Technical Memo

AUSTINO PPC

Response to Auckland Councils Healthy Water Queries

Austino

TO:	Lee Tee, Carmel O'Sullivan	**HG PROJECT NO :**	A2001228.00
FROM:	Dipal Harrat	**DATE:**	12 April 2024

1.0 PURPOSE

The purpose of this Technical Memorandum is to respond to Auckland Council's Healthy Water regarding the feasibility of mitigating the adverse effects associated with the future development of the 84 and 100 Hobsonville Road Private Plan Change Area (PPC) area.

A Stormwater Management Plan (SMP) for 84 and 100 Hobsonville PPC was submitted to Auckland Council on the 15th of December as part of a soft lodgement. In response, Auckland Council have requested further information. The SMP submitted to Auckland Council as part of the soft lodgement process intention was to begin discussions with Healthy Waters on the proposed stormwater management approach for the PPC.

2.0 AUCKLAND COUNCIL REQUESTS

The following queriers were raised by Auckland Councils Healthy Waters on the 8th of March 2024. Along with each query is Harrison Grierson response.

TABLE 1: HG's Response to HW Queriers

SPECIFIC REQUEST BY HEALTHY WATERS	
Wetland 5 on Hobsonvile Road was discussed and it was stated that 29% of Precinct 1 can drain to Wetland 5 and there is potential for Wetland 5 to service secondary flow 29% of Precinct 1. Has there been any discussion with Healthy Water on whether this is a feasible option? And is this the preferred option to manage stormwater for Precinct 1? If so, please provide reasons why this would be the preferred option.	There have been no conversations with Healthy Water regarding Wetland 5 servicing the secondary flow from 29% of Precinct 1. Although 29% of Precinct 1 is within the Stream Management Area, the precinct's topography indicates that it is not practically achievable for Wetland 5 to service its secondary flow. This assumption will be reviewed at resource consent.
It is understood that the culvert design did not allow for upstream urban development. In the event of blockage of the culvert it is expected that the motorway will be overtopped in a significant storm event. Has there been discussion with Waka Kotahi about the three culverts under the Upper Harbour Motorway and the effects the proposed development will have on the three culverts? Are there any plans from Waka Kotahi to address the flooding risk of the culverts?	There has been no discussion with Waka Kotahi regarding the three culverts under the Upper Harbour Motorway. Discussions with Waka Kotahi are planned as part of the SMP stakeholder liaison. In the URS assessment, the three culverts were analysed with two land use scenarios. The future Land Use (Scenario 2) scenario includes Plan Change 12, part of Plan Change 13 and the Fulton Hogan Precinct A2 potential development associated with Whenuapai Stage 2. There has been no updated assessment of the culverts. The 'real' capacity of the culverts

TABLE 1: HG's Response to HW Queriers	
SPECIFIC REQUEST BY HEALTHY WATERS	
Table 3 summarises the 2012 URS assessment. Is this assessment still relevant and has there been any updated assessment?	referenced in the SMP is still relevant. The 'real' culvert capacity is defined as the maximum flow that can pass through the pipe with the application of an upstream water level at the soffit of the pipe. This gives an indication of the maximum culvert capacity.
The HW regionwide model indicates that the existing habitable floor at 162 Brigham Creek Road will be inundated under a 100 year ARI MPD scenario (with both 2.1 and 3.8 degree climate change). The same model indicates that the house will not be inundated under the existing edv scenario (existing development imperviousness, no climate change allowance) Please discuss the following: • Will the development in the plan change area result in habitable floor flooding of 162 Brigham Creek Road? • What option were explored to manage any change in flood effects at 162 Brigham Creek Road? • What are the benefits and costs, the efficiency and effectiveness, and any possible alternatives to manage the effects on 162 Brigham Creek Road?	A quantitative analysis was conducted at 162 Brigham Creek Road. The Healthy Waters region model indicates that the property will be marooned in the existing development 100-yr ARI scenario with no climate change. The property's habitable floor was inundated in both the MPD (2.1 and 3.8 degrees of climate change) scenarios 100-yr ARI event. It was expressed in the SMP that the property's habitable floor may be inundated due to climate change alone. A more detailed assessment will be undertaken at resource consent to include comprehensive catchment modelling to include commentary on the 162 Brigham Creek Road. The intention of Sections 7.11 & 7.12 of the SMP was to begin a conversation will Healthy Water to determine an appropriate flood mitigation approach for the private plan change area. We would like to continue this conversation with Healthy Water moving forward. The benefits and costs, the efficiency and effectiveness, in managing the effects on 162 Brigham Creek Road will be explored at resource consent.
Table 7 provides a summary of the stormwater management options. Please provide further guidance of what stormwater management is recommended and the feasibility and implementation details.	The preferred stormwater management approach is outlined in Section 7.2 of the SMP. Further detail of the feasibility and implementation will be provided in the lodgement process.
Please indicate if the use of SMAF 1 is the BPO and will be sufficient to mitigate effects on the stream environment such as erosion, instream habitat changes, etc.., including accounting for the existing state of the stream, its vulnerability to erosion and future changes in flow associated with the change in land use. Please also address the following: • What is the current condition of the streams? • Please provide a geomorphic assessment of the streams to verify whether the proposed SMAF 1 is sufficient, alongside an assessment of the current condition of the existing stream – to demonstrate infiltration requirements can be achieved and effects of the change in land use and	Bioresearches have completed an Ecological Impact Assessment (EcIA) in support of the private plan change area (March 2024). This report addresses the potential ecological effects to accompany the PPC application, by providing: • An assessment of the ecological values of native flora and fauna and freshwater habitats within the site; • An assessment of the ecological effects associated with the proposed PPC; and • Recommendations to avoid, remedy or mitigate potential adverse effects and offset and/or compensate potential residual adverse effects. The Bioresearches report has been attached at the end of the Technical Memo. The proposed SMAF 1 is assumed to be sufficient.

TABLE 1: HG's Response to HW Queriers	
SPECIFIC REQUEST BY HEALTHY WATERS	
increased flows can be appropriately mitigated. • How will the stream be affected and will any works to the stream be required to support the plan change?	
Section 3.4.1 of the SMP proposes attenuation of the 10% and 1% AEP events. Section 7.1.1 of the SMP appears not to propose attenuation. Can you please provide clarification on whether attenuation is proposed to be provided?	Apologies, this is a mistake. Attenuation of the 10% and 1% AEP event is not proposed. Section 7.1.1 was written with the intention of starting a discussion with Healthy Waters.
A number of stormwater management is discussed; however, it is unclear what is the recommended Stormwater management for the plan change area is. The SMP needs to be clear on what stormwater management is required. Please include details such as location, size, outfall details, life cycle, cost, etc to ensure there is sufficient land, including space for the operations and maintenance of the proposed stormwater management.	Section 7.1 outlines potential stormwater management options. The preferred stormwater management approach is outlined in Section 7.2. The preferred stormwater management approach will be refined through continued conversations with Healthy Waters. Details such as the location, size, outfall details, life cycle cost, etc will be provided at resource consent.
For precinct 2 please provide further information on what assets are proposed to be vested to Council and details about what the design, health and safety, operations and maintenance requirements these assets will be? Has there been any discussion with Healthy Waters. Please clarify if there are any communal devices and if any assets will be vested to Council for Precinct 1.	The stormwater pipe network and communal devices outlined in Section 7.2 of the SMP for Precinct 2 are proposed to be vested to Council. All the assets within the Precinct 1 area are proposed to be privately owned and maintained. Detail of the proposed infrastructure to be vested to council will be provided at resource consent.
Please provide further on consideration of the impacts/effects of the proposed change of land use on upstream and downstream property area in terms of flood flows extents, velocities, depths, duration, etc for the 2-, 10- and 100-year rainfall events (excluding climate change)? Please provide further details. Please include comments on effects on the Watercare Services property at 161 Brigham Creek Road, Whenuapai.	A high-level HEC-HMS analysis has been conducted to determine the peak flows prior to the three Upper Harbour Highway Motorway culverts in 10% AEP for the existing, existing plus PPC and MPD scenario with 3.8 degrees of climate change. This analysis is summarised in Section 3 of this report. An assessment of 10% and 100% for the predevelopment, post development, and full development of the catchment is provided in Section 3 of this report. This demonstrates that development of the Austino PPC will not have a significant impact on the culvert performance. A more detailed assessment will be undertaken at the resource consent stage to include comprehensive catchment modelling to include commentary on the 161 properties. From our understanding 161 Brigham Creek Road is currently shown in the 100-yr ARI flood plain

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	(Whenuapai RFHA Model (2023-update)). This modelling assumes MPD in the catchment, the proposed Austino PPC does not propose to exceed the impervious model of the FUZ and therefore can be said to not increase the risk to the properties as presented.
The culverts may have capacity for the 10% AEP MPD event. Have the impacts for changes in water levels adjacent to the culverts been considered? Please provide further information	The changes in water levels adjacent to the culvert have not been considered. This will be assessed at resource consent.
We understand that Watercare own 27 Trig Road. In the event of blockage or partial blockage of the culverts this is likely to result in increased water levels on their land. Has there been any consultation with Watercare.	There has been no consultation with Watercare. Consultation with Watercare for this matter will occur post lodgement of the PPC.
Auckland Climate Plan Identifies a climate change factor of 3.8 degrees and the SWCoP is currently in the process of being updated to include 3.8 degrees. Please provide further information on how a 3.8 degree increase will affect the wider environment as a result of the proposed plan change development.	A more detailed assessment will be undertaken at the resource consent stage to include comprehensive catchment modelling to include commentary on climate change of 3.8 degree affect on the wider development.

3.0 HEC-HMS ANALYSIS

3.1 INTRODUCTION

A high-level HEC-HMS analysis has been conducted to analyse the predevelopment, post development, and full development effect on the peak flow prior to the Upper Harbour Highway Motorway culverts in the 3.8 degrees scenario.

The Plan Change Area is drained by two streams, listed from west to east: the Trig Stream and the Rawiri Stream. The Trig Stream and Rawiri Stream both discharge into the Waiarohia Stream a short distance downstream of the site.

The Trig and Rawiri Streams discharge beneath the Upper Harbour Motorway via an arrangement of three Waka Kotahi culverts. The Trig Stream utilises twin 2,100 mm culverts to discharge flows beneath the Motorway and the Rawiri Stream is drained by a single 1,950 culvert. The Rawiri, Trig, and Waiarohia streams discharge to the north under the Upper Harbour Motorway via twin culverts C2, C3 and D.

- Twin culverts C2 and C3, located at the confluence of the Trig Stream and the Waiarohia Stream. Both culverts C2 and C3 have a diameter of 2,100 mm;
- Culvert D, located at the confluence of the Rawiri Stream and the Waiarohia Stream. Culver D has a diameter of 1,950 mm.

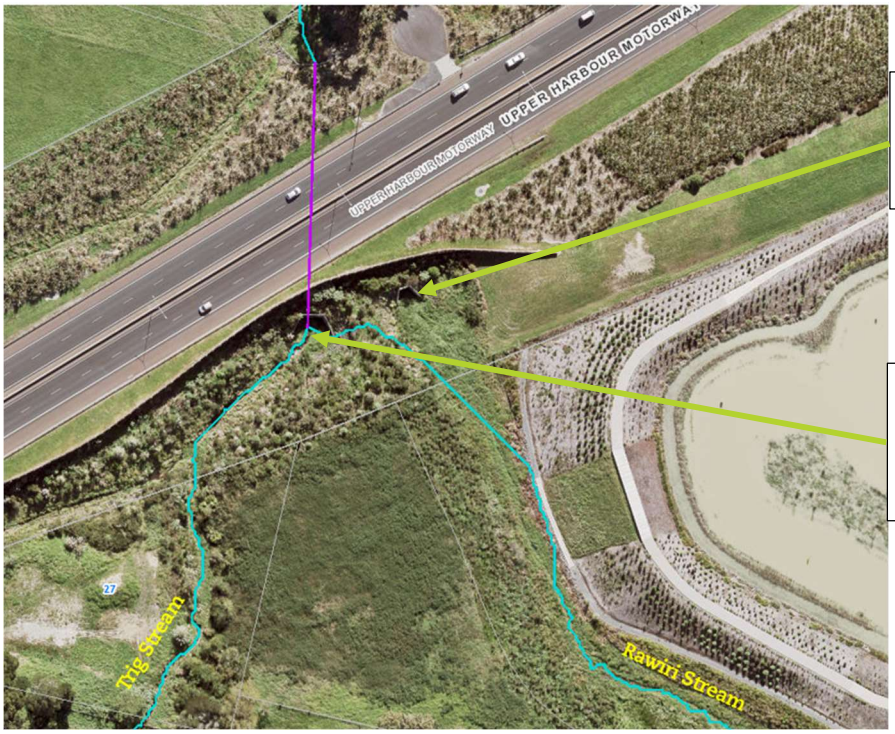


FIGURE 1. LOCATION OF UPPER HARBOUR MOTORWAY CULVERTS

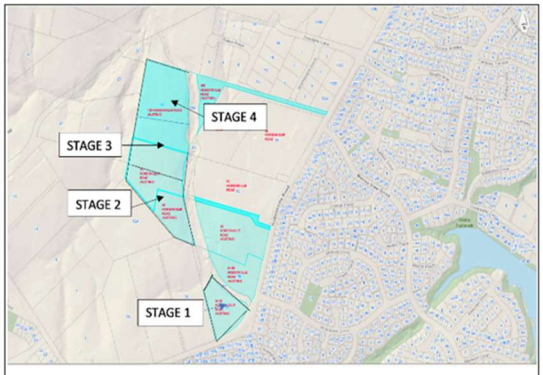
The peak flow at the culverts the were modelled at the culverts to determine whether the culverts have capacity to convey the 10% AEP event in various land use scenarios.

3.2 LAND USE SCENARIOS

The land use scenarios modelled in HEC-HMS include:

- Predevelopment
- Predevelopment including the PPC land use
- Maximum Probable Development (MPD)

The existing development and PPC imperviousness were determined using preliminarily staging information for the PPC, shown in the image below. The imperviousness of the stages and associated zones are based on the recommended MPD coverages based on Auckland Unitary Plan (AuP) OiP from hydraulic modelling.



	Stage 1	Stage 2	Stage 3	Stage 4	TOTAL
Gross Site Area (sqm)	17,477	31,137	31,137	31,139	110,890
Total Developable Land (excludes open space, road widening)	15,442	30,050	30,050	30,050	106,942
Net Residential Land (excludes streets, lanes)	11,955	24,400	24,400	24,400	83,955

FIGURE 2.PRIVATE PLAN CHANGE PRELIMINARILY STAGING.

3.3 MODEL INPUTS

Several inputs into the HEC-HMS model were taken from GeoMaps. The Location in which these inputs were taken is shown below in Figure 1.

FIGURE 3. GEOMAPS OLFP DRAINING OT THE UPPER HARBOUR MOTORWAY CULVERTS.

The GeoMaps inputs used in the model are summarised below:

- Catchment Area draining to the Upper Harbour Highway culverts.
- Time of Concentration (Existing and Future). It was assumed that the time of concentration in the existing development plus PPC scenario was equal to time of concentration of the existing development scenario.
- Existing imperviousness.

The peak flow prior to the Upper Harbour Motorway was determined for the 10- and 100-year ARI events without climate change. For these events a 24-hour TP108 design storm was applied to the catchment.

