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Marton Rail Hub Development

Assessment of Ecological Effects

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CONFIDENTIAL

wsp

150 YEARS IN AOTEAROA

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Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for Rangitikei District Council ('**Client**') in relation to the proposed Marton Rail Hub development ('**Purpose**') and in accordance with the Conditions for Contract of Consultancy Services Agreement with the Client dated 29 January 2021. The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

1 Introduction

1.1 Background and Project Description

The development of the Marton Rail Hub (the Project) has been proposed by Rangitikei District Council in partnership with Ngā Wairiki Ngāti Apa, Infrastructure Reference Group and Rangitīkei Forestry Holdings Ltd.

The rail hub project will set up Rangitīkei District as a key logistical hub for the forestry industry across the Lower North Island. In August 2020, the project was awarded $9.1 million funding through the Infrastructure Reference Group from the $3 billion set aside in the Government's COVID-19 Response and Recovery Fund. Rangitīkei District Council progressed with a District Plan Change, that would allow the industrial build to take place on 217 hectares of former farmland. The Plan Change was reviewed by an independent commissioner and the final decision was that 40 hectares of "Rural" farmland would be re-zoned to "Industrial" at this time. However, a high level of interest from the involved parties means that the development area will now need to be extended, to accommodate a 62ha development area, referred to as the Comprehensive Development Plan or CDP (Figure 1-1). Rangitīkei District Council and Rangitīkei Forestry Holdings Ltd have committed funds for the development of roading, rail access and a log yard and debarking facility at the site. Other proposals for the site include wood processing facilities, a sawmill and biodegradable plastics and packaging plants and associated infrastructure (Figure 2-1).

Figure 1-1 – Comprehensive Development Area (CDP)

Rangitīkei District Council and Rangitīkei Forestry Holdings Ltd have committed funds for the development of roading, rail access and a log yard and debarking facility at the site. Other proposals for the site include wood processing facilities, a sawmill and biodegradable plastics and packaging plants and associated infrastructure (Figure 2-1). The designated site of the proposed development is near to a malt factory in the outskirts of Marton and includes LOT 1 DP 82685, LOT 1 DP 10342, LOT 1 DP 11224, LOTS 4-6 9, LOTS 4-7 and Part LOT 4 Deeds 25, Part Lot 5 Deeds 25, Part Lot 6 Deeds 25 and Lot 2 DP 497482. The proposed layout for the site is shown in Figure 2-1.

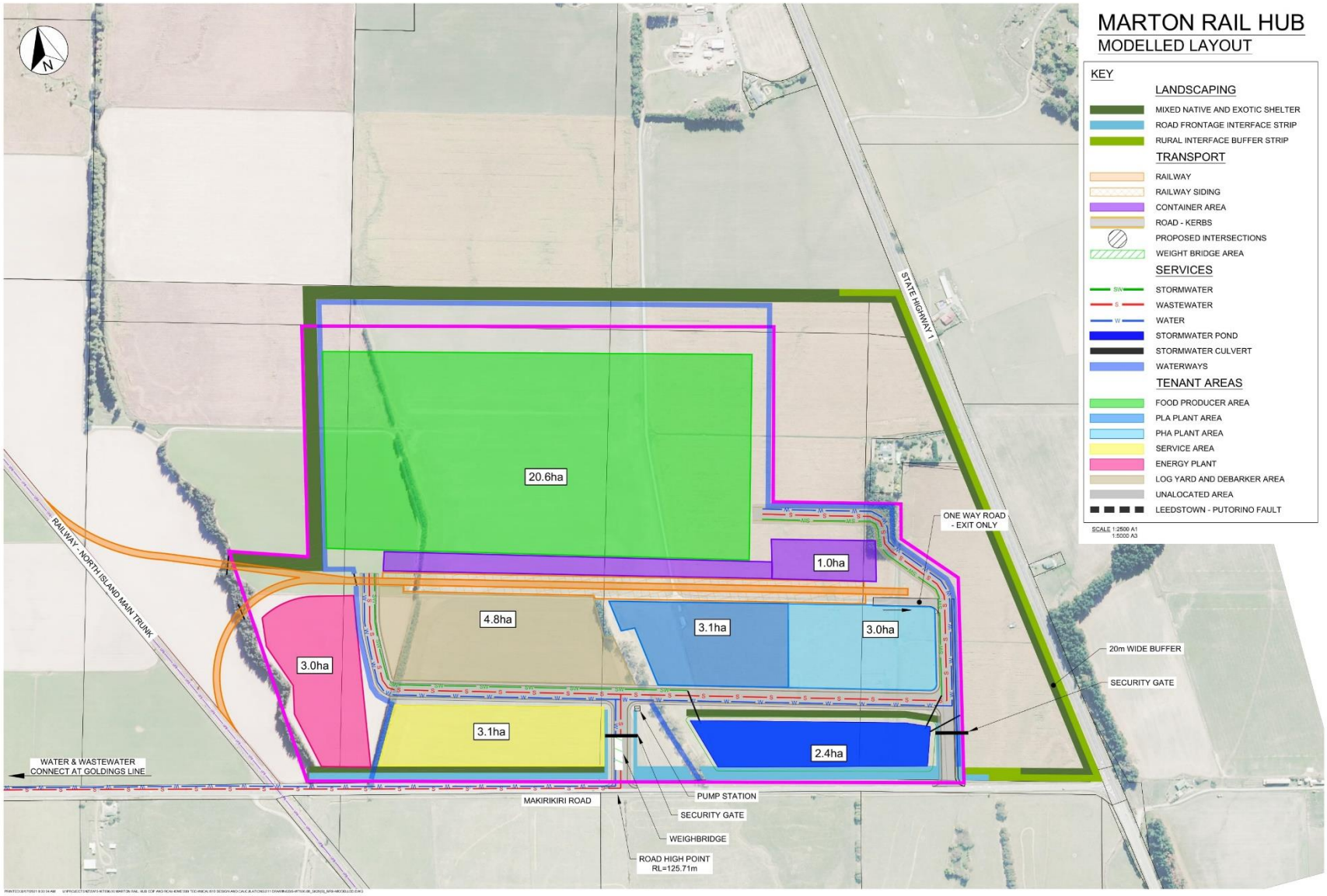

Figure 1-2: Proposed site layout for the Marton Rail Hub development.

1.2 Purpose

Rangitīkei District Council have engaged WSP to prepare a comprehensive development plan for the entire 62ha CDP, including all supporting technical assessments to inform and to prepare resource consent applications for the proposed log yard and debarking facilities. This report will help to inform the consent conditions by providing an assessment of the ecological values and potential effects on flora and fauna as a result of the Project within the CDP.

1.3 Scope of Assessment

This report provides an Assessment of the Ecological Effects (AEE) of the Project described in Section 1.2 above.

The scope of this AEE is to provide:

- a description of ecological characteristics and values of the ecology that are potentially affected by the development hub, including vegetation, aquatic ecology, birds, lizards, and bats;
- an assessment of the nature and significance of effects of the Project on the ecological values identified; and
- details of measures recommended to avoid, remedy or mitigate adverse effects, if required.

2 Methodology

2.1 Overview

The overall approach used to undertake the AEE involved applying the "Ecological Impact Assessments" guidelines published by the Environment Institute of Australia and New Zealand (EIANZ, 2018) using data and ecological information gathered by two primary methods:

- a desktop review of existing data and ecological information; and
- site visits conducted on 2 February 2021, and 31 May 2021 by WSP ecologist Alex Reid.

2.2 Desktop Assessment

The desktop assessment included review of the following information sources:

- aerial imagery (Google Earth and street view, February 2021; Horizons Regional Council online maps);
- information provided for the Manawatū Plains Ecological District[1];
- Horizons Regional Council and Rangitikei District Council plans and documents with regard to catchment, stream, vegetation and terrestrial values;
- national land environment databases managed by Manaaki Whenua Landcare Research;
- New Zealand Freshwater Fish Database;
- eBird Database;
- Department of Conservation (DOC) Bat Bioweb Database; and
- Herpetofauna Bioweb Database.

[1] Department of Conservation. 1987. Ecological regions and districts of New Zealand.

2.3 Field Assessment

A field assessment of the proposed rail hub development site was undertaken by Alex Reid on 2 February 2021 to assess the ecological value of habitats within the CDP. This initial CDP was later updated, resulting in a complete shift and expansion of the CDP. Another field assessment was undertaken on 31 May 2021 to assess the new area. The following assessments were undertaken:

- Vegetation components/habitat types within the CDP were recorded and mapped;
- Tributary streams have been assessed using the National Rapid Habitat Assessment Protocol Development for Streams and Rivers (Clapcott 2015);
- Habitat assessments and manual searches for lizards;
- Observations of birds, visually or by call within or adjacent to the CDP were recorded;
- A site meeting and walkover was held on with Chris Shenton of Ngā Wairiki Ngāti Apa on 2 February 2021. The ecology of the area was discussed;
- Acoustic monitoring of long-tailed bat activity adjacent to the CDP. Bat monitors were located along the shelter belt of trees running perpendicular to West of the CDP. Acoustic monitoring followed DOC's best practice guidelines (Sedgeley et al., 2017). These results are detailed by WSP (2021a).
- Assessment of vegetation for suitability as roosting habitat for long-tailed bats was undertaken on 7 May 2021 to determine areas of high-quality roosting habitat. Trees identified as potential bat roosts are those >15 cm diameter at breast height (DBH) and have one or more of the following attributes:
    - Cracks, crevices, cavities, fractured limbs, or other deformities, large enough to support roosting bat(s);
    - Sections of loose flaking bark large enough to support roosting bat(s);
    - A hollow trunk, stem or branches; and/or
    - Deadwood in canopy or stem of sufficient size to support roost cavities or hollows.

2.4 Methodology for Assessment of Effects

2.4.1 EIANZ Guidelines

Guidelines for undertaking environmental assessment were used to aid assessing ecological impacts of the Project (EIANZ, 2018). The guidelines assist in assessing values and effects in a consistent and transparent way. However, sound professional judgement is still required when applying the framework and matrix approach.

The approach involves assigning values for vegetation, habitats or species using the criteria in Table 2-1 below and then assigning a magnitude of effects rating using the criteria in Table 2-2 below. An overall level of effects is then determined by combining the value from Table 2-1 with the magnitude from Table 2-2 using the matrix in Table 2-3 below.

2.4.2 Assessment of Ecological Values

The first step of the EIA guidelines approach requires ecological values to be assigned on a scale of 'negligible', 'low', 'moderate', 'high', or 'very high' to each ecological feature (Table 2-1). Species were valued according to their conservation status; those 'At Risk' or 'Threatened' were valued at a higher level than those classified as 'Not Threatened'. Threat classifications have been sourced for plants (De Lange et al., 2018); birds (Robertson et al., 2016); reptiles (Hitchmough et al., 2016); fish (Dunn et al., 2018); and bats (O'Donnell et. al., 2018).

The ecological value of the CDP has been assessed against regional criteria for assessing the significance of rare, threatened and at-risk habitats set out in Policy 13.5 of the Horizons One Plan (HOP). Refer to Appendix A – Regional Criteria for Assessing Habitat Significance. Species values

have been assessed against the Ecological Impact Assessment (EcIA) Guidelines for Assigning Species Values (Roper-Lindsay et al., 2018). Ecological values for the project site have been scored using a modified version of the EcIA Guidelines for assigning values, presented on Table 2-1.

Table 2-1: Assignment of values to species and habitats (adapted from EIANZ, 2018)

Value	Species Value Requirements	Habitat Value Requirements
Very High	Nationally 'Threatened' species occur or expected to occur regularly within the CDP on a permanent or seasonal basis.	Meets the definition of a rare or threatened habitat under Schedule F of the Horizons One Plan and meets all three criteria of a significant habitat under Policy 13-5.
High	Nationally 'At Risk' species occur or expected to occur on a permanent or seasonal basis.	Meets the definition of a rare, threatened or at-risk habitat under Schedule F of the Horizons One Plan and meets one or two criteria (or up to three for at-risk habitats) of a significant habitat under Policy 13-5.
Moderate	No Nationally 'Threatened' or 'At Risk' species occur, but locally uncommon or rare species, or keystone species (that are considered important for ecological integrity and function) present on a permanent or seasonal basis.	Meets the definition of an at-risk habitat under Schedule F of the Horizons One Plan but does not meet the criteria of a significant habitat under Policy 13-5. OR, is a habitat that provides locally important ecosystem services (e.g. erosion and sediment control, and landscape connectivity).
Low	No species present that are Nationally 'Threatened', 'At Risk', locally uncommon or rare, or considered keystone species.	Nationally or locally common habitat that does not provide locally important ecosystem services.
Negligible	Exotic species, including pests, species having recreational value	Modified or exotic habitat that does not provide locally important ecosystem services

2.4.3 Magnitude of Effects

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

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

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

2.4.4 Overall Level of Effects

The last step in the effects assessment process is to determine the overall level of effect using the EIANZ matrix shown in Table 2-3.

