



Memorandum

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Date: 13 May 2026
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Message Ref: Summary of Cannon Point Stage 3 ecological knowledge for Fast Track Referral Application
Project No: BM260093

Introduction

This referral document provides a high-level ecological overview to support the FTAA referral application of Stage 3 of the Cannon Point development near Tōtara Park, Upper Hutt. It summarises the ecological features known or anticipated within the Stage 3 area, drawing directly on the detailed ecological baseline established in the Stage 1 & 2 Ecological Impact Assessment (EclA) (Appendix 2), and supplements that information with the targeted survey work currently underway to provide a site-specific EclA for a future Substantive Application made under FTAA 2024.

Stage 3 occupies the western portion of the wider Cannon Point site and comprises earthworks, access formation, and residential lot development of a similar scale and nature to what has already been assessed, consented, and built in Stages 1 and 2. Because the ecological patterns and habitat types extend consistently across the property, the Stage 1 & 2 EclA provides a reliable basis for understanding ecological values and potential effects in Stage 3.

The purpose of this referral document is to:

- Summarise the ecological context and habitats present within Stage 3.
- Compare these values to those already documented for Stages 1 and 2, which are considered to have relevance given the relatively short timeframes and lack of any land use changes since the Stage 1 and 2 assessment.
- Identify the likely level of ecological effects associated with the Stage 3 works.
- Outline the ongoing surveys and management approaches that will be used to confirm and address any potential ecological effects.

This referral document is not a full Ecological Impact Assessment. A comprehensive EclA, including detailed analysis and any required management plans, will be prepared to support the substantive resource consent application once the final Stage 3 design and updated field survey results are available.

Targeted ecological fieldwork is currently underway in Stage 3, including:

- Deployment of lizard survey equipment (artificial refugia, cameras, pitfall traps) – survey completion by end of April 2026.
- Deployment of bat acoustic recorders to confirm the expected absence – survey completion by end of April 2026.
- Updated wetland delineation to verify whether extents have changed from earlier mapping – targeting completion April/May 2026.
- Collection of incidental avifauna observations during all field visits.

These results will be incorporated into the full EclA, but their ongoing status is noted here as part of the project's proactive ecological due diligence.

Overall, this referral document provides a concise and effects-focused summary demonstrating that ecological values and potential effects in Stage 3 are well understood, predictable, and manageable, based on the substantial prior work undertaken across the site and the continued refinement of site-specific data. This referral document has been supported by a general site walkover when deploying the lizard and bat survey gear on 6 March 2026 to confirm the ecological features and values mapped as part of the early scoping work relating to Stage 1 and 2 (which included high level survey of Stage 3) remain representative of the current condition and features.

Project and Site Overview

Project Description

Stage 3 of the Cannon Point development forms the westernmost portion of the wider subdivision near Tōtara Park, Upper Hutt (Figure 1). Stages 1 and 2 (combined 2.4 ha) involved construction of the main access road and residential lots; Stage 3 (3.5 ha) comprises additional earthworks, platform formation, and associated infrastructure across the remaining upper terrace and hillside land.

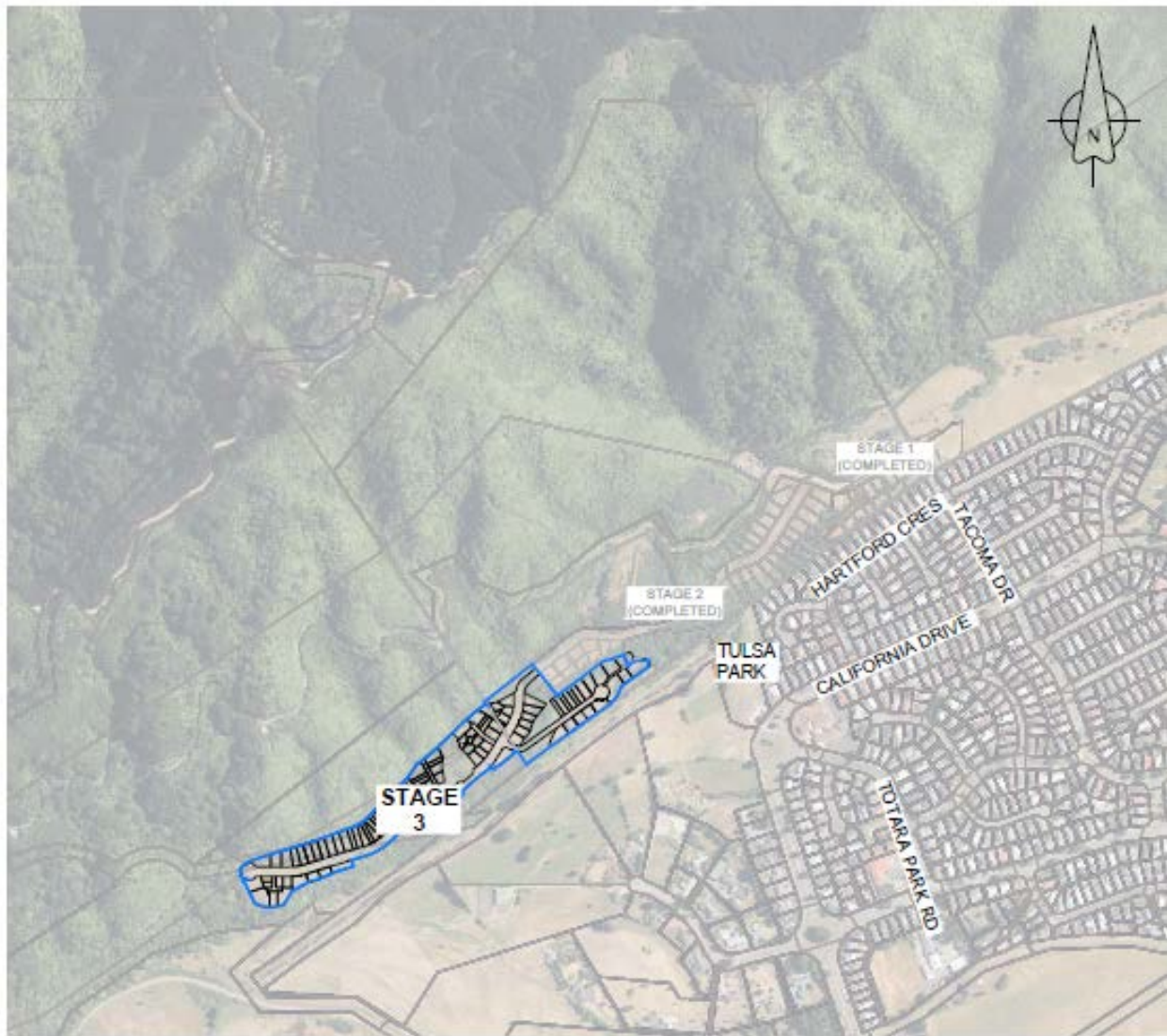


Figure 1: Location and extent of Stage 3 in relation to Stage 1 and 2.

The nature and scale of works in Stage 3 are broadly consistent with those already undertaken, involving vegetation clearance, earthworks, access formation, and localised modification of existing tracks or slopes. Because the ecological setting, landforms, and habitat types in Stage 3 match those previously assessed, the Stage 1 & 2 Ecological Impact Assessment provides the primary ecological baseline for this stage.

Across the wider site, the earlier EcIA identified pasture, early-seral māhoe–tree fern forest, and mixed native–exotic scrub, along with three small non-significant tributary streams with no fish populations due to downstream barriers. Stage 3 occupies the same landscape context and is therefore expected to support similar ecological assemblages and values. Ongoing targeted surveys (wetland re-mapping, lizard and bat monitoring) will confirm localised details ahead of the full Stage 3 effects assessment.

Site Context and Landscape Setting

The Cannon Point property is located on an elevated river terrace system along the northwestern edge of Tōtara Park in the Upper Hutt Valley. The site sits within the Wellington Ecological District, a landscape historically characterised by podocarp–broadleaf forest but now largely modified through agriculture, grazing, and residential development.

The Stage 3 area comprises a mix of pasture, regenerating scrub, and steep escarpment margins typical of this part of the western Hutt Valley hills. As described in the Stage 1 & 2 EcIA, regenerating forest and scrub

communities on the site form part of a much larger (>700 ha) area of early-seral broadleaf forest on the surrounding hill slopes. These communities provide moderate ecological value but are common and widespread in the Ecological District.

Small wetlands have previously been identified on the mid-terrace in Stages 1 and 2. These were shown to be induced features resulting from historic track construction and altered drainage patterns and were assessed as low-value systems with simple vegetation structure and limited ecological function. Similar small-scale wetland features occur in Stage 3, and updated delineation work is planned to confirm their extent.

Several small tributaries to the Hutt River originate or pass through the development area. As documented in the Stage 1 & 2 assessment, these streams exhibit variable shading, macrophyte dominance in lower reaches, and moderate to low habitat quality, with no fish observed during electrofishing and spotlighting surveys. Stage 3 occupies the same catchment context and is expected to interact with comparable stream types.

A range of common native and exotic birds utilise the wider site, with occasional observations of At-Risk species such as pipit and Threatened species such as New Zealand falcon during Stage 1 & 2 surveys, though no high-value habitat for these species exists within the development footprint. Lizard habitat is present in localised scrub margins and boulder fields identified across the broader site, and surveys have assumed that species recorded nearby, including northern grass skink, copper skink, and raukawa gecko, may be present wherever suitable microhabitats occur.

Overall, Stage 3 sits within a well-defined and previously assessed ecological environment, with predictable vegetation communities, fauna assemblages, and freshwater features already characterised through earlier work.

Relationship to Stages 1 & 2

The ecological patterns and values identified in Stages 1 and 2 extend naturally into the Stage 3 area. The same vegetation communities, stream systems, and fauna habitat types occur across all three stages (see Map in Appendix 1). Because the earlier EclA (see Appendix 2 for the Stage 1&2 EclA) established a robust baseline for the entire property, and because Stage 3 does not introduce new ecosystem types or higher-value habitats, effects anticipated for Stage 3 fall within the same Very Low to Low range already assessed for Stages 1 and 2.

In particular:

- **Vegetation:** Stage 3 vegetation is consistent with the pasture, māhoe/tree fern forest margins, and mixed seral scrub already assessed in detail in earlier stages.
- **Wetlands:** Any wetlands in Stage 3 are expected to be similar to low-value induced features to those previously mapped.
- **Streams:** Stage 3 waterways form part of the same small tributary system, with similar ecological conditions and no fish presence recorded elsewhere.
- **Fauna:** Lizard, bird, and invertebrate fauna expected in Stage 3 match those documented in Stages 1 & 2; no new taxa of conservation concern are anticipated.

Stage 3, therefore, builds directly on a strong ecological understanding developed through the Stage 1 & 2 EclA, supplemented by targeted surveys currently underway to confirm localised habitat use and refine final impact assessments.

Summary of Ecological Values in Stage 3

The ecological values expected within the Stage 3 area can be reliably inferred from the comprehensive assessments undertaken for Stages 1 and 2, supplemented by initial walkovers and early deployment of

ecological survey equipment. The Stage 1 & 2 EcIA established a strong ecological baseline for the entire Cannon Point property, and the Stage 3 landscape exhibits the same vegetation types, hydrological features, and fauna habitats identified previously. No new habitat types, sensitive communities, or higher-value ecosystems are expected within the Stage 3 footprint but will be confirmed by ongoing fieldwork.

Below, the values documented for Stages 1 and 2 are summarised, followed by a description of values within Stage 3.

Vegetation

Stage 1 & 2 Baseline

Three main vegetation communities were mapped (Appendix 1):

- **Exotic pasture (Community A)** — Negligible ecological value. Dominated by exotic grasses and common weeds.
- **Regenerating māhoe–tree fern forest (Community B)** — Moderate ecological value; considered ecologically significant under Policy 23 for representativeness, although structure and diversity were limited.
- **Mixed native/exotic scrub (Community C)** — Low ecological value; highly modified with strong weed incursion and lacking structural integrity.

No old-growth forest, rare plant assemblages, or high-value understory communities were identified anywhere within the Stage 1 and 2 footprint.

Stage 3 Values

Stage 3 contains the same broad vegetation pattern, with large areas of exotic pasture interspersed with edges of regenerating scrub and forest (Appendix 1). The upper margins of Stage 3 include steep faces similar to those of Community C, with patchy māhoe, occasional native saplings, and extensive areas of gorse, blackberry, cherry, and *Tradescantia*. No indicators of higher ecological value, such as mature podocarp species, intact understory, or rare plant records, have been observed to date.

Accordingly, vegetation values in Stage 3 are expected to range from **Negligible (pasture)** to **Low (scrub)**, with possible **localised Moderate values** where the margins of regenerating forest extend into the Stage 3 development envelope.

Wetlands

Stage 1 & 2 Baseline

Wetlands were assessed using Clarkson/MfE prevalence, dominance, and pasture tests. Two wetland 'areas' met the NRP definition of "natural wetland" (Appendix 1), though these were anthropogenically induced and of Low ecological value, characterised by simple sedgeland, rushland, or buttercup-dominated vegetation and minimal ecological diversity.

Wetland areas were small, geographically isolated on terrace surfaces, and lacked hydrological features typical of natural alluvial wetlands.

Stage 3 Values

Preliminary inspections indicate that Stage 3 contains a similar small, drainage-induced wet area associated with historic track formation or impeded flow paths (Appendix 1). As in Stages 1 and 2, this feature is expected to be:

- Small in size,
- Structurally simple,

- Of **Low ecological value**, and
- ecological effects can be readily managed using the effects management hierarchy.

Accurate wetland delineation (pending) will confirm the extent and status of potential wetlands.

Freshwater Streams

Stage 1 & 2 Baseline

Three small streams (A, B, and C) were assessed. Key characteristics included:

- Moderate habitat quality in upper shaded reaches; Low to Very Low quality in lower macrophyte-dominated reaches.
- No fish species detected despite using electrofishing and spotlighting, due to downstream barriers.
- Macroinvertebrate communities are expected to be depauperate relative to high-quality local reference streams.
- Streams not listed as significant waterways under the NRP.

Stage 3 Values

Stream segments in Stage 3 (Appendix 1) are part of the same headwater system feeding into Te Awa Kairangi/Hutt River and are expected to hold **Moderate value in upper forested reaches** and **Low value in pasture-dominated lower reaches**. No fish passage or high-value freshwater habitat is anticipated. Effects in Stage 3 can be assessed using the same ecological value framework and management approach applied in earlier stages.

Avifauna

Stage 1 & 2 Baseline

A mix of common native and exotic birds was recorded, including pipit (At Risk – Declining), and New Zealand falcon (Threatened – Nationally Increasing) during the Stage 1 and 2 assessment. These species may occasionally visit the Stage 3 site. North Island rifleman (At Risk Declining) and long-tailed cuckoo (Threatened-Nationally Vulnerable) have also been observed to the north of the proposed Stage 3 footprint. However:

- No high-value habitat (old forest, wetlands, large riparian corridors) exists onsite.
- All species present are mobile and able to utilise the extensive habitat surrounding the site.

Stage 3 Values

Given similar vegetation patterns and the absence of new high-value habitat features, the avifauna community in Stage 3 is expected to be the same as that documented previously, dominated by common native species with occasional use by At-Risk or Threatened birds in low numbers. No sensitive nesting or foraging habitats are expected within the Stage 3 footprint.

Incidental observations collected during ongoing fieldwork will inform the ecological value of nesting and foraging habitats.

Herpetofauna (Lizards)

Stage 1 & 2 Baseline

Suitable habitat exists in forest margins, boulder fields, and scrub margins for species such as northern grass skink, copper skink, raukawa gecko, and potentially At-Risk arboreal geckos (ngahere gecko, barking gecko). Presence in Stages 1 and 2 was assumed due to habitat availability.

Stage 3 Values

Stage 3 contains similar microhabitats (scrub margins, rock piles, and occasional logs) and could support the same suite of species.

Lizard survey equipment deployed across Stage 3 will confirm the presence/absence of skinks and geckos. The survey equipment/methodology includes ACOs, tracking tunnels, Critterpics, Gee Minnow trapping, manual searching and spotlighting.

Based on habitat character, ecological values are expected to be **Low to Moderate**, with any At-Risk species likely at very low densities due to the landscape's disturbance and lack of intact shrubland or forest.

Bats

Stage 1 & 2 Baseline

Bats were considered highly unlikely to be present due to the absence of large cavity-bearing trees and no regional records in recent decades.

Stage 3 Values

The same landscape constraints apply. Acoustic recorders have been deployed to verify bat presence/absence. Ecological value for bats is anticipated to be **Negligible**.

Assessment of Ecological Effects

The ecological effects anticipated from the Stage 3 works are expected to be **Very Low to Low**, consistent with the outcomes assessed and confirmed for Stages 1 and 2. Because Stage 3 contains the same vegetation types, stream systems, and fauna habitats already characterised across the site, and there are no new or higher-value ecological features, the effects are predictable, well understood, and readily managed through standard construction practices and the project-shaping measures already applied in earlier stages.

However, as demonstrated above, we are providing comprehensive ecological assessments for all ecological aspects, to ensure any assumptions from Stage 1 and 2 are tested.

The assessment below is aligned with the EIANZ (2018) ecological impact assessment framework used in the Stage 1 & 2 EclA, considering both **ecological value** and **magnitude of effect**.

Vegetation Clearance

Stage 3 vegetation comprises predominantly **pasture (negligible value)** and **scrub margins (low value)**, with potential minor encroachment into the outer edges of **regenerating forest (moderate value)**. These vegetation types match those already assessed in Stages 1 & 2, where small-scale clearance of common seral vegetation was found to have a **Negligible magnitude** and a **Very Low overall level of effect**.

Because vegetation clearance in Stage 3 is small in area, affects common habitat types, and represents a negligible proportion of the broader vegetation community available across the adjacent hills (>700 ha of similar regenerating forest remains), the magnitude of effect is expected to be **Negligible**.

Overall Level of Effect: Very Low.

Effects on Wetlands

An induced wetland feature, similar to those in Stages 1 & 2 (all assessed as **Low ecological value**), is present in Stage 3. In earlier stages, avoidance of natural wetlands was successfully achieved through project shaping, with any potential hydrological effects assessed as **Negligible to Low magnitude**, depending on scale and likelihood of accidental drainage events.

Updated delineation is underway to confirm extents; however, given:

- The small scale of the wetlands previously identified

- Their anthropogenic origin
- The low ecological value assigned to such features.
- The ability to readily adopt the effects management hierarchy if direct and/or indirect effects are identified

Effects on wetlands in Stage 3 are expected to be **Negligible to Low magnitude**.

Overall Level of Effect: Very Low to Low, depending on the degree and type of indirect and/or direct effects.

With standard buffers, ESC controls, and adoption of the effects management hierarchy, effects will sit at the **Very Low** end.

Effects on Freshwater Streams

Streams within Stage 3 are expected to mirror those assessed previously, small tributaries with **Moderate value in upper reaches** and **Low value in lower, macrophyte-dominated sections**. Stage 1 & 2 surveys confirmed:

- Absence of fish populations
- Limited macroinvertebrate diversity
- Overall low ecological value in pasture sections.

