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Ecological assessment

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Disclaimers and Limitations

This report (**'Report'**) has been prepared by WSP exclusively for Kainga Ora (**'Client'**) in relation to Due Diligence for 99-103 State Highway 1, Waikanae (**'Purpose'**) and in accordance with the Short form Agreement with the Client dated 25 February 2022. The findings in this Report are based on and are subject to the assumptions specified in the Report and the offer of Services dated 25 February 2022. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

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1 Introduction

1.1 Background

Thames Pacific currently propose to undertake residential development of up to 371 residential units at the site located at 99 and 103 State Highway 1, Waikanae (the site). The proposal will contain a mixture of standalone and terrace housing. The final subdivision plan is yet to be provided as the project is currently at the due diligence stage.

The proposal aims to add significantly to the development capacity in Waikanae, aiming to account for nearly 15% of the shortfall in housing demand. This will therefore reduce land demand pressure and increase housing supply and thus contribute to improved housing affordability over the longer term.

1.2 The Site

The site is located in Waikanae (Figure 1). The site contains the KO65 Ecological site under the Kapiti Coast District Council. The portion of the site that adjoins the road is located within an area that is known for ponding and contains two known stream corridors (Figure 2).

KO65 is defined in the district plan as Waikanae North Scrubland, an area of 6.85ha dominated by Kanuka-Manuka scrub, this is an area identified as significant under the District Plan.

The site itself is currently zoned Rural in the Operative Kapiti Coast District Plan (2020), although it has been identified as an area of expected residential development as identified in the *“Te Tupu Pai – Growing Well Community Consultation Document”* (the Draft Growth Strategy).



Figure 1: Site location (sourced from KCDC online maps).

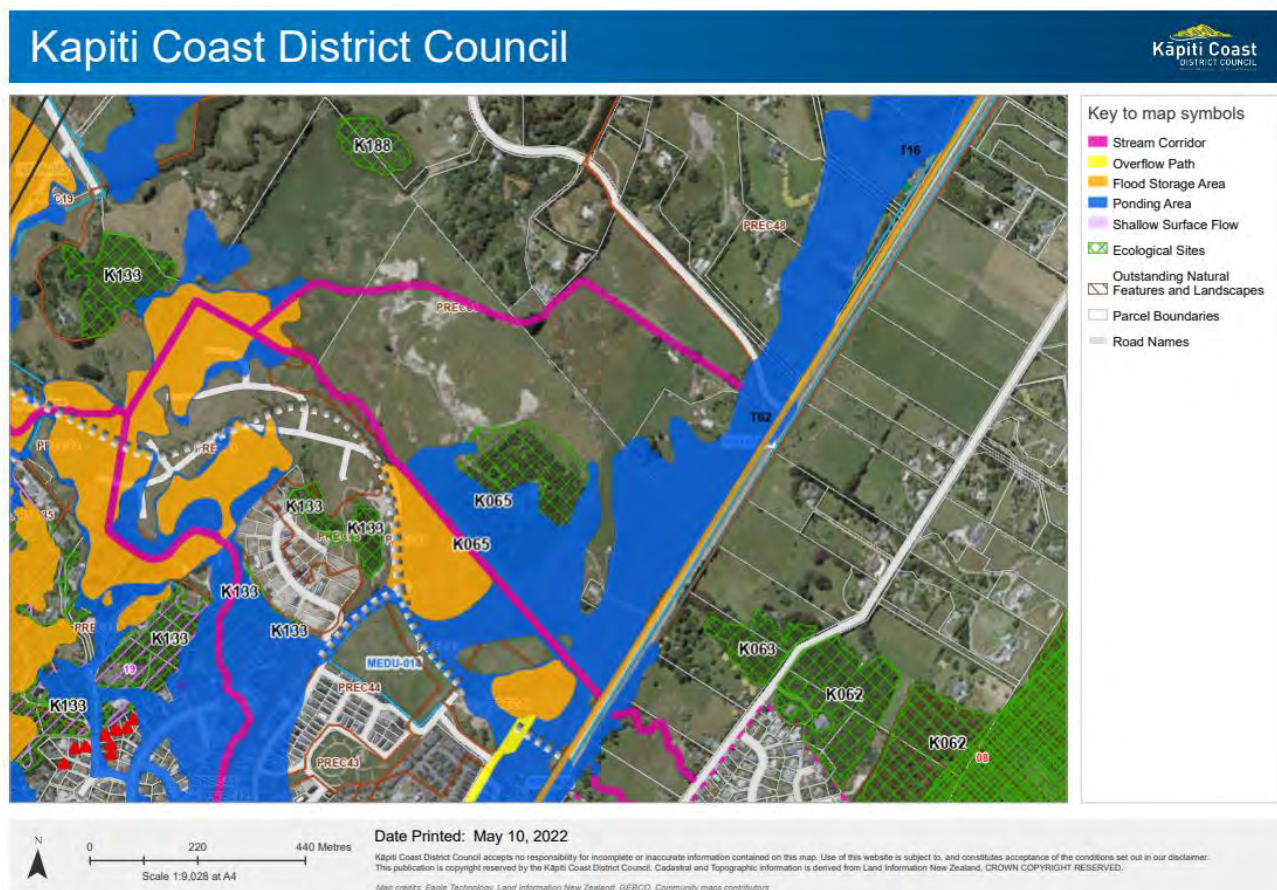


Figure 2: KCDC maps showing the site and its relevant features.

The land is currently characterised a rural pasture used for grazing, also supporting a stand of native bush. The Waimeha Stream runs through the site. This stream is scheduled under Schedule B of the Greater Wellington Regional Plan – Nga Taonga Nui a Kiwa.

1.3 Purpose and Scope

To respond to Kainga Ora's request to undertake a due diligence assessment for the proposed development of the site at 99-103 State Highway 1, Waikanae. The following scope of work is proposed:

- Desktop review of existing relevant ecological databases, reports and plans to provide details on vegetation, habitats and species present or potentially present within the site, including identification of protected or scheduled areas;
- Field investigation to confirm vegetation and habitat types present and undertake wetland delineation of areas that could potentially be wetland.
- Mapping of vegetation and habitats present; and
- Preparation of a report on findings.

The wetland delineation survey has been proposed due to the presence of what appears to be rush pasture within the site (based on review of aerial images and street view). Since the presence of "natural wetland", as defined by the National Policy Statement for Freshwater Management (2020), has significant implications for site development it is important to understand at an early stage if these are present.

1.4 Proposed Activity

The project proposes to create approximately 317 residential allotments, reserves and the associated infrastructure including roads, parking, three waters, and to ensure hydraulic neutrality is achieved as part of the development.