Table 2-3: Criteria for describing the level of effects (EIANZ, 2018)

Magnitude	Ecological Value				
	Very High	**High**	**Moderate**	**Low**	**Negligible**
Very High -*	Very High	Very High	High	Moderate	Low
High	Very High	Very High	Moderate	Low	Very low
Moderate	High	High	Moderate	Low	Very low
Low	Moderate	Low	Low	Very Low	Very low
Negligible	Low	Very Low	Very Low	Very Low	Very low
Positive	Net Gain	Net Gain	Net Gain	Net Gain	Net Gain

The level of effect or risk posed on ecological values ranges from Very High/High to Low/Very Low level, with the potential under some circumstances for a Net Gain. Moderate level effects, or greater, typically require measures to avoid, remedy or mitigate effects, while Low to Very low effects levels are not normally of concern, although care may be required to minimise effects through design, construction and operation of a project.

3 Ecological Context

3.1 Ecological Region

The ecological regions and districts of New Zealand are defined by the Department of Conservation (DOC)[2]. Marton is situated within the Manawatū Plains Ecological District, which is part of the Manawatū Ecological Region. The Manawatū Plains District is low, loess covered, has windy plains and terraces and a range of soils including volcanic ash, gleyed clay soils, stony soils, and alluvial and peaty soils. The District was originally in forest with large wetlands were also present. Today there are small isolated forest and flax swamp remnants in a largely farmed landscape.

Vegetation: formerly included semi-swamp forest dominated by kahikatea and pukatea on low-lying land near rivers; tōtara forest on free-draining soils and low-rainfall areas. Small, isolated, important areas of flax swamp and forest remain, including locally characteristic tōtara forest, and some black beach forest.

Birds: include dabchick on lakes adjacent to the Foxton Ecological District, grey teal, shoveler and grey duck.

Bats: include long-tailed bats *(Chalinolobus tuberculatus)*.

Reptiles: include goldstripe gecko (*Hoplodactylus chrysosireticus*), which occurs South of Pātea. Ornate skink (*Oligosoma ornatum*) is known from bush remnants near Levin but is uncommon and localised South of Taranaki-Gisborne). Glossy brown skink (*Oligosoma zelandicum*) known from a few scattered sites, Palmerston North is its eastern limit. The Southern limit of the elegant gecko (*Naultinus elegans*) is near Whanganui.

Fish: include short jawed kōkopu (*Galaxias postvectis*) and brown mudfish (*Neochanna apoda*).

Modifications: largely cleared for farms. Farming includes intensive sheep, beef and crops, and some dairying. There is increasing areas of orchards and market gardens.

3.2 Catchment

The proposed Marton Rail Hub site is in the Rangitikei Catchment. More precisely, the proposed project site is within the Tutaenui Surface Water Subzone (Rang_4d), which is part of the Coastal Rangitikei Surface Water Zone (Rang_4) and the encompassing Rangitikei Groundwater Management Zone. Groundwater within this management zone is generally shallow and unconfined. Groundwater is predominately recharged by rainfall, however, there is also high connectivity between ground and surface waterbodies in this area (TCG 2014).

There are three unnamed ephemeral streams that run through the CDP (Figure 4-1). The ephemeral streams are tributaries of the Tutaenui Stream, which itself is a tributary of the Rangitīkei River. The Tutaenui Stream is classified as a Flood Control Drainage stream under Schedule B of the HOP. Further, the Rangitīkei River is classified as a Site of Significance – Aquatic, Site of Significance – Riparian, Trout Fishery – Other, Water Supply, and Flood Control Drainage river under Schedule B of the Horizons One Plan. No Schedule B values are recognised for the unnamed tributary streams within the CDP.

[2] Ecological Regionals and Districts of New Zealand. New Zealand Biological Resources Centre, Publication No. 5 (in four parts), Part 2. Department of Conservation, Wellington, June 1987.

4 Assessment of Ecological Values

4.1 Vegetation and Habitats

4.1.1 Threatened Environment Classification

The proposed CDP is situated within an area classified as having <10% indigenous cover remaining. In these types of environments, the loss of habitats for indigenous species has been greatest in the past and little indigenous biodiversity remains (TEC, 2012).

4.1.2 Potential Natural Vegetation

In the absence of human interference, the likely vegetation occurring within the CDP and surrounds is podocarp dominated forest that might have included the following types: kahikatea-pukatea-tawa forest, mātai-kahikatea-tōtara forest, kahikatea-tōtara forest, rimu-mātai-miro-tōtara/kāmahi forest, and/or rimu-mātai-miro-tōtara/kāmahi forest (Manaaki Whenua Landcare Research tool).

4.1.3 Habitat Assessment

There are six broad habitat types, including streams within the CDP that have been identified and mapped (Figure 4-1). These habitat types are:

1. Farmland pasture/crops
2. Pine stand
3. Macrocarpa stand
4. Eucalyptus stand
5. Rank grass, exotic weeds
6. Streams – A, B and C (Section 4.5.3)

It should be noted that each habitat type has been assessed without regard to stream values, and the ephemeral stream has been assessed in isolation of terrestrial habitats. The vegetation components and the ecological value of each of the habitats listed above are detailed below.

Plant species that were observed during the site visits are presented in Table 4-1. Only two indigenous species were present on site, tī kōuka (cabbage tree; *Cordyline australis*) and pūkio (sedge; *Carex secta*), both within habitats 2 and 3 (pine, macrocarpa stand). Both indigenous species are classified as Not Threatened and no locally uncommon species were found to be present.

Figure 4-1: Habitat types and streams present within the CDP site and wider area.

Table 4-1 - Plant species observed within the proposed CDP.

Common Name	Scientific Name	Threat Classification[3]
Gymnosperms		
Macrocarpa	*Cupressus macrocarpa*	Introduced and naturalised
Radiata pine	*Pinus radiata*	Introduced and naturalised
Dicotyledonous Trees and Shrubs		
Blue gum	*Eucalyptus globulus* subsp. *globulus*	Introduced and naturalised
Gorse	*Ulex europaeus*	Introduced and naturalised
Hawthorn	*Crataegus monogyna*	Introduced and naturalised
Monocotyledonous Trees and Shrubs		
Tī kōuka	*Cordyline australis*	Not Threatened
Dicotyledonous Herbs (including composites)		
Birdsfoot trefoil	*Lotus corniculatus*	Introduced and naturalised
Broad-leaved dock	*Rumex obtusifolius*	Introduced and naturalised
Buttercup	*Ranunculus repens*	Introduced and naturalised
California thistle	*Cirsium arvense*	Introduced and naturalised
Curled dock	*Rumex crispus*	Introduced and naturalised
Dandelion	*Taraxacum officinale* agg.	Introduced and naturalised
Fennel	*Foeniculum vulgare*	Introduced and naturalised
Orache	*Lotus corniculatus*	Introduced and naturalised
Oxtongue	*Picris hieracioides*	Introduced and naturalised
Red clover	*Trifolium pratense*	Introduced and naturalised
Scentless mayweed	*Tripleurospermum inodorum*	Introduced and naturalised
Small-leaved wire weed	*Polygonum arenastrum*	Introduced and naturalised
Water pepper	*Persicaria hydropiper*	Introduced and naturalised
Watercress	*Nasturtium officinale*	Introduced and naturalised
White clover	*Trifolium repens*	Introduced and naturalised
Willow weed	*Persicaria maculosa*	Introduced and naturalised
Monocotyledonous Herbs		
Arum lily	*Zantedeschia aethiopica*	Introduced and naturalised
Wandering Jew	*Tradescantia fluminensis*	Introduced and naturalised
Dicotyledonous Lianes		
Ivy	*Hedera helix*	Introduced and naturalised
Sedges		
Pūkio	*Carex secta*	Not Threatened
Umbrella sedge	*Cyperus eragrostis*	Introduced and naturalised
Rushes		
Soft rush	*Juncus effusus var. effusus*	Introduced and naturalised
Grasses		
Brown top	*Agrostis capillaris*	Introduced and naturalised
Creeping bent	*Agrostis stolonifera*	Introduced and naturalised
Tall fescue	*Lolium arundinaceum subsp. arundinaceum*	Introduced and naturalised
Yorkshire fog	*Holcus lanatus*	Introduced and naturalised

[3] Conservation status of New Zealand indigenous vascular plants, 2017 (de Lange, 2018).

4.1.3.1 Farmland Pasture/Crops

Agricultural farmland with sown pasture grass and planted crops (Plate 1). Exotic avifauna and a mammalian pest (brown hares) were observed in this habitat. Also present in this habitat type are narrow strips of rank grass and other exotic weeds present along fence lines between paddocks. These are generally dominated by Yorkshire fog (*Holcus lanatus*), tall fescue (*Lolium arundinaceum* subsp. *arundinaceum*) species of dock (*Rumex obtusifolius* and *Rumex crispus*), and small-leaved wire weed (*Polygonum arenastrum*).

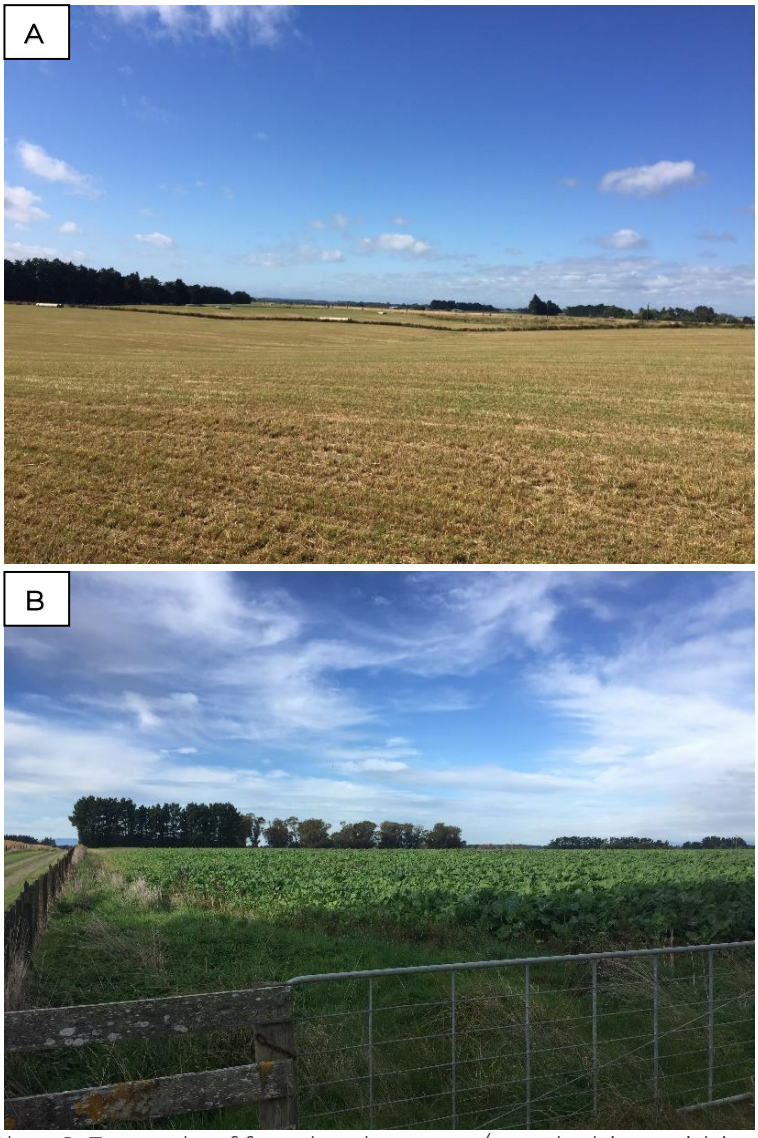

Plate 1: Example of farmland pasture/crop habitat within the CDP. (A) pasture grass and (B) crop paddocks.

