiding principles. One of these is that the offset should result in no loss of stream length. When applied here, this means that the loss of values associated with 35 m of Stream I1 needs to be offset through a minimum planting of **35 m** of Stream P1, along with fencing from livestock. See **Figure 9** for the proposed location of planting**.**

The full calculations for determining the length of stream required to be planted can be seen in **Appendix D**.

8.4.2 Offsetting stream extent

The planting of 20 m on both banks of Stream P1 will offset the loss of value of Stream I1 but it does not replace the extent of the stream that will be lost. The extent of stream lost will be offset through the re-creation of wetland, as a 'trade-up' offset from stream extent to wetland extent.

For the 'trade-up' offset calculations, a ECR is calculated in the same way as for like-for-like offsets, using the SEV scores for the stream and the Wetland Ecological Value scores for the wetland (see **Appendix D** for results of the WEV scoring). In this case, the area of historic wetland at the northern end of the site is proposed to be re-created through planting. Aerial photographs from 1944 indicate that the area of wetland at the northern end of the site used to be larger than it is today (**Figure 8**).

Drains that have been dug through the wetland (shown as drains D1 – D5 on **Figure 5**) will be infilled to improve the hydrology of this part of the site. Areas of raised ground around the existing areas of wetland, that are currently much drier and supporting dry-land plant species, will be excavated to the level of the existing areas of wetland. Existing pasture grass communities will be removed and replaced with wetland plant communities, and the area fenced from livestock.

Figure 8. 1944 aerial imagery indicating the area of former wetland (green lines) at the northern end of the site. The approximate site boundary is marked in red.

Using the ECR, and the stream area multiplier (calculated by multiplying the width of stream by the width of planting – 10 m either side of the stream) and the length of stream to be lost, the area of wetland required to be planted to offset the extent of the impacted stream can be calculated. The calculations show that **471.5 m²** of the historic wetland needs to be planted and re-created as wetland as an equitable exchange to offset the loss of extent (35 m) of Stream I1.

As part of the restoration model assumptions, a 10 m buffer around the re-created wetland will also be planted with native species, and the area fenced from livestock.

The full calculations for determining the area of wetland required to be planted can be seen in **Appendix D**.

The level of effect of the loss of 35 m of Stream I1 has been assessed as being low, as although the magnitude of the effect has been assessed as high, the value of the stream is negligible due its short length, deeply incised channel, and lack of suitable fish habitat. Implementing these proposals for offsetting the loss of the stream will enhance the value of Stream P1 and restore 471.5 m² of wetland, thus creating a net biodiversity gain.

8.5 Removal of Wetland W7

The proposed managed fill area includes filling much of the gully that is currently occupied by Wetland W7. Approximately 2,108 m² of W7 will be filled in. Under the current managed fill design, the loss of this area of W7 cannot be avoided, minimised, or remedied. The wetland cannot be mitigated by re-creating a wetland on the finished managed fill as there is no guarantee that groundwater will be remediated or that a rehabilitated wetland will persist.

The proposal, therefore, is to **offset** the loss of Wetland W7 through creation of wetlands, and through restoration planting of wetlands elsewhere on the site. Most of the offset planting is proposed around the central section of Stream P2, to re-create the former extent of wetland in this area (Historic Wetland HW3), as indicated by aerial imagery from 1944 (**Figure 8**). The remainder of the offset planting will take place in the area of former wetland around Wetland W3 and Stream P1 (Historic Wetland HW1) (**Figure 10**).

The area required for planting is calculated using the same method as described in the sections above, using the WEV scores for the impacted wetland (Wetland W7) and the wetlands proposed for the offset planting.

Details of the WEV scoring, ECR calculation and calculation of the area of wetland required for offset planting can be seen in **Appendix D.** The results of these calculations indicate that 1,800 m² of impacted W7 will be offset by planting and re-creating 2,682 m² of wetland at the historic Wetland HW3 around Stream P2, and the remaining 308 m² of impacted W7 will be offset by restoring 453 m² of wetland at the historic Wetland HW1.

As part of the restoration model assumptions, a 10 m buffer around the wetlands will also be planted with native species.

All planted areas will be fenced from livestock.

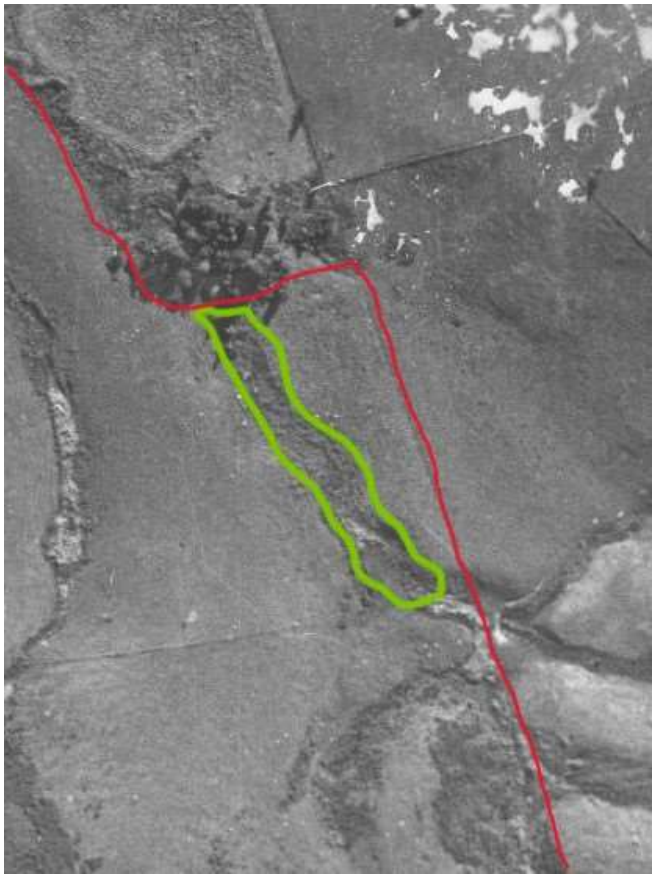


Figure 8. Aerial imagery from 1944 indicating the extent of the former wetland (green line). The approximate site boundary is marked in red.