Any Stage 3 works involve either:

- Complete avoidance of streambeds, or
- Minor localised disturbance associated with access formation or bank stabilisation.

Where similar disturbances occurred in Stages 1 & 2 (e.g., culvert installation), the magnitude of effect was assessed as **Low**, with an **Overall Very Low to Low level of effect** depending on reach value and duration of disturbance.

For Stage 3, with no fish present and with standard erosion and sediment controls, effects are expected to be **Negligible to Low magnitude**.

Overall Level of Effect: Very Low to Low.

Effects on Avifauna

The Stage 1 & 2 EcIA found that:

- Most birds present are common species,
- At-Risk/Threatened species such as pipit and falcon may pass through but do not rely on the site for core habitat, and
- Clearance was too small and too marginal to affect these species' populations meaningfully.

North Island rifleman and long-tailed cuckoo have also been observed in the wider area. Stage 3 has the same habitat pattern, and no high-value nesting, foraging, or roosting environments are anticipated.

Effects are therefore potentially limited to:

- Temporary disturbance during vegetation clearance and earthworks, and
- Displacement from marginal foraging habitat in pasture or scrub.

Given the mobility of birds and the extensive availability of similar habitat nearby, the magnitude of effect is considered **Negligible**.

Overall Level of Effect: Very Low.

Effects on Herpetofauna (Lizards)

Stage 1 & 2 work assumed the potential presence of several native lizard species based on habitat availability, with effects assessed as **Very Low** provided standard DOC-compliant protocols were applied (e.g., pre-clearance checks, salvage where required).

Stage 3 contains similar marginal habitat (scrub edges, scattered debris, localised rock piles). Lizard survey devices are deployed and will confirm species presence/absence prior to construction.

Expected effects:

- Small-scale habitat removal of **Low–Moderate value** habitat
- Very low likelihood of affecting large numbers of individuals
- Standard salvage/relocation measures can reduce the magnitude to **Negligible**

Overall Level of Effect: Very Low.

Bat Effects

Stages 1 & 2 determined bats to be **highly unlikely** due to the absence of large roost trees and no regional records in several decades. Stage 3 mirrors the same landscape pattern.

Acoustic recorders deployed in Stage 3 will test this expectation.

Anticipated value: **Negligible**

Anticipated magnitude: **Negligible**

Overall Level of Effect: Very Low.

Cumulative Effects (Stages 1–3)

The Stage 1 & 2 EcIA found all ecological effects to be **Very Low to Low**, with no residual effects requiring offsetting and no significant adverse ecological effects anticipated under the RMA.

Stage 3 introduces:

- Similar scale of works
- Within the same ecological context
- With the same avoid/minimise measures
- No additional high-value ecological features.

Cumulatively, effects remain within the same **Very Low–Low envelope**, well below thresholds for significance, with no escalation of risk at the site-wide scale.

Summary of potential effects

Across all ecological components (vegetation, wetlands, streams, avifauna, herpetofauna, and bats) Stage 3 effects are expected to be **Very Low**, with occasional **Low** effects possible where small, induced wetlands or stream margins are close to earthworks. All potential effects can be avoided or reduced through standard construction management practices already established for earlier stages.

No significant adverse ecological effects are expected.

Recommended Management Approach and Potential Management Plans

Ecological effects associated with Stage 3 are expected to remain within the **Very Low to Low** range, consistent with the patterns documented for Stages 1 and 2. These effects can be effectively managed through a combination of avoidance, minimisation, standard construction environmental controls, and ecological offsetting if required (subject to the findings of the ongoing fieldwork).

Avoid, Minimise, Remedy, Offset Framework

Avoidance remains the most reliable and proportionate management approach for Stage 3, particularly given the low ecological value of most habitats and the flexibility in earthworks alignment. The intention is to keep ecological effects at the same low level demonstrated in Stages 1 and 2.

Avoidance Measures

The project should prioritise avoiding direct disturbance to ecological features wherever practicable.

Key avoidance actions include:

- Maintaining modest buffers around wetlands (with final delineations pending).
- Avoiding disturbance to perennial or intermittent stream channels and wetlands to the extent practicable.
- Locating earthworks and platforms within pasture or modified scrub to avoid regenerating forest margins.
- Keeping machinery out of wet areas and natural depressions where possible.
- Avoiding clearance of vegetation on the terrace slope to the south.

Minimisation Measures

Where complete avoidance cannot be achieved, standard minimisation measures will effectively reduce ecological risk:

- Changes in project design / layout where practicable.
- Install and maintain erosion and sediment control measures.
- Fell vegetation directionally away from wetland and stream margins.
- Stage earthworks to limit exposed soil areas.
- Restrict operations during wet conditions to minimise sediment mobilisation.

Remediation measures

Any residual effects can be remedied through localised reinstatement and planting. Because all affected habitats are low value, offsetting is unlikely to be required.

- Rehabilitate disturbed margins with eco-sourced native planting where appropriate.
- Stabilise cut faces with suitable vegetation in areas prone to erosion.
- Re-establish ground cover promptly post-construction.

Offset measures

If effects cannot be avoided, minimised or remedied, opportunities have been identified within the Site (land owned by the applicant) to offset for any residual ecological effects. Subject to the findings of the ongoing fieldwork, this may include wetland enhancement (within the site and near UHCC land) and replanting indigenous flora.

Management Actions by Ecological Component

Vegetation

Vegetation clearance in Stage 3 primarily affects low-value pasture and scrub. Ensuring that clearance remains tightly confined will manage effects to negligible levels.

- Mark clearance boundaries clearly on the ground.
- Fell trees and shrubs away from sensitive ecological features.
- Clean machinery before entering the site to prevent the spread of weeds.

Wetlands

Wetland re-mapping is underway, but wetlands are expected to be small (500 m² -1000 m²), induced, and of low value. Avoidance remains the preferred approach where practicable.

- Avoid placing earthworks, fill, or drainage structures within delineated wetlands.
- Maintain surface hydrology by avoiding diversions, channelisation, or compaction of surrounding soils.
- Mark out wetland boundary with flagging.
- Monitor wetland condition during construction to identify unexpected sedimentation or drying.
- Where avoidance is not practicable, minimisation through project shaping is preferred.
- Opportunities for offsetting for any residual effect(s) have been identified including wetland enhancement and potential wetland creation if needed (likely located in the lower terrace of the site).

Freshwater Streams

Streams within Stage 3 have similar values to those in earlier stages. Effects can be kept very low by managing the proximity of earthworks.

- Maintain at least 10 m separation from stream edges where practicable.
- Install erosion and sediment controls to prevent discharge to streambeds.
- Avoid machinery entry into stream channels.
- Where disturbance is unavoidable, minimise the footprint and duration of works.

Avifauna

Bird species expected in Stage 3 are common and mobile. Effects relate mainly to temporary disturbance during vegetation clearance.

- Conduct pre-clearance checks for active nests during the bird breeding season.
- Establish temporary no-work buffers if nests are detected.
- Limit noisy or disruptive activities near forest margins during early morning hours when practicable.

Herpetofauna (Lizards)

Lizard gear has been deployed and will confirm presence. If lizards are found, standard DOC-aligned procedures will be effective.

- Undertake pre-clearance searches in a suitable microhabitat.
- Leave felled vegetation on the ground for 48–72 hours to allow passive dispersal.
- Implement salvage and relocation only if required by survey results.
- Ensure contractors are aware of the presence and protection status of lizards.

Bats

Bats remain unlikely but are being checked for due to recorder deployment. Measures will be scaled to findings.

- Review bat detector data prior to construction.
- If bats are recorded, apply pre-felling inspection protocols and adjust timing of works as needed.

Ecological enhancement opportunities

There is the potential to restore and/or enhance the retained ecological features as part of this development, including enhancement planting and weed control in retained vegetation and improvements to wetland habitat. Enhancement of retained vegetation and wetland habitat is likely to lead to improved habitat opportunities for indigenous fauna.

Potential Management and enhancement Plans

Depending on the final design and survey outcomes, several concise management plans may be prepared to support the full Stage 3 EcIA or consent conditions. These are anticipated to be short, targeted documents.

Vegetation & Weed Management Plan

Would outline:

- Vegetation clearance boundaries.
- Weed hygiene measures.
- Monitoring for and removal of invasive species post-construction.
- Enhancement and/or restoration actions within any retained native-dominated vegetation.

Wetland Management Plan

Required only if works occur close to wetland edges. Would include:

- Wetland maps and setbacks.
- Hydrological protection measure.
- Construction-phase monitoring.
- Adaptive management triggers.
- Restoration actions.
- Wetland enhancement/creation and monitoring.

Freshwater Management Plan

If stream margins or beds are affected, this plan would address:

- ESC measures.
- Disturbance protocols.
- Riparian reinstatement.

Lizard Management Plan

Prepared only if lizard surveys confirm presence in areas to be disturbed. Would include:

- Salvage methodology.
- Identification of relocation sites.
- Wildlife Act Authority requirements.

Integration with CEMP

Many ecological requirements can be folded directly into the Construction Environmental Management Plan, including sediment controls and reporting pathways.

Effects management summary

With the above measures in place, focused primarily on avoidance, but through use of the effects management hierarchy, post-mitigation ecological effects from Stage 3 are anticipated to be at **Very Low overall levels**. These recommendations mirror the approach taken successfully in Stages 1 and 2 and no significant ecological effects are expected to arise from Stage 3. .

Conclusion

Stage 3 of the Cannon Point development occurs within the same ecological landscape and habitat context previously assessed in detail for Stages 1 and 2 (see Figure 1 for context). The earlier EclA established that the site is dominated by low-value terrestrial habitats, small, induced wetlands, and moderate- to low-value stream reaches, with no significant indigenous ecosystems, high-value fauna habitat, or sensitive ecological features present within the development footprint. The patterns observed across the broader site (common early-seral vegetation, limited fauna habitat, absence of fish, and small isolated wetlands) extend consistently into the Stage 3 area.

Based on these known ecological values and the additional survey work currently underway, the potential ecological effects of Stage 3 are expected to fall within the **Very Low to Low** range. Small-scale vegetation clearance, limited earthworks near common stream margins, and potential disturbance to low-value wetland or lizard habitat can all be effectively managed through standard construction practices, avoidance/minimisation through project shaping, and adoption of the effects management hierarchy to ensure effects are successfully managed to Very Low overall levels.

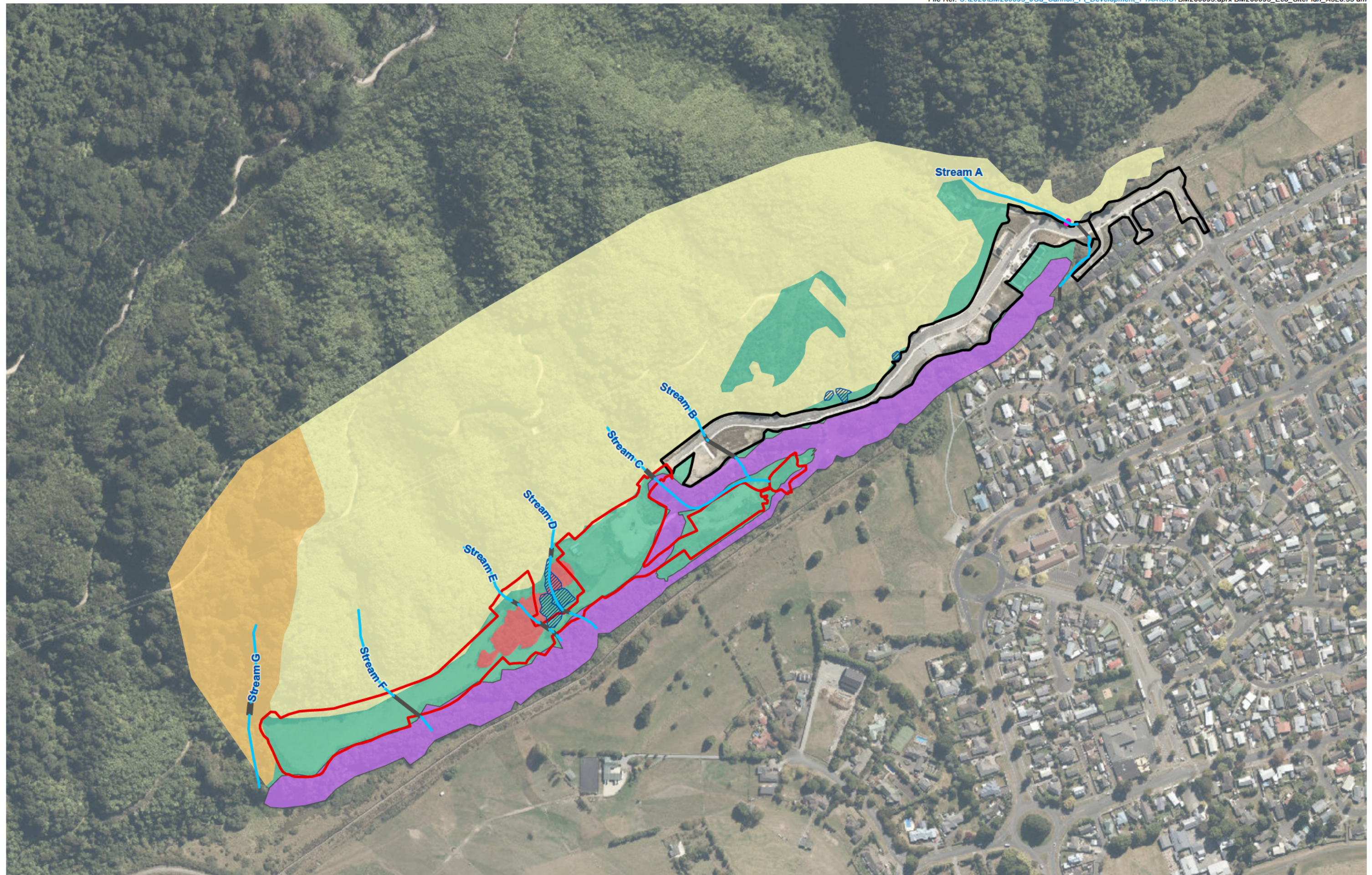
Ongoing investigations, including wetland re-mapping, lizard surveys, and bat detector retrieval, will test and refine our understanding of ecological values prior to final design and will inform any offsetting requirements and targeted management plans required at the consent stage. However, based on the baseline information available and the predictable ecological character of the site, **no significant adverse ecological effects are anticipated** from Stage 3.

Overall, with modest design adjustments and adherence to the recommended management measures, the ecological risks associated with Stage 3 are low, well understood, and straightforward to manage. We are confident that most effects can be avoided, and any unavoidable effects can be appropriately minimised, remedied and offset within the Stage 3 and, if needed, the Stage 4 extent (note stage 4 is not considered or assessed here, but we understand it will form part of the FTAA substantive application).

Appendices:

1. Site map showing ecological features as at 2021
2. Stage 1&2 Ecological Impact Assessment.

Appendix 1: Site map showing ecological features as at 2021



Appendix 2: Stage 1&2 Ecological Impact Assessment



Cannon Point Subdivision Stage 1 and 2

Ecological Impact Assessment
Prepared for Cannon Point Development Limited

1 September 2021



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Cover photograph: A small stream, channel within the Cannon Point subdivision, © BML, 2020

CONTENTS

1.0	Introduction	1
1.1	Scope	1
1.2	Site location and project description	2
2.0	Methods	4
2.1	Desktop investigation	4
2.2	Field investigation	4
2.3	Assessing Ecological Significance	8
2.4	Evaluation of the Level of Ecological Value & Effects	9
3.0	Results – Existing Environment	15
3.1	Site Context	15
3.2	Terrestrial Vegetation	15
3.3	Avifauna	18
3.4	Herpetofauna	19
3.5	Bats	20
3.6	Terrestrial Invertebrates	21
3.7	Wetlands	21
3.8	Stream environment	23
3.9	Aquatic fauna	26
4.0	Ecological Significance	27
4.1	Terrestrial Environment	27
4.2	Wetlands	27
4.3	Waterways	28
5.0	Ecological Value	28
5.1	Vegetation	28
5.2	Avifauna	29
5.3	Herpetofauna	29
5.4	Wetland habitats	29
5.5	Aquatic habitat	30
5.6	Aquatic fauna	32
5.7	Summary of ecological values	33
6.0	Assessment of Ecological Effects	34

6.1	Terrestrial Environment	34
6.2	Wetland Environment	36
6.3	Stream Environment	37
7.0	Summary of the Level of Ecological Effects	40
8.0	Avoid, Minimise, Remedy and Mitigate – Recommendations	41
8.1	Avoid, Minimise, Remedy and Mitigate:	41
8.2	Offset:	44
9.0	Conclusion	45
10.0	References	46

Appendices

Appendix 1: Site Photos

Appendix 2: Wetland species lists

Appendix 3: RPHA score sheets

1.0 Introduction

1.1 Scope

Boffa Miskell Ltd have been engaged by Cannon Point Development Limited to prepare an Ecological Impact Assessment (EIA) for Stages 1 and 2 of the proposed construction of a road carriageway and 46 lot residential subdivision of Lot 2 DP 306622 and Lot 1 DP 52931, near Tōtara Park, Upper Hutt.

The objectives of this ecological impact assessment are to:

- Describe the ecological environment and features of the area;
- Determine the significance (in terms of section 6(c) of the RMA) and ecological value of that environment and its features;
- Identify the magnitude and overall level of potential adverse effects on the ecological values of the area that will be impacted by construction of a road carriageway in stage 1, and the carriageway and lot platforms in Stage 2;
- Identify opportunities and methods to avoid, minimise, remedy, and mitigate potential adverse ecological effects; and
- To address residual ecological effects, after the effects management hierarchy has been applied, through ecological offsetting.

This assessment begins by describing the project and site location (Section 1.2). It then describes the assessment methodology (Section 2.0) and the results (Section 3). This is followed by an assessment of the ecological significance and values of the site (Sections 4 and 5) and an assessment of effects (Sections 6 and 7). The assessment finishes with recommendations to avoid, minimise, remedy, and mitigate potential adverse ecological effects (Section 8), and a conclusion (Section 9).

The ecological components covered in this report include terrestrial vegetation, avifauna (birds), herpetofauna (lizards and frogs), bats, terrestrial invertebrates, freshwater habitat (wetlands and waterways), and freshwater fauna.

1.1.1 Assumptions & Limitations

We have applied the following assumptions to our Ecological Impact Assessment.

- We understand district resource consents for stage 1 incorporating substages 1 and 2 (referred to in this report as stage 1 and 2) have been obtained from Upper Hutt City Council(UHCC). A separate variation to this consent is being lodged with UHCC for additional earthworks in the form of the fill pad as shown in figure 1. Therefore, this assessment is intended to support the regional consenting of Stage 1 and Stage 2 and so focuses on water features.
- We assume there will be no vegetation clearance or direct stream effects beyond the earthworks extent boundary which has a district Council consent
- We assume there will be no vegetation clearance to facilitate the establishment of the western fill site, which includes for the temporary access track to it.

- We assume there will be no direct or indirect effects to Stream C alongside the western fill site.
- Field work was not undertaken for bats and terrestrial invertebrates on the assumption that the literature for bats in the Hutt valley which has not registered them for many decades is correct and because the vegetation removal is of common early seral types in which threatened or rare invertebrates are highly unlikely.