The pasture grassland does not meet the criteria of a significant habitat. The habitat consists of exotic pasture and crop species and does not provide locally important ecological functions. No 'At Risk' or 'Threatened' species were observed in this habitat type.

The ecological value of the farmland pasture/crops habitat is **Negligible**.

4.1.3.2 Pine Stand

There are a number pine tree stands within the CDP, consisting of relatively young (approximately 15-20 years old) radiata pines (*Pinus radiata*). The understory is largely bare expect along stream margins where in places pine stands form part of the riparian zone. Further, pine stands appear to be managed around field edges across the site.

Plate 2: Looking north along one of the managed pine stands, which is next to cropped paddock.

There is low potential for exotic weeds, such as wandering Jew, to provide habitat for ornate and/or glossy brown skinks (At Risk-Declining) due to little ground cover and temporary stream flow that covers some of the smaller riparian plants. Further, no lizards were detected during lizard spot-checks.

Pine stands meet the criteria of significant habitat under the Horizons One Plan as they provide habitat for long-tailed bats, classified as "Threatened-Nationally Critical" (WSP 2021) which have been confirmed as present within the CDP and wider area. They also act as riparian buffers to streams (particularly streams A and B), providing shading, important water filtration services, and capture and retain sediment that might otherwise enter streams.

While the intrinsic value of this vegetation is **Low**, due to the presence of threatened long-tailed bats that are proven to utilise the pine habitats within the CDP, ecological value of all pine stands is assessed as **Very High**.

4.1.3.3 Macrocarpa Stand

There is a large mature macrocarpa (*Cupressus macrocarpa*) stand to the north-west of the CDP, which appears to be managed (Plate 3). The stand forms part of the riparian margin of the western most stream within the CDP. The understory is dominated by rank grasses and exotic weeds in places.

Plate 3: Looking north along the macrocarpa stand.

It also acts as a riparian buffer to stream A, providing shading, important water filtration services, and captures and retains sediment that might otherwise enter the stream. This habitat type is also likely to be hydraulically connected to the unconfined groundwater system, which is connected to the wider ecosystem network

There is low potential for exotic weeds, such as wandering Jew, to provide habitat for lizards due to there being little ground cover and surface water that temporarily covers some of the scattered riparian plants. No lizards were detected during spot-checks, and the potential for the macrocarpa stand to provide habitat for lizards is low.

The macrocarpa stand meets the criteria of significant habitat under the Horizons One Plan as it provides habitat supporting rare long-tailed bats, classified as "Threatened-Nationally Critical" (WSP 2021). Mature macrocarpa trees are known to provide roosting habitat for long-tailed bats, and due to edge formation of this stand and presence of stream corridor, bats will likely also utilise this habitat for commuting and foraging.

The value of the macrocarpa stand habitat is Very High, due to the presence of long-tailed bats. If ornate or glossy brown skinks were discovered to be using this habitat, this would also trigger a High ecological value based on the presence of these species.

4.1.3.4 Eucalyptus Stand

The eucalyptus stand is relatively small, consisting mature blue gum trees (*Eucalyptus globulus* subsp. *globulus*), situated towards to south of middle section of the CDP (Figure 4-1). The stand forms part of the riparian margin of a stream. The understory is dominated by rank grass.

Plate 4: Looking north along the eucalyptus stand within the CDP.

It also acts as a riparian buffer to stream C, albeit the buffer is of relatively poor ecological quality (supporting no indigenous vegetation) and stream C is very degraded, exhibiting minimal groundwater influence and no flow.

There is low potential for lizards within this habitat, despite the understory being rank grass. There is little ground cover and the long grass is an island surrounded by managed farmland. No lizards were observed during lizard spot-checks.

While the intrinsic value of this vegetation is Low, the eucalyptus stand meets the criteria of significant habitat under the Horizons One Plan as it likely provides habitat supporting rare long-tailed bats, classified as "Threatened-Nationally Critical" (WSP 2021). The eucalyptus stand was assessed as providing high quality roosting habitat for long-tailed bats due to the presence of numerous roost features such as cavities and flaking bark. This habitat is therefore assessed as having Very High ecological value.

4.1.3.5 Rank Grass, Exotic Weeds

These habitats, located adjacent to the railway line on the western side of the property, consist of mixed exotic species dominated by rank grasses, white clover, buttercup and birdsfoot trefoil (*Lotus corniculatus*). Scattered patches of orache (*Lotus corniculatus*) and California thistle (*Cirsium arvense*) are present, and watercress (*Nasturtium officinale*) and ivy are sometimes dominant in the bed of the stream. Scattered throughout is fennel (*Foeniculum vulgare*), soft rush (*Juncus effusus* var. *effusus*) and dock. Other species occasionally occurring include gorse (*Ulex europaeus*), hawthorn, pampas grass (*Cortaderia selloana*) and tī kōuka.

There is potential for the rank grasses and weeds to provide habitat for the northern grass skink (Not Threatened). However, the habitat is surrounded by managed farmland and no lizards were detected during lizard spot-checks, therefore, the potential for lizards within this habitat is likely to be low. Exotic avifauna was observed in this habitat.

The ecological value of rank grass, exotic weed habitat is assessed as **Negligible.**

Plate 5: Example of type 4 habitat – rank grass, exotic weeds. (A) Rank grass with visible fennel and dock., (B) Riparian zone rank grass, watercress and buttercup. (C) Brown top grass with scattered red clover and birdsfoot trefoil.

4.2 Birds

4.2.1 eBird Database

eBird is a collaborative enterprise with hundreds of partner organizations, thousands of regional experts, and hundreds of thousands of users, managed by the Cornell Lab of Ornithology. eBird holds data on bird distribution, abundance, habitat use and trends through checklist data collected by users of the tool within a simple, scientific framework. A search of the database revealed three existing records within 20km of the proposed CDP, collected between 2017 and 2021. No 'At Risk' or 'Threatened' species have been recorded within the project area (Table 4-2).

4.2.1 Field Observations

Bird species observed during field assessments were the Australasian magpie, European goldfinch, Pūkeko, and welcome swallow. These are all noted in table 4-2.

As no threatened bird species have been observed or are likely to be present within the CDP. The ecological value of the CDP for birds has been assessed as **Low.**

Table 4-2 - Bird species recorded on eBird within 40km of the proposed CDP. Birds noted with an asterix (*) were observed during field assessments.

Common Name	Scientific Name	Threat Classification[4]
Australian magpie *	*Gymnorhina tibicen*	Introduced and naturalised
Bellbird	*Anthornis melanura melanura*	Not Threatened
Chaffinch	*Fringilla coelebs*	Introduced and naturalised
Eastern rosella	*Platycercus eximius*	Introduced and naturalised
Eurasian blackbird	*Turdus merula*	Introduced and naturalised
European goldfinch *	*Carduelis carduelis*	Introduced and naturalised
European greenfinch	*Chloris chloris*	Introduced and naturalised
European starling	*Sturnus vulgaris*	Introduced and naturalised
Grey warbler	*Gerygone igata*	Not Threatened
Greylag goose	*Anser anser*	Introduced and naturalised
House sparrow	*Passer domesticus*	Introduced and naturalised
Kereru	*Hemiphaga novaeseelandiae*	Not Threatened
Mallard	*Anas platyrhynchos*	Introduced and naturalised
New Zealand kingfisher	*Todiramphus sanctus*	Not Threatened
North Island fantail	*Rhipidura fuliginosa*	Not Threatened
Paradise shelduck	*Tadorna variegata*	Not Threatened
Pukeko *	*Porphyrio melanotus*	Not Threatened
Rock pigeon	*Columba livia*	Introduced and naturalised
Rook	*Corvus frugilegus*	Introduced and naturalised
Shining cuckoo	*Chrysococcyx lucidus*	Not Threatened
Silvereye	*Zosterops lateralis*	Not Threatened
Song thrush	*Turdus philomelos*	Introduced and naturalised
Southern black-backed gull	*Larus dominicanus dominicanus*	Not Threatened
Spur-winged plover	*Vanellus miles*	Not Threatened
Swamp harrier	*Circus approximans*	Not Threatened
Tui	*Prosthemadera novaeseelandiae novaeseelandiae*	Not Threatened
Welcome swallow *	*Hirundo neoxena*	Introduced and naturalised
White-faced heron	*Egretta novaehollandiae*	Not Threatened
Yellowhammer	*Emberiza citrinella*	Introduced and naturalised

[4] Conservation status of New Zealand birds, 2016. (Robertson et al., 2017)

4.3 Bats

4.3.1 DOC Bat Bioweb Database

New Zealand bat data is managed by DOC. The 2021 bat database has seven records of long-tailed bat (*Chalinolobus tuberculatus*; Threatened-Nationally Critical[5]) within 20km of the proposed CDP, with the two closest detections being *c.* 9km from the site. The proximity of bat records to the project site informed the need for the acoustic survey to determine presence of bats within the CDP.

4.3.2 Acoustic Bat Survey

An acoustic bat survey was undertaken in March-April 2021. Long-tailed bats were detected at low (0.2 mean passes per night (ppn)) to moderate (45.4 mean ppn) levels within shelterbelt habitats (i.e. pine and macrocarpa stands; WSP, 2021a) (Figure 4-2) that run perpendicular the proposed CDP. It should be noted that this survey was undertaken prior to the relocation of the proposed CDP, therefore not all habitats within the updated CDP were surveyed. However, as there are similar habitats present to those surveyed, it is reasonable to assume that bats will also utilise habitats directly within the CDP.

Site Number	Total Passes	Average Bat Activity (total passes/nights recorded) ± Std Dev
Site 1	771	45.4 ± 42.6
Site 2	40	2.4 ± 2.0
Site 3	3	0.2 ± 0.39
Site 4	138	12.5 ± 8.73
Site 5	27	1.6 ± 1.9
Site 6	176	10.4 ± 9.8
Site 7	87	8.7 ± 7.5
Site 8	467	27.5 ± 57.4
Site 9	183	10.8 ± 7.2
Site 10	69	4.1 ± 4.1

Figure 4-2- Location plan of acoustic bat survey sites and average activity levels recorded at each site.

4.3.3 Roost Habitat Assessment

A roost habitat assessment was undertaken on 7 May 2021 by WSP ecologists. The purpose of this assessment was to determine the quality of roosting habitat for bats within the CDP and identify any trees or stands of trees that are likely to be of significant value to roosting bats. Vegetation identified within the CDP includes approximately 1.3 ha of pine *(Pinus radiata),* and 0.6 ha of blue gum (*Eucalyptus globulus subsp. Globulus)* trees. Long-tailed bats are known to frequently use pine and gum trees as roost trees in modified landscapes (Dekrout, 2009). It was noted during the site visit that the blue gum trees had significantly more roost features present (i.e. flaky bark,

[5] Conservation status of New Zealand bats, 2017 (O'Donnell et al., 2018)

cavities) whereas the pines being ~20 years old plantations did not appear to have many obvious roost features. This is likely due to the relatively young age of the pine trees, meaning they are in good health and roost features such as cavities have not yet formed. However, as the shelterbelt of pines provide substantial edge habitat for bats, it is still considered to be of high value for long-tailed bats.

4.3.4 Ecological Value

Long-tailed bats are classified as "Threatened-Nationally Critical" and are protected under the Wildlife Act (1953). The species roosts in cavities and damaged branches of mature native and exotic trees and often uses wooded stream corridors as flight paths and foraging areas. These habitats are common within and adjacent to the CDP. As long-tailed bats have been confirmed as present immediately adjacent to (and presumably within) the CDP, ecological value is assessed as **Very High.**

4.4 Herpetofauna

4.4.1 Herpetofauna Bioweb Database

New Zealand herpetofauna (reptiles and amphibians) data is managed by DOC. The 2021 herpetofauna database has 13 records within 11km of the proposed CDP (Table 4-3). Five species of indigenous lizards and two species of exotic frog have been recorded. Indigenous lizards include two species classified as At Risk-Declining, which are the glossy brown and ornate skinks. A species of undetermined gecko (*Naultinus* sp) has also been recorded *c.* 6km from the site. It is likely that this was an elegant gecko (*Naultinus elegans*), classified as At Risk-Declining, living near to its southern range limit.