3.4 UPPER HARBOUR MOTORWAY CULVERTS

The Trig and Rawiri Streams discharge beneath the Upper Harbour Motorway via an arrangement of three Waka Kotahi culverts. The Trig Stream utilises twin 2,100 mm culverts to discharge flows beneath the Motorway and the Rawiri Stream is drained by a single 1,950 culvert. Investigation undertaken by Woods in 2013 found through field inspections that due to Culverts C2, C3 and D proximity and lack of defined delineation between the Trig and Rawiri Streams it is likely catchment runoff from higher rainfall events will utilise all three culverts and result in local ponding at the inlet. Table 1 summarises the 2012 URS assessment of the culverts. Table 1 summarises the 2012 URS assessment of the culverts.

Table 1. Summary of URS 2012 Culvert Assessment (Replicated from: URS 2012 Modelling Report)

PARAMETER	CULVERT C2	CULVERT C3	CULVERT D
Length (m)	69.80	69.90	66.50
Diameter (mm)	2100	2100	1950
Entrance type	Square edge with headwall		
Modelled capacity (m^3/s)	7.50	7.40	6.32
Surcharge in 1% AEP event?	Yes	Yes	Yes
Flooding issue?	No	No	No

The 2012 Culvert modelling assessment indicates the real capacity of these culverts, defined as the maximum flow that can pass through the pipe with the application of an upstream water level at the soffit

of the pipe. The 'real' capacity is assumed to be a conservative estimate of the culvert's actual capacity. The three culverts have a cumulative 'real' capacity of 21.22 m3/s.

3.5 RESULTS

The peak flow prior to the culverts in the 10% AEP event including 3.8 degrees of climate change increase to rainfall is summarised below in Figure 4.

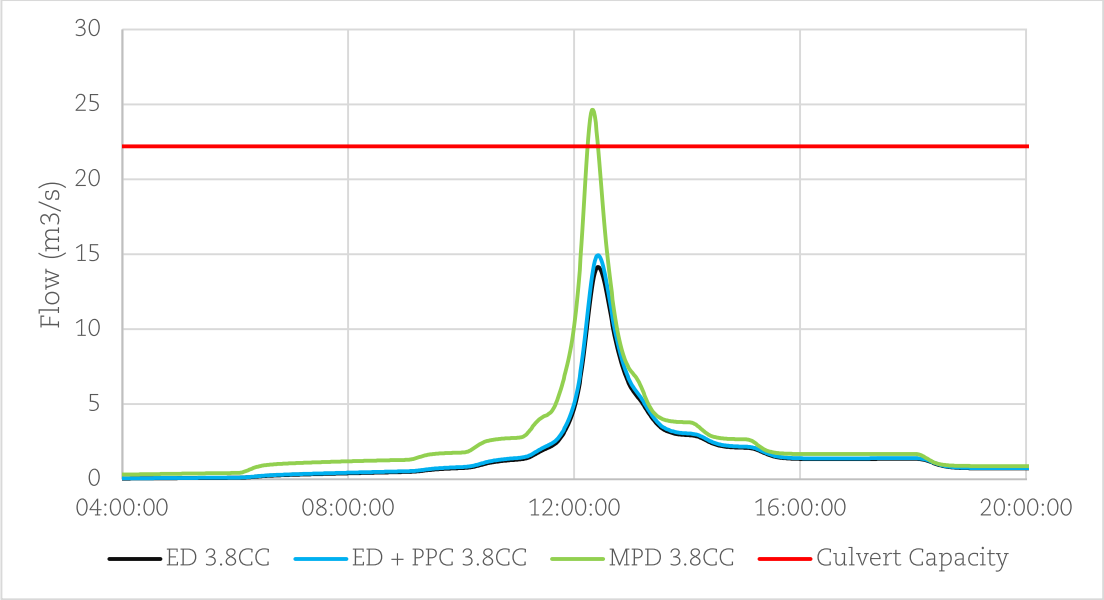


FIGURE 4. HYDROGRAPH PRIOR TO THE THREE UPPER HARBOUR HIGHWAY CULVERTS IN THE 10% AEP EVENT INCLUDING 3.8 DEGREES OF CLIMATE CHNAGE.

This illustrates that in the 10% AEP event the Austino PPC will not have a significant impact on the Upper Harbour Highway culverts.

The peak flow prior to the culverts in the 1% AEP event including 3.8 degrees of climate change increase to rainfall is summarised below in Figure 4.

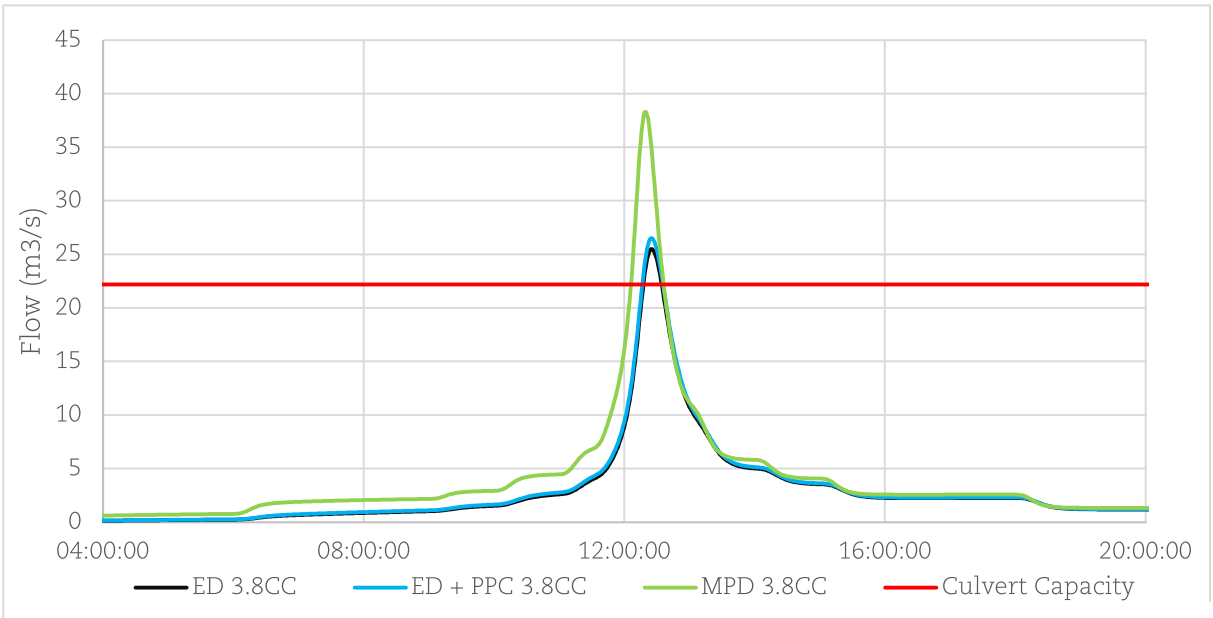


FIGURE 5. HYDROGRAPH PRIOR TO THE THREE UPPER HARBOUR HIGHWAY CULVERTS IN THE 1% AEP EVENT INCLUDING 3.8 DEGREES OF CLIMATE CHNAGE.

In the 1% AEP event with 3.8 degrees of climate change in the predevelopment scenario the combined culvert capacity is exceeded. In the 1% AEP event the Austino development will not have a significant impact on the three Upper Harbour Highway Motorway culvert performance.

Bioresearches
A Babbage Company

Assessment of Ecological Effects: 84, 90 & 100 Hobsonville Road, West Harbour, Auckland.

Austino Limited

March 2024

Assessment of Ecological Effects: 84, 90 & 100 Hobsonville Road, West Harbour, Auckland. **March 2024**

DOCUMENT APPROVAL

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Author:	Christel du Preez Senior Ecologist	
Reviewer:	Kate Feickert Senior Ecologist	

Reference: Bioresearches (2024). Assessment of Ecological Effects: 84, 90 & 100 Hobsonville Road, West Harbour, Auckland.. Report for Austino Limited pp 44.

CONTENTS

1 INTRODUCTION

1.1 Background

Austino New Zealand Limited engaged Bioresearches to complete an Ecological Impact Assessment (EcIA) in support of a private plan change (PPC) application for 86, 90 and 100 Hobsonville Road, West Harbour, Auckland (hereafter referred to as 'the site') (Figure 1). The PPC seeks to rezone the 10.7 ha site from Future Urban Zone to Residential - Terraced Housing and Apartment Building Zone, Residential - Mixed Housing Urban, and to Business - Light Industry Zone, which will be applied to under two precincts (Precinct 1 And Precinct 2). Refer to Section 0 for more details.

Bioresearches undertook an ecological constraints assessment of the site in 2019 (Bioresearches, 2019), which was used to inform this current assessment. This report addresses the potential ecological effects to accompany the PPC application, by providing:

- An assessment of the ecological values of native flora and fauna and freshwater habitats within the site;
- An assessment of the ecological effects associated with the proposed PPC; and
- Recommendations to avoid, remedy or mitigate potential adverse effects and offset and/or compensate potential residual adverse effects.

1.2 Site description

The site is located south of the Upper Harbour Motorway and north of Hobsonville Road. The surrounding area to the west is utilised for agricultural purposes, while light industrial developments are located to the east of the site. The Rawiri Stream originates between Precinct 1 and 2 and forms the eastern boundary of Precinct 2. Trig Stream forms the western boundary of Precinct 2.

The site is currently zoned as Future Urban Zone, with the north-eastern extent of Precinct 1 zoned as Open Space – Informal Recreation Zone.

Due to the historical agricultural use of the site, the primary vegetation cover over the site is exotic pasture grasses, which are maintained through mowing. Mature trees and scrub make up shelterbelts along boundaries of the site. No Significant Ecological Areas (SEA's) are located within the site or are in close proximity thereof.

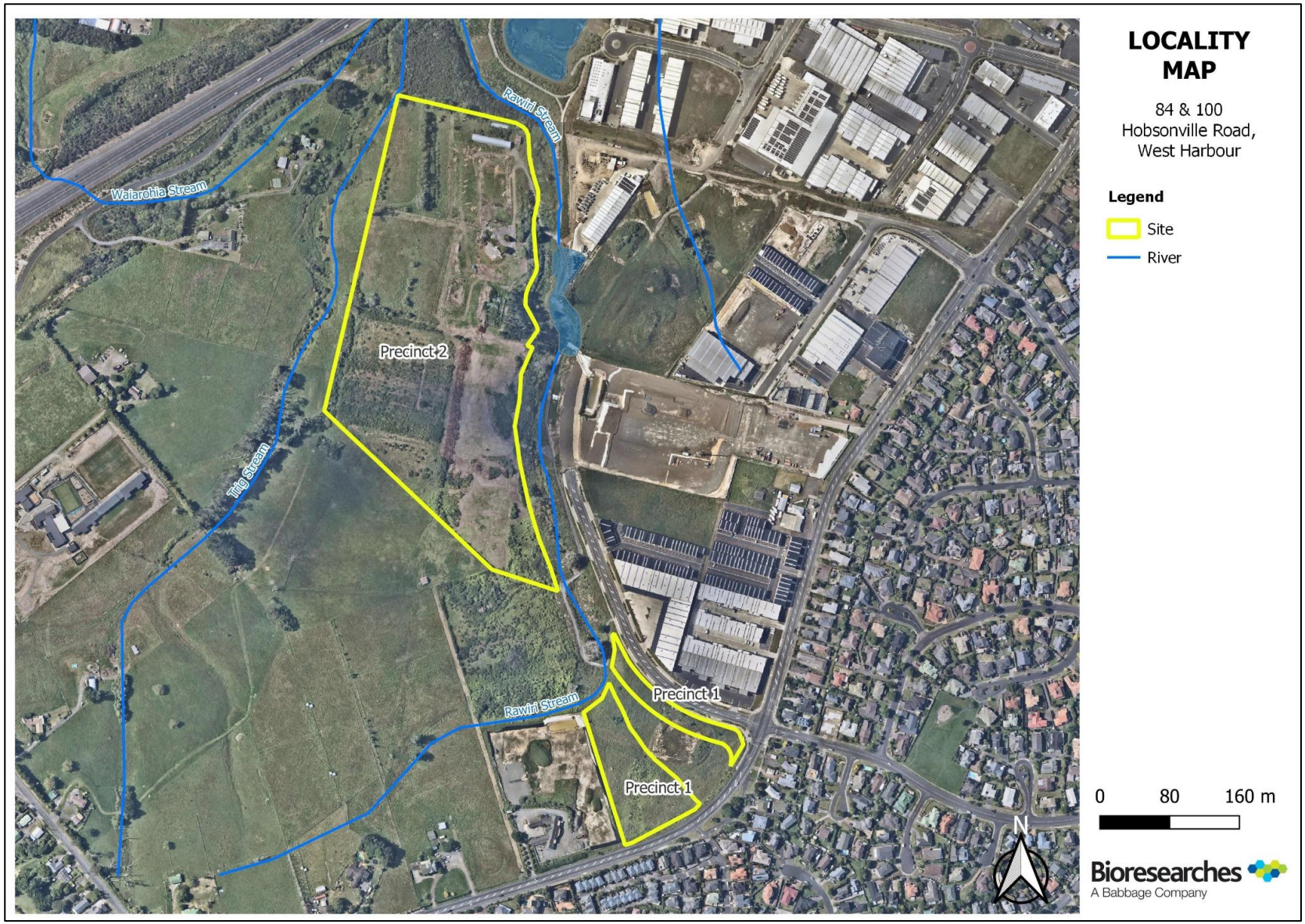

Figure 1. Overview of the site, presenting the permanent streams as obtained from Auckland Council GeoMaps.

1.3 Proposed PPC design

The following information was extracted from the Urban Design Statement (Harrison Grierson, 2023). Figure 2 and Figure 3 reflects the draft urban design.

Precinct descriptions

The proposed zoning for Precinct 1 would be 'Business - Light Industrial', which partly matches the current zoning of 84 Hobsonville Road. This would align with the existing industrial zoning adjacent, and with the wider Hobsonville industrial area. Precinct 2 are proposed a mixture of Residential - Mixed Housing Urban and Residential - Terraced Housing Apartment zoning. Both Precinct areas include a boundary interface with future urban zoned land.

Transport network

A collector road is proposed across the southern section of Precinct 2, with connections across the eastern boundary (crossing the Rawiri Stream), western boundary and the south boundary. As part of this assessment report, the effects of a proposed crossing along the eastern boundary were assessed.

There are currently three easements (A, B and C) over the Rawiri Stream to access the site from the east/Westpoint Drive. It is envisioned to combine the three easements to one location over the Rawiri Stream (to either easement A or B) and potentially relinquish easement C (the most northern crossing point).

Riparian environment

The existing riparian environment for Rawiri Stream will be enhanced through the provision of an open space zone which would be vested to council. Potential altering of the stream environment could be an opportunity as the current interface would be improved upon. Other green spaces will be incorporated along the most northern boundary of the site, as well as within the central western corner of the site.