1.2 Site location and project description

The proposed Cannon Point subdivision is located within Lot 2 DP 306622 and Lot 1 DP 52931 near Tōtara Park, Upper Hutt. The development has been broken down to three stages:

- Stage 1: This area covers the western end of Lot 1 DP 52931 and the eastern end of Lot 2 DP 306622 and includes Lots 1-11 (Figure 1). UHCC land use consents have already been granted for this phase, so this report will only deal with those considerations necessary for regional consents (freshwater and wetlands)
- Stage 2: This area includes lots 12-46 (Figure 1). This report will consider all ecological aspects for the Stage 2 area, including terrestrial and freshwater components.
 - Stage 2 will also incorporate the use a portion of Stage 3 towards the eastern most extent of it, as a fill pad to store material removed from the site. This pad, and the temporary track required to access it, is included in this report.
- Stage 3: This is the western section of the property. This stage will be consented separately, and is not considered in this report.

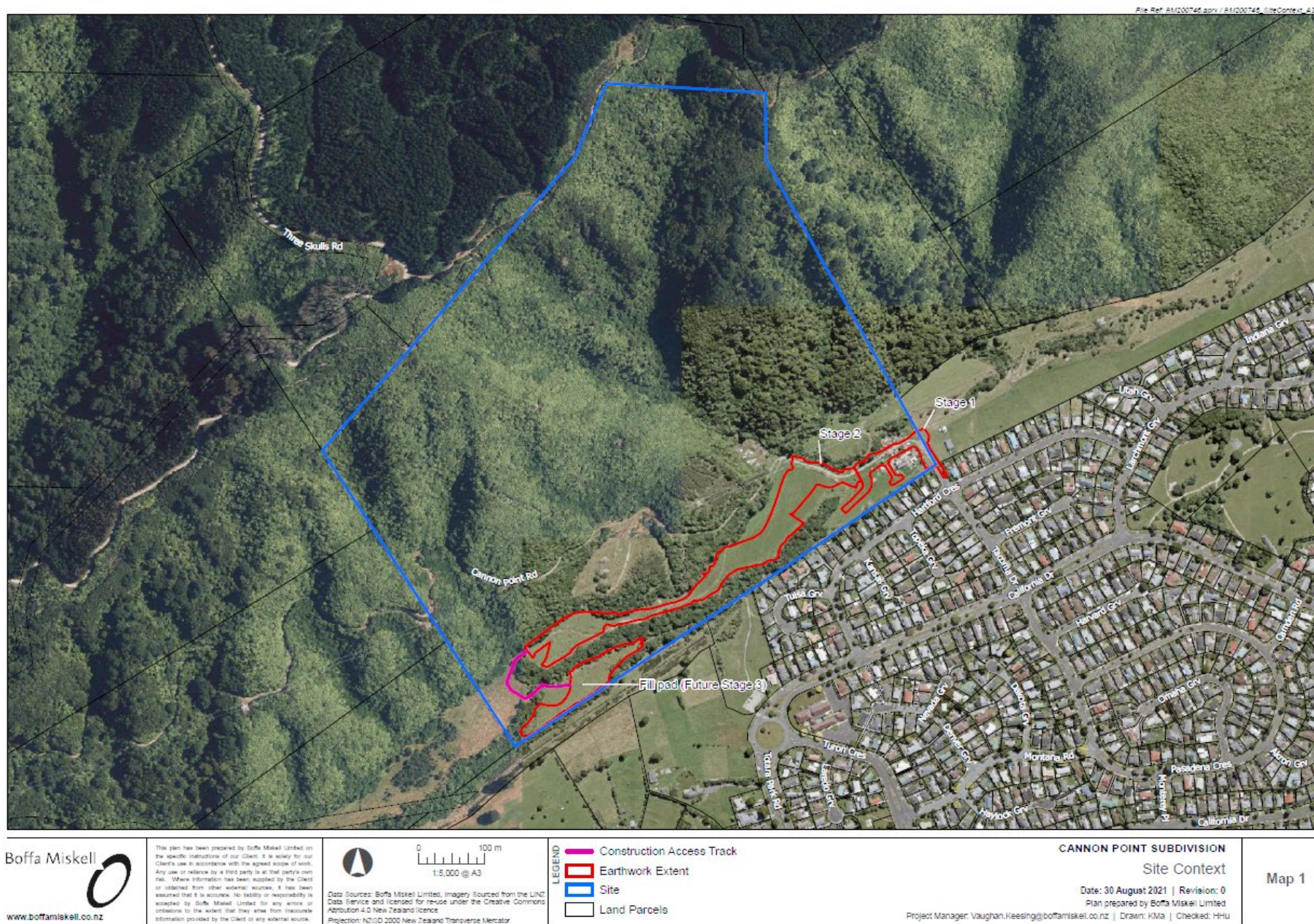


Figure 1: The location of the Site, adjacent to Tōtara Park in Upper Hutt.

Design input

Boffa Miskell Ltd. ecologists were involved in the carriageway design such that the following ecological outcomes could be achieved (and are discussed in further detail later in this report):

- The road plan/design has been altered to:
 - Avoid existing natural wetlands
 - Avoid the need to redirect/divert any existing perennial/intermittent watercourses
 - Minimise necessary indigenous vegetation clearance
 - Include fish passage provisions through the Stream A culvert as a future-proofing measure assuming fish passage will eventually be provided at downstream barriers.

2.0 Methods

2.1 Desktop investigation

The desktop investigation included a review of scientific literature (published and unpublished), the District Plan and associated Ecological Site information, and relevant websites. Ecological databases were also accessed. These included: the LENZ Threatened Environments Classification (Landcare Research Ltd, 2012), the NIWA-administered New Zealand Freshwater Fish Database (NZFFD; (National Institute of Water and Atmospheric Research, n.d.)¹, two 10x10 km grid squares of the Ornithological Society of New Zealand's (OSNZ) Atlas of Bird Distribution in New Zealand that encompasses the proposed project site (Robertson et al., 2007), and the DOC-administered herpetofauna distribution (BioWeb) database².

2.2 Field investigation

2.2.1 Terrestrial vegetation

To establish the native (and exotic) plant assemblages, communities and botanical values present, the project ecologists undertook walking transects to observe and record species within the proposed development area. Given the regenerative nature, age and complexity of the vegetation and the expected potential effects no other more quantitative survey data collection (such as RECCE plots (McNutt, n.d.)) was considered necessary. Species present within the understory, subcanopy, canopy and emergent vegetation tiers were recorded, as well as canopy height and estimated composition (proportions of species in each tier).

¹ The NZFFD was accessed on 04 February 2021. The database website is <https://nzffdms.niwa.co.nz>

² The BioWeb database was accessed on 26 September 2019.

The descriptions of the various assemblages were compiled to create a vegetation map that describes the plant communities within the proposed development area. The nomenclature describing the vegetation follows (Atkinson, 1985).

The area of proposed vegetation clearance was estimated by totalling the amount of vegetation contained within the proposed earthworks site, including any temporary works, using aerial photography.

2.2.2 Avifauna

A desktop investigation provided sufficient information to inform the current assessment. General observations were also made in the field on the suitability of habitats within the project area for different avifauna species. A roaming inventory was opportunistically compiled of all bird species seen and heard while on site and during the other field surveys conducted.

2.2.3 Herpetofauna

A desktop investigation was undertaken to determine the species likely or potentially present within the site. Observations were then made during a site walkover of habitat suitability within the project area. No lizard surveys were undertaken, as the time of year was unsuitable (lizards become inactive over the winter period, and surveys at this time are ineffective).

2.2.4 Bats

No bats have been recorded within the area and the vegetation is not considered suitable for roosting bats. Therefore, no bat surveys or valuation has occurred for this assessment.

2.2.5 Terrestrial invertebrates

Targeted sampling for terrestrial invertebrates was not conducted as such surveys in peri-urban early seral habitats are often inconclusive. The desktop investigation was used to inform the current assessment.

2.2.6 Wetland verification and delineation

Potential wetlands were noted during an initial site walkover on 23 June 2020 and verified using online historic imagery. A subsequent site visit was undertaken on 1 July 2020 by suitably qualified ecologists to survey the potential wetland areas throughout the site. During the visit, a general walkover of the site was conducted to establish any further potential natural wetland areas and understand the wider vegetation communities, their placement in regard to surrounding topography, and underfoot soil moisture.

To assist with confirming the wetland status of the identified areas (see maps below), 2 m x 2 m plots were established in each discernible vegetation community type within the potential wetland in accordance with the Plot Sampling Procedure described in *A Vegetation Tool for Wetland Delineation* (Clarkson, 2013). This process involved identifying all species within the 2 m x 2 m plots and estimating their percent cover (based on above-ground live biomass). Then testing for wetland species affiliated cover dominance, and then if doubt remains examination of

the soils for hydric condition and then a prevalence test. Locations of areas and the delineations which resulted from this are identified in Figure 3.

The Proposed Natural Resources Plan [decisions version] (PNRP) definition of a natural wetland does not differentiate between wetlands dominated by indigenous or exotic vegetation. Therefore, no assessment or testing of the indigenousness of the potential wetlands has been undertaken (irrespective of the importance placed on indigenous ecosystems in Policy 23 of the RPS).

i. Pasture Dominance Test

Before the dominance and prevalence test the PNRP and the NPS FM (New Zealand Government, 2020) both have wetland exclusions under the definitions of natural wetland. Both accept that potential wetland dominated by pasture (or “improved pasture”) are not natural wetland. A Pasture Dominance Test is conducted (using pasture species outlined in Stewart et al., (2014) as recognised by GWRC, although we consider this an overly restrictive list which does not account for the common pasture community assemblage), which considers that if a plot is more than 50% pasture cover, it is not considered a natural wetland, irrespective of the Prevalence/Dominance outcomes).

ii. Dominance Test

A wetland species Dominance Test which considers the dominant species in the plot and their wetland affinity rating can aid in determining if an area is a natural wetland.

This test ascertains the “dominant” species following a 50/20 rule, whereby all species are ranked according to their percentage cover, and the highest covering species are sequentially selected until cumulative coverage immediately exceeds 50%. Any other species which comprise at least 20% coverage are also selected. The “Dominance Test” threshold is then met if more than 50% of the dominant species are OBL, FACW, or FAC.

iii. Prevalence Test

To determine if an area could be considered a wetland where it has not done so in the dominance test, each vegetation species identified is allocated to a prescribed category based on their degree of affinity for water, as described by Clarkson (2013). These categories are:

- OBL: Obligate. Almost always is a hydrophyte, rarely in uplands (estimated probability >99% occurrence in wetlands)
- FACW: Facultative Wetland. Usually is a hydrophyte but occasionally found in uplands (estimated probability 67–99% occurrence in wetlands)
- FAC: Facultative. Commonly occurs as either a hydrophyte or non-hydrophyte (estimated probability 34–66% occurrence in wetlands)
- FACU: Facultative Upland. Occasionally is a hydrophyte but usually occurs in uplands (estimated probability 1–33% occurrence in wetlands)
- UPL: Obligate Upland. Rarely is a hydrophyte, almost always in uplands (estimated probability <1% occurrence in wetlands)

Using these data, a Prevalence Index Score was calculated for each plot. Mathematically, this score must fall between 1 and 5, with 1 indicating entirely wetland species (OBL), and 5 indicating entirely upland species (UPL). A score below 3 is indicative of a wetland/hydrophilic community, though Clarkson (2013) cautions that a score between 2.5 and 3.5 is not reliable for determining a hydrophilic community on vegetation measures alone.

2.2.7 Aquatic Habitat

This section outlines the methodology used to collect (and analyse) information on the aquatic ecosystems.

Stream verification

The waterways were visited and the extent and form verified by walking from base to source within the proposed development to confirm the nature of the watercourses, differentiate the extent of perennial and ephemeral sections (if relevant), and to describe and delineate the riparian plant communities present. The stream definitions follow those outlined in the PNRP.

Stream habitats and morphology

Habitat characteristics were noted and described including both instream (e.g. substrate, hydraulic components, etc) and along the banks (e.g. erosion, riparian vegetation, buffer width).

A rapid physical habitat assessment (RPHA) was completed in each waterway in accordance with Clapcott (2015). This process involves assessing and scoring the condition of each of ten habitat parameters and summing the total to provide a condition score out of 100.

Water quality

Water quality parameters were not measured as they are not relevant to this assessment.

Riparian condition/vegetation

The riparian condition and vegetation was noted and described where/if it differed from pasture grasses. The width of functionally effective riparian buffer was estimated.

Deposited sediment

The approximate percentage cover of deposited sediment is a parameter within the rapid physical habitat assessment. Therefore, no further measures were taken.

Periphyton/diatoms/aquatic macrophytes

No detailed periphyton or macrophyte surveys have been undertaken (being inappropriate in winter); however, species present and approximate coverage were noted.

Macroinvertebrate community

No macroinvertebrate community samples were collected at this time due to the limited potential for adverse effects to the benthos, and because it was considered possible to estimate the macroinvertebrate community composition without sampling from experience with similar habitats in the district sufficiently so to “value” the fauna.

Freshwater fish

The fish community was surveyed by a combination of electric fishing (EFM) and spotlighting. Where water depths, flows, and macrophytes allowed, electric fishing occurred. Spotlighting occurred in areas not suitable for EFM surveying. Fish surveys were carried out using the standard methods detailed in Joy, David, & Lake (2013), modified as necessary to account for the small channel size and length (relative to the proposed development) and overhanging or wetland vegetation. Fishes were identified and measured before being returned to their habitats (whilst ensuring they were placed sufficiently downstream to be outside of any forthcoming electrical field(s) in the case of EFM survey).

2.3 Assessing Ecological Significance

2.3.1 Terrestrial Environment

A requirement of an ecological impact assessment is to carry out an assessment of significance under Section 6(c) of the Resource Management Act (RMA). The terrestrial values on site have been assessed against the criteria in Policy 23 of the Wellington Regional Policy Statement (Greater Wellington Regional Council, 2013). Table 1 outlines those criteria. Under Policy 23, indigenous vegetation and habitats of indigenous fauna are considered significant if they meet one or more of the criteria.

Table 1. Policy 23 of the Wellington Regional Policy Statement – Identifying indigenous ecosystems and habitats with significant indigenous biodiversity values – district and regional plans (Greater Wellington Regional Council, 2013).

Significance Criterion:	Explanation:
(a) Representativeness	The ecosystems or habitats that are typical and characteristic examples of the full range of the original or current natural diversity of ecosystems and habitat types in a district or in the region, and: (i) Are no longer commonplace (less than about 30% remaining); or (ii) Are poorly represented in existing protected areas (less than about 20% legally protected).
(b) Rarity	The ecosystem or habitat has biological or physical features that are scarce or threatened in a local, regional, or national context. This can include individual species, rare and distinctive biological communities and physical features that are unusual or rare.
(c) Diversity	The ecosystem or habitat has a natural diversity of ecological units, ecosystems, species, and physical features within an area.
(d) Ecological context of an area	The ecosystem or habitat: (i) Enhances connectivity or otherwise buffers representative, rare, or diverse indigenous ecosystems and habitats; or (ii) Provides seasonal or core habitat for protected or threatened indigenous species.
(e) Tangata whenua values	The ecosystem or habitat contains characteristics of special spiritual, historical or cultural significance to tangata whenua, identified in accordance with tikanga Maori.

Note that we have not assessed tangata whenua values as this is not an ecological criterion.

2.3.2 Freshwater Environment

2.3.2.1 Wetland Determination and Regulations

The PNRP definition of “natural wetland” includes the following add-on:

“Note that, because of the rarity of wetlands in the Wellington Region, all natural wetlands will meet the representative and rarity criteria listed in Policy 23 of the Regional Policy Statement 2013 and therefore meet the definition of significant natural wetland”.

The PNRP defines a “natural wetland” as a “permanently or intermittently wet area, shallow water and land water margin that supports a natural ecosystem of plants and animals that are adapted to wet conditions, including in the beds of lakes and rivers.” The meaning of “natural” becomes crucial and is not defined in the PNRP. However, under the “natural processes” and “natural lake” definitions the suggestion is that the feature is formed by non-human processes that are the result of the surrounding topography, hydrology, winds, and other “natural” processes. In essence, it has, or could have, formed and persisted in the absence of human modification/activity. Irrespective of the lack of a definition of “natural”, the PNRP acknowledges that natural wetlands do not include damp gully heads or wetted pasture, or pasture with patches of rushes (there are other exceptions but those relate to the source of the water).

Policy 23 of the Regional Policy Statement 2013 (RPS) is used to identify significant indigenous ecosystems and habitats of indigenous fauna as prescribed by Section 6(c) of the RMA. Policy 23 pronounces that any wetland in the Wellington Region is considered significant if it is indigenous, and meets specifications in at least one of its five categories (representativeness, rarity, diversity, ecological context, and tangata whenua values). However, the current PNRP states that all features found to be “natural wetland” are by default significant (because of rarity in Policy 23). However, this is erroneous because Policy 23 is directed to indigenous species features while the “natural wetland” definition in the PNRP does not make a distinction between exotic or indigenous features. Therefore, in this assessment, we focus on the ecological values present.

2.3.2.2 Streams and rivers

Streams and rivers in the Wellington Region have been assessed for significance by GWRC in the RPS against four criteria, and significant waterways are listed in Schedule F1 of the PNRP. Those criteria are:

- *High macroinvertebrate community health;*
- *Habitat for indigenous Threatened/At Risk fish species;*
- *Habitat for six or more migratory indigenous fish species; and*
- *Inanga spawning habitat (reach of tidal influence).*

2.4 Evaluation of the Level of Ecological Value & Effects

The methodology for assessing the level of the ecological values and effects associated with the proposed Village follows that in the EIANZ Ecological Impact Assessment Guidelines (Roper-Lindsay et al., 2018). This is considered to represent the best practise approach in New Zealand. In summary, this method requires:

- An assessment of the values of the communities, habitats, and ecosystems;
- An assessment of the magnitude of the effects on these values based on prescribed criteria;
- The application of a matrix which determines the level of effect based on the ecological value of the site or species assessed and the magnitude of impact.

This process is described in detail below.

2.4.1 Assigning Value

2.4.1.1 Terrestrial and Freshwater Communities

For terrestrial (Table 2) and freshwater (Table 3) communities we have applied the four criteria (representativeness, rarity/distinctiveness, diversity and pattern, ecological context) as described in the EIANZ guidelines. For freshwater ecological value, the EIANZ guidelines use the same criteria but tailored to freshwater ecosystems and fauna. In addition, the guidelines also use the concept of freshwater system “integrity” using aspects of ‘native-ness’, pristineness, diversity, and resilience (adaptability) (EIANZ guidelines, Section 5.3).

Table 2. Attributes to consider when assigning ecological value or importance to a site or area of vegetation/habitat/community (Roper-Lindsay et al., 2018).