Table 4-3 - Lizard and frog species recorded within 11km of the proposed CDP.

Common Name	Scientific Name	Threat Classification [6] [7]
Northern grass skink	*Oligosoma polychroma*	Not Threatened
Glossy brown skink	*Oligosoma zelandicum*	At Risk-Declining
Southern bell frog	*Ranoidea raniformis*	Introduced and Naturalised
Brown tree frog	*Litoria ewingii*	Introduced and Naturalised
Undetermined gecko	*Naultinus* sp	
Raukawa gecko	*Woodworthia maculata*	Not Threatened
Ornate skink	*Oligosoma ornatum*	At Risk-Declining

4.4.2 Field Assessment

Spot-checks and manual searches for lizard species were conducted within those habitats known to be favoured, and present within the CDP. These habitats included rank grass and exotic weeds present within riparian margins, and along the railway line to the west of the CDP. No lizards were found during any of the spot-checks or any sign of movement whilst walking over the site. It should be noted that the farmlands within which these potential habitats are located close to are subject to frequent disturbance for management purposes (i.e. harvesting crops). Based on the site visit and assessment of habitats, it is considered unlikely (although not certain) that At-Risk or Threatened lizard species are present within CDP.

Based on the field assessment the value of the site for lizards is assessed as **Low.**

[6] Conservation status of New Zealand reptiles, 2015 (Hitchmough et al., 2016)

[7] Conservation status of New Zealand amphibians, 2017 (Burns et al., 2018)

4.5 Freshwater Ecosystems

4.5.1 New Zealand Freshwater Fish Database

A search of the NZFFD revealed 21 records within 10km of the proposed rail hub site. All records are from the Tutaenui Stream and its tributaries. Note that no fish have been recorded from any of the ephemeral streams within the proposed CDP. Six species of indigenous fish, two species of indigenous crustacean (kōura and shrimp), and one species of exotic fish (goldfish) have been recorded within the Tutaenui Stream and its tributaries between 1980 and 2017 (Table 4-4). These include three species classified as At Risk-Declining: longfin eel, torrentfish and brown mudfish. The latest record of longfin eel is from 1992, while the latest for torrentfish is from 1980. Brown mudfish have been recorded as recently as 2017 from around the lower reaches of the Tutaenui Stream near to its confluence with the Rangitīkei River.

Due to possible presence of species with an "At Risk-Declining" threat classification, ecological potential value of aquatic fauna has been assessed as **High.**

Table 4-4 - Fish species recorded on the NZFFD within 10km of the proposed CDP.

Common Name	Scientific Name	Threat Classification[8][9]
Common bully	*Gobiomorphus cotidianus*	Not Threatened
Cran's bully	*Gobiomorphus basalis*	Not Threatened
Goldfish	*Carassius auratus*	Introduced and Naturalised
Kōura	*Paranephrops planifrons*	Not Threatened
Longfin eel (tuna)	*Anguilla dieffenbachii*	At Risk-Declining
Shortfin eel (tuna)	*Anguilla australis*	Not Threatened
Shrimp	*Paratya curvirostris*	Not Threatened
Torrentfish	*Cheimarrichthys fosteri*	At Risk-Declining
Brown mudfish	*Neochanna apoda*	At Risk-Declining

4.5.2 Wetlands

The wetlands database tool suggests that before human intervention the proposed CDP and surrounds was within a wetland ecosystem. This extensive wetland was likely to have been a forested swamp, consisting of vegetation types cited above in section 4.1 of this report.

The wetlands database, however, does not recognise any current wetlands within the proposed CDP.

4.5.3 Streams

Three streams were identified during the field assessment. Two are intermittent stream (stream A) and one is ephemeral (streams B and C) (Figure 2-1). One of the streams recognised by Horizons Regional Council was found to not (or no longer) be a stream during the field assessment and the length of one of the existing streams was reduced.

4.5.3.1 Stream A

This is a hard-bottom intermittent stream. The stream bed is composed of cobbles with some gravel and scattered boulders. There is very little fine sediment present. Other important substrate

[8] Conservation status of New Zealand freshwater fishes, 2017 (Dunn et al., 2018)

[9] Conservation status of New Zealand freshwater invertebrates, 2018 (Grainger, 2018)

types present within the stream bed include wood, leaves, macrophytes, and root mats. When surface flow is present these substrates can provide good habitat for fish and invertebrates.

There is some bank erosion particularly within the southern reach where the stream meanders more. Some of the undercut banks, however, could provide suitable fish habitat when there is flow present. The large pine and macrocarpa trees that form the riparian margin provide excellent shading of the stream bed throughout the day. The buffer between the large riparian trees generally varies between two and four metres either side of the stream. The understory consists of patchy exotic species, dominated by wandering Jew (*Tradescantia fluminensis*) with scattered patches of arum lily (*Zantedeschia aethiopica*), rank grasses and occasional umbrella sedge (*Cyperus eragrostis*). Indigenous species, tī kōuka and pūkio were also observed at times in this habitat.

Runs are the dominant hydraulic component when stream flow is present (classified as moderate current, continuous surface and depths greater than riffles). The nature of the stream channel suggests relatively high flows pass through at times

Plate 5: Stream A beneath pine stand. Wandering Jew, arum lily and tī kōuka can be observed along the stream bank in plates B and C. (A and B) Stream on 2 February with little surface water. (C and D) Stream on 31 May with surface water. Plate D was taken along the southern edge of the CDP.

4.5.3.2 Stream B

This is as soft bottom intermittent stream with pooled water in places. The stream bed was covered by macrophyte growth throughout much of the reach. The riparian margin is dominated by a pine stand, sometimes only along one side of the bank, rank grasses with scattered dock and occasional umbrella sedge. Willow weed (*Persicaria maculosa*) is often dominant in the bed of the stream.

Water pepper (*Persicaria hydropiper*), buttercup (*Ranunculus repens*) and arum lily are also present.

Plate 6: Stream B alongside pine stand on 31 May 2021. (A) Stream channel covered by exotic weeds and aquatic species. (B) Stream with visible surface water with rank grass and exotic weeds along riparian margin. (C) small bridge crossing over the stream.

4.5.3.3 Stream C

This is a soft bottom ephemeral stream that was predominantly dry on 31 May 2021 with pasture grass being the dominant vegetation type in the bed of the stream. Some buttercup was observed adjacent to a failed culvert. The northern extent of the stream appeared to have been recently excavated.

Plate 7: Stream C on 31 May 2021. (A) Stream crossing within pasture grass habitat. The culvert has eroded internally and was perched at the outlet (not visible in the above plate.) (B) dry stream channel meandering through pasture grass paddock. The channel appeared to have been recently excavated.

4.5.4 Ecological Values of Streams

The tributary streams within the CDP are degraded to varying degrees, having been altered overtime by the surrounding land use activities. Streams A and B are intermittent streams, which appear to flow during winter months when the groundwater level rises. Stream C is ephemeral and likely only flows following rain events.

Streams A and B have low representativeness and rarity/distinctiveness values. There is potential for aquatic species, including 'At Risk' species (e.g. longfin eel, torrentfish and brown mudfish) to utilise Streams A and B at times when surface flow or ponding is present. Stream A is moderately

complex within the CDP, exhibiting a meandering channel with encroaching vegetation, exposed roots, undercut banks and a mix of substrate sizes, which also provide moderate habitat for aquatic species. Stream B has low complexity and species habitat.

The values of Streams A and B are Moderate and Low, respectively. The ecological value of Stream C is Negligible as the bed of the stream is dominated by pasture grasses and has a poorly defined channel, indicating flow is infrequent.

4.6 Summary of Habitat and Species Values

Table 4-5 provides a summary of the ecological value of habitats and species at the proposed Marton Rail Hub development site.

Table 4-5 - Summary of the ecological values of habitats and species at the proposed Marton Rail Hub development site. Those values marked with a (*) are value accordingly due to presence of long-tailed bats, however the intrinsic value of the vegetation is Low.

Habitat / Species	Ecological Value
Farmland pasture/crops	Negligible
Pine stand	Very High*
Macrocarpa stand	Very High*
Eucalyptus stand	Very High*
Rank grass, exotic weeds	Negligible
Stream A	Moderate
Stream B	Low
Stream C	Negligible
Avifauna	Low
Long-tailed bat	Very High
Herpetofauna	High
Freshwater fish	High

5 Assessment of Ecological Effects

5.1 Proposed Site Layout

The proposed Marton Rail Hub site is to include:

- Operation of rail siding;
- Log yard and debarker;
- Container storage
- Plastic manufacturing; and
- Food processing

It is proposed that the log yard and rail sidings are developed on site initially, ahead of the rest of the site. This will involve the construction of rail, roads, stormwater and communications infrastructure. There will be no treated wood, or chemicals for treating wood, stored on site and the log yard surface will be a hard-concrete surface that is easily maintained. The assessment of ecological effects has been based on the proposed site layout, displayed in Figure 2-1.

5.2 Effects on Vegetation/Habitats

5.2.1 Effects on Farmland Pasture/Crops

The majority of construction work proposed within the CDP will occur within farmland pasture/crop habitat, which is of **Negligible** ecological value. The wider area land use is dominated by agricultural activities and the relatively small loss of farmland within the CDP will have a minimal ecological impact.

The magnitude of effects on farmland pasture/crops has been assessed as **Negligible**, therefore the overall level of effects on these habitats is expected to be also **Very Low.**

5.2.2 Pine/Eucalyptus Stands

Both the pine and eucalyptus stand present within the CDP provide habitat for long-tailed bats and act as riparian buffers for Streams A, B and C. The CDP has been planned, to avoid as much possible, removal of high-quality vegetation for bats and wherever possible, trees are proposed to be retained.

Most of the trees within the western most shelterbelt, along Stream A, will be retained, however, a small number of trees, in two places, will be removed in order to provide rail access to the CDP. Further, the energy plant will be developed adjacent to the pines along Stream A. Most of the pine trees located along Stream B will be removed for construction of the log yard and debarker, rail siding, container and food processing areas.

The eucalyptus stand is situated close to the centre of the CDP. A road has been proposed that will bisect this stand, which will likely require the removal of several blue gum trees. The log and debarker, PLA plant, service area, and stormwater pond will be developed adjacent to this habitat.

Pine and eucalyptus stands are common and scattered throughout the surrounding farmland, and as an exotic species the value of this vegetation is intrinsically **Low**. The magnitude of effects on both the pine and eucalyptus stands have therefore been assessed as **Low** giving an overall level of effect of **Very Low**.

While the overall level of effect of the loss of the vegetation has been assessed as Very Low based on their intrinsic value, these stands of exotic trees do provide habitat of significant value for long-tailed bats. Effects of the loss of these habitats for bats is therefore addressed is Section 5.4.

5.2.3 Macrocarpa Stand

The macrocarpa stand provides habitat for long-tailed bats and the trees themselves have been assessed as high quality roosting habitat. The macrocarpa stand also acts as a riparian buffer for Stream A. The macrocarpa stand was within the boundary of the original CDP, however, the updated layout, excludes the macrocarpa stand, meaning that this habitat is outside of the impact zone and will not be affected by the proposed development.

The magnitude and overall level of effects on the macrocarpa stand has therefore been assessed as **Negligible.**

5.2.4 Rank Grass, Exotic Weeds

Rank grass, exotic weed habitats are of **Low** ecological value, and there is minimal potential for this habitat to be occupied by native lizards based on how fragmented this habitat is within the surrounding farmland, and on the results of the lizard spot-checks, whereby none were found.

The rank grass, exotic weed habitat was within the boundary of the original CDP, however, the updated layout, excludes the main areas of this habitat, meaning that most of these areas are outside of the impact zone. There is, however, small areas of rank grass, exotic weed habitat in places, such as along fence lines and along the interface between farmland and other habitat types (e.g. pine forest). These areas are relatively small and have been incorporated into other habitats

they form a part of, for example, the rank grass beneath blue gum trees is part of the eucalyptus stand.