The project may involve the following activities:

- Subdividing land.
- Bulk earthworks that include discharges to land and water, stream reclamation, minor culverting and erosion and sediment control works.
- Earthworks and development within Flood Hazard areas.
- Construction of residential units.
- Developing open space, including remediation planting of the ecological site.
- Diverting and discharging stormwater run-off within 100m of a wetland.
- Constructing infrastructure for three waters services.
- Constructing roads, vehicle access and other transport infrastructure.

2 Methodology

2.1 Overall approach

The overall approach used to undertake the ecological impact assessment involved application of the *“Guidelines for undertaking Ecological Impact Assessments (EclA) published by the Environment Institute of Australia and New Zealand (EIANZ, 2018)”* using data and ecological information gathered by two primary methods:

- A desktop review of existing data and ecological information; and,
- Field survey conducted on 3rd of May.

2.2 Desktop assessment

The desktop assessment involved the following:

- Review of Kapiti District Council Operative District Planning Maps and Schedules;
- Review of Greater Wellington Regional Council Planning Maps;
- Search of the Department of Conservation’s BioWeb Herpetofauna database for relevant lizard records;
- Search of the Department of Conservations Bat Bioweb Database for relevant bat data;
- Search of the New Zealand Freshwater Fish Database (NZFFD) for relevant fish records (Crow, 2017); and,
- Search of site specific eBird data (Sullivan et al, 2009).

2.3 Field Survey

The field survey was undertaken on the 3rd of May and comprised of a team of the following ecologists:

- Melanya King (WSP Ecologist) delineating wetlands, assessing likely effects on vegetation, bats, lizards and birds.
- Amber Garnett (WSP Ecologist) assessing effects on aquatic ecology.

The field survey consisted of the following:

- Site walkover;
- Rapid habitat assessments undertaken at multiple sites for each of the waterways found onsite;
- Wetland delineation;
- Recording all bird species observed or heard;

- Assessment of habitats for their potential to support bats, and lizards; and
- General assessment of vegetation values.

The vegetation survey involved mapping and describing vegetation types and recording plant species present, as well as recording weed species presence.

The assessment of the site in regards to providing suitable habitat for bats and lizards was completed via a desktop study.

The freshwater assessment undertaken by Amber Garnett was a habitat-based assessment focussed on the multiple waterways present on site and considered effects of the proposed development, particularly the effects of proposed earthworks in close proximity to the stream.

Boundaries of potential wetlands found during the site walkover were delineated following the New Zealand Wetland Delineation Protocols (MfE, 2020). This involved using:

- the Vegetation Tool for Wetland Delineation in New Zealand (Clarkson, 2013) supported by the Dominance Test and Prevalence Index underpinned by the New Zealand wetland plant indicator status ratings for 2021 (Clarkson et al., 2021). The potential wetland area covered less than 2 ha so one representative plot was established in each major vegetation type. Two plots were established in total (Figure 3).
- Hydric Soils – Field Identification Guide (Fraser et al., 2018). Five test pits were dug, two around each of the vegetation plots.
- Wetland Delineation Hydrology Tool for Aotearoa New Zealand (MfE, 2021).

Given that this is a high-level due diligence study, and the ecological works were undertaken outside of the ecological survey season, no species-specific surveys were undertaken, and no detailed instream aquatic sampling has been undertaken at this time, this is likely to be recommended should this project go ahead.

2.4 EIANZ Guidelines Assessment of Effects Methodology

2.4.1 EIANZ Guidelines

Guidelines for undertaking Ecological Impact Assessments (EcIA) published by the Environment Institute of Australia and New Zealand (EIANZ, 2018) were used to aid assessing ecological impacts of the Project. The guidelines assist in assessing values and effects in a consistent and transparent way. However, sound professional judgement is still required when applying the framework and matrix approach recommended.

The approach involves assigning values for vegetation, habitats or species using the criteria in Table 1 and then assigning a magnitude of effects rating using the criteria in Table 2. An overall level of effects is then determined by combining the value of an ecological feature or attribute (Table 1) with the rating for the magnitude of effect (Table 2) using the matrix in Table 3.

Note, however that this is a high-level assessment undertaken in the absence of detailed survey information and a full proposal of works, therefore not all values and magnitudes can be fully assessed. Further survey information and detailed information on the proposed works and construction methodologies is required to complete this impact assessment. However the below recommendations outline required actions prior to works occurring.

2.4.2 Assessment of Ecological Values

Terrestrial Ecology

The first step of the EcIA guidelines approach requires ecological values to be assigned on a scale of 'Low', 'Moderate', 'High', or 'Very High' to each ecological feature (Table 1). Species were valued according to their conservation status; those 'At Risk' or 'Threatened' were valued at a higher level than those classified as 'Not Threatened'. Threat classifications have been sourced as follows: bats

(O'Donnell et al., 2018); birds (Robertson et al., 2021); herpetofauna (Hitchmough et al., 2021); aquatic fauna (Dunn et al., 2018; Grainger et al., 2018) and plants (de Lange et al., 2018).

Greater Wellington Regional Council Proposed Natural Resources Plan identifies significant ecological features and wetlands. They also have a policy framework to assess areas of high and outstanding natural character, or natural features and landscapes. These criteria have been used as the basis for assigning value to vegetation and habitat.

Table 1: Assignment of values to vegetation, habitats, and species (adapted from EIANZ, 2018)

Value	Species Value Requirements	Vegetation/Habitat Value Requirements
Very High	Nationally 'Threatened' species occur or expected to occur regularly within the Project footprint on a permanent or seasonal basis.	Meets the majority or all of the ecological criteria outlined in Regional Policy Statement for the Greater Wellington region (Policy 25).
High	Nationally 'At Risk' species occur or expected to occur on a permanent or seasonal basis.	Meets some of the ecological criteria outlined in the Regional Policy Statement for the Greater Wellington region (Policy 25).
Moderate	No Nationally 'Threatened' or 'At Risk' species occur, but locally uncommon or rare species, or keystone species (that are considered important for ecological integrity and function) present on a permanent or seasonal basis.	Habitat does not meet the ecological criteria outlined in the Regional Policy Statement for Greater Wellington region (Policy 25) but does provide locally important ecosystem services (e.g., erosion and sediment control, and landscape connectivity).
Low	No species present that are Nationally 'Threatened', 'At Risk', locally uncommon or rare, or considered keystone species.	Nationally or locally common habitat that does not provide locally important ecosystem services.
Negligible	Exotic species, including pests, and species with recreational values occur or are expected to occur within the project area either permanently or seasonally.	Limited ecological values other than as a local habitat.