Matter:	Attributes to be Considered:
Representativeness	Criteria for representative vegetation and habitats: • Typical structure and composition • Indigenous species dominate • Expected species and tiers are present • Thresholds may need to be lowered where all examples of a type are strongly modified Criteria for representative species and species assemblages: • Species assemblages that are typical of the habitat • Indigenous species that occur in most of the guilds expected for the habitat type
Rarity/Distinctiveness	Criteria for rare/distinctive vegetation and habitats: • Naturally uncommon, or induced scarcity • Amount of habitat or vegetation remaining • Distinctive ecological features • National priority for protection Criteria for rare/distinctive species or species assemblages: • Habitat supporting nationally Threatened or At Risk species, or locally uncommon species • Regional or national distribution limits of species or communities • Unusual species or assemblages • Endemism
Diversity and Pattern	• Level of natural diversity, abundance, and distribution • Biodiversity reflecting underlying diversity • Biogeographical considerations – pattern, complexity • Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation
Ecological Context	• Site history, and local environmental conditions which have influenced the development of habitats and communities • The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (from “intrinsic value” as defined in RMA) • Size, shape, and buffering • Condition and sensitivity to change • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material • Species role in ecosystem functioning – high level, key species identification, habitat as proxy

Table 3: Matters that may be considered when assigning ecological value to a freshwater site or area (Roper-Lindsay et al., 2018).

Matter:	Attributes to be Considered:
Representativeness	- Extent to which site/catchment is typical or characteristic - Stream order - Permanent, intermittent, or ephemeral waterway - Catchment size - Standing water characteristics
Rarity/Distinctiveness	- Supporting nationally or locally Threatened, At Risk or uncommon species - National distribution limits - Endemism - Distinctive ecological features - Type of lake/pond/wetland/spring
Diversity and Pattern	- Level of natural diversity - Diversity metrics - Complexity of community - Biogeographical considerations - pattern, complexity, size, shape
Ecological Context	- Stream order - Instream habitat - Riparian habitat - Local environmental conditions and influences, site history and development - Intactness, health and resilience of populations and communities - Contribution to ecological networks, linkages, pathways - Role in ecosystem functioning – high level, proxies
Ecological Integrity³	- Nativeness – the degree to which an ecosystem's structural composition is dominated by the indigenous biota characteristics of the particular region - Pristineness – relates to a wide array of structural, functional, and physico-chemical elements (including connectivity), but is not necessarily dependent on indigenous biota constituting structural and functional elements - Diversity – richness (the number of taxa) and evenness (the distribution of individuals amongst taxa); link to a possible reference condition; the use abundance weighting; and geographical scale - Resilience (or adaptability) – quantifying the probability of maintaining an ecosystem's structural and functional characteristics under varying degrees of human pressure or stressors such as climate change.

Each of the four or five criteria are subjectively scored “High”, “Moderate”, “Low” or “Very Low/Nil”, based on the assessor’s experience and knowledge of the site. The four or five criteria scores are then combined to provide a single site score (or score for an area of vegetation/habitat/community) which ranges from “Very High” to “Negligible” (Table 4).

Table 4. Scoring for sites or areas combining values for the four matters in Table 2 and (Roper-Lindsay et al., 2018).

Matter:	Attributes to be Considered:
Very High	- Area rates High for 3 or all of the four assessment matters listed in Table 2. - Likely to be nationally important and recognised as such.
High	- Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or - Area rates High for 1 of the assessment matters, Moderate for the remainder.

³ In addition to the measure prescribed in Table 2, an additional matter is considered when assigning ecological value to freshwater environments as described in (Roper-Lindsay et al., 2018). Ecological Integrity is considered as a way of integrating structural and functional components of freshwater systems into the ecological values matrix. The ‘nativeness’, ‘pristineness’, ‘diversity’, and ‘resilience’ are all considered when determining ecological integrity.

	• Likely to be regionally important and recognised as such.
Moderate	• Area rates High for one matter, Moderate and Low for the remainder, or • Area rates Moderate for 2 or more assessment matters Low or Very Low for the remainder • Likely to be important at the level of the Ecological District.
Low	• Area rates Low or Very Low for majority of assessment matters and Moderate for one. • Limited ecological value other than as local habitat for tolerant native species.
Negligible	• Area rates Very Low for 3 matters and Moderate, Low or Very Low for remainder

2.4.1.2 New Zealand Biota (Individual Species)

New Zealand biota have been assessed by the Department of Conservation (DOC) for their threat from extinction against a standard set of criteria, which is described in Townsend et al. (2008), and its associated lists published for each taxonomic group⁴. This provides a consistent basis to assign ecological value for individual species (Table 5).

Table 5. Factors to consider when assigning value to terrestrial and freshwater species (Roper-Lindsay et al., 2018).

Ecological Value:	Determining Factors:
Very High	• Nationally Threatened species found in the ZOI (zone of influence) either permanently or seasonally.
High	• Species listed as At Risk – Declining, found in the ZOI, either permanently or seasonally.
Moderate	• Locally (Ecological District) uncommon or distinctive species; or • Species listed as any other category of At Risk, found in the ZOI either permanently or seasonally.
Low	• Nationally and locally common indigenous species.
Negligible	• Exotic species, including pests, species having recreational value.

2.4.1.2.1 Recent revisions to the conservation status of formerly 'Not Threatened' plants due to Myrtle Rust

In 2018, several plant species in the Myrtaceae family including mānuka and kānuka species underwent significant status declines, from 'Not Threatened' to 'Threatened- Nationally Vulnerable' (de Lange et al., 2018). The rationale for these changes were driven by the recent emergence and spread of the infectious diseases Myrtle Rust. Different Myrtle species are considered to have different susceptibility to Myrtle Rust disease and patterns of infection and decline overseas suggest that the full impact of this disease has not yet been realised in New Zealand. Therefore, a precautionary approach was taken in the threat classification assessments to include all Myrtle species in New Zealand (de Lange et al., 2018).

The implications of this is that widespread and common species, such as kānuka (typically dominant components of regenerating ecosystems and planting mixes), are attributed a very high value (EIANZ; Roper-Lindsay et al., 2018) and their occurrence becomes significant under most district or regional plans according to the Resource Management Act. This is not consistent with valuations of common species.

⁴ Classifications as listed in: (Dunn et al., 2018) for freshwater fish; (Robertson et al., 2017) for birds; (de Lange et al., 2018) for vascular plants; (Hitchmough et al., 2016) for lizards; and (Grainger et al., 2018) for freshwater invertebrates.

Species identified at the Cannon's point site that are affected by these changes are mānuka (*Leptospermum scoparium*), and kānuka (*Kunzea robusta*). We did not identify any rata (*Metrosideros* spp.), or ramarama but they too qualify. All of these species were 'Not Threatened' prior to 2018 because they were, and still are, widespread within their natural ranges. To date we are not aware of any die back or areas of rust disease striking areas of mānuka and kānuka.

For the reasons above we treat both mānuka and kānuka in this report as common species which do not gain the added value and status of Threatened or At Risk (Townsend et al., 2008) taxa.

2.4.2 Assessing Magnitude of Impact

Once the value of the ecosystem components has been determined, the magnitude of the impact is assessed. Magnitude of Effect is a measure of the extent or scale of the impact, its duration, and the degree of change that it will cause. A spatial scale in which to assess the effect is required, for a stream this is often the catchment, sometimes the Ecological District (ED) is appropriate; it is rare that the feature itself is the spatial scale on which to judge the magnitude and then only where that feature is relatively unique. A typical scale of magnitude ranges from very high to negligible as outlined in (Table 6). The potential timescale of the effect (Table 7) also contributes to the magnitude assessment.

Table 6. Criteria for describing magnitude of effect (Roper-Lindsay et al., 2018).

Magnitude of Effect:	Description:
Very High	Total loss of, or very major alteration to, key elements/ features of the baseline conditions, such that the post development character, composition and/or attributes will be fundamentally changed 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 baseline conditions such that 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 one or more key elements/features of the baseline conditions such that post development character, composition and/or attributes of the existing baseline 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 baseline conditions. Change arising from the loss/alteration will be discernible but underlying character, composition and/or attributes of existing baseline condition will be similar to predevelopment circumstances/patterns; AND/OR having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation; AND/OR having negligible effect on the known population or range of the element/feature.

Table 7: Possible timescales for the duration of the adverse effects as described in the EIANZ guidelines (Roper-Lindsay et al., 2018)

Magnitude of Effect:	Description:
Permanent	Effects continuing for an undefined time beyond the span of one human generation (taken as approximately 25 years⁵)
Long term	Where there is likely to be substantial improvement after a 25-year period (e.g. the replacement of mature trees by young trees that need >25 years to reach maturity, or restoration of ground after the removal of a development) the effect can be termed 'long term'
Temporary	- Long term (15-25 years or longer – see above) - Medium term (5-15 years) - Short term (up to 5 years) - Construction phase (days or months)

2.4.3 Assessing the Overall Level of Effect

The Overall Level of Effect is determined by applying the following matrix (Table 8), which combines the ecological value and the magnitude of the effect. The overall level of effect is then used to guide the environmental management (mitigation/offsetting) response, including the extent and nature. The following approach (described in detail in Section 6.4.3 of the EIANZ (2018) guidelines) is used in interpreting the complexity of the management approach based on the overall level of effect⁶:

- Very High adverse effect – Unlikely to be ecologically acceptable, irrespective of compensation proposals. These activities should be avoided. Where avoidance is not possible then a net biodiversity gain is appropriate/required.
- High and/or Moderate adverse effect – Such an effect can be managed via a range of options (such as avoidances, design alterations, offsets) but requires careful assessment and analysis on individual cases.
- Low and/or Very Low adverse effect – Assuming normal design, construction, and operational care is exercised to minimise adverse effects then these levels of effect are not normally of concern⁷.

⁵ The EIANZ guidelines (2018) note: "that in some environments (low fertility) or involving some species (slow growth rates, long lived, low fecundity) 25 years may be an underestimate so that context should be considered".

⁶ Some regional and/or district plans provide commentary and/or specific direction towards a particular impact management approach for 'adverse effects'.

⁷ The EIANZ (2018) guidelines note that "If effects are assessed taking impact management developed during project shaping into considerations, then it is essential that prescribed impact management is carried out to ensure Low or Very Low-level effects".

Table 8. Criteria for describing the level of effect (Roper-Lindsay et al., 2018).

ECOLOGICAL VALUE						
		Very High	High	Moderate	Low	Negligible
MAGNITUDE	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

3.0 Results – Existing Environment

This section combines the results of the desktop and field investigations to describe the existing environment within the proposed project site.

3.1 Site Context

The proposed project site is located in the Wellington Region within the Upper Hutt City District. It is located within the Wellington Ecological District (ED 39.01), which is characterised by steep, strongly faulted hills comprised of greywacke/argillite. The district was historically vegetated primarily with podocarp-broadleaf forest; however, much of the area has been cleared for farming and development.

Historically, the site itself was likely to have been vegetated with rimu-matai broadleaf forest and rimu/tawa-kāmahi forest but beech too was present (and remains a common canopy species in the wider hills) (LCDB 5, 2020).

3.2 Terrestrial Vegetation

The Land Cover Database broadly classifies the current vegetation within the project area as an assemblage of broadleaved indigenous hardwood, indigenous forest, and urban parkland/open space (Landcare Research Ltd, 2019).

The communities were mapped (Figure 2) and photographed (Appendix 1) during field surveys, and the site was found to be comprised of the following vegetation communities.

3.2.1 Exotic pasture (Community A)

Figure 2 shows the areas of pasture within the study area. These areas are currently grazed, and include cocksfoot, Yorkshire fog, creeping buttercup, clover, and lotus. This is a primarily exotic community, though there are occasional native *Juncus* taxa (*J. edgariae*) present.

3.2.2 Regenerating māhoe-tree fern forest (Community B)

On the slopes to the north of the site is regenerating broadleaved forest, with a canopy height of approximately 8 m (Figure 2). It is comprised primarily of māhoe (*Melicytus ramiflorus*) along the lower margins and gullies, and tree ferns (*Dicksonia squarrosa*, *Cyathea dealbata*, *Cyathea medullaris*) on the ridges and upper slopes. Also present within this forest is pate (*Schefflera digitata*) and patches of young tōtara (*Podocarpus totara*), a sparse understory of kawakawa (*Piper excelsum*), supplejack (*Ripogonum scandens*), and a ground layer primarily comprised of ferns (*Asplenium* spp. *Parablechnum nova-zealandiae*, *Pneumatopteris pennigera*). There are occasional emergent rewarewa within the riparian zone of Stream A.

Along the lower margin (within the Project Site) the community becomes more fragmented and disturbed, and has higher proportions of weed incursion throughout and at the margins; primarily blackberry and gorse. There are also mature planted exotics present (cypresses) along the forest edge. Some areas of the margin are smothered by muehlenbeckia vine.

3.2.3 Mixed native and exotic scrubland/forest (Community C)

Along the southern boundary of the site is a band of mixed native and exotic shrubland, on the face of a steep, south-facing bank (Figure 2). This community is dominated by māhoe (*Melicytus ramiflorus*); however, there are also significant areas of blackberry (*Rubus fruticosus*) and gorse (*Ulex europaeus*), as well as a number of native and exotic vine species throughout the scrub. There are occasional, more mature native trees throughout this community. These are primarily tōtara (*Podocarpus totara*), and a single large (10 m) kānuka (*Kunzea robusta*). This community is scrubby on the upper slope (within the project area), and becomes more forest-like further down the slope, with increased canopy height and cover.

At the upper slope margin is a band of gorse and broom, and occasional cherry trees. The understory is sparse rangiora (*Brachyglottis repanda*), hangehange (*Geniostoma ligustrifolium*), and blackberry, and the ground layer has occasional ground ferns, and in some areas, thick mats of Tradescantia (*T. fluminensis*). In more open areas there is both Himalayan honeysuckle and Japanese honeysuckle present.

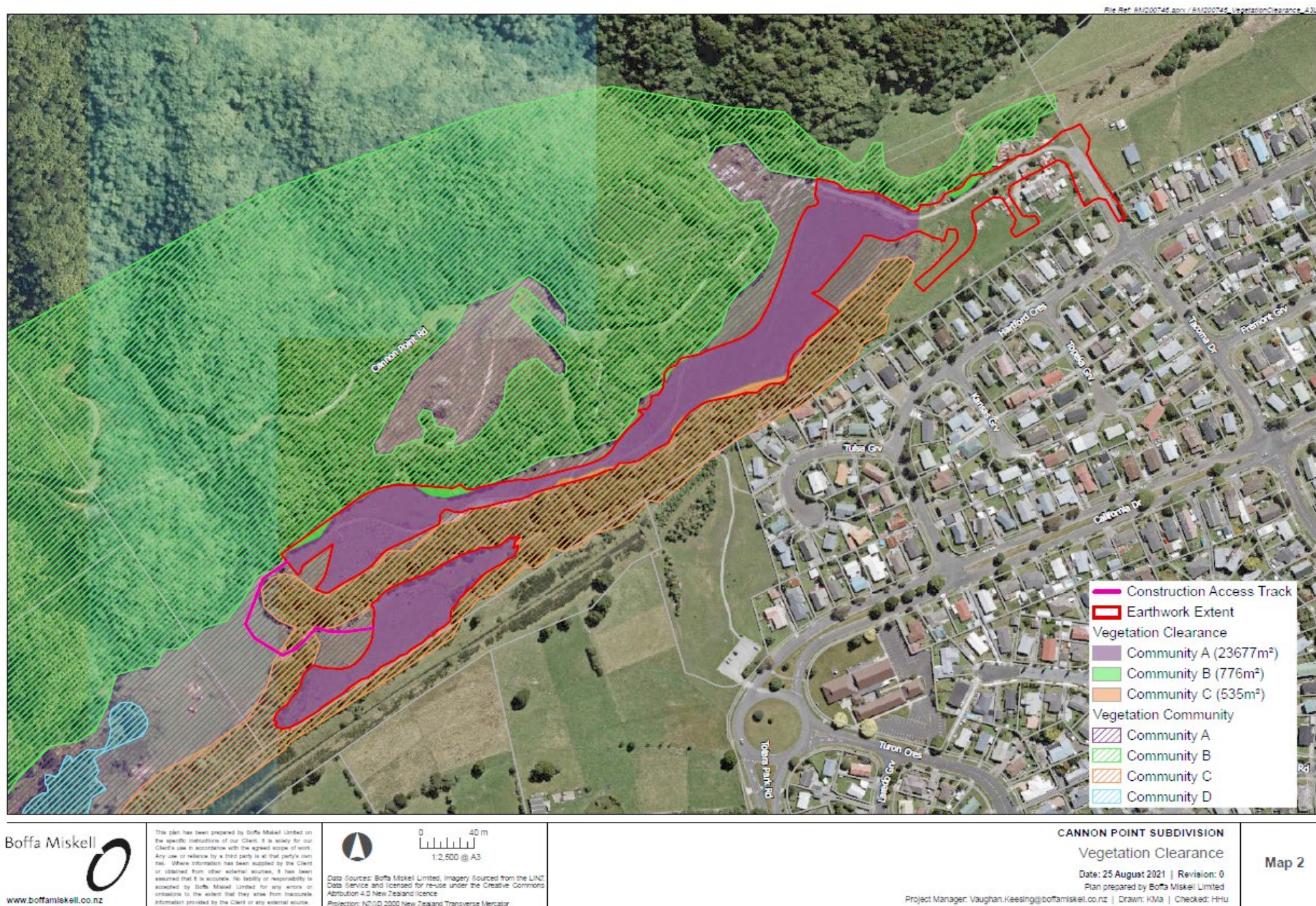


Figure 2: Vegetation communities present within the Site, and proposed areas of clearance.

3.3 Avifauna

The vegetation communities present on site (as described in Section 3.2 above) may support a number of avifauna species. The habitats are pre-dominantly terrestrial and could provide habitat to both pastoral and forest species. Freshwater habitats available for avifauna include several small tributaries and some small wetland areas.

A potential species list has been generated using data from the OSNZ bird distribution atlas, which was then refined based on the habitats available within the project area (Table 9). This list identifies 36 bird species that could potentially use the area, including 18 indigenous species and 18 exotic species. Three of the indigenous species have a threat status of At Risk, those being; New Zealand pipit (*Anthus novaeseelandiae*; At Risk - Declining), whitehead (*Mohoua albigilla*; At Risk - Declining), and New Zealand Falcon (*Falco novaeseelandiae*; At Risk - Recovering). The pipit may use the pasture for foraging, and the whitehead may be present within the regenerating forest present on the site. Falcons were observed on several occasions during the roaming inventory, in the regenerating forest north of the site.

The other 15 indigenous species that use, or are likely to use, the project site are classed as Not Threatened; these species, as well as the introduced species, are all common and widespread in the surrounding landscape.

Table 9. Avifauna potentially present with the project site, based on the OSNZ data and habitat types available.