The magnitude of effects on rank grass, exotic weeds have been assessed as **Negligible**, therefore the overall level of effects on these habitats is assessed as **Very Low**.

5.3 Effects on Aquatic Ecosystems

The proposed development will result in the diversion of Stream B and possibly the loss of some of Streams B and C within the CDP. The streams are of **Low** and **Negligible** values, respectively, and are situated within a landscape that has many farmland streams that are intermittent or ephemeral.

It is proposed that Stream B will be diverted around the boundary of the CDP site and become part of the stormwater network. The diversion will be around the boundary of the food producer area and between the energy plant and proposed road before reconnecting the channel back with its natural line at the southern boundary of the road (refer to Figure 2-1). This would require the stream to be culverted beneath the rail siding. This option would increase the length of the stream reach within the CDP by approximately 150m.

Stream C is ephemeral and likely only contains water following a rain event. The stream bed and banks are dominated by pasture grass and the channel seems to be managed as farmland drainage. There is very little potential for the stream to support aquatic species. Any impact within the bed of Stream C will have minimal effect on the environment.

The hard surface of Rail Hub Development site will mean that there is little potential for organic plant material, from logs and bark, to leach into and influence groundwater quality. Bark and log material will be able to be swept from the log yard surface regularly and stormwater will be directed to sumps within the site.

Outside of the CDP, overland flow will be collected by the stormwater system along the northern boundary of the CDP and discharged to Stream B, which flows into stream A. There is not likely to be an adverse change in water quality beyond the existing conditions.

The magnitude of effect of diverting Stream B around the boundary of the food producer has been assessed as **Low**, giving an overall level of effect of **Very Low**.

The magnitude of effects on Streams A and C have been assessed as **Negligible,** which also results in **Very Low** overall levels of effects.

Stream diversions are typically accompanied by riparian enhancement in the form of restoration planting, to provide higher quality habitat than baseline conditions and an overall gain in ecological value.

5.4 Effects on Aquatic Fauna

Stream reaches within the CDP are intermittent or ephemeral and have the potential to support fish when there is ponding or surface flow present. Stream A is the largest and has the greatest potential to intermittently support fish life. Stream B holds only a small amount of water and is choked by aquatic macrophytes in places therefore has very low potential for fish to be present. Stream C remained dry between site visits and does not support any fish life. Approximately 3km downstream of the CDP there is a 'very high risk' barrier to fish, as observed on the NIWA Fish Passage Assessment Tool[10]

This means that any fish present within the CDP will be either climbing species (e.g. eels) or remnants from a time before the downstream barrier was constructed. Any fish surviving

[10] NIWA Fish Passage Assessment Tool. https://fishpassage.niwa.co.nz/

upstream of the barrier would be in very low abundance due to the difficulty of getting over the barrier and water flow being temporary. Only Stream A, which has at least some pooled water year-round, may be able to support fish life permanently, however this is unlikely.

The magnitude of effects on freshwater fish has been assessed as Low based on low likelihood of presence absence of threatened fish species, water flow being seasonal, and a 'very high risk' barrier to fish passage known from downstream.

The overall effects on aquatic fauna are therefore assessed as Low

5.5 Effects on Birds

Only introduced common native bird species were observed within the CDP and/or recorded to be present within the wider area. However, all native bird species are protected under the Wildlife Act, 1953. Vegetation and habitats present within the CDP such as the large stands of trees will likely provide nesting habitat for birds. The removal of some of these trees for development may reduce the availability of nesting habitats, however the such effects are likely to be Low in the context of the wider landscape.

As the magnitude of effects have been assessed as Low, the overall level of effects on native bird species are expected to be Very Low. However, to ensure no native bird species are harmed during tree removal, standard practice would be to ensure no native bird nests are present in trees immediately prior to felling or avoid felling within bird nesting season altogether.

5.6 Effects on Bats

5.6.1 Injury/Death During Vegetation Removal

As there will be removal of potential roost trees there is a risk of felling a tree while there are bats actively roosting within, which would likely result in injury or death to a bat. This is an offence against the Wildlife Act (1953). The magnitude for removal of potential roost trees is assessed as High resulting in an overall level of effect of Very High.

The implementation of Vegetation Removal Protocols (detailed in Appendix B) prior to felling of all trees within the CDP are critical to ensure no bats are actively roosting within.

5.6.2 Habitat Loss

Potential roost trees will likely be removed for construction of the elements within the Rail Hub. Though this may reduce the pool of roosts within the immediate area of the landscape, the loss of these trees is relatively low in the context of the wider landscape.

Furthermore, as the majority of trees to be removed will be pine trees of a relatively young age, there are likely few roosting opportunities for bats within these trees. Thus, the magnitude of effects of the loss of this habitat is Low.

There is significantly better roosting habitat present within the eucalyptus stand, and while only few of these trees are likely to be removed, the Rail Hub will be built completely around it. The construction of these buildings and associated disturbances from operations will likely deter bats or alter their utilisation of this habitat. It is also possible that bats may cease to use this habitat altogether.

However, as stated above, the loss of this habitat as roosting trees is relatively low due to the availability of similar trees in the wider landscape outside of the CDP. The magnitude of effects of the loss/disturbance of this habitat is therefore assessed as Low giving a Moderate overall level of effect.

5.6.3 Fragmentation

The loss of the shelterbelt of pines within the middle of the CDP, combined with the construction of buildings will result in a physical change in the landscape. However, as the landscape is already highly fragmented, bats are likely adapted to these environments.

A large shelterbelt of vegetation will remain present within 500 m to the west of the shelterbelt that will be removed. There will therefore be suitable commuting routes remaining outside the CDP and this will ensure that there are commuting corridors within the adjacent landscape. In the worst-case scenario, there may be an alteration of commuting routes of less than 1km.

The magnitude of potential fragmentation effects is therefore expected to be **Low** giving a **Moderate** overall level of effect.

It should be noted that significant planting of vegetation buffers around the entire CDP are being incorporated as part of the landscape visual mitigation. Consideration of incorporation of suitable bat roost forming trees and connected vegetation corridors into these plans will significantly reduce fragmentation effects and possible result in a net gain due to increase of edge habitats than is currently present.

5.6.4 Lighting Effects

Long-tailed bats tend to avoid lit-zones and will respond by flying alongside or above these areas when commuting. It is not yet known what lighting will be present within the CDP, if any. However, it is likely that any lighting will be directed towards operations, away from bat habitats. Additionally, as the operational areas of the CDP will be built in habitats that bats will likely avoid (i.e. open landscapes), the introduction of lighting will not result in a change of habitat utilisation across the CDP.

Magnitude of lighting effects on bats are therefore expected to be **Low** giving an overall **Moderate** level of effect.

Best practise lighting design specifications for bats should be considered to minimise effects of light spill beyond the CDP.

5.7 Effects on Herpetofauna

The daytime lizard spot-checks and manual searches found no lizards within the affected habitats. If lizards were present in substantial numbers, it is highly likely they would have been detected during the search. Therefore, the likelihood that lizards are occupying habitat within the CDP is expected to be low.

Based on results of the spot-checks/manual searches, and fragmentation of potential habitat within the agricultural landscape, the magnitude of effects on lizards have been assessed as **Low** therefore, overall effects are expected to be **Negligible.** However, all native lizards are absolutely protected under the Wildlife Act 1953 and as a precaution, passive mitigation measures should be employed during vegetation clearing to encourage the dispersal of any lizards away from the impact area.

5.8 Summary of Magnitude and Overall Level of Effects

Table 5-1 provides a magnitude of effects, and overall effects rating summary for the ecological attributes of the proposed Marton Rail Hub development site. These overall effects are given prior to the implementation of measures to avoid, remedy and mitigate, which are presented in Section 6.

Table 5-1: Summary of the magnitude of unmitigated effects on habitats and species as a result of the Rail Hub development. (Those values marked with a (*) are value accordingly due to presence of long-tailed bats, however the intrinsic value of these habitats is Low.

Habitat / Species	Ecological Value	Magnitude of Effects	Level of Un-mitigated Effect.
Farmland pasture/crops	Negligible	Negligible	Very Low
Pine/ Eucalyptus stands	Very High*	Low	Moderate
Macrocarpa stand	Very High*	Negligible	Low
Rank grass, exotic weeds	Negligible	Negligible	Very Low
Stream A	Moderate	Negligible	Very Low
Stream B	Low	Low	Very Low
Stream C	Negligible	Negligible	Very Low
Birds	Low	Low	Very Low
Long-tailed bats	Very High	Low to High	Low to Very High
Herpetofauna	High	Low	Low
Freshwater fish	High	Low	Low

6 Recommendations to Avoid, Remedy, and/or Mitigate Ecological Effects

6.1 Management of Freshwater Ecosystems and Fish

6.1.1 Fish Passage

All works impacting the beds of streams should be undertaken within a dry stream bed to avoid the release of sediment to water. This might be undertaken in summer months when surface water is either absent or minimal, or undertaken in winter by diverting flow around the affected site and de-watering the impacted area. Because there is a low likelihood of any substantial number of fish occupying streams within the CDP, a temporary barrier to fish passage as a result of a culvert installation would likely have no adverse ecological impact on the populations of fish in catchment. This means that for several days water could be pumped around each of the sites that require culvert to be installed without fish passage being maintained. However, undertaking this work in summer months when flow is largely absent from streams is the preferred option. This will have less of an impact on the freshwater environment as stream beds will likely be dry in most places.

6.1.2 Water Quality

To help protect and maintain the quality of freshwater systems an Erosion and Sediment Control Plan (ESCP) should be prepared and implemented following the Greater Wellington Regional Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region (GWRC, 2021), as adopted by Horizons Regional Council as the minimum standard for designing an ESCP.

There will also need to be a spill management plan to manage refuelling, chemicals and the containment of any spills within the CDP as to avoid contaminating streams and groundwater environments.

All discharges to streams that are associated with the construction and operation of the rail hub should comply with the water quality targets for the Tutaenui Surface Water Subzone (Appendix B).

6.1.3 Riparian Enhancement

Enhancement planting is recommended to be undertaken along the margins of any diverted streams as part of the planting plan for the rail hub site. This could be incorporated into a wider planting management plan that includes mitigation and amenity planting. Riparian planting would aim to replace the loss of exotic riparian vegetation along stream margins with indigenous species to enhance the health of affected stream environments within the CDP. The recommendation is to plant a minimum width of 10m along each stream bank. If it is not practical to plant 10m widths then 5m widths can be planted on each bank, however, this will require more regular maintenance to prevent weeds from establishing and natural regeneration of indigenous species would be limited by reduced space (Parkyn et al., 2000). Plants should be planted every 1-1.5m (or 5m spacings for conifers) right up to the stream margin, with smaller plants such as sedges closest to the water's edge. A 1m wide grass strip should be left along the back edge of the planted margin (i.e. the edge furthest from the stream) to help filter sediment. Suitable riparian plants for the Rangitīkei Ecological Area are provided in Appendix C. A variety of plants from the list should be selected with input from Ngā Wairiki Ngāti Apa, and locally eco-sourced where possible.

6.2 Bat Management

- The removal of all vegetation greater than 15 cm Diameter at Breast Height (DBH) must require implementation of Vegetation Removal Protocols by a suitably qualified bat ecologist. These protocols are presented in Appendix D.
- If lighting is to be installed within the CDP, best practice design for bats should be incorporated wherever possible. These specifications include:
    - Low intensity, longer wavelength and warm colour LED bulbs.
    - Highly directional downwards using baffles, and away from bat habitats
- Supplementary planting of both exotic and native tree species known to provide roosting habitats should be incorporated into planting plans and designed to retain edge effects allowing commuting routes between other habitats around the area of the CDP. A list of suitable native and exotic plant species is provided in Table 6-1.

Table 6-1 – Native and exotic plants species that could be incorporated into planting plans to provide mitigation for loss of bat habitats.