Freshwater Ecology

Freshwater ecological values have been assessed against the EcIA guidelines for assigning value to freshwater ecosystems, supported by the National Rapid Habitat Assessment Protocol Development for Streams and Rivers (Clapcott, 2015). For the assessment criteria refer to Appendix B.

2.4.3 Magnitude of Effects

In determining a rating for the magnitude of effects on each ecological value consideration was given to the scale of habitat loss relative to the size of the available resource, duration of the effect, likely effect at population level with respect to individual species and degree to which the proposed development was likely to impact on the sustainability of the ecosystem and associated species. The magnitude of the effects is described as 'Negligible', 'Low', 'Moderate', 'High', or 'Very High' (Table 2). In assessing the magnitude of effects, standard best practice in terms of minimising effects and post construction restoration have been assumed to be part of the Project.

Table 2: Criteria for describing the magnitude of effects (EIANZ, 2018)

Magnitude	Description
Very high	Total loss of, or very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally change and may be lost from the site altogether; AND/OR loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR having a minor effect on the known population or range of the element/feature.

Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR having negligible effect on the known population.
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2.4.4 Overall Level of Effects

The last step in the effects assessment process was to determine the overall level of effect using the EIANZ matrix (Table 3).

Table 3: Criteria for describing the level of effects (EIANZ, 2018).

Magnitude	Ecological Value				
	Very High	High	Moderate	Low	Negligible
Very High	Very High	Very High	High	Moderate	Low
High	Very High	Very High	Moderate	Low	Very Low
Moderate	High	High	Moderate	Low	Very Low
Low	Moderate	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low
Positive	Net Gain	Net Gain	Net Gain	Net Gain	Net Gain

The level of effect or risk posed on ecological values ranges from Very High/High to Low level (signified by an effect of Low or Very Low in Table 3). Moderate level effects, or greater, typically require measures to avoid, remedy or mitigate effects, while Low to Very low effects levels are not normally of concern, although care may be required to minimise effects through design, construction, and operation.

3 Ecological Description

A site walkover was undertaken by Melanya King and Amber Garnett on the 3rd of May 2022. The following features were visually assessed:

- Potential wetland areas
- Waimeha Stream
- Unnamed tributary of the Waimeha Stream
- Highly modified waterways
- Existing vegetation
- Birds and lizards and suitable habitat for these fauna
- Bat habitat

Note due to the timing of this site walkover and the scope of this project no species-specific surveys or detailed aquatic studies were undertaken at this time.

The above features are described in the following sections of the report along with an assessment of their ecological value. Figure 3 (below) identifies the location of the key ecological features found to be within the site. This site appears to have been grazed for many years, although may have been recently retired, due to the recent change in ownership.

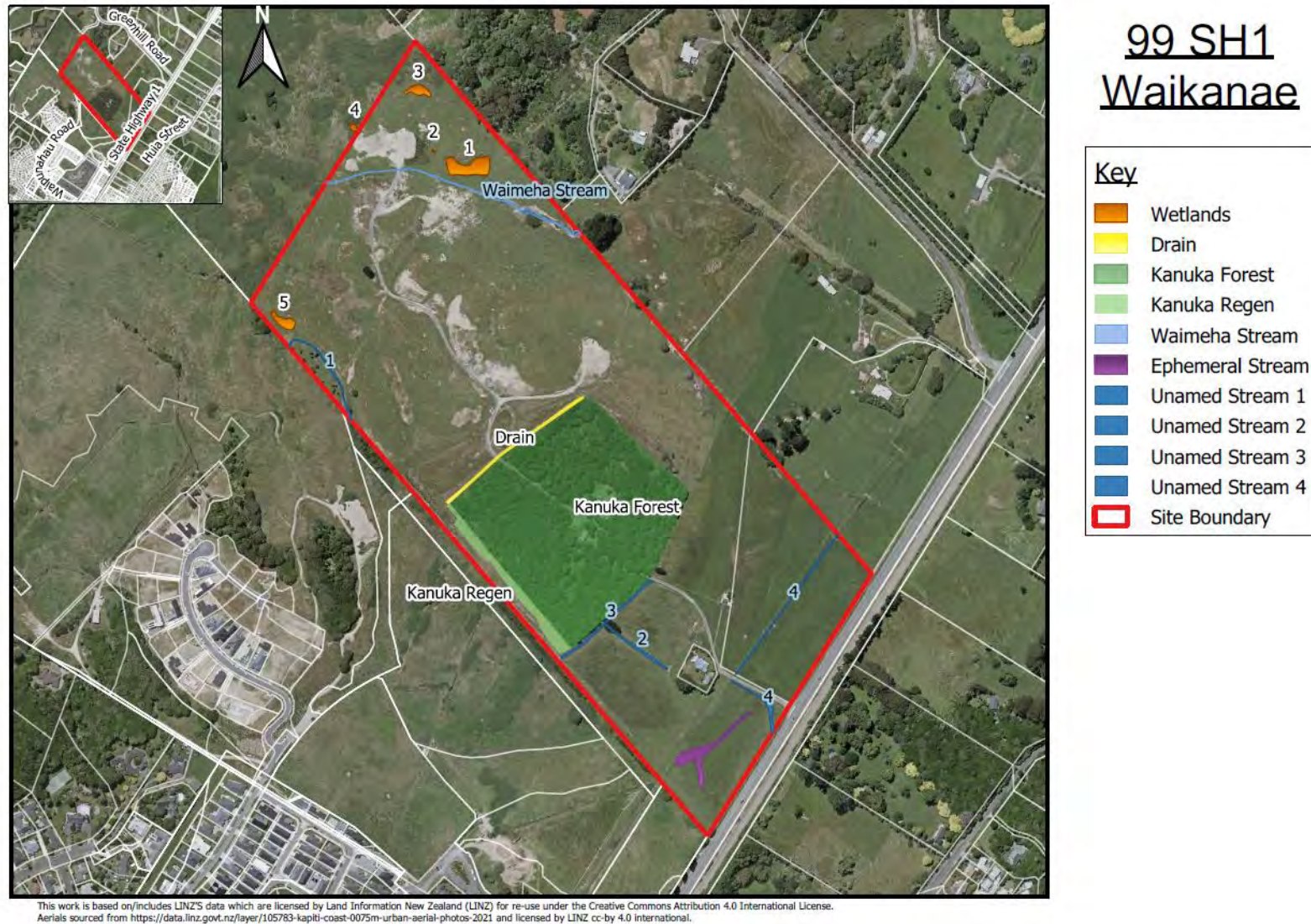


Figure 3: Identified environmental features of the site based on the site visit.