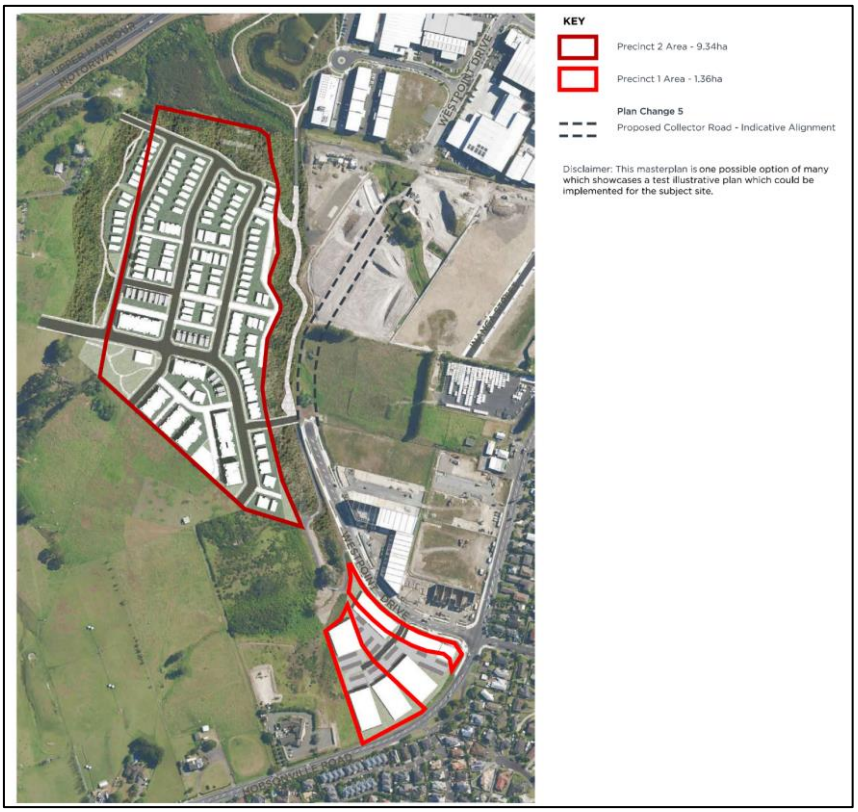

Figure 2. Draft illustrative masterplan of Precincts 1 and 2

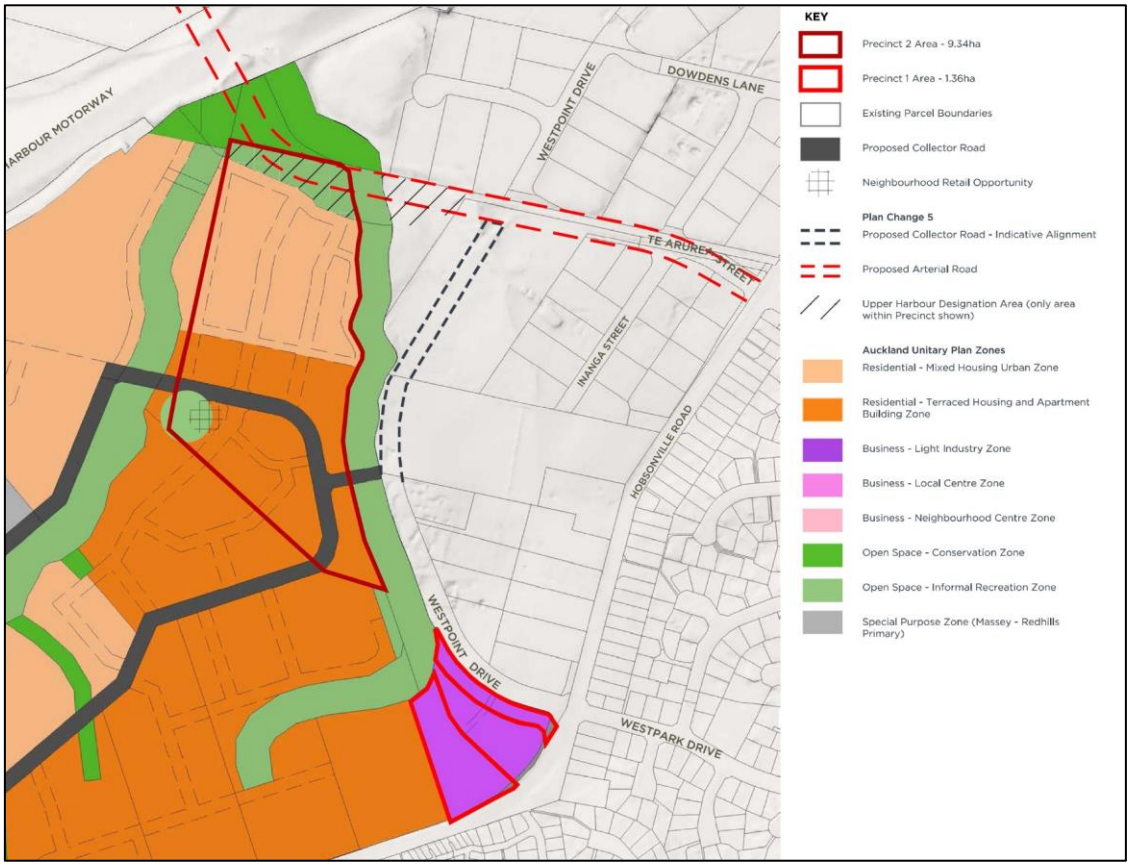

Figure 3. Draft zoning masterplan and proposed transport connections (noting the crossing of the Rawiri Stream outside the eastern Precinct 2 boundary) of Precincts 1 and 2.

2 STATUTORY CONTEXT

This section summarises the legislation, policy, plans and strategies relevant to the protection, conservation and enhancement of nature conservation interests associated with the site. Section 6.4 provides more detailed description of the relevance of the National Policy Statements (NPS) and Auckland Unitary Plan (AUP) and how the PPC meets the required objectives.

The ecological values described in this report allow significant ecological issues and adverse effects to be identified as they relate the Resource Management Act 1991 (RMA). The identification of significant values and subsequent management recommendations to mitigate adverse effects are consistent with standards and objectives of the following legislative, policy statement and regional plan documents.

2.1 Legislation

2.1.1 Resource Management Act 1991 (RMA)

The purpose of the RMA is to achieve sustainable management. Important elements of this are the maintenance of indigenous biodiversity and protection of significant indigenous vegetation and habitats. The RMA requires that any adverse effects of development be avoided in the first instance, and where avoidance is not reasonably practicable, impacts should be minimised, remedied, or mitigated. These elements are given effect in Sections 5, 6 and 7, and Schedule 4 sets out the requirements for effects assessments.

2.1.2 Wildlife Act 1953

The Wildlife Act (WA, 1953) provides legal protection to listed species classed as wildlife. It controls how people interact with Wildlife, including all native birds, bats, frogs and lizards and some invertebrates. Note is does not cover plants or freshwater fish.

2.1.3 National Environmental Standards for Freshwater (NES-F, 2020)

The National Environmental Standards for Freshwater 2020 (NES-F) set requirements for carrying out certain activities that pose risks to freshwater and freshwater ecosystems. As part of the PPC, a watercourse crossing is proposed to provide access to the site. During the resource consenting phase, an updated ecological assessment should be undertaken to ensure it aligns with the NES-F or any future environmental standards.

2.2 National policy statements

2.2.1 Freshwater

The National Policy Statement for Freshwater Management 2020 (NPS-FM) provides direction under the RMA, to local authorities on managing activities that affect the health of freshwater, and provides protections to freshwater bodies, including natural inland wetlands, includes provisions for monitoring and reporting on freshwater quality and quantity, and for addressing the impacts of land use activities on freshwater resources.

As part of the PPC, a watercourse crossing is proposed to provide access to the site. During the resource consenting phase, an updated ecological assessment should be undertaken to ensure it aligns with the NPS-FM or any future guidance policies.

2.2.2 Indigenous Biodiversity

The NPS-IB provides direction to councils to protect, maintain and restore indigenous biodiversity in the terrestrial environment, requiring at least no further reduction nationally. It is relevant to the proposal because the site is within the terrestrial environment, and it contains indigenous biodiversity as defined in Section 1.6 (Interpretation) of the NPS-IB.

The indigenous biodiversity within the site includes that which is subject to a notified Significant Natural Area (SNA, or SEA as per the Auckland Unitary Plan (AUP), NPS-IB), some of which occurs within the Special Purpose Quarry Zone (SPQZ) for the Auckland Unitary Plan, as well as indigenous biodiversity that is not subject to SNA.

The NPS-IB requires that indigenous biodiversity that is not protected by an SNA:

a. Is managed by applying the effects management hierarchy (avoid, minimise, remedy, offset, compensate), where those effects are significant.
b. is managed to give effect to its Objective and Policies, where those effects are not significant (Section 3.16 (2)).

2.3 Regional plans and policies

The Auckland Unitary Plan (AUP) is the principal statutory planning document for Auckland. It was prepared by Auckland Council for the purpose of giving effect to the RMA as a regional council and as a territorial authority.

There are no AUP overlays within the site which pertain to ecology (e.g., Significant Ecological Areas (SEAs)).

3 ASSESSMENT APPROACH AND METHODOLOGY

3.1 EcIA Assessment

This assessment generally follows the EcIA Guidelines for use in New Zealand published by the Environmental Institute of Australia and New Zealand (EIANZ) (Roper-Lindsay *et al.,* 2018). The EcIA Guidelines provide a standardised matrix framework that allows ecological effects assessments to be clear, transparent, and consistent. The EcIAG framework is generally used in Ecological Impact Assessments in New Zealand as good practice, and a detailed analysis of this methodology is presented in Appendix A.

Note that this report does not quantify any offset/compensation requirements (if applicable).

3.2 Tangata Whenua as Partners

The NPSIB recognises tangata whenua as kaitiaki of, and partners, in the management of indigenous biodiversity (NPSIB, Policy 2). At the time of preparation of this report, no acknowledged taonga species have been identified with respect to this project or are currently listed in the public domain.

3.3 Desktop Review

A desktop review of various online GIS databases was undertaken to determine the extent of ecological protection overlays (e.g., covenants, conservation land, Significant Ecological Area's (SEA)), 'ecosystem type' classifications, and visualise historical land-use using historical aerial images. The scheduling of SEAs and classification of ecosystems provides a means for Councils to protect and maintain indigenous biodiversity within Districts and Regions. The desktop review also included a search for fauna records from various information sources.

Specifically, the following databases were reviewed:

- Department of Conservation Bioweb records for herpetofauna and bats[1];
- Auckland Council herpetofauna records;
- iNaturalist records for herpetofauna and birds within approximately a 5 km radius from the site[2];
- New Zealand Bird Atlas eBird database[3]. Bird data is recorded in 10 km^2 grid squares. Grid square AB66 was accessed as this is positioned over the site[4];
- NIWA's New Zealand Freshwater Fish Database[5] records were accessed for affected stream catchments;
- Auckland Council Geomaps[6];
- Department of Conservation Threat Classification Series[7];
- Auckland Council conservation status reports for vascular plants (Simpkins *et al.*, 2022)[8], bats (Woolly *et al.*, 2023)[9], and reptiles (Melzer *et al.*, 2022)[10];
- Retrolens historic aerial imagery[11]; and
- Indigenous terrestrial and wetland ecosystems of Auckland (Singers *et al.*, 2017)[12].

3.4 Site Investigations

A site visit was undertaken on 1 March 2024. During the visit, additional information was gathered on terrestrial and freshwater habitats and native fauna presence within the site. The methodologies utilized for each of these assessments are listed below in the sections below.

[1] https://www.doc.govt.nz/our-work/monitoring-reporting/request-monitoring-data/
[2] https://inaturalist.nz/home
[3] https://ebird.org/home
[4] https://ebird.org/atlasnz/block/blkAB66
[5] https://nzffdms.niwa.co.nz/
[6] https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html
[7] All Department of Conservation Threat Classification Documents are listed in the below webpage. When individual reports are referenced hereafter, they are referenced in-text.
https://www.doc.govt.nz/aboutus/science-publications/conservation-publications/nz-threat-classification-system/
[8] https://knowledgeauckland.org.nz/media/egzhyd1g/tr2022-19-conservation-status-of-vascular-plant-species-in-auckland.pdf
[9] https://knowledgeauckland.org.nz/media/2592/tr2023-04-conservation-status-of-bat-species-in-auckland.pdf
[10] https://knowledgeauckland.org.nz/media/2324/tr2022-03-conservation-status-reptile-species-auckland.pdf
[11] https://retrolens.co.nz/
[12] https://knowledgeauckland.org.nz/media/1399/indigenous-terrestrial-and-wetland-ecosystems-of-auckland-web-print-mar-2017.pdf

3.4.1 Terrestrial Habitats

The vegetation within the site was assessed using a 'walk through' methodology. Botanic values recorded included native and exotic vascular vegetation, and notes were made on the quality and extent of vegetation present on site. Potential fauna habitats for indigenous lizards, bats and birds were assessed qualitatively.

3.4.2 Freshwater habitats

During the site assessment, the presence and extent of wetlands, streams and other freshwater habitats within the site were noted and the quality of any freshwater habitat was visually assessed as described below.

3.4.2.1 Streams

During the site assessment, the presence and extent of water was noted, reference photos were taken, and freshwater habitats were marked using a handheld GPS unit. Watercourses were classified under the Auckland Unitary Plan (AUP) to determine, in accordance with the definitions in these plans, the ephemeral, intermittent or permanent status of these watercourses (Table 1). In addition, these watercourses were assessed as to whether they were natural or artificial, in accordance with AUP definitions, using information from both the desktop review and site visit.

Table 1. AUP criteria for permanent, intermittent rivers and streams and ephemeral streams[13]

Criteria	Definition
Permanent Stream	
1	The continually flowing reaches of any river or stream, excluding ephemeral reaches
Intermittent or ephemeral stream*	
1	Evidence of natural pools
2	Well defined banks and bed
3	Retains surface water present more than 48 hours after a rain event
4	Rooted terrestrial vegetation not established across channel
5	Organic debris from flooding present on floodplain
6	Evidence of substrate sorting, including scour and deposition
***If three or more of the six assessment criteria can be met with confidence, the watercourse is considered intermittent. If at least three criteria cannot be met, the watercourse is considered ephemeral.**	

The quality of the aquatic habitat was assessed, noting ecological aspects such as channel modification, hydrological heterogeneity, riparian vegetation extent, substrate type and any fish or macroinvertebrate habitat observed. Riparian and catchment information was also reviewed.

The ecological value of the stream was then assigned based upon factors such as:

- The intactness of the riparian zone;
- Permanency of flow and complexity of habitat present within the stream;
- Observable water quality parameters; and
- Modifications to hydrology and catchment of the stream.