Common name	Latin name	Value to bats
Exotic Trees		
Giant gum	*Eucalyptus regnans*	Roosting
Brown Barrel	*Eucalyptus fastigata*	Roosting
Messmate	*Eucalyptus obliqua*	Roosting
Tasmanian Blackwood	*Acacia melanoxylon*	Roosting
Radiata pine	*Pinus radiata*	Roosting
London plane	*Platanus x acerifolia*	Roosting
Sessile oak	*Quercus petraea*	Roosting
Native Trees		
Makomako	*Aristotelia serrata*	Encourages insects for foraging
Mingimingi	*Coprosma propinqua*	Encourages insects for foraging
Karamu	*Coprosma robusta*	Encourages insects for foraging
Ti kouka	*Cordyline australis*	Roosting; Encourages insects for foraging
Kahikatea	*Dacrycarpus dacrydioides*	Roosting; Encourages insects for foraging
Rimu	*Dacrydium cupressinum*	Roosting; Encourages insects for foraging
Pokaka	*Elaeocarpus hookerianus*	Encourages insects for foraging
Kanuka	*Kunzea var.*	Encourages insects for foraging
Manuka	*Leptospermum var.*	Encourages insects for foraging
Mahoe	*Melicytus ramiflorus*	Encourages insects for foraging
Harakeke	*Phormium tenax*	Encourages insects for foraging
Manatu	*Plagianthus regius*	Encourages insects for foraging
Totara	*Podocarpus totara*	Roosting; Encourages insects for foraging
Matai	*Prumnopitys taxifolia*	Encourages insects for foraging

6.3 Bird Management

All native bird species are protected under the Wildlife Act, 1953. Therefore, to ensure no native bird species are harmed during tree removal, it is recommended that an ecologist be present to inspect trees/vegetation for presence of occupied native bird nests immediately prior to felling. Alternatively, felling of trees within bird nesting season (September to January) could be avoided altogether.

6.4 Lizard Management

Lizards are absolutely protected under the Wildlife Act 1953 from killing and injury. The overall effect on lizard populations as a result of the rail hub development is likely to be low, however, passive mitigation measures should be implemented to minimise risk of losing protected species. This should include the following:

- Cut rank grass, exotic weed areas, including areas on along the boundaries of other habitats (e.g. areas of ranks grass or weeds along the boundary of, and beneath, pine trees.) within the project site to a height of 100–150mm at least 48 hours prior to earthworks. Rake the cut grass to areas outside of the impact area. This will remove lizard cover within the impact area and encourage any lizards that might be present to seek refuge outside of the impact area where cover remains intact.

- Relocation of ground cover habitats, such as woody debris or sprawling ground plants (e.g. wandering jew which is most commonly present along the riparian margin of streams) that may provide refuge for lizards, to a spot outside of the zone of direct impact. This should be undertaken within 48 hours prior to earth works within rank grass and shelterbelt areas (including beneath trees). This will help to disperse any lizards that might be present, away from impact zone.

7 Summary of the Overall Level of Effect

As per EIANZ Step 3, Table 2-3 shows the overall level of ecological effects. These effects for each habitat/species are summarised in Table 7-1.

Based on the EIANZ methodology, and assuming the appropriate mitigation detailed in Section 6 of this report is implemented, it is considered there will be effects of no greater than **Low** for all vegetation, habitats and fauna species as a result of the development of the Rail Hub.

Table 7-1: Matrix showing overall level of effect following mitigation. Source: Roper-Lindsay et al. (2018).

Habitat / Species	Ecological Value	Magnitude of mitigated Effect	Overall level of Effect
Farmland pasture/crops	Negligible	Negligible	Very Low
Pine/eucalyptus stands	Very High	Low	Very Low
Macrocarpa stand	Very High	Negligible	Negligible
Rank grass, exotic weeds	Negligible	Negligible	Very Low
Stream A	Moderate	Low	Low
Stream B	Low	Low	Very Low
Stream C	Negligible	Negligible	Very Low
Birds	Low	Negligible	Very Low
Long-tailed bats	Very High	Negligible	Low
Herpetofauna	High	Negligible	Very Low
Freshwater fish	High	Negligible	Very Low

8 Conclusion

Five terrestrial habitat types and three streams were identified within the Marton Rail Hub Development area. Pine, macrocarpa and eucalyptus stands within the area were identified as having Very High value as habitat for long-tailed bats (Threatened-Nationally Critical, Very High value), which have been detected at low to moderate levels of across the site. Terrestrial habitats also provide habitat for a range exotic and common native birds with low values, and potentially for lizards with High ecological values, however the potential for any substantial lizard population at the site was assessed as low. Further, the possibility of High value fish species to occupy intermittent streams (with Low to Moderate values) at the site was also assessed as Low due to downstream barriers and temporary flow conditions. Recommendations to avoid, remedy, and/or mitigate adverse ecological effects have been provided and include the careful management of freshwater environments, protected species and high-risk vegetation for bats. Based on the recommendations provided by this report the overall level of effects the proposed developed is expected to have on habitats and species have been assessed as ranging from Negligible to Low.

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Appendix A
Regional Criteria for Assessing Habitat Significance

Regional Criteria for Assessing Habitat Significance

Schedule F

Schedule F (Indigenous Biological Diversity) of the HOP classifies rare, threatened and at-risk habitat types within the Manawatu-Whanganui Region. The habitats within the project site have been assessed against those listed in Schedule F to determine if any rare, threatened or at-risk habitats are present within the project footprint. Refer to Schedule F in the HOP for further details.

Policy 13.5

Policy 13.5 of the HOP sets out the criteria for assessing the significance of, and the effects of activities on, an area of habitat Rare and threatened habitats listed in Schedule F of the HOP are considered to significant habitats, whereas at-risk habitats may or may not be considered a significant habitat. The significance of a rare, threatened or at-risk habitat is based on the following criteria:

Rare habitats are areas of significant indigenous vegetation or significant habitats of indigenous fauna under criterion (ii)(E) below. Threatened habitats are areas of significant indigenous vegetation or significant habitats of indigenous fauna under criterion (i)(A) below. An area of rare habitat or threatened habitat may also be an area of significant indigenous vegetation or significant habitat of indigenous fauna under one or more of the other criteria below. An at-risk habitat may be recognised as being an area of significant indigenous vegetation or a significant habitat of indigenous fauna if one or more of the following criteria are met:

In terms of representativeness, that habitat:

a. comprises indigenous habitat type that is under-represented (20% or less of known or likely former cover), or

b. is an area of indigenous vegetation that is typical of the habitat type in terms of species composition, structure and diversity, or that is large relative to other areas of the same habitat type in the Ecological District or Ecological Region, or has functioning ecosystem processes.

ii. In terms of rarity and distinctiveness, that habitat supports an indigenous species or community that:

a. is classified as threatened (as determined by the New Zealand Threat Classification System and Lists*), or

b. is distinctive to the Region, or

c. is at a natural distributional limit, or

d. has a naturally disjunct distribution that defines a floristic gap, or

e. was originally (i.e., pre-human) uncommon within New Zealand, and supports an indigenous species or community of indigenous species.

iii. In terms of ecological context, that habitat provides:

a. connectivity (physical or process connections) between two or more areas of indigenous habitat, or

b. an ecological buffer (provides protection) to an adjacent area of indigenous habitat (terrestrial or aquatic) that is ecologically significant, or

c. part of an indigenous ecological sequence or connectivity between different habitat types across a gradient (e.g., altitudinal or hydrological), or

d. important breeding areas, seasonal food sources, or an important component of a migration path for indigenous species, or

e. habitat for indigenous species that are dependent on large and contiguous habitats.

Appendix B
Surface Water Quality Targets

Table B1: Water Quality Targets (or standards where specified under conditions/standards/terms in a rule) for Rivers in Tutaenui Sub-zone. Source: Horizons One Plan.

Water Management Zone	Subzone	pH		Temp (°C)		DO (% SAT)	scBODs (g/m³)	POM (g/m³)	Periphyton	DRP (g/m³)	SIN (g/m³)	Deposited Sediment Cover (%)	MCI	Ammoiacal Nitrogen (g/m³)		Tox	Visual Clarity (m)	
		Range	Δ	<	Δ	>	<	<	Chla (mg/m²)	<	<	≤	>	<	Max	%	< 50th %ile	%Δ
Coastal Rangikei (Rang_4)	Tutaenui (Rang_4d)	7 to 8.5	0.5	24	3	60	2	5	200	0.01	0.11	25	100	0.4	2.1	95	2.5	30

Table B2: Water Quality Targets (or standards where specified under conditions/standards/terms in a rule) Key: Definition of abbreviations and full wording of the water quality targets (or standard where specified under conditions/standards/terms in a rule). Source: Horizons One Plan.

Header	Sub Header	Full wording of the Water Quality Target (or standard where specified under conditions/standards/terms in a rule)
pH	Range	The pH of the water must be within the range 7 to 8.5 unless natural levels are already outside of this range
	Δ	The pH of the water must not be changed by more than 0.5
Temp (°C)	<	The temperature of the water must not exceed 24°C
	Δ	The temperature of the water must not be changed by more than 3°C
DO (% SAT)	>	The concentration of dissolved oxygen (DO) must exceed 60% of saturation
scBODs (g/m³)	<	The monthly average five-days filtered / soluble carbonaceous biochemical oxygen demand (sCBOD5) when the river flow is at or below the 20th flow exceedance percentile must not exceed 2g/m³
POM (g/m³)	<	The average concentration of particulate organic matter when the river flow is at or below the 50th flow exceedance percentile must not exceed 5g/m³
Periphyton	Chla (mg/m²)	The algal biomass on the river bed must not exceed 200mg of chlorophyll a per m²
DRP (g/m³)	<	The annual average concentration of dissolved reactive phosphorus (DRP) when the river flow is at or below the 20th flow exceedance percentile must not exceed 0.01 g/m³, unless natural levels already exceed this Water Quality Target (or standard where specified under conditions/standards/terms in a rule).
SIN (g/m³)	<	The annual average concentration of soluble inorganic nitrogen (SIN)[1] when the river flow is at or below the 20th flow exceedance percentile must not exceed 0.11g/m³, unless natural levels already exceed this Water Quality Target (or standard where specified under conditions/standards/terms in a rule)
Deposited Sediment Cover[2] (%)	≤	The maximum cover of visible river bed by deposited sediment less than 2mm in diameter must be equal to or less than 25%, unless natural physical conditions are beyond the scope of the application of the deposited sediment protocol of Clapcott et al. (2011).
MCI[3]	>	The Macroinvertebrate Community Index (MCI) must exceed 100, unless natural physical conditions are beyond the scope of application of the MCI. In cases where the river habitat is suitable for the application of the soft-bottomed variant of the MCI (sb-MCI) the Water Quality Target (or standard where specified under conditions/standards/terms in a rule) also apply.
Ammoiacal Nitrogen[4] (g/m³)	<	The average concentration of ammoniacal nitrogen must not exceed 0.4g/m³
	Max	The maximum concentration of ammoniacal nitrogen must not exceed 2.1g/m³
Tox. or Toxicants	%	For toxicants not otherwise defined in these Water Quality Targets (or standards where specified under conditions/ standards/terms in a rule) the concentration of toxicants in the water must not exceed the trigger values for freshwater defined in the 2000 ANZECC guidelines Table 3.4.1 for the level of protection of 95% of species. For metals the trigger value must be adjusted for hardness and apply to the dissolved fraction as directed in the table.
Visual Clarity (m)	< 50th %ile	The visual clarity of the water measured as the horizontal sighting range of a black disc must equal or exceed 2.5m when the river^ is at or below the 50thflow exceedance percentile.
	%Δ	The visual clarity of the water measured as the horizontal sighting range of a black disc must not be reduced by more than 30%.

[1] Soluble inorganic nitrogen (SIN) concentration is measured as the sum of nitrate nitrogen, nitrite nitrogen, and ammoniacal nitrogen or the sum of total oxidised nitrogen and ammoniacal nitrogen.

[2] The Deposited Sediment Cover (%) Water Quality Target (or standard where specified under conditions/standards/terms in a rule) only applies for State of the Environment monitoring purposes to determine if the percentage cover of deposited sediment on the bed of the river will provide for and maintain the values in each WMSZ. The effects of deposited sediment on the bed of rivers in relation to resource consent applications should be determined using the deposited sediment protocols of Clapcott et al. (2010).