8.6 Removal of Stream E1

Stream E1 is an ephemeral stream, or overland flow path, that flows immediately after a rain event, and is otherwise dry. It has very limited value ecologically, although it has value for stormwater drainage and therefore inputs of water to downstream wetlands and streams.

The proposed managed fill area will result in the removal of Stream E1. The level of ecological effect of its removal has been assessed as being very low, and therefore no mitigation is proposed. Stormwater drainage through the gully and to downstream wetlands and streams will continue as surface water over the sloped surface of the managed fill as each stage is completed, and as groundwater that will be collected at the base of the managed fill area and directed to the downstream end (see **Section 8.3**).

8.7 Overall ecological effects and management

The proposed managed fill facility will result in multiple effects on ecology values on the site.

Mitigations applied through timing for vegetation clearance, erosion and sediment controls and wildlife salvage and relocation will reduce the severity of adverse effects on some values, and avoid potential effects on adjoining or nearby streams and wetlands.

Residual adverse effects after mitigation will be present. In response a comprehensive package of ecological enhancements is proposed in the form of biodiversity offsets comprising wetland re-creation, wetland restoration, and stream margin revegetation (which will also provide substantial benefits to native birds, insects and lizards over time). **Figures 10a and 10b** illustrate the extent of the ecological enhancements.

A summary of these positive actions is provided below in **Table 8**.

With the re-creation of historic wetlands, and the restoration of a section of Stream P1, the adverse effects of the managed fill will be fully mitigated and offset.

Residual adverse effects on ecology values of the site after mitigation and offsetting will be nil, with positive benefits arising in the longer term through additional wetland protection (Wetlands W1-W3 and Wetlands W5 and W6) through fencing and planting.

Several of the ecological interventions described in this report require further design work in the form of management plans, both to provide detail on methods and implementation, and also to provide assurance to Council that these mitigations and enhancements will be undertaken at the locations and to the standard of quality required to deliver ecological protections or benefits.

Management plans will be produced as a condition of resource consent, and will be submitted to Auckland Council for approval prior to the commencement of physical works on the site for:

1. Native freshwater fish relocation plan, for works to reclaim Stream I1, and to removed existing farm culverts and installed new proposed culverts;
2. Ecological Mitigation and Offsetting Plan, for the re-creation and restoration of wetlands across the site, and the riparian restoration of streams.

Table 8. Summary of proposed biodiversity offsets to address residual effects following mitigation measures.

Residual effects after mitigation	Proposed offset	Residual effect
Stream I1 – loss of stream extent and value	Planting of 35 m length x 20 m width of Stream P1 to offset the loss of stream value Re-creating 471.5 m² of former wetland at Wetland HW1 to offset the loss of stream extent	**Net Gain** Stream I1 in its current state has low ecological value as a result of its short length, lack of riparian vegetation, and deeply incised channel. The proposed offset with enhance the value of Stream P1 and re-create former wetland.
Wetland W7 – loss of 2, 108 m² of area to the fill area	Re-creation of 2, 682 m² of former wetland around Stream P2 Re-creation of 453 m² of former wetland around Wetland W3. The offset model assumes additional planting of a 10 m margin around the re-created wetlands.	**Net Gain** Wetland W7 is currently in poor condition as a result of pugging and grazing by stock. Re-creating wetland elsewhere on the site through blocking drains, fencing from stock and planting will create good quality wetland habitat that can be maintained in good condition.

Figure 10a. Northern end of the site showing proposed planting for offsets and mitigation:

- Re-creation of wetland (Wetland HW1) to offset the loss of extent and value of Wetland W7 (453 m²) and the loss of extent of Stream I1 (dark yellow polygon) plus a planted 10 m buffer (pale yellow polygon).
- Planting of a minimum of 35 m x 20 m of Stream P1 (pale blue polygon) to offset the loss of value of Stream I1.
- Planting of 10 m buffers to Wetlands W1, W2 and W4 to reduce any potential impact of sediment runoff during construction and operation of the access track (pale green polygons).
- Streams are shown with a turquoise line, and drains are shown with a pink line.
- The proposed access track is shown with an orange line.
- The site boundary is shown with a red line.

