Plan Change 14 to the Waipā District Plan

Ecological Values and Effects Assessment

Report prepared for

Fonterra Ltd

Prepared by

RMA Ecology Ltd

Report number and date

Job 2325

March 2024

BETTER ECOLOGICAL OUTCOMES

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Project No. 2325

Version date: 27 March 2024

Version status: Issued

Citation:

RMA Ecology Ltd. March 2024. Plan Change 14 to the Waipā District Plan: Ecological values and effects assessment. Report prepared for Fonterra Ltd. 38 pages + appendix.

Revisions

Revision	Date	Description

Contents

1.0 Introduction

1.1 Background

Fonterra Ltd (Fonterra) is preparing a Private Plan Change (PCC; PC14) application for a block of land located between Zig Zag Road and the Waikato Expressway at Hautapu, north of Cambridge, referred to as the Bardowie Farm site ('the site') (Figure 1).

1.2 Purpose and scope

Fonterra has engaged RMA Ecology Ltd to undertake an assessment of the ecological values at the site[1]. We understand that our work will be used, in part, to assess 'feasibility' of development of the site. 'Feasibility' implies the identification of issues that may be critical to determining a design (e.g. Structure Plan layout, yield, or earthworks design) or which may be important when applying for a Plan Change or resource consents.

The main purpose of this report is to classify and map areas of important ecological values – ecosystems or species that may have relevance to the Structure Plan design process (for example, which may have a notable effect on infrastructure or Lot layout, or which may introduce risk to the planning process, or substantial cost by way of offsetting). Ecological values assessed include wetlands, streams, native wildlife (fish, birds, and bats), native vegetation and significant natural areas (SNAs).

The PC14 area includes a kiwifruit block to the south; that block was not assessed for ecological values under this report.

We have prepared this report by using a combination of desktop-based assessment and field-based survey. The approach included assessment of both aquatic and terrestrial values and provides the following:

- A description of the vegetation types that exist at the site and their ecological significance (meeting the significance criteria within the Waikato Regional Policy Statement);
- A classification and description of the streams at the site based on the definitions within the Waikato Regional Plan;
- A delineation and classification of wetlands at the site based on the definitions within the Resource Management Act 1991 and the National Policy Statement – Freshwater Management; and
- An assessment of the likelihood of native wildlife (birds, bats, lizards, fish) being present at the site.

[1] Offer of service dated 23 June 2023.

This report contains the following:

- An overview of the methods used to identify, classify, and assess ecological features, the ecological values, and the ecological significance of those features; and
- A quantitative and qualitative summary of ecological features, values, and significance, and how these features may function as constraints and opportunities for the Structure Plan process.

The next phase of ecology reporting (not reported here) would normally include the following, once resource consent applications are being prepared to enable subdivision and land use development:

- An assessment of the type and magnitude of potential effects associated with the development, construction, and operational activities, including potential habitat loss and degradation, and direct mortality or injury of indigenous fauna; and
- Recommendations to address adverse effects.

Figure 1. The site - investigations area shown within the red polygon. Hautapu is visible to the west, and Cambridge to the south.

2.0 Methods

Desktop and field assessments were used to identify and classify ecological features and determine their ecological value and significance.

Following this, an ecological management lens was applied based on standard practice which includes recommended setbacks from streams, wetlands, and native vegetation as protection and/or restoration buffers. Additional restoration opportunities representing best practice underpinned by ecological theory are also presented.

2.1 Desktop assessment

A desktop assessment of the site and surrounding area was undertaken to provide insight into the recent history of the site and to identify potential or mapped ecological features by reviewing:

- Historic and present-day aerial images;
- Waipa District Council and Waikato Regional Council GIS;
- New Zealand Freshwater Fish Database;
- National Amphibian and Reptile Database System (Herpetofauna);
- Bird Atlas of New Zealand;
- DOC bat database; and
- iNaturalist records.

Areas mapped as Significant Natural Areas (SNAs) under the Waipa District Plan were identified. The National Policy Statement – Indigenous Biodiversity (NPS-IB) and Waikato Regional Policy Statement Criteria for determining significance of indigenous biodiversity were also applied.

Areas of indigenous vegetation which are not already listed as SNAs, were assessed to determine if they are considered to be 'SNA-qualifying' under the NPS-IB and the Waipa District Plan.

Individual species were recorded and their conservation status checked against the national threatened species classification list for plants[2].

[2] de Lange, Peter J., Jeremy R. Rolfe, John W. Barkla, Shannel P. Courtney, Paul D. Champion, Leon R. Perrie, Sarah M. Beadel, Kerry A. Ford, Ilse Breitwieser, Ines Schönberger, Rowan Hindmarsh-Walls, Peter B. Heenan and Kate Ladley (2017). Conservation status of New Zealand indigenous vascular plants. New Zealand Threat Classification Series 22. 82p.

For wildlife species assessed as potentially being present, their conservation status was checked against the national threatened species classification lists for fish[3], birds[4], bats[5], and reptiles[6].

2.2 Field assessment

Field assessments were undertaken between June 2023 and January 2024. The weather was fine and sunny during site visits, with no recent rainfall.

2.2.1 Wetlands

The site was assessed for wetlands based on the definition in the Waikato Regional Plan and the Resource Management Act 1991 (RMA). The site was also assessed for 'natural inland wetlands' based on the definition within the National Policy Statement for Freshwater Management 2020 (NPS-FM) (last amended January 2023).

The updated NPS-FM technical support documents regarding wetland classification and delineation require that a step-wise assessment is undertaken. That assessment includes application of the exclusion criteria based on pasture grassland, assessment of threatened species habitat use, and then application of three separate vegetation tests (Rapid Test, Dominance Test, and Prevalence Index). Wetland soils and hydrology information can be applied if the results of vegetation community and exotic pasture grass exclusion are inconclusive. Key for identification of natural inland wetlands at this site are whether any wet areas have developed in or around a deliberately constructed water body, or are dominated by pasture grasses.

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

The methodology applied for the identification of wetlands at this site was as follows:

- Visual assessment as to whether the potential wetland area could support a threatened species;
- Visual assessment as to whether the potential wetland and surrounding area is clearly dominated by pasture grass species (the Rapid Pasture Test);
- Visual assessment of areas where the vegetation composition includes species that are scored as wetland obligate, facultative wetland, or facultative (e.g., rushes, wet pasture or

[3] Dunn, N.R., Allibone, R.M., Closs, G.P., Crow, S.K., David, B.O., Goodman, J.M., Griffiths, M., Jack, D.C., Ling, N., Waters, J.M., Rolfe, J.R. (2018) Conservation status of New Zealand freshwater fishes, 2017. New Zealand Threat Classification Series 24. Department of Conservation, Wellington. 11 p

[4] Robertson, Hugh A., Karen A. Baird, Graeme P. Elliott, Rodney A. Hitchmough, Nikki J. McArthur, Troy Makan, Colin M. Miskelly, Colin. J. O'Donnell, Paul M. Sagar, R. Paul Scofield, Graeme A. Taylor and Pascale Michel (2021). Conservation status of birds in Aotearoa New Zealand. New Zealand Threat Classification Series 36. Department of Conservation, Wellington. 43p.

[5] O'Donnell, C. F. J., K.M. Borkin, J.E. Christie, B. Lloyd, S. Parsons and R.A. Hitchmough (2017). Conservation status of New Zealand bats New Zealand Threat Classification Series 21. 4p.

[6] Hitchmough, Rod, Ben Barr, Carey Knox, Marieke Lettink, Joanne M. Monks, Geoff B. Patterson, James T. Reardon, Dylan van Winkel, Jeremy Rolfe and Pascale Michel (2021). Conservation status of New Zealand reptiles. New Zealand Threat Classification Series 35. Department of Conservation, Wellington. 15p.

'wetland-type' vegetation) as assessed by Clarkson et al.[7] (following the Pasture Exclusion Test, and Wetland Delineation Protocols as laid out in the Pasture Exclusion Assessment Methodology[8]);

- Where these compositions exist, an assessment of vegetation, soils, and hydrology is required according to the Pasture Exclusion Assessment Methodology:
    - Vegetation is assessed through plant identification and percentage cover estimates (as per the method described by Clarkson[9]) of 2 m x 2 m plot areas within each potential wetland area;
    - Soils are assessed by applying the criteria outlined in Fraser (2018)[10] for identifying hydric (wetland) soils – which involves excavation and examination for gleyed, mottled, peaty, or wet soils; and
    - Hydrology is assessed by applying the criteria outlined in the Ministry for the Environment tool[11];

An area can be classified as a wetland based on the definition within the Waikato Regional Plan and the RMA, but not be classified as a 'natural inland wetland' under the NPS-FM because the definition of the latter includes some exclusions:

"Natural inland wetland means a wetland (as defined in the [Resource Management] Act) that is not:

(a) in the coastal marine area; or

(b) a deliberately constructed wetland, other than a wetland constructed to offset impacts on, or to restore, an existing or former natural inland wetland; or

(c) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body; or

(d) a geothermal wetland; or

(e) a wetland that:

(i) is within an area of pasture used for grazing; and

(ii) has vegetation cover comprising more than 50% exotic pasture species (as identified in the National List of Exotic Pasture Species using the Pasture Exclusion Assessment Methodology (see clause 1.8)); unless

(iii) the wetland is a location of a habitat of a threatened species identified under clause 3.8 of this National Policy Statement, in which case the exclusion in (e) does not apply"

The boundaries of potential wetland areas are delineated by carrying out assessments of the various vegetation communities and through professional judgement.