[13] Table reproduced from: https://content.aucklanddesignmanual.co.nz/regulations/practice-notes/Documents/RC%203.3.17%20Stream%20Classification.pdf

3.4.2.2 Natural Inland Wetlands

Potential natural inland wetlands were assessed following the Ministry for the Environment's (MfE) wetland delineation protocols (MfE, 2022) to ascertain if the area presented with the physical characteristics to be considered an RMA wetland (Figure 4), which is defined as:

> *'permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions'.*

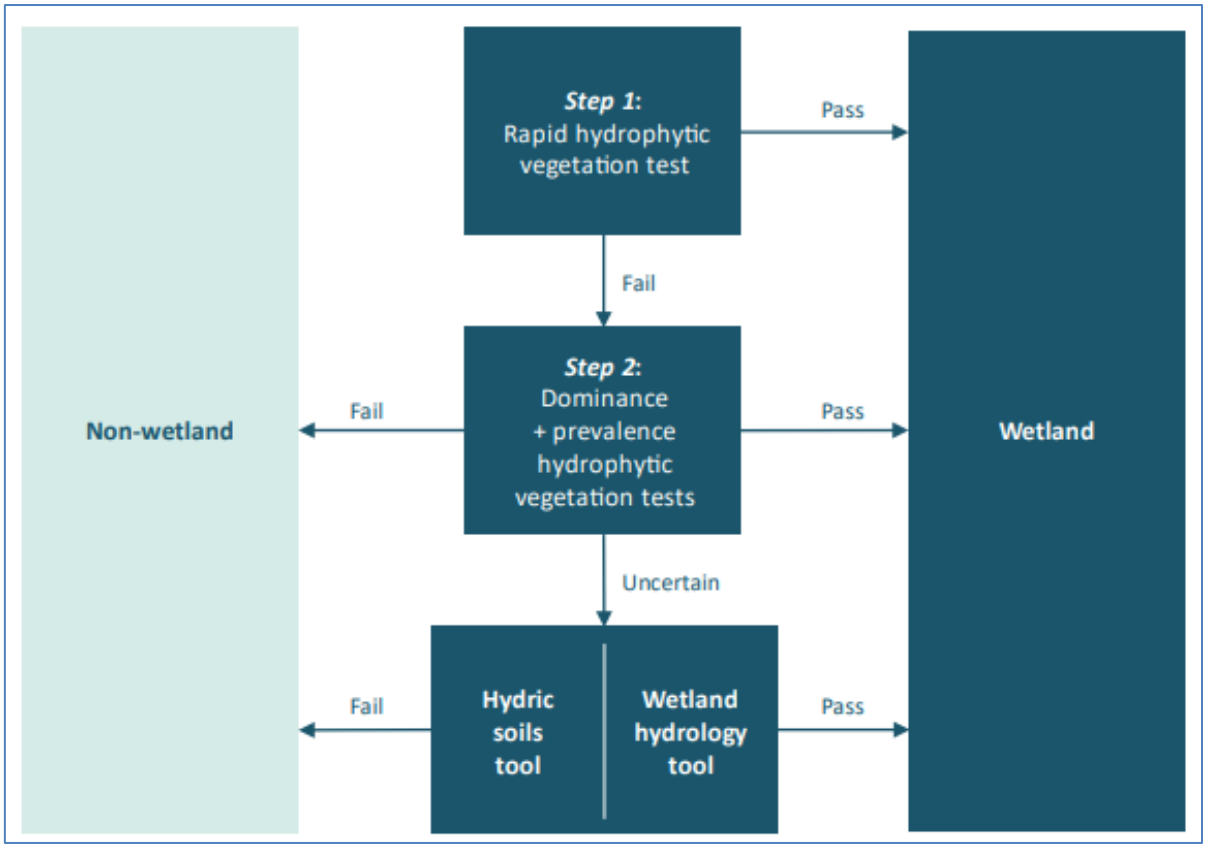

Figure 4. Simple flow chart of steps for determining an RMA wetland using the hydrophytic vegetation, hydric soils and wetland hydrology tools. Reproduced from MfE (2022).

When following this process, if the rapid test was not appropriate for determining if an area was an RMA wetland, vegetation assessment in accordance with Clarkson (2013) was undertaken; based on the dominance and prevalence of plant species assigned the following 'wetland plant indicator ratings' within a vegetation plot:

- Obligate wetland vegetation (OBL) – almost always a hydrophyte, rarely in uplands;
- Facultative wetland (FACW) – usually a hydrophyte, but occasionally found in uplands;
- Facultative (FAC) – commonly occurs as either a hydrophyte or non-hydrophyte;
- Facultative upland (FACU) – occasionally a hydrophyte but usually in uplands; and
- Upland (UPL) – rarely a hydrophyte, almost always in uplands.

Where the dominance and/or prevalence tests applied to the vegetation plot results showed unclear results, hydric soils and hydrology tests were undertaken in accordance with the associated protocol (Ministry for the Environment, 2021; Fraser *et al.,* 2021).

If the area did meet the definition of an RMA wetland, then the definition of a Natural Inland Wetland (as published in the National Policy Statement for Freshwater Management (NPS-FM)) was applied to ascertain if the area could also be considered a 'natural inland wetland'. This definition is as follows:

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

3.4.3 Fauna

Opportunistic observations of fauna during the site visits were recorded. In addition, a hand-search method was used to identify any potentially present lizard fauna under woody debris and deadfall where available (Wildlife Authority 37605-FAU, 98006-FAU), and an informal assessment of the suitability of the terrestrial habitats to support bats was undertaken, by observing the structure and features of mature trees on site. A formal bat survey was not undertaken.

4 EXISTING ENVIRONMENT

4.1 Vegetation

4.1.1 Desktop assessment

Historically (pre-1900's), the site would have been vegetated with Pūriri forest (WF7). By the 1940s, mature vegetation had been largely cleared, as indicated by the earliest historic aerial imagery available for the site (Figure 4). Typical shelterbelts and scrub vegetation were observed along the property boundaries. For the most part, it seems like the site was utilized for agricultural purposes up until fairly recently.

No other legal vegetation protections (e.g., DOC, QEII National Trust, Nature Heritage Fund Covenants, or Nga Whenua Rahu) were identified on or in the vicinity of the site.

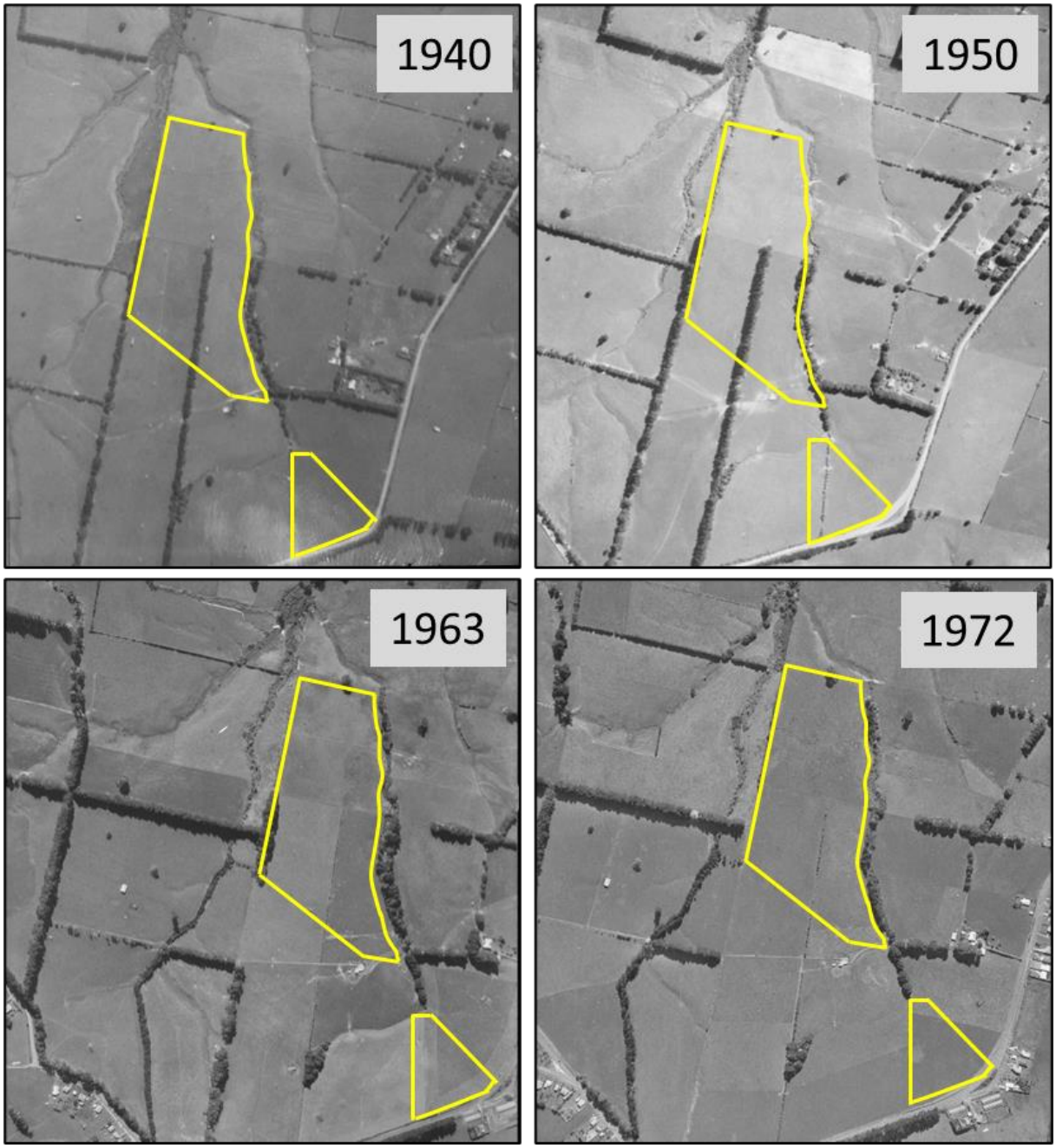

Figure 5. Historic aerial image of the site (yellow polygons) from 1940 to 1972. Imagery sourced from Retrolens.

4.1.2 Vegetation descriptions

The site does not support a recognised ecosystem classification; and the vegetation within, and surrounding the site is not subject to a SEA overlay or contains notable trees.

4.1.2.1 Precinct 1

Until 2019, the southern end of the site (where Precinct 1 is proposed) was used for pasture (Figure 6). Between 2020 and 2021, earthworks extended into the site, resulting in the removal of all vegetation. Since then, common pasture species and rank grasses have established across the site. A stockpile remains within the proposed Precinct 1 area.

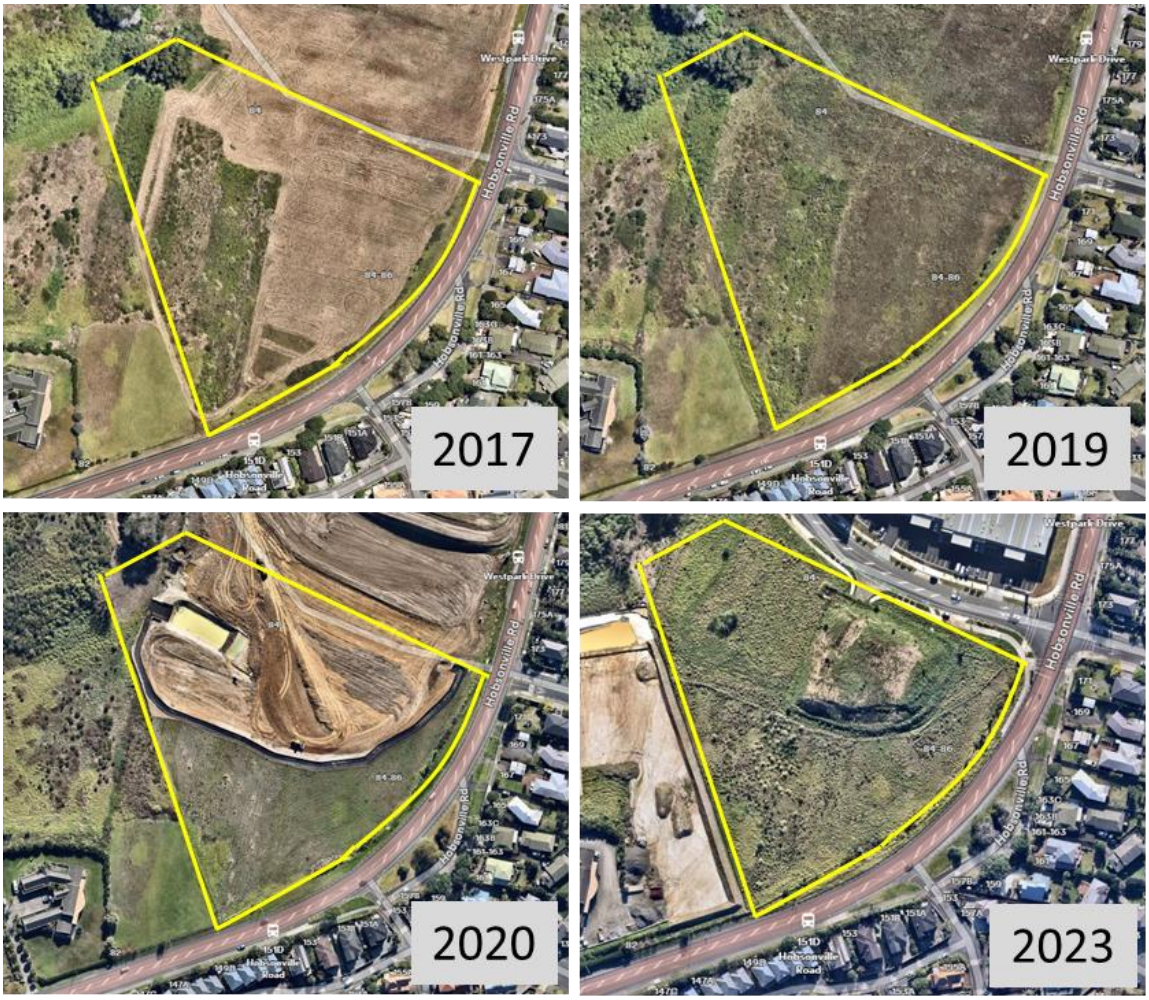

Figure 6. Overview of the land use changes to proposed Precinct 1 (yellow outline) between 2017 and 2023).

The vegetation associated with the proposed Precinct 1 primarily comprised long pasture grasses (Figure 7). A few cabbage trees (*Cordyline australis*) were observed along Hobsonville Road (likely amenity planting) and were the only native vegetation in this section of the site. Other exotic vegetation located along the road included gorse (*Ulex europaeus*), woolly nightshade (*Solanum mauritianum*) and pampas grass (*Cortaderia selloana*).

Figure 7. Overview of proposed Precinct 1. Photographs depicts the most southwestern extent (left) and northwestern extent (right) of proposed Precinct 1.

Given that the vegetation within proposed Precinct 1 consists predominantly of exotic species, lacks complexity, and is not connected to any other vegetated area, the site is considered to have **very low** botanical value.

4.1.2.2 Precinct 2

Historically, proposed Precinct 2 was also used for agricultural purposes, including pasture and fruit orchards. Following the initial assessment conducted by Bioresearches in 2019, vegetation clearing has taken place in select locations (Figure 8).

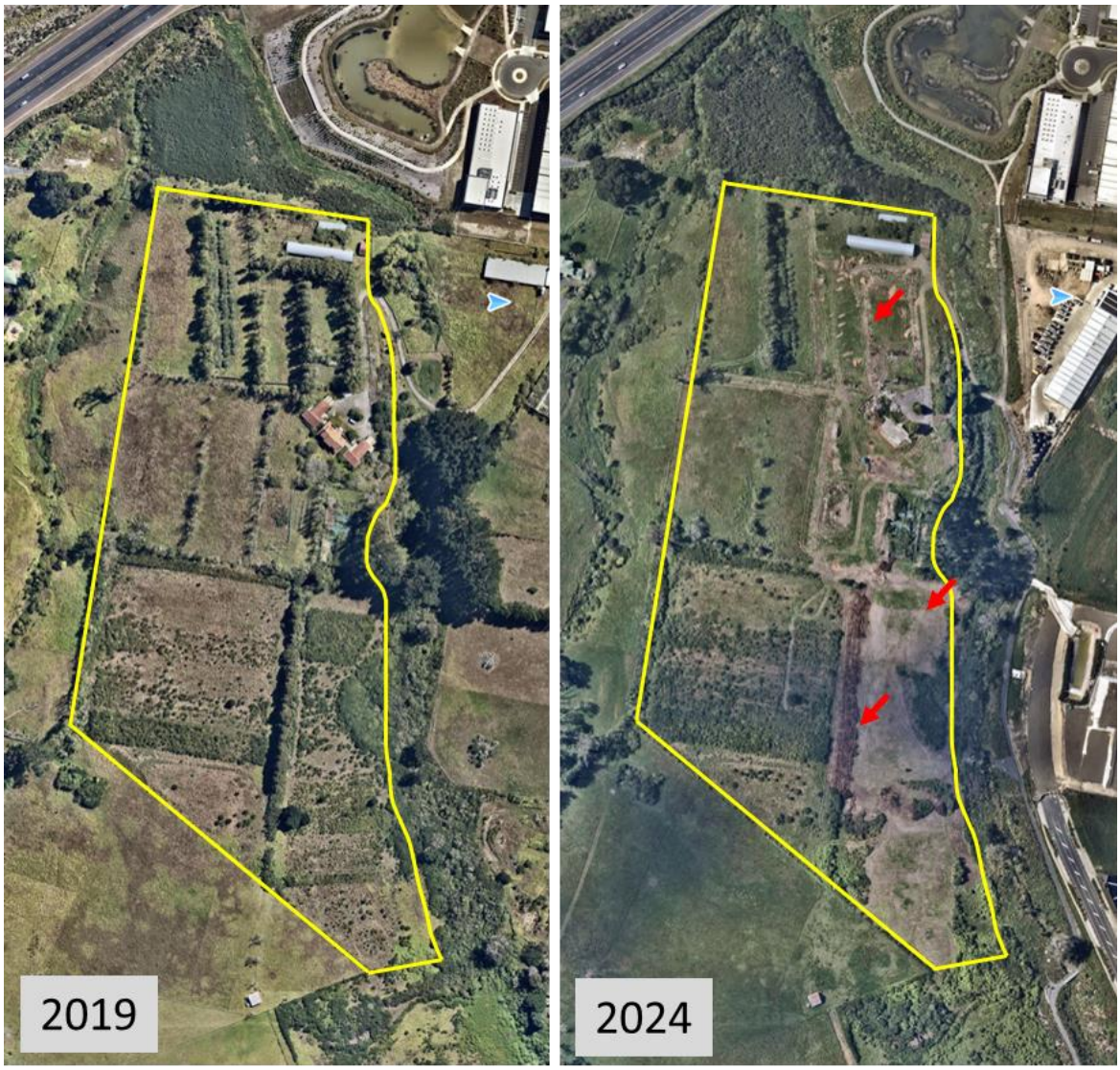

Figure 8. Proposed Precinct 2 in 2019 versus 2024, indicating (red arrows) areas of vegetation clearing.

- **Northern extent (100 Hobsonville Road)**

The vegetation of proposed Precinct 2 was predominantly composed of rank pasture grass, with shelter belts consisting of large pine (*Pinus* spp.) and feijoa (*Acca sellowiana*) trees, along with amenity plantings primarily located in the central eastern portion, surrounding the remaining building platform (Figure 9). Fruit trees have been removed in the northeastern extent of the site. Chinese privet (*Ligustrum sinense*) saplings have

sporadically established throughout the area. Native vegetation observed was limited to māhoe (*Melicytus ramiflorus*) trees, occasional cabbage trees, and pōnga (*Cyathea dealbata*).

Figure 9. (Left) Rank grasses dominate the northern portion of the site. Noting the large pine trees in the background, located along the eastern boundary of the site. (Right) Shelterbelts/fruit trees have been cut down.

- **Southern extent (90 Hobsonville Road)**

The vegetation associated with the southern portion of the site was characterized by long pasture grasses in the eastern extent and dense patches of Chinese privet, particularly in the western portion and the southernmost corner of the site (Figure 10). Japanese honeysuckle (*Lonicera japonica*) was also notable along the southeastern boundary. Native vegetation was limited to a few mamaku (*Sphaeropteris medullaris*), karamū (*Coprosma robusta*), and cabbage trees scattered sparsely across the area (Figure 11).

Considering the low diversity and abundance of native vegetation throughout proposed Precinct 2, the site is considered to be of **very low** botanical value.

Figure 10. Typical vegetation of the southern portion of proposed Precinct 2. (Left) long rank grasses surrounded by Chinese privet scrub. (Right) A strip cleared of trees (former shelterbelt) overlooking an area of short rank grasses.

Figure 11. Single native species (Left – cabbage tree; Right – mamaku) amongst the exotic species, primarily Chinese privet, gorse, and notably Japanese honey suckle (left).

4.1.2.3 Riparian vegetation along eastern boundary

Between 2020 and 2022, the riparian yard along the Rawiri Stream has undergone revegetation (Figure 12) with native vegetation as part of the industrial development situated along Westpoint Drive. This was guided by the ecological and landscape enhancement plan established by Morphum Environmental in 2015.

Prior to revegetating the riparian margin of the stream, the vegetation in the upper reaches of Rawiri Stream was characterized by a canopy dominated by exotic plant species, with some indigenous vegetation regenerating. The mid-reaches featured mature exotic trees, including stands of pine and willow trees, with patches of limited vegetated cover interspersed between the exotic stands. Vegetation in the lower reaches of the stream consisted of *Glyceria* grass species, with exotic scrub on the true left bank, and a planted true right bank incorporated into the stormwater pond landscaping (Morphum Environmental, 2015).

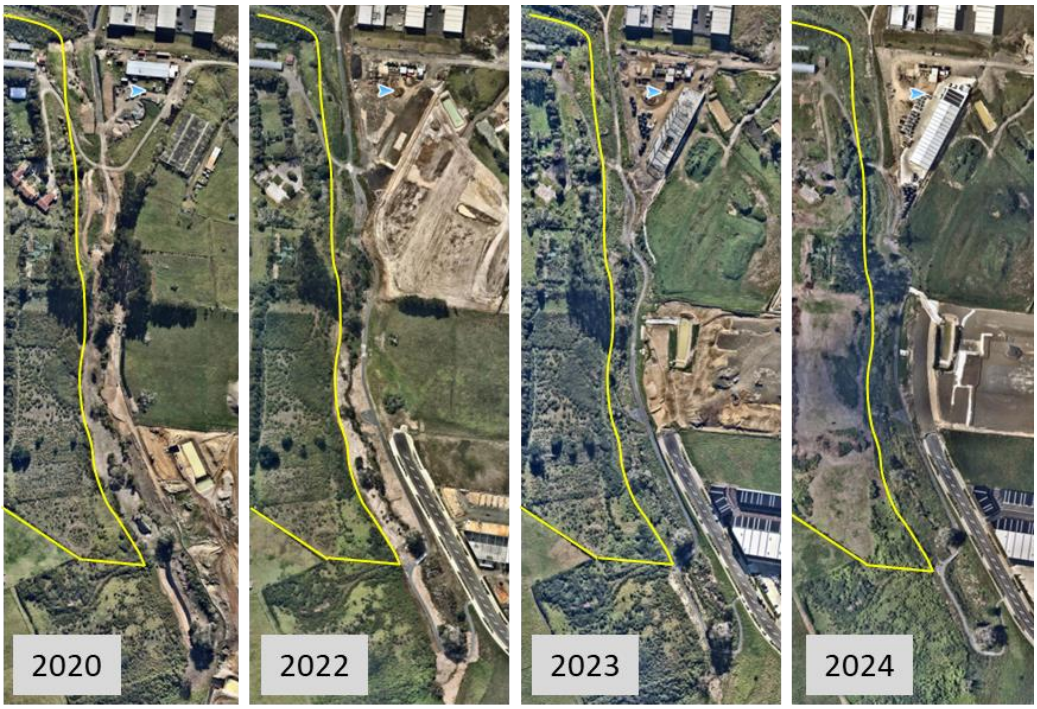

Figure 12. Revegetation of the Rawiri Stream outside the proposed Precinct 2 boundary (yellow line) between 2020 and 2024.

During the site assessment in March 2024, the riparian vegetation comprised native species such as *Machaerina* spp., a variety of *Carex* species, giant umbrella sedge (*Cyperus ustulatus*), cabbage trees and karamū. Long, rank grasses have also become established along the stream, alongside invasive exotic species such as gorse and Chinese privet.

The planting of native species within the riparian margin along the stream has not yet yielded an immediate effect on the overall ecological value of the stream. However, it is anticipated that as the vegetation becomes more established, it will eventually have a positive influence. Consequently, the riparian vegetation is currently regarded as having **low** botanical value.

Figure 13. Riparian vegetation composition of the Rawiri Stream, outside the eastern boundary of the site.

4.2 Avifauna

Table 2 lists the avifauna recorded from desktop databases; however, sea birds, pond (such as the New Zealand Dabchick) and wetland birds (such as the pūweto / spotless crake) and non-native species were excluded, due to a lack of any marine, coastal or wetland/pond habitat within or immediately adjacent to the site.

Table 2. Native avifauna identified during the desktop study, with corresponding conservation status (Robertson et al., 2021).

Conservation status	Common name	Scientific name	Record source
At Risk - Declining	North Island fernbird	*Poodytes punctata vealeae*	New Zealand Bird Atlas
Not Threatened	Masked lapwing / spur-winged plover	*Vanellus miles*	New Zealand Bird Atlas
	kererū / New Zealand pigeon	*Hemiphaga novaeseelandiae*	iNaturalist, New Zealand Bird Atlas
	Kāhu / swamp harrier	*Circus approximans*	New Zealand Bird Atlas
	pīpīwharauroa / shining cuckoo	*Chrysococcyx lucidus lucidus*	New Zealand Bird Atlas, iNaturalist
	pīwakawaka / North Island fantail	*Rhipidura fuliginosa placabilis*	New Zealand Bird Atlas, iNaturalist
	Pied Stilt / poaka	*Himantopus himantopus*	New Zealand Bird Atlas
	pūkeko	*Porphyrio melanotus melanotus*	New Zealand Bird Atlas
	pūtangitangi / Paradise Shelduck	*Tadorna variegata*	iNaturalist, New Zealand Bird Atlas
	riroriro / grey warbler	*Gerygone igata*	New Zealand Bird Atlas
	Kōtare / sacred kingfisher	*Todiramphus sanctus vagans*	New Zealand Bird Atlas
	tauhou / silvereye	*Zosterops lateralis lateralis*	New Zealand Bird Atlas, iNaturalist
	welcome swallow	*Hirundo neoxena neoxena*	New Zealand Bird Atlas, iNaturalist
	ruru / morepork	*Ninox novaeseelandiae novaeseelandiae*	New Zealand Bird Atlas, iNaturalist
	Pūkeko	*Porphyrio melanotus*	New Zealand Bird Atlas
	kakīānau / black swan	*Cygnus atratus*	New Zealand Bird Atlas
	Tūī	*Prosthemadera novaeseelandiae*	New Zealand Bird Atlas

The desktop study identified the presence of a Threatened or At Risk (TAR) bird species (North Island fernbird) within the vicinity of the site, however the North Island fernbird is found mainly in dense wetland vegetation but is occasionally found in drier shrubland. Fernbirds are also sensitive to the impacts of introduced predators. Given the low suitability of the site for fernbirds, coupled with its position near roadways (i.e. SH18/Upper Harbour Motorway to the northwest of the site) and surrounding ongoing urbanisation, it is considered highly unlikely fernbird would be present within the site. Consequently, the habitats present within the site are not considered suitable to support the TAR species identified within the desktop study.

The site is therefore expected to support a range of common, not threatened native bird species, and is consequently considered to be of **Low** ecological value for birds.

4.3 Herpetofauna

The indigenous herpetofauna of the Auckland Region includes 18 terrestrial taxa, of which 12 occur on the region's mainland (c.f. islands). A further four introduced species are also known to occur in the region (van Winkel *et al*., 2018). The terrestrial species are listed in Table 3, which also lists the species recorded within 5 km of the site during the literature search. This includes three native and one introduced lizard species. None of these identified species are located within the site, with the closest record (native elegant gecko) approximately 1.2 km south of the site.

Table 3. Terrestrial herpetofauna of the Auckland region, corresponding NZ conservation statuses and reported occurrence within 5 km of the site.

	Common name	Species name	NZ threat status*	Reported within 5 km of the site
Indigenous	***Woodworthia "Muriwai"***	Muriwai gecko	Nationally Critical	
	Mokopirirakau granulatus	Forest gecko	At Risk – Declining	
	Naultinus elegans	Elegant gecko	At Risk – Declining	✓
	Dactylocnemis pacificus	Pacific gecko	At Risk – Relict	✓
	Woodworthia maculata	Raukawa gecko	Not Threatened	
	Oligosoma ornatum	Ornate skink	At Risk – Declining	
	Oligosoma striatum	Striped skink	At Risk – Declining	
	Oligosoma moco	Moko skink	At Risk – Relict	
	Oligosoma smithi	Shore skink	At Risk – Naturally Uncommon	
	Oligosoma aff. smithi	Tatahi skink	At Risk – Naturally Uncommon	
	Oligosoma aeneum	Copper skink	At Risk – Declining	✓
	Leiopelma hochstetteri	Hochstetter's frog	At Risk – Declining	
Introduced	***Lampropholis delicata***	Plague skink	Introduced & Naturalised	✓
	Ranoidea aurea	Green and golden bell frog	Introduced & Naturalised	
	Ranoidea raniformis	Southern bell frog	Introduced & Naturalised	
	Litoria ewingii	Whistling tree frog	Introduced & Naturalised	

* Hitchmough *et al*., 2021; Burns *et al*., 2018

4.3.1 Field assessment

The opportunistic searches carried out on site (Figure 14) did not detect any native lizards, however, plague skinks were observed. The plague skink is an 'Unwanted Organism' (Biosecurity Act 1993) that has the potential to compete with indigenous skinks. However, the impacts of this species on indigenous lizards are not clearly understood and therefore, its presence does not add or detract from the site's ecological values. As this species is exotic, it is not considered further.

4.3.2 Habitat assessment for native herpetofauna

Skinks and geckos in the Auckland Region generally require dense ground cover (ground dwelling species such as copper and ornate skink) or contiguous areas of vegetation with dense foliage, cavities (such as cracks, flaky bark and hollows) and / or epiphytes (suitable for forest gecko, pacific gecko and elegant gecko (which are arboreal species)).

Native lizard habitats are largely absent from the northern portion of the site, as:

- It lacks substantial native vegetation within the site;
- The regular mowing of open green spaces is preventing development of 'rank grassland' type habitats; and
- The lack of understorey in areas associated with stands of trees.

It is unlikely that native lizards will inhabit the area due to the lack of suitable habitat within the northern portion of the site and the lack of connectivity to suitable vegetation outside of the site. However, rank grassland is present within the southern portion of proposed Precinct 2 and within proposed Precinct 1.

The habitat suitability pertaining to native geckos is considered **low,** and these are considered highly unlikely to be present, however, the site may support native skinks, in particular copper skink which are known to persist in modified, edge habitats.

Figure 14: Potential lizard habitat searched during the site visit.

4.4 Bats (pekapeka)

Two endemic species of bats (pekapeka) are found in New Zealand, including the long-tailed bat (LTB; *Chalinolobus tuberculatus*) and short-tailed bat (STB; *Mystacina tuberculata*); the latter is represented by three subspecies (O'Donnell *et al.,* 2023). Both species are listed as 'Threatened' or 'At Risk' under the New Zealand threat classification system (i.e., LTB - 'Nationally Critical' and Southern STB – 'At Risk – Recovering') (Townsend *et al*., 2008; O'Donnell *et al*., 2023). Their threat statuses reflect the chronic decline in populations across much of New Zealand, due to the loss and fragmentation of habitats and adverse impacts of pest mammals (e.g., rodents, cats), with some population recovery from conservation management apparent in Southern STB populations.

4.4.1 Desktop assessment

Department of Conservation (DOC) bat records were accessed within the vicinity of the site (Figure 15). The closest record was for a LTB, 2.1 km northwest within a raupō reedland and 1.7 km northeast of the site close to the Sinton Stream. Other LTB records were recorded southwest of the site, still within the 5 km site radius. Whilst other surveys have been completed nearer to the site (530 m to the west) which have not detected bats, the area is generally not well surveyed.

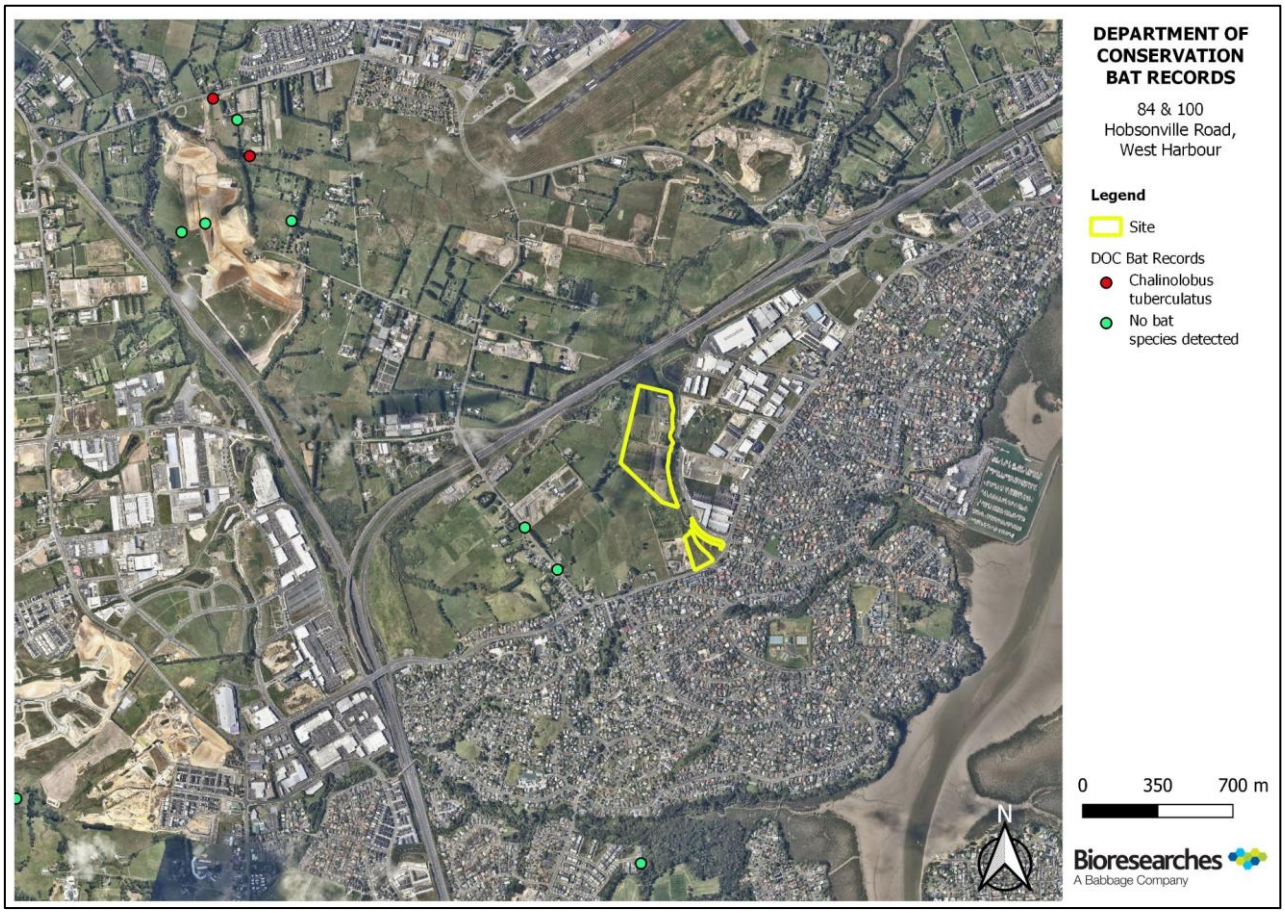

Figure 15. Bat records within the vicinity of the site.

4.4.2 Habitat assessment

Long-tailed bats utilise habitat features such as vegetated stream corridors for foraging and flight paths, and mature trees (both native and exotic) with habitat features such as loose bark, cracks or rot holes as roosts. The pine treeland along the central eastern boundary of proposed Precinct 2 may potentially provide suitable bat habitat (Figure 16).

Mature pine trees (along the central eastern boundary) that may potentially be removed from site were of large enough size to be considered as bat habitat (>15 cm DBH, or diameter at breast height). These trees also contained potential roost habitat with cavities or epiphytic vegetation present.

Although there are no bat records within the immediate vicinity of the site, or within the wider riparian corridor associated with the Rawiri Stream located along the eastern boundary of the site, LTBs can have very large home ranges (>100 km^2). It is very unlikely that the site would form an important part of a LTB's home range. However, suitable habitat, though scarce, is present on-site in the form of mature pines. The presence of LTB records within 10 km of the site, often located within similar fringe/fragmented forest pieces, also prevents the presence of LTBs from being excluded.

Jones *et al*. (2019) discusses the impact of roadways on bat habitat:

> "Either because of direct mortality or behavioural avoidance of the road due to light, noise or traffic movement, roads can be barriers to bats' foraging, commuting and migration."

The impact of the adjacent roads (such as SH18/Upper Harbour Motorway and Hobsonville Road) is likely to render the habitat significantly less important to LTBs, due to the impacts of noise, light and traffic. The value of the vegetation pertaining to native bats is therefore considered **low.**

Figure 16: Potential bat-roosting trees (pine trees) that may potentially be removed from the site.

4.5 Freshwater Habitat

Figure 17 below maps the freshwater habitats identified surrounding the site, as discussed in the sections that follows.

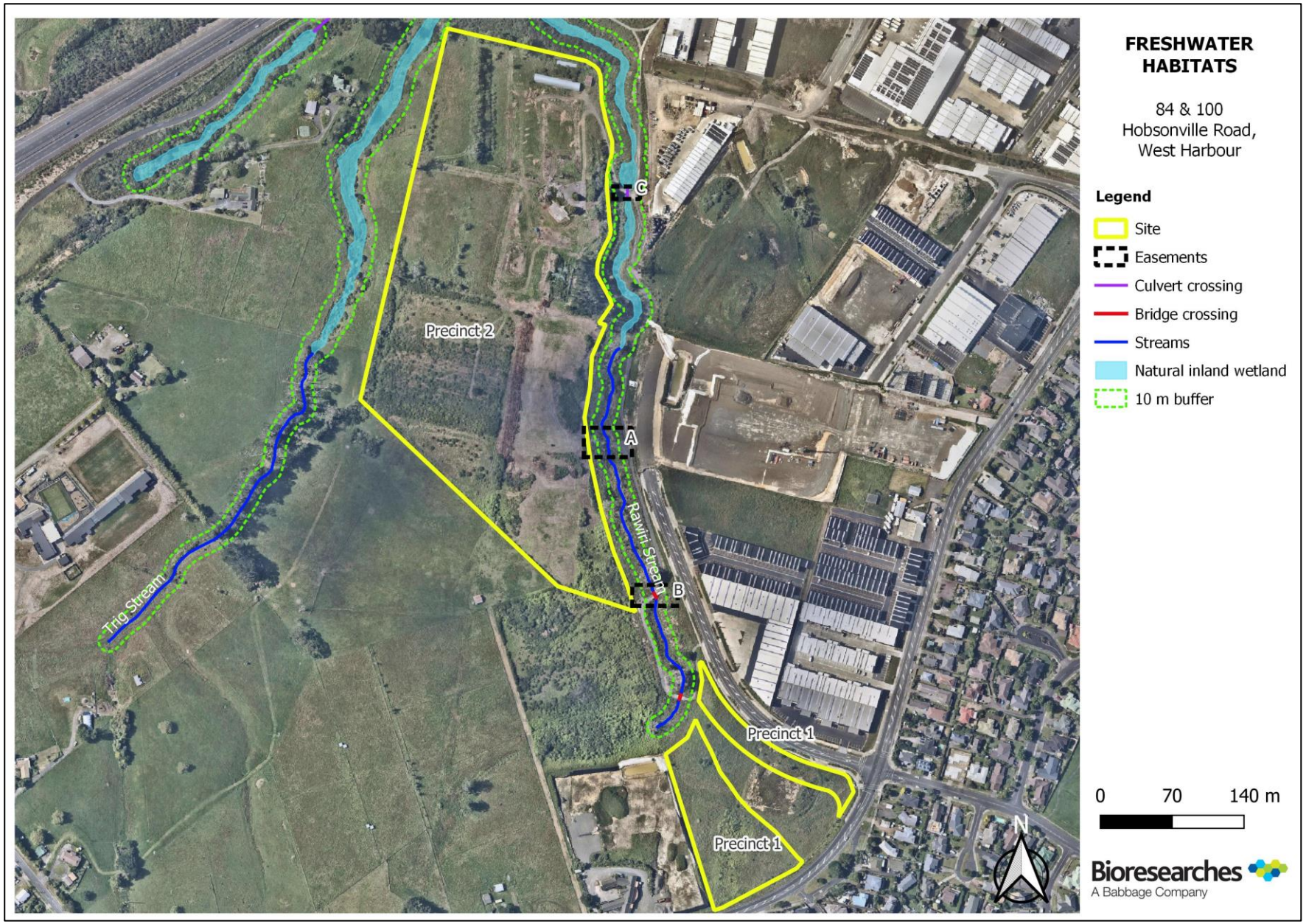

Figure 17: Freshwater habitats surrounding the site.

4.5.1 Precinct 1

According to the Bioresearches assessment conducted in 2019, none of the predicted flow paths in the southern corner of the site were classified as permanent or intermittent streams. No channels or water were observed during the site assessment in 2019, and terrestrial pasture grasses were rooted throughout the area. The earthworks carried out during 2020/2021 have also led to topographical changes in this area. However, during the 2024 site assessment, no areas presenting natural inland wetland or stream characteristics were identified.

Therefore, no freshwater watercourses are situated within the boundaries of proposed Precinct 1.

4.5.2 Precinct 2

There are no natural inland wetlands present within the boundaries of proposed Precinct 2.

As part of the 2019 Bioresearches assessment, all of the overland flow paths indicated by Auckland Council GeoMaps were investigated. It was confirmed that there are no defined channels or water in the vicinity of any of these indicated flow paths, and terrestrial vegetation, such as long pasture grass and Chinese privet, was rooted throughout these areas. Therefore, none of the indicated overland flow paths within proposed Precinct 2 met the criteria for intermittent or permanent streams.

4.5.3 Freshwater habitats outside the site boundaries

Focus was placed on providing an overview of the watercourses outside the eastern boundary of the site, since it is likely that the eventual development would require an access way crossing over this watercourse (Rawiri Stream).

4.5.3.1 Rawiri Stream

The Rawiri Stream is located outside the eastern boundary of the site. It drains in a general northerly direction, and confluences with the Trig Stream outside the northern boundary of the site, whereafter it drains underneath SH18. Given its catchment of approximately 60 ha and the characteristics of the assessed reach, this stream was classified as a permanent stream.

The stream channel within the site averages between 0.7 to 1.2 m wide (Figure 18). The depth is variable, ranging from 0.25 m to approximately 0.7 m deep. The streambed primarily consists of soft sediment, with occasional gravels observed. A significant portion of the banks of the stream sections were incised (notably that of the upstream reach), and active erosion on the banks was observed. The substrate within the stream is mostly solid clay, and a high loading of fine sediment was observed, causing the water to be murky and opaque in areas of very slow-flowing water. The hydrological heterogeneity within this reach is moderate, with runs, riffles, and shallow to deep pools present in the stream. A variety of favourable aquatic habitats, including woody debris, riffles, undercut banks, and root mats, were observed.

As detailed in Section 4.1.2.3, the riparian vegetation of the Rawiri Stream consists of a mix of recently established native species and exotic weeds. While the riparian vegetation, combined with steep stream banks in the upstream reach and overhanging vegetation in the midstream reach, effectively shades the stream, the lower stream reach and wetland areas have minimal shading due to lower embankments and

less dense vegetation. Although the riparian corridor is expected to provide filtration and bank stability functions, this is currently limited due to the recent establishment of vegetation.

A desktop search for native fish records, using the New Zealand Freshwater Fish Database (NZFFDB), was undertaken within the stream catchment, but no fish have been recorded. Two native fish species, however, have been documented in the Waiarohia Stream downstream of the confluence with the Rawiri Stream. This includes Not Threatened species shortfin eel (*Anguilla australis*) and banded kōkopu (*Galaxias fasciatus*). Considering the habitat characteristics of the stream, which include suitable habitat for native fish species, it is likely that these fish species are present in the Rawiri Stream.

Overall, the Rawiri stream does retain some ecological values and the surrounding land use changes, and due to the native fish habitat, which this stream provides, it is considered of **moderate** ecological value.

Figure 18: Typical characteristics of the Rawiri Stream.

4.5.3.2 Natural inland wetland

The downstream reach of the Rawiri Stream hosts a natural inland wetland, likely formed due to sediment deposition resulting from a change in gradient or instream structure (Morphum Environmental, 2015). Hydrologically driven by frequent overbank flooding from the shallow Rawiri Stream channel flowing through it, this wetland was observed to have shallow surface water during a site visit in March 2024.

Exotic reed sweetgrass (*Glyceria maxima*), which has a wetland indicator status rating of 'Obligate' dominated the downstream reach of the wetland. Wetland areas not dominated by reed sweetgrass comprised a mixture of exotic sedges, rushes and pastural weeds including mercer grass (*Paspalum distichum* - FACW), paspalum (*Paspalum dilatatum* - FACU), Yorkshire fog (*Holcus lanatus* - FAC), soft rush (*Juncus effusus* - FACW), water pepper (*Persicaria hydropiper* - FACW), buttercup (*Ranunculus repens* - FAC), narrow-leaved plantain (*Plantago lanceolata* - FACU) and lotus (*Lotus pedunculatus* - FAC). This wetland passed the 'Rapid Test' and was classified as a 'natural inland wetland' under the NPS-FM, and therefore no further tests (i.e., soil or hydrology) were undertaken.

The hydrologic variation and habitat diversity within the wetland was assessed as low, comprising shallow surface water. However, the shading provided by the recently planted riparian margin would provide moderate value habitat for native freshwater fauna both within the stream and the wetland. Despite being dominated by exotic weed species, the wetland serves important hydrological functions and is considered to have **moderate** ecological value.

Figure 19: Overview of the wetland associated with the Rawiri Stream. The wetland dominated by mercer grass and willow weed looking downstream (top left) and upstream (top right) of an existing culvert crossing (easement C). Reed sweetgrass dominated the lower reach of the wetland (bottom).

Another natural inland wetland is located outside the western boundary of the site (Figure 20), associated with the Trig Stream. While this wetland was not ground-truthed, its extent depicted in Figure 17 is delineated based on desktop analysis. Given its characteristics, including a homogeneous cover predominantly consisting of what appeared to be mercer grass, and a lack of riparian vegetation coverage, it was assumed to possess similar ecological value to that of the Rawiri Stream wetland.

Figure 20: Overview of the wetland located outside the western boundary of the site.

5 ECOLOGICAL VALUE

Table 4 combines the fauna and habitat information presented in Section 4 to assign an ecological value for each habitat present within the site.

Table 4. Summary of ecological values of habitats and species within and surrounding the site. The ecological value is assigned by considering the information discussed in Section 4 on the structure and condition of the habitats combined with their potential to support native fauna.

Habitat	Botanic value	Species which habitat may support				Ecological value of habitat
		Avifauna	Herpetofauna	Bats	Fish	
Grassland vegetation within Precinct 1	Very Low	Unlikely to support any more than common, Not Threatened species.	Potentially supports copper skink.	No	N/A	**Moderate**
Grassland vegetation within Precinct 2	Very Low	Unlikely to support any more than common, Not Threatened species.	Potentially supports copper skink.	No	N/A	**Moderate**
Mature pine treeland within Precinct 2	Very Low	Unlikely to support any more than common, Not Threatened species.	No	May provide a flight corridor and roosting habitat, although highly unlikely to be important habitat or frequently visited.	N/A	**Moderate**
Riparian corridor vegetation	Low	Unlikely to support any more than common, Not Threatened species.	Potentially supports copper skink.	May provide a flight corridor and roosting habitat, although highly unlikely to be important habitat or frequently visited.	N/A	**Moderate**
Rawiri stream	N/A	Unlikely to support any more than common, Not Threatened species.	N/A	N/A	Could be utilised by native fish, however this isn't likely to be high-value habitat.	**Moderate**
Rawiri Stream wetland	N/A	Unlikely to support any more than common, Not Threatened species.	N/A	N/A	Could be utilised by native fish, however this isn't likely to be high-value habitat.	**Moderate**

6 ASSESSMENT OF ECOLOGICAL EFFECTS

The proposed PPC seeks to rezone approximately 10.7 ha of land from predominantly FUZ to either residential zones (proposed Precinct 2) or Business – Light Industrial Zones under the AUP. No additional provisions are proposed as part of the PPC. All Auckland-wide and zoning provisions within the AUP will apply to the re-zoned land and will enable Auckland Council to regulate and manage future development of the area.

The main threats to the long-term viability of ecosystems in the Auckland regions include habitat destruction, fragmentation, edge effects and invasion by pest plants and animals. These threats are often augmented through an increase in human population density.

This section assesses the potential effects of the proposed PPC on the current and potential ecological values within the site and the associated wider landscape. It is noted that any future development of the site is likely to require resource consenting and therefore be subject to more detailed assessments of effects.

6.1 Terrestrial Ecology

6.1.1 Terrestrial Vegetation

Future rezoning to residential/business will likely result in the majority of the site being cleared of vegetation to facilitate development. While this development will be subject to future resource consents, the plan change ultimately enables a fundamental change in land use. However, despite the future dominance of residential (Precinct 2) and business (Precinct 1) land use, there will be opportunities to retain existing ecological values where appropriate and protect land from further degradation through considered design. There will be opportunities to enhance terrestrial ecological values through revegetation and the protection of the riparian margin and development of an esplanade reserve. These potential enhancements will increase the quantity and diversity of native vegetation within the site, as well as result in a large increase in ecological connectivity and available terrestrial habitat for indigenous fauna.

Future residential/business zoning is expected to result in a high magnitude of effect due to the expected total clearance of the site. This will largely be the removal of exotic species from site (specifically Chinese privet) but may include native scrub vegetation suck as karamū. Exotic vegetation within the riparian margin of the Rawiri Stream is proposed to be removed to improve the biodiversity value of this habitat. Larger specimen trees that may need to be removed (and which provide value to fauna) should be replaced with native species that provide a similar fauna function. It is noted that exotic vegetation removal has already occurred within the riparian margin of the Rawiri Stream (refer to Section 4.1.2.3), as such, removal of any young exotic specimens that has established since then does not warrant addressing effects associated with loss.

However, it will also provide opportunities for restoration and enhancement that would provide significant improvement in regard to terrestrial ecological values.

6.1.1.1 Terrestrial vegetation - Objectives and policies

Chapter E15 of AUP outlines the direction for managing vegetation and biodiversity across the Auckland region. The AUP requires the maintenance or enhancement of contiguous indigenous vegetation cover and biodiversity values, with provisions for addressing degraded ecological areas while also acknowledging the necessity for development. This enhancement involves activities such as managing and removing pest plants along riparian areas, which is a permitted activity under Chapter E15.4.1.

Although there is a general emphasis on protecting contiguous vegetation cover, instances where vegetation removal (albeit predominantly grassland and exotic scrub) is unavoidable in small areas are anticipated. Any adverse effects resulting from these activities will be mitigated through on-site restoration, enhancement planting, and weed control measures along the Rawiri Stream corridor.

For any rezoning that occurs in urban areas, it will be a restricted discretionary activity to carry out vegetation alteration or removal within 10 m of a stream (Table E15.4.1; A19). This is not considered to be likely, as the Rawiri Stream and wetland, is located more than 10 m outside of the site boundaries.

6.1.1.2 Pest Mammals

The future residential zoning of proposed Precinct 2 is expected to lead to a significant increase in the human population density within the area. An increase in human population density has been found to decrease possum and rodent numbers, and increase domestic cats in residential areas (Miller, 2020). In turn, mustelids numbers can become very limited where cats are in abundance.

The current site is not known to have pest control measures, and most pest mammals are likely at carrying capacity. The anticipated reduction in agricultural land with an urban re-zone will likely result in an overall decrease in the possum, mustelid, and rodent abundance, however, may increase hedgehog and domestic cat numbers. Overall, urbanisation of the site is expected to provide positive outcomes for reducing pest mammal populations within the site. Future rezoning to urban will provide opportunities for increases in vegetation cover and increases in ecological spaces within then site, which would provide opportunities to decrease possum, mustelid, hedgehog and rodent densities.

6.1.2 Terrestrial fauna

The current land use within the site has led to the replacement of native vegetation with rank and pasture grasses. Ecologically valuable areas are thus limited, mostly confined to the eastern boundary of the site, specifically associated with the Rawiri Stream.

The transition from FUZ to residential/business land use may have indirect implications for native terrestrial fauna due to habitat loss and reduced food sources. However, the majority of vegetation along the riparian margin will likely be further enhanced through infill planting and weed management. Consequently, the anticipated impact is deemed low to moderate, with the retained vegetation likely improving in quality under the proposed changes.

Potential indirect consequences of the land use change include alterations to light and noise levels, as well as disturbances during and after construction, especially during sensitive periods like breeding seasons. Although it is acknowledged that, over recent years that urbanisation surrounding the site has rapidly increased, and some of these aspects already impact on the site.

The removal of vegetation carries the risk of adversely affecting terrestrial fauna. Direct impacts on bats, birds, and herpetofauna could include damage to roosts, nests, eggs, and fledglings, as well as the loss of individuals during vegetation removal, construction, and earthworks.

The Wildlife Act 1953 protects native fauna such as bats, lizards and birds. Therefore, it is a legal requirement to manage potential direct and indirect effects on fauna which may result from the clearance of vegetation and potential bat, avifauna, and lizard habitat across the site. Management plans are proposed to address high level changes associated with the plan change, which will be required and implemented through resource consent activities. As such, it is considered important to manage both direct and indirect effects on fauna resulting from vegetation clearance and potential habitat loss. To address these concerns, surveys for native fauna should be undertaken during the resource consenting phase, so that effects can be avoided, and appropriate effects management strategies can be integrated into the design, to minimise effects to native fauna as much as possible. If native species are detected, management plans must also be composed (during the resource consenting phase) to focus on the proposed changes associated with the PCC.

6.1.2.1 Bats

Land-use changes in the site will have the potential to directly and indirectly affect LTB's that may potentially be in the immediate area. Potential direct effects may include foraging, commuting and roost habitat loss; injury and/or death of individual bats (in a worst-case scenario) during tree felling; and impacts on foraging and commuting behaviour patterns due to changes in levels of artificial light. Indirect effects may include an increase in predation pressure in the landscape due to an increase in pest numbers (e.g. rats, cats).

The small pine treeland located along the central eastern portion of the site (proposed Precinct 2) may potentially provide suitable bat habitat. These trees have the potential to be utilised as roosting habitat for native bats. If a tree with bats roosting inside was felled (removal thereof yet to be confirmed), this could lead to the death or injury of native bats.

It is recommended that a bat survey be undertaken to determine the presence or absence of bats. If they are found to be present, the design of the Precincts should consider how bats are using the site to ensure that connectivity is maintained to minimise habitat loss for bats, and a site-specific Bat Management and Monitoring Plan (BMMP) should be prepared to manage potential adverse effects on LTB's. The BMMP should at a minimum outline roost tree felling protocols, contingencies measures for the incidental detection of bats during felling operations, and appropriate measures to compensate for the roost trees, where necessary (e.g. provision of artificial roost box and monitoring).

Overall, the change in land-use may impact LTB's. However, provided a survey is completed which allows for the finalised precinct designs to not result in a net loss of bat habitat, and maintain habitat connectivity for bats; and a BMMP is developed by the time of resource consenting, to include appropriate management measures, it is considered these adverse effects can be adequately managed.

Should the finalised precinct designs not result in a net loss of bat habitat and maintain habitat connectivity for bats; and any effects management measures detailed in a BMMP be implemented, it is considered that the magnitude of effects of the proposed vegetation clearance to bats would be low.

6.1.2.2 Herpetofauna

The site and riparian yard contain low value herpetofauna habitat, and there is a low potential for the presence of copper skinks. All indigenous reptiles and amphibians are legally protected under the Wildlife Act 1953, and vegetation and landscape features that provide significant habitat for native herpetofauna are protected by the Resource Management Act 1991. Statutory obligations require management of resident reptile and amphibian populations if they are threatened by land disturbance i.e., land development.

The clearance of the vegetation within Council land, as it pertains to fauna values, could result in the harm or mortality of indigenous skinks. Potential direct and indirect effects of vegetation removal include tree removal, habitat loss, and food resources loss, however it is considered the enhancement planting and weed management of the Rawiri Stream will provide an improvement on the current situation in the long-term.

To confirm if lizards are present in the site, a lizard survey should be undertaken. If this confirms that native lizards are absent from these areas, the vegetation could be removed without further consideration of lizards. However, if the survey detects that native lizards are present, or if a lizard survey is not undertaken, a Lizard Management Plan (LMP) should be prepared to manage potential effects of the vegetation clearance to lizards. The LMP should address the following (where relevant):

- *Credentials and contact details of the ecologist/herpetologist who will implement the plan;*
- *Timing of the implementation of the LMP;*
- *A description of methodology for survey, trapping and relocation of lizards rescued including but not limited to: salvage protocols, relocation protocols (including method used to identify suitable relocation site(s)), nocturnal and diurnal capture protocols, supervised habitat clearance/transfer protocols, artificial cover object protocols, and opportunistic relocation protocols;*
- *A description of the relocation site(s); including discussion of:*
    - *provision for additional refugia, if required e.g., depositing salvaged logs, wood or debris for newly released native skinks that have been rescued;*
    - *any protection mechanisms (if required) to ensure the relocation site is maintained (e.g.) covenants, consent notices etc;*
    - *any weed and pest management to ensure the relocation site is maintained as appropriate habitat.*
- *Monitoring methods, including but not limited to:*
    - *baseline surveying within the site;*
    - *baseline surveys outside the site to identify potential release sites for salvaged lizard populations and lizard monitoring sites;*
    - *ongoing annual surveys to evaluate translocation success;*
    - *pre and post – translocation surveys; and*
    - *monitoring of effectiveness of pest control and/or any potential adverse effects on lizards associated with pest control;*
- *A post-vegetation clearance search for remaining lizards.*

If these effects management measures are followed, it is considered that the magnitude of effects of the proposed vegetation clearance to lizards would be low, resulting in an overall **Low** level of effect. No further effects management measures for lizards are required.

6.1.2.3 Birds

The vegetation removal activities on site have the potential to disturb nesting common native birds utilising the affected vegetation. Adult birds are likely able to relocate themselves during vegetation removal, and the surrounding area contains many areas of higher quality habitat than the vegetation proposed to be removed, which any displaced birds can utilise.

However, chicks and eggs are at risk of injury or death during vegetation removal activities, as they are not able to relocate themselves. Consequently, the following effects management measures are proposed to reduce the likelihood of impacts to native birds:

> *"Vegetation removal must be undertaken outside the main native bird breeding season (September to January inclusive) except where a suitably qualified ecologist has confirmed that vegetation is clear of any native nesting birds, eggs, or chicks. Should an active nest be found, a 10 m exclusion zone must be demarcated, and works must remain outside of this zone until the chicks have fully fledged."*

If these effects management measures are followed, it is considered that the magnitude of effects of the proposed vegetation removal upon birds would be low.

6.2 Freshwater Ecology

6.2.1 Rawiri Stream

The proposed PPC will not affect stream protection measures required by the AUP's objectives, policies and rules. The PPC will not require any stream works. Any future stream works undertaken as part of future development will be subject to resource consenting at a later stage.

A stream crossing will be required to facilitate access to the site, likely associated with easement A or B (Figure 17). It is anticipated that future stream crossings will adhere to best practices, resulting in minimal effects on aquatic values. An updated ecological assessment of the Rawiri Stream and assessment of the effects of the proposed access road crossing should be undertaken during the resources consenting phase. Given the Rawiri Stream's narrow channel, the use of a short-span bridge structure is highly recommended. This will avoid any stream works, maintain flow within the stream and ensure ongoing fish passage throughout the stream.

Future residential/business rezoning is expected to result in changes to water quality as a result of changes in land use. Rural waterways tend to be affected by high sediment loads, nutrients and stock faecal contamination, while urban waterways tend to be affected by altered hydrological regimes, heavy metals and hydrocarbons. During development there will be the opportunity for riparian margin restoration and protection, and treatment of contaminants as part of the wider development.

6.2.2 Natural inland wetlands

Since no natural inland wetlands are located within the site, no reclamation of wetlands is expected. Considering that the Rawiri Stream wetland is located directly adjacent to the site (within 100 m of the site, but more than 10 m away from the site - Figure 17), it may potentially be subjected to indirect effects. Resource consents will be required as part of the resource consenting stage, and the effects of any changes to wetlands, will be assessed at that stage.

6.2.3 Earthworks and associated sedimentation

Earthworks activities associated with the land use change, including any works in watercourses, have the potential to result in an uncontrolled discharge of sediment laden water. Increased sediment in the receiving environment can impact water quality within the surrounding streams and wetlands and result in sediment deposition, changing habitat features. Further, modifications to landforms through earthworks can result in changes to contributing catchments.

Activities such as earthworks, associated with the change in land use, carry the risk of sediment-laden runoff to enter watercourses. The streams and wetlands can be negatively affected by increased sediment inputs, specifically on factors like water quality and altered habitat characteristics, similar to what possibly led to the development of the Rawiri Stream wetland. Additionally, alterations to landforms through earthworks may affect the contributing catchments.

While the potential alterations to the contributing catchments remain unclear, measures to control earthworks will be addressed at the time of resource consent. However, it is anticipated that potential sediment effects resulting from earthworks across the site can be effectively managed through the implementation of erosion and sediment control plans (ESCPs) designed and maintained in accordance with Auckland Council's GD05 - Guidance for Erosion and Sediment Control. Special attention should be given to areas where earthworks are planned in close proximity to the Rawiri Stream and its associated wetland.

Development of these ESCPs will reduce the potential for an uncontrolled discharge of sediment laden water to the receiving freshwater environment, to an overall low magnitude of effects.

6.2.4 Stormwater management

The main threats to the freshwater ecology, as a result of a the proposed residential/business zones, are in relation to stormwater through:

- The potential increase in impervious surfaces as a result of subsequent development (change in water quantity and the hydrological regime); and/or,
- The potential increase in pollutant runoff as a result of subsequent development (change to water quality).

Future development of the land for urban purposes is expected to result in an increase in impervious surfaces. This increase can amplify the adverse stormwater effects on the receiving freshwater environment by resulting in scouring, erosion or high levels of contaminant inputs. The Rawiri Stream and wetland is already receiving stormwater runoff from neighbouring industrial developments (along the eastern side of the stream). Increased impervious surfaces have the potential to alter the volume and rate at which stormwater enters the receiving environment. High velocity flows can cause stream erosion and scour, which

contributes to bank instability and sediment deposition. In contrast, baseflows can be reduced as a result of infiltration being reduced as surface flows are directed to the stormwater network.

The national, regional and local regulations and guidelines outline the requirement of a Water Sensitive Design (WSD) approach to be undertaken for stormwater for any future development. The aim of this is to protect and enhance downstream environments and mimic natural water systems and processes for stormwater management. Auckland Council GD01 and GD04 provides guidance on applying a water sensitive urban design approach to treating urban stormwater runoff. This includes using devices such as swales, rain gardens, tree pits and permeable paving to treat stormwater prior to it entering the receiving environment.

To align with the NPS-FM and NES-F, future stormwater design will be required when rezoning occurs, to avoid adverse effects on any freshwater habitats surrounding the site, by minimising erosion through appropriate setbacks, achieving net neutrality and minimising/avoiding partial or complete wetland drainage.

The following WSD examples should be considered (but are not limited to) as part of the stormwater design includes:

- It is preferable that stormwater devices/management infrastructure be located outside of the delineated extent of streams and wetlands;
- It is preferred to have all stormwater discharges located in the highest possible point in the catchment;
- It is preferred that discharge be first to land or to a constructed wetland or raingarden, and not directly into a natural inland wetland or stream, as this will allow for water filtration and reduced the attenuate flow into the wetland or stream;
- Drainage of wetlands that would alter its water level range or hydrological regime must be avoided;
- Ensure well designed erosion control measures.

A preliminary stormwater management plan (SMP), prepared by Harrison Grierson in 2023, has been developed to guide the approach to stormwater management for the site. It proposes the construction of seven raingardens/constructed wetlands, aligned with the proposed staging plan. The draft SMP adheres to Auckland Council GD01 and GD04 recommended designs for managing stormwater, taking into account water quality, stream hydrology, and flood prevention. The stormwater management strategy adopts a communal management device approach (e.g., rain gardens/constructed wetlands) and aligns with the region-wide Network Discharge Consent (NDC).

6.3 Summary of terrestrial and freshwater effects

Table 5 summarises the potential ecological effects of the PPC upon the ecological features.

Table 5: Summary of effects, management measures and expected level of effect on native terrestrial and freshwater values

Habitat / Species	Potential effect	Summarised recommended effects management measures	Level of effect
Avifauna	Removal of suitable habitat vegetation (i.e. mature trees)	Remove vegetation outside of the breeding season or undertake pre-clearance surveys	Low
Herpetofauna	Removal of grassland vegetation	Maintain site conditions to prevent lizard habitat formation; undertake a lizard survey and/or implement LMP if conditions change	Low
Bats	Removal of potential suitable habitat (i.e. mature Pine trees) Indirect effect of light and noise on bat passage	Undertake bat survey and/or implement BMMP Any potential effects are likely to be reduced by infill planting the corridor along Rawiri Stream	Unknown until bat survey implemented. Very low to low
***Rawiri Stream Wetland**	Potential loss of catchment yield	Ensure suitable stormwater management devices are installed to maintain predevelopment catchments.	Very low
	Indirect effects of the development (i.e. untreated stormwater runoff, sedimentation)	Planting of wetland and 10 m buffer with native species. Implement ESCP	Very low/ possibly a positive effect Very low
***Rawiri Stream**	Vegetation removal within 10 m as part of access road crossing	Implement ESCP	Very low
	Access road crossing construction (assumed no stream works)	Planting of stream riparian zones with native vegetation	Very low
	Loss of catchment yield	Ensure suitable stormwater management devices are installed to maintain predevelopment catchments.	Very low

*Updated ecological and effects assessment to be undertaken as part of the resource consenting phase, when confirmed locality and design of the crossing structure is available.

6.4 Relevant Policy Documents

6.4.1 National Policy Statements

6.4.1.1 National Policy Statement for Freshwater Management (NPS-FM) 2020

The NPS-FM provides national direction for decisions regarding water quality and quantity, and integrated management of land, freshwater and coastal environments under the Resource Management Act 1991. The NPS-FM contains national objectives for protecting ecosystems, indigenous species and the values of outstanding water bodies and wetlands.

The main objective of the NPS-FM is to ensure the health and well-being of water bodies and freshwater ecosystems are prioritised. The PPC is in accordance with the objective of the NPS-FM as all freshwater ecosystems have been identified within the site; no wetland/stream reclamation or works are proposed and any potential significant adverse effects identified during future re-zoning to urban will be able to be appropriately avoided, minimised, remedied or offset under the effects management hierarchy.

As part of the PPC, a watercourse crossing is proposed to provide access to the site. During the resource consenting phase, an updated ecological assessment should be undertaken to ensure it aligns with the NPS-FM or any future guidance policies.

6.4.1.2 National Policy Statement for Indigenous Biodiversity (NPS-IB)

The NPS-IB provides direction to councils to protect, maintain and restore indigenous biodiversity in the terrestrial environment, requiring at least no further reduction nationally. It is relevant to the proposal because the site is within the terrestrial environment, and it contains indigenous biodiversity as defined in Section 1.6 (Interpretation) of the NPS-IB.

The indigenous biodiversity within the site includes that which is subject to a notified Significant Natural Area (SNA, or SEA as per the Auckland Unitary Plan (AUP), NPS-IB), some of which occurs within the Special Purpose Quarry Zone (SPQZ) for the AUP, as well as indigenous biodiversity that is not subject to SNA.

The NPS-IB requires that indigenous biodiversity that is not protected by an SNA:

c. Is managed by applying the effects management hierarchy (avoid, minimise, remedy, offset, compensate), where those effects are significant.
d. is managed to give effect to its Objective and Policies, where those effects are not significant (Section 3.16 (2)).

There are no AUP overlays within the site which pertain to ecology (e.g., Significant Ecological Areas (SEAs)).

6.4.2 Auckland Unitary Plan

The AUP sets out a number of policies and objectives that gives effect to the RMA to promote the sustainable management of natural and physical resources. This section addresses the objectives and policies set out in the AUP pertaining to ecology.

6.4.2.1 B2 – Urban Growth and Form

Consistent with B2, through vegetation protection and enhancement, the PPC will provide ample opportunity to enhance the quality of the natural environment, including those scheduled in the AUP. Additionally, it has been demonstrated above that the adverse environmental effects of the PPC, including potential significant adverse effects on receiving waters, will be avoided/minimised.

Adverse environmental effects of urban rezoning in future, including significant adverse effects from urban development on receiving waters that can be appropriately avoided, remedied or mitigated.

6.4.2.2 B7 – Natural Resources

Consistent with B7, areas of significant indigenous biodiversity value and freshwater environments have been identified within and surrounding the site, and these areas will not be adversely affected by the proposed PPC.

Urbanisation of the site in future will provide opportunities for all freshwater habitat to be protected from significant adverse effects of subdivision use and development, as well as provide further opportunities to maintain indigenous biodiversity through the protection, restoration and enhancement of areas where ecological values are degraded and where development is occurring, namely through planting and protection of riparian margins.

6.4.2.3 E1 – Water Quality and Integrated Management

Consistent with E1, the PPC to residential/business zones avoids adverse effects on freshwater systems as no physical works are proposed, since no watercourses are located within the site. However, consideration should be given to a potential access road crossing over the Rawiri Stream.

Anticipated future urbanisation can appropriately manage discharges, subdivision and development that affect freshwater systems to maintain or enhance water quality, flows, stream channels and their margins.

6.4.2.4 E3 – Lakes, Rivers, Streams and Wetlands

Consistent with E3, upon investigation of the site, no watercourses are present within the site, by streams and wetlands are located in close proximity to it, specifically along the eastern boundary. Additionally, reclamation and adverse effects will be avoided, and future residential/business development within the site provides opportunities to protect and enhance the freshwater systems.

6.4.2.5 E15 – Vegetation Management and Biodiversity

Consistent with E15, the vegetation and biodiversity values of the site have been identified. The PPC avoids adverse effects on vegetation and biodiversity values (through the application of relevant management plans) within the site and receiving environments.

Subsequent urban rezoning in future is expected to provide opportunities to maintain and enhance ecosystem services and indigenous biodiversity values, particularly in sensitive environments, and buffer any areas of existing indigenous vegetation cover (such as the Rawiri Stream), while providing for appropriate subdivision, use and development.

6.4.2.6 Appendix 1 – Structure Plan Guidelines

Consistent with the Structure Plan Guidelines, it has been demonstrated that the PPC provides opportunities and mechanisms to protect and maintain natural resources, particularly those that have been scheduled in the AUP.

6.4.3 Auckland Plan 2050

The Auckland Plan 2050, states that Auckland's natural environment is inextricably connected to Aucklanders' sense of identity and place. Auckland's natural environment not only supports its people, but it is home to many special local ecosystems and is essential for the survival of both indigenous wildlife and species from across the world. However, many of Auckland's treasured natural environments, ecosystems, and indigenous species are already under significant pressure from human activity, and some are in decline. To reverse this decline, Auckland must ensure that development is sustainable and has minimal negative impacts on the natural environment.

Consistent with the Auckland Plan 2050, the proposed PPC and anticipated future rezoning provides opportunity to restore degraded ecosystems where appropriate, while providing for appropriate development.

6.4.4 Auckland's Urban Ngahere (Forest) Strategy

Auckland's Urban Ngahere (Forest) Strategy was formed to protect Auckland's urban ngahere in the face of a growing and urbanising population through supporting principles such as; preference for natives, ensure urban forest diversity, protect mature healthy trees, create ecological corridors and connections and access for all residents.

The expected future urbanisation of the site will be consistent with the Urban Ngahere Strategy, as it will create opportunities for enhancement of ecological corridors, connections and diversity through the planting of native riparian vegetation and maintaining existing vegetation where practicable, while also providing for public access.

7 SUMMARY

The impact of rezoning from FUZ to residential/business zones has been considered in relation to the terrestrial and freshwater values present on site. It is considered that the proposed PPC is appropriate for the site.

The ecological values of the site reflect those typically associated with its historical rural land uses and its current surrounding urban development. While isolated areas of higher ecological value have been noted, the terrestrial ecological values within the site are primarily attributed to the majority of low-value exotic vegetation. It is crucial to conduct thorough bat surveys to ascertain the potential presence of bats utilizing the site and the identified habitats. No freshwater habitats are present within the site, but consideration was given to the Rawiri Stream, and wetland located outside the eastern boundary of the site, which are both considered of moderate ecological value.

Future development of the site is anticipated to provide for the appropriate protection and enhancement of indigenous terrestrial and freshwater biodiversity values of the site and surrounding areas. It is recognised that the operative AUP and the NES-F provide a framework that manage any proposed future development at the resource consenting phase to ensure development aligns with the appropriate polices and regulations.

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9 APPENDICES

Appendix A – Ecological Impact Assessment Methodology

The assessments were undertaken in general accordance with Ecological Impact Assessment guidelines, published by the Environment Institute of Australia and New Zealand (EIANZ; Roper-Lindsay *et al*. 2018). The Guidelines provide criteria for assigning value to habitat for assessment purposes. Values are assigned (High, Moderate, Low, Very Low, Table 7) based on the following four assessment matters (as described in Roper Lyndsay et al. 2018):

1. Representativeness
2. Rarity / Distinctiveness
3. Diversity / Pattern
4. Ecological Context

The level of effect is then determined by determining the magnitude (Table 8) and combining the value of the ecological feature/attribute with the score or rating for magnitude of effect to create a criterion for describing the level of effects (Table 9). The cells in Table 9 italics in represent a 'significant' effect under the EIANZ 2018 guidelines.

Cells with low or very low levels of effect represent low risk to ecological values rather than low ecological values *per se*. A moderate level of effect requires careful assessment and analysis of the individual case. For moderate levels of effects or above, measures are expected to be introduced to avoid through design, or appropriate mitigation needs to be addressed (Roper-Lindsay *et al*. 2018).

Table 6. Criteria for assigning value to habitat/species for assessment.

Value	Determining Factors
Very High	Nationally Threatened species found in the 'zone of influence' (ZOI) either permanently or seasonally. Area rates 'High' for at least three of the assessment matters of Representativeness, Rarity/distinctiveness, Diversity and Pattern, and Ecological Context. Likely to be nationally important and recognised as such.
High	Species listed as At Risk – Declining found in the ZOI either permanently or seasonally. Area rates 'High' for two of the assessment matters, and 'Moderate' and 'Low' for the remainder OR area rates 'High' for one of the assessment matters and 'Moderate' for the remainder. Likely to be regionally significant and recognised as such.
Moderate	Species listed as At Risk – Relict, Naturally Uncommon, Recovering found in the ZOI either permanently or seasonally. Locally uncommon or distinctive species. Area rates 'High' for one of the assessment matters, 'Moderate' or 'Low' for the remainder OR area rates as 'Moderate' for at least two of the assessment matters and 'Low' or 'Very Low' for the remainder. Likely to be important at the level of the Ecological District.
Low	Nationally and locally common indigenous species. 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	Exotic species including pests, species having recreational value. Area rates 'Very Low' for three assessment matters and 'Moderate', 'Low' or 'Very Low' for the remainder.

Table 7. Criteria for describing the magnitude of effects (EIANZ 2018)

Magnitude	Description
Very High	Total loss of, or a very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally 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 of major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances and patterns; AND/OR Having minor effect on the known population or range of the element/feature.
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature.

Table 8. Criteria for describing the level of effects (EIANZ 2018). Where text is italicised, it indicates 'significant effects' where mitigation is required.

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