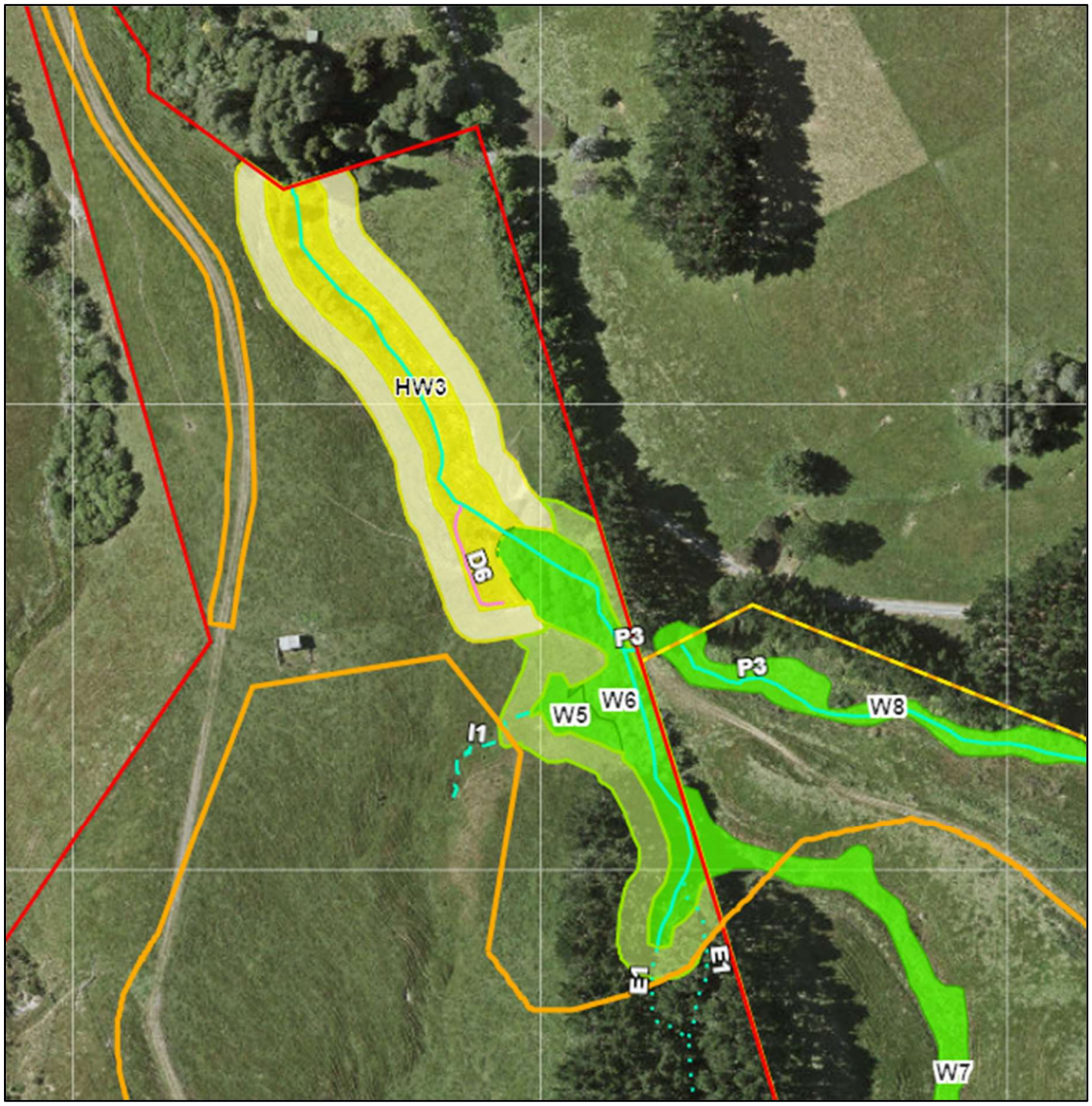


Figure 10b. Central section of the site showing proposed planting for offsets and mitigation:

- Re-creation of wetland (Wetland HW3) to offset the loss of extent and value of Wetland W7 (2, 682 m²) plus a 10 m planted buffer (pale yellow polygon).
- Planting 10 m buffer to Wetlands W5 and W6 to reduce any potential impact of sediment runoff during construction and operation of the managed fill (pale green polygon).
- Permanent streams are shown with a turquoise solid line, the intermittent stream with a dashed turquoise line, and the ephemeral stream with a dotted turquoise line.
- The proposed access track and fill area are shown with an orange line.
- The site boundary is shown with a red line.

9.0 Conclusions

The proposed development of a managed fill at Ararimu Road will impact upon one natural wetland and one natural intermittent stream across two sub-catchment gully systems.

An area of pine plantation has recently (March-April 2024) been cleared under an authorised felling permit, leaving the central gully bare of vegetation. An ephemeral stream, or overland flow path, runs through this central gully. Potential impacts also include the effects of earthworks within 10 m of wetlands and works within two streams to remove/ install culverts. Values for birds, lizards, and indigenous vegetation are either low or nil.

The development of the managed fill will result in the removal of approximately 2,108 m² of Wetland W7 and 35 m of Stream I1.

The loss of Wetland W7 cannot be avoided, minimised, or remedied under the development proposal. The managed fill activities will result in its permanent loss. The wetland cannot be mitigated by re-creating a wetland on the finished managed fill as there is no guarantee that groundwater will be remediated or that a rehabilitated wetland will persist. The proposal, therefore, is to offset the loss of Wetland W7 through the re-creation of historic wetland around Stream P2 (historic Wetland HW3) and the re-creation of historic wetland around Wetland W3 (historic Wetland HW1).

A Wetland Ecological Valuation calculation shows that for the loss of 2,108 m² of Wetland W7, a total of 3,131 m² of wetland must be restored to provide for no-net-loss of wetland ecological values, through fencing from stock, weed control and planting of native wetland species. This total area will be divided between the historic wetland around Stream P2 (2, 682 m²) and the historic wetland around Wetland W3 (453 m²). As part of the restoration model assumptions, a 10 m setback of native shrub and tree species around the wetlands will also be planted, and the area fenced from livestock.

The temporary loss of the remaining downstream end of Wetland W7 to the construction of a sediment retention pond and outlet for Stage 1 of the development, will result in the temporary loss of function of the wetland. To mitigate for this temporary loss, the wetland will be restored through planting, planting of a 10 m setback, and fencing from stock.