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

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

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

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

[11] Ministry for the Environment. (2021). Wetland delineation hydrology tool for Aotearoa New Zealand. Wellington: Ministry for the Environment.

2.2.2 Watercourses

Watercourses were mapped and classified onsite according to the definitions within the Waikato Regional Plan:

> "River: A continually or intermittently flowing body of fresh water, and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal).
>
> Perennial stream: A stream that flows all year round assuming average annual rainfall.
>
> Ephemeral streams: Streams that flow continuously for at least three months between March and September but do not flow all year.
>
> Modified watercourse: An artificial or modified channel that may or may not be on the original watercourse alignment and which has a natural channel at its headwaters.
>
> Artificial watercourse: A watercourse that contains no natural portions from its confluence with a river or stream to its headwaters and includes irrigation canals, water supply races, canals for the supply of water for electricity power generation and farm drainage canals.
>
> Farm drainage canal: An artificial watercourse on a farm that contains no natural portions from its confluence with a river or stream to its headwaters, and includes a farm drain or a farm canal."

2.2.3 Native vegetation

Indigenous vegetation was mapped and described in terms of its composition and values. Areas listed as SNAs under in the Waipa District Plan were identified using Waipa District Council GIS.

All vegetation at the site was assessed for significance based on the Waikato Regional Policy Statement and the NPS-IB criteria for determining significance of indigenous biodiversity.

The NPS-IB became active on 4 August 2023. It seeks to achieve an objective of maintaining indigenous biodiversity so that there is, at the least, no overall reduction nationally. Seventeen policies are required to be implemented to achieve this objective. The identification of Significant Natural Areas (SNA) is central to the technical implementation of the NPS-IB. Appendix 1 of the NPS-IB lays out criteria for the identification of SNA, including representativeness, rarity, distinctiveness and pattern, and ecological context. These are the same core criteria used by the Waikato Regional Council to identify SNA.

2.2.4 Wildlife

A wildlife survey was conducted during the site visit. The survey involved general visual observations of potential habitat and wildlife.

For lizards, potential habitat was assessed and debris (e.g., logs, corrugated iron) were inspected; however, this did not constitute a comprehensive survey using a range of methods (e.g., the use of artificial cover objects, pitfall traps, etc.).

For fish, survey methods included the use of fyke nets and Gee's minnow traps set for four nights at thirteen locations on site, with a further two locations trapped for two nights (as water tables dropped during the survey, below the inlet of these two traps). The full diversity of habitats at the site were sampled (wetlands, pools, runs, drains), but with a focus on potential black mudfish (Neochanna diversus) habitat.

Black mudfish have a threat status of At Risk–Declining and are known to inhabit farm drains and wetlands in parts of the Waikato. Fine mesh (3 mm) Gee's minnow traps were used at prime mudfish habitat, such as areas of shallow water likely to dry out in summer, within close proximity of tree roots (Figure 2; Plate 1a).

All birds seen or heard on site were recorded. Call playback was used to survey for the more elusive wetland birds, including marsh crake, spotless crake, fernbird, and bittern. Five sites with potential habitat (shallow water with dense cover) were surveyed at dusk every day for three days (Figure 3). Calls of each species in turn were played for 20 seconds, followed by 1 minute of listening for a response.

Blue Wattle Ecology Ltd conducted a bat survey at the site on behalf of RMA Ecology. A visual inspection was undertaken to analyse potential habitat features of trees, other vegetation, and waterbodies for long-tailed bats. Two automated Bat Monitors (ABMs – DOC model 'AR4') were deployed to record from dusk to dawn for a period of 21 nights, from 5 to 26 September 2023 to determine if bats are present. They were placed within a stand of willows near a disused settling pond (W27) and a kahikatea dominated wetland (W27) (Figure 8).

Figure 2. Gee's minnow and Fyke net locations (blue diamonds).

Plate 1a. Gee's minnow trap set in a shallow wetland forest pool to sample for mudfish.

Figure 3. Locations of wetland bird call playback survey points (yellow circles). Wetland extent is indicated by cyan polygons.

3.0 Results

3.1 Ecological context

The c. 72 hectare site is within the Hamilton Ecological District[12] which would have been originally been almost completely forested, with a considerable portion of that covered by wetland.

The site is typical of the Waipa rural environment in that original vegetation has been cleared, watercourses have been modified to various degrees, most wetlands have been drained, and pasture is the dominant vegetation cover, with scattered individual exotic trees and hedgerows, and with riparian plantings. The site is mostly surrounded by rural and semi-rural land, except to the south where industrial and residential development and the Waikato motorway have been developed recently.

Mangaone Stream runs through the northern part of the site. The incised flood plain and historic meanders of Mangaone Stream are the dominant topographical features of the site. The remainder of the site is generally flat. The site is classed as lowland, with an altitudinal range of 60-70 m above sea level. It lies 55 km inland from the sea.

3.2 Terrestrial ecology

3.2.1 Vegetation

The existing vegetation can be categorised into four communities:

1. Exotic pasture: Exotic grassland, as managed for pastoral agriculture, is the most common vegetation community at the site and is often dominated by perennial ryegrass (Lolium perenne), paspalum (Paspalum dilatatum), and white clover (Trifolium repens) (Plate 1b). In wetter areas, Mercer grass (Paspalum distichum), creeping bent (Agrostis stolonifera), and soft rush (Juncus effusus) become prevalent.
2. Planted native: Planting has been undertaken in two stages, starting with 20+ years ago along Mangaone Stream and in two blocks on the floodplain (Figure 4). Additional areas were planted approximately 7 years ago. Common restoration species that have been planted include kānuka (Kunzea robusta), kōhuhu (Pittosporum tenuifolium), tarata (Pittosporum eugenioides), mānuka (Leptospermum scoparium, makomako/wineberry (Aristotelia serrata) and lacebark (Hoheria sp.). The riparian plantings are 5- 50 m wide, and provide important shading and bank stability services along Mangaone Stream (Plate 2). Scattered exotic weeds are present in some of these areas, including Tradescantia fluminensis, blackberry (Rubus fruticosus agg.), tree privet (Ligustrum lucidum), Chinese privet (Ligustrum sinense) and hawthorn (Crataegus monogyna). Two wetland areas on the

[12] Ecological Districts and Regions are a framework developed to manage indigenous biodiversity in New Zealand and to communicate spatial extent of ecologically distinct and representative areas. Classification is based upon ecosystem types and species features where the topographical, geological, climate, soil and biological features including the broad cultural pattern produce a landscape and range of biological communities. A description of the framework can be found in the publication: McEwen, 1987. Ecological regions and districts of New Zealand. Third edition. Produced for the Department of Conservation, Wellington by the New Zealand Biological Resources Centre (publication 5).

stream floodplain were planted in purei (Carex secta), harakeke / flax (Phormium tenax), tī kōuka / cabbage tree (Cordyline australis), and kahikatea (Dacrycarpus dacrydioides).

3. Exotic trees and scrub: Hedgerows of mixed exotics, primarily crack willow (Salix fragilis) and barberry (Berberis sp.), border much of the site (Plate 3, Figure 4). Neglected areas have developed into exotic scrub dominated by blackberry. Mature exotic oaks (Quercus sp.) are dotted around the north-eastern paddocks, and approximately 0.2 ha of exotic forest dominated by crack willow (Salix fragilis) has established in and around former treatment ponds.
4. Rank grass and weeds: Small areas of ungrazed margins have developed into rank exotic grasses or weeds.

A list of plant species recorded onsite is presented in Appendix A.

Plate 1b. Typical vegetation cover over the majority of the site: grazed exotic pasture, with ditches and exotic vegetation in damper areas (e.g., Mercer grass and creeping buttercup). Stands of native trees planted along Mangaone Stream can be seen in the distance.

Plate 2. Indigenous vegetation planted 20+ years ago on left, and indigenous vegetation planted around 6 years ago on to the right. Mangaone Stream runs through the centre left.

Plate 3. A dense mixed exotic hedgerow on the southeast border of the site. Species include crack willow and barberry, with fringing rank grass and weeds.

