Mananui Mineral Sands Project

Ecological Assessment

Prepared for Westland Mineral Sands Co. Ltd

18 November 2024

Document Quality Assurance

Bibliographic reference for citation:

BlueGreen Ecology Limited 2024. *Mananui Garnet Mine: Ecological Assessment*. Report prepared by BlueGreen Ecology Limited for Westland Mineral Sands Co. Ltd.

Authors:	Dr Vaughan Keesing Senior Ecologist BlueGreen Ecology Limited & Ms Taralee Harvey-Brown Boffa Miskell Limited Ecologist	
Status: Final	Revision / version: E	Issue date: 18 November 2024

Template revision: 20150331 0000

Cover photograph: scattered Kahikatea in the lower wetland© Boffa Miskell Ltd, 2023

Executive Summary

A proposed sand mine at 713 Ruatapu Road (Lot 1 Deposited Plan 3854 in Certificate of Title WS8C/973), requires the removal of native forest fragments set in pasture, and the diversion of a number of drainage channels.

Site investigations were undertaken (in 2018 and in 2023 in winter) to understand and describe the ecological nature and condition of the affected features. The studies included consideration of natural inland wetlands, remaining forest fragments and waterways.

Native bat, bird and lizard specific surveys were conducted in the spring-summer of 2023-2024. No bats or lizards were reported. With respect to the avian survey the values of the site, some very high, were all associated with the wetland and Mahinapua Creek and none with the pasture forest fragments.

Following habitat surveys of the 4.2 ha of forest fragments (comprising 7 fragments) and comparison studies of the escarpment forest and southern Department of Conservation Reserve, we have been able to assess the ecological value and RMA significance of these fragments, describe their composition and condition, and form an opinion as to the fauna supported.

No natural inland wetlands are considered present west of the escarpment, within the pasture. To the east of the escarpment, a WCRC Land and water plan schedule 2 wetland was determined to be significant (in accordance with schedule 1 of the WCRLWP) and of 'very high' value (and therefore schedule 1). Adjoined is a schedule 1 wetland. Both (the entire wetland feature) is a "natural inland wetland" as per the NPS-FM (2020). The wetland in total is very representative and contains high value fauna and is of considerable size and quality and of very high value. These wetlands are not directly nor indirectly (via hydrology) adversely affected by the proposed activities.

There is one artificial channel that has naturalised and contains low numbers of indigenous fish, and a number of highly modified drains on the property without habitat potential. Salvage of fish is recommended so that these species are not harmed.

The removal of 4.2 ha of low value forest fragments which are largely canopy remnants without much in the way of ground tier, or middle tier, will have a less than minor adverse effect. There will be faunal management requirements to ensure harm is minimised to indigenous bird nesting, and any indigenous gecko or bats (should either be found present in the upcoming spring-summer surveys). Such protocol are standard practice with generally accepted methods.

There are no SNA affected. I do not consider the pasture fragments to be part of adjacent better bush areas on DoC land or the eastern escarpment forest and wetland (even though historically they were) because they are sufficiently separated now and different in condition, value and composition and do not and values or functions to those larger SNA as to be included or incorporated. Restoration (as a remedy to the forest loss) of approximately 4.75 ha of broadleaf/podocarp forest is proposed along the western boundary of the avoided escarpment forest. This, under section 1.7 (Maintenance of IB) in the NPS IB (2023) will cause the maintenance of indigenous biological diversity on the property. The escarpment forest is critical as a buffer to the significant eastern wetland from both the proposal and the existing (and post-mining) farming land use. The proposed revegetation would create a wider forest with better resilience and remove the current stock access. Two volunteered indigenous wetlands, not associated with an adverse effect to any wetland, are proposed as part of the 1.7 km long and 30m wide restored forest edge (Ca. 2.37 ha) and these will improve long term water quality discharged to the east wetland.

The application (following the ecological recommendations in this report) will result in a net ecological gain for the property and better secure the valuable and significant eastern features. It is important to note that in the absence of this proposal, under the status quo, the poor-quality forest fragments will slowly disappear, and the escarpment forest and wetland will continue to be challenged by adjoining land uses.

With the effects management proposed (a remedy) in this report and the ecological benefits proposed, the result of the application will be a proposal consistent with planning and policy provisions (the maintenance of indigenous biological diversity) and a net ecological gain.

One of the safeguards is that the effects to the forest fragments occur either periodically or in the first year such that the remedial works/ restoration are undertaken well before the mining activity closes and it is expected that the full restored area will be in place and most or even all will have been established 5-10 years before the mine activity is finished. This gives a certainty to success as monitoring will show well before the consent (and mining) is completed such that further remedial actions can be guaranteed where such is tied to the conditions of consent.

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1 Introduction

1.1 Project Background

Westland Mineral Sands Co. Ltd commissioned Boffa Miskell Ltd and then Bluegreen Ecology limited to carry out an ecological values and effects assessment to assist in consenting a sand mining project at Mananui, West Coast, NZ. As part of that process, we have undertaken a range of ecological surveys, desktop and historic data collection and made values and significance assessments based on new statutory processes, including the National Policy Statement for Freshwater Management (2020) (NPS-FM) and National Policy Statement for Indigenous Biodiversity (2023) (NPS-IB), as well as the West Coast Regional Policy Statement (2020).

The proposed mining site is located 7km southwest of Hokitika at the address of 713 Ruatapu Road, between the inlet of Tūwharewhare (Māhinapua Creek) and State Highway 6.

There is a high concentration of particular minerals which are the target of the application in the property and especially so towards the south and eastern end of the property. The property is on sand dune rolling country, which is relatively clear of indigenous communities, although there are remnant vegetation fragments over laying some of the denser mineral deposits. There are areas beyond the pasture and outside the proposed mining area which are indigenous forest and natural inland wetlands. A large wetland complex is recognised in the Regional Plan (Plan change 1 - schedule 1 & 2 wetlands (HOKPO20a –Tūwharewhare and Lake Tarleton)) as shown below (Figure 1). Schedule 1 wetlands (coloured red) are those confirmed as significant, schedule 2 (coloured blue) are those suspected of being significant and require ground truthing.

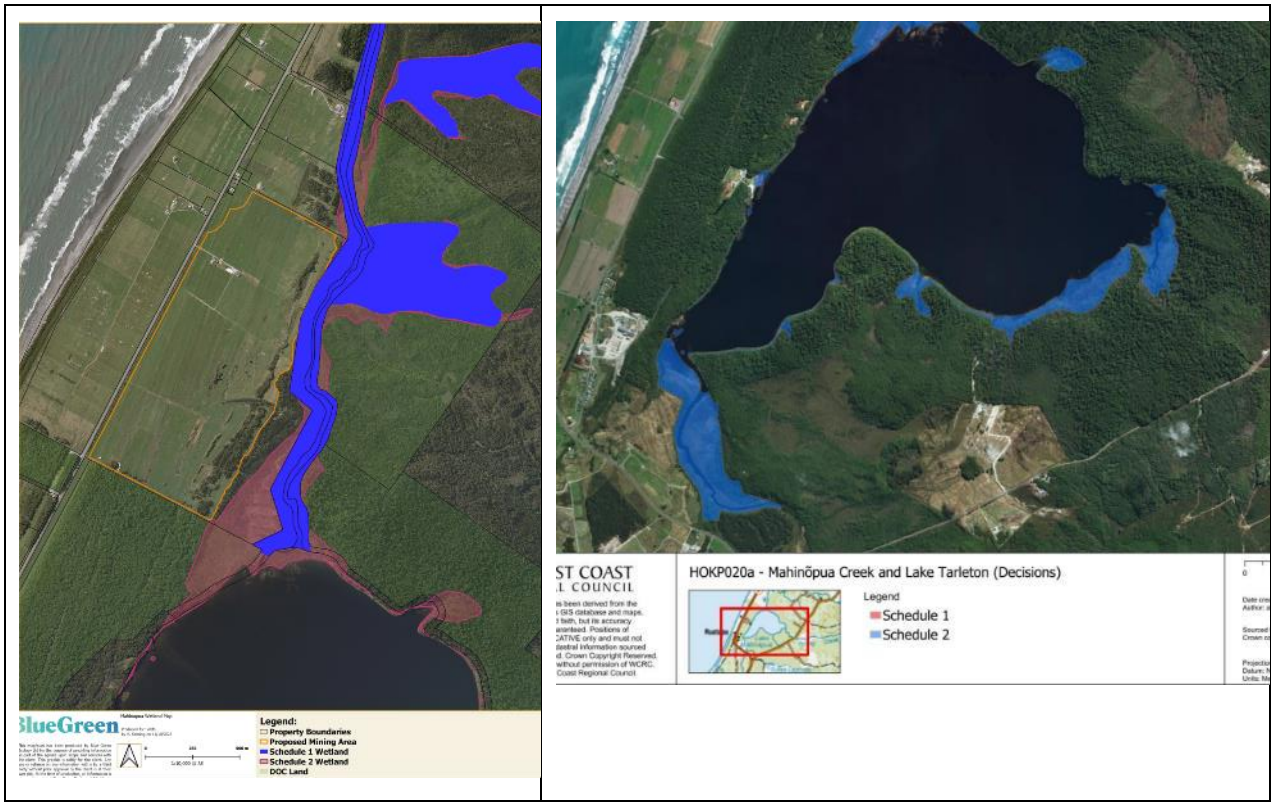

Figure 1. Schedule 1 and 2 wetlands and the property (outlined in yellow)

One of the objectives of this assessment is to test the schedule 2 wetland area associated with the property against the ecological significance criteria in the WCRLWP, as well as better define the wetland boundaries as prescribed by the NPS-FM methods for wetland delineation (delineation protocol, MfE 2002).

The recognition of the wetlands and the buffering forest escarpment as ecologically significant was made in an earlier BML survey and report for a different client and the wetland was recognised as significant under regional significance criteria set out in the West Coast Land and Water Plan (schedule 3).

The forest on the site beyond the wetland and dune escarpment has been slowly reduced in size and degraded in quality through the years and is not part of the recognised scheduled wetlands. The Westland District does not, as yet, have a set of mapped Significant Natural Areas (SNAs), therefore the forested areas on the property have not previously been tested for significance. We test the significance of those features in this report.

The Westland District Council maps show the lake as a site significant to Māori (SASM 110 and 111) which includes the river as far as the coast. The DOC managed forest around the lake is identified as an outstanding natural landscape in the same maps. The property only has a Pounamu management area overlay, and no SNA or any other environmental layer has been identified.

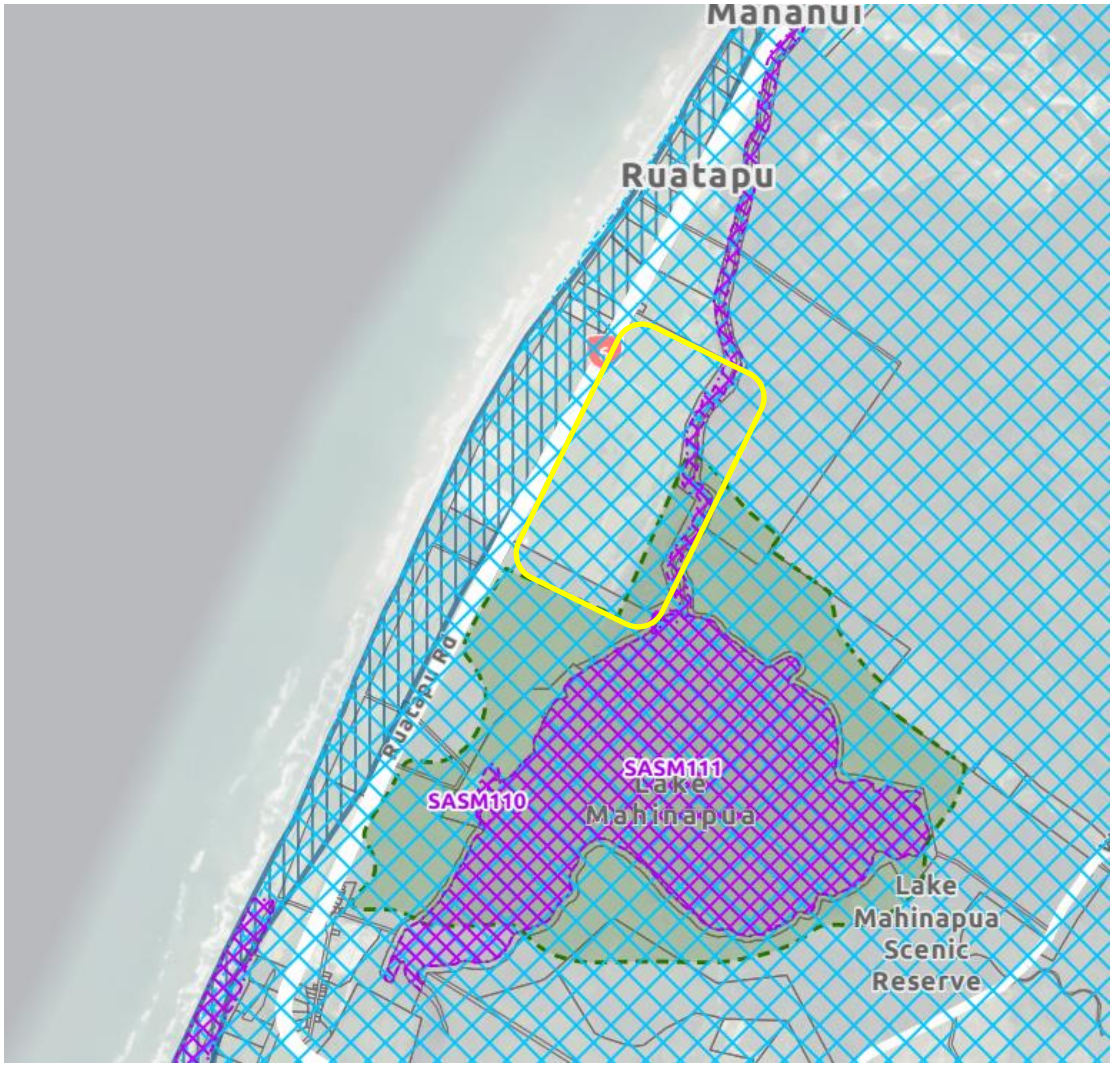

Figure 2 West Coast Districts mapped "values" for the site and general location, and property indicated in yellow.

The current land use at the site is grazing and there are no fences or other barriers to prevent livestock entering the remnant forest fragments, the escarpment forest, or the lower Tūwharewhare edge wetlands.

The site is adjacent to Department of Conservation lands, and there is a considerable area of protected lands / habitats between Ross, Hokatrika and the central divide (Figure 3)

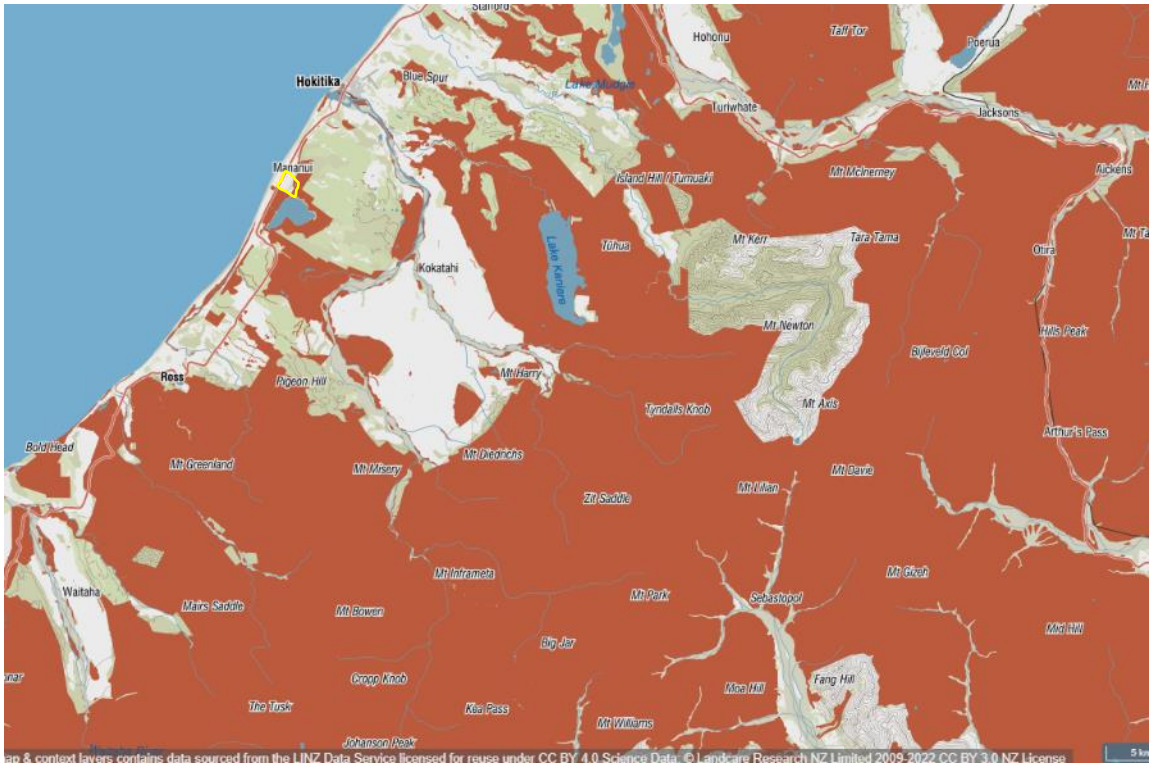

Figure 3. Protected Areas Network (red). The site is approximately out lined in yellow.

An aerial photograph from 1951 (below, Photo 1), shows that at that time a substantial part of the southern half of the property still retained large areas of broadleaf/podocarp forest on the dunelands, while the northern portion was relatively clear and used (initially) for dairying. It is this southern area that retains the majority of the remnants today, although much reduced from 1951.