The loss of Stream I1 cannot be avoided, minimised, remedied, or mitigated under the development proposal. The managed fill activities will result in its permanent loss. The proposal, therefore, is to offset the loss of Stream I1 through the planting of a section of Stream P1, to replace the loss of value, and to restore an area of historic wetland to replace the loss of stream extent.

A Stream Ecological Valuation calculation shows that for the loss of 35 m of Stream I1 value, 35 m of Stream P2 must be planted, to a width of 20 m on both banks, to replace lost stream value. To replace lost stream extent, the proposal is to ‘trade-up’ and restore not stream extent but wetland extent. A combined Wetland Ecological Valuation and Stream Ecological Valuation calculation shows that for the loss of 35 m of Stream I1 extent (average width 0.2 m), 471.5 m² of wetland must be restored, through fencing from stock, weed control, and planting native species.

The temporary loss of the remaining downstream end of Stream I1 to the construction of a sediment retention pond and outlet will result in the temporary loss of function of the stream. To mitigate for this temporary loss, the stream channel will be reconstructed following the removal of the pond and associated structures, and the riparian margin planted to 10 m in native plants.

Recommendations for the management of adverse ecological effects include:

1. The development and implementation of an Erosion and Sediment Control Plan in accordance with Council's GD05 design guidelines to prevent the mobilisation of sediments into waterways that are proposed for protection and restoration; and
2. Salvage of native eels and fish from Stream I1 and Wetland W7 that are proposed to be infilled, and from Stream P1 and Stream P2 that are proposed to be disturbed through the removal and/ or installation of culverts. The salvage of eels and fish will be undertaken by a qualified expert and in accordance with a Native Freshwater Fish Relocation Plan outlining the approach for salvage and the location(s) where salvaged species will be released; and
3. Preparation of a site Ecological Mitigation and Offsetting Management Plan that will provide details of the ecological management needed to achieve the anticipated benefits from the restoration and protection of former wetlands around Stream P2 and at the northern end of the site, and from the restoration and protection of Stream P1; and
4. The culvert installation for Streams P1 and P2 will comply with the culvert design objectives of the NES-F, including embedment, flow velocity (using flexible baffles if necessary), and gradient to ensure that the culverts are not a barrier to the movement of native freshwater fish.

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Appendix A: Wetland assessment methodology

Areas of a site that are considered to be a potential wetland, based on an initial, visual assessment of vegetation and hydrological conditions, are then further assessed, following the steps detailed below:

- Visual assessment as to whether the potential wetland area could support a threatened species;
- Visual assessment as to whether the potential wetland and surrounding area is clearly dominated by pasture grass species (the Rapid Pasture Test) or whether the potential wetland is clearly dominated by wetland species (the Rapid Wetland Test);
- Visual assessment of areas where the vegetation composition includes species that are scored as wetland obligate, facultative wetland, or facultative (e.g., rushes, wet pasture or 'wetland-type' vegetation) as assessed by Clarkson *et al.*[10] (following the Pasture Exclusion Test, and Wetland Delineation Protocols as laid out in the Pasture Exclusion Assessment Methodology[11]);
- Where these compositions exist, an assessment of vegetation, soils, and hydrology is required according to the Pasture Exclusion Assessment Methodology:
    - Vegetation is assessed through plant identification and percentage cover estimates (as per the method described by Clarkson[12]) of 2 m x 2 m plot areas within each potential wetland area;
    - Soils are assessed by applying the criteria outlined in Fraser[13] for identifying hydric (wetland) soils – which involves excavation and examination for gleyed, mottled, peaty, or wet soils; and
    - Hydrology is assessed by applying the criteria outlined in the Ministry for the Environment tool[14].
- The boundaries of potential wetland areas are delineated by carrying out assessments of the various vegetation communities and through professional judgement.

Figure A1 below outlines the steps taken to determine the presence of a wetland.

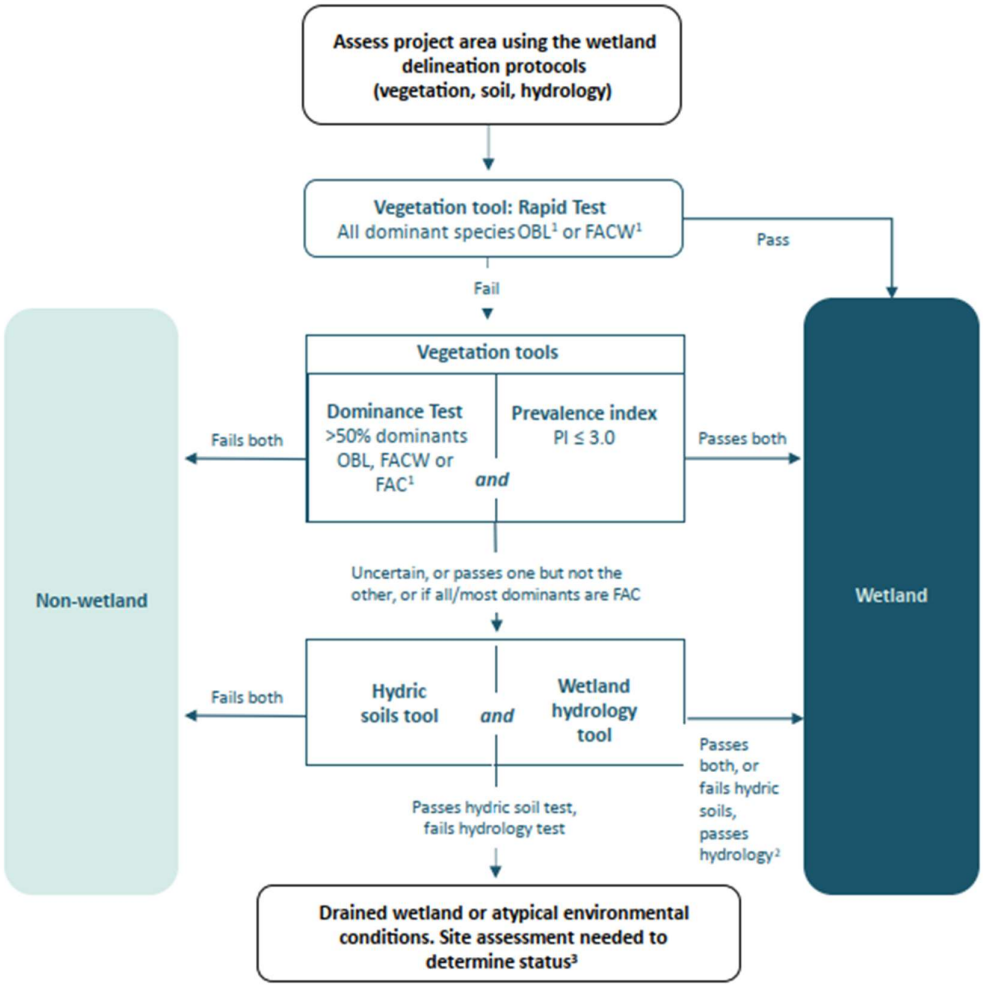
[10] Clarkson B. R., Fitzgerald N. B., Champion P. D., Forester L., Rance B. D. (2021). *New Zealand wetland plant indicator status ratings 2021: Data associated with Manaaki Whenua - Landcare Research contract report LC3975* for Hawke's Bay Regional Council.