3.2.2 Significant Indigenous Vegetation and SNAs

There are no Significant Natural Areas (SNA) listed at the site under the Operative Waipa District Plan. All substantial areas of indigenous vegetation at Bardowie are restoration plantings. The NPS-IB does not differentiate between areas of natural regeneration and areas of restoration planting. Therefore, areas of restoration planting should be included in assessments using the SNA criteria when discussing significance vegetation under the NPS-IB.

The maturing native plantings along Mangaone Stream at sites 1, 2, 3 and 4 are approximately 20 years old, and meet the criteria as significant indigenous vegetation under the NPS-IB (Figure 4; however, they cannot be considered a SNAs as these areas are not automatically recognised as such under the NPS-IB SNA process). They meet the representative criterion, illustrating ecological integrity and function typical of the character of the Hamilton Ecological District. They display full canopy closure and multi-tiered vegetation, and illustrate natural processes of regeneration, with native undergrowth and seedlings of climax species establishing naturally (Plates 4 - 5). These areas of indigenous forest provide habitat and food for a typical suite of native bird species, with bellbird, tui, grey warbler, and fantail observed.

These indigenous forest areas meet the rarity criterion, having been reduced to less than 10 % of their prehuman extent in the land environment (LENZ 2023). The presence of native trees 15-20 cm in diameter at breast height (dbh) has the potential to provide limited habitat for threatened long-tailed bats, with small cavities observed in some trees. Large parts of areas 1 and 4 also meet the definition as wetland.

These four native planting areas also meet the ecological context criterion by providing an important buffer to wetlands W22 and W24 and the Mangaone Stream, and are important for the natural functioning of these ecosystems by providing shade, organic matter inputs, and nutrient attenuation. These forest areas also provide a potential stepping stone between areas of native bat habitat to the north and south.

No other vegetation was deemed to be significant habitat or vegetation under the Waipa District Plan. The more recent plantings of indigenous vegetation (5-7 years old) at sites 5, 6, 7, 8 and 9 do not meet the criteria as significant habitat or vegetation under RPS. Although native forest has been reduced to less than 10 % coverage in this land environment, application of a baseline of ecological integrity and function to the rarity criterion s6(d) is deemed to be appropriate and ecologically correct. These areas of recent planting lack canopy closure or natural processes of regeneration, provide limited habitat, and do not contain the full complement of species expected in indigenous forest in the Ecological District. There are no SNAs within 100 m of the site listed in the Waipa District Plan.

There are ample opportunities to continue to improve the terrestrial biodiversity at the site, especially along the watercourses and wetlands where additional native plantings would provide multiple benefits.

Plate 4. Established stand of kanuka, Pittosporum sp., other early succession natives, and kahikatea planted 20+ years ago (site 2). Natural recruitment is occurring in the understorey.

Plate 5. Established stand of kanuka, ti kouka / cabbage tree) and mahoe, planted 20+ years ago. (site 2). Natural recruitment is apparent in the understorey

Plate 6. Established wetland plantings of kahikatea, ti kouka (cabbage tree), harakeke (flax) and purei, planted 20+ years ago and fenced from stock (site 1 and wetland W22).

Figure 4. Vegetation cover at the site, including mature planted indigenous forest (green polygons), recently planted indigenous forest, planted wetland vegetation (grey polygons) and exotic trees, scrub, and hedgerows (blue polygons).

3.2.2.1 Threatened plants

Two species were identified at the site which have a threat status: mānuka (At Risk – Declining) and kānuka (Threatened – Nationally Vulnerable). Both of these species are members of the Myrtaceae family which (along with all native species in the Myrtaceae family) were only recently afforded a higher threat status due to the emerging threat of myrtle rust (Austropuccinia psidii).

It is well recognised by ecologists and Councils that mānuka, kānuka and other common native species in the Myrtaceae family should not receive a higher level of protection for individuals (or vegetation communities that they are a part of) compared to 'Not Threatened' species.

3.2.3 Birds

Eleven native and eleven exotic bird species typical of rural Waikato were detected at the site (Table 1). None are classified as Threatened or At Risk. The loss of original vegetation at or near the site, and the lack of comprehensive pest animal control across the site suggests that rare or threatened species are unlikely to inhabit the site.

Black shag (Phalacrocorax carbo; At Risk – Relict), little black shag (Phalacrocorax sulcirostris; At Risk – Naturally Uncommon) and little shag (Phalacrocorax melanoleucos; At Risk – Relict) have all been recorded within 2-8 km from the site. The Waikato River and Lake Te Koo Utu in Cambridge are known feeding and roosting areas. Shags are highly mobile and may visit the site on occasion to feed at Mangaone Stream and the adjacent artificial ponds. No shags were observed during the survey. No evidence of breeding was found, and there are no waterbodies or trees onsite large enough to support a breeding population.

Table 1. List of bird species detected during the field survey.

Species	Common name	Conservation status
Acridotheres tristis	Common Indian myna	Introduced and naturalised
Alauda arvensis	Eurasian skylark	Introduced and naturalised
Anas platyrhynchos	Mallard	Introduced and naturalised
Carduelis carduelis	European goldfinch	Introduced and naturalised
Circus approximans	Kahu, harrier hawk	Native - Not Threatened
Columba livia	Rock pigeon	Introduced and naturalised
Egretta novaehollandiae	White faced heron	Native - Not Threatened
Gerygone igata	Grey warbler	Native - Not Threatened
Gymnorhina tibicen	Australian magpie	Introduced and naturalised
Hemiphaga novaeseelandiae	Kereru	Native - Not Threatened
Hirundo neoxena	Welcome swallow	Native - Not Threatened
Passer domesticus	House sparrow	Introduced and naturalised
Phasianus colchicus	Ring-necked pheasant	Introduced and naturalised
Porphyrio melanotus	Pūkeko	Native - Not Threatened

Prosthemadera novaeseelandiae	Tui	Native - Not Threatened
Rhipidura fuliginosa placabilis	Pīwakawaka, fantail	Native - Not Threatened
Sturnus vulgaris	European starling	Introduced and naturalised
Todiramphus sanctus	Kotare, sacred kingfisher	Native - Not Threatened
Turdus merula	Blackbird	Introduced and naturalised
Turdus philomelos	Song thrush	Introduced and naturalised
Vanellus miles	Spur-winged plover	Native - Not Threatened
Zosterops lateralis	Silvereye	Native - Not Threatened

Spotless crake and North Island fernbird have been recorded 15 km to the southwest at Lake Ngaroto. No crakes, fernbirds or bittern were detected on the site. Although crakes and bittern are known to range widely between areas of suitable habitat, presence of a resident population is unlikely, due to the lack of predator control, the small areas of preferred habitat (tall reed or rush cover), and isolation from nearby populations.

3.2.4 Bats

Long-tailed bats/pekapeka (Chalinolobus tuberculatus; Threatened – Nationally Critical) are common in and around Cambridge. On the Waikato Regional Council maps website and in the National Bat Database, there are eight records in and around exotic trees within 100 m of the southern boundary of the site during 2016 and 2018, including three from a row of trees on the southern boundary of the site (Figure 5). This row of trees no longer exists.

A further 20 records are located within two copses of mature exotic trees 2 - 2.5 km to the northeast of the site (Figure 5). The site lies entirely within confirmed long tailed bat habitat, as identified by WRC by extending a radius of 10 km from known bat detections.

Suitable bat habitat exists on site in the form of large exotic trees (willow and poplar), up to 40 m high, and one kauri tree near the homestead, likely planted (Plate 7). Many of these trees are isolated and exposed, providing limited habitat value, but sites B3 to B4, and B5 are of higher value, being located in the more sheltered stream valley surrounded by other trees (Figure 6, Plate 7).

Over 2 ha of maturing (20+ year old) planted indigenous forest has the potential to provide suitable bat foraging and roosting habitat extending from sites B1 to B2 and B7 to B8 (Figure 6). Many of these trees are over 20 cm diameter at breast height (dhb). Small cavities are present in some of these trees, primarily mahoe, kahikatea, wineberry, cabbage tree, Hoheria and Pittosporum spp. (Plate 8).

The bio-acoustic bat survey by Blue Wattle Ecology detected low levels of bat activity (Appendix B), suggesting that long-tailed bats are using the site as foraging or commuting habitat.

However, the national bat database and personal observations by the report's author show high detection rates of bats in the surrounding area, making this site of high value for bats, in particular the Mangaone Stream corridor, wetlands, and disused settling ponds (Figures 7 - 8).

Figure 5. Long tailed bat observations from the DOC national database (red dots) relative to the site (yellow rectangle).

Plate 7. Potential bat roost sites; (a) a 20 m kauri at site B9 (b) approximately 0.1 ha of crack willow extending from site B3 to B4, and (c) a 40 m Lombardy poplar at site B5.

Plate 8. Examples of planted indigenous trees with small cavities providing potential long-tailed bat roosts (a) wineberry at site B7 (b) kanuka at site B2.