3.1 Vegetation

The vegetation of the site was dominated by grazed pasture species (Figure 4). The dominant species in the pastoral areas were multiple common pasture grass species, buttercup (*Ranunculus repens*), willow weed (*Persicaria maculosa*), curled dock (*Rumex crispus*), plantain (*Plantago lanceolata*), prickly sow thistle (*Sonchus asper*), white clover (*Trifolium repens*), blackberry (*Rubus fruticosus*).

Around the multiple waterways (discussed in later sections of this report) there were areas of *Carex* species, *Juncus* spp, *Isolepis* species and *Isolepis prolifera*.



Figure 4: Photos showing the dominant vegetation types present on the site.

Within the site there is a separate title containing an existing property, this house is surrounded by common garden species with a mix of natives. Species found in this area were: macrocarpa (*Cupressus macrocarpa*), kohuhu (*Pittosporum tenuifolium*), agapanthus (*Agapanthus praecox*), lemon tree (*Citrus limon*), blackwood (*Accacia melanoxylon*), lancewood (*Pseudopanax crassifolius*), manuka (*Leptospermum scoparium*), karaka (*Corynocarpus laevigatus*), puriri (*Vitex lucens*), karo (*Pittosporum crassifolium*), hebe (*Veronica stricta*), mahoe (*Melicytus ramiflorus*), these species were found in association with common lawn species and additional fruit and vege species.

The greater Wellington Regional Council (GWRC) mapping system identifies the vegetated block in the centre of the site (Figure 5) as:

- DoC Ecological Area (Waikanae North Shrubland),
- DoC Freshwater Ecosystem – Wetland (Regional Rank – 13)
- Threatened Indigenous Environment – 8.03ha.

GWRC Web Map



Figure 5: Known ecological features shown on GWRC mapping system.

The area identified in Figure 5 as Waikanae North Shrubland is an area dominated by mature kanuka forest, the areas to the west of the site are regenerating with young sapling kanuka (likely a case of kanuka re-invading the pasture due to a reduction in grazing pressure of the site (Figure 6a & c).

This area will not be significantly adversely affected by the proposal; however, a few incursions were undertaken to determine an approximate species list for this forest area (Table 4), note that this is not an exhaustive list and there are likely many other species within this kanuka forested habitat.

There are multiple mown tracks through the forest block, and some outbuildings within the block itself.

Table 4: Plant species found within the Kanuka Shrubland area and their associated threat status.

Common Name	Scientific Name	Threat Status
Kanuka	<i>Kunzea robusta</i>	Threatened – Nationally Vulnerable
Lancewood	<i>Pseudopanax crassifolius</i>	Not Threatened
Tawa	<i>Beilschmiedia tawa</i>	Not Threatened
Tree fern	<i>Dicksonia sp.</i>	Not Threatened
Umbrella sedge	<i>Cyperus ustulatus</i>	Not Threatened
Red matipo	<i>Myrsine australis</i>	Not Threatened
Mahoe	<i>Melicactus ramiflorus</i>	Not Threatened
5 Finger	<i>Pseudopanax arboreus</i>	Not Threatened

7 Finger	<i>Schefflera digitata</i>	Not Threatened
Kawakawa	<i>Piper excelsum</i>	Not Threatened
Wharangi	<i>Melicope ternate</i>	Not Threatened
Japanese aucuba	<i>Aucuba japonica</i>	Exotic
Kanono	<i>Coprosma autumnalis</i>	Not Threatened
Leather leaf fern	<i>Pyrosia elaeagnifolia</i>	Not Threatened
Buttercup	<i>Ranunculus repens</i>	Exotic
Bush lawyer	<i>Rubus cissoides</i>	Not Threatened
Arum lily	<i>Zantedeschia aethiopica</i>	Exotic
Hanging spleenwort	<i>Asplenium flaccidum</i>	Not Threatened
Small leaved pohuehue	<i>Muehlenbeckia complexa</i>	Not Threatened
lemonwood	<i>Pittosporum euginoides</i>	Not Threatened
Asplenium species	<i>Asplenium sp.</i>	
Totara	<i>Beilschmeideia tawa</i>	Not Threatened
Nightshade	<i>Solanum sp.</i>	Exotic
Ink weed	<i>Phytolacca octandra</i>	Exotic
Tradescantia	<i>Tradescantia fluminensis</i>	Exotic





Figure 6: Site photos of Kanuka Shrubland area. A: overview of the site, B: marginal vegetation, C: kanuka regeneration outside the fenced boundary, D-H: internal site photos showing understorey and tracks through the site.

The dominant species in this forested area is kanuka which is a Nationally Vulnerable species, therefore, this particular vegetated area is classed as having a high value ecological value. It is important to note that while Kanuka is classified as a Nationally Vulnerable species this is due to the threat it faces from Myrtle rust, there is currently no evidence that populations of this species are being significantly impacted by the disease within New Zealand. Furthermore, the species is a common species throughout New Zealand. Consequently this species has been assigned a low value for the purposes of this assessment. This forested area is also identified as significant under the district plan.

It was noted during the site visit that there was a very high rabbit/hare population on site, this has likely had a significant adverse effect on the existing vegetation and regeneration of the Kanuka Shrubland area itself.

The remainder of the vegetation on the site (the pastoral areas) is classed as having Low ecological value, due to the dominant vegetation species being pasture species with the occasional common native and exotic species.

3.2 Wetland determination

During the site walkover 5 potential wetland areas were identified in the back portion of the site (Figure 3). These wetland areas are described in detail below. None of the wetlands are fenced for stock exclusion.

It is important to note that the NPS-FM and NES-F 2020 are currently under review and the below wetland delineation is subject to change.

3.2.1 Wetland 1

This wetland is approximately 972m² and appears to dry up in the warmer months (Figure 7). This wetland has a palustrine hydrosystem due to its hydrology. Appendix A to this report provides the wetland delineation. This wetland is located in duneland, which is grazed as part of a managed farm. This wetland does not contain an area of open water.



Figure 7: Wetland 1.

Wetland vegetation was recorded in 2 different vegetation types within this wetland using 2x2m plots. The surrounding pasture was vegetated with common grass species. Table 5 identifies the species found in each of the vegetation plots.

Table 5: Species present in vegetation plots for Wetland 1

Plot	Common Name	Scientific Name
1	Broom rush	<i>Juncus sarophorus</i>
	Willow weed	<i>Persicaria maculosa</i>
	Ryegrass	<i>Lolium perenne</i>
	Buttercup	<i>Ranunculus repens</i>
2	Broom rush	<i>Juncus sarophorus</i>
	Buttercup	<i>Ranunculus repens</i>
	Ryegrass	<i>Lolium perenne</i>
	Plantain	<i>Plantago lanceolata</i>
	Budding club-rush	<i>Isolepis prolifera</i>

It is important to note that part of this wetland appeared to be dying and these areas are likely to dry up and disappear. A soil pit was dug at each plot looking for hydric soils Figure 8. Both pits were dug to approximately 30cm depth and contained organic soils.