[11] Ministry for the Environment. 2022. *Pasture exclusion assessment methodology*. Wellington: Ministry for the Environment.

[12] Clarkson, B. (2013). *A vegetation tool for wetland delineation in New Zealand*. Report prepared for Meridian Energy Limited by Landcare Research.

[13] Fraser S., Singleton P., Clarkson B. (2018). *Hydric soils – field identification guide*. Envirolink Tools Contract C09X1702. Manaaki Whenua – Landcare Research Contract Report LC3233 for Tasman District Council.

[14] Ministry for the Environment. (2022). *Wetland delineation hydrology tool for Aotearoa New Zealand*. Wellington: Ministry for the Environment.



Footnotes:
[1] Wetland indicator status abbreviations: FAC = facultative, FACW = facultative wetland, OBL = obligate wetland.
[2] For example, recent wetland.
[3] The US procedures for atypical or problematic situations are recommended.

Figure A1. Flow chart of steps for wetland vegetation determination. Wetland indicator status abbreviations: FAC = facultative (equally likely to occur in wetlands or non-wetlands – estimated probability 34-66 %); FACW = facultative wetland (occurs usually in wetlands – 67-99 %); OBL = obligate wetland (occurs almost always in wetlands >99 %). Source: Ministry for the Environment. 2022. *Pasture exclusion assessment methodology*. Wellington: Ministry for the Environment.

Appendix B:

B1) SEV scores

			Site name/number		
	Function	Variable (code)	Ararimum P1	Ararimu P2	Ararimu I1
		Vchann	0.100	0.100	0.500
		Vlining	0.900	0.800	1.000
		Vpipe	0.300	1.000	1.000
1	NFR	=	0.110	0.333	0.600
		Vbank	0.200	0.200	0.200
		Vrough	0.350	0.400	0.500
2	FLE	=	0.070	0.080	0.100
		Vbarr	1.000	1.000	1.000
3	CSM	=	1.000	1.000	1.000
		Vchanshape	0.200	0.200	0.600
		Vlining	0.900	0.800	0.800
4	CGW	=	0.667	0.600	0.730
		Hydraulic function mean score	0.462	0.503	0.660
		Vshade	0.260	0.240	0.320
5	WTC	=	0.260	0.240	0.320
		Vdod	0.675	0.680	-
6	DOM	=	0.675	0.680	-
		Vripar	0.000	0.050	0.000
		Vdecid	0.000	0.000	0.000
7	OMI	=	0.000	0.030	0.000
		Vmacro	0.690	0.705	-
		Vretain	0.200	0.200	-
8	IPR	=	0.200	0.200	-
		Vsurf	0.380	0.388	0.180
		Vripfilt	0.600	0.600	0.600
9	DOP	=	0.490	0.494	0.170
		Biogeochemical function mean score	0.325	0.340	0.163
		Vgalspwn	0.400	0.550	0.000
		Vgalqual	0.000	0.000	0.000
		Vgobspwn	0.100	0.100	0.100
1	FSH	=	0.050	0.050	0.050
		Vphyshab	0.482	0.329	0.180
		Vwatqual	0.260	0.420	0.200
		Vimperv	0.800	1.000	1.000
1	HAF	=	0.510	0.520	0.390
		Habitat provision function mean score	0.280	0.280	0.220
		Vfish	-	-	-
2	FFI	=	-	-	-
		Vripcond	0.200	0.230	0.200
		Vripconn	0.130	0.700	0.050
4	RVI	=	0.026	0.161	0.010
		Biodiversity function mean score	0.165	0.465	0.125
		Overall SEV score (maximum value = 1)	**0.338**	**0.366**	**0.337**