Figure 6. Sites providing potential long tailed bat roost habitat. Note, B10 and B11 are large poplars with multiple cavities located several metres outside the site boundary.

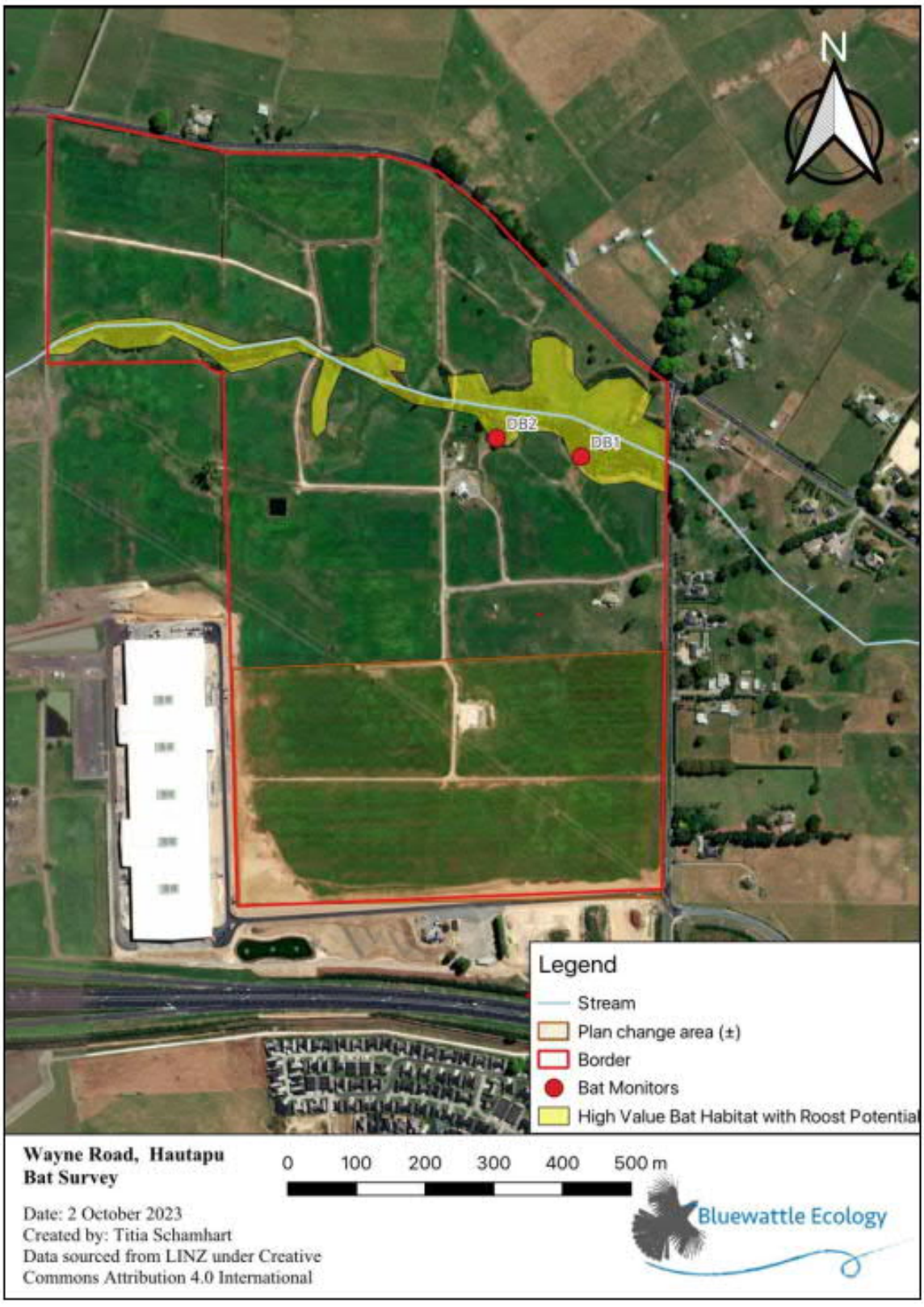

Figure 7. Location of bat bioacoustics monitoring devices and areas of high value bat habitat with roost potential at the site (image sourced from Blue Wattle Ecology report; Bat survey, Swayne Rd, Hautapu, 6 October 2023).

3.2.5 Lizards

Seven native lizard species and one exotic lizard species are known to be present in the Waipa area (Table 2). Most are unlikely to be present at the site due to the lack of suitable habitat, and isolation from other areas of habitat. The native copper skink (Oligosoma aeneum) and the exotic plague skink (Lampropholis delicata) are the most likely to be present.

Table 2. Lizard species which are known in the wider area surrounding the site, conservation status, preferred habitat, and likelihood of presence at the site.

Species	Common name	Conservation status	Preferred habitat	Presence likelihood
Dactylocnemis pacificus	Pacific gecko	Not Threatened	Arboreal/ terrestrial including forest, scrub, clay banks, rock, dense ground cover.	Nil
Lampropholis delicata	Plague skink	Introduced	Wide range of habitats including gardens and rough pasture. Typically found in low dense vegetation and leaf litter.	Moderate-High
Mokopirirakau granulatus	Forest gecko	At Risk - Declining	Arboreal species which live in forest and scrub.	Nil
Naultinus elegans	Elegant gecko	At Risk - Declining	Strongly arboreal often inhabiting pioneer scrubland and regenerating forest.	Nil
Oligosoma aeneum	Copper skink	At Risk - Declining	Grasslands, shrubland and forest. Also found in urban areas, most commonly in thick rank grass, compost heaps, or under rocks, logs, and other debris.	Moderate
Oligosoma ornatum	Ornate skink	At Risk - Declining	Forested areas and shrubland; found amongst leaf litter, in dense low foliage, thick rank grass and under rocks or logs.	Very low
Oligosoma robinsoni	Crenulate skink	At Risk - Declining	Range of habitats from dune systems and boulder beaches on the coast, to open forest, scrub or pasture at inland sites.	Nil
Oligosoma striatum	Striped skink	At Risk - Declining	Range of habitat types, but primarily arboreal in habit, occupying mature forest canopies. Strong preference for damp habitats. May persist in or under rotting logs and dense vegetation (such as pampas shelter belts) in pasture where mature forest has recently been cleared.	Nil

A cursory lizard survey was undertaken during the site visit. No lizards were detected. Habitat was recorded in the form of planted native forest, rank grass and weeds, exotic hedgerows, logs, stumps and scattered debris (Plate 9). The majority of the site is grazed pasture, which is inhospitable to native lizards.

The history of the site suggests native lizards are unlikely to be present. The site was completely deforested prior to replanting along the stream and floodplain in recent decades. As it remains isolated from other areas of native forest, recolonisation by native skinks and geckos is unlikely.

Plate 9. Rank grass and blackberry bordering native plantings and Mangaone Stream. This is potential habitat for the native copper skink, although if this area floods regularly, it will not be favoured by this species.

3.3 Aquatic ecology

3.3.1 Wetlands

NPS-FM qualifying 'natural inland wetlands' are present on the site, all of which are located within the floodplain and former meanders of Mangaone Stream.

Features of these wetlands include obligate and native wetland plants and high water tables, providing habitat for indigenous fish and wetland birds, and a range of ecosystem services such as improving water quality, attenuating flow, and sequestering carbon. A number of these wetlands have been planted in indigenous wetland vegetation, including kahikatea, ti kouka / cabbage tree, harakeke /flax and purei (Plate 6 and Plate 10).

Other wet areas that were located in maintained pasture areas outside the Mangaone stream valley have lower water tables and were dominated by exotic herbs and grasses, primarily creeping bent (Agrostis stolonifera), Mercer grass (Paspalum distichum), creeping buttercup (Ranunculus repens), and soft rush (Juncus effusus). These wet areas were located within paddocks that have been subject to dairy cattle grazing for many decades and are regularly subjected to pasture maintenance, including weed spraying and re-sowing with pasture grasses.

Plate 10. Wetland W28, which has been fenced and partially planted in native harakeke, purei and tī kōuka around six years ago.

The NPS-IB wetland classification guidance documents rely upon expert judgement as well as on-site measurement. We have not mapped areas of pasture weeds – including Mercer grass and creeping bent – as natural wetlands in grazed pasture paddocks which are subject to ongoing management for farm grazing and pasture sward management, as those areas do not support a natural community of wet-adapted plants and animals, and they are under continual pasture improvement practices.

Nine natural wetlands are present on the site, all within the Mangaone Stream corridor, where water tables are close to or at the ground surface (Figure 8).

Three former settling or treatment ponds (labelled W19, W13, and W27) are artificially constructed wetlands, and do not meet the definition of a natural wetland under the NPS-FM (2023) (Figure 8). Although not a natural inland wetland, W19 has potential value for native waterfowl and wetland birds, with shallow water, flax and raupo margins with overhanging native trees. Only pukeko and mallards were observed there during the survey.