Figure 8: Soil pits dug Wetland 1.

3.2.2 Wetland 2

This wetland is approximately 9m² and appears to dry up in the warmer months (Figure 9). This wetland also has a palustrine hydrosystem due to its hydrology. Appendix A to this report provides the wetland delineation. This wetland is located in duneland, which is grazed as part of a managed farm. This wetland does not contain an area of open water.



Figure 9: Wetland 2.

Wetland vegetation for this wetland was recorded using one 2x2m vegetation plot. The surrounding pasture was vegetated with common pasture grass species. Table 6 identifies the species found in the vegetation plot.

Table 6: Species present in vegetation plots for Wetland 2

Plot	Common Name	Scientific Name
1	Buttercup	<i>Ranunculus repens</i>
	Broom rush	<i>Juncus sarophorus</i>
	Willow weed	<i>Persicaria maculosa</i>
	Plantain	<i>Plantago lanceolata</i>

A soil pit was dug at the above plot looking for hydric soils Figure 10. This pit was dug to approximately 30cm depth and contained organic soils.



Figure 10: Soil pit dug for Wetland 2.

3.2.3 Wetland 3

This wetland is approximately 282m² and seems to be very similar to the two discussed above (Figure 11). Appendix A to this report provides the wetland delineation. This wetland is located in duneland, which is grazed as part of a managed farm. This wetland also does not contain an area of open water.



Figure 11: Wetland 3.

Wetland vegetation for this wetland was recorded using one 2x2m vegetation plot. The surrounding pasture was vegetated with common pasture grass species. Table 7 identifies the species found in the vegetation plot.

Table 7: Species present in vegetation plots for Wetland 3.

Plot	Common Name	Scientific Name
1	Willow weed	<i>Persicaria maculosa</i>
	Broom rush	<i>Juncus sarophorus</i>
	Buttercup	<i>Ranunculus repens</i>
	Marsh bedstraw	<i>Galium palustre</i>

A soil pit was dug at the above plot looking for hydric soils Figure 12. This pit was dug to approximately 30cm depth and contained organic soils.



Figure 12: Soil pit dug for Wetland 3.

3.2.4 Wetland 4

This wetland is located in a lowland area between two dunes (Figure 13), this wetland was full of dead/dying willow weed and is predominantly on the adjacent landowners' land. This wetland has a palustrine hydrosystem and is surrounded by pasture and blackberry. It is 91m² and is unfenced for stock exclusion.



Figure 13: Wetland 4.

Wetland vegetation for this wetland was assessed using a 2x2m vegetation plot. Table 8 identifies the species found in the vegetation plot.

Table 8: Species present in vegetation plots for Wetland 4.

Plot	Common Name	Scientific Name
1	Willow weed	<i>Persicaria maculosa</i>
	Marsh bedstraw	<i>Galium palustre</i>
	Broom rush	<i>Juncus sarophorus</i>

A soil pit was dug at the above plot looking for hydric soils Figure 14. This pit was dug to approximately 30cm depth and contained organic soils. Hydric soils were not found.



Figure 14: Soil pit dug for Wetland 4.

3.2.5 Wetland 5

This wetland is of a similar vegetation composition and overall condition as wetlands 1-3 described above. This wetland has a palustrine hydrosystem and is surrounded by pasture species (Figure 15). It is 335m² and is unfenced for stock exclusion.



Figure 15: Wetland 5.

Wetland vegetation was assessed using a 2x2m vegetation plot. Table 9 identifies the species found in the vegetation plot.

Table 9: Species present in vegetation plots for Wetland 3.

Plot	Common Name	Scientific Name
1	Broom rush	<i>Juncus sarophorus</i>
	Ryegrass	<i>Lolium perenne</i>
	Buttercup	<i>Ranunculus repens</i>
	Budding club-rush	<i>Isolepis prolifera</i>

A soil pit was dug at the above plot looking for hydric soils Figure 16. This pit was dug to approximately 30cm depth and contained organic soils. Hydric soils were not found.



Figure 16: Soil pit dug for Wetland 5.

3.2.6 Summary

The vegetation for all the plots discussed above was assessed under the Dominance Test and Prevalence Index. Table 10 identifies the results of the dominance and prevalence tests and gives an overall wetland pass or fail comment.

The overall wetland determination has been based on the MfE (2020) wetland delineation procedure (Appendix A). The overall wetland determination is presented below in Table 10. Noting that all 5 wetlands meet the criteria of being natural wetlands under the current guidance.

Table 10: The Dominance and Prevalence tests for all 5 wetlands on site.

Wetland	Dominance test %	Prevalence Test	Hydric Soil?	Wetland?
1 – Plot 1	100	2.06	No	Yes
1 – Plot 2	100	2.38	No	Yes
2	100	2.19	No	Yes
3	100	1.94	No	Yes
4	100	1.90	No	Yes
5	100	2.12	No	Yes

Note: The Dominance Test threshold is met if more than 50% of the dominants from all strata are OBL, FACW, or FAC (i.e., the plant community is considered hydrophytic and the Prevalence Index (B/A) threshold is met if ≤ 3 (i.e., the vegetation is considered hydrophytic).

3.3 Watercourses

There are five perennial watercourses within the site boundary. The Waimeha Stream and unnamed streams 1, 2, 3 and 4 (Figure 3). There is also an ephemeral flow path and a drain within the site boundary (refer to Figure 3). Unnamed streams 1, 2, 3 and 4 are all highly modified streams, discussed in more detail below.

3.3.1 Waimeha Stream

The Waimeha Stream flows through the site towards the righthand boundary (Figure 3). In accordance with GWRC's PNRP the Waimeha Stream has Schedule B - Ngā Taonga Nui a Kiwa value. The Waimeha Stream and all of its tributaries have Schedule FI value and are recognised as habitat for indigenous Threatened/ At Risk fish and as habitat for six or more migratory indigenous fish species. The Waimeha Stream is further recognised for inanga spawning (noting that the mapped inanga spawning habitat is outside of the property boundary).

A site visit was conducted on 3 May 2022. Rapid Habitat Assessments (RHA) were conducted at two locations (RHA site 6 and RHA site 7) on the Waimeha Stream, within the site boundary (Figure 17), in accordance with Clapcott (2015).



Figure 17: Locations of RHA along the Waimeha Stream within the property boundary (image sourced and modified from GWRC maps).