B2) Assumptions/ reasons for scores including for Stream 1I estimated scores

Variable (code)	Ararimum	Assumptions/reasons	Ararimu	Assumptions/reasons	Ararimu	Assumptions/reasons for score
Vchann	0.100	straightened and/ or deepened to increase flood capacity.	0.100	straightened and/ or deepened to increase flood capacity.	0.500	Channel is all natural but is incised from flood flows.
Vlining	0.900	50% of the channel is natural with no modification, and 50 % contains an unnatural loading of fine sediment.	0.800	The channel bed contains an unnatural loading of fine sediments.	0.800	Channel noted to contain fine sediments.
Vpipe	0.300	Three piped inflows are presents.	1.000	No piped inlets.	1.000	No piped inlets.
=	0.110		0.333		0.600	
Vbank	0.200	The floodplain is present but connectivity is reduced due to channel incision.	0.200	The floodplain is present but connectivity is reduced due to channel incision.	0.200	The floodplain is present but connectivity is reduced due to channel incision.
Vrough	0.350	The surrounding vegetation is a mix of previously grazed pasture and wetlands.	0.400	The surrounding vegetation is a mix of previously grazed pasture and wetlands.	0.500	The surrounding vegetation is long pasture grasses that has not been grazed recently.
=	0.070		0.080		0.100	
Vbarr	1.000	There are no barriers to fish migration.	1.000	There are no barriers to fish migration.	1.000	There are no barriers to fish migration.
=	1.000		1.000		1.000	
Vchanshape	0.200	Automatic data entry.	0.200	Automatic data entry.	0.600	Automatic data entry.
Vlining	0.900	Natural channel bed with some sections containing an unnatural loading of fine silt.	0.800	Bed contains an unnatural loading of fine silt throughout the test reach.	0.800	Channel noted to contain fine sediments.
=	0.667		0.600		0.730	
Hydraulic function mean score	0.462		0.503		0.610	
Vshade	0.260	Shading rated mostly as 'very low' as there is no woody riparian vegetation – some shade is provided by the channel topography.	0.240	Shading rated mostly as 'very low' as there is no woody riparian vegetation – some shade is provided by the channel topography.	0.320	Shading rated between 'low' and 'very low' – some shade is provided by the steep, narrow (incised) channel banks.
=	0.260		0.240		0.320	
Vdod	0.675	Automatic data entry using stream velocity and rating of oxygen reducing processes data.	0.680	Automatic data entry using stream velocity and rating of oxygen reducing processes data.	-	No data available – the stream flow was too small to measure.
=	0.675		0.680		-	
Vripar	0.000	No woody vegetation within the riparian zone.	0.050	Minor shading of one cross section by willow.	0.000	No woody vegetation within the riparian zone.
Vdecid	0.000	No evergreen trees or bushes within the riparian zone.	0.000	No evergreen trees or bushes within the riparian zone.	0.000	No evergreen trees or bushes within the riparian zone.
=	0.000		0.030		0.000	
Vmacro	0.690	Recorded on site.	0.705	Recorded on site.	-	Not recorded as formal SEV not undertaken on
Vretain	0.200	Automatic data entry.	0.200	Automatic data entry.	-	Data not included as Vmacro data was not recorded.
=	0.200		0.200		-	
Vsurf	0.380	Recorded on site.	0.388	Recorded on site.	0.180	Estimated for x1 cross section from a photograph taken during the site visit.
Vripfilt	0.600	Uniform vegetation cover of long grasses.	0.600	Uniform vegetation cover of long grasses; very limited woody vegetation.	0.600	Uniform vegetation cover of long grasses.
=	0.490		0.494		0.170	
Biogeochemical function mean	0.325		0.340		0.163	
Vgalspwn	0.400	Recorded on site.	0.550	Recorded on site.	0.000	No length of near-flat slope.
Vgalqual	0.000	Unsuitable for fish spawning.	0.000	Unsuitable for fish spawning.	0.000	Unsuitable for fish spawning.
Vgobspwn	0.100	Automatic data entry.	0.100	Automatic data entry.	0.100	Automatic data entry.
=	0.050		0.050		0.050	
Vphyshab	0.482		0.329		0.180	Very low habitat diversity and abundance due to narrow, steep-sided channel with limited in-stream features.
Vwatqual	0.260		0.420		0.200	Estimated as not all variables available.
Vimperv	0.800		1.000	No impervious surfaces in the upstream catchment.	1.000	No impervious surfaces in the upstream catchment.
=	0.510		0.520		0.390	
Habitat provision function mean	0.280		0.280		0.220	
Vfish	-	No fish data available.	-	No fish data available.	-	No fish data available.
=	-		-		-	
Vripcond	0.200	Automatic data entry.	0.230	Automatic data entry.	0.200	Automatic data entry.
Vripconn	0.130	Recorded on site.	0.700	Recorded on site.	0.050	Estimated data from photographs.
=	0.026		0.161		0.010	
Biodiversity function mean score	0.165		0.465		0.125	
Overall SEV score	**0.338**	Final SEV score does not include data for the following variables:	**0.366**	Final SEV score does not include data for the following variables:	**0.337**	Final SEV score does not include data for the following variables:
		Vfish, Vmci, Vept, Vinvert.		Vfish, Vmci, Vept, Vinvert.		Vdod, Vmacro, Vretain, Vfish, Vmci, Vept,
		This data is not required for a SEV that may be used for any mitigation or offset modelling.		This data is not required for a SEV that may be used for any mitigation or offset modelling.		