As the Retrolens historic aerial photographs from 1981 show (below , photo 2) the south-eastern corner of the property has had remnant trees present across the pasture and in four loose clusters from larger areas in the south, to smaller areas in the north. The cut drain is evident, and there is no suggestion of the presence of any wetlands. Disturbance can be seen in the north towards the Creek in the lower natural wetland. In 1984 this pattern was similar, while the 1988 aerial shows a considerably increased spacing between the fragments and trees. By 2020 the extent of indigenous trees has reduced considerably, and pasture now dominates all but four much thinner stands of trees.

Photo 1. 1951 aerial (Tai Poutini resources).

Various google earth images between 2010 and 2022 (Photo 2) show standing water in a number of the dune hollows that were previously planted in hedge rows, but these features have not been natural wetland dune hollows since at least 1980 and likely never, given it would all have been tall forest like the southern DoC lands (i.e. a hinau / kamahi with varying amounts of kahikatea and totara).

1981

1984

1988

2020

Photo 2. Series of aerial photographs of the site through time

1.2 Scope and Objectives of this report

This report will describe and evaluate the terrestrial and aquatic ecological features, including flora and fauna, determine ecological values and significance and work through the effects management hierarchy as it relates to the mining proposal. The assessment considers inland natural wetlands and waterways as per the NPS FM (2020), and also reflects the NPS IB (2023). Fauna surveys have been undertaken in November 2023 (bats, reptiles, bird), which have informed this assessment. The effects management (Section 8 of this report) will consider the hierarchy as outlined in the NPS FM (2020, 3.21(1)) and NPS IB (2023, clause 1.6) i.e.– avoid where practicable, minimise where practicable, then remedy where practicable, and only then offset more than minor residual effects (followed by compensation) (section 8.3 of this report). It acknowledges the new offset principles of Appendix 3 (NPS IB (2023)). The above culminates in an ecological values and effects assessment report.

This assessment also considers the RPS schedule 1 and 2 wetlands (on the property), as there is a requirement to test the schedule 2 area under the Regional policy criteria. From an ecological perspective, I have advised the company in preliminary discussions on the proposal that mining the wetland should be avoided, and this was accepted.

The focus of the ecological work, given previous studies (Boffa Miskell 2019), was to assist the client to ensure the mine development could meet the consenting pathways provided within the national policy documents including

complying with the effects management hierarchy, and ultimately would result in true ecological gains and net benefits both on site, and locally ,through functional and connectivity and buffering improvements.

1.3 The Study Area

The Study area is South of Hokitika, within the West Coast region and Westland District boundaries. The site address is 713 Ruatapu Road, Lot 1 Deposited Plan 3854 in Certificate of Title WS8C/973, and is 140.2-hectares in size. The project site is within the Hokitika Ecological District and the broader Whataroa Ecological Region (McEwen, 1987).

2 Methodology

2.1 Desktop Review

A desktop review was undertaken to gather information on the existing ecological values within and adjacent to the property. The desktop review included reviewing:

- Recent aerial imagery, including Google Earth;
- GIS (Geographic Information System) databases including:
  - Topographical (Topo50) data (Land Information New Zealand);
  - Threatened Environment Classification (Walker et al. 2015);
  - Ecological region and ecological district GIS layers (from data.govt.nz);
- Ecological databases including:
  - DOC Herpetofauna database records;
  - Bird records for the general area on the New Zealand Bird Atlas[1]; and
  - The NIWA-administered New Zealand Freshwater Fish database (NZFFD)[2].
- Online Westland District Plan Maps.

Prior to the site visit, a vegetation map was prepared using high resolution aerial photography. This map formed the basis of the field investigations and descriptions of vegetation and habitat.

2.2 Site Investigations

In addition to site data gathering completed by BML in 2018 and existing published data, the site was visited from the 13th to 14th of June 2023 by two ecologists between the hours of 10.30am and 7.30pm. The site investigation consisted of walking through the site collecting qualitative data and quantitative data at representative locations (including wetlands). The collection of data included representative vegetation RECCE plots (Figure 4). It also included two 10m by 50m survey areas (transects) in the fragmented forest, to establish the density and diameter at breast height (DBH) of canopy trees. The forests of both the southern adjacent DoC managed lands and the wetland escarpment to the east (and the further east wetland) were also assessed, despite being outside the mining area and therefore not directly affected, but to provide a comparison and to understand what adjacent values might be affected indirectly. Photographs were taken of all plots and all areas of interest, and the plots were GPS located. These photographs are provided ().

Avian data included opportunistic encounter records, and then from 7-9th November a formal avian survey was conducted in forest and the eastern wetland. The methods included 5 minute counts at 11 forest locations and along transects in the Mahinapua Scenic Reserve and point counts (Dawn and daytime) in the eastern wetland.

[1] NZ Bird Atlas grid square: https://ebird.org/atlasnz/block/blkCY46 – accessed 18 November 2022.

[2] This database holds records of freshwater fish distributions and occurrences based on previous surveys.

Lizard surveys were carried out between 6 and 8 November 2023 to determine presence of species within or near the Project Site. The lizard survey used passive techniques consisting of diurnal and nocturnal visual encounter surveys (VES), manual searches and tracking tunnels.

For bats an acoustic bat survey was undertaken using Song Meter Mini Bat (Wildlife Acoustics) full spectrum recorders which passively record both long-tailed bat (at 40 kHz) and short-tailed bat (at 28 kHz) echolocation calls. The surveys were conducted over 24 nights during November 2023. 11 ABMs were deployed. Habitat features preferred by long-tailed bats for roosting, commuting, and foraging were targeted.

In summary during the vegetation surveys:

- The plant communities within the site were classified using the classification system and naming conventions developed by Atkinson (1985);
- Plant species, and their overall cover (using the 'DAFOR' scale) was recorded in each of the main vegetation communities;
- Recce plots (Hurst & Allen, 2007) were undertaken in representative vegetation communities;
- General notes were made on the condition of the plant communities and habitats present;
- A roaming inventory was compiled of all bird species seen and heard, and incidental observations of other terrestrial fauna were recorded followed by formal avian surveys in spring.
- Habitat suitability for terrestrial indigenous fauna (lizards and terrestrial invertebrates) was assessed; and formal survey carried out in spring.
- An acoustic survey was carried out over 24 nights in spring for bats near and in the forest fragments
- A handheld Garmin Global Positioning System (GPS) was also used to mark locations of interest, photographs were taken and field notes were recorded.
- Threatened plants: The current conservation status was assigned via New Zealand plant conservation network (de Lange et al., 2018; New Zealand Plant Conservation Network, 2019).
- Terrestrial Invertebrates: Surveys were not conducted for terrestrial invertebrates and the modified fragments affected are highly unlikely to support any invertebrate fauna that is specific to the fragments and is not better represented in the adjacent unmodified (relatively) DoC managed and escarpment areas.

Waterways

- The three potential waterway features were walked to establish the presence of surface water, assess riparian condition, define the presence of an active bed and the quality of the aquatic habitat. The use of historic aerial imagery was also pivotal in determining the classification of the water ways (artificial or natural). At night these waterways were viewed by torch (spot lighting), to establish if fish, and if so, what species were present.

Wetland

- The farmed pasture area was walked and wetlands within identified (where present) using the rapid wetland assessment (Clarkson, 2013; Ministry for the Environment, 2020), i.e. the presence of cover of wetland obligate and wetland facultative species (as well as pasture species which are wetland species, but not listed in the MfE pasture list).

  The walked forests, wetlands and nocturnal streams also afforded observation of a number of fauna, most especially birds and these were recorded. The location of the vegetation plots and transects is shown on Figure 4.

E-DNA

No samples were collected for E-DNA analysis on the site. The on-site features did not warrant a survey as there was little water to sample and no area that could not be directly sampled. In terms of Tūwharewhare, E

DNA sampling would have returned results for the wider catchment above the site, but not what was relevant to the site itself, the immediate receiving habitat of any discharges. Some E DNA samples were collected in the lower river to illustrate what that might reveal although that data has not been processed yet. There is existing EDNA data for the lake.

Figure 4. Survey vegetation plot and transect locations.

2.3 Assessing Significance

Section 6(c) of the RMA requires the ecological significance of a site to be determined. The NPS-IB also requires District Councils to map SNAs within their district. Westland District Council has not as yet identified its SNAs. Reflecting this, criteria to assess significance has been set within the current Regional Policy Statement (see Appendix 6 of the RPS).

The assessment criteria in the recent NPS IB (2023) must also be considered. The NPS IB (2023) assesses significance based on 4 overarching criteria (as below). Appendix 4 to this report reports the NPS IB criteria and their assessment guidance and details.

In accordance with the NPS-IB, an area qualifies as a significant if it meets any one of the attributes of the following four criteria:

(a) representativeness:
(b) diversity and pattern:
(c) rarity and distinctiveness:
(d) ecological context.

2.4 Evaluation of the Ecological Value and Effects

2.4.1 Assessing ecological value

'Significance' and 'Ecological value' are separate aspects of a feature (Roper-Lindsay et al., 2018). A significance assessment under Section 6(c) of the RMA, does not provide the range of information necessary for an effects assessment under Schedule 4 of the RMA. For this reason, we undertake a values assessment following the EIANZ (Roper-Lindsay et al., 2018) which provides a score for ecological value ranging from 'low' to 'very high'.

Habitats are tested using a range of sub criteria (Table 4, page 64, EIANZ (2018)) under: Representativeness, Rarity / distinctiveness, Diversity & Pattern and Ecological Context.

Regarding species, many New Zealand biota have been assessed by DOC against a standard set of criteria and lists published for each taxonomic group (Townsend et al., 2008) and regularly updated. This provides a consistent basis on which to assign ecological value for individual species.

Table 1: Assigning value to species for assessment purposes (from EIANZ (2018).

Determining factors	
Nationally Threatened species, found in the ZOI either permanently or seasonally	Very High
Species listed as At Risk – Declining, found in the ZOI, either permanently or seasonally	High
Species listed as any other category of At Risk, found in the ZOI either permanently or seasonally	Moderate
Locally (ED) uncommon or distinctive species	Moderate
Nationally and locally common indigenous species	Low
Exotic species, including pests, species having recreational value	Negligible

2.4.2 Assessing magnitude of impact

Once the value of the ecosystem components has been determined, the magnitude of the effect is assessed (Table 2). Magnitude of effect is a measure of the extent or scale of the impact, its duration, and the degree of change that it will cause (Roper-Lindsay et al., 2018). A typical scale of magnitude ranges from 'negligible' to 'very high' (i.e., severe). The overall level of effect is then assessed using the below matrices, regarding both the magnitude of the effect and the ecological value of the area or community affected.

Table 2: Criteria for describing magnitude of effect (from 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 one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances 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 or range of the element/feature

2.4.3 Assessing level of effect

The ecological value and the magnitude of effect are then used as inputs into table 3, to determine the effects of the project on the ecological elements of a site. This process was developed so as to enable consideration of the effects management hierarchy, which sequentially considers avoidance of values, minimisation of effects, the remediation of affected values, and then the offsetting of any residual adverse effects which are more than minor (or, lastly, compensation of those residual effects if required). The following assessment leads to the level of effect to be managed.

Table 3: Criteria for describing level of effect (from EIANZ (2018)

Ecological Value ▸ Magnitude ▾	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

EIANZ (2018) guidelines note that the level of effect can then be used as a guide to the extent and nature of ecological response required (including the need for biodiversity offsetting). The new NPS IB (2023) also addresses this identifying a hierarchy of effects management related to significant adverse effects outside of SNA, and the need to maintain IB and for habitat of highly mobile fauna for other adverse effects. The NPS IB still requires, however, that the level of effect including residual effects is understood. With respect to the EIANZ examples are:

- **'Very high'** and **'High'** represent a high level of effect on ecological or conservation values and warrant avoidance and/or extremely high intensity mitigation and remediation actions. Biodiversity offsetting should be considered where these adverse effects cannot be avoided.
- **'Moderate'** represents a level of effect that requires careful assessment and analysis of the individual case. Such an effect could be mitigated through avoidance, design, or extensive appropriate mitigation actions.
- **'Low'** and '**Very low'** should not normally be of concern, although normal design, construction and operational care should be exercised to minimise adverse effects. If effects are assessed taking mitigation into consideration, then it is essential that prescribed mitigation is carried out to ensure Low or Very low-level effects.
- **'Very low'** level effects can generally be classed as 'not more than minor' effects.

3 Results - Desktop Review

3.1 Ecological Context

The Site sits in the Whataroa Ecological Region (ER), in the Hokitika Ecological District (50.01).

The Whataroa ER contains a large proportion of primary forest which often exists contiguously from the alps to the ocean, covering whole catchment systems (e.g. the catchment of the Mikinui River). These areas are considered intact, highly functional, and resilient systems, requiring little outside management beyond control of exotic pest mammals. This contiguous indigenous cover from alps to ocean while common on the west coast, is rare nationally (Westland Tai Poutini National Park Management plan 2001-2011 (2014)).

3.2 Historical Vegetation

Vegetation, prior to clearance and farming of the site, was a back dune complex of tall forest comprised of: rimu-rata/kamahi-hinau forest and kahikatea forest in the damper areas and totara in the drier – coastal areas. An example of this forest type is found to the south of the site, within Lake Māhinapua Department of Conservation Scenic Reserve, (Singers & Rogers, 2014), (Leathwick et al., 2004). Historically the active dunes were spinifex-Pingao with a variety of shrubs such as sand pimelea and sand coprosma moving up into stable dunes of harakeke and mahoe wind shared low coastal shrub, blending with increased shelter to mahoe with totara with kamahi and then hinau back into what is present today in the DoC areas of hinau with kamahi and rimu eventually with kahikatea toward the lake and creek. The “coastal environment” has shifted with 1000s of years and the vegetation community today suggests that the influence of the coast is pronounced in the first 100m back from the harakeke sand edge. The sequence is from active foredune to stabilising hind dune with harakeke to stable hind dune in mahoe to old dune in totara-kamahi. We illustrate the extent of the coastal environment related to vegetation pattern in Figure 5.

Figure 5. Google maps aerial of Mananui bush which s at the southern limit of the property.

3.3 History of Land Use & Modification

Following on from the gold rush and then native forestry industry (1864-1900), European farming started in the area from 1867, with dairy farming prominent on the flats from that time (Woodham (Havill) 1981). It is likely that much of the original vegetation was cleared in the years following 1864, being close to an area of settlement (see 1951 aerial photograph above).
The dairy farming operation at the site ended in the 1980s and since that time the site has been grazed. The remaining areas of fragmented primary forest in the south-eastern area were progressively removed to enhance farming operations in the 1980s-2000.

3.4 LENZ Threat Classification

Under the Land Environment New Zealand threat classification (Landcare Research Ltd, 2012) the site is not 'At-Risk' and not 'Under-Protected'. Over 30% of this environment type remains in indigenous vegetation and of that, more than 20% is legally protected (i.e., Category 6 within the Threatened Environments Classification reference).

3.5 Avifauna

Twenty-five bird species were recorded during the 5MBCs conducted in the forest fragments on site (Figure 6), including 14 indigenous species and 11 introduced species. One Threatened species was recorded, Australasian bittern. The bittern was heard in the adjacent Māhinapua Creek Wetland. All other indigenous species recorded are Not Threatened. Sixteen species were recorded during the 5MBCs conducted in the Māhinapua Scenic Reserve, including 11 indigenous species and five introduced species. See Appendix 6.

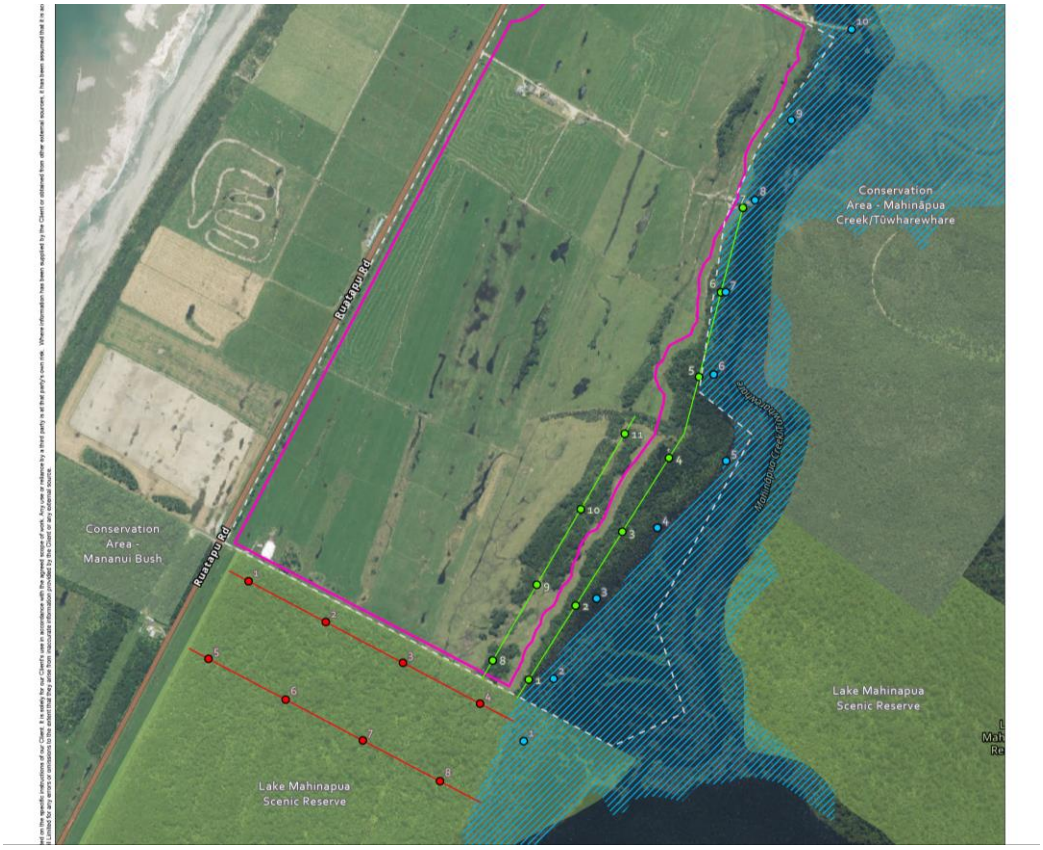

Figure 6. Avian survey transects and point count locations. Red = Scenic reserve trans, blue eastern wetland point counts and Green, site forest fragment transects.