[3] The Macroinvertebrate Community Index (MCI) Water Quality Target (or standard where specified under conditions/standards/terms in a rule) applies only for State of the Environment monitoring purposes to determine if the aquatic macroinvertebrate communities are adequate to provide for and maintain the values in each WMSZ. This Water Quality Target (or standard where specified under conditions/standards/terms in a rule) is not appropriate for monitoring the effect of activities such as discharges to water on macroinvertebrate communities upstream and downstream of the activity.

[4] Ammoniacal nitrogen is a component of SIN. SIN Water Quality Target (or standard where specified under conditions/standards/terms in a rule) should also be considered when assessing ammoniacal nitrogen concentrations against the Water Quality Target or standard where specified under conditions/standards/terms in a rule).

Appendix C

Riparian Plant List for Rangitikei Ecological District

Plant List

This list contains suitable plants for the Rangitikei Ecological Area.

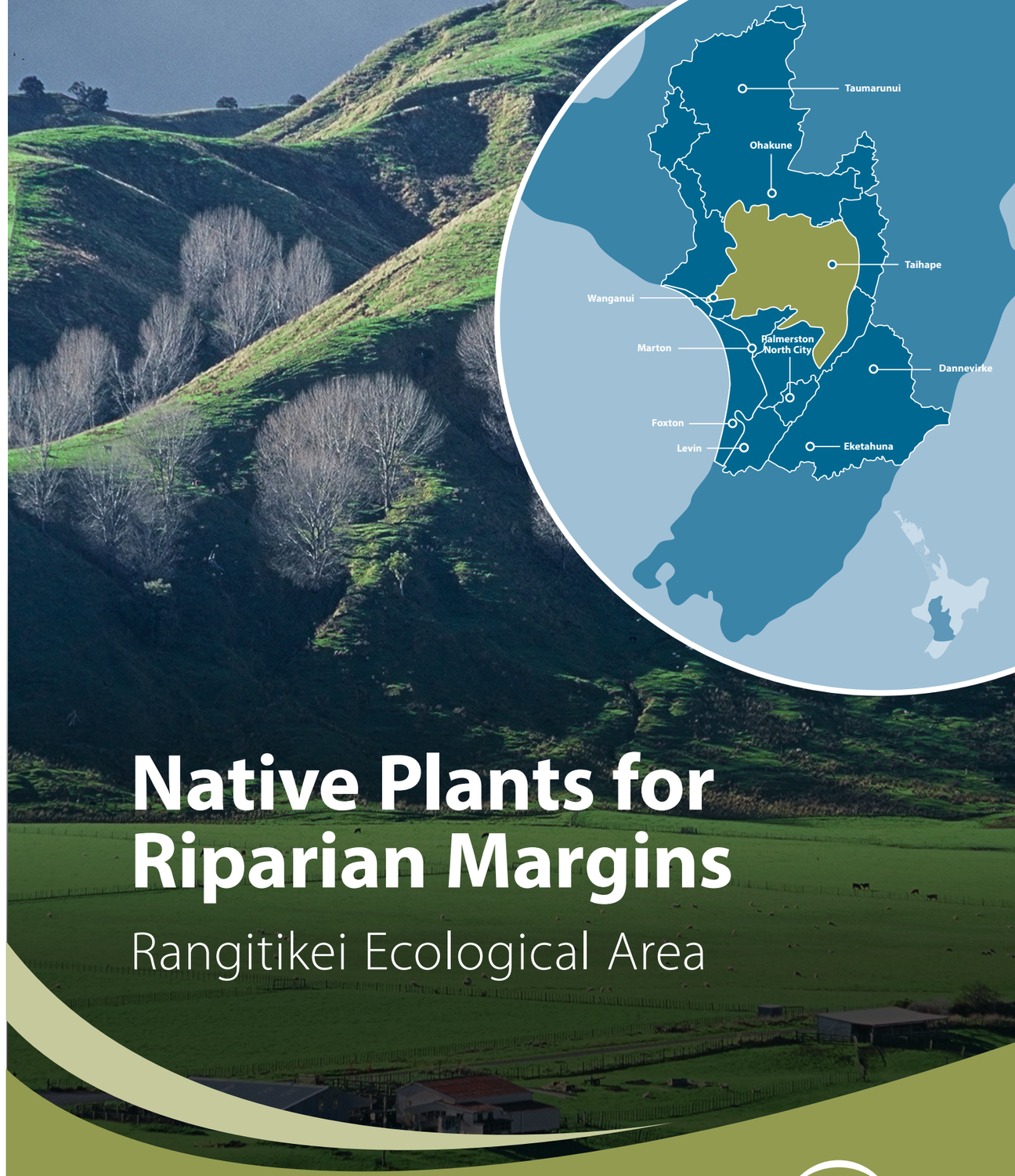
The list includes information on suitable habitat for each species and their environmental tolerances.

NAME		HEIGHT	SUITABLE HABITATS				SOIL MOISTURE			TOLERANCES/PALATABILITY			ENCOURAGES	
Common name	Species name	Height at maturity	Wetland	Riparian	Bush	Slope/ Open	Wet	Damp	Free draining	Frost tolerance	Wind tolerance	Possum palatability	Birds	Bees
NARROW LEAVED GROUND COVER														
Flax, Harakeke	*Phormium tenax*	2.5m	✓	✓			✓	✓✓	✓	✓✓	✓✓		✓	
Mtn Flax, Whaririki	*Phormium*	1.5m		✓		✓			✓✓	✓✓	✓✓		✓	
Purei	*Carex secta*	1.5m	✓	✓			✓	✓		✓✓	✓✓			
Swamp sedge	*Carex virgata*	1m	✓	✓			✓	✓✓		✓✓	✓✓			
Toetoe	*Cortaderia fulvida*	1.5m		✓		✓		✓	✓✓	✓✓	✓✓			
SHRUBS														
Karamu	*Coprosma robusta*	4m		✓		✓		✓✓	✓	✓	✓✓	✓	✓	
Koromiko	*Hebe stricta*	2m		✓		✓		✓	✓	✓✓	✓✓	✓		✓
Manuka	*Leptospermum scoparium*	6m	✓	✓		✓	✓	✓✓	✓	✓✓	✓✓		✓	✓
Mingimingi	*Coprosma propinqua*	4m	✓	✓			✓	✓✓		✓✓	✓✓		✓	
TREES														
Cabbage tree, Ti kouka	*Cordyline australis*	12m	✓	✓		✓	✓	✓✓	✓	✓✓	✓✓		✓	✓
Five-finger	*Pseudopanax arboreus*	8m			✓	✓		✓	✓✓	✓✓	✓✓	✓✓	✓	✓
Kahikatea	*Dacrycarpus dacrydioides*	60m	✓		✓		✓	✓✓		✓✓	✓✓		✓	
Kanuka	*Kunzea ericoides*	20m		✓	✓	✓			✓	✓✓	✓✓			✓
Kohuhu	*Pittosporum tenuifolium*	8m		✓	✓	✓	✓	✓✓	✓	✓✓	✓✓		✓	
Kowhai	*Sophora godleyi*	25m		✓	✓	✓		✓	✓✓	✓✓	✓✓		✓	✓
Lemonwood, Tarata	*Pittosporum eugenioides*	12m		✓	✓	✓		✓✓	✓	✓✓	✓✓			✓
Long-leaved lacebark	*Hoheria sexstylosa*	8m		✓	✓	✓		✓	✓	✓✓	✓✓	✓		✓
Ribbonwood, Manatu	*Plagianthus regius*	15m		✓	✓		✓	✓✓		✓✓	✓✓	✓		✓
Totara	*Podocarpus totara*	30m		✓	✓	✓		✓	✓	✓✓	✓✓	✓✓		

For further information about riparian planting contact:

Horizons Regional Council, Freshwater Management Team

0508 800 800 | **www.horizons.govt.nz**



Native Plants for Riparian Margins

Rangitikei Ecological Area

horizons regional council

2014/643

Native Plants
for Riparian Margins

Rangitikei Ecological Area

Below are native plants suitable for riparian margins in the Rangitikei Ecological Area. Included at the back of the information sheet is a plant list with each species environmental tolerances and habitat suitability.

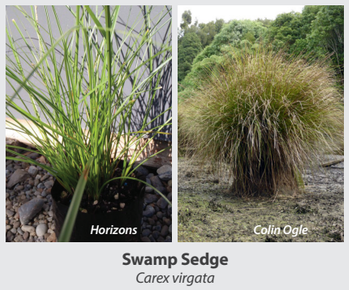
Unless otherwise indicated, all photos have been provided by Taranaki Regional Council

Narrow leaved ground cover

Flax, Harakeke
Phormium tenax

Mtn flax, Whariariki
Phormium cookianum

Purei
Carex secta



Swamp Sedge
Carex virgata

Toetoe
Cortaderia fulvida

Shrubs

Karamu
Coprosma robusta

Koromiko
Hebe stricta

Manuka
Leptospermum scoparium

Mingimingi
Coprosma propinqua

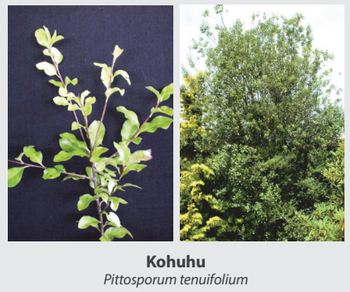
Trees

Cabbage Tree
Cordyline australis

Five-finger
Peudopanax arboreus

Kahikatea
Dacrycarpus dacrydioides

Kanuka
Kunzea ericoides



Kohuhu
Pittosporum tenuifolium

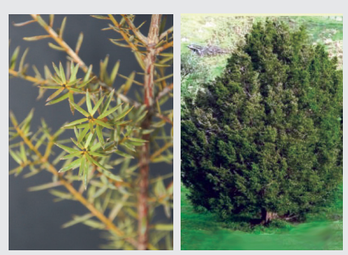
Trees

Kowhai
Sophora godleyi

Lemonwood
Pittosporum eugenioides

Long-leaved Lacebark
Hoheria sexstylosa

Ribbonwood
Plagianthus regius



Totara
Podocarpus totara

Appendix D
Vegetation Removal Protocols

Appendix A

Vegetation Removal Protocols

Adapted from:
Smith, D.; Borkin, K.; Jones, C.; Lindberg, S.; Davies, F.; Eccles, G. 2017. Effects of land transport activities on New Zealand's endemic bat populations: reviews of ecological and regulatory literature. NZ Transport Agency research report 623. Annex DH*.

*The protocols outlined in this document are currently under review by industry professionals are subject to change in the near future.

1 Introduction

This document presents Vegetation Removal Protocols (VRP) to be implemented prior to removal of all vegetation for the Marton Rail Hub Development (the Project). These protocols follow industry best practice adhering to both the Bat Management Framework set out by Waka Kotahi New Zealand Transport Agency (Smith et al., 2017) and the Department of Conservation's (DOC's) best practice manual of conservation techniques (Sedgeley et al., 2012).

The protocols aim to provide clear, concise procedures that are to be followed prior to the removal of all trees and vegetation in the proposed designation of the Project, with the goal of avoiding mortality or injury to long-tailed bats during clearance activities.

There are four protocols that must be followed:

Protocol A: Identification of potential bat roost habitat;

Protocol B: Pre-felling procedures;

Protocol C: Felling procedures; and

Protocol D: Bat Injury or Mortality.

These protocols are not project specific and a combination or a specific part of the methods can be used prior to vegetation clearance. The Project Bat Ecologist (PBE) to determine the most appropriate method for the Project.

1.1 Project Bat Ecologist

The implementation of these protocols must be undertaken by a nominated Project Bat Ecologist (PBE). The nominated PBE must be recognised by the Department of Conservation (DOC) as competent to Class C (Appendix A). Class A and B bat ecologists may form part of their team and undertake tasks outlined within this VRP under supervision from the PBE. The PBE is not required to be present at the site all the time but must retain sufficient oversight of their team to be confident good decisions are being made regarding presence/absence of bats and potential roost sites. However, the PBE is expected to be available to oversee vegetation removal.