Figure 8. Wetlands at the site (cyan polygons), all located around the Mangaone Stream.

3.3.1 Watercourses

The site contains one watercourse that can be defined as a river - Mangaone Stream, which is a modified watercourse. It is a perennial stream, 957 m in length across the site. This watercourse would have originally been meandering but had been subject to considerable straightening and deepening by the early 1940s (Figure 4).

A network of 23 farm drainage canals were mapped at the site (Figure 9). This network of drains has further modified the hydrological regime. A number of these farm drainage canals are piped at their point of entry into Mangaone Stream. Several additional underground drainage pipes also drain into the stream. Watercourses F3, F4, F20 and F22 have been mapped as farm drainage canals (artificial watercourses).

It is unlikely these watercourses flow continuously for at least three months between March and September. At the time of survey after a very wet summer and autumn, they held water but no flow was apparent after several days without rain. Drain excavation is apparent on historic aerials (Figure 10), and no natural channel exists upstream, in line with the WRC definition of farm drains.

At some point in the past these intermittent watercourses would have represented the meandering channel of Mangaone Stream. However, it is not clear from aerial imagery available on Retrolens that this was the case at the time the stream was realigned. The area is covered in scrub in the 1930s. By the early 1940s, the stream had been modified to a straight channel.

Figure 10. 1970s aerial image of the site, showing recently excavated drains, and the modified channel of Mangaone stream, which was straightened at a prior date.

Figure 9. Watercourses at the site (blue line represents stream; purple lines are farm drainage canals).

The Mangaone Stream is fully fenced from stock and has native riparian planting along one bank along most of its length, and two banks in places (Plate 12 and Plate 2). Some farm drainage canals have native plantings along some of their length and are fenced from stock, while others are unfenced and open (Plate 11). Plantings provide some shading, bank stability and organic matter inputs, while the fencing prevents sedimentation and bank collapse from stock access, as well as direct effluent discharge.

The stream is predominantly hard-bottomed, but shows significant sedimentation, which is typical of a deforested, rural, lowland, catchment. The habitat is relatively poor, although there is some habitat heterogeneity in the form of occasional pools, runs, and undercut banks. The watercourse has been artificially deepened and therefore has limited connectivity to the floodplain. A moderate level of shading limits macrophyte growth. The stream's upstream catchment is agricultural and downstream there are multiple culverts that may be barriers to fish passage.

There are ample opportunities for restoring this stream by riparian planting along the unplanted bank. In general, all rivers should be provided with a 10 m wide planted riparian margin on each side (total 20 m wide corridor).

Plate 11. An unfenced shallow farm drainage canal (F14).

Plate 12. A straightened section of the Mangaone Stream (Stream M1) that is fenced from stock, with some shading from mature planted native vegetation on one bank.

3.3.2 Fish

Trapping and netting in Mangaone Stream detected native At Risk longfin eels (Anguilla dieffenbachii), shortfin eels (Anguilla australis), koura / freshwater crayfish (Paranephrops planifrons), and the exotic southern bell frog (Ranoidea raniformis) (Plate 13). No fish or aquatic vertebrates were detected outside of Mangaone Stream.

No black mudfish were detected onsite, despite the presence of multiple ephemeral wetlands and watercourses (farm drainage canals) with tree cover, providing moderate quality habitat. The survey took place during the optimal time of year, focusing on mudfish habitat, and involved significant survey effort, including 60 trap nights and 2 hours of dip netting for fry. This suggests that it is unlikely black mudfish are present onsite. The New Zealand Freshwater Fish Database was reviewed. No black mudfish have been recorded in the catchment.

In the New Zealand Freshwater Fish Database, one additional species has been recorded in the Mangaone Stream catchment within the last 5 years; the native banded kokopu (Galaxias fasciatus – Not Threatened). It was not detected in this survey, but suitable habitat exists where riparian planting borders the Mangaone Stream.

Plate 13. Koura and short-finned eel caught in Gee's minnow traps at Mangaone Stream.

3.4 Summary of ecological values

Overall, the ecology values reflect a highly modified landscape. Although most ecological features have been lost or are degraded, there are pockets of significant value and substantial opportunity to enhance the remaining features and return biodiversity and ecological function to the site. This assessment identified the following features:

- Context: The predominant existing land use of the site is pastoral agriculture.
- Vegetation: All original vegetation at the site has been removed historically. There are four areas of mature planted native forest which have moderate-high ecological values. Any future development should seek to avoid adverse effects and further enhance these areas.
- Birds: Eleven native and eleven exotic bird species typical of rural Hamilton were detected at the site – none of which are At Risk, Threatened, or rare at a national, regional or local scale. Three At Risk shag species may utilise the Waikato River and riparian vegetation alongside the site.
- Bats: Low levels of bat activity were recorded onsite within the Mangaone Stream corridor. Suitable foraging and commuting habitat exists, as well as trees with potential to provide roost cavities. There are 28 records of long tailed bats within 2.5 km of the site. Given the high threat status of long-tailed bats and high use of the surrounding area, this corridor is considered high value bat habitat.
- Lizards: No native lizards were observed and none are likely to be present at the site.

- Wetlands: There are 9 NPS-qualifying wetlands at the site. They are located along the Mangaone Stream and range from low to moderately high in ecological value. Three former settling ponds do not class as natural inland wetlands.
- Streams: There are 957 m of river at the site (Mangaone Stream). The stream is typically degraded from deforestation and sedimentation.
- Fish: Native shortfin eel, longfin eel, and koura were recorded at the site. In addition, banded kokopu have been recorded in the catchment and may be present at the site.

4.0 Assessment of Structure Plan and Design Guidelines

A Plan Change 14 Structure Plan has been developed to identify the key elements that are required to enable development of the future industrial and commercial park. Design Guidelines support the Structure Plan. They are recognised as an important way to promote desirable outcomes within the future development, including ecological outcomes.

The approved Structure Plan requires that all development shall be in general accordance with the Design Guidelines.

The Structure Plan and Design Guidelines incorporate the results of our ecological surveys and workshop design sessions that were held as part of this design process. The recommendations and features within the Design Guidelines align with best practice and legislative requirements by incorporating ecological considerations through several key design drivers, including:

- Enhancing connectivity between features within the site and to neighbouring sites;
- Restoring and improving ecological functions, energy flows and habitats;
- Preserving the existing hydrology and strengthening water management systems;
- Creating buffers around ecological features.

These drivers are expressed in the Structure Plan and Design Guidelines as:

1. Improving connectivity: A multi-purpose green corridor along Mangaone Stream (Figure 11) will provide connectivity and integration of ecological services through stormwater management, conveyance, and treatment, as well as opportunities to enhance and connect existing wetlands, regenerating native forest and riparian plantings, and create lateral connections to constructed treatment swales and green connections to the west.

   This area of expanded and enhanced indigenous vegetation and waterways will be more diverse and resilient to threats, and will provide a corridor of high value habitat for long-tailed bats, birds, fish, and other biodiversity.

Figure 11. Indicative concept design for the site (as per the Structure Plan)..

2. Enhancing and protecting existing ecological features: The Plan Change 14 Structure Plan and Design Guidelines retain and promote enhancement of existing ecological features, focusing on a green corridor around Mangaone Stream.

    a. Our on-site investigations have confirmed that most of the wetlands and stream within the site are currently degraded and accessed by stock, and their margins are generally dominated by exotic pasture, with the exception of parts of Mangaone Stream. The Structure Plan will enhance the stream and wetlands by excluding stock within the riparian zone and wetlands, and undertaking riparian planting. Riparian planting will improve stream condition by providing shading, organic matter inputs and woody debris to the stream. The removal of stock will have a positive impact on water quality by reducing inputs of sediment, nutrient and faecal contamination. Planting with eco-sourced native vegetation is proposed along wetland and stream margins, to a minimum width of 10 m (for streams either side).

    b. Rivers (Mangaone Stream) will be retained, protected from channelisation and discharge, and enhanced through planting of native vegetation along the riparian zone. The National Environmental Standards for Freshwater require that fish passage is maintained through any in-stream structures that are constructed. Where adverse effects are unable to be avoided, existing mitigation and offsetting frameworks (e.g., AUP Appendix 8 principles) will be applied; there are considerable additional opportunities on site where ecological enhancement could take place.

    c. Natural wetlands will be retained, protected from infilling and diversion of water, and enhanced by adding to existing native restoration planting.

    d. Indigenous vegetation will be retained, and significantly expanded by undertaking native planting with eco-sourced species appropriate to the site. Indigenous revegetation will provide additional habitat and food, and enhance corridors for native fauna to move between ecological features, particularly bats, birds, and fish.