During the eastern wetland point count surveys Australasian bittern and South Island fernbird were detected (Figure 7). Bittern were heard at six point count locations and based on the direction and volume of the calls it is likely that this represented two individuals, one that was repeatedly heard at the southern extent of the survey transect in rushland, and one near the northern extent of the survey transect in an area of open water bordered by flaxland.

Over the point count survey duration, four incidental bittern observations (calls heard) were made while walking between point count locations 1, 2, 3 and 4. All calls were heard to the south and are assumed to be the same individual heard during the point counts.

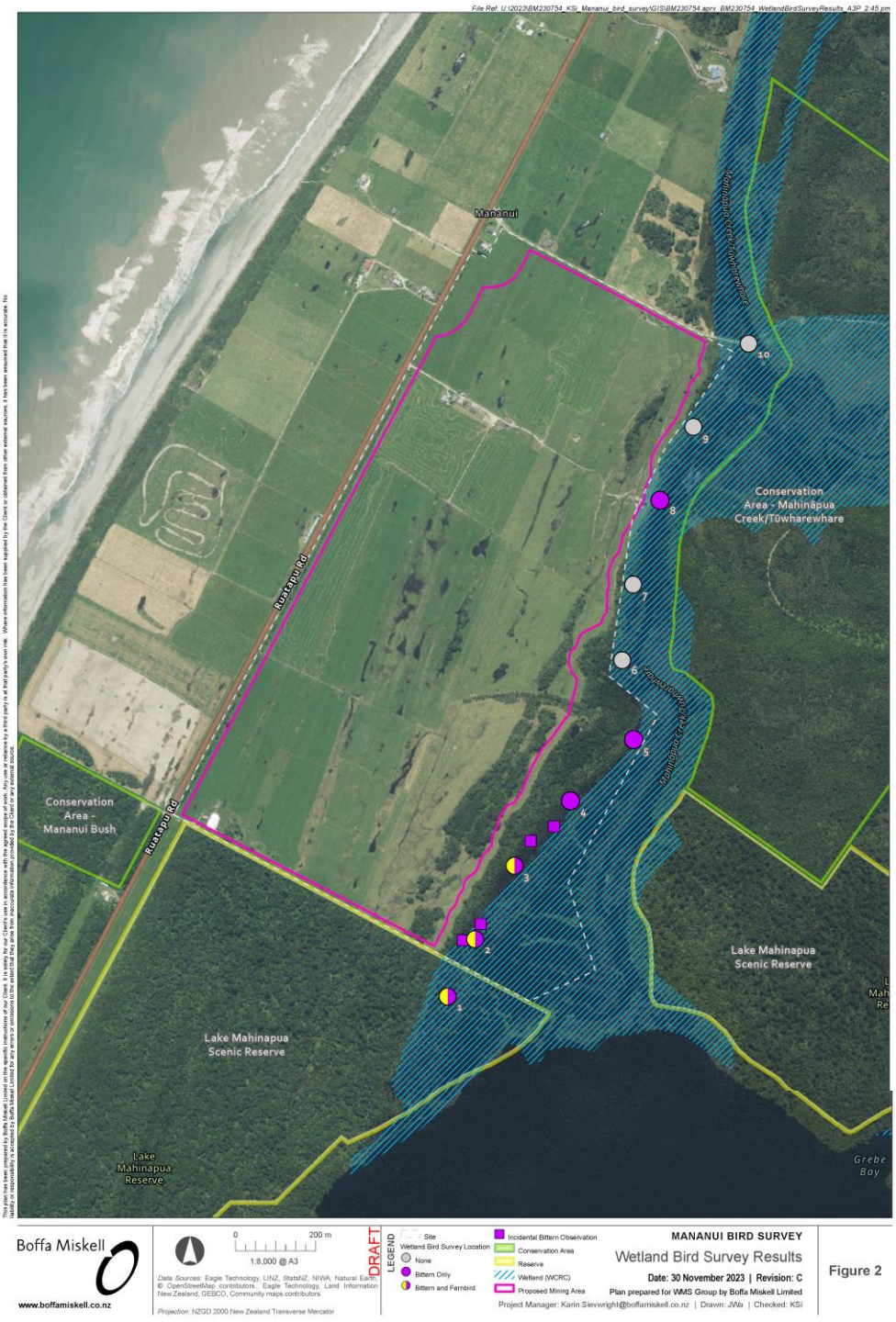

Figure 7. Wetland avian survey results.

Eight species not recorded during the formal surveys were incidentally observed (seen and or heard). All incidental observations were of indigenous species, including one Threatened species (White heron in the eastern wetland), two At Risk species (black and little shag, over the eastern wetland).

3.6 Herpetofauna

The likely presence of lizards was informed by the DOC publication, Conservation of lizards in West Coast conservancy (Whitaker & Lyall, 2004, Department of Conservation Herpetofauna Database (BioWeb)) and then by specific survey (Appendix 7).

Of the four lizards potentially present, two of these, the West Coast green gecko and the speckled skink are listed as 'Threatened (Nationally vulnerable)' and 'At Risk', respectively (Hitchmough et al 2015). The other two: common grass skink (*Oligosoma nigriplantare polychroma),* and forest gecko (*Hoplodactylus (Mokopirirakau) granulatus*) are more likely to be present, but the habitat is small, modified, and isolated in pasture. The northern grass skink is at its southern range at this site, but is not a threatened species. The forest gecko is an At Risk Declining species (near its southern range).

Due to habitat preference, it is likely that forest gecko, West Coast green gecko and common skink could be present in some of the forest habitats within the site. That said, the absence of ground vegetation and most middle tier vegetation makes this probability remote in the isolated small forest fragments within the area to be mined. Lizard presence is much more likely in the eastern intact forest (escarpment) outside the mining area, rather than the kamahi / kahikatea treelands in pasture. Speckled skink may be present in the forest remnants, but the site does not contain preferred habitat for this species.

A specific survey was undertaken in Spring of 2023 summer of 2023-2024 (Figure 8). Those results are appended to this report. No lizards were recorded in those surveys. It is always the case that results of survey for arboreal lizards in tall forest will not be conclusive. The author could not rule out their presence, but if present they must be in low abundance.

Figure 8. Lizard survey locations.

3.7 Bats

There are no records of short-tailed bats in the area. There is limited suitable habitat for this species within the study site and the larger more likely roost trees (if bats are present in the wider landscape) are in the DOC managed lands to the south (large old hinau and rimu), and in the lower escarpment (large old kahikatea).

The nearest recorded longtail bat population is located approximately 50km south of the study area near Harihari and the second nearest population approximately 100km north, near Reefton (O'Donnell, 2001). Therefore, while we cannot rule out the presence of closer bat populations, and even the use of the fragmented forest patches on site by long-tailed bats, it is unlikely.

A bat survey was undertaken (24 nights over November 2023) as well as a roost tree assessment by a qualified and experienced bat ecologist (Appendix 8). The acoustic survey of which 23 nights were of suitable climatic conditions produced no record of bat calls. The roost tree assessment concluded that the older trees and the state contained moderate to high value roost trees if bats where present.

3.8 Terrestrial macro-invertebrates of concern

There are no records of *Powelliphanta* lands snails in the study area, and none are expected in the absence of core habitat and good ground cover (Walker 2003). Furthermore, other large iconic at risk or threatened invertebrate species (e.g. *Geodorcus helmsi* (Helms stag beetle) or the Forest ringlet (*Dodonidia helmsii*)) are also very unlikely, because of the history of modification, such as the removal of the ground tier and middle tier structures and limited age and isolation of the remaining trees. For example the host plants of the Forest ringlet (which would be at its southern limit at the site (i.e. Gahnia and Chionochloa spp.) are very infrequent on site and generally not in the pasture treelands. There remains an outside chance that Helms stag beetle could be present, while night investigations have not seen this species. Helms Stag beetle is one of the few invertebrates recognised and protected by the Wildlife Act (1953)

There will be a range of common invertebrate taxa present common to all forest features, including a range of phasmids (Stick insects), orthoptera (weta), coleoptera (Beetle), spiders, wasps, ants, moths, butterflies and true flies.

4 Results - Site Investigations - Habitats

4.1 Vegetation

The plant community descriptions cover four main vegetation communities (not including pasture): i.e.: fragmented forest in pasture, escarpment or DoC managed (relatively unmodified) forest, natural wetlands, and exotic scrub and shrubland. Our map (Figure 9) recognises fifteen variations of these four basic types across the whole site.

The condition of each of these communities differed according to their location relative to pasture and ease of access by livestock. Indigenous systems along the boundary of the site were in better condition than those inward of the boundary, which were located either within, or adjacent to, the pasture. While the canopy of most fragments was in reasonable condition, the lower tiers and in some especially, the ground tier was depauperate.

The following table provides a brief description of each habitat. A range of site photographs are presented in Appendix 3. Areas are calculated for the assemblages described and those habitats proposed to be cleared. This table should be read with reference to (Figure 9).

Table 4: Description and Extent of Native Vegetation (Study Area)

Plant communities in pasture forest plots		Area (ha)	To be cleared
Exotic weeds and scrub (Figure 9 # 1 & 3, 14)	• This community is found mainly around the proposed cut location in the middle of the site. Gorse is dominant in the western half and gorse and blackberry is dominant in the east, but this eastern area has young karamu saplings.	0.84	All
DoC "Dammed" kahikatea (Figure 9 # 2)	• Over the southern boundary is a small, ponded area which contains a *Carex* sedgeland with small emergent kahikatea and *Coprosma* species (*C. propinqua*, *C. tenuicaulis* etc). This wetland is an artifice of some historic drainage management and is supported by a pan. The edge hinau-kamahi forest is dying back, because of the inundation.	0.26	None
DoC Hinau /Kamahi / Kahikatea Figure 9# 4	• This eastern end of the DoC managed land is similar to the western end, except that there is a greater representation of kahikatea as emergent trees.	53 - total west side of the lake	None
Escarpment Hinau/kamahi/rimu (Figure 9 #s 5, 6)	• Hinau/Kamahi/Rimu vegetation is found on the escarpment bank in drier areas running parallel to the wetland. The canopy is high and relatively closed, with very large epiphyte laden hinau and kamahi dominating the canopy, with occasional emergent rimu trees. The subcanopy is diverse, with lemonwood, mahoe, quintinia and horopito scattered throughout. The ground tier is variable in terms of species richness depending on cattle access. There is a younger and older component of the escarpment forest, with the younger element northward.	5.6	None

Plant communities in pasture forest plots		Area (ha)	To be cleared
DoC Hinau / kamahi forest Figure 9 # 7	• The forested area of the DoC managed land on the southern boundary is a mature Hinau-kamahi forest with occasional emergent rimu and kahikatea and totara closer to the coast. The under canopy is relatively thick with supple jack, several fern species and a number of sub-canopy broadleaf shrubs and saplings. Kiekie is prevalent here, as are epiphytes. • There are also a range of native grasses (bush rice grass, *Carex uncinata*, *Dianella* sp.) in the ground cover (as well as mosses).	125 total west side of lake	None
Kahikatea treeland in pasture (Figure 9 # 8)	• Kahikatea treeland makes up most of the pasture forest plots (but with slightly varying emphasis on canopy dominance (kamahi or the presence of rimu)), with occasional standalone old Kamahi and Rimu present amongst the canopy. Supple jack dominates the subcanopy and middle tier, with scatterings of young pigeonwood, *Coprosma*, fern species and mapou (5% each). The ground tier is sparse.	0.3	All
Kahikatea/ Kamahi treeland in pasture (Figure 9 # 9, 10)	• This community is found above grazed pasture, where there is a scattered loose canopy dominated by old Kamahi (50%), Kahikatea (25%) and some Hinau and Miro. • The ground cover is predominantly pasture (80%). This area has been damaged by grazing and no seedlings of native vegetation were seen, nor in the understory.	1.4	All
Kamahi mixed treeland in pasture (Figure 9 #s 11, 12 & 13)	• Two closed canopy (90%) small fragments dominated by Kamahi with some tree fuchsia and Kahikatea. The middle tier was largely absent except for single Miro and Kamahi trees. Ground cover was regenerating with various species of *Coprosma*, ferns, spleenworts, and dense hanging supplejack. • The understory had no pasture species present (very dark) although a thick organic layer was noted. • A small fragment is also present at the far west and south end of the property. This is a small 0.2 ha fragment of lose canopy kamahi / hinau over broadleaf shrub and tree fern, grazed under and modified.	2.5	All
Wetland (Figure 9 # 15)	• This wetland is continuous with the lower contour lines at the base of the escarpment (Section 15). It is intact with three general types; inundated lose canopy Kahikatea and sedge close to the escarpment, open sedge and turf areas predominantly in the north and tangle fern-shrub wetlands southward. • This wetland community is contiguous with the wetland fringe of Lake Māhinapua and the riparian wetlands along Tūwharewhare.	15.1	None
Escarpment young Kahikatea (Figure 9 # 17)	• Kahikatea forest (dense) is found predominantly in wetter depressions below the escarpment bank in the northern most area of the wetland. The middle tier of	0.21	None

Plant communities in pasture forest plots		Area (ha)	To be cleared
	the young kahikatea is dense and diverse, species such as supplejack and various coprosmas dominate. Kahikatea seedlings dominate the ground cover, and the wet conditions mean epiphytes such as mosses and spleenworts grew prolifically. • Leaf litter is thick in these areas (100%).		
Old escarpment kahikatea (Figure 9 # 16)	• This older stand is largely a dense canopy kahikatea alone with little middle tier and very little ground tier, with much of the ground containing standing shallow water. A few ferns and occasional divaricate shrubs on drier rises are present.	0.32	None

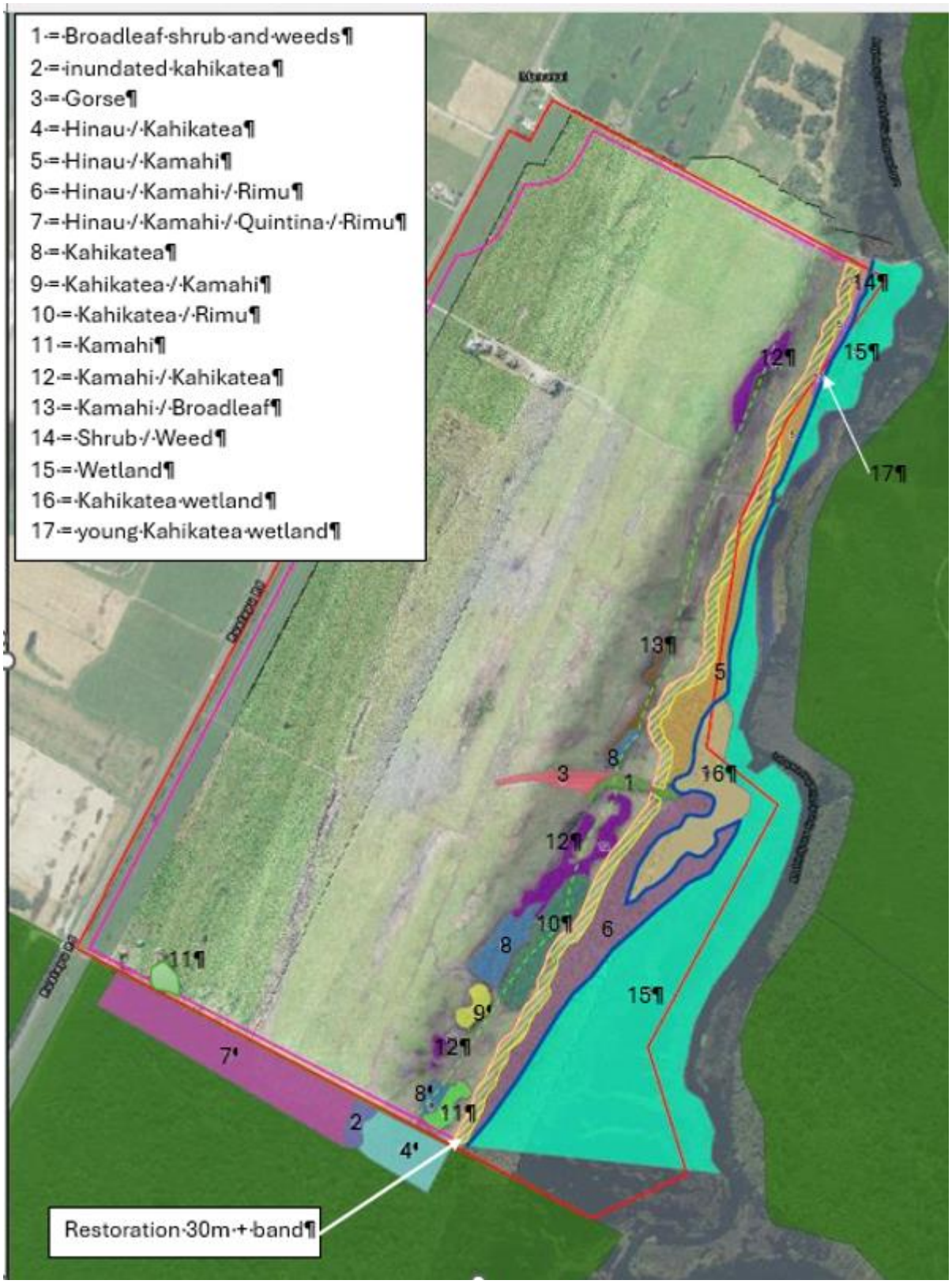

Figure 9: Indigenous vegetation communities delineated within the study area and the area proposed to form the habitat planting (yellow hatched). The green dash line represents 100m from the delineated natural wetland edge.

4.1.1 Plot data.

Twelve 20m by 20m vegetation plots were recorded on site, one in the southern DoC managed forest, two in the eastern escarpment forest, one on the wetland edge, one in the northern young kahikatea and six in the various pasture fragments (see Figure 4). The species recorded are listed by plot and vegetation type in Appendix 1 and in Appendix 2 the stem densities of the fragments.