2 Vegetation Removal Protocols

2.1 Protocol A: Identification of potential bat roost habitat

Prior to undertaking this protocol, ensure the clearance footprint has been visually delineated using flagging tape or boundary pegs, to ensure all trees that are required for removal are assessed appropriately. This also ensures that no more vegetation than necessary is removed.

1 All vegetation that might be disturbed and/or removed for construction must first be assessed by a competent ecologist (Class C) as either High-Risk or Low-Risk regarding the presence of potential bat roost features.

- **High-Risk** vegetation is defined as those possessing any suitable features to host roosting bats. This vegetation[1] is identified as being >15 cm Diameter at Breast Height (DBH) and possess one or more of the following features:

[1] Roosts tend to be observed in mature trees that are >15cm DBH; however, native bats have also been observed in tree ferns, cabbage trees and epiphytes, therefore this vegetation should also be considered as High-Risk.

- *Cracks, crevices, cavities and/or fractured limbs large enough to support roosting bat(s);*
- *Sections of loose flaking bark large enough to support roosting bat(s);*
- *A hollow trunk, stem or branch;*
- *Deadwood in canopy or stem of sufficient size to support roost cavities or hollows; and*
- *Bat droppings, grease marks and/or urine staining around cavities.*

- **Low-Risk** roosting trees include all trees <15 cm DBH and any trees >15 cm DBH that lack the characteristic features of a bat roost. These trees can be felled immediately without requiring further acoustic or visual monitoring. However, any vegetation that demonstrates evidence of roosting bats (e.g. roost features, droppings, grease marks, urine staining) should be treated as a potential roost tree and investigated accordingly.

2 All High-Risk trees shall be subjected to pre-felling monitoring as per Protocol B. Pre-felling vegetation assessments using acoustic or visual methods (see Protocol B for details) shall be undertaken only by an appropriately certified (by DOC) PBE with proven competency in the particular method.

3 No trees or vegetation identified as potential roosts can be felled or cleared without the approval of the PBE.

2.2 Protocol B: Pre-felling procedures

Once potential roosts have been identified using Protocol A, occupancy will be confirmed using one or a combination of methods outlined below, immediately prior to vegetation clearance. The most effective method will be determined by the PBE on a case-by-case basis.

If activity in the Project area is predictably low or uncommon, acoustic surveys are to be used in the first instance to determine occupancy of the potential roost trees. However, if occupancy is not able to be ruled out solely using this method, then visual surveys by way of arborist inspection and/or dusk emergence watches are to be carried out.

2.2.1 Acoustic Monitoring via Automated Bat Detectors

1 The identified potential roost trees will be acoustically monitored for a minimum of two consecutive nights immediately prior to felling. Monitors will be programmed to detect activity from one hour before dusk until one hour after dawn.

2 Ideally monitoring shall occur between October 1st and April 30th when bats are more active and less likely to be in torpor.

3 The following weather parameters must be met to ensure a valid night where bat activity is likely:

(a) Dusk temperatures must remain between 10-17°C.
(b) Rainfall must remain below 2.5 mm in the first two hours after dusk.
(c) Monitoring shall take place outside of a full moon and one night either side.

4 Where a night of monitoring is lost due to adverse weather or presence of a full moon, further monitoring must occur until two consecutive nights are achieved, with no bats detected.

5 The Automatic Bat Monitors (ABMs) should be placed so that detection of bats is likely if they are using the potential roosts.

6 ABM data will be analysed the morning of felling to indicate occupancy of potential roosts. If the PBE can confirm there is no evidence (e.g. no activity indicating roosting) for the two consecutive nights prior to felling, the tree can then be felled with the PBE present. However, if bat activity patterns suggest the possibility of bats roosting in the vicinity of the ABM, then visual inspections (see 2.2.2) will be necessary to confirm if it is an occupied roost.

7 Results of acoustic surveys will be clearly relayed to the clearance supervisor as soon as possible on the day of felling. The clearance supervisor will be either be given approval to remove the vegetation if the PBE is confident no bats are present, otherwise the PBE will communicate what further monitoring is necessary and associated timelines for this work.

2.2.2 Visual inspections

This method can be used in areas of common or expected bat activity and where arborists are able to reach all areas of the tree. It should be used as the next step if roosting is not able to be ruled out by ABMs. The project ecologist will inspect the roost feature if it is low enough on the tree to inspect from the ground. However, most features are usually higher and require inspection by an arborist or trained climber.

1 All vegetation identified as a potential roost may be inspected to confirm occupancy by roosting bats.

2 An arborist may undertake a visual inspection of vegetation by climbing (under guidance and supervision of the PBE) and relaying any potential evidence of bats (e.g. urine staining, cavities, droppings) by way of live audio-visual equipment and/or photographs for review of the PBE. This must be undertaken immediately prior to (same day) removal. The arborist will also check for signs of roosting bats using a handheld bat detector (to detect social and echolocation calls from roosting bats).

3 Arborists may carefully inspect and check the extents of split branches, and if necessary, use an endoscopic camera to inspect cavities for presence of roosting bats.

4 If potential roosts are located within tree ferns or other 'delicate' vegetation, climbing will only be undertaken if it is safe to do so for the climber and if this will not damage the roost or disturb potentially roosting bats at the time of inspection. All climbing must take place under the careful supervision of the PBE to prevent roost damage or disturbance/injury to roosting bats.

5 If no bat activity or evidence of roosting bats at the potential roost trees is identified and the PBE determines the vegetation can be removed, this information should be relayed to the contractors in sufficient time to allow contractors to clear vegetation prior to dusk the same day.

2.2.3 Dusk/Dawn Roost Watches

This method should be used if potential roosts cannot be ruled out using acoustic monitoring and/or visual inspection techniques (e.g. high bat activity areas, vegetation that is unsuitable for climbing). In this instance, the following methodology should be implemented.

1 Observations should begin before sunset. Bats begin to leave their roosts while there is still light outside therefore there is potential to observe bats without the aid of cameras or video equipment.

2 Ambient temperature should be >10°C and there should be no precipitation (otherwise bats may not emerge).

3 Observations shall be carried out close to potential roost sites where flying bats are back-lit against the sky (where possible). It may be useful to have more than one person observing potential roost sites from different angles to determine precise trees or vegetation and exit holes.

4 A thermal Imaging camera should be used wherever possible to assist in the detection of bats and provides the opportunity to review footage should there be any bat passes observed and/or heard.

5 Hand-held bat detectors should be used to alert the ecologist(s) to the presence of bats nearby, narrowing down the potential roost site locations and allowing roosts to be confirmed.

6 This method should be repeated at dusk and dawn (return observations) for two consecutive nights prior to felling.

7 If no bat activity at the potential roost trees is identified and the PBE determines the vegetation can be removed, this information should be relayed to the contractors in sufficient time to allow contractors to clear vegetation prior to dusk the same day.

2.3 Protocol C: Felling Protocol

1 If bats are confirmed, via either of the methods detailed above, to be roosting within the tree, it must not be felled. The following actions will be taken:

(a) Roost trees should be clearly marked, and all relevant staff briefed to ensure the tree is not removed. DOC will be informed by email with relevant information such as photos, GPS co-ordinates.
(b) Felling around the roost must not occur within a tree length of the roost and disturbance minimised, particularly around dusk/dawn.
(c) Further acoustic and/or visual monitoring must continue until the PBE can confirm that no bats are roosting within the vegetation in question.
(d) If bats are confirmed to still be roosting within the vegetation after seven days of monitoring, then a meeting between all stakeholders as well as a council representative and DOC staff will be held to decide an appropriate way forward. This will be a risk assessment-based approach dependent on the type of roost identified.

2 The PBE should be onsite to supervise all potential vegetation clearance operations to advise staff should bats be detected (either leaving trees or injured) and to inspect each felled tree or vegetation for signs of bats. Removal must occur on the same day as per the pre-felling procedures listed in Protocol B.

3 If bats are detected while felling is in progress, felling must stop long enough to allow any uninjured bats to escape (if it is safe to do so). Every effort should be made to relocate the section of the trunk/branch where the bats were roosting before felling may recommence.

4 Attempts should be made to capture any observed bats by the PBE for injury assessment.

5 Uninjured bats will be released immediately and if any injured or deceased bats are salvaged, Protocol D shall be implemented

6 All High-Risk trees shall be thoroughly inspected immediately after felling with the aid of a handheld detector by the PBE, to check for any roosting bats remaining within the tree.

7 If any injured bats are observed during/after vegetation clearance, then Protocol D must be implemented.

2.4 Protocol D: Bat Injury or Mortality

In the event of finding a dead or injured bat(s) the following procedures will be implemented:

1 Injured bats will be placed in a dark material-lined bag by the PBE (Class D) to ensure the bat is handled appropriately.

2 Injured bats will be taken immediately to the nearest available veterinarian for assessment/treatment. The vet will make a decision as to whether to euthanise the bat or not (this does not require DOC approval). If the vet decides that the bat can be rehabilitated, the vet will contact DOC on the emergency hotline (0800 362 468)

3 If the bat is dead or has been euthanised by the vet, it will be taken to the local DOC office as soon as practicable (required under the Wildlife Act, 1953). The bat(s) must be stored in a fridge at less than 4°C.

References

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, Version 1.0. Inventory and Monitoring Toolbox: Bats, Department of Conservation.

Appendix A
Bat Ecologist Competency Levels*

*These are currently under review by industry professionals and are subject to change

Class	Key Field Activity	Competency	Individual Experience/Knowledge
A	*ABMs*	*Setting up automatic bat detectors monitoring systems (ABMs)*	*Recent previous experience in installing ABMs in at least 2 comprehensive surveys*
B	*Analysing ABMs*	*Setting up ABMs, and analysing and interpreting results*	*Recent previous experience at analysing and interpreting ABM results in at least 2 comprehensive surveys*
C1	*Identifying bat roosts (short tailed bats)*	*Finding and identifying short-tailed bat roosts that are either occupied or unoccupied. This competency may also include arborists*	*Recent extensive experience in searching for and finding active and inactive roost (by radio tracking, exit observations, and/or visual inspections)*
C2	*Identifying bat roosts (long tailed bats)*	*Finding and identifying long-tailed bat roosts that are either occupied or unoccupied. This competency may also include arborists*	*Recent extensive experience in searching for and finding active and inactive roost (by radio tracking, exit observations, and/or visual inspections)*
D	*Handling bats*	*Handling bats (in one or more field methods), as outlined in DOC's best practice manual (Sedgeley et. al. 2012)*	*Has undertaken field training from a competent trainer demonstrating the required technique to the trainer's satisfaction and meets DOC's best practice manual standards (Sedgeley et. al. 2012) to carry out one or more of the following specialised field methods:* · *extracting bats from mist net using harp traps at roost sites* · *handling bats* · *marking bats (e.g. forearm band, temporary marks)* · *using wing biopsies for genetic sampling attaching transmitters* · *inserting transponder tags* · *applying release technique*
E	*Trainer for class X*	*Competent at the relevant class plus capable of training staff*	*Has a high level of knowledge and experience regarding the competency they are training people in.*
F	*Bat Management*	· *Survey/monitoring programme design*[2] · *Survey data analysis and interpretation*[1] · *Preparation of bat impact assessment reports*[1]	· *Competency in 3 or more of A/B/C/D activities (field experience relating to competency classes A/B/C/D activities)*

	· *Can recommend impact management strategies (e.g.: mitigation) for projects*[1] · *Prepare, co-author, or certify the appropriateness of BMMPs*[1] *Presentation of expert evidence for projects impacting bats*	· *Experience writing ecological assessments and/or species restoration or recovery plans Thorough knowledge of available bat survey techniques and methodology, and their limitations Thorough knowledge of the threat's bats face and national recovery actions* · *Thorough knowledge of measures to avoid, mitigate or compensate for impacts of infrastructure projects on bat populations* · *Understands seasonality and conditions of bat activity, and how these might affect surveys* · *Can recognise and articulate how the practical constraints of a survey affect the conclusions in an impact assessment* · *Understand the importance of sampling design and sample size (effort) in determining whether monitoring results will have sufficient statistical power to detect changes in the variable of interest*

1 http://www.DOC.govt.nz/our-work/biodiversity-inventory-and-monitoring/bats/

2 May be undertaken by individuals or a team which collectively has these competencies

wsp.com/nz