SPECIES Robertson et al. 2012		CONSERVATION STATUS Robertson et al. 2017	Native forest	Exotic Forest	Scrub / shrubland	Farmland / open country	Freshwater / wetlands	Coastal / Estuary	Oceanic	Urban/Residential
New Zealand Pipit	<i>Anthus n. novaeseelandiae</i>	Declining								
Whitehead	<i>Mohoua albigilla</i>	Declining								
New Zealand Falcon	<i>Falco novaeseelandiae</i>	Recovering ^{DP St}								
Paradise Shelduck	<i>Tadorna variegata</i>	Not Threatened								
New Zealand Pigeon	<i>Hemiphaga novaeseelandiae</i>	Not Threatened ^{CD Inc}								
Grey Warbler	<i>Gerygone igata</i>	Not Threatened								
New Zealand Tomtit (North Island ssp)	<i>Petroica macrocephala toitoi</i>	Not Threatened								
Bellbird ssp	<i>Anthornis melanura</i>	Not Threatened								
Tui	<i>Prosthemadera n. novaeseelandiae</i>	Not Threatened ^{OL St}								
Australasian Harrier	<i>Circus approximans</i>	Not Threatened ^{SO}								
Pukeko	<i>Porphyrio m. melanotus</i>	Not Threatened ^{Inc SO}								
Spur-winged Plover	<i>Vanellus miles novaehollandiae</i>	Not Threatened ^{SO}								

Table 10: Native lizard species recorded within 10 km of the study site (DOC BioWeb Database). Conservation status and nomenclature follows Hitchmough et al. (2016).

Common Name	Scientific Name	Conservation Status	Habitat Preferences	Functional group
Recent records (<30 years)				
Northern grass skink	<i>Oligosoma polychroma</i>	Not Threatened	Dry open areas with low vegetation or debris such as logs or stones for cover.	Terrestrial skink
Copper skink	<i>O. aeneum</i>	Not Threatened	Open and shaded areas where sufficient cover is available (e.g., rock piles, logs, dense vegetation).	Terrestrial skink
Raukawa gecko	<i>Woodworthia maculata</i>	Not Threatened	Forest, scrub, grassland and coastal areas.	Terrestrial/arboREAL gecko
Ngahere gecko	<i>Mokopirirakau</i> sp. 'Southern North Island'	At Risk – Declining	Forest and scrub, especially kānuka / mānuka, and creviced clay banks	Arboreal gecko
Barking Gecko	<i>Naultinus punctatus punctatus</i>	At Risk – Declining	Forest and scrub, especially kānuka / mānuka.	Arboreal gecko
Older records (>30 years)				
Ornate skink	<i>O. ornatum</i>	At Risk – Declining	Open and shaded areas where sufficient cover is available (e.g., rock piles, logs, dense vegetation).	Terrestrial skink
Pacific gecko	<i>Dactylocnemis pacificus</i>	At Risk - Relict	Forest and scrub, grassland and coastal areas	Terrestrial/arboREAL gecko

3.4.1.1 Herpetofauna habitat

The site could potentially provide habitat for all of the species listed in Table 10. The forest and scrub present within the site may house arboreal species (the three geckoes recently recorded), though the relatively young age of the vegetation, simple community assemblage, and lack of pest control at the site decrease the likelihood of their presence.

The boulderfields and debris present throughout the forest and scrub areas would provide good habitat for the copper skink, and potentially the raukawa gecko. The scrubby/weedy margins of Community C is suitable habitat for the northern grass skink.

As no surveys have been undertaken at this time, it will be assumed that the presence of suitable habitat indicates the presence of lizards within the study area. Therefore, this assessment will work on the assumption that those species recently recorded in the wider area (the first five species listed in Table 10) are present, and the values and effects will be determined accordingly.

3.5 Bats

Bats may be present in the wider area although records of bats of either species in the Hutt valley are very old and there are none in at least the last 3 decades. That said the project site

also contains little suitable bat habitat (i.e. does not have large trees with cavities and epiphytes. Therefore, bats are considered highly unlikely to be present at the project site.

3.6 Terrestrial Invertebrates

No terrestrial invertebrate data were discovered during the desktop investigation. Habitats within the proposed site are likely to contain an assemblage of terrestrial invertebrates typical of early regenerating forest and pastoral environments within the area and it is highly unlikely that there are rare or threatened species.

3.7 Wetlands

The weather conditions were wet at the time of survey and followed a very wet month (NIWA suggests >149% of normal rainfall for June in the Wellington Region).

3.7.1 Wetland Descriptions

Two wetland areas were identified within the proposed development area, on either side of the existing public walking track that bisects the site. The wetlands were mapped (Figure 3) and photographed (Appendix 1) during field surveys and described as follows.

Area 1 – eastern side of walking track

This area appears a result of water collecting at the toe of the terrace coupled with the elevated access track encouraging water retention via limited discharge toward the eastern terrace. No obvious channels or flow paths were evident suggesting it may be largely fed by rainwater. The appearance of two distinct plant community groups meant two plots were surveyed.

Plot 1 – This plot represented the area with a plant community most likely to represent a natural wetland. At the time of survey, the soil was damp with some surface water evident when stood on. The vegetation community presented as *Isolepis* with scattered rushes. Of the plant taxa present, *Isolepis prolifera* was the most prevalent (45% plot coverage) with creeping buttercup (*Ranunculus repens*) also abundant (32% plot coverage). There were also small abundances of *Prunella vulgaris* (2% coverage), Yorkshire fog (*Holcus lanatus*; 7%), *Lotus pendunculatus* (3%), wiwi (*Juncus edgariae*) (14%), and an unidentified moss (4%) were also present.

Plot 2 – This plot is representative of pasture and scattered rush section of Area 1. *Juncus edgariae* was the only native taxa present in the plot and contributed 18% of the coverage. Yorkshire fog was the most prevalent species, covering over half the community (55% coverage) and creeping buttercup also prominent (18%). *Achillea millefolium* (2%), *Galium aparine* (1%), *Prunella vulgaris* (1%) and *Lotus pendunculatus* (3%) were the other species present.

Area 2 – western side of walking track

The Area 2 potential wetland has been induced by poor drainage caused by the vehicle track (southern edge of the terrace) compaction and addition of materials and is unlikely to have been a feature prior to the access track being installed.

Plot 3 – This plot accounts for the *Carex*-fern vegetation community within the potential wetland area. The native *Carex secta* dominated the vegetation within this community, covering 75% of the area. Monkey musk (*Erythranthe guttata*) was next most common, providing 12% cover,

followed by *Hypolepis ambigua* (4%), *Bracken spp* (2%), creeping buttercup (5%), *Lotus pendunculatus* (1%) and *Juncus effuses* (1%).

Plot 4 – This area was considered a *Juncus*-meadow grass/buttercup community. This section was dominated by creeping buttercup (38% cover) and meadow foxtail (*Alopecurus pratensis*) (35%) with *Juncus* providing 10% cover, including 6% from *Juncus sarophorus* and 4% from *Juncus effuses*. In addition, *Galium aparine* (2% cover), Yorkshire fog (6%), *Carex secta* (4%) and watercress (*Nasturtium officinale*) (6%) were also present.

Plot 5 – This area is an *Isolepis*-buttercup-pasture section, with buttercup dominating and providing 65% cover followed by Yorkshire fog at 20%. *Isolepis prolifera* provided 8% cover, *Callitriche stagnalis* provided 5%, and *Juncus effuses* provided 2%.

3.7.2 Wetland Delineation

Five plots were spread throughout the two potential wetlands areas on site to assist with determining wetland dominance and prevalence scores and in delineating the wetland boundary. Appendix 3 contains a full species list.

Pasture test

The vegetation cover in the Plot 2 community is 60% provided by pasture species that are listed in Stewart et al., 2014. Therefore, this community/area is not considered a natural wetland habitat as per the PNRP definition, but as wet pasture.

Dominance test

All plots passed the dominance test (noting the plot 2 result above) in the sense that the dominant species in all plots had some wetland affinity (Table 11). In Plot 3, dominance was achieved by obligate species, with a mixture in the other plots; however, in no cases did facultative wetland species contribute to the dominance result.

Prevalence test

Of the five surveyed plots, no communities had a prevalence score greater than 3 (which would suggest it is not a wetland habitat). All plots were sufficiently below the threshold that we are confident they resemble wetland habitats according to the (Clarkson, 2013).

Wetland delineation summary

Of the five plots across two areas, only Plot 2 can be considered not a natural wetland, due to the dominance of pasture. The remaining four areas are considered natural wetlands and are treated as such for this assessment.

Table 11 – All plots and their Prevalence, Dominance, and Pasture results, and their outcome as wetland or non-wetland.

Area	Plot no.	Vegetation types	Prevalence score	% dominant wetland sp.	Pasture % cover	Native % cover	Overall outcome
1	1	<i>Isolepis</i> and scattered rush	1.97	100	10.7%	58.9%	Natural Wetland
	2	Pasture with scattered rush	2.86	100	60%	18%	Non-wetland
2	3	<i>Carex</i> , fern, and exotic aquatic herb	1.35	100	1%	81%	Natural Wetland
	4	Meadow grass, buttercup, <i>Juncus</i>	2.72	100	6.1%	15.8%	Natural Wetland
	5	Buttercup, pasture grass, <i>Isolepis</i>	2.72	100	20%	8%	Natural Wetland

We note that the LENZ prediction (Landcare Research Ltd, 2012) of the historic land cover for this site is of rimu-matai-broadleaf forest and rimu/tawa-kāmahi forest which are typically found in dry areas. This indicates the area, historically, was likely covered in terrestrial forest rather than wetlands or wetland forest.

3.8 Stream environment

Three unnamed streams/flow paths cross the site before entering the concrete-lined stormwater drainage channel which directs flows into Te Awa Kairangi/Hutt River (FIGURE 3?). Because large sections of the streams are currently either piped and/or are not proposed to be directly affected, detailed descriptions are not provided for those sections. Some general descriptions are provided to assist with understanding the form and function of the waterways, which is useful when assessing the effect(s) of daylighting or culverting using the stream simulation⁸ approach. Each tributary is described below.

Full RPHA score sheets are provided in Appendix 4.

3.8.1 Stream A

Stream A comprises two sections; the upper reach flows through regenerating riparian vegetation before flowing through a culvert under the existing track, compared with the lower section which does not have a vegetated riparian zone and is dominated by macrophyte growth. As such, the upper reach is >90% shaded, has minimal active erosion, and a mixture of substrate and hydraulic components. Whereas the lower reach is an open, uniform channel with minimal flow and habitat complexity, with shade cover (approx. 40%) provided for by topography (i.e. the incised channel) and/or emergent macrophyte growth.

- The RPHA score of the upper reach is 70/100 compared to 47/100 in the lower reach.
- Two culverts exist along the stream including one under the existing access track and another further downstream which helps convey flows into the existing stormwater riser.

⁸ A method for the design and construction of culverts which mimics that form of the natural channel throughout the length of the culvert, and allows for unrestricted passage of aquatic fauna. As described in the NIWA fish passage guidelines (Franklin et al., 2018)

Flows then enter an approx. 250 m culvert before discharging to a concrete lined channel to the southwest of the site, which flows to the Hutt River.

- The stream is unfenced, including through the pasture areas.

3.8.2 Stream B

Stream B is culverted along most of the terrace, so only the upper section was assessed. Like the other streams, the upper section is under the regenerating native forest, and has high canopy cover and low erosion. This stream has very low flow and is likely ephemeral, with a riffle/cascade system.

- The RPHA score for this reach was 59/100
- This stream has two culverts; one under the track just below the native forest, and another along the width of the terrace (approximately 40 m). The length of stream between the two culverts is less than a metre (i.e. the culverts nearly abut one another)
- This stream is unfenced.

3.8.3 Stream C

Stream C is comprised of 3 reaches, assessed separately; the upper reach flows through the regenerating vegetation at the north end of the site, the middle reach enters a narrow band of disturbed riparian vegetation, and the lower reach exits the canopy and runs through open pasture, with high macrophyte cover. The upper reach has very high canopy cover, no visible bank erosion, and a moderate variety of substrate types. The middle reach also has high canopy cover and minimal erosion; however, it is wider and flatter with fewer substrate types present. It also has a narrower undisturbed riparian width. The lower reach only has approximately 25% shading, and very few substrate types. It also has slightly higher bank erosion, though still less than 5%.

- The RPHA scores are 74/100 for the upper reach, 64/100 for the middle reach, and 32/100 for the lower reach.
- One culvert is present in this stream (within the site) under the existing access track, between the upper and middle sections.
- The stream is unfenced, including through the pasture areas.

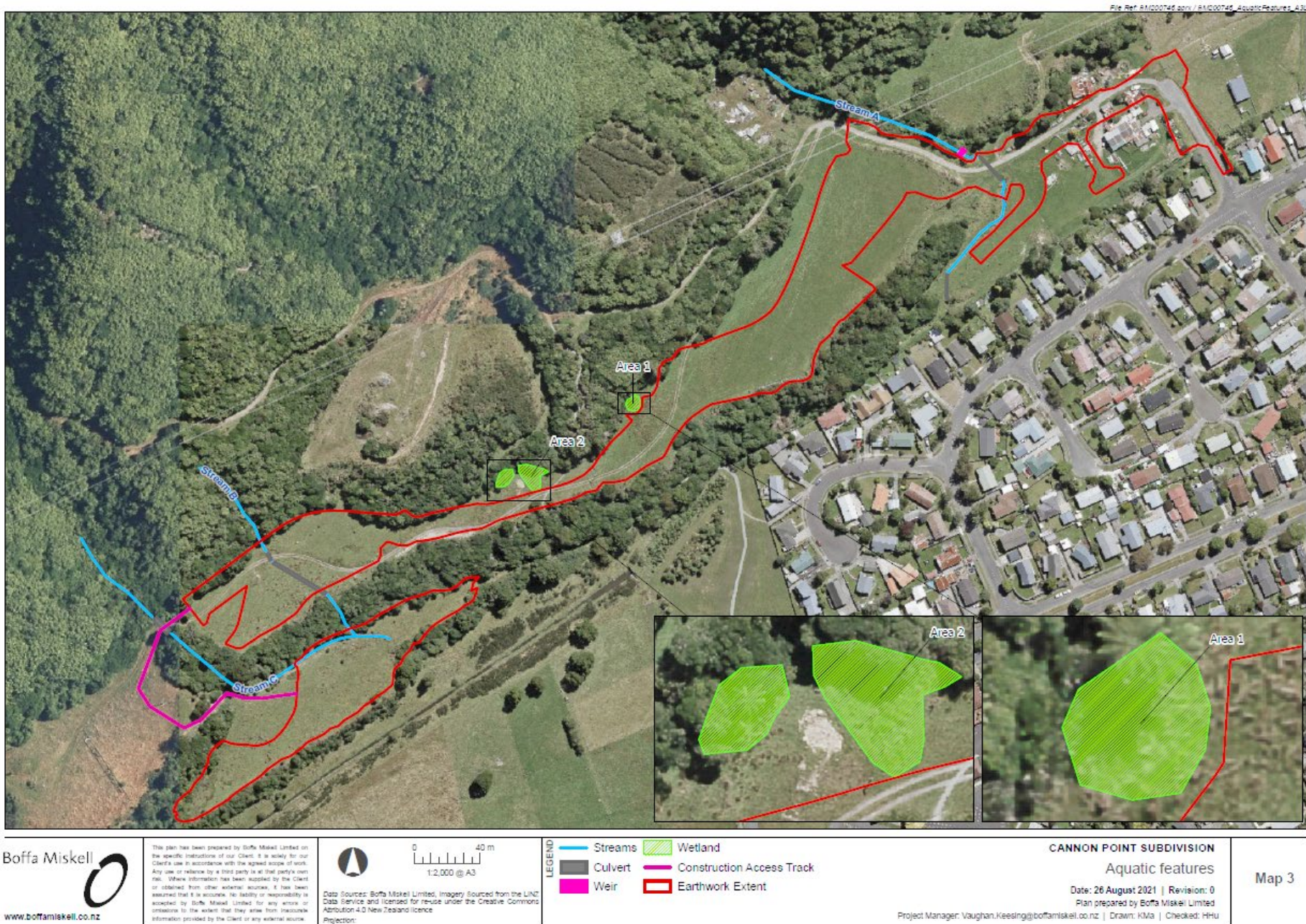


Figure 3: The streams and wetland areas present within the Site.

3.9 Aquatic fauna

3.9.1 Macroinvertebrate community

No macroinvertebrate community data was publicly accessible for the watercourses either within the proposed development or in the vicinity of it. However, previous macroinvertebrate sampling of the lower reaches of Speedy's Stream (Kingett Mitchell Ltd, 2005) and experience with the benthos present can provide some indication of the taxa which are likely to be present within the Cannon Point catchment due to the similarity in surrounding vegetation and topography. Kingett Mitchell Ltd (2005) found Speedy's Stream, along with three other streams, had the greatest taxa richness (26 taxa) across 10 Hutt Valley urban and peri-urban streams. Of these taxa, 82% were mayflies with a further 4.5% being other EPT taxa. The lower Speedy's Stream had an MCI of 128 and a QMCI of 8.6 (Kingett Mitchell Ltd, 2005) which indicates it has excellent water quality (Stark & Maxted, 2007). In our opinion, the macroinvertebrate communities observed elsewhere (Kingett Mitchell Ltd, 2005) are not a directly comparable community structure due to dissimilarities in catchment sizes, stream sizes, and flow regimes. The macroinvertebrate community within site, particularly in macrophyte-dominated reaches) is likely to be a depauperate version of the Speedy's Stream community.

The macroinvertebrate community was not specifically surveyed; however, kōura (freshwater crayfish; *Paranephrops planifrons*) were observed throughout site during the fish surveys.

3.9.2 Fish community

The NIWA-administered New Zealand Freshwater Fish Database (NZFFD) does not include fish data for these tributaries of Te Awa Kairangi/Hutt River. Furthermore, because connectivity between the proposed development and Hutt River is unknown but believed to be severely modified and limited, fish data for the wider Te Awa Kairangi/Hutt River was not deemed relevant or useful to understand the community likely within these streams.

The various tributaries were surveyed throughout and upstream of site, where possible, via EFM and spotlighting. Overall, no freshwater fish taxa were observed in any reach. This is further evidence fish passage into the development is currently not being provided for.

We would expect in small, partially forest covered, intermittent and low flow perennial streams, on hard substrates, not far from the main stem of the Hutt the following species: banded kōkopu, redfin bully and, kōaro. These species are not "cryptic" and if present our sampling methods would have discovered at least one of these species. We are confident that there are no populations of fish within the proposed development (or upstream).

4.0 Ecological Significance

4.1 Terrestrial Environment

The regenerating forest (Community B) present is representative (to a degree) of a developing seral hill country broadleaf system as defined under policy 23 (the under canopy is a little sparse). The community also falls into a land environment which is “threatened”: between 20 and 30% indigenous cover remaining -category 3 - (Threatened Environments Classification 2012), but mahoe serial regeneration in the ED is a common community, especially on hill country, and for that reason we do not accept a rarity category. Diversity and pattern is typical (hence also representative) but there is no especially contextual values. Given the representativeness criteria is met the community **is considered to be Ecologically Significant**.

The pasture (Community A) and shrubland (Community C) areas do not trigger any of the criteria and are therefore **not considered to be significant**. The shrub does fall within a land environment of 10-20% indigenous cover remaining; however, it is not a representative community type (having high proportions of exotic and weedy incursions) and therefore does not trigger this rarity.

It should be noted that the UHDC identifies the shrubland (Community C) areas within their Draft Significant Natural Areas and Landscapes as being potentially significant⁹; however, as it is still in draft form, we have not included this in our assessment of significance.