The Waimeha Stream was observed to be flowing and soft-bottomed across its length within the property boundary. There are two small single barrel culverts along the Waimeha Stream within the property boundary (Figure 17). There is very little in the way of riparian vegetation along the length of the stream. Surrounding vegetation was predominantly grazed pasture and soft rush (*Juncus effusus*). There was a large macrocarpa tree at RHA site 7. It was noted during the site visit that there are many rabbit holes along both banks of the Waimeha Stream within the property boundary. Figure 18 shows key features of the Waimeha Stream within the property boundary. A summary of the RHA conducted on the Waimeha Stream can be seen in Table 11. RHA 6 and RHA 7 scored 33 and 28, respectively.

Table 11: RHA on the Waimeha Stream within the property boundary.

Habitat parameter	RHA 6 Score	RHA 7 Score
Deposited sediment	6	7
Invertebrate habitat diversity	4	2
Invertebrate habitat abundance	3	2
Fish cover diversity	4	4
Fish cover abundance	4	4
Hydraulic heterogeneity	5	2
Bank erosion	3	2
Bank vegetation	2	2
Riparian width	1	1

Riparian shade	1	2
Total score (out of 100)	33	28
(Note: Each habitat parameter is scored on a scale of 1 to 10. A high score indicates better habitat condition)		

Table 12 (below) shows stream parameters measured on-site for both RHA sites along the Waimeha Stream. An initial assessment of the bankfull width and the current culvert size indicates that the culverts located within the Waimeha Stream are undersized and would not comply the NES-F (2020) regulations.

Table 12: Physical stream characteristics measured on site for the Waimeha Stream.

Physical parameter	Downstream Site - Waimeha Stream	Upstream Site - Waimeha Stream
Bankfull width	3.6 m	5 m
Wetted channel width	1.4 m	2.4 m



Figure 18: Photographs of the Waimeha Stream (WSP site visit, 3 May 2022).

3.3.2 Highly Modified Streams on site

Under GWRC PNRP multiple watercourses within the site boundary fall within the definition of a highly modified stream (GWRC, 2019). Figure 19 shows in purple all streams within the site area that have been mapped as a highly modified streams by GWRC. Blue indicates natural streams within the site boundary. Stream names and assigned names for unnamed tributaries of the Waimeha Stream have been added. Under the PNRP many watercourses that are considered to be drains are natural watercourses that have been highly modified, often over many decades, and includes channels dug to drain natural wetlands. All watercourses that were flowing at the time of the site visit (3 May 2022) were assessed. For reporting purposes all unnamed watercourses within the property boundary were assigned a number from 1-4. Locations of these streams within the property boundary is provided in the following sections summarising the ecological assessment at each site. Unnamed streams 1, 2, 3 and 4 are all highly modified and are discussed in more detail below.

Since all four of the Unnamed Streams are tributaries of the Waimeha Stream all have values under Schedule B - Ngā Taonga Nui a Kiwa of GWRC's PNRP. The Waimeha Stream and all of its tributaries also have Schedule F1 value and are recognised as habitat for indigenous Threatened/ At Risk fish and as habitat for six or more migratory indigenous fish species. The Waimeha Stream is further recognised for inanga spawning (noting that mapped inanga spawning habitat is outside of the property boundary).



Figure 19: Highly modified streams within the site boundary (GWRC, 2019),

3.3.3 Unnamed Stream 1

Unnamed Stream 1 (Figure 20) is a tributary of the Waimeha Stream that runs mostly through the neighbouring property on the left-hand side of the property boundary. There is a section of this stream, approximately 100m long, that flows through the property before entering the neighbouring property once more.



Figure 20: Location of RHA site 9 along the Unnamed Stream 1 within the property boundary (image sourced and modified from GWRC maps).

The Unnamed Stream 1 was observed to be flowing and hard bottomed on the neighbouring property. Observations of substrate within the property boundary were unable to be made due to the strong incision of the channel within the stretch of stream located in the property boundary. Stream features observed can be seen in Figure 21. There was little in the way riparian vegetation along the stream, some regenerative kanuka seedlings (*Kunzea ericoides*) and blackberry (*Rubus fruticosus*) could be seen along the banks. Within the channel there was watercress (*Nasturtium officinale*). Surrounding vegetation was predominantly grazed pasture. A RHA was conducted at one location (RHA site 8) on Unnamed Stream 1, within the site boundary (Table 13), in accordance with Clapcott (2015).

Table 13: RHA on the Unnamed Stream 1 within the property boundary.

Habitat parameter	Unnamed Stream 1 (RHA 8) Score
Deposited sediment	7
Invertebrate habitat diversity	4
Invertebrate habitat abundance	4
Fish cover diversity	6
Fish cover abundance	6

Hydraulic heterogeneity	6
Bank erosion	5
Bank vegetation	5
Riparian width	1
Riparian shade	1
Total score (out of 100)	45
Note: Each habitat parameter is scored on a scale of 1 to 10. A high score indicates better habitat condition)	

Table 14 identifies stream parameters measured for Unnamed Stream 1 within the property boundary.

Table 14: Physical stream characteristics measured on site for the Unnamed Stream 1.

Physical parameter	Unnamed Stream 1
Bankfull width	4.7 m
Wetted channel width	2.8 m
Depth	No depth was measured due to incised channel



Figure 21: Photographs of the Unnamed Stream 1 at RHA site 9 (WSP site visit, 3 May 2022).

3.3.4 Unnamed Streams 2 and 3

Unnamed Streams 2 and 3 (refer to Figure 22) are highly modified watercourses in accordance with the GWRC highly modified streams classification for the area (Figure 19).

A site visit was conducted on 3 May 2022. Rapid Habitat Assessments (RHA) were conducted at one location on Unnamed Stream 2, within the site boundary (Figure 22), in accordance with Clapcott (2015). Unnamed Streams 2 and 3 enter Unnamed Stream 1 just outside of the property boundary.



Figure 22: Location of RHA site along the Unnamed Stream 2 and 3 within the property boundary (image sourced and modified from GWRC maps).

The Unnamed Streams 2 and 3 were heavily vegetated in budding club-rush (*Isolepis prolifera*), as such observations of substrate within the stream were unable to be made but it has been assumed that Unnamed Streams 2 and 3 are soft bottomed. Flow was relatively stagnant in Unnamed Streams 2 and 3, as a result of the high proportion of aquatic vegetation within the channel. There was little in the way riparian vegetation along Unnamed Stream 2, some regenerative kanuka seedlings (*Kunzea ericoides*) could be seen along the bank and there was a small row of pine trees (*Pinus radiata*) on the true right. Unnamed Stream 3 bordered the bush block (discussed above). Surrounding vegetation to both streams was predominantly grazed pasture. There was clear evidence of stock access to the stream channel on the right-hand bank of Unnamed Stream 2 which showed pugging and erosion of the channel into the stream. A summary of the RHA conducted on the Unnamed Streams 2 is provided in Table 15.