When the indigenous sub-canopy plant species richness is considered (the areas affected by the current lands use practices and to avoid effects of the presence of exotic species), the pasture fragments have reduced species richness, but are still similar to the DoC managed forest (Figure 10). Despite having similar species richness, the grazed fragments lack the biomass of indigenous vegetation in the lower tiers (illustrated below).

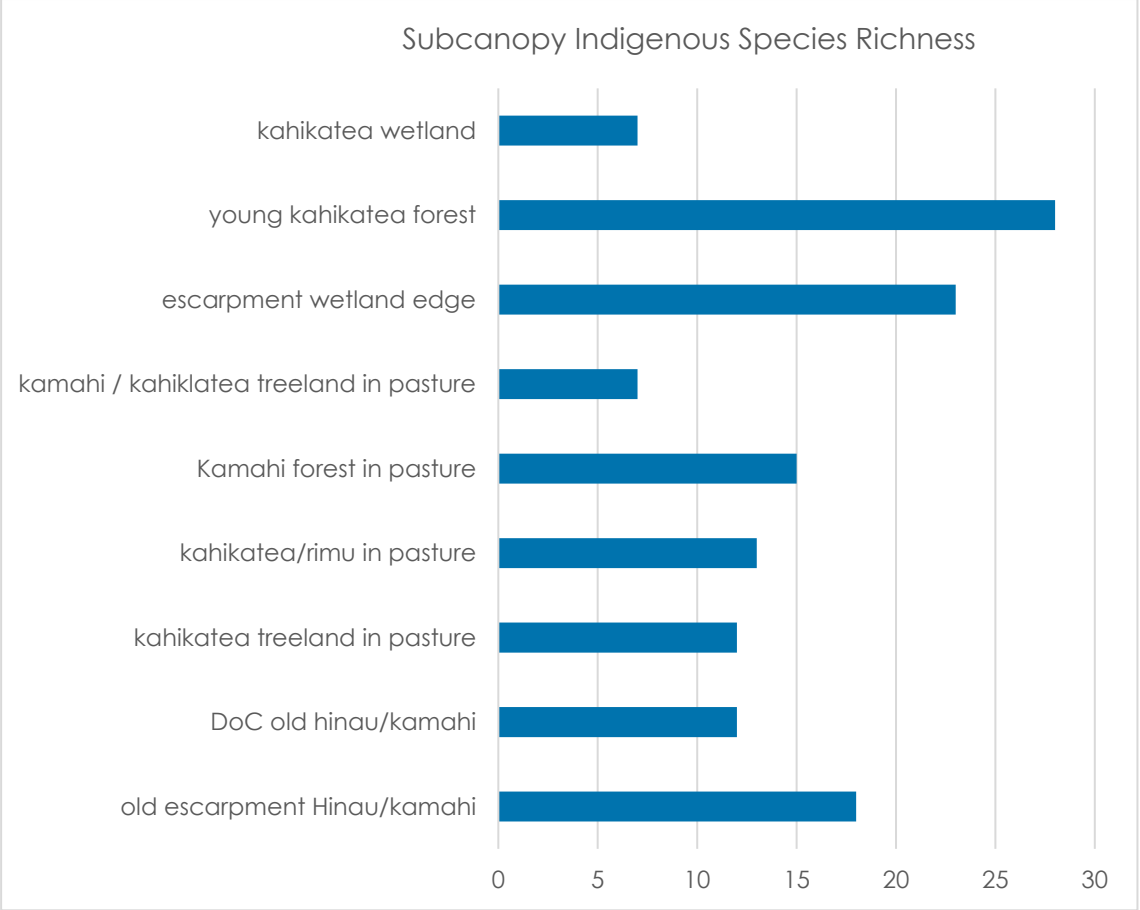

Figure 10. Species richness of non-canopy indigenous taxa in plot data.

The separation, or difference in indigenous plant cover comes in the form of ground and middle tier biomass, represented here as vegetation cover estimates (Figure 11). The cover of indigenous species in each tier was recorded in each plot. Those fragments in pasture clearly (and as expected) have reduced ground cover and middle tier cover. All forests had a similar canopy cover with similar species represented and much more than the grazed under fragments.

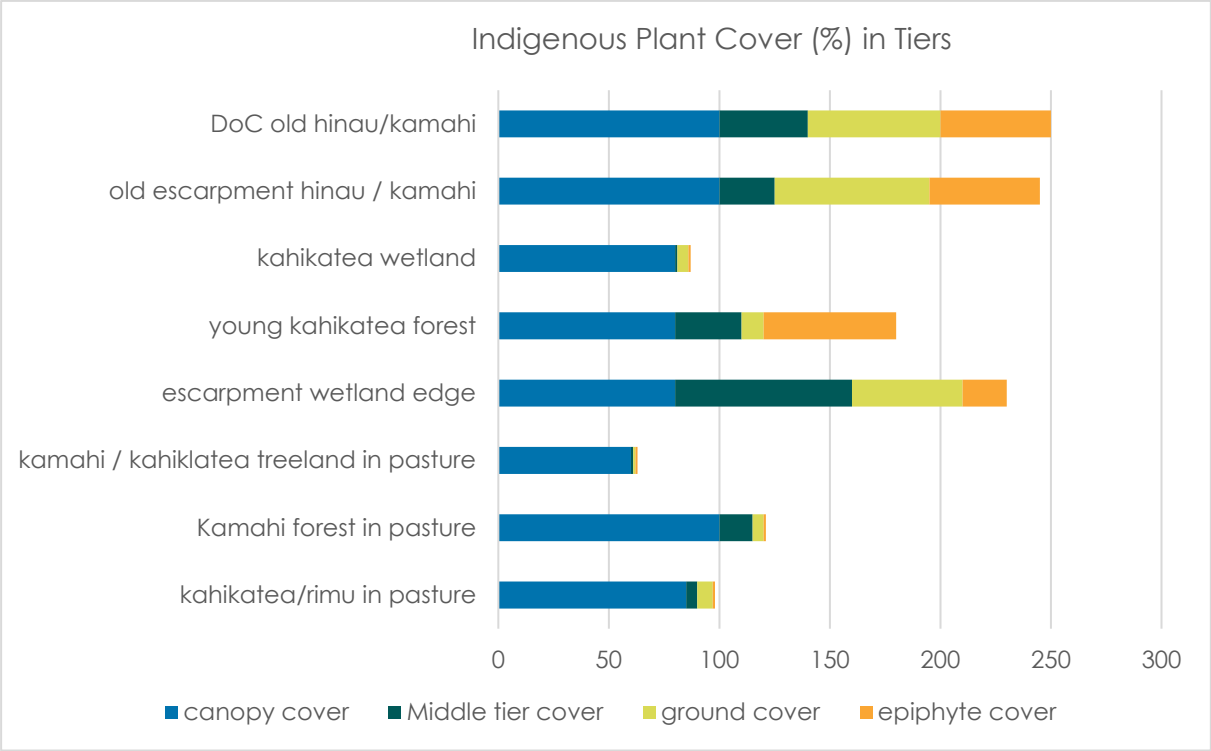

Figure 11. Tier vegetation cover estimates by habitat types.

All the forest areas on the property and adjacent DoC managed land have the same basic canopy species (kamahi, hinau, kahikatea, rimu) and those canopies are generally mature to maturing. The fragments in pasture are however, without very mature trees, such as those found in the lower escarpment and on the DoC reserve. I assume this relates to selective felling. Very mature trees are important as habitat for particularly bats, but also cavity nesting birds such as kaka and kakariki. The fundamental differences in the forests relate to the level of historic clearance and so size / complexity, the ongoing stock grazing, and the biomass (or ground cover) in each forest, as well as the abundance of epiphytes. The pasture forests have greatly reduced ground cover and middle tier representation, and reduced amounts of epiphyte (such as kiekie and filmy ferns) and this decreases their ecological function, integrity, their representativeness and sustainability and so their ecological value. The escarpment forest is higher value in that there is less livestock access (but not none), while the DoC managed forest's ground tier is unaffected by grazing and has the greatest ground cover and epiphyte cover (biomass) (Figure 11).

As a comparison the Waipoua forest (Northland) has an average of 52 species per stand (10 trees, 13 shrubs, 10 herbs, 17 lianes and epiphytes) which is considered relatively species rich in NZ (Burns, 1995). Two surveys to the south in the DoC managed area (Swimmers Beach and Bellbird walk (Jane & Donaghy 2006)) recorded 97 and 82 native species, and around 70-80 of those in the lower tiers. Compared to this, the features assessed here range from comparative (young kahikatea) to poor (old kahikatea wetland and fragments in pasture) – between 10 and 15 native taxa.

In the Waikato, fenced 4-5 year old recovering fragments of kahikatea forest typically had a species richness of around 25 (gaining 10 after fencing) (Smale et al., 2005).

4.1.2 Threatened, At Risk or locally uncommon plants.

Two threatened – nationally vulnerable species (Townsend et al., 2008) were found within the vegetation communities on site. These were Climbing Rata (*Metrosideros fulgens*) and Akatea (*Metrosideros perforata*), both of which were found within the pasture plots, in the escarpment and in the DoC managed forest.

When myrtle rust arrived in New Zealand, species in the Myrtaceae were given a higher status of threat out of an abundance of caution. Since then, myrtle rust has been detected on five of the rata vines: *M. carminea*, *M. fulgens*, *M. perforata, M. colensoi* and *M. diffusa*. However, there have been no records of infection of *M. perforata* in the field and it is showing resistance to artificial infection attempts, whereas *M. fulgens* does show susceptibility (Manaaki Whenua[3]).

Fossil fern (Figure 12) is a somewhat unusual and 'naturally uncommon' species (de Lange 2009) recorded in the lower escarpment on a large kamahi, with plentiful climbing rata and leather leaf fern. This area would be unaffected by mining and this species was not detected within the mining area.

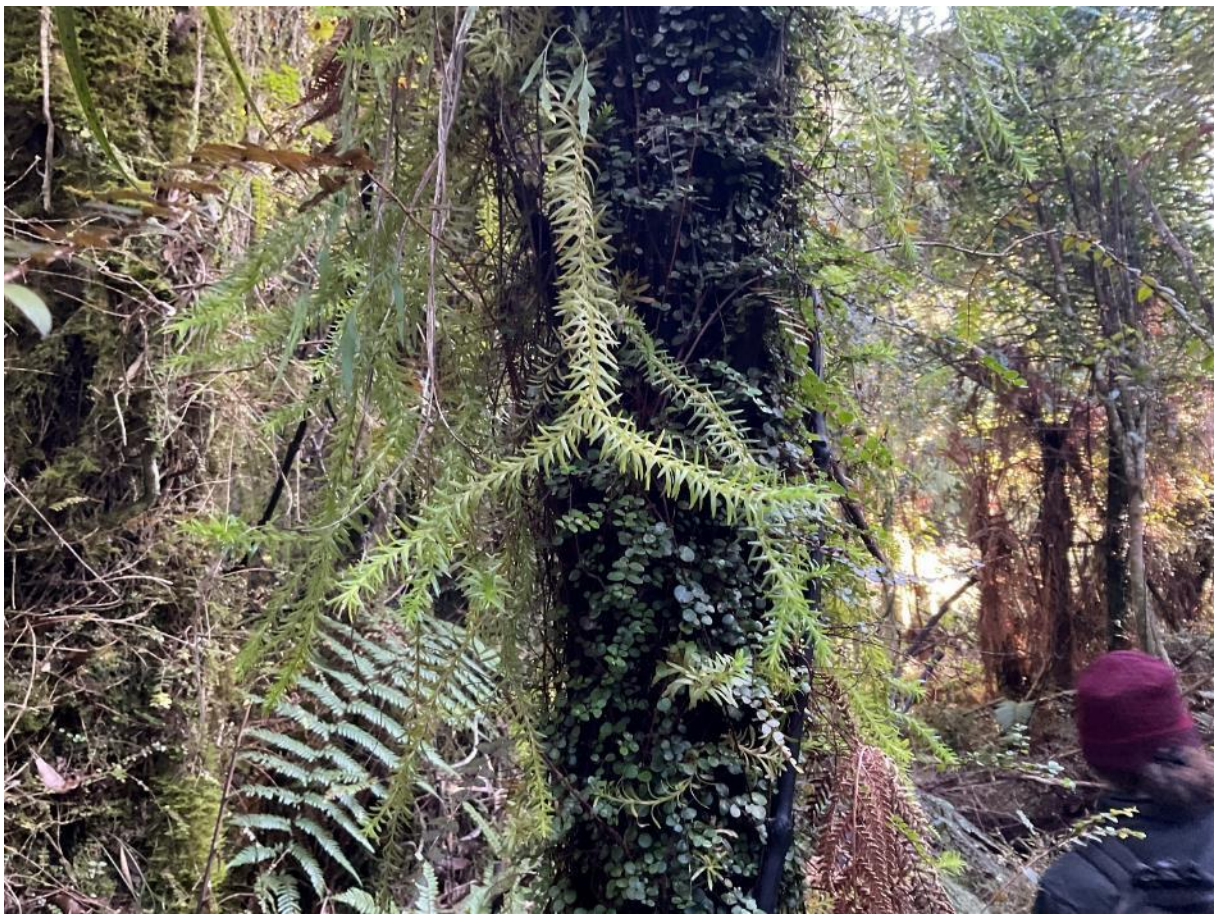

Figure 12 Tmesipteris sigmatifolia. A naturally uncommon mature forest species.

4.2 Avifauna

The field investigation found, in relation to the terrestrial vegetation being affected, preferred or marginal habitat for 17 bird species. Of those possible, a total of 12 species were seen or heard on site[4]. These are listed in Table 5.

[3] https://www.landcareresearch.co.nz/discover-our-research/biodiversity-biosecurity/ecosystem-resilience/beyond-myrtle-rust/news/rata-vines-beautiful-and-vulnerable

[4] On site refers to the property in total, not just the mine area.

Table 5: Native bird observations within the proposed mine area, or immediately adjacent and their threat status (Robertson et al., 2021).

Common Name	Latin Name	Threat status	Habitat present within study area	Seen or heard on site
Fernbird South Is. ssp	*Bowdleria punctata ssp*	Declining	√	√(***)
Australasian bittern	*Botaurus poiciloptilus*	Nationally critical	√	√(***)
Bellbird ssp	*Anthornis melanura melanura*	Not threatened	√	√
Brown Creeper	*Mohoua novaeseelandiae*	Not threatened	√	
Grey Warbler	*Gerygone igata*	Not threatened	√	√
New Zealand Tomtit (South Island ssp)	*Petroica macrocephala macrocephala*	Not threatened	√	√(**)
Paradise Shelduck	*Tadorna variegata*	Not threatened	√	√
Weka ssp	*Gallirallus australis ssp*	Not threatened	√	√
New Zealand Kingfisher	*Todiramphus sanctus vagans*	Not threatened	√	
New Zealand Pigeon	*Hemiphaga novaeseelandiae*	Not threatened	√	√
Shining Cuckoo	*Chrysococcyx l. lucidus*	Not threatened	√	
New Zealand Fantail (South Island ssp)	*Rhipidura fuliginosa fuliginosa*	Not threatened	√	√
Pukeko	*Porphyrio m. melanotus*	Not threatened	√	√
Welcome Swallow	*Hirundo n. neoxena*	Not threatened	√	√
Tui	*Prosthemadera n. novaeseelandiae*	Not threatened	√	√(*)
Australasian Harrier	*Circus approximans*	Not threatened	√	√
Silvereye	*Zosterops lateralis lateralis*	Not threatened	√	
Spur-winged Plover	*Vanellus miles novaehollandiae*	Not threatened	√	

(*) seen on the DoC forest adjacent, (**) in escarpment forest, (***) only in the eastern wetland.

Birds not seen on site, but which may be present include the following:

White heron and shag species - No tree roosts were seen within the site for species such as white heron, or the 4 shag species and there is no feeding habitat within the site for these species. However, a white heron (Kotuku – *Ardea alba Linnaeus* - Nationally critical) was seen standing in the pasture, to the west of the pasture fragments during the day.

Migrant species - The migrant species (Australasian Pied Stilt, South Island Pied Oystercatcher, Banded dotterel) may utilise the paddocks when flooded, but the site does not contain core or seasonal habitat for them. The only forest migrant species that may breed within the site is shining cuckoo (*Chrysococcyx lucidus*).

Shining cuckoo and grey warbler - In terms of shinning cuckoo (not threatened) their habitat is better described as forest and scrub where their host lives – That host being grey warbler. While Grey warbler are on site they are not numerous in the pasture fragments but are likely to be abundant just south in the near 200 ha of DoC managed mature forest and across the Mahināpua River in extensive DoC managed forests.

Wetland species - In the wetland we recorded South Island fern bird, western weka and have a photographic record from another consultant on site of an Australasian bittern (on the escarpment edge). It is likely, given the size of the wetland-river-lake complex that there are banded rail and marsh crake within the larger wetland area which is outside the mining area.

NZ Pipit - While the majority of the site is farm pasture and not rank or long grasslands it is remotely feasible the NZ Pipit ("naturally uncommon" and scheduled highly mobile fauna) may be present (in the pastural lands).

Overall, we consider that birds that reside in, or use the affected portion of the site are dominated by common native species including tui, bellbird, fantail, grey warbler, kereru, kingfisher, silver eye (and exotics) and those species which utilise open country (Australasian harrier, spur winged plover, paradise shelduck, and NZ Pipit).

In terms of the higher "value" species (those with' threatened 'and 'at-risk' classifications), the wetland and escarpment forest are the significant habitat. We recorded or have reliable records in these habitats of: South Island fernbird (in the wetland), and Australasian bittern and consider it likely that banded rail and marsh crake will also be present. All of these species are specified highly mobile fauna (NPS IB schedule 2) and so their habitat is of greater than typical value.