4.2 Wetlands

Wetland significance is determined using the PNRP definition rather than the RPS criteria (which focuses on indigenous communities). Four vegetation plot communities can be considered **significant natural wetlands** according to the PNRP criteria. These plots, and the reasons for significance, are summarised below:

- i. Plot 1 (Area 1) – due to having a wetland prevalence score of 1.97
- ii. Plot 3 (Area 2) – due to having a wetland prevalence score of 1.35
- iii. Plot 4 (Area 2) – due to having an ambiguous wetland prevalence score of 2.72 and not being dominated by pasture species
- iv. Plot 5 (Area 2) – due to having an ambiguous wetland prevalence score of 2.72 and not being dominated by pasture species.

Plot 2 is **not a significant natural wetland** according to the PNRP criteria due to being pasture.

Figure 3 illustrates the significant natural wetlands and their extent in the Stage 2 application area.

⁹ <https://uhcc.maps.arcgis.com/apps/webappviewer/index.html?id=f9c096b90a5a49e58f658ad460fa503d>

4.3 Waterways

The waterways found within the proposed Cannon Point development are not included in Schedule F1 of the PNRP as significant indigenous freshwater ecosystems.

In summary, the waterways through the proposed development **are not significant waterways** in the Wellington region given their absence of fish, limited aquatic habitat opportunity, and likely represented by moderate quality macroinvertebrate community.

5.0 Ecological Value

The assessment of ecological values is different from “significance” in that values include aspects not considered (or not considered in the same way) by the set criteria for RMA Section 6(c).

Following the EIANZ guidelines described in Section 2.0 (Roper-Lindsay et al., 2018), ecological values have been assigned to the species and habitats described in Section 3.0 and summarised in Table 13.

5.1 Vegetation

The regenerating forests on the site (Community B) are considered to have **Moderate Ecological Value**. This community generally scored low for Representativeness and Diversity as, although dominated by native vegetation, it has a simple structure and a largely absent understory, with missing taxa in all tiers. This community is not representative of the vegetation which would naturally occur here (rimu-mataī broadleaf forest or rimu/tawa-kāmahi forest) but it is representative to a limited degree of a serial community on its way to that climax community. There are few emergent species present within the area (though adjacent communities have rewarewa, tawa, and black beech present), and little evidence of continued succession in the way of seedlings or saplings.

The community scored medium for rarity and context. According to the Threatened Environments Classification (2012), it falls within an environment with between 20 and 30% indigenous cover remaining (considered to be much reduced and seriously fragmented). This community comprises the margin of a much larger area of broadleaf forest (>700 ha), and therefore provides value as a disturbance buffer.

The mixed native and exotic scrubland (**Community C**) is considered to be of **Low Ecological Value**. While its nominally in a Threatened Environments (10-20% indigenous cover left); it is a locally common vegetation serial type, further, no rare species are present within the vegetation. The high presence of exotic species (especially invasive pest species such as *Tradescantia* and blackberry) reduce the value of the site (and add risk to its persistence), and the size and linearity of the fragment means it is subject to edge effects throughout the whole community, as evidenced by the number of weedy intrusions.

The pasture (**Community A**), as a primarily exotic community that provides minimal contextual value (outside of providing occasional foraging habitat for native avifauna) is considered to have negligible ecological value.

5.2 Avifauna

Three of the species potentially present within the site have a threat status of At-Risk; the whitehead (Declining), the New Zealand pipit (Declining), the long-tailed cuckoo (Naturally Uncommon) and the New Zealand falcon (Recovering). Based on the EIANZ guidelines for assigning value to individual species (Roper-Lindsay et al., 2018), the values of this species are be **High, High, Moderate** and **Moderate**, respectively. All other species potentially present within the site are common, Not Threatened species (or exotic) and are therefore of **Low Value**.

5.3 Herpetofauna

With regards to potential herpetofauna, there are several species with a threat classification of “At Risk – Declining” that may be present within the site, based only on suitable habitat availability (in the absence of surveys). These species may be present within and at the margins of the forest and shrubland communities (Communities B and C), and therefore these areas are considered to be **High Value** for herpetofauna. The grazed pasture areas (Community A) do not provide suitable cover for any native lizard species and therefore has **Negligible Value** for herpetofauna.

The (potential) herpetofauna assemblage is considered to be of **High Ecological Value**.

5.4 Wetland habitats

Disregarding the PNRP designated significance, the two wetland areas found within the proposed development area are considered to have **Low Ecological Value** (Table 12). They are derivatives of land-use changes (induced by human activities), largely from poorly installed and/or maintained culverts under the existing vehicle access track. This is further supported by there being no discernible change in contour or landform within and surrounding the identified areas (i.e. there are no obvious identifiers other than culvert blockages that differentiate them from other areas along the terrace). Therefore, and in relation to the species present in them they are not representative of typical alluvial-landscape wetlands. Furthermore, the vegetation communities within each wetland lack complexity and thus appropriate diversity. In regard to ecological context, the wetlands are not ecologically important or integral in the wider landscape, being isolated on an upper terrace and too small to offer any specific faunal resource and do not have an integrity, form, function, or resilience suitable to a valuable ecological feature.

Table 12: Summary of ecological value of each wetland area as per using the EIANZ guideline criteria.

Classification	Ecological Component	Criteria	Ecological Value
Wetlands	Area 1	Representativeness – Low Rarity/Distinctiveness – Low Diversity and Pattern – Low Context - Low	Low
	Area 2	Representativeness – Low Rarity/Distinctiveness – Low Diversity and Pattern – Low Context - Low	Low

5.5 Aquatic habitat

The streams and/or sub reaches have been grouped for valuation due to a general lack of diversity between these groups. The groups are as follows:

- Upper perennial/intermittent - upstream of the development (Streams A and C).** These reaches include the sections flowing down the steep terrace slopes and/or through forested areas upstream of the potential earthworks extent.
- Lower perennial - within and downstream of the development (Streams A and C).** These reaches include the unvegetated sections of stream which flow along the terrace sections of the proposed development and downstream of the development.
- Ephemeral (Stream B).** This includes Stream B upstream of the confluence with Stream C.

5.5.1 Upper perennial/intermittent - upstream of the development (Streams A and C)

Criteria	Assessment	Value
Representativeness	These sections resemble natural flow paths with limited modifications. However, some waste is present, including concrete blocks in Stream A for example.	Moderate
Rarity and distinctiveness	There are no rare or distinct features in the upper perennial/intermittent reaches, and it is unlikely they support Threatened or At Risk fish species.	Low
Diversity and pattern	The upper perennial/intermittent reaches have a range of habitats and substrates which provide good macroinvertebrate and fish habitat opportunities. However, evident fish passage/access issues downstream of the proposed development limit fish access to these features.	Moderate
Ecological context	Historic land clearance surrounding and/or downstream of the upper perennial/intermittent reaches to facilitate ongoing farming practices has occurred; however, these reaches are straddled by regenerating and/or remnant forest which provides good shade and organic inputs. Downstream fish access issues exclude fish from these reaches.	Low

Criteria	Assessment	Value
Ecological integrity	Nativeness – the upper perennial/intermittent reaches are expected to have reasonable macroinvertebrate communities reflecting the good shade provision, organic inputs, and absence of predatory fish. Downstream access issues exclude fish from the reaches meaning there are no stable fish populations - Low Pristineness – These reaches resemble natural channels surrounded or upstream of notable land use changes (including downstream stream modifications). However, concrete and other inorganic inputs are evident in places. Considered to be in a slightly modified state – Moderate Diversity – these reaches have good habitat and hydraulic diversity relative to the flow volumes, are expected to have moderate macroinvertebrate diversity, but lack of fish diversity – Moderate Resilience – These catchments are extensively forested upstream of these reaches. These reaches resemble natural channels and typically have a minimum 7 m wide riparian buffer on both sides – Moderate	Moderate
OVERALL ECOLOGICAL VALUE		Moderate

5.5.2 Lower perennial - within and downstream of the development (Streams A and C)

Criteria	Assessment	Value
Representativeness	The lower perennial reaches were indicative of modified channels that have typically been either straightened and/or culverted.	Low
Rarity and distinctiveness	The flat reaches have no rare or distinct features and their highly modified states make it unlikely that they support Threatened or At Risk fish species.	Low
Diversity and pattern	The flat reaches, where they haven't been piped, are typically clogged with fine deposited sediment or with macrophytes that retain fine sediments. Morphologically, these reaches are uniform, often with, at most, only run/riffle habitats present. There are limited habitat opportunities for macroinvertebrates and less so for fish.	Low
Ecological context	Historic land clearance has occurred surrounding the flat reaches to facilitate ongoing farming practices. Stock, historically, could access these reaches (only a few sheep remain on site which could access Stream A at the time of survey). Any functional shade is provided by topography rather than riparian vegetation, but predominantly no shade is provided.	Very Low
Ecological integrity	Nativeness – the flat reaches are expected to contain depauperate macroinvertebrate communities, which are indicative of macrophyte-dominated, soft-bottom conditions, with no resident stable fish populations - Low Pristineness – historically farmed and heavily modified – Low Diversity – these reaches have a lack of diversity – Low Resilience – extensive stock access and land clearance, with corresponding effects on the stream – Low	Low
OVERALL ECOLOGICAL VALUE		Low

5.5.1 Ephemeral (Stream B)

Criteria	Assessment	Value
Representative ness	The steep ephemeral Stream B resembles a natural flow path with limited modifications. It is typical of 1 st order ephemeral streams which originate in the steep hills surrounding the lower reaches of Te Awa Kairangi/Hutt River.	Moderate
Rarity and distinctiveness	There are no rare or distinct features and the prevailing ephemeral conditions make it unlikely to support Threatened or At Risk fish species.	Low
Diversity and pattern	It has a limited range of habitats and substrates which provide good macroinvertebrate and fish habitat opportunities (which is typical of ephemeral reaches).	Low
Ecological context	Historic land clearance surrounding and/or downstream to facilitate ongoing farming practices has occurred; however, it is straddled by regenerating and/or remnant forest which provides good shade and organic inputs. Downstream fish access issues exclude fish from these reaches for foraging purposes during periods of flow.	Low
Ecological integrity	Nativeness – it is expected to have a macroinvertebrate community that is typical of ephemeral flow conditions. It may be that a reasonable macroinvertebrate community periodically forms if there is prolonged flow due to the good shade provision, organic inputs, and absence of predatory fish – Low Pristineness – it resembles a natural 1st order ephemeral channel which is predominantly forested. Considered to be in a slightly modified state – Low Diversity – it has limited habitat and hydraulic diversity due to predominant absence of flows (typically riffle/cascade systems when there is flow) and is expected to have a macroinvertebrate community typical of forested 1st order ephemeral streams, lack of fish diversity – Low Resilience – The catchment is extensively forested upstream. It resembles a natural channel which has a wide riparian buffer on both sides – Moderate	Low
OVERALL ECOLOGICAL VALUE		Low

5.6 Aquatic fauna

No Threatened or At Risk aquatic fauna were observed on site or are expected to be there. Therefore, all potentially residing aquatic fauna will have Negligible (for introduced taxa) or Low (for indigenous taxa) Ecological Value.

5.7 Summary of ecological values

Table 13. Ecological values of habitats and indigenous species within the proposed project site.

Classification	Ecological Component	Criteria	Ecological Value
Terrestrial	Regenerating māhoe/tree fern forest (Community B)	Representativeness – Low Rarity/Distinctiveness – Medium Diversity and Pattern – Low Context - Medium	Moderate
	Mixed native and exotic scrub (Community C)	Representativeness – Very low Rarity/Distinctiveness – Moderate Diversity and Pattern – Very Low Context - Low	Low
	Exotic pasture (Community A)	Representativeness – Very Low Rarity/Distinctiveness – Very Low Diversity and Pattern – Very Low Context - Low	Negligible
	New Zealand pipit	At Risk - Declining	High
	Whitehead	At Risk - Declining	High
	New Zealand Falcon	At Risk - Recovering	Moderate
	Herpetofauna	At Risk species potentially present within the site	High
Wetlands	Area 1	Representativeness – Low Rarity/Distinctiveness – Low Diversity and Pattern – Low Context - Low	Low
	Area 2	Representativeness – Low Rarity/Distinctiveness – Low Diversity and Pattern – Low Context - Low	Low
Freshwater	Upper perennial (Streams A and C)	Representativeness – Moderate Rarity/Distinctiveness – Low Diversity and Pattern – Moderate Context – Low Ecological Integrity - Moderate	Moderate
	Lower perennial (Streams A and C)	Representativeness – Very Low Rarity/Distinctiveness – Low	Low

Classification	Ecological Component	Criteria	Ecological Value
		Diversity and Pattern – Very Low Context – Very Low Ecological Integrity - Very Low	
	Ephemeral (Stream B)	Representativeness – Moderate Rarity/Distinctiveness – Low Diversity and Pattern – Low Context – Low Ecological Integrity - Low	Low

6.0 Assessment of Ecological Effects

There are a number of potential direct and indirect effects on ecological values associated with the construction of the Cannon Point development. These effects are discussed below and are in light of the various design changes and managements suggested as part of the shaping that has been continuous through the development design process. The Overall Level of Effect on habitat types and species within the area are summarised in Section 7.0 and Table 14.

6.1 Terrestrial Environment

6.1.1 Terrestrial Vegetation Loss

The current construction works planned within the site primarily affect the grazed pasture habitat (**Community A**), with some small areas of native vegetation clearance. The grazed pasture is a predominantly exotic community of negligible ecological value and is a very common agricultural vegetation community in the region. Therefore, given the abundance of that habitat type in the local area the magnitude of effect is considered to be Low, and the **Overall Level of Effect is Very Low**.

The clearance of approximately 0.08 ha of regenerating forest (**Community B**) will be required. This community covers an area of over 250 ha on the hills above the proposed site, and so clearance will result in the loss of <0.04% of the total community in the local area. This is also a common community type throughout the Hutt Valley Western Hills, so on a catchment scale, the loss proposed here would be negligible. Therefore, at a Moderate value and a Negligible magnitude, the **Overall Level of Effect is Very Low**.

Construction will also result in the loss of approximately 0.05 ha of the mixed native and exotic scrub (**Community C**). Within the wider study site this community covers an area of approximately 4.2 ha, so the proposed clearance would equate to around 1.2% of the community. It should also be noted that much of the clearance in this community is at the upper margin, which is largely dominated by weedy species such as gorse, cherry, and blackberry, and the amount of indigenous clearance here will be lower than 0.15 ha. Māhoe-dominated scrub is a very common early successional community in the Wellington Region, and therefore

the magnitude of loss of this vegetation is considered negligible. At a Low value and Negligible magnitude, the **Overall Level of Effect on this community is Very Low.**

6.1.2 Species Habitat Loss, Disturbance and Displacement

6.1.2.1 Avifauna

Vegetation clearance will result in some habitat loss for avifauna within the project area. Most of the species present, or potentially present, on site are common native and exotic species that are able to use a variety of habitats. They are also flighted, mobile species, and are able to move and occupy alternative areas of habitat available within the surrounding area when displaced and or disturbed from the area during construction activities.

Three At-Risk species potentially use habitats within or adjacent to the site; the NZ pipit, whitehead and NZ falcon.

There is a low probability that NZ pipit may use the pasture areas for foraging. They also use rough pasture habitats for nesting; however this requires cover (tussock/long grasses, fernlands, etc). Due to the ongoing grazing of the site, and the expected continued grazing until clearance commences, it is unlikely that sufficient cover is provided for nesting. While the clearance of pasture areas will displace any foraging pipits, there are plentiful habitats in the surrounding areas (farmlands, rough pasture, riverbeds) to which they can easily relocate. Therefore, the magnitude of effect on pipit (High value) is considered to be Negligible, and the **Overall Level of Effect is considered to be Very Low.**

The whitehead (High value) may use the forest and scrub habitats within the site for foraging and nesting. However, the areas of clearance are at the more disturbed margins of these communities, and are therefore less likely to host abundant numbers of whiteheads, or be utilised as nesting habitat. Any whiteheads that are displaced can move into the adjacent, large areas of broadleaf forest to the north. Therefore, the magnitude of effect on any whitehead population present would be Negligible and the **Overall Level of Effect would be Very Low.**

Falcon (High value) were observed over the broadleaf forest to the north of the project site during other surveys, and likely nest and forage within the forest. However, the small scale of clearance at the forest margin is unlikely to have an impact, especially given the scale of undisturbed forest immediately adjacent. As the margins of the forest are unfenced, and the pasture is grazed, there is likely too much disturbance within the clearance areas for falcon nesting. Therefore, the magnitude of effect is considered to be Negligible and the **Overall Level of Effect to be Very Low.**

Based on these factors, we consider that without mitigation the Magnitude of Effect of avifauna habitat loss, disturbance and displacement will be Negligible. A Negligible Magnitude of Effect on Low to High Value avifauna species, results in a **Very Low Overall Level of Effect.**

6.1.2.2 Herpetofauna

The clearance of the small areas of forest and scrub vegetation may result in a very limited amount of habitat loss for native lizard species, as well as the potential for injury or mortality to any lizards inhabiting the areas of clearance. The At-Risk species potentially present (the ngahere gecko and the barking gecko) are both arboreal lizards, and would therefore be present within forest vegetation itself. However, populations of these species tend to be greatly reduced where pest control is not implemented, and they are less likely to be present in disturbed areas such as the unfenced margin. So, if present, they are expected to be at low densities, and primarily present within the interior of the forest.

The magnitude of effect is therefore considered to be negligible, and the **Overall Level of Effect to be Very Low**.

The other lizard species considered to be potentially present within the site are all classified as Not Threatened (Low ecological value). Small areas of suitable habitat will be lost for these species, but as with the other terrestrial species described, this clearance will be Negligible relative to the scale of habitat present in the surrounding areas. So, the **Overall Level of Effect will also be Very Low for these species**.

The magnitude of effect of the proposal is considered to be Negligible on a potentially Low to High value herpetofauna community, resulting in a **Very Low Overall Level of Effect**.

6.2 Wetland Environment

6.2.1 Wetland hydrology - accidental complete drainage (construction and operational)

The natural wetlands identified are either a result of the raised access track encouraging water retention (Area 1) or blocked or poorly installed culverts under the existing vehicle track (Area 2 and Area 3). The identified areas of natural wetland (whose areas have been delineated) have been avoided in terms of direct effects, because of the identification by the ecologists and then design responses to avoid those areas.

In terms of the roading and hydrological aspects of the wetland, **if** the existing track culverts were unblocked and/or the access track was removed it is likely the wetlands will at least partially drain. To ensure compliance with the current policy direction of GWRC and the NPS-FM (2020) (that effects on wetlands are avoided) careful management of the wetlands and any new or removal of structures will be important to retain their existing hydrological regime.

While often not being mapped, it is our experience that small wetlands such as these (i.e. that are a result of small-scale drainage alterations) are common throughout the modified peri-urban, and rural landscape. Therefore, **if** drainage of the wetlands (and depending on the extent) did occur because of track and culvert works, it could have an overall High magnitude of effect on the prevalence of these natural wetlands at the site scale, but a Low magnitude of effect in the wider landscape. These potential effects are, however, sort to be avoided.

- A High magnitude of effect on a low value system results in a **Low Overall Level of Effect within the river terrace**.
- A Low magnitude of effect on a low value system results in a **Very Low Overall Level of Effect within the wider landscape**.