There is also the opportunity to provide for targeted creation of lizard, bat, and invertebrate habitat (for example, by including logs, refuge stacks, and specific wetland plant and forest tree species within riparian revegetation planting plans).

e. Bats: Due to the presence of long-tailed bats onsite, and an area of high value bat habitat along the Mangaone Stream corridor, we support recommendations by BlueWattle Ecology Ltd (Appendix B), to provide controls at the resource consent stage, including low impact outdoor lighting designs if subdivision and development is proposed within 25 m of high value bat habitat. Potential strategies include limits to lighting intensity (lux) and colour temperature (kelvin), shielding light sources, restricting lighting during peak bat activity periods, and minimizing the duration of artificial lighting as much as possible.

f. Legal protection will be established for the green corridor around Mangaone Stream. The Mangaone Stream Reserve will be formed by subdivision and vested with Council. Regenerating forest, natural wetlands and constructed wetlands and stormwater retention ponds will be included and enhanced to provide significant ecological, cultural, water management and recreational benefits. Contaminating and high noise generating activities will be strongly discouraged along the reserve to protect water quality and bat and bird habitat values. Further enhancement and protection along the stream corridor to the west is envisaged when the remainder of the PC14 site is developed.

3. Buffers around ecological features: Rivers, natural wetlands and constructed wetlands will be buffered by a 10 m margin of native plantings. These buffers and the features themselves will be incorporated in the Mangaone Stream Reserve. Construction will comply with the NPS-FM by avoiding all but minor earthworks within 10 m buffers of wetlands.

4. Stormwater management systems: Improvements to habitat, function, and biodiversity values will occur as a natural outcome of the re-design of water conveyance systems across the site.

    a. Water quality treatment will be provided for prior to discharge into natural wetlands and Mangaone Stream through a network of roadside treatment swales feeding into offline attenuation wetlands within the Mangaone Stream Reserve (Figures 11 and 12). They will be designed in accordance with the SMP and Council standards.

    b. Flood mitigation will be achieved through attenuation to reduce downstream flood risk. The construction of ephemeral attenuation wetlands will attenuate flow by ‘throttling’ flow behind a bund and through a culvert. The construction of these devices will comply with the NPS-F by avoiding impacts to existing wetlands and streams, being constructed offline from Mangaone Stream, providing 10 m buffers from existing wetlands and stream, and avoiding hydrological impacts and sediment discharge to these wetlands.

    c. Swales and constructed wetlands and margins will be vegetated with native wetland species appropriate to the site and incorporating eco-sourcing principles. Designs will comply with the NPS-FM by incorporating fish passage, following the national guidelines.

Water quality treatment and flood mitigation will be further addressed at source where practicable and necessary, for example for impermeable yard and car parking areas in case of storms, floods or accidental spillage. Examples of potential extra protections include onsite retention tanks, and rain gardens, to be planted in indigenous species.

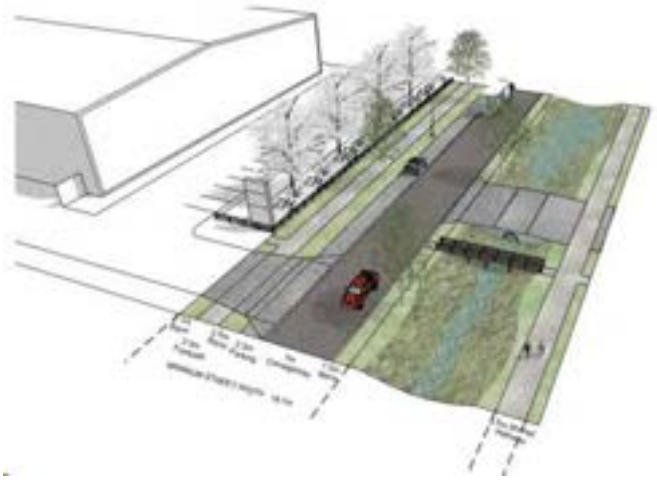

Figure 12. Indicative swale design for a local road at the PC14 site.

5.0 Conclusion

The identification of the ecological values documented in this report will assist in their recognition at the time of future resource consent applications.

Overall, the Structure Plan and supporting Design Guidelines provide for significant enhancements to the condition, extent, diversity, and connectivity of native vegetation, waterways, riparian margins, wetlands, and habitats for wildlife. The overall outcome from the proposed Plan Change will be a clear, positive, net-benefit for indigenous biodiversity values and ecological services. This net-gain will be most evident through the establishment of the c.15 hectare Mangaone Stream Reserve, incorporating extensive native revegetation along riparian margins and natural and constructed wetlands.

The Plan Change 14 Structure Plan and Design Guidelines and are well aligned with the intent, and comply with the policies, of existing national, regional, and local legislation aiming to protect and enhance waterways and biodiversity.

The NPS-FM / NES-F, NPS-IB, Wildlife Act, Waikato Regional Policy Statement and Waipa District Strategies and Plans include a comprehensive set of objectives and policies to provide for the protection and enhancement of the identified ecological features onsite. From an ecological perspective, these rules are appropriate to address relevant effects that may be generated at the time of resource consent.

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Appendix A: Plant species list

Table A1. Plant species recorded within the project area, including their threat status and Waikato Regional Pest Management Plan (RPMP) status. Common exotic pasture grasses and herbs are not included.

Scientific name	Common name	Threat Status (de Lange et al., 2018)	Waikato RPMP Status (2022-2032)
Agathis australis	Kauri	Native - Threatened – Nationally Vulnerable	-
Alsophila dealbata	Ponga, silver fern	Native - Not threatened	-
Aristotelia fruticosa	Makomako, wineberry	Native - Not threatened	-
Brachyglottis repanda	Rangiora	Native - Not threatened	-
Carex secta	Purei	Native - Not threatened	-
Carex geminata	Rautahi	Native - Not threatened	-
Coprosma robusta	Karamu	Native – Not threatened	-
Cordyline australis	Ti kouka, cabbage tree	Native – Not threatened	-
Cortaderia selloana	Pampas	Exotic – Introduced and naturalised	Sustained control Site-led (wetlands)
Berberis darwinii	Darwin's Barberry	Exotic – Introduced and naturalised	Progressive containment
Dacrycarpus dacrydioides	Kahikatea	Native – Not threatened	-
Dodonaea viscosa	Akeake	Native – Not threatened	-
Eleocharis acuta	Spike sedge	Native - Not threatened	-
Griselinea littoralis	Kapuka, broadleaf	Native - Not threatened	-
Isolepis prolifera		Native - Not threatened	-
Juncus edgariae		Native - Not threatened	-
Juncus effusus	Soft rush	Exotic - Introduced and naturalised	-
Kunzea robusta	Kānuka	Native - Threatened – Nationally Vulnerable	-
Leptospermum scoparium var. scoparium	Mānuka	Native - At Risk – Declining	-
Ligustrum lucidum	Tree privet	Exotic - Introduced and naturalised	-
Ligustrum sinense	Chinese privet	Exotic - Introduced and naturalised	Site-led (wetlands)
Lonicera japonica	Japanese honeysuckle		Site-led (wetlands)
Melicytus ramiflorus	Mahoe	Native - Not threatened	-
Muehlenbeckia australis	Pohuehue	Native - Not threatened	-
Myrsine australis	Maupo	Native - Not threatened	-
Nasturtium officinale	Watercress	Exotic - Introduced and naturalised	
Pennisetum clandestinum	Kikuyu	Exotic - Introduced and naturalised	Exotic pest plant - Not a legally declared pest plant
Phormium tenax	Harakeke	Native - Not threatened	-
Pittosporum eugenioides	Tarata	Native - Not threatened	-
Pittosporum tenuifolium	Kohuhu	Native - Not threatened	-

Scientific name	Common name	Threat Status (de Lange et al., 2018)	Waikato RPMP Status (2022-2032)
Pteridium esculentum	Rarauhe, bracken	Native - Not threatened	-
Quercus robur	English oak	Exotic - Introduced and naturalised	-
Rubus fruiticosus agg.	Blackberry	Exotic - Introduced and naturalised	Site led (wetlands)
Salix fragilis	Crack willow	Exotic - Introduced and naturalised	Site-led (wetlands)
Salix cinerea	Grey willow	Exotic - Introduced and naturalised	Site led (wetlands)
Tradescantia fluminensis	Tradescantia	Exotic - Introduced and naturalised	-
Typha orientalis	Raupo	Native - Not threatened	-

Appendix B: Bat Survey Report

Fonterra Limited

Bat Survey
Swayne Road, Hautapu

TABLE OF CONTENTS

Prepared by: Titia Schamhart

Reviewed by: Gerry Kessels

Version: Final - 040424

PWF Ref: RMA.00742

Front photo courtesy of Department of Conservation Waikato – the moment a long-tailed bat takes flight after being captured for monitoring. Note its mouth is open for echo location calling.