4.3 Freshwater

4.3.1 Waterways

There are three possible waterways to be considered based on the proposed mine location, according to aerial imagery and the 250 topographic map. There are two (southern) systems that discharge north and then east and the northern system which drains north and then east (A-C, Figure 13).

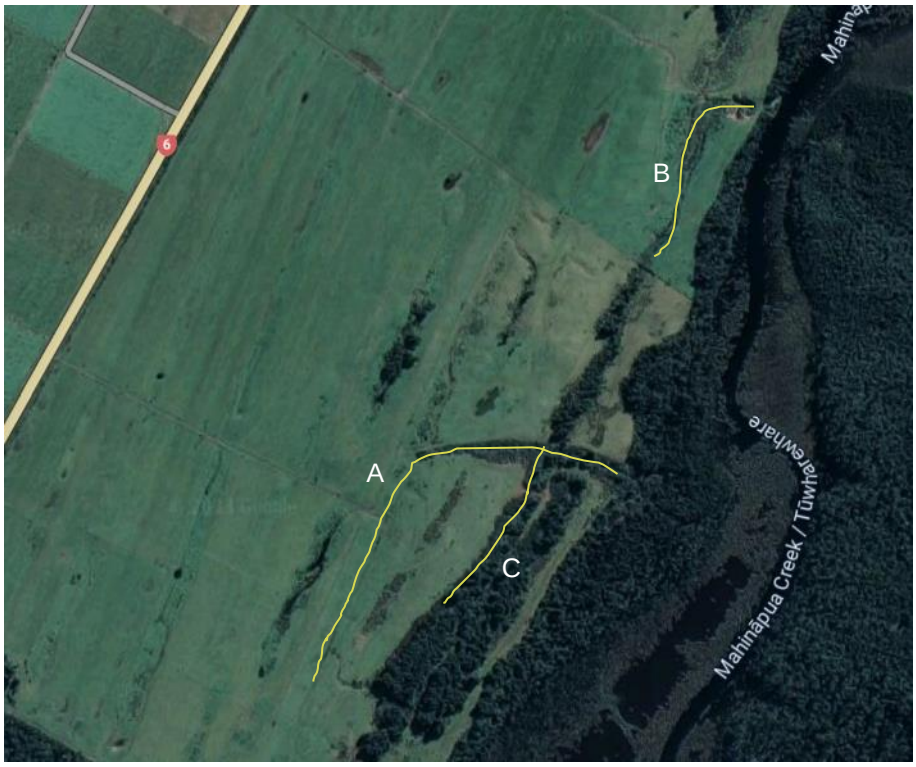

Figure 13. Water courses assessed.

All three systems are cut drainage systems and based on the historical aerial photograph evidence, the topography of the land, the catchment sizes, depth of groundwater and substrate (sand)they are not natural or even modified natural waterways. The historic aerial photos below (Figure 14, Figure 15, Figure 16) show the development of the drains sometime after 1950. The 1981 aerial is particularly telling whereby channel “C” is not at all evident until the aerial of 1988. In 1988 there is a clear sign of a new straight lined drainage channel.

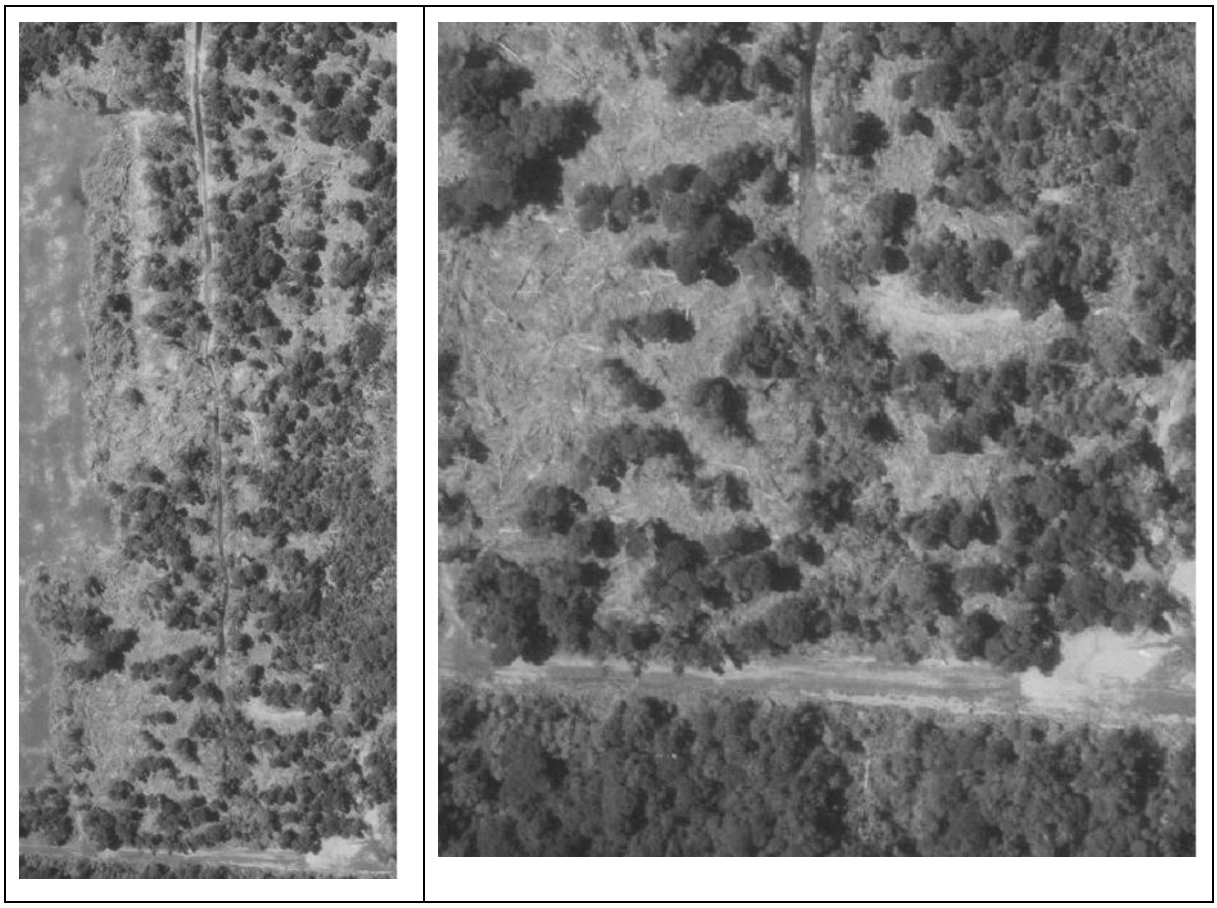

Figure 14 Channel “A” no clear source of water is present, and the channel is regular and straight.

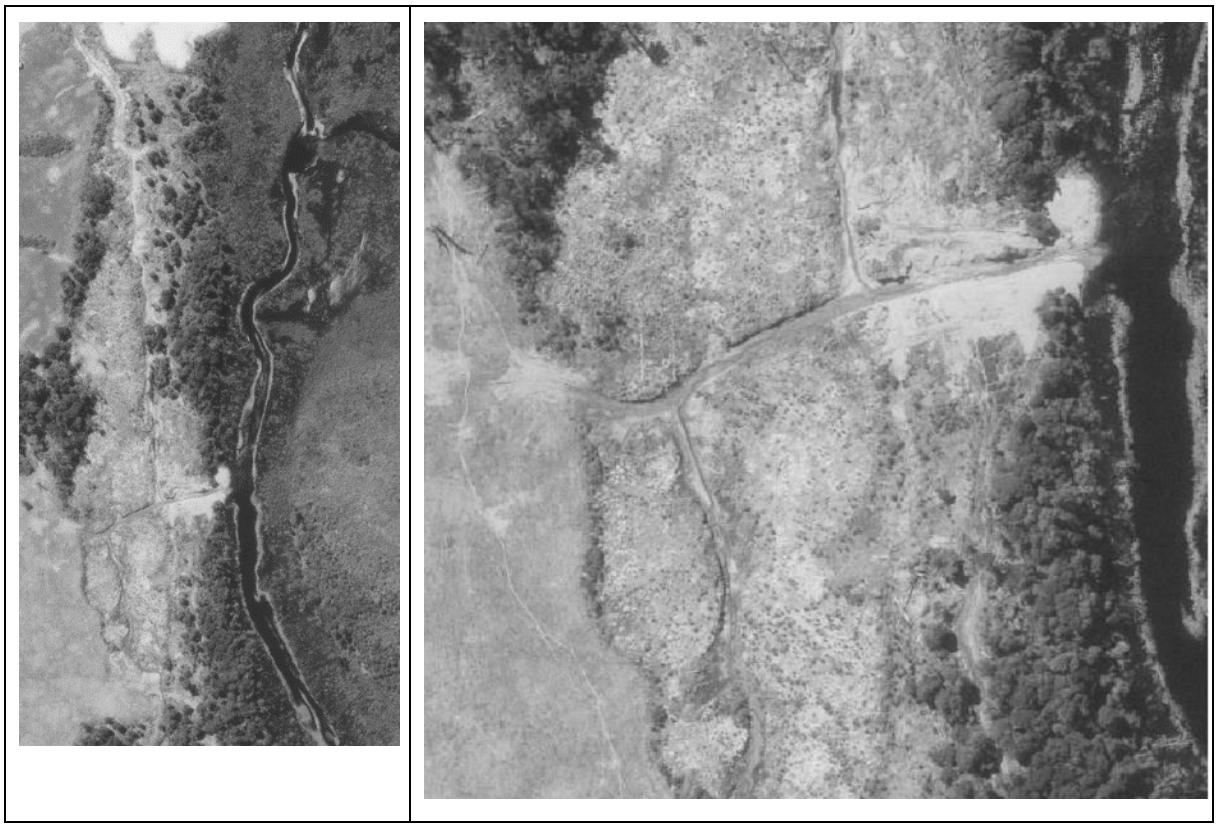

Figure 15. Water channel B, the northern feature.

Figure 16, Water channel "C" or absence of such until 1988.

The northern system (“B” Figure 13) loosely begins in one of the northern kahikatea pasture fragments and discharges along the south-north running old inter dune hollow. It is largely a muddy unformed channel without a clear bed and banks and better resembles wet mud, rather than a flowing stream of water (Photo 3). At some point in the past a channel was dug directing flow towards the eastern wetland (Photo 4).

Photo 3. Looking south from the northern portion of the property adjacent to the forest escarpment (left).

Towards the old quarry/mined northern area, a bed and bank forms which we understand is a machine dug system to assist in drainage when the area was quarried. This shallow (<5m) and 20-30 cm wide flow, has scattered emergent macrophyte growth (starwort in the main channel) and a bed of mud and small cobbles, but insufficient water and cover to sustain native fish or contain a macroinvertebrate community representative of a healthy stream.

Photo 4. The created drain with excavated channel and banks.

The Western system (“A”) appears a drainage channel dug into a dune hollow. This system also runs in a south to north direction (photo 5). There is no apparent spring at the upper southern end, water sits without a visible flow, at this upper end without draining. The channel is joined by one ephemeral /intermittent true right tributary from between the bush fragments (Photo 5). The channel is around 1m wide and is 200mm deep, and the substrate is mostly comprised of soft muds. The channel / drain is regularly maintained and is suspected to be mostly dry during summer. There is no instream cover, (i.e., wood, leaf litter or debris), it is a channel of muds and shallow water. There is no aquatic habitat of any sustained quality of permeance. The drain is intersected by the “cut” a dug drain draining the water to the kahikatea wetland.

<table>
<tr>
<td> 
Upper (southern) end</td>
<td> 
A “tributary” from the pasture forest fragments</td>
</tr>
<tr>
<td> 
Middle section</td>
<td> 
A close up of the habitat quality</td>
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Short fin eel	The cut, a dug drainage channel

Photo 5. Series of photographs illustrating the western drain ("B" Figure 8).

The cut drain is deeply set with little to no riparian vegetation on the true right bank and primarily gorse and blackberry on the true left bank, with karamu, kiokio and grasses.

We fished this system and the cut (800m) (night spot lighting) and found one short fin eel. This eel was not "in residence" it was opportunistically foraging as there is no daytime cover at all in the system.

The last system ("C") is a small channel east which passes up through the southern bush fragments arising off the cut (Photo 6). This system had greater flow at survey and is likely intermittent (although we consider the upper-middle 50m (that which contains the large pool) may hold water for much of the year), with a clearly defined bank and bed. The bed is dominated by sands and muds. In the bush sections, the bed is covered in dense leaf litter and woody debris and while the water depth is ca. 300-400mm, the open water is taken up with this litter. There are at least three short tributaries that enter the channel on the true right side, all of which appear intermittent at best. Above (upstream) of the stable pool there is a continuation of the dune hollow into the southern forest fragment but no water on the surface and so no aquatic habitat above the pool.

	
Upper-middle forested pool	Banded kokopu in the lower forest fragment stream

	
One of the side tributaries	Upper (southern) dry channel

Photo 6. The natural stream ("C" on figure 8), and side tributary example

The upper pool is an area of around 2-3m wide and 20m long. The depth is over 300mm and much of that depth is soft sediments and rotting organic matter and a surface of leaf litter and small woody debris. There were a number of suspected (not seen clearly) banded kokopu in this pool. This is the upper limit of stable aquatic habitat, but its condition was considered, though typical, to be relatively poor quality due to the anaerobic nature of the bed and organics, and limited likely connection to the lower system as the channel water clearly dries frequently. While this channel has become naturalised and has some habitat value it, from the evidence available, is a constructed (artificial) water course. Lastly (Photo 7) there is a small inundation to the south of the property in line with the central drain.

Photo 7. Inundated "wetland" (possibly due to the farm track) on Doc managed lands immediately to the south.

This feature (Ca. 0.11ha) is unusually situated along the length of the southern boundary and could be a result of the creation of a bund (Rekker & Etheridge 2023) which may have, many years ago, caused the damming.

This feature has since (or always had) a sediment pan (perched on a thin organic soil layer) making a perched water body (Rekker & Etheridge 2023). This water body has resulted in the dieback of the drier broadleaf species (evidence of decaying hinau) and promoted kahikatea, as well as swamp coprosma, *Carex* species, *Astelia species*, kiekie, cabbage tree and wetland fern species. The hydrologist and geologist considers that it is isolated from the ground water on the property and there is no sign of a directional flow in the feature itself (Rekker & Etheridge 2023, section 6.2.8). The area classifies as a natural inland wetland under the NPS FM (2023) definitions.

4.3.2 Fish

The night spotting was conducted on 13/06/2023 and covered just over 1km of waterway, including the western central drain (drain A, Figure 13), the cut, the western forest stream (C, Figure 13) and the northern drain (B,). Table 6 records the species observed. No fish were seen in the northern drain. One short fin eel was seen in the western central drain.

Table 6. Fish species recorded during night spotting survey

Survey area	Fish species	Length (mm)	Count
Central drain at start of water	Shortfin	300	1
Above cut confluence in forest stream	Banded Kokopu	70, 120	2
Above culvert in a small pool	Banded Kokopu	80, 60	2
Above culvert in channel	Shortfin	350	1
Above culvert before pool	Longfin	300	1
Upper reach of aquatic extent (pool)	Banded Kokopu	100	1
		Total fish	8

4.3.3 Tūwharewhare (Māhinapua Creek) and wetland

The Creek and associated wetlands arise from the 340 ha lake which is feed from a 3131 ha catchment and drains north to the Hokitika River near the coast. The ecological quality of the lake via SPI[5] is measured as high (67.5%), Native condition 59.1%, invasive impact 21% (LAWA 2023). Thus, while there is an element of invasive macrophyte the lake bed remains relatively native and representative.

The wetlands north of the lake are extensive and varied and are properly classified as “swamp” (Johnson & Gerbeaux 2004). There are, on the property at least 5 wetland community types – oioi-tangle fern restiad, harakeke flaxland, swamp coprosma-divaricate wetland shrubland, *Carex-Isolepis* sedgelands, kahikatea-rushlands, shallow water wetlands (with emergent macrophytes (both exotic and indigenous) merging with wet shrublands and escapement kahikatea forest caused by hydrological gradients and substrate changes. Ecotones are plentiful and vegetation sequences evident and in good quality. The diversity of identifiable wetland classes is evident and the patterns are distinct and the blend distinctive. The wetland feature is large. There is at least one ‘At Risk declining’ bird species (South Island fernbird) and one ‘Nationally critical’ species (Australasian bittern) resident. There will likely be a number of wetland plant species which are at least ‘At Risk’. The wetland has a high integrity, and has strong buffers west (escarpment forest) and east – the Mahināpua river. Further survey will reveal other species of importance.

[5] Lake Submerged Plant Indicators - a method of characterising the ecological condition of lakes based on the composition of native and invasive plants growing in them. A higher LakeSPI percentage result is associated with better ecological health.

Suren & Lambert in 2008 and 2010 undertook some wetland macroinvertebrate surveys (Suren & Lambert 2008, 2010[6]) in the wetlands of the Tūwharewhare Creek, the "the main channel meandering through the wetland". They show that, as with most NZ wetlands, there is a simple relatively low taxa richness community of species well adapted to variable depth and high organic loading and variable DO conditions. The 11 common taxa include: Chironominae, Cycloipoidea, Daphniidae, Hydra, Lymnaea, Microvelia, Nematoda, Oligochaeta, Paroxyethira hendersoni, Potamoprygus antipodarum, Procordulia smithii. These are all highly tolerant (MCI <4) taxa, well adapted to low oxygen level sand high nutrient organic levels and variable water. Those studies also found that the Tūwharewhare wetland had water with relatively low pH (5.5) and raised nutrients (7.4 µg/1 NH_4-N; 5.5 µg/1 NO_3-N; 2.1 µg/1 DRP etc).