Appendix C: Wetland plot data and wetland classification assessment

Site	Ararimu Road cleanfill				pasture grasses		
Date & Recorders	Emily Roper 22/2/2023			Wetland 1	Wetland 2	Wetland 3	Not wetland
Common name	**Species (hydrotype)**	**group score**		WP1	WP2	WP3	WP4
Paspalum	*Paspalum dilatatum* FACU	4		1%	1%		10%
Soft rush	*Juncus effusus* FACW	2		30%	60%	20%	10%
creeping buttercup	*Ranunculus repens* FAC	3		3%	5%	10%	10%
Yorkshire fog	*Holcus lanatus* FAC	3		1%	2%	28%	5%
Lotus	*Lotus pedunculatus* FAC	3		2%	1%	2%	5%
Creeping bent	*Agrostis stolonifera* FACW	2		46%	26%	28%	5%
Jointed rush	*Juncus articulatus* FACW	2					
Water pepper	*Persicaria hydropiper* FACW	2		6%			1%
Perennial rye grass	*Lolium perenne* FACU	4					
Slender clubrush	*Isolepis cernua* OBL	1					
Toad rush	*Juncus bufonius* FACW	2					
Blue sweet grass	*Glyceria declinata* OBL	1		5%		8%	
Clubrush	*Isolepis prolifera* OBL	1					
Oval sedge	*Carex ovalis* FACW	2					
Water forget-me-not	*Myosotis laxa* OBL	1					
Loosetrife	*Lythrum hyssopifolia* FACW	2					
sweet vernal	*Anthoxanthum odoratum* FACU	4				1%	
rush	*Juncus saraphorus* FACW	2					
Browntop	*Agrostis capillaris* FACU	4					45%
Gypsywort	*Lycopus europaeus* OBL	1		3%			
Sharp-fruited rush	*Juncus acuminatus* OBL	1		3%		3%	5%
Spearwort	*Ranunculus flammula* FACW	2			5%		
Narrow-leaved plantain	*Plantago lanceolata* FACU	4					2%
Selfheal	*Prunella vulgaris* FACU	4					1%
Hawkbit	*Leontodon saxatilis* FAC	3					1%
Bare ground/standing water							
			Total cover	100%	100%	100%	100%
			% pasture grasses	4%	4%	31%	67%
Prevalence Index (Hydrophytic vegetation ≤3)			as per Clarkson calculation	2	2.1	2.3	3.3
Excluded as NPSFM wetland (>50% pasture in improved pasture?)			Yes = not wetland; stop				Yes
			No = go to 'Dominance Test' score	No	No	No	
Dominance Test score (>50%) for OBL, FACW, or FAC			Yes = go to 'Prevelance Index'	Yes	Yes	Yes	
			No = go to 'Prevelance Index'				
Prevelance Index (≤ 3.0)			Yes = wetland, if passes Dominance Test also	Yes	Yes	Yes	
			No = not wetland; stop OR if Dom Test 'yes' go to next steps				
All or most dominants FAC?			Yes = go to 'hydric soils and wetland hydrology'				
			No = wetland				
Hydric soils present	M = mottling; G = gleyed; W = wet		Yes = go to 'wetland hydrology rpesent'				
			No = not wetland; stop				
Wetland hydrology present			Yes = wetland				
			No = not wetland; stop				
NPSFM wetland (Yes or No)				Yes	Yes	Yes	No

Appendix D – offset calculations for Stream I1 and Wetland W7

Di) SEV calculations for the offset of the loss of Stream I1 value

The SEV scores for the impacted stream and the offset stream are:

Impacted Stream I1

- current SEV (SEVi-C) = 0.337
- future potential state SEV (SEVi-P) = 0.337

Offset Stream P1

- current SEV (SEVm-C) = 0.338
- future potential state SEV (SEVm-P) = 0.513

The Environmental Compensation Ratio (ECR) is calculated using the standard formula as follows:

ECR = [(SEVi-P – SEVi-I) / (SEVm-P – SEVm-C)] x 1.5

Where SEVi-I is the SEV score of the impacted stream following impact, which in this case is 0.0 as the stream is to be filled in.

Therefore:

ECR = [(0.337 – 0.0) / (0.513 – 0.338)] x 1.5

ECR = 2.89

The area of Stream 1I that will be lost: Length (35 m) x Width (0.2 m) = 7.0 m²

The area of stream that must be planted to offset the loss of Stream 1I value = ECR x Area lost

= 2.89 x 7.0 m²

= 20.22 m ²

The length of stream that must be planted to offset the loss of Stream I1 value = Area to be planted / Width of Stream P1

= 20.22 m² / 0.96 m

= 21.1 m of Stream P1

The SEV method has an underlying set of guiding principles. One of these is that the offset should result in **no loss of stream length**. When applied here, this means that the loss of values associated with 35 m of Stream I1 needs to be offset through a minimum planting of **35 m** of Stream P1.

Dii) SEV calculations for the offset of the loss of Stream I1 extent

The SEV score for the impacted stream and the WEV score for the offset wetland are:

Impacted Stream I1

- current SEV (SEVi-C) = 0.337
- future potential state SEV (SEVi-P) = 0.337

Offset Wetland HW1

- current WEV (WEVm-C) = 0.0*
- future potential state WEV (WEVm-P) = 0.758

* The current WEV for Historic Wetland HW1 is 0.0 as this area of former wetland is currently so degraded that it does not qualify as wetland under the NPS-FM (it has been drained and seeded with pasture grass).

The SEV: WEV Environmental Compensation Ratio (ECR) is calculated using the formula as follows:

ECR = [(SEVi-P – SEVi-I) / (WEVm-P – WEVm-C)] x 1.5

Where SEVi-I is the SEV score of the impacted stream following impact, which in this case is 0.0 as the stream is to be filled in.