EXECUTIVE SUMMARY

RMA Ecology, on behalf of Fonterra, engaged Bluewattle Ecology to undertake bat survey at Swayne Road, Hautapu as part of a proposed plan change at the southern part of the site.

Automatic bio-acoustic bat monitors were placed within a stand of trees near a watercourse and wetland on the property between 5 and 26 September 2023 to determine if bats are present.

The bioacoustic survey for this assessment was conducted under optimal weather conditions, using best practice survey methods. This survey resulted in a low rate of confirmed bat detections (two detection for the entire survey), which indicates that the usage of bats of the site was very low during the time surveyed.

However, the low rate of detection from a single survey event does not guarantee that long-tailed bats are not using the site outside the period surveyed. This species mobility and seasonal variations in habitat usage and the high detection rate of bats nearby suggest that bats will regularly use this general locality for foraging and commuting, but that the watercourse and its riparian vegetation are the most important habitats to protect, rather that the intensively grazed pastureland.

Although the risk of harming bats during construction at this site is low given the lack of trees in the plan change area, the high national threat status of this species and the suitability of commuting habitat means that lighting restrictions are recommended near the watercourse on the property. This can be achieved by preparing a customised plan for bat-friendly outdoor lighting control in consultation with an experienced bat ecologist adjacent to the watercourse. This lighting plan should encompass strategies such as defining limits for lighting intensity (lux) and colour temperature (kelvin) within 25 metres of the watercourse, shielding light sources, restricting lighting during peak bat activity periods, and minimising the duration of artificial lighting as much as possible.

1 INTRODUCTION

1.1 SCOPE

RMA Ecology Limited, on behalf of Fonterra Limited, engaged Bluewattle Ecology to undertake a bat survey at Swayne Road, Hautapu as part of a proposed plan change at the southern part of the Hautapu site (Figure 1).

The southern part of the site is intended to become a milk tanker parking and off-loading area. The middle and northern part of the site, containing a mosaic of wetlands, stream and planted native bush areas, will be untouched.

1.2 BACKGROUND

According to O'Donnell et al (2018)[1], long-tailed bats (Chalinolobus tuberculatus) are classified as "threatened - national" by the Department of Conservation (DOC). They have been observed to use suitable habitat within Hautapu and the wider landscape surrounding the site on a regular basis (DOC database and pers. obs.), and it is possible they could make use of the native and exotic trees and pasture habitat within the property for roosting and foraging, as well as visual cues for commuting[2].

Figure 1. Location map of the property at Swayne Road, Hautapu.

[1] O'Donnell, CFJ; Borkin, KM; Christie, JM; Lloyd, B; Parsons, S; and Hitchmough, RA. 2018. Conservation status of New Zealand bats, 2017. New Zealand Threat Classification Series 21. Published by the Department of Conservation, Wellington, NZ. 4 p

[2] O'Donnell, CFJ. 2000. Influence of season, habitat, temperature, and invertebrate availability on nocturnal activity of the New Zealand long- tailed bat (Chalinolobus tuberculatus). New Zealand Journal of Zoology 27: 207-221.

2 METHODOLOGY

2.1 QUALIFICATIONS & EXPERIENCE

The author of this report has the suitable experience and qualifications to undertake this assessment. She is certified by DOC as meeting the following standards for Competency as a bat expert: Standard 1.3.2; Standard 3.1; and Standard 3.3. The reviewer of the report is also a certified DOC bat ecologist.

2.2 LITERATURE AND DATABASE

The presence of bats in the wider landscape surrounding the subject site was determined by accessing the National Bat Database administered by DOC and the I-Naturalist NZ[3] database on 29 September 2023. In addition, the databases and reports on long-tailed bats held by Bluewattle Ecology were reviewed.

2.3 FIELD SURVEY

On 5 and 26 September 2023 a visual inspection was undertaken to analyse the potential habitat features of the trees, other vegetation and biophysical features (such as waterbodies) at Swayne Road for long-tailed bats. This inspection involved assessing the trees and other vegetation for their suitability as key structural attributes as potential long-tailed bat habitat.

2.4 BIOACOUSTICS SURVEY

Two Automated Bat Monitors (ABMs – DOC model 'AR4') were deployed for a period of 21 nights, from 5 to 26 September 2023, shown in Figure 2. All detectors were calibrated to have the same time and date settings (NZST) and were pre-set to start monitoring one hour before sunset until one hour after sunrise. The distance between detectors monitoring locations was at least 50 m apart to increase the chance of independent bat monitoring. The recorders were suspended at least 2 m above the ground to reduce superfluous detections caused by terrestrial insects (usually cicada species). ABMs record any sound that may be a bat call or echolocation, with the frequency spectrum assessed ranges from 0 Hz to 88 kHz. When the ABM is triggered by a potential bat pass it records one file for each pass. The recordings are prepared in a form of a compressed image of a spectrogram which represent 1-6 seconds of recording, and are saved onto an SD card in the form of bitmap format images. The images were assessed using DOC developed "BatSearch 3.2" software and the data analysed according to methodological protocols described by Sedgeley et al (2012)[4].

The survey was conducted at appropriate times to maximize the likelihood of detecting long-tailed bats. Late spring and summer are the seasons when bats are generally more active, and this includes the period when females are occupying maternity roosts (late spring to early summer) and when young bats are flying independently and establishing territories (mid-summer). Mating of long-tailed bats occurs in later summer and autumn.

[3] https://www.inaturalist.org/observations (accessed 21 December 2022).
[4] Sedgeley, J., O'Donnell, C., Lyall, J., Edmonds, H., Simpson, W., Carpenter, J., Hoare, J., McInnes, K. 2012. DOC best practice manual of conservation techniques for bats. Inventory and monitoring toolbox: bats DOCDM-131465. Department of Conservation, Wellington.

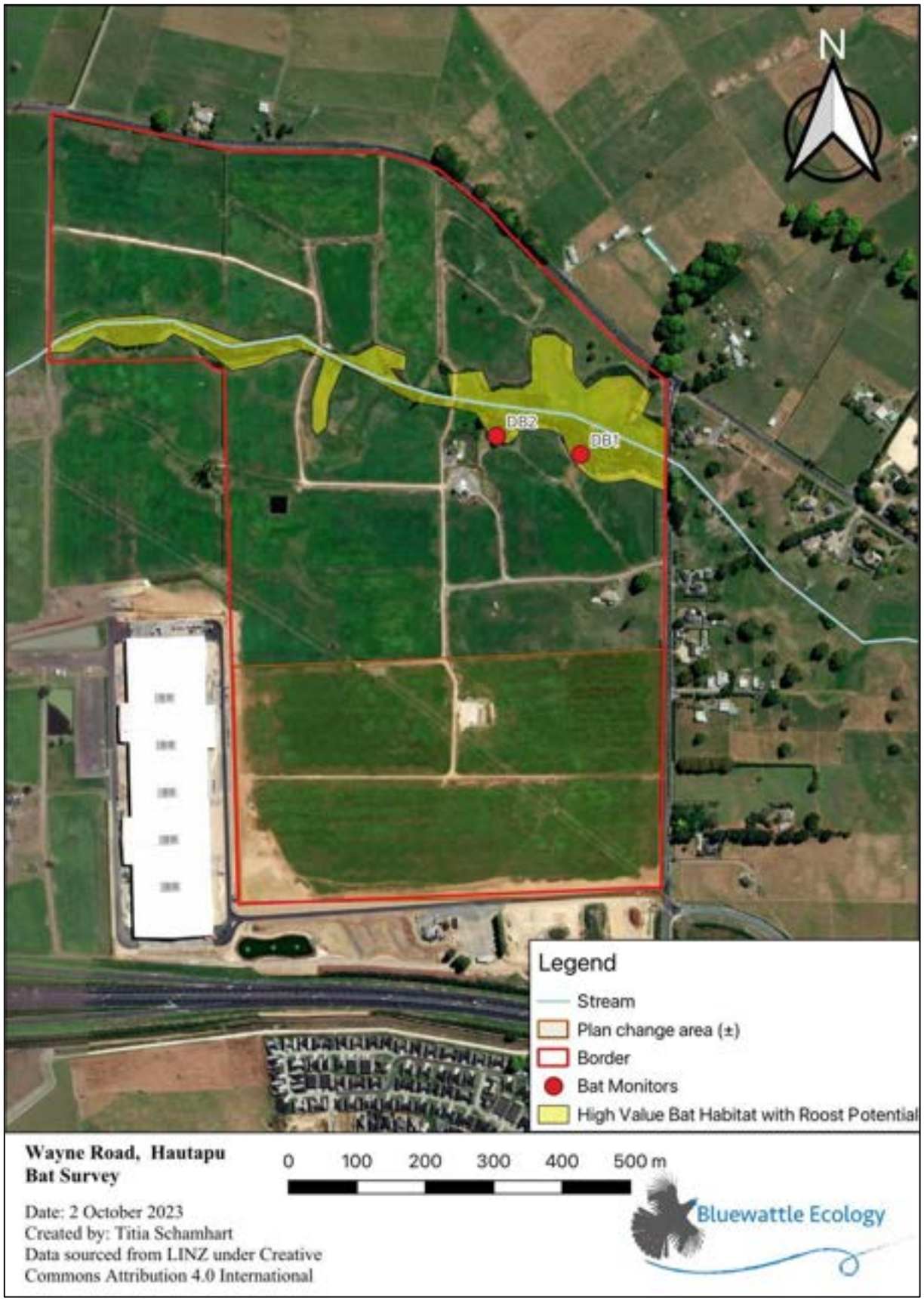

Figure 2. Locations of bat detectors during the 5 – 26 September 2023 deployment at Swayne Road, Hautapu.