The NIWA freshwater data base holds 30 records spanning 1981 to 2019 for the lake and the creek and some smaller tributaries. The most substantive fish record is from a Department of Conservation effort in 2019 in the lake. Both pest fish and natives are present, and the taxa richness of indigenous species is only moderate (7). The species recorded and their frequency in the records is shown in Table 7 below,

Taxa	Frequency of occurrence in records
Gold fish Carassius auratus	16
Perch Perca fluviatilis	16
Inanga Galaxias maculatus	14
Cat fish Ameiurus nebulosus	8
giant kokopu (Galaxias argenteus	6
Short fin eel Anguilla australis	6
banded kokopu (Galaxias fasciatus	4
Long fin eel Anguilla dieffenbachii	4
common bully (Gobiomorphus cotidianus)	3

Table 7.Fish species frequency in NIWA FFDB records

[6] NZ J marine and freshwater research 2010. Temporarl variation of invertebrate communities in perennial wetlands. Volume 44: issue 4.

5 Determination of Significance

5.1 Terrestrial

The indigenous vegetation and habitats of indigenous fauna (avifauna, bats, herpetofauna) within the proposed works boundary are assessed against the significance criteria in Appendix 1 of the recently adopted Regional Policy statement (Table 8). The RPS criteria are not inconsistent with the current NPS IB criteria released on 4 August 2023. For this assessment we assume that native bats are not present in the forest fragments given their age and condition, and we also assume that the threatened and at risk herpetofauna are not present in the pasture forest fragments due again to their condition. Recent survey results support these assumptions. The RPS significance criteria are as follows:

Representativeness

a) Indigenous vegetation or habitat of indigenous fauna that is representative, typical or characteristic of the indigenous biological diversity of the relevant ecological district. This can include degraded examples where they are some of the best remaining examples of their type, or represent all that remains of indigenous biological diversity in some areas.

b) Indigenous vegetation or habitat of indigenous fauna that is a relatively large example of its type within the relevant ecological district.

2. Rarity/Distinctiveness

a) Indigenous vegetation or habitat of indigenous fauna that has been reduced to less than 20% of its former extent in the region, or relevant land environment, ecological district, or freshwater environment.

b) Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened, at risk, or uncommon, nationally or within the relevant ecological district.

c) The site contains indigenous vegetation or an indigenous species at its distribution limit within the West Coast region or nationally.

d) Indigenous vegetation or an association of indigenous species that is distinctive, of restricted occurrence, occurs within an originally rare ecosystem, or has developed as a result of an unusual environmental factor or combinations of factors.

3. Diversity and Pattern

a) Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of indigenous ecosystem or habitat types, indigenous taxa, or has changes in species composition reflecting the existence of diverse biological and physical features or ecological gradients.

4. Ecological Context

a) Vegetation or habitat of indigenous fauna that provides or contributes to an important ecological linkage or network, or provides an important buffering function.

b) Indigenous vegetation or habitat of indigenous fauna that provides important habitat (including refuges from predation, or key habitat for feeding, breeding, or resting) for indigenous species, either seasonally or permanently.

In order to test significance, we focus on the in-pasture features, those that are proposed to be lost and give only a brief assessment to the escarpment forest areas, which are clearly of better structure and quality and also not adversely affected. With respect to the eastern wetland we test this for significance to determine if it is significant as much of it is currently schedule 2 not 1 in the Regional Land and Water Plan. We do not further test the wetland on the southern DoC managed land or the wider forest in the reserve, determining that it is significant simply based on its very apparent representativeness and intactness.

For the purposes of this assessment, because the features are so similar, we have grouped feature type 8 Kahikatea treeland and types, 11, 12, 13 kamahi mixed treeland and also cluster #'s 9 and 10 (smaller fragments of kahikatea/ kamahi mixes) (Table 4). We consider that this is the appropriate scale to undertaken our assessment. In this regard, we record that two small areas of supply jack were identified in the southern fragments, but these two areas do not represent separate features in their own right, but form part of the wider features as assessed below.

Table 8. Section 6C (WCRC RPS criteria), analysis of significance.

WC RPS Criteria	In pasture			Escarpment	
Representativeness	Kahikatea treeland in pasture (#8)	Kamahi mixed treeland in pasture (#11,12,13)	Kahikatea/kamahi treeland in pasture (#9, 10)	hinau/kamahi mix (#5, 6)	young kahikatea (#17)
a) Indigenous vegetation or habitat of indigenous fauna that has been reduced to less than 20% of its former extent in the region, or relevant land environment, ecological district, or freshwater environment.	LENZ > 30% remaining and > 20% protected - least at risk land environment. The forest type is one of the more common types remaining in the ED and on this landform. Its structure however, is not entirely representative, missing key elements in the middle and ground tier. Meets -No	LENZ > 30% remaining and > 20% protected - least at risk land environment. As for the kahikatea treeland, not underrepresented in the ED and its structure and also missing ground tier and middle tier elements. Meets - No	LENZ > 30% remaining and > 20% protected - least at risk land environment. As for the kahikatea treeland, not underrepresented in the ED and its structure is also missing ground tier and middle tier elements. Meets - No	LENZ > 30% remaining and > 20% protected - least at risk land environment. Not an underrepresented type. Meets - No	LENZ > 30% remaining and > 20% protected - least at risk land environment. Not an underrepresented type. Meets - No
b) Indigenous vegetation or habitat of indigenous fauna that is a relatively large example of its type within the relevant ecological district.	Less than 1 ha - no	2 ha - no	2 ha - No	6 ha - No	1-2 ha - No

Rarity/Distinctiveness					
a) Indigenous vegetation or habitat of indigenous fauna that has been reduced to less than 20% of its former extent in the region, or relevant land environment, ecological district, or freshwater environment.	No	No	No	No	No
b) Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened, at risk, or uncommon, nationally or within the relevant ecological district.	2 climbing rata, both only so classified because of the threat of myrtle rust, which has not as yet been recorded to damage natural populations. Abundant in all forests of the ED Meets -no	2 climbing rata, both only so classified because of the threat of myrtle rust, which has not as yet been recorded to damage natural populations. Abundant in all forests of the ED Meets -no	2 climbing rata, both only so classified because of the threat of myrtle rust, which has not as yet been recorded to damage natural populations. Abundant in all forests of the ED Meets -no	2 climbing rata, both only so classified because of the threat of myrtle rust, which has not as yet been recorded to damage natural populations. Abundant in all forests of the ED. Reasonable potential for West Coast Green Gecko (nationally vulnerable) and speckled skink and forest gecko (At Risk). Tmesipteris - naturally uncommon. Meets - Yes	2 climbing rata, both only so classified because of the threat of myrtle rust, which has not as yet been recorded to damage natural populations. Abundant in all forests of the ED. Likely forms part of home range for fern bird and bittern. Reasonable potential for West Coast Green Gecko (nationally vulnerable) and speckled skink and forest gecko (At Risk). Meets - Yes

c) The site contains indigenous vegetation or an indigenous species at its distribution limit within the West Coast region or nationally.	No	No	No	No	No
Diversity and Pattern					
a) Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of indigenous ecosystem or habitat types, indigenous taxa, or has changes in species composition reflecting the existence of diverse biological and physical features or ecological gradients.	It has a low species diversity and has very limited sequences, ecotones or gradients, it is rather uniform and being only small fragments has little potential to hold diverse fauna. Meets - No	A typical canopy richness but a low middle and ground tier richness means an over all low diversity, and limited ecotones, gradients or variation in habitat. Meets - No	As with the former, all the in pasture forest fragments have a low diversity (even taken together) and are missing structural components and have been isolated and simplified over the years. Meets - No	Typical, not high. Meets - No	Typical but not high and while there are two ecotones, one up slope into a regenerating shrub hinau forest the other down slope into the wetland proper the sequence and diversity is typical in the ED and locally Meets - No
Ecological Context					
a) Vegetation or habitat of indigenous fauna that provides or contributes to an important ecological linkage or network, or provides an important buffering function.	No, the fragments do not buffer any valued adjacent habitat and are fragments in pasture and there is plentiful forest south, and east which	No, the fragments do not buffer any valued adjacent habitat and are fragments in pasture and there is plentiful forest south, and east which	As for the other fragments, other than the riparian forest (mostly on the true right) of the only small and low value stream habitat. However, we do not consider the	The escarpment forest provides an important buffer to a very valuable and quality wetlands surrounding the true left margin of the Mahināpua River. It is also part of the	The escarpment forest provides an important buffer to a very valuable and quality wetlands surrounding the true left margin of the Mahināpua River. It is also part of the

	facilitate networking of species. Meets - No	facilitate networking of species. Meets - No	benefits functionally it offers the stream to be sufficient to qualify as an important buffering function or aid in linkages to any special or important habitat. Meets - No	wetland faunal network facilitating refuge in high river flows and passage through a drier margin. Meets - Yes	wetland faunal network facilitating refuge in high river flows and passage through a drier margin. Meets - Yes
b) Indigenous vegetation or habitat of indigenous fauna that provides important habitat (including refuges from predation, or key habitat for feeding, breeding, or resting) for indigenous species, either seasonally or permanently	Given the expansive of dry and wet forest south and east which has greater diversity and abundance of all of the features and species in the fragments, these small fragments have no important habitat or refuge function, indeed all are edge and predator affected small, depauperate fragments. Meets - No	Given the expansive of dry and wet forest south and east which has greater diversity and abundance of all of the features and species in the fragments, these small fragments have no important habitat or refuge function, indeed all are edge and predator affected small, depauperate fragments. Meets - No	Given the expansive of dry and wet forest south and east which has greater diversity and abundance of all of the features and species in the fragments, these small fragments have no important habitat or refuge function, indeed all are edge and predator affected small, depauperate fragments. Meets - No	Part of the larger wetland complex of the Mahināpua lake and river, this forest area, while thin, may form part of the seasonal flooding refugia for wetland species. Meets - Yes	Part of the larger wetland complex of the Mahināpua lake and river, this forest area, while thin, may form part of the seasonal flooding refugia for wetland species. This is probably true of the older kahikatea forest also. Meets - Yes
Significant ?	NO	NO	NO	YES	YES

The NPS IB (2023) set of criteria have the same overarching items, however representativeness is not a test of system rarity as in the WC RPS. In the NPS IB, representativeness is about the typicalness of the assemblage species and its integrity. It asks if the feature has ecological integrity that is typical of the character of the ED. In the above table the first three sets of features – the forest fragments within pasture, do not, they are depauperate, overly modified single cohort (same aged) remnants,

whereas the typical character of this forest types in the ED is of full structural components of higher species richness in all tiers and a variety of age classes/sizes. Furthermore, the typical suite of fauna is not present in these fragments.

The diversity and pattern criterion in the NPS-IB is sufficiently similar to that provided above for our conclusion to stand, as is the rarity criterion.

The context criterion set out in the NPS-IB considers shape and size, which the RPS criteria set does not (aside from if it is a large example under rarity/ distinctiveness). All of the forest fragments in pasture, however, are small, thin, edge affected, non-sustainable features and they do not contribute importantly to protecting indigenous biological diversity in the wider landscape.

We test the NPS IB criteria in Table 9 below.

Table 9. NPS IB (2023) Appendix 1 Significance Criteria.

NPS IB Criteria	In pasture			Escarpment	
Representativeness	Kahikatea treeland in pasture (#8)	Kamahi mixed treeland in pasture (#11,12,13)	Kahikatea/kamahi treeland in pasture (#9, 10)	hinau/kamahi mix (#5, 6)	young kahikatea (#17)
a) Indigenous vegetation that has ecological integrity that is typical of the character of the ecological district	The ED has large quantities of intact and almost pristine forest of this nature - there is a loose collection of canopy trees and substantive gaps in the expected tiers and species, especially the ground cover and forest edges. Meets - NO	The ED has large quantities of intact and almost pristine forest of this nature - there is a canopy of trees but substantive gaps in the expected tiers and species in guilds (including the epiphytes), especially the ground cover and forest edges. Meets - NO	The ED has large quantities of intact and almost pristine forest of this nature - there is a canopy of trees but substantive gaps in the expected tiers and species in guilds (including the epiphytes), especially the ground cover and forest edges. Meets - NO	This more intact forest has areas of good middle and ground tier and the integrity is similar to that of the DoC land south and so of the protected forests of the ED. Meets - YES	This to is a more intact forest with a good middle and ground tier and the integrity is similar to other examples of kahikatea forest in the ED. Meets - YES

b) Habitat that supports a typical suite of indigenous fauna that is characteristic of the habitat type in the ED and retains at least moderate range of species expected for the habitat type in the ED	Highly unlikely typical, in the absence of invertebrate studies. But the observations illustrate that the bird life is reduced from that of the escarpment forest. Meets - NO	Highly unlikely typical, in the absence of invertebrate studies. But the observations illustrate that the bird life is reduced from that of the escarpment forest. Meets -NO	Highly unlikely typical, in the absence of invertebrate studies. But the observations illustrate that the bird life is reduced from that of the escarpment forest. Meets - NO	The edge and pastural effects may diminish the fauna (invertebrate and bird) but the escarpment forest is likely to be typical of all edge forests in the ED. The fauna however, will be reduced from the more central forests in conservation land of which there is an abundance and that abundance is the "typical". Meets - NO.	The forest areas, although well connected north and south, is narrow and small. The fauna will be reduced from the more central forests in conservation land of which there is an abundance and that abundance is the "typical". Meets - NO.
Diversity and Pattern					
a) At least a moderate diversity of indigenous species, vegetation, habitats of indigenous fauna or communities in the context of the ED	NO	NO	NO	YES	YES
b) presence of indigenous ecotones, complete or partial gradients or sequences	NO	NO	NO	In combination with the wetlands as a whole yes, but alone no.	In combination with the wetlands as a whole yes, but alone no.

				Meets - NO	Meets - NO
Rarity/Distinctiveness					
a) provides habitat for an indigenous species that is listed as Threatened or At Risk (declining) in the New Zealand Threat Classification System list.	2 climbing rata, both only so classified because of the threat of myrtle rust, which has not as yet been recorded to damage natural populations. Abundant in all forests of the ED. Meets -no (rejected in the same way the IB suggests kanuka alone should not cause a significance acceptance outcome)	2 climbing rata, both only so classified because of the threat of myrtle rust, which has not as yet been recorded to damage natural populations. Abundant in all forests of the ED. Meets -no	2 climbing rata, both only so classified because of the threat of myrtle rust, which has not as yet been recorded to damage natural populations. Abundant in all forests of the ED. Meets -no	2 climbing rata, both only so classified because of the threat of myrtle rust, which has not as yet been recorded to damage natural populations. Abundant in all forests of the ED. Reasonable potential for West Coast Green Gecko (nationally vulnerable) and speckled skink and forest gecko (At Risk). Meets - Yes	2 climbing rata, both only so classified because of the threat of myrtle rust, which has not as yet been recorded to damage natural populations. Abundant in all forests of the ED. Likely forms part of home range for fern bird and bittern. Reasonable potential for West Coast Green Gecko (nationally vulnerable) and speckled skink and forest gecko (At Risk). Meets - Yes
b) an indigenous vegetation type or an indigenous species that is uncommon within the region or ecological district.	NO	NO	NO	Tmesipteris sigmatifolia - naturally uncommon. Meets - Yes	NO

c) an indigenous species or plant community at or near its natural distributional limit.	NO	NO	NO	NO	NO
d) Indigenous vegetation that has been reduced to less than 20 per cent of its pre-human extent in the ecological district, region, or land environment.	NO	NO	NO	NO	NO
e) indigenous vegetation or habitat of indigenous fauna occurring on naturally uncommon ecosystems.	NO - the farmland is no longer “dune” (active or otherwise)	NO	NO	NO	NO
f) the type locality of an indigenous species.	NO	NO	NO	NO	NO
g) the presence of a distinctive assemblage or community of indigenous species.	NO	NO	NO	NO	NO
h) the presence of a special ecological or scientific feature.	NO	NO	NO	NO	NO
Ecological Context					

a) at least moderate size and a compact shape, in the context of the relevant ecological district.	NO - small and very thin	NO - small and thin	NO - small and thin	NO - small and thin	NO - small and thin
b) well-buffered relative to remaining habitats in the relevant ecological district.	NO -a treeland in pasture thin and long and without edge vegetation. Meets - No	NO -a treeland in pasture thin and long and without edge vegetation. Meets - No	NO -a treeland in pasture thin and long and without edge vegetation. Meets - No	The western edge is poorly buffered, but the eastern edge is well buffered by the wetland east and to the south and north are continuances of forest offering buffering. Meets - Yes	The western edge is poorly buffered, but the eastern edge is well buffered by the wetland east and to the south and north are continuances of forest offering buffering. Meets - Yes
c) provides an important full or partial buffer to, or link between, one or more important habitats of indigenous fauna or significant natural area.	No, the fragments do not buffer any valued adjacent habitat and are fragments in pasture and there is plentiful forest south, and east which facilitate networking of species. Meets - No	No, the fragments do not buffer any valued adjacent habitat and are fragments in pasture and there is plentiful forest south, and east which facilitate networking of species. Meets - No	As for the other fragments, other than the riparian forest (mostly on the true right) of the only small and low value stream habitat. However, we do not consider the benefits functionally it offers the stream to be sufficient to qualify as an important buffering function or aid in linkages	The escarpment forest provides an important buffer to a very valuable and quality wetlands surrounding the true left margin of the Mahināpua River. It is also part of the wetland faunal network facilitating refuge in high river flows and passage through a drier margin.	The escarpment forest provides an important buffer to a very valuable and quality wetlands surrounding the true left margin of the Mahināpua River. It is also part of the wetland faunal network facilitating refuge in high river flows and passage

			to any special or important habitat. Meets - No	Meets - Yes	through a drier margin. Meets - Yes
d) important for the natural functioning of an ecosystem relative to remaining habitats in the ecological district.	NO	NO	NO	Important to the significant wetlands, but not relative to the rest of the ED Meets - NO	Important to the significant wetlands, but not relative to the rest of the ED Meets – NO
Significant ?	NO	NO	NO	YES	YES

We do not test the gorse and regenerating shrub/weed (#3, and 14) assemblages for significance, as these are predominantly weed edges with few indigenous species little to no current ecological function or values.

5.2 Wetland

There are no natural inland wetlands on the pastural area of the property – westward of the escarpment forest. In particular we do not consider any wet areas containing rush/buttercup within the pastural area constitute a natural inland wetland, and we do not consider that any area of the forest fragments constitutes a forest swamp.