6.2.2 Wetland hydrology - partial modification (operational)

No modification(s) to the catchments of the existing natural wetlands is proposed as part of this development. Therefore, the drainage regime of the wetlands has been designed to mimic the existing conditions, including utilising aspects of the road carriageway to manage and maintain the existing downstream flow rates. For example, the drainage of Area 1 is currently dominated by soakage to ground (based on no evidential discharge location) which has been retained, and any excess overland discharge will be captured by the road drainage network. Area 2 will follow a similar drainage pattern, but a small berm is proposed between the existing ground and the

carriageway to encourage water retention. With these provisions, there is not expected to be any change or modification in the existing hydrology regime of the natural wetlands, meaning no effect is anticipated, equating to a no more than negligible magnitude of effect. A negligible magnitude of effect on the low ecological value wetlands results in an **Overall Very Low Level of Effect (or effect avoided)**.

6.2.3 Sediment Discharge Events

It is assumed good practice erosion and sediment control measures will be implemented during the construction phase of the Cannon Point development. However, there remains a residual risk, especially during adverse weather events, of these controls being compromised and extraneous material entering wetland habitat(s). It is assumed based on the fish survey evidence that the wetlands do not support functional fish communities (noting we cannot rule out there being an occasional eel in isolated wetlands due to their ability to travel overland for periods). Additionally, the wetland vegetation will be able to survive sediment-pulses provided they are not substantive enough to turn the wetlands into terrestrial environs. Effects from sediment discharges into the wetlands is expected to be limited to an altering of the topography/bathymetry. We assess two levels of discharge: Typical and moderate discharges. The extreme event is firstly very unlikely and secondly the effect will be self-evident and the issues apparent. A typical small-scale pulse of sediment would result in a Low Magnitude a moderate event a moderate magnitude of effect. This leads to a low value feature receiving either a **Low or Very Low Overall Level of Effect**. In the case of sediment discharge, it should not happen but there are remedial actions that can be undertaken.

6.2.4 Contaminant Run-Off

The forested upstream catchment, low hydrological flows of the wetlands within the site, and expected absence of freshwater fish fauna, coupled with the relatively low vehicle volume and lot-derived run-off expected from this development, suggests there is low risk of adverse ecological effects from contaminants (such as heavy metals, oils, chemicals and herbicides). Furthermore, wetlands naturally filter contaminants from water, especially where aquatic/hydrophilic vegetation biomass is high. Therefore, the increase in impermeable surfaces as part of the development is not of ecological concern with regard to downstream water quality. It is expected stormwater, and thus contaminant run-off, will be managed and contained within the stormwater network meaning contaminant loading in the remaining existing wetlands (that are not being modified or attached to the stormwater treatment system) is not expected to be high or measurable. In summary, a Negligible Magnitude of Effect on the Low Value wetlands results in an **Overall Very Low Level of Effect**.

6.3 Stream Environment

6.3.1 Culvert installation - Stream A

Originally an oversized box culvert was proposed for under the carriageway on Stream A. Subsequent hydrological modelling suggested this would result in downstream flooding issues. To ameliorate this risk, the existing hydrology needs to be maintained meaning the existing 600 mm diameter culvert will be replaced with a culvert of the same size. To ensure fish passage is provided for, this culvert (including inlet and outlet structures) is proposed to be fitted with spat

rope and roughened aprons with low flow points to facilitate fish passage (in the event downstream barriers are removed in the future and passage is made possibly from lower down in the system).

Additionally, approximately 5 m of streambed is expected to be disturbed upstream and downstream of the proposed (and therefore existing) culvert to allow for the installation and armouring of the inlet and outlet. The walls/banks of the inlet and outlet structures will be protected using gabion baskets.

- In the short term (construction and operational phase) the magnitude of effect is expected to be low given there is an existing culvert.
 - A low magnitude of effect on the moderately valued upper section results in a **Low Overall Level of Effect**
 - A low magnitude of effect on the low valued lower section results in a **Very Low Overall Level of Effect**
- In the long term (operational phase - assuming downstream barriers are fixed) the provision of fish passage through the culvert is expected to have a positive magnitude of effect. A positive magnitude of effect, irrespective of the ecological value of the stream, results in an **Overall Net Gain**. This Net Gain will not be realised until downstream fish barriers are fixed.

6.3.2 Ephemeral flow path loss - Stream B

The approximately 200 mm diameter pipe under the terrace has been poorly maintained such that sheet flows typically arise following heavy rainfall rather than being conveyed through the pipe. As such, the section of Stream B between the outlet of this pipe and the confluence with Stream C is expected to receive flows that are greatly reduced from the natural. The current proposal captures and conveys the ephemeral Stream B headwaters as part of the road carriageway stormwater infrastructure. Given the existing pipe and limited flows within it, the potential loss of flow path (noting much of it is currently piped) will result in a very slight change from the existing baseline condition, with the change barely distinguishable, equating to a Negligible Magnitude of Effect. A Negligible Magnitude of Effect on the Low Ecological Value Stream B, results in an **Overall Very Low Level of Effect**.

When assessing the potential effects of stream loss, we recognise Policy 7 of the NPS-FM (2020) which encourages “*The loss of river extent and values is avoided to the extent practicable*”. As the NPS-FM (2020) does not define “river”, we default to the definition in the RMA which defines a “River” as “*a continually or intermittently flowing body of fresh water...*”. Therefore, the potential loss of Stream B extent (as an ephemeral flow path) is not captured under Policy 7 of the NPS-FM (2020).

6.3.3 Sediment Discharge Events

It is assumed good practice erosion and sediment control measures will be implemented during the construction phase of the Cannon Point development. It is also assumed that the sediment discharges can only affect downstream reaches which are the poor condition lower reaches. However, there remains a residual risk, especially during adverse weather events, of these controls being compromised and extraneous material entering a watercourse(s). Currently, the streams are typically dominated by fine sediments (sands and silts) with a presumed corresponding depauperate macroinvertebrate community (the upper forested systems being

better). A substantive sediment pulse would be required to notably alter the macroinvertebrate community structure in the long-term as recovery by fine sediment-tolerant taxa is rapid. Rather than reflect the unlikely scenario of a massive discharge (which will cause more damage for longer) we reflect on the more probable of a small-scale localised discharge to lower reaches. In this scenario a Low Magnitude of Effect on the Low (being the most likely recipient) Value macroinvertebrate community will have a **Very Low Overall Level of Effect**.

6.3.3.1 Sediment Discharge Effects on Aquatic Fauna in lower reaches

The Not Threatened kōura (freshwater crayfish) were observed in high abundances throughout the development site¹⁰. Further there are likely areas of high-quality macroinvertebrate assemblages. Direct effects within the stream environments are expected to be limited to 5 m either end of the proposed culvert; this will result in a one of short term very minor sediment discharge in the lower reaches of the site. There may also be infrequent overland discharges from earthworks that escape the controls (typically as a result of rain events). These too are likely small scale and flushed because of the increased flows flowing these rain events.

Generally, because of the scale and management that is to happen, we consider the likely sediment discharge will be Negligible. Koura (as we have monitored through Transmission Gully discharges) are robust and, being large bodied taxa, generally are not buried or overly affected by even substantive sediment deposition. Additional accidental discharges from earthworks may infrequently escape the controls, but the expected lower reach soft bottom macroinvertebrate fauna will only likely suffer small scale losses and recover quickly. We judge the magnitude of potential sediment discharge to aquatic macroinvertebrate fauna in the lower receiving reaches (given management) will be of **Negligible Magnitude** and on a generally Low valued fauna, which results in a **Very Low Overall Level of Effect**.

6.3.4 Contaminant Discharge

An increase in impermeable surfaces (roadways, car parks, housing, etc) commonly increases contaminant run-off, particularly metals (lead, zinc, copper (Auckland Regional Council, 2008)) and hydrocarbons associated with vehicle fuels, as well as oils and outdoor cleaning compounds and smaller levels of sediments. Contaminants associated with run-off primarily enter waterways in small pulses associated with medium and/or large rainfall events. These contaminants adhere to sediment particles and can become buried in deposition zones or transported through the system when flows are sufficient. To enter the food web, these contaminants require sediment feeding detritivores and/or plants to absorb them. Furthermore, contaminant accumulation is slow and often reflects the rate of development (urbanisation) on a catchment/landscape scale. Therefore, the addition of the proposed Cannon Point development is unlikely to measurably decrease water quality via stormwater/contaminant run-off. The **Negligible Magnitude** of Effect, irrespective of the ecological value of the system or the expected species within will result in a **Very Low Overall Level of Effect**.

6.3.4.1 Stormwater Infrastructure

Stormwater is proposed to be treated and managed via a bioretention system that then discharges into the existing stormwater infrastructure in Tōtara Park. Therefore, there are not expected to be any effects of stormwater discharge on the aquatic environment.

¹⁰ A possible consequence of the absence of fish

7.0 Summary of the Level of Ecological Effects

Table 14 summarises the level of ecological effects on the ecological components impacted, or potentially impacted, by the proposed Cannon Point development.

Table 14. Summary of the Overall Level of Potential Ecological Effects for the project site.

Ecological Component	Component/Effect	Ecological Value	Magnitude of Effect	Overall Level of Effect
Terrestrial	Regenerating māhoe forest (Community B)	Moderate	Negligible	Very Low
	Mixed native and exotic scrub (Community C)	Low	Negligible	Very Low
	Exotic pasture (Community A)	Negligible	Low	Very Low
	New Zealand pipit	High	Negligible	Very Low
	Whitehead	High	Negligible	Very Low
	NZ Falcon	Moderate	Negligible	Very Low
	Herpetofauna	High	Negligible	Very Low
Wetland	Wetland hydrology - accidental complete drainage - site scale	Low	High	Low
	Wetland hydrology - accidental complete drainage – landscape scale	Low	Low	Very Low
	Wetland hydrology - partial modification	Low	Negligible	Very Low
	Sediment discharge (typical event)	Low	Low	Very Low
	Sediment discharge event (moderate event)	Low	Moderate	Low
	Contaminant run-off	Low	Negligible	Very Low
Freshwater	Culvert installation - Stream A (upper section) - short term	Moderate	Low	Low
	Culvert installation - Stream A (lower section) - short term	Low	Low	Very Low
	Culvert installation – Stream A - long term	Moderate	Positive	Net Gain

Ecological Component	Component/Effect	Ecological Value	Magnitude of Effect	Overall Level of Effect
	Ephemeral flow path loss - Stream B	Low	Negligible	Very Low
	Sediment discharge (physical environment) to perennial lower reaches	Low	Low	Very Low
	Sediment discharge lower stream (known aquatic fauna - kōura)	Low	Negligible	Very Low
	Contaminant discharge	Moderate	Negligible	Very Low
	Stormwater infrastructure – no aquatic effects			

8.0 Avoid, Minimise, Remedy and Mitigate – Recommendations

The following actions are recommended to avoid, minimise remedy, mitigate and offset any potential adverse ecological effects of construction of the Cannon Point development on terrestrial and freshwater habitats, flora, and fauna.

8.1 Avoid, Minimise, Remedy and Mitigate:

8.1.1 Terrestrial Environment

- To avoid unnecessary vegetation clearance, the areas to be cleared should be identified by an ecologist and clearly delineated with flagging tape or bunting before clearance.
- To be certain of protection areas of natural wetland should be demarcated on the ground by flagging tape etc also.
- To avoid damaging the wetland habitats, nearby vegetation should be felled so that it falls away from these areas.
- To allow for passive dispersal of terrestrial fauna, felled woody vegetation should be left in place for three days post-felling.
- Prior to any vegetation clearance during the nesting season, checks will be made for nesting indigenous avifauna and, if found, measures will be put in place to ensure the nest is not disturbed (i.e. exclusions zones established and clearance delayed within that zone).

- If any areas identified as potential lizard habitat are to be affected, a Wildlife Authority ("permit") must be applied for through the Department of Conservation, and a Lizard Management Plan must be prepared¹¹.
- To avoid potentially introducing exotic weed species into the area (or spreading existing weeds), any machinery used during construction should be cleaned before and after entering the site.
- No vegetation clearance (including trimming) shall occur to facilitate the western fill site and access track to it.

8.1.2 Wetland Environment

- The development has been designed so that effects inside the wetlands are avoided and the hydrology is maintained.
 - Any structures placed within the catchments for the wetlands shall ensure the existing hydrological regime is retained and maintained.
- No infrastructure is to be placed within the bounds of the existing natural wetlands.
- To minimise effects from potential discharge events, industry standard erosion and sediment controls should be in place and maintained throughout the construction of the development.
- To minimise the potential for weed incursion in the wetlands following development and clearance works nearby, the following mitigation is recommended:
 - Clearing, as much as practicable, the exotic vegetation from surrounding, the wetlands
 - Establishing a post-development infrastructure-free buffer (excluding the road) around the wetland edges that is at least 5 m wide to ensure future developments do not encroach.
 - Establishing an indigenous, eco-sourced vegetated 5 m minimum riparian buffer
 - Ensuring all planting is suitably managed and maintained until such a time that it is deemed self-sufficient.
- Given the proximity of works to the natural wetlands, the condition of the wetlands should be monitored during construction and for a period of at least 2 years following construction to confirm they still meet the definition of a natural wetland.
 - Details of the monitoring and reporting, including an adaptive management process in case drying is observed should be captured in a Wetland Management Plan.

¹¹ While the potential effect on lizards is considered to be Very Low, all native lizards are absolutely protected under the Wildlife Act 1953, and any works that may affect them must be conducted under a valid permit. The permit application typically requires a Lizard Management Plan, outlining what efforts will be made to avoid or mitigate for effects on lizards.

8.1.3 Freshwater Environment

- To minimise effects from potential discharge events, industry standard erosion and sediment controls should be in place and maintained throughout the construction of the development.
- In the event of an unforeseen sediment discharge occurring, an adaptive management/response approach should be developed and enacted by a suitably experienced ecologist to assess for potential adverse ecological effects on the aquatic environment. In the event of believed adverse effects, their assessment should include recommendations to remedy or mitigate the effect.
- Where/if vegetation clearance occurs within 10 of the stream banks, suitable native trees and shrubs should be planted along the banks to assist with bank stability, shading, and run-off. Planting should occur as close as practicable to the bank edge and within the next practicable planting season.
- Fish passage should be provided for through the Stream A culvert with confirmation of passage provisions provided by a suitably qualified and experienced freshwater ecologist.
 - Prior to installation of the Stream A culvert, a suitably qualified and experienced freshwater ecologist shall confirm the fish passage design elements are present and satisfactory.
 - No fish passage success monitoring is recommended due to the presence of notable downstream barriers.
 - The fish passage measures should be regularly inspected and maintained to ensure fish passage potential remains in the event downstream barriers are fixed.
- Where necessary, armouring the culvert inlet and outlet should be done using boulders along the edges which can provide aquatic habitat but do not result in subsurface flows through the low-flow channel which will be included.
- Upstream and downstream works within the streambed which are required for culvert installation should be minimised so that direct effects are minimised as much as practicable.
- If the streambed is directly affected outside of what is needed to facilitate the installation of the culvert, then an adaptive management process shall be enacted to remedy any effects.
- No works or modification to the stream environment should occur as part of the western fill site or access track to it.
 - Any fill material for the western fill site should be setback at least 5 m from any stream environment, with appropriate erosion and sediment control measures installed.
 - No extraneous material from establishing the track to the western fill site shall enter the stream environment.

8.2 Offset:

After following the avoid, minimise, remedy, and mitigate actions recommended above there are not expected to be any residual adverse effects that need to be offset.

9.0 Conclusion

The proposed road carriageway and subdivision near Tōtara Park, Upper Hutt, is situated along an old Hutt River terrace. Stages 1 and 2 are dominated by managed/grazed pasture, with indigenous/exotic mixed vegetation, regenerating indigenous forest, two natural wetland areas, and three small tributaries of Hutt River.

The project site has ecologically significant features - the regenerating seral forest vegetation triggers the representative criteria and several fauna potentially present trigger the rarity criterion. Two wetland areas are considered “natural wetlands” according to the PNRP definition. The unnamed tributaries of Hutt River are not listed as significant waterways in the PNRP.

The terrestrial, wetland, and freshwater components within the proposed site and the species that use, or potentially, use these areas range in Ecological Value from Negligible to High. The actual and potential Magnitude of Effect on these components and species as a result of construction range from Negligible to Moderate, with the potential for some positive effect in the long term. Using EIANZ's guidelines, this results in Very Low to Low Overall Levels of Ecological Effect and potential isolated Net Gain.

Several recommendations are provided that should be implemented to minimise and mitigate for potential impacts of construction of the road carriageway and subdivision. If these recommendations eventuate, then there are not expected to be any residual ecological effects that require offsetting.

10.0 References

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Appendix 1: Site photos

Vegetation/habitats



Photo 1: Pasture areas (Community A) and the shrubland margin (Community C)



Photo 2: Example of Community B (regenerating forest)



Photo 3: Upper margin of Community C (shrubland)



Photo 4: A boulderfield at a forest margin, which may provide lizard habitat

Wetlands



Photo 5: *Isolepis* and *Juncus* dominant in Plot 1



Photo 6: Area of Plot 2 location in pasture and rushes (non-wetland)



Photo 7: *Carex secta* in Plot 3



Photo 8: Dominant grasses and buttercup in Plot 4.