Table 15: RHA on the Unnamed Stream 2 within the property boundary.

Habitat parameter	Unnamed Stream 2 (RHA 5) Score
Deposited sediment	1
Invertebrate habitat diversity	1
Invertebrate habitat abundance	1
Fish cover diversity	1
Fish cover abundance	1
Hydraulic heterogeneity	1
Bank erosion	2.5
Bank vegetation	1
Riparian width	1
Riparian shade	1

Total score (out of 100)	11.5
Note: Each habitat parameter is scored on a scale of 1 to 10. A high score indicates better habitat condition)	

There are three small single barrel culverts and crossings along the Unnamed Stream 3 (no culverts on Unnamed Stream 2 were identified) (Figure 22). Stream features can be seen in Figure 23. Physical stream characteristics are shown in Table 16 for the Unnamed Stream 2 where the RHA assessment was conducted. An initial assessment of the bank full width and the current culvert size indicates that the culverts located within the Unnamed Stream 3 are undersized and would not comply with the NES-F (2020) regulations. All culverts on Unnamed Stream 3 were heavily congested with weeds.

Table 16: Physical stream characteristics measured on site for the Unnamed Stream 2.

Physical parameter	Unnamed Stream 2
Bankfull width	3.3 m
Wetted channel width	1.3 m
Depth	13 cm



Figure 23: Photographs of the Unnamed Stream 2 and 3 (WSP site visit, 3 May 2022).

3.3.5 Unnamed Stream 4

Unnamed Stream 4 (refer to Figure 24) is a highly modified watercourse according to the GWRC highly modified streams classification for the area (Figure 19).

A site visit was conducted on 3 May 2022. A RHA was conducted at four locations on Unnamed Stream 4, within the site boundary (Figure 24), in accordance with Clapcott (2015).



Figure 24: Locations of RHA along the Unnamed Stream 4 within the property boundary (image sourced and modified from GWRC maps).

Unnamed Stream 4 enters the property boundary through a culvert underneath the Old SH1 (culvert 9). Where it enters the property, it is hard bottomed with visible gravel substrate within the wetted channel. There is a twin barrel culvert (culvert 8) that conveys flow beneath the main driveway to the property (noting there are also buried cables at this location). Further downstream there are another two single barrel culverts (culverts 7 and 6). Riparian vegetation along the length of Unnamed Stream 4 includes soft rush (*Juncus effusus*), common duck weed (*Lemna minor*) and grazed pasture. Stream features observed on-site can be seen in Figure 25. A summary of the RHA conducted on the Unnamed Stream 4 can be seen in

Table 17. The sites scored 24, 12.5 and 17, respectively.

Table 17: RHA on the Unnamed Stream 4 within the property boundary.

Habitat parameter	RHA 1 Score	RHA 3 Score	RHA 3 Score	RHA 4 Score
Deposited sediment	3	1	3	9
Invertebrate habitat diversity	2	1	2	1
Invertebrate habitat abundance	1	1	1	1
Fish cover diversity	2	2	3	2
Fish cover abundance	2	1	2	1
Hydraulic heterogeneity	2	1	2	1
Bank erosion	7	1	1	2
Bank vegetation	3	2.5	1	1
Riparian width	1	1	1	1
Riparian shade	1	1	1	1
Total score (out of 100)	24	12.5	17	20
Note: Each habitat parameter scored on a scale of 1 to 10. A high score indicates better habitat condition)				

Table 18 shows stream parameters measured on-site for all sites along the Unnamed Stream 4. An initial assessment of the bankfull widths and the current culvert sizes indicates that the culverts located within the Unnamed Stream 4 are undersized and would not comply the NES-F (2020) regulations.

Table 18: Physical stream characteristics measured on site for the Unnamed Stream 4.

Physical parameter	RHA 1	RHA 2	RHA 3
Bankfull width	3 m	2.3 m	2.7 m
Wetted channel width	1.1 m	0.8 m	1 m
Depth	20 cm	13 cm	18 cm

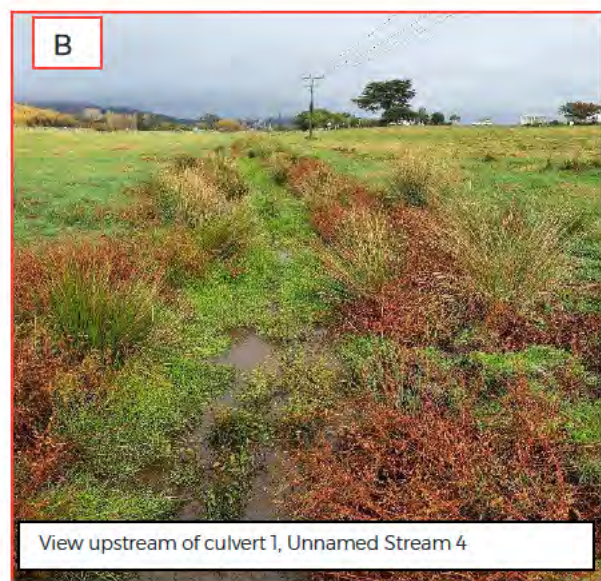


Figure 25: Photographs of the Unnamed Stream 4 (WSP site visit, 3 May 2022)

3.3.6 Ephemeral Flow Paths

There is an ephemeral flow path within the site boundary (refer to Figure 3). At the time of the site visit on 3 May 2022 there was no water within the channel. Substrate was mostly grazed pasture with some willow weed (*Polygonum persicaria*) present.