A natural inland wetland is defined as “permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions” but are not:

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

The recognition in the field of such a feature is by way of the MfE (2020) delineation protocol and inclusive of pasture species lists (Clarkson et al 2021) and pasture exclusion methodology (Clarkson et al 2022).

We have assessed rush and/or creeping buttercup in hollows across areas of the pasture on the property. There are small areas in the pasture that will meet the wet adapted species dominance criteria of the MfE (2020) delineation protocol, but these small areas are in a fully pastoralised landscape used and managed (now and into the future) for all manner of stock farming and this has been the case for at least 50 years.

The restriction on farms for protection of natural inland wetland in paddocks is an area of at least 500 m2 and none of these very small technical wetlands meet anything like that minimum area. These small patches in an otherwise pasture community are simply opportunistic colonisers (rushes in the main) not assemblages that represent a natural indigenous wetland community.

The pasture exclusion assessment method (incorporated by reference (Clarkson, Denyer and Bartlem 2022) looks at small “wetland patches" in a pasture area, i.e. scattered small qualifying “wetlands” and it suggests that Councils form an opinion as to if these areas should be included. Tasman District operates as follows: if hydrologically connected patches less than 10 m2 occur within an area with overall more than 50% of the area being wetland, the overall area is mapped as wetland. Conversely, the overall area is not mapped as natural wetland if patches are less than 10 m2 and overall, sum to less than 50 per cent of the pasture area. This is the case here and so the small “natural wetland” ticking features in the paddocks can be considered not small natural inland wetlands but, as a whole, damp areas of pasture.

These rush (or creeping buttercup) areas were not present several years ago and through a change in farm management following the first mineral sand mining exploration, have been allowed to form (a reduction in pasture management). If this process was allowed to continue (i.e. reduced farm management or removal of stock) new forest (through shrubland) would form, not wetland. That forest would be the same mixture as south on the DoC reserve, i.e. a kamahi-hinau forest with areas of kahikatea and totara depending on the subtle topographic relief. That forest can be seen in the 1951 aerial (Photo 1). It is not wetland or swamp forest.

On this property kahikatea swamp forest is present in the lower lying eastern wetlands where kahikatea becomes the dominant cover on wet ground. Kahikatea is a FAC species, equally as likely to be in dry as wet conditions (Clarkson et al 2021) and is therefore equally as likely to be on a ridge, hill side or a swamp. It is not indicative of swamp. The Kahikatea observed in the fragments of forest in the pasture belong to the hinau-kamahi forest type common on these hind (historic) dunes and areas on the outer edge (in pasture) are sufficiently wet at times to have allowed the Isolepis to colonise. The Isolepis is a common coloniser of forest seepages as well as lake and pond margins, alone it does not constitute a representative wetland assemblage, nor with kahikatea make a swamp forest. As such these areas do not constitute a swamp forest. The dominant tree canopy is kamahi-hinau.

A swamp is defined (Jonhson & Gerbeaux 2010) as: a wetland that receives a relatively rich supply of nutrients and often also sediment via surface runoff and groundwater from adjacent land. Swamps usually have a combination of mineral and peat substrates. Leads of standing water or surface channels are often present, with gentle permanent or periodic internal flow, and the water table is usually permanently above the ground surface, or periodically above much of it. Vegetation cover is often sedge, rush, reed, flax, tall herb, or scrub types, often intermingled, and also forest.

The soil in this farm is not peat but are sands with high mineral content (see Figure 3 in the Application Assessment of Environmental Effects). As identified in the hydric soil report, the soils on site fall into four generalised profiles and in the main these are not hydric soils. The ground water is below and often well below (>0.5m) the surface and is not in any location, other than the drains, always above or at the surface (KSL (Etheridge et al) 2023)). There is little to no internal flow as there is no standing water. The forest fragment areas do not meet the requirements of a swamp.

In the round the areas of pasture are pasture, and areas of forest are fragments of forest, there are small areas of ambiguous wet pasture but no natural inland wetlands of any ecological consequences that should be recognised by the NPS FM (2020) delineation process are present.

Much of the wetland that is on the property is identified as Schedule 2 in the RLWP – possibly significant, primarily because no one has been to survey and test the area. The rest is schedule 1 and both are together east of the escarpment forest.

This survey has afforded that ground truthing ability. Without formally traversing the criteria - In Appendix 4 – the wider wetland below the escarpment forest (in the east) and adjoining with Tūwharewhare (feature # 15, Figure 9, approximately 18 ha) is very clearly a significant wetland.

In terms of representativeness, integrity, diversity, context and distinctiveness, it has at least 5 community types – oioi-tangle fern restiad, harakeke flaxland, swamp coprosma-divaricate wetland shrubland, Carex-Isolepis sedgelands, kahikatea-rushlands, shallow water wetlands (with emergent macrophytes) merging with wet shrublands and escapement kahikatea forest caused by hydrological gradients and substrate changes. Ecotones are plentiful and vegetation sequences evident and in good quality. The diversity of identifiable wetland classes is high, the patterns are distinct and uncommon, the blend distinctive. The wetland feature is large. There is at least one ‘At Risk declining’ bird species (South Island fernbird) and one ‘Nationally critical’ species (Australasian bittern) resident. There will likely be a number of wetland plant species which are at least

‘At Risk’. The wetland has a high integrity and has strong buffers west (escarpment forest) and east – the Tūwharewhare River. It meets most of the significance criteria and it should be considered a schedule 1 – significant wetland.

5.3 Water ways

The West Coast Land and Water Plan does not have a set of significance criteria for rivers / streams. This, however, is not of issue here as none of the waterways discovered on site are natural waterways. We have concluded they are all artificial (dug new and not replacement) systems even while one has naturalised.

6 Ecological Value

An assessment of value, while similar in some respects to significance assessment, is a separate and subtly different assessment, although it uses similar parameters. An assessment of ecological value guides our consideration of the site sensitivity to change (its resilience), the importance of ecological adverse effects, and the need for, and quantum of, effects management.

Following the EIANZ guidelines (2018) we use four criteria (representativeness, rarity/distinctiveness, diversity and pattern, and ecological context) but unlike the determination of significance, we provide an ecological value score of 'negligible', 'low', 'moderate', 'high' or 'very high' against each of these criteria.

This assessment is carried out for all ecological components that have the potential to be impacted through the proposed mining project (whether they have been assessed as significant or not).

Note that the eastern wetland and riverine system and the vegetative escarpment buffer is to be left in place (the project hydrologists, made aware of the need to ensure there is no draining of any natural wetland, have confirmed that there will be no induced drainage due to the mining and the wetland will remain unimpacted). Therefore, these areas are not included further in this assessment as any impacts on this system are to be avoided within the project design. Surveys nevertheless have been undertaken in the habitats.

We remind the reader that in terms of natural wetland and forest swamp, there are no features and no values associated with these types of systems on the current farm (that upper terrace between the Road and the Forrest escarpment in the west).

6.1 Terrestrial Communities

6.1.1 Exotic pasture

- This vegetation is not representative, rare, distinctive, and contains no particular diversity or pattern of features or taxa.
- It provides some habitat for some common native species of open country (harrier, spur wing plover, weka etc), however, these species are either widespread, and common and / or have plenty of similar habitat nearby. It also could be utilised from time to time by migrant or vagrant birds such as pied stilt and kotuku, but is not core habitat and part of a much wider network of modified pastoral landscape.
- It is often disturbed by farming practices of re sowing, mowing, tilling and cattle grazing
- We conclude that it has **negligible ecological value**.

6.1.2 Kahikatea treeland in pasture (#8 -0.3ha)

- The vegetation is highly modified and fragmented into three small clusters and a single row of trees. It is not representative, or rare vegetation. It has low species richness and diversity and lacks any type of valuable pattern. It is unlikely to provide important habitat for significant species of indigenous fauna but will be used by common birds such as fantail, wax eye and grey warbler. It is all edge affected and susceptible to winds and humidity changes, weed incursion and is currently grazed by cattle.
- Given the local context it will not be core or important seasonal habitat for any important indigenous species, it does not provide a buffer function or a linkage corridor function and is not an important seed source.

- We conclude that it has **low ecological value**.

6.1.3 Kamahi mix treeland in pasture (#11, 12, 13 – 2.4ha)

The treeland and scrub has:

- Small and thin pockets.
- Exotic species including blackberry and gorse, especially on the margins.
- Cattle browse it throughout.
- The exotic presence and reduced ground cover and middle tier reduce the representativeness.
- There are also no threatened, rare or locally uncommon plant species within this community. We therefore score this community low for rarity and distinctiveness
- Low in diversity of taxa and community and physical gradients as a result, this community scores low in diversity and pattern within the site.
- Most of this community is riparian or forest edge vegetation; therefore, there is some functions of shade and detritus to waterways but little linkage or other functional uses. A low to moderate value of ecological context.

Overall, we conclude that the kamahi-tree fern scrub in pasture is of **low ecological value.**

6.1.4 Kahikatea/kamahi treeland in pasture (#9, 10 – 1.4ha).

This forest fragment type includes one of the larger fragments (ca. 1ha) and greater species richness than the other fragments, however even then:

- the middle tier and ground tier is depauperate and the areas are all edge effected (50m wide). While the canopy (comprised of young canopy kahikatea and occasional rimu and kamahi) is sound and closed, there is little sign of recruitment or an understorey. The absence of typical ground and middle tier vegetation and ongoing exposure and livestock access has greatly reduced the vegetation and faunal resources and refugia, to the point where seasonal resources are still foraged for, but the fragments importance in the wider landscape is minimal.
- We consider that this fragment type has low representativeness in 2 of the tree forest tiers and has limited species richness, low diversity, an absence of distinctive features and a relatively uniform canopy of youngish common trees without any particular contextual important.

We assess the two fragment types as of **low ecological value**.

6.1.5 Escarpment (Hinau/kamahi and young kahikatea forest)

- This forest is representative and has three typical tiers of vegetation species (including epiphytes), it is part of the home range of at least one ‘threatened’ and one ‘At Risk’ bird species, and one ‘naturally uncommon’ plant species, it has important buffering functions to the wetland east, it is a mosaic of hydrological responses and includes a kahikatea wetland forest and a number of emergent aged kahikatea, it has the expected range of diversity and pattern.
- Overall, we conclude that this forest has **high ecological value**.

6.1.6 Wetland

The wetland east of the escarpment, for all of the factors and features describe in the significance assessment and the ecological description has **very high value**.

- I.e. representativeness is very high in that the assemblages all are indigenous and represent assemblages befitting the various hydrology and provide at least three community types which are intact in all structural elements.
- The diversity of plants and animals is high, largely because of their intactness and it is habitat of a number of rare, threatened and at risk fauna.
- Wetland ecosystems in low lands anywhere including the west coast are rare ecosystems and the condition and size of the features present are outstanding and form a very important part of a sequence from lake to river to escarpment in a very wide sequence of systems, all largely surrounded by indigenous forests.
- It is a highly valued mahinga kai resource (Ngati Waewae 2018) both in water, on the water and in the adjacent and downstream wetlands.

6.2 Fauna

6.2.1 Avifauna

Other species

- The common, widespread and conservation secure species within the ecological district, i.e.: fantail, silvereye, grey warbler, western weka, bell bird, kereru, tui, pukeko, tom tit, ruru, and welcome swallow are considered to have a low relative ecological value with respect to an effects assessment (not their own intrinsic value). That is, an activity at a site which adversely affects several individuals is unlikely to impact the local populations of these species.
- South Island fernbird and bittern (recorded in the western wetland), are likely resident.
- Those At Risk / naturally uncommon species (South Island fernbird, bittern) (as per EIANZ (2018)) are "**High**" value.
- The nationally threatened species (bittern) are of "**Very high**" value.

6.2.2 Bats

- Although not recorded in the area historically or in recent survey, the long-tail bat has limited potential to utilise the site for feeding and roosting. This species is listed as nationally critical and so ***if present*** are of "**Very high**" value and they would raise the value of the habitat they were found in.

6.2.3 Herpetofauna

- Of the four lizard species potentially present, two are of particular ecological note, the West Coast green gecko and speckled skink. Given the condition of the forest floor in the fragmented forest patches, it is most likely an arboreal gecko could be present and speckled skink habitat preferences are for coastal areas. Surveys for these taxa was undertaken in spring-summer 2023-2024 with no

indications of taxa present. We, based on the survey results and habitat condition, assume that they are not present, or if so in such low abundance as to be undetectable.

- If present West Coast Green Gecko has a threat status of nationally vulnerable and so "**Very high**" value.
- If present At Risk species (speckled skink and forest gecko) have "**High**" value.

6.3 Summary of Ecological Values

Table 10 summarises the assessment of ecological value above, as based on the EIANZ (2018) methodology.

The presence of some fauna which is as yet unproven does not automatically make a low habitat become one of high ecological value. For example, a kotuku standing in the paddock periodically does not confer a very high ecological value to the pasture. However, the presence of a reasonable population of west coast green gecko in one of the fragments would increase its current "Low" value upwards.

Table 10: Summary of all habitat potentially will be impacted through proposed works.

Ecosystem Component	Habitat Value	Fauna values
Terrestrial Habitat		
Pasture	Negligible	High transitory
Kahikatea treeland in pasture (#8)	Low	If gecko population present- High
Kamahi mixed treeland in pasture (#11,12,13)	Low	If gecko population present - High
Kahikatea/kamahi treeland in pasture (#9, 10)	Low	If gecko population present - High
Hinau/kamahi mix (#5, 6, 17) (escarpment)	High	High - avian, gecko
Wetland		
Eastern wetland complex	Very High	Very High
Forest drainage channel		
Perennial pool and channel	Low	Low (accepting long fin eel is transitory)

7 Assessment of Effects

The assessment follows the EIANZ (2018) guidance and considers the effects management hierarchy out lined in the NPS FM (2020) and NPS IB (2023) – i.e., avoidance, minimisation, remedy and then where residual effects are more than minor, they are offset. We note that there are no SNAs on the property and so elements of the NPS IB and RPS related to SNAs are not in effect. Regardless of the significance of the vegetation to be affected we have considered its value generally and in light of NPS IB clause 1.7 about the maintenance of indigenous biological diversity (in a way akin to the old “no net loss” paradigm).

7.1 Avoidance and minimisation

The project, in order to attain the subsurface minerals on the property, requires clearance of the forest fragments in pasture and removal of drains.

There are minerals under the embankment forest too and likely under the wetlands but the client, in discussion with the ecologist and hydrologist, has agreed to avoid both of those features and thereby protect their ecological values.

Avoidance of the forest fragments within pasture was also explored; however, the geological studies show (Figure 17) that the densest, thickest resource lies under the south-eastern corner of the pasture area and the forest fragments including the embankment. From an ecological perspective if the mining was to limit itself to the western edge of the fragmented pasture and avoid all adverse ecological effects, then this would not result in the proposed benefits offered, and to be gained from the project.

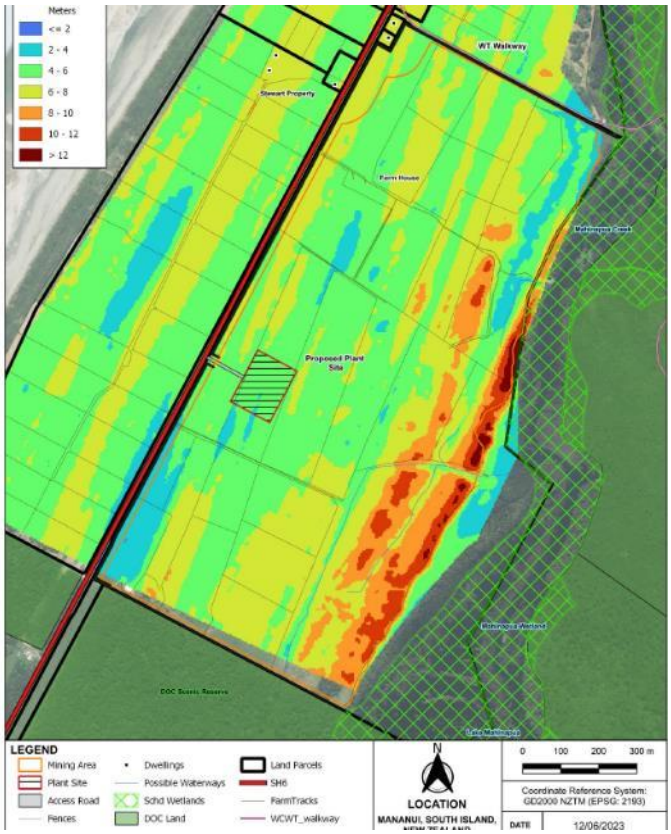

Figure 17. Heat map of the thickness of the resources sort to be mined.

Wetland hydrology

There are no direct effects to the scheduled wetlands or any natural inland wetland. The eastern wetland will be at least 30m distance from the mine pits closest point, which will be of limited extent (length of open pit) at that eastern edge and of an equivalent altitude (RL) and so there should be no gradient for loss from the wetland and an interceding substrate. The hydrologists (Rekker & Etheridge 2023) state that

"*Any depletion of flows in [Tūwharewhare] Creek will be temporary, short term, well below widely accepted effects thresholds for ecological stream health and cause no adverse effects. The proposed activity is expected to generally augment flows in the creek for the duration of mining, although the scale of any augmentation will be smal*l." And that

"*A precautious assessment of changes in groundwater seepage from the eastern edge of the mine site to the [Tūwharewhare] Creek riparian wetland also shows a net increase in seepage during mining. Both increases and decreases are projected to occur over time and fall within the range of the natural variability. Any reduction in seepage, which would be intermittent and interspersed with increased seepage, would comprise a negligible component of the wetland water budget and be of no consequence to the wetland hydrology*."

Ecologically we consider this (and the modelled 0.2mm change potential) to say that there will be no "drainage" of the wetland such that the water budget is any different, it is within natural variation, and that we consider is sufficient to be certain the wetland plant life and so wetland habitat will not be affected in any way (avoided).