Photo 9: *Isolepis* growing with buttercup in Plot 5

Stream A



Photo 10: Lower reach



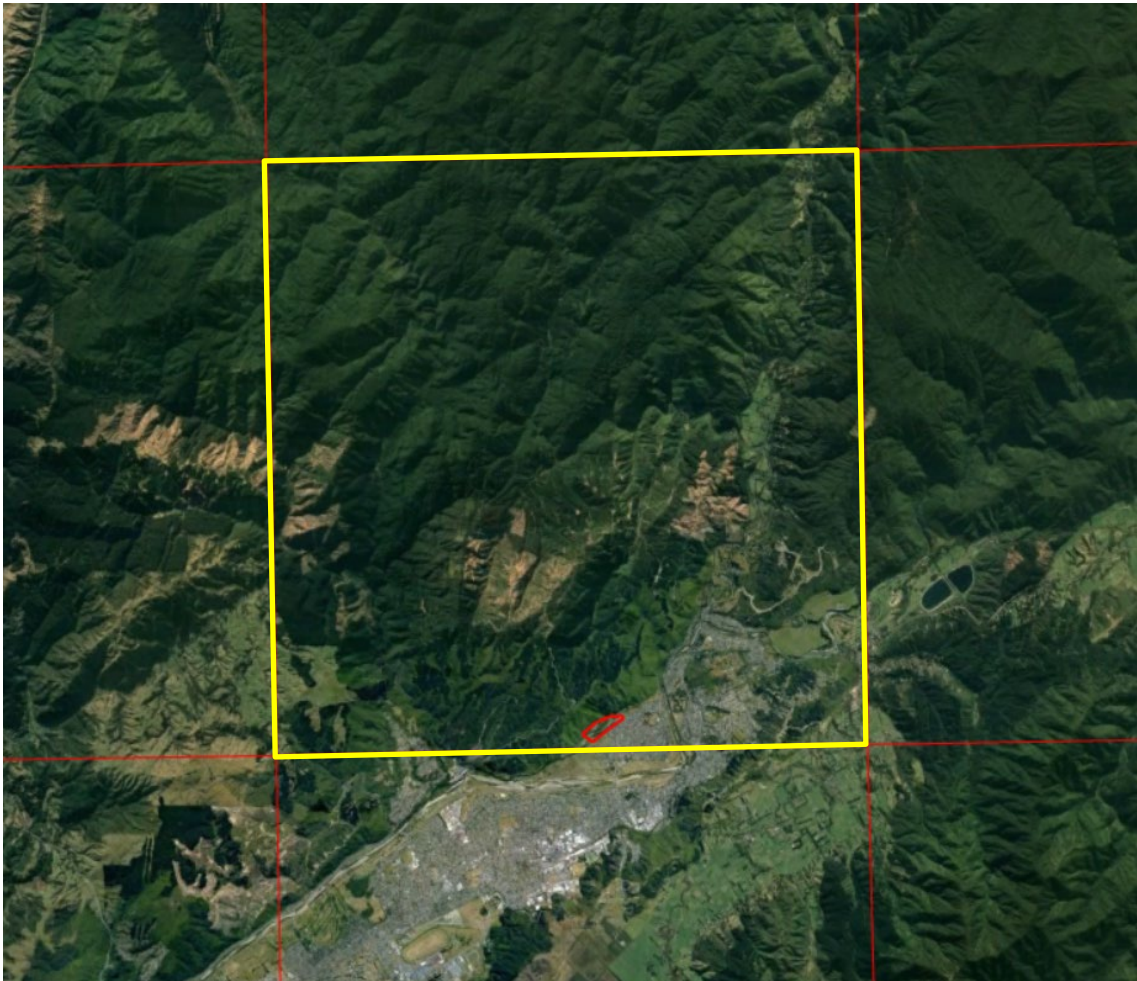
Photo 11: Manhole/riser at the downstream extent of Stream A

Stream C



Photo 12: the mid-stretch of Stream C

Appendix 2: OSNZ bird atlas square relative to the Site



Appendix 3: Wetland species lists

Area 1									
Plot 1									
UPL	% cover	FACU	% cover	FAC	% cover	FACW	% cover	OBL	
		Prunella vulgaris	2	Ranunculus repens	32	*Juncus edgariae	14	*Moss sp.	4
				Lotus pendunculatus	3			*Isolepis prolifera	45
				Holcus lanatus	7				
Total	0		2		42		14		49
Plot 2									
UPL	% cover	FACU	% cover	FAC	% cover	FACW	% cover	OBL	
		Achillea millefolium	2	Holcus lanatus	55	*Juncus edgariae	18		
		Galium aparine	1	Ranunculus repens	18				
		Prunella vulgaris	1	Lotus	5				
Total	0		4		78		18		0
Area 2									
Plot 3									
UPL	% cover	FACU	% cover	FAC	% cover	FACW	% cover	OBL	
*Hypolepis ambigua	4	*Bracken	2	Ranunculus repens	5	Juncus effusus	1	*Carex secta	75
				Lotus	1			Erythranthe guttata	12
Total	4		2		6		1		87
Plot 4									
UPL	% cover	FACU	% cover	FAC	% cover	FACW	% cover	OBL	
		Galium aparine	2	Ranunculus repens	38	*Juncus sarophorus	6	*Carex secta	4
				Holcus Lanatus	6	Juncus effusus	4	*Nasturtium officinale	6
				Alopecurus pratensis	35				
Total	0		2		79		10		10
Plot 5									
UPL	% cover	FACU	% cover	FAC	% cover	FACW	% cover	OBL	
				Ranunculus repens	65	Juncus effusus	2	*Isolepis prolifera	8
				Holcus lanatus	20			Callitriche stagnalis	5
Total	0		0		85		2		13

Appendix 4: RPHA score sheets

Stream A

Stream A - Upper											
Habitat Parameter	Condition category										Score
1. Deposited sediment	The percentage of the stream bed covered by fine sediment										5
	0	5	10	15	20	<u>30</u>	40	50	60	>75	
Score	10	9	8	7	6	5	4	3	2	1	
2. Invertebrate habitat diversity	The number of different substrate types such as <u>boulders</u> , <u>cobbles</u> , <u>gravel</u> , <u>sand</u> , <u>wood</u> , <u>leaves</u> , root mats, macrophytes, <u>periphyton</u> . <u>Presence of interstitial space</u> score higher.										10
	<u>>5</u>	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
3. Invertebrate habitat abundance	The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles, clear of filamentous algae/macrophytes.										5
	95	75	70	60	50	<u>40</u>	30	25	15	5	
Score	10	9	8	7	6	5	4	3	2	1	
4. Fish cover diversity	The number of different substrate types such as <u>woody debris</u> , root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, <u>boulders</u> , <u>cobbles</u> . <u>Presence of substrates providing spatial complexity</u> score higher										7
	>5	5	5	<u>4</u>	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
5. Fish cover abundance	The percentage of fish cover available										4
	95	75	60	50	40	30	<u>20</u>	10	5	0	
Score	10	9	8	7	6	5	4	3	2	1	
6. Hydraulic heterogeneity	The number of hydraulic components such as <u>pool</u> , <u>rifle</u> , <u>fast run</u> , slow run, rapid, <u>cascade/waterfall</u> , turbulence, backwater. <u>Presence of deep pools</u> score higher.										7
	>5	5	5	<u>4</u>	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
7. Bank erosion	The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank, or stock pugging										9
Right bank	0	<u><5</u>	5	15	25	35	50	65	75	>75	
Left bank	0	<u><5</u>	5	15	25	35	50	65	75	>75	
Score	10	9	8	7	6	5	4	3	2	1	
8. Bank vegetation	The maturity, diversity, and naturalness of bank vegetation										6
Left AND right bank	Mature native trees with diverse and intact understory	Regenerating native* or flaxes/sedges/tussock > dense exotic				Mature shrubs, sparse tree cover > young exotic, long grass			Heavily grazed or mown grass > bare/impervious ground		
Score	10	9	8	7	6	5	4	3	2	1	
9. Riparian width	The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s)										7
Left bank	≥30	15	10	<u>7</u>	5	4	3	2	1	0	
Right bank	≥30	15	10	<u>7</u>	5	4	3	2	1	0	
Score	10	9	8	7	6	5	4	3	2	1	
10. Riparian shade	The percentage of shading of the stream bed throughout the day due to vegetation, <u>banks</u> , or other structure(s)										10
	<u>≥90</u>	80	70	60	50	40	25	15	10	≤5	
Score	10	9	8	7	6	5	4	3	2	1	
Total	Sum of parameters 1 - 10)										70

Stream A - lower

Habitat Parameter	Condition category										Score
1. Deposited sediment	The percentage of the stream bed covered by fine sediment										1
	0	5	10	15	20	30	40	50	60	>75	
Score	10	9	8	7	6	5	4	3	2	1	
2. Invertebrate habitat diversity	The number of different substrate types such as boulders, <u>cobbles</u> , <u>gravel</u> , <u>sand</u> , wood, leaves, root mats, <u>macrophytes</u> , periphyton. Presence of interstitial space score higher.										6
	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
3. Invertebrate habitat abundance	The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles, clear of filamentous algae/macrophytes.										1
	95	75	70	60	50	40	30	25	15	5	
Score	10	9	8	7	6	5	4	3	2	1	
4. Fish cover diversity	The number of different substrate types such as woody debris, <u>root mats</u> , <u>undercut banks</u> , overhanging/encroaching vegetation, <u>macrophytes</u> , boulders, <u>cobbles</u> . Presence of substrates providing spatial complexity score higher										5
	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
5. Fish cover abundance	The percentage of fish cover available										9
	95	75	60	50	40	30	20	10	5	0	
Score	10	9	8	7	6	5	4	3	2	1	
6. Hydraulic heterogeneity	The number of hydraulic components such as <u>pool</u> , <u>riffle</u> , <u>fast run</u> , <u>slow run</u> , <u>rapid</u> , <u>cascade/waterfall</u> , turbulence, backwater. Presence of deep pools score higher.										8
	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
7. Bank erosion	The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank, or stock pugging										9
Right bank	0	<5	5	15	25	35	50	65	75	>75	
Left bank	0	<5	5	15	25	35	50	65	75	>75	
Score	10	9	8	7	6	5	4	3	2	1	
8. Bank vegetation	The maturity, diversity, and naturalness of bank vegetation										2
Left AND right bank	Mature native trees with diverse and intact understory		Regenerating native or flaxes/sedges/tussock > dense exotic			Mature shrubs, sparse tree cover > young exotic, long grass			Heavily grazed or mown grass > bare/impervious ground		
Score	10	9	8	7	6	5	4	3	2	1	
9. Riparian width	The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s)										1
Left bank	≥30	15	10	7	5	4	3	2	1	0	
Right bank	≥30	15	10	7	5	4	3	2	1	0	
Score	10	9	8	7	6	5	4	3	2	1	
10. Riparian shade	The percentage of shading of the stream bed throughout the day due to vegetation, <u>banks</u> , or other structure(s) (<u>steep</u> s										5
	≥90	80	70	60	50	40	25	15	10	≤5	
Score	10	9	8	7	6	5	4	3	2	1	
Total	Sum of parameters 1 - 10)										47

Stream B

Habitat Paramete	Condition category										Score
1.	The percentage of the stream bed covered by fine sediment										1
Deposited sediment	0	5	10	15	20	30	40	50	60	>75	
Score	10	9	8	7	6	5	4	3	2	1	
2.	The number of different substrate types such as boulders, <u>cobbles</u> , <u>gravel</u> , <u>sand</u> , <u>wood</u> , <u>leaves</u> , root mats, macrophytes, <u>periphyton</u> . Presence of interstitial space score higher.										8
Invertebrate habitat diversity	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
3.	The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles, clear of filamentous algae/macrophytes.										2
Invertebrate habitat abundance	95	75	70	60	50	40	30	25	15	5	
Score	10	9	8	7	6	5	4	3	2	1	
4.	The number of different substrate types such as <u>woody debris</u> , root mats, undercut banks, <u>overhanging/encroaching</u> vegetation, macrophytes, boulders, <u>cobbles</u> . Presence of substrates providing spatial complexity score higher										4
Fish cover diversity	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
5.	The percentage of fish cover available										4
Fish cover abundance	95	75	60	50	40	30	20	10	5	0	
Score	10	9	8	7	6	5	4	3	2	1	
6.	The number of hydraulic components such as pool, <u>riffle</u> , fast run, slow run, rapid, <u>cascade/waterfall</u> , turbulence, backwater. Presence of deep pools score higher.										2
Hydraulic heterogeneity	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
7.	The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank, or stock pugging										10
Bank erosion											
Right bank	0	<5	5	15	25	35	50	65	75	>75	
Left bank	0	<5	5	15	25	35	50	65	75	>75	
Score	10	9	8	7	6	5	4	3	2	1	
8.	The maturity, diversity, and naturalness of bank vegetation										8
Bank vegetation											
Left AND right bank	Mature native trees with diverse and intact understory	Regenerating native or flaxes/sedges/tussock > dense exotic				Mature shrubs, sparse tree cover > young exotic, long grass			Heavily grazed or mown grass > bare/impervious ground		
Score	10	9	8	7	6	5	4	3	2	1	
9.	The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s)										10
Riparian width											
Left bank	≥30	15	10	7	5	4	3	2	1	0	
Right bank	≥30	15	10	7	5	4	3	2	1	0	
Score	10	9	8	7	6	5	4	3	2	1	
10.	The percentage of shading of the stream bed throughout the day due to vegetation, <u>banks</u> , or other structure(s)										10
Riparian shade	≥90	80	70	60	50	40	25	15	10	≤5	
Score	10	9	8	7	6	5	4	3	2	1	
Total	Sum of parameters 1 - 10)										59

Stream C

Upper

Habitat Parameter	Condition category										Score
1. Deposited sediment	The percentage of the stream bed covered by fine sediment										3
	0	5	10	15	20	30	40	50	60	>75	
Score	10	9	8	7	6	5	4	3	2	1	
2. Invertebrate habitat diversity	The number of different substrate types such as <u>boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton</u> . Presence of interstitial space score higher.										10
	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
3. Invertebrate habitat abundance	The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles, clear of filamentous algae/macrophytes.										5
	95	75	70	60	50	40	30	25	15	5	
Score	10	9	8	7	6	5	4	3	2	1	
4. Fish cover diversity	The number of different substrate types such as <u>woody debris</u> , root mats, undercut banks, <u>overhanging/encroaching vegetation</u> , macrophytes, <u>boulders, cobbles</u> . Presence of substrates providing <u>spatial complexity</u> score higher										7
	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
5. Fish cover abundance	The percentage of fish cover available										5
	95	75	60	50	40	30	20	10	5	0	
Score	10	9	8	7	6	5	4	3	2	1	
6. Hydraulic heterogeneity	The number of hydraulic components such as <u>pool, riffle, fast run</u> , slow run, rapid, <u>cascade/waterfall</u> , turbulence, backwater. Presence of deep pools score higher.										6
	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
7. Bank erosion	The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank, or stock pugging										10
Right bank	0	<5	5	15	25	35	50	65	75	>75	
Left bank	0	<5	5	15	25	35	50	65	75	>75	
Score	10	9	8	7	6	5	4	3	2	1	
8. Bank vegetation	The maturity, diversity, and naturalness of bank vegetation										8
Left AND right bank	Mature native trees with diverse and intact understory	Regenerating native or flaxes/sedges/tussock > dense exotic				Mature shrubs, sparse tree cover > young exotic, long grass			Heavily grazed or mown grass > bare/impervious ground		
Score	10	9	8	7	6	5	4	3	2	1	
9. Riparian width	The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s)										10
Left bank	≥30	15	10	7	5	4	3	2	1	0	
Right bank	≥30	15	10	7	5	4	3	2	1	0	
Score	10	9	8	7	6	5	4	3	2	1	
10. Riparian shade	The percentage of shading of the stream bed throughout the day due to vegetation, <u>banks</u> , or other structure(s)										10
	≥90	80	70	60	50	40	25	15	10	≤5	
Score	10	9	8	7	6	5	4	3	2	1	
Total	Sum of parameters 1 - 10)										74

Middle

Habitat Parameter	Condition category										Score
1. Deposited sediment	The percentage of the stream bed covered by fine sediment										5
	0	5	10	15	20	<u>30</u>	40	50	60	>75	
Score	10	9	8	7	6	5	4	3	2	1	
2. Invertebrate	The number of different substrate types such as <u>boulders, cobbles, gravel, sand, wood, leaves</u> , root mats, macrophytes, periphyton. Presence of interstitial space score higher.										10
	<u>>5</u>	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
3. Invertebrate habitat	The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles, clear of filamentous algae/macrophytes.										7
	95	75	70	<u>60</u>	50	40	30	25	15	5	
Score	10	9	8	7	6	5	4	3	2	1	
4. Fish cover diversity	The number of different substrate types such as <u>woody debris</u> , root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, <u>boulders, cobbles</u> . Presence of substrates providing spatial complexity score higher										4
	>5	5	5	4	4	3	<u>3</u>	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
5. Fish cover abundance	The percentage of fish cover available										2
	95	75	60	50	40	30	20	10	<u>5</u>	0	
Score	10	9	8	7	6	5	4	3	2	1	
6. Hydraulic heterogeneity	The number of hydraulic components such as <u>pool, riffle, fast run, slow run, rapid, cascade/waterfall</u> , turbulence, backwater. Presence of deep pools score higher.										4
	>5	5	5	4	4	3	<u>3</u>	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
7. Bank erosion	The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank, or stock pugging										10
	<u>0</u>	<5	5	15	25	35	50	65	75	>75	
Right bank	<u>0</u>	<5	5	15	25	35	50	65	75	>75	
Left bank	<u>0</u>	<5	5	15	25	35	50	65	75	>75	
Score	10	9	8	7	6	5	4	3	2	1	
8. Bank vegetation	The maturity, diversity, and naturalness of bank vegetation										6
	Mature native trees with diverse and intact understory		Regenerating native or flaxes/sedges/tussock > dense exotic			Mature shrubs, sparse tree cover > young exotic, long grass			Heavily grazed or mown grass > bare/impervious ground		
Left AND right bank											
Score	10	9	8	7	6	5	4	3	2	1	
9. Riparian width	The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s)										6
	≥30	15	<u>10</u>	7	5	4	3	2	1	0	
Left bank	≥30	15	10	7	5	<u>4</u>	3	2	1	0	
Right bank	≥30	15	10	7	5	<u>4</u>	3	2	1	0	
Score	10	9	8	7	6	5	4	3	2	1	
10. Riparian shading	The percentage of shading of the stream bed throughout the day due to vegetation, <u>banks</u> , or other structure(s)										10
	<u>≥90</u>	80	70	60	50	40	25	15	10	≤5	
Score	10	9	8	7	6	5	4	3	2	1	
Total	Sum of parameters 1 - 10)										64

Lower

Habitat Parameter	Condition category										Score
1. Deposited sediment	The percentage of the stream bed covered by fine sediment										1
	0	5	10	15	20	30	40	50	60	>75	
Score	10	9	8	7	6	5	4	3	2	1	
2. Invertebrate	The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.										1
	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
3. Invertebrate habitat	The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles, clear of filamentous algae/macrophytes.										1
	95	75	70	60	50	40	30	25	15	5	
Score	10	9	8	7	6	5	4	3	2	1	
4. Fish cover diversity	The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher										1
	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
5. Fish cover abundance	The percentage of fish cover available										10
	95	75	60	50	40	30	20	10	5	0	
Score	10	9	8	7	6	5	4	3	2	1	
6. Hydraulic heterogeneity	The number of hydraulic components such as pool, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater. Presence of deep pools score higher.										1
	>5	5	5	4	4	3	3	2	2	1	
Score	10	9	8	7	6	5	4	3	2	1	
7. Bank erosion	The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank, or stock pugging										9
	0	<5	5	15	25	35	50	65	75	>75	
Right bank	0	<5	5	15	25	35	50	65	75	>75	
Left bank	0	<5	5	15	25	35	50	65	75	>75	
Score	10	9	8	7	6	5	4	3	2	1	
8. Bank vegetation	The maturity, diversity, and naturalness of bank vegetation										3
	Mature native trees with diverse and intact understory		Regenerating native or flaxes/sedges/tussock > dense exotic			Mature shrubs, sparse tree cover > young exotic, long grass			Heavily grazed or mown grass > bare/impervious ground		
Left AND right bank											
Score	10	9	8	7	6	5	4	3	2	1	
9. Riparian width	The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s)										1
	≥30	15	10	7	5	4	3	2	1	0	
Left bank	≥30	15	10	7	5	4	3	2	1	0	
Right bank	≥30	15	10	7	5	4	3	2	1	0	
Score	10	9	8	7	6	5	4	3	2	1	
10. Riparian	The percentage of shading of the stream bed throughout the day due to vegetation, banks, or other structure(s)										4
	≥90	80	70	60	50	40	25	15	10	≤5	
Score	10	9	8	7	6	5	4	3	2	1	
Total	Sum of parameters 1 - 10)										32