Therefore:

SEV: WEV ECR = [(0.337 – 0.0) / (0.758 – 0.0)] x 1.5

SEV: WEV ECR = 0.67

The 'trade up' ECR = SEV: WEV ECR x Stream Area Multiplier

Therefore:

Trade up ECR = 0.67 x [(10x2) + 0.2)]

Trade up ECR = 13.47

The area of wetland required to be restored as offset for the loss of extent of Stream I1 = Trade up ECR x Length of stream lost

= 13.47 x 35 m

= 471.5 m²

Diii) WEV calculations for the offset of the loss of Wetland W7 value and extent

Area of loss of Wetland W7 = 2,108 m²

Area of offset Wetland HW3 = 2,682 m²

Area available of offset Wetland HW1 (remainder after restoration for Stream I1 offset) = 487.5 m²

The WEV scores for the impacted wetland and the offset wetland are:

Impacted Wetland W7

- current WEV (WEVi-C) = 0.479
- future potential state WEV (WEVi-P) = 0.743

Offset Wetland HW3

- current WEV (WEVm-C) = 0.0
- future potential state WEV (WEVm-P) = 0.750

Offset Wetland HW1

- current WEV (WEVm-C) = 0.0
- future potential state WEV (WEVm-P) = 0.758

The Environmental Compensation Ratio (ECR) is calculated using the standard formula as follows:

ECR = [(WEVi-P – WEVi-I) / (WEVm-P – WEVm-C)] x 1.5

Where WEVi-I is the WEV score of the impacted wetland following impact, which in this case is 0.0 as the wetland is to be filled in. WEVm-P is the potential score for the offset wetland and WEVm-C is the current score, which has been assumed to be 0.0 as the existing state of the wetland is so degraded that it does not currently display wetland features (these areas are currently dominated by pasture species and so therefore pass the pasture exclusion test).

Therefore, for offset Wetland HW3:

ECR = [(0.743 – 0.0) / (0.750 – 0.0)] x 1.5

ECR = 1.49

And for offset Wetland HW1:

ECR = [(0.743 – 0.0) / (0.758 – 0.0)] x 1.5

ECR = 1.47

The area of Wetland HW3 required to be restored to offset the loss of 1,800 m² of Wetland W7 = ECR x area of wetland lost

= 1.49 x 1,800 m²

= 2,682 m²

The area of Wetland HW1 required to be restored to offset the remaining 308 m² of Wetland W7 = ECR x area of wetland lost

= 1.47 x 308 m²

= **453 m²**

Div) WEV scores for wetlands

		Wetland W7			Wetland HW3		Wetland HW1	
		WEVi-C	WEVi-P	WEVi-I	WEVm-C	WEVm-P	WEVm-C	WEVm-P
Component	**Attribute**	Av Score	Av Score	Av Score	Av Score	Av Score	Av Score	Av Score
Catchment	Land use affecting catchment hydrology	2.200	1.000	0.000	0.000	1.125	0.000	1.750
Catchment	Diversion of flows	5.000	5.000	0.000	0.000	5.000	0.000	5.000
Catchment	Water quality in catchment	3.000	4.000	0.000	0.000	4.000	0.000	4.000
Catchment	Mammalian predators in catchment	2.000	2.000	0.000	0.000	2.000	0.000	2.000
Catchment	Key undesirable plants in catchment	3.000	3.000	0.000	0.000	3.000	0.000	3.000
Catchment	% impervious surfaces in catchment	5.000	3.000	0.000	0.000	4.000	0.000	4.000
Catchment	% catchment in vegetation of any sort	5.000	5.000	0.000	0.000	4.000	0.000	4.000
Catchment	Degree of runoff control – flood and first flush	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Catchment	Wetland connections	3.000	3.000	0.000	0.000	3.000	0.000	3.000
Wetland	Size and shape	0.500	0.500	#DIV/0!	#DIV/0!	1.000	#DIV/0!	0.500
Wetland	Change in hydrology	4.333	4.667	#DIV/0!	#DIV/0!	4.667	#DIV/0!	4.667
Wetland	Change in water/ soil quality or state (physico chemical parameters)	2.500	5.000	#DIV/0!	#DIV/0!	5.000	#DIV/0!	5.000
Wetland	Change in ecosystem intactness	4.000	4.667	#DIV/0!	#DIV/0!	4.667	#DIV/0!	4.333
Wetland	Change in amount of animal damage and harvest by humans	2.333	4.000	#DIV/0!	#DIV/0!	4.000	#DIV/0!	4.000
Wetland	Change in dominance of native plants	1.000	4.500	#DIV/0!	#DIV/0!	4.500	#DIV/0!	4.500
Buffer	Animal damage	0.000	5.000	0.000	0.000	5.000	0.000	5.000
Buffer	Weeds	0.000	5.000	0.000	0.000	5.000	0.000	5.000
Buffer	Canopy dieback	0.000	5.000	0.000	0.000	5.000	0.000	5.000
Buffer	Buffer	0.000	5.000	0.000	0.000	5.000	0.000	5.000
Buffer	Drains	5.000	5.000	0.000	0.000	5.000	0.000	5.000
Overall Mean Score		2.393	3.717	#DIV/0!	#DIV/0!	3.748	#DIV/0!	3.788
Maximum attainable Score		5.000	5.000	5.000	5.000	5.000	5.000	5.000
Wetland Condition (WEV score)		**0.479**	**0.743**	**0.000**	**0.000**	**0.750**	**0.000**	**0.758**

Note that there are no scores for the Wetland component for WEVi-I as the wetland after impact will no longer exist. There are no scores for the Wetland component for WEVm-C as Wetland HW3 and HW1 are so degraded as a result of drainage, grazing and the sowing of pasture grass, that they do not currently meet the criteria of a wetland under the NPS-FM.

Appendix E: Method of wetland assessment for offset calculations as developed by RMA Ecology Ltd and Auckland Council

See attachment.