This is also the case for the small natural wetland on the DoC managed land south with a perched wetland separate from ground water and a 10m interceding soils buffer it too will not be drained by a temporary pit near (10m) to the northern edge.

For completeness, we reiterate that there are no natural inland wetlands within the pastural land being affected that require planning consideration. In particular, our assessment is that the wet pasture areas are wet pasture not natural inland wetlands.

Discharges

We assume that surface sediment discharges, if any surface flows were to leave the mine site / plant, and dust discharges off the property are managed appropriately and have best practice management regimes and therefore consider these of no indirect impact to the forest edges or further distant eastern wetland.

Effects management

In terms of area of habitat affected the applicant has agreed to a setback to minimise their activities on the southern boundary (10m). With respect to the eastern edge our understanding is that while they are not clearing any of the existing eastern escarpments' western edge vegetation, they will mine as close as they can. Our recommendation to avoid effects to the forest edge is to ensure they disturb earth only outside of the drip line (the fullest canopy extent) of any indigenous shrub or tree species and that the slope into the pit on the bush side does not result in the baring of roots or the instability of the slope that may result in exposure of roots.

This is required to ensure there is reduced chance of non-direct effects to adjacent values (there is hydrological separation, no root disturbance etc). In addition, salvage of species and resources from the forest fragments prior to clearance again reduces the possible harm.

During nesting, there remains the potential for nest, egg and parent loss from canopy tree felling / clearance. Given the quality of the in-pasture fragments it is unlikely nesting is abundant, but some nesting of common forest native species may occur. To minimise the potential adverse effect of destroying the

nests and birds nesting, either canopy tree removal should be undertaken outside the common breeding season (July-February inclusive), or else if within the season, a pre-tree felling nest survey be completed, so as to avoid felling those trees with nesting native bird species.

For bats, there is a DoC protocol for minimising the risk of felling bat roosts (BRP DoC 2021) which will be followed.

For arboreal lizards (gecko) we recommend a pre-clearance check and salvage set of procedures to manage the clearance in a way that protects gecko and allows then to be safely transferred (or to self-evacuate) to the escarpment forest (or DoC estate). If successful then effects on gecko are avoided. These protocol are standard and have been practiced at scale on a number of roading projects around the country including Transmission Gully and Mount Messenger and numerous Council have guidelines (e.g. Auckland Unitary Plan SCM: Lizards).

7.2 Indigenous Habitat Loss

Under the proposed mining scenario which is a long “worm” of excavation over time (Figure 18) all of the Map areas 1, 3, 8, 9, 10, 11, 12, and 13 – the in-pasture forest fragments and gorse - would all be removed (cleared). That clearance is unlikely to occur until the mine process arrives at the eastern end of the mine extent.

Figure 18. Proposed mine path (starts south-west corner and mines the southern and eastern boundary first)

Regardless of clearance timing, in total we measure (based on the site visit, and against recent (June 2023) drone imagery) the ecological features affected to be as follows:

- Gorse / weed shrubland – clearance of 0.3 ha
- Forest fragments – clearance of 4.2 ha

We consider that the clearance of the predominantly gorse / blackberry cut drain riparian vegetation is not an adverse effect on the extent or values of a wetland or river, or a significant adverse effect on indigenous biodiversity that requires avoidance, minimisation or any other management.

7.2.1 Forest clearance - magnitude and level of effect prior to mitigation

The magnitude of an effect is related to the scale of comparison and temporal persistence of the effect. The scale is often related to the scale at which the values of an area are considered, which can be national (such as a threat classification), Regional – as in a regionally uncommon species, or most often, an Ecological District (a LENZ and representative rarity level). A consideration at only a site level is unusual, not typically relevant and not intended by the guidance.

The EIANZ (2018) guide recommends that an assessment at the scale of the feature (e.g. contiguous dunes, wetland system, forest community) should be done". Which in this case is podocarp/broadleaf indigenous forest within either the Ecological District (**ED**) or within a catchment or on a local common landform where environmental conditions are similar. The NPS IB (Appendix 1, clause 1(3)) states the scale of assessment is to be the features ED and for rarity the ED, region and nation.

We assess the magnitude of the forest clearance at the ED and at a smaller local level, i.e. the dune terraces east of Woodstock-Rimu Road and from Ruatapu north to the Hokitika River.

The loss of 4ha of the podocarp / broad leaf forest fragments at the ED scale, is considered to be of a magnitude that is 'negligible' i.e., the amount of clearance relative to the amount present in the ED is very, very small (<< 0.1%). The ED contains thousands of hectares of indigenous podocarp / broadleaf forest. Even at a local scale – i.e., the dune terraces between Ruatapu and Hokitika inland to Woodstock – Rimu Road there is around 2300 ha of similar indigenous forest, meaning the 4 ha loss on site causes a 0.17% reduction in that habitat type (and the loss is of small isolated fragments) – this, through a rough estimate, is a cautious one and should be considered a Negligible magnitude of effect (at the scale of assessment: "*Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR having negligible effect on the known population or range of the element/feature*)".

At the very far end of the precautionary scale, the on-site magnitude of effect is a 40% reduction in broadleaf/podocarp forest which we would deem a 'moderate' magnitude of effect *("Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature)".*

The forest fragments identified all have 'low' ecological values and their removal is considered to be a 'negligible' magnitude of effect, which results in a '**very low' level of effect**, or what is more commonly termed a 'less than minor' adverse effect with respect to the Resource Management Act (1991).

I note also with respect to vegetation effects that the geology report calculates that there is a 1% chance that an alpine fault earthquake occurs and coincides with the pit being adjacent to the escarpment forest and that this event could cause slumping of trees associated with the pit edge into the pit. I am not concerned that this unlikely event would cause anything but a negligible increase on an effect that may naturally occur because it is possible under a strong enough earthquake that those trees would fall in any case and also because the effect in that scenario would be an increased risk over all of 100m of the 1.7 km forest length.

7.2.2 Discharges to the wetland and / or Tūwharewhare (Māhinapua Creek)

As recorded above, the general life (macroinvertebrates, plants, fish and birds) in wetlands is well adapted to silts and sediment inflowing and being deposited, in general wetlands are built on this process. Therefore, it would take a substantive amount of concentrated sediment and contaminants entering the wetland to significantly affect the life and functions of the wetland.

The terrain prevents much of the eastern wetland from being suspectable to over land flows, if water could top the mine pit and flow east, as the escarpment physically blocks surface flows. But there are several areas of lower escarpment terrain that might for such a flow, one at the cut and one at the old mine site and in the northern quarter. Alternatively, there may be a subsurface path for slow filtered discharge to the wetland (and so the Creek). The hydrologists (Rekker & Etheridge 2023) have assessed this potential for turbid water and for contaminated water to reach the eastern wetlands and Tūwharewhare. In regard to raised turbidity discharge they say:

"*Turbid water in the mine excavation is very unlikely to be transported more than 50 m from the edge of the excavation. Given that the proposed mine pit will be located at least 50 m from Tūwharewhare…….the potential for turbidity changes in the receiving environment is low, even without accounting for dilution in the creek and filtration in the fine substrate of the riverbed*. "

This seems logical given the terrain and mine process. We are reliant also on the construction and mine sediment management regime designed by both the hydrologists and Ridley (2023) who propose to use barriers and capture systems and filtration to ensure discharges are managed. Lastly, we note and support the development of two new wetlands, one at the cut and one in the north which while creating a buffer when farming returns for water discharge will also protect the eastern wetland and Creek through the mine life. From my perspective to be effect in this future role they should be fully vegetated shallow wetlands (<1.5m deep) with multiple depths created by stepped terraces and not just uniform depth open water ponds.

I think that by and large there is little risk of a significant discharge of sediment and that it would require a significant discharge to cause a measurable species and system disruption in the wetland or Creek. I consider, with the proposed defences (pit management to have positive inflow of ground water by pumping to a trench etc) and the natural landform, that the magnitude of a discharge would be low and the risk of such a discharge very low.

There has also been consideration of the wider water quality that may be discharged subsurface. The sands contain a range of minerals and metals. The hydrologists state that there may be a suite of dissolved metals in the minerals processing discharge water at concentrations above environmental screening thresholds (Aluminium, copper, chromium). Their conservative modelling shows that, after accounting for reasonable mixing, all water quality determinants will be below screening threshold values in Tūwharewhare with the exception of aluminium. Not that that water will get to the Creek.

Aluminium is naturally elevated in Tūwharewhare and in groundwater beneath the site. Although the proposed activity could potentially cause a small, short-term, increase in aluminium concentrations in the creek under a precautionary worst-case scenario, and such change would fall within the natural variability and is very unlikely to cause a measurable change in aluminium concentrations. They conclude that the activity will not cause adverse surface water quality effects".

We agree that it is unlikely that there could be a surface discharge of processing water and while there may be a concentration of naturally occurring elements related to the project and a subsurface discharge of these to the wetland and creek, the systems of the eastern wetland and creek exist with the current substrate minerals and raised metal concentrations. We consider the systems present (given the macroinvertebrate communities and fish present) are robust to these elements, even in raised concentrations, and that it is unlikely

concentrations of those elements could be released in a focused area of the wetland or creek. We assess the likely impact as negligible and would be unmeasurable in terms of an adverse effect.

7.2.3 Noise and light

The mine operation requires machinery (a dredge or digger/s in the trench), some truck movement, and a western central processing plant and work will be 24 hours a day. Thus, there will be lighting at night in the trench and at the plant, and there will be a modicum of noise arising in the trench and from the plant. The noise experts (Marshall Day Acoustics September 2023) predict conservatively that noise levels from the activity (at the western, nor-west, sou-western boundaries) will be between 30 and 55 dB LAeq. Their modelling suggests that the levels will be less in the eastern native habitats (which is twice as far from the western boundary). They predict a level of 30 (or less) dB at the southern DoC camp ground. We interpret the level at the property boundary south and east to be in the vicinity therefore of 35-40 dB. 40 dB has been described as about the level of a library[7], or akin to bird song, but quieter than a refrigerator.

The lighting is designed to be directional and downward such that light pollution is minimised (light can attract shore moving sea birds such as the Westland petrel (Tāiko) and cause (as with insects) confusion and result in the bird heading inland inappropriately and target the site. This is secured through proposed condition 16.2, which requires that the Australian Government's National Light Pollution Guidelines for Wildlife January 2020 (or subsequent revision) are adhered to. Those guidelines have other requirements, including that external lighting is minimised on the seaward side of buildings to minimise light spill toward the coast. In any case, we note that the Westland petrel, being centred in Punakaiki, are too distant to be affected by this site light display except for the rare occasions when they roam to the waters about Stewart Island (typically day time flights).

The species of greatest value and most potential re disturbance, are several species of local sea bird and the wetland avian fauna: fernbird, bittern and possibly banded rail and marsh crake, which are of conservation importance and use habitats present outside (but adjoining) the footprint. Most common bush species (weka, tui, fantail., grey warbler) on the edges have habituated (to a degree) to human land use noise and lighting at other sites, and are not generally negatively affected in a measurable way. Some traffic noise interference with song-mating has been recorded in the literature (Parris & Schneider, 2009) and light disturbance affects feeding behaviour in black back gulls (Pugh & Pawson, 2016). The disturbance of relevance is any impact that would diminish the fitness or breeding success of the wetland bird species of conservation interest as that relates to the NPS IB schedule 2. In that respect noise will not be of issue and lighting at night is screened from the wetland (see below).

The landscape is already a working environment with machinery and vehicle noise and lighting from housing and cars, the pertinent question is what the additional noise and light of the mining operation will be and will it have an effect.

To that end we have examined the landform, the proposed operations and researched the literature.

Wetland birds

Our first observation is that the wetland habitat in which bittern and fern bird occupy is always more than 30m distant from the mine trench, even when it is at its closest, but it is only close (within 50m) for a short period of the mine life (months in the first year of operation). The plant is, at its closest, 550m from the wetland.

The second relevant observation is that the wetland east sits lower in the landscape than the mine trench (Figure 19) and that there will always be the forested escarpment between the wetland and the trench (which

[7] How Loud Is 40 Decibels (dB)? With Noise Comparison Chart | House Grail

is always sub-surface) and the plant. The escarpment and forest on that escarpment, screen and buffer both noise and light from the trench and plant.

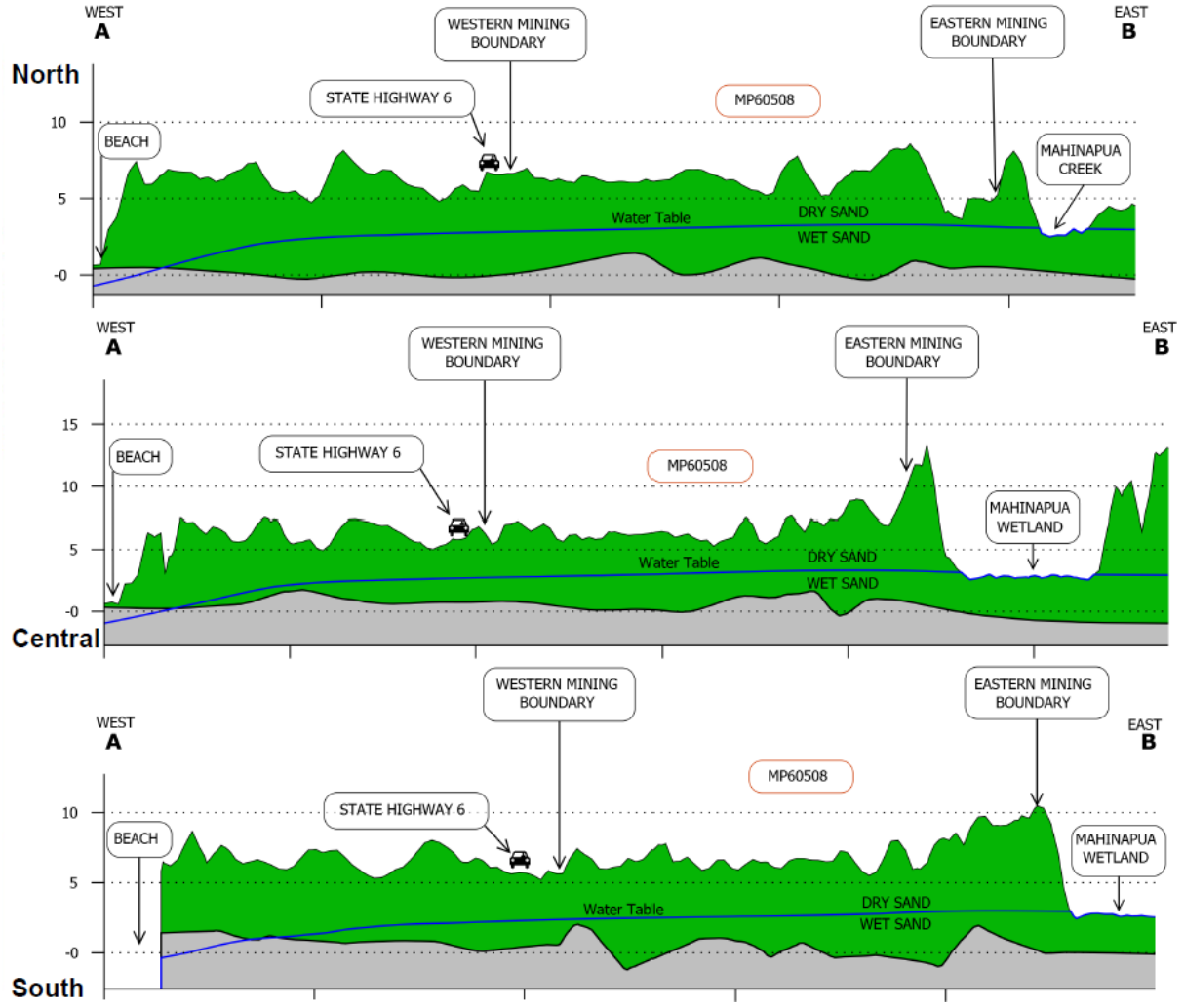

Figure 19. three cross sectional profiles of the landform to be mined.

As the mine activity itself is below ground surface, and the eastern wetland is set low in the surrounding topography and buffered by the escarpment and its forest vegetation on top, we consider there will be no visual connection between the two, and no light perception and little to no noise perceptible in the wetland.

The operating plant produces less noise than the machinery working in the trench and the lower level "sluicing" of sands and transport in the various conduits at 550+m distance and buffered by the escarpment landform and forest from the significant habitats for birds will mean, again, low to no perception in the wetland (i.e. < 30 dB).

Lights at the plant will likely produce at least a dull aura of light above the forest at night. We do not consider it likely the anticipated light pollution will be sufficient to disturb any activities or rest of the wetland species. Nevertheless, we recommend orienting the lights down and away from the coast and to follow the Australian National Light Pollution guidelines for wildlife (ANLPW 2023).

Sea birds

As occurs in other areas of the West Coast, but more often where there are coastal escarpments and river out lets, a small range of sea birds come to land and use sites to roost or nest on (e.g. Tāiko at Punakaiki). It is unlikely but possible night traveling sea birds in this area, those heading inland or along the coast, may be

attracted to the plants lights, depending on how they are orientated, and diverted from their path and become disorientated or even collide with the infrastructure. This raises their risk of predation at site and from collision death with the plant infrastructure. Such an impact to many sea species (petrels in the main) would be (depending on which species) a moderate magnitude effect, and likely to a high value species, meaning at least a moderate level effect. We understand the Project will be designed to ensure that the lighting will be designed to be oriented away from the coast and downward to minimise attraction.

To that end the ANLPW guide states for sea birds (as it relates to the plant):

- turning lights off during fledging periods (generally Jan-Feb)
- modifying light wavelengths
- shielding the light source and preventing upward light spill
- implementing a rescue program for grounded birds (Rodríguez et al. 2017a).
- keeping light intensity as low as possible. Most bird groundings are observed in very brightly lit areas (Rodríguez et al. 2017a).

Insects

It is a perception of most that there is a large group of insects that are attracted to lights at night.

In