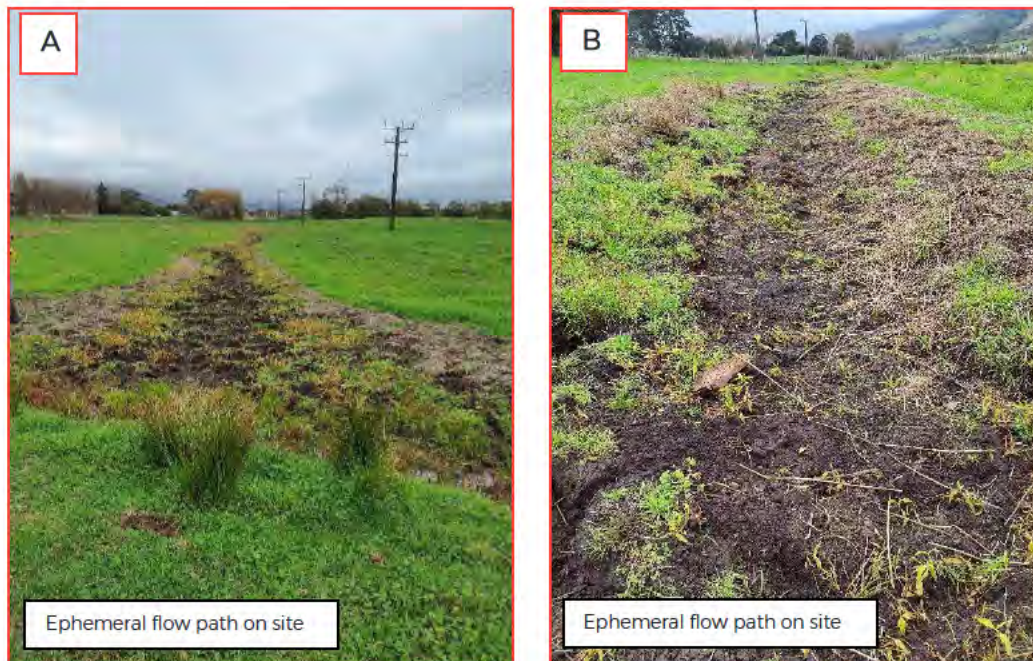


Figure 26: Photographs of the ephemeral flow paths (WSP site visit 3 May 2022).

3.3.7 Drain

There appeared to be a drain running parallel with the bush block on the property (Figure 27). Access was hindered by vegetation growth, but the waterway is not mapped as a highly modified stream according to GWRC PNRP. There appeared to be a perched culvert that ran underneath the gravel access track through the bush block.



Figure 27: Photographs of a drain on-site (WSP site visit, 3 May 2022).

3.3.8 Aquatic fauna

A fish survey was not undertaken as part of this ecological due diligence report. The Waimeha Stream could not be located in the Freshwater Fish Database. However, under Schedule F1 of the PNRP and in an ecological impact assessment conducted by Boffa Miskell, the following species were listed as present in the Waimeha Stream (Table 19) (GWRC, 2019; Park, 2012). Several, 'At-Risk Declining' species have been observed in the Waimeha Stream and as such the ecological value of the Waimeha Stream and its tributaries is considered high despite the currently degraded nature of the streams within the site (as reflected in the RHA scores).

Table 19: Freshwater fish species observed in the Waimeha Stream (Source: GWRC, 2019; Park, 2012)

Scientific name	Common name	Threat classification	Species value
<i>Anguilla dieffenbachii</i>	Longfin eel	At-Risk-Declining	High
<i>Galaxias maculatus</i>	Īnanga	At Risk-Declining	High
<i>Anguilla australis</i>	Shortfin eel	Not Threatened	Low
<i>Gobiomorphus cotidianus</i>	Common bully	Not Threatened	Low
<i>Gobiomorphus huttoni</i>	Redfin bully	Not Threatened	Low
<i>Gobiomorphus gobioides</i>	Giant bully	At Risk - Naturally Uncommon	Moderate
<i>Galaxias fasciatus</i>	Banded kōkopu	Not Threatened	Low
<i>Gobiomorphus basalis</i>	Cran's bully	Not Threatened	Low
<i>Galaxias argenteus</i>	Giant kōkopu	At Risk-Declining	High

No fish records could be found for the unnamed streams within the property boundary.

Low invertebrate diversity and abundance within the Waimeha Stream mouth has been reported and invertebrates within the Waimeha Stream are dominated by non-sensitive invertebrate species (Park, 2012).

3.4 Bats

A review of the Bioweb Bat Database shows records for long-tailed bat (*Chalinolobus tuberculatus*) approximately 11km west of the site on Kapiti Island. The long-tailed bat is considered a Very High value species based on its threat classification which is 'Threatened-Nationally Critical'. Bats are absolutely protected from killing and injury under the Wildlife Act 1953.

Long-tailed bats roost in cavities in mature trees and forage small insects around forest edges and over wetlands and pasture. The site supports these habitats and it is therefore possible that long-tailed bats use this site, particularly given their confirmed presence only 11km away. An acoustic survey would be required to confirm the level of use of the site by this species.

3.5 Birds

During the site visit the following species were noted as present on the site:

- Pukeko
- Eastern Rosella
- Paradise duck

- Magpie
- Fantail
- Harrier hawk

No 'At Risk' or 'Threatened' bird species were recorded during the site visit. The bird fauna are common species typical of a semi urban/rural landscape.

The area is likely to provide habitat for other common native and introduced bird species not observed during the survey. It is possible that Waikanae as a whole supports At Risk or Threatened bird species however it is unlikely that the project site provides important habitat for any of these species.

There are no site-specific records found on eBird for the site. The closest records are those of the Nga Manu Nature Reserve (Table 20). It is possible that some of these birds may be found within the site itself due to its proximity to Nga Manu and the existing kanuka shrubland habitat on site. Note that most indigenous birds are absolutely protected from killing and injury under the Wildlife Act 1953.

Table 20: Birds identified on eBird¹ for the Nga Manu Nature Reserve and their conservation status:

Latin Name	Common Name	Status
<i>Cygnus atratus</i>	Black Swan	Not Threatened
<i>Tadorna variegata</i>	Paradise Duck	Not Threatened
<i>Anas platyrhynchos</i>	Mallard	Introduced and Naturalised
<i>Anas gracilis</i>	Grey Teal	Not Threatened
<i>Callipepla californica</i>	California Quail	Introduced and Naturalised
<i>Hemiphaga novaeseelandiae</i>	New Zealand Pigeon	Not Threatened
<i>Porphyrio melanotus</i>	Pukeko	Not Threatened
<i>Larus dominicanus</i>	Southern Black-backed Gull	Not Threatened
<i>Prosthemadera novaeseelandiae</i>	Tui	Not Threatened
<i>Gerygone igata</i>	Grey Warbler	Not Threatened
<i>Rhipidura fuliginosa</i>	New Zealand Fantail	Not Threatened
<i>Hirundo neoxena</i>	Welcome Swallow	Not Threatened
<i>Zosterops lateralis</i>	Silvereye	Not Threatened
<i>Sturnus vulgaris</i>	Common Starling	Introduced and Naturalised
<i>Turdus merula</i>	Eurasian Blackbird	Introduced and Naturalised
<i>Passer domesticus</i>	House Sparrow	Introduced and Naturalised
<i>Chloris chloris</i>	European Greenfinch	Introduced and Naturalised

¹ eBird. 2021. eBird: An online database of bird distribution and abundance New Zealand Scaup[web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: <http://www.ebird.org>. (Accessed: Date: 18/05/2022 [https://ebird.org/hotspot/L2305893])