3 RESULTS

3.1 LITERATURE AND DATABASE REVIEW

According to a search of the national DOC bat database, I-Naturalist and Bluewattle Ecology database, there is evidence that bats have been present in the directly surrounding area of the site in question. The closest record of bat activity was up to 483 passes directly on the north border of the site in 2016, and more recently 687 passes in 2018, 1.5 km to the north/east.

3.2 BIOACOUSTICS SURVEY

3.2.1 VALIDITY OF SURVEY EVENT

Analysis of an existing data sets[5,6,8] shows long-tailed bat activity is strongly influenced by temperature. It is suggested that bat monitoring should take place when temperatures one to four hours after sunset are >7°C, ideally >10°C. In this context, minimum temperatures remained above 7°C during 20 nights of the survey period (Table 1).

Maximum rainfall in the hours after sunset until midnight was less than 10 mm over the entire survey period, minus one night, and therefore rainfall is unlikely to have affected bat emergence during 20 nights of surveying [6,7].

Wind conditions were suitable on 20 nights of the surveyed period, with maximum wind gusts between dusk and dawn below 5.6 m/s[8].

This leaves for a total of 19 suitable survey nights, which is in line with best practice (Mueller et al 2022)[9].

[5] O'Donnell, C., and J. Sedgeley. 2012. Introduction to bat monitoring v1.0:33.
[6] O'Donnell, C. 2000. Conservation status and causes of decline of the threatened New Zealand Long-tailed Bat Chalinolobus tuberculatus (Chiroptera: Vespertilionidae). Mammal Review 30:89–106.
[7] Appel, G., Bobrowiec, P., & Lopez-Baucells, A. (2019). Temperature, rainfall, and moonlight intensity effects on activity of tropical insectivorous bats .pdf. 1–12.
[8] Smith, D., K. Borkin, C. Jones, S. Lindberg, F. Davies, and G. Eccles. 2017. Effects of land transport activities on New Zealand's endemic bat populations: reviews of ecological and regulatory literature October 2017:249.
[9] Mueller, H. Davidson-Watts, I & Kessels, G. 2021. Peacocke Structure Plan Area Change – Long-tailed bat report. Consultancy report prepared for Hamilton City Council.

Table 1. Summary of weather conditions during the survey period – bold number are unsuitable survey conditions. Data obtained from NIWA CLIFLO database, at station number 26117

Date (NZST)	Min. temperature (°C) between 18:00 – 22:00	Max. Precipitation (mm/h) between 18:00 – 22:00	Max. wind speed (m/s) between 18:00 – 22:00
5/09/23	13.7	0.6	5.1
6/09/23	12	0	3.6
7/09/23	8.6	0	3.1
8/09/23	8.7	0	2.8
9/09/23	7.3	0	3
10/09/23	8.5	0	1.8
11/09/23	11.4	7.7	3.3
12/09/23	6.3	0	4.8
13/09/23	11.8	0	6.3
14/09/23	11.8	0.2	5
15/09/23	10	0	3.8
16/09/23	9.6	0	4.2
17/09/23	13.4	0	5.4
18/09/23	12.3	0	4.9
19/09/23	11.3	0	4.1
20/09/23	9.9	0	3.6
21/09/23	13.4	0	3.3
22/09/23	14.4	0	4.2
23/09/23	13.7	13.2	5
24/09/23	13.2	1	2.8
25/09/23	13.1	0.2	2.3
26/09/23	13.7	0.6	5.1

3.2.2 RESULTS

Monitoring with two ABMs (DB1 and DB2) resulted in 2 confirmed bat detections.

ABM DB1 was functional for 9 survey nights, and DB2 was functional for the entire 21 nights of the survey period (Table 2), and weather conditions were suitable for maximisation of detection of bat calls by the ABMs on 19 nights of the survey period (s3.2.1 and Table 1).

Table 2. Summary bat survey results from the ABMs deployed from 21 December 2022 to 5 January 2023.

Site	Nights detector was functional	Total no. bat passes	Mean no. of bat passes per night	No. of nights with bat passes	Percentage % of nights with bat passes	Feeding buzzes
DB1	9	0	0	0	0	0
DB2	21	2	0.1	0	10	0

3.3 ASSESSMENT OF EFFECTS ON LONG-TAILED BAT HABITAT

While habitat utilisation by long-tailed bats within a rural landscape is known to include open pasture land, long-tailed bats are regarded as having a preference for native/exotic forests, vegetated gully systems and riparian margins (Davidson-Watts, 2018)[10]. In this case, given the low detection of bats and the relatively small proportion of potential foraging and commuting habitat compared to that in the wider landscape, it is considered that the effect loss of potential commuting and foraging habitat because of the proposed plan change will be low.

Application of the ECiA guidelines[11] to determine the effects of loss of this stand of trees on long-tailed bats in this location was determined as follows:

- Ecological Value: High.

  Referring to section 5.2 of the ECiA guidelines, acknowledging that bats have been detected in this survey, and that high number of passes have been detected in the adjoining properties, the northern part of the site along the stream margin (shown as 'High Value Bat Habitat' in Figure 2) has habitat that is considered suitable as potential roosting habitat, and the entire site as suitable foraging and commuting habitat. The site may occasionally be used by this species, given that previous surveys have detected bats on the site and within the home range of this species.

- Magnitude of Effects: Low.

  Referring to section 6.4.2 of the ECiA guidelines, this ABM survey indicates the probability of bats regularly utilising this habitat is low, and the loss of no trees in this plan change area approximating to a 'no change' situation; and likely having a minor effect on the known population or range of long-tailed bats in this locality.

- Level of effects: Low.

  Referring to section 6.4.3 and the matrix table; Table 10 of the ECiA guidelines, the overall level of effects, before mitigation is applied, is considered to be Low.

A Low level of ecological effects on long-tailed bat habitat associated with the modification of a small area of potential habitat, as determined by application of the ECiA guidelines, require that normal design, construction and operational care should be exercised to minimise adverse effects and prescribed impact management recommendations are carried out to ensure Low or Very Low level effects are achieved during construction and operation.

[10] Davidson-Watts, I. (2018). Long-tailed bat trapping and radio tracking baseline report Southern Links, Hamilton. Report prepared for Aecom NZ Ltd.

[11] https://www.eianz.org/document/item/4447

4 CONCLUSION AND RECOMMENDATIONS

4.1 CONCLUSION

The bioacoustic survey for this assessment was conducted under optimal weather conditions, using best practice survey methods. This survey resulted in a low rate of confirmed bat detections, which indicates that the usage of bats of the site was very low during the time surveyed.

However, the low rate of detection from a single survey event does not guarantee that long-tailed bats are not using the site outside the period surveyed. This species mobility and seasonal variations in habitat usage and the high detection rate of bats nearby suggest that bats will regularly use this general locality for foraging and commuting, but that the stream, pond and its riparian vegetation are the most important habitats to protect, rather that the intensively grazed pastureland.

4.2 RECOMMENDATIONS

4.2.1 LIGHTING CONTROLS

Long-tailed bats are responsive to artificial lighting (Schamhart et al,2023[12]). Hence, it is recommended to reduce the use of artificial lighting near areas classified as High Value Bat Habitat as shown in Figure 2. This can be achieved by preparing a customised plan for bat-friendly outdoor lighting control in consultation with an experienced bat ecologist. This lighting plan should encompass strategies such as defining limits for lighting intensity (less than 0.3 lux) and colour temperature (2,700 kelvin) within at least 25 metres of High Value Bat Habitat, shielding light sources, restricting lighting during peak bat activity periods, and minimising the duration of artificial lighting as much as possible.

[12] Schamhart, T., Browne, C., Borkin, K. M., Ling, N., Pattemore, D. E., & Tempero, G. W. (2023). Detection rates of long-tailed bats (Chalinolobus tuberculatus) decline in the presence of artificial light. New Zealand Journal of Zoology, 1-11.

Figure 3. Suitable roosting, foraging and commuting habitat at the north end of the site, which will be untouched.

Figure 4. Waterbody providing valuable feeding habitat for bats, at the north end of the site, which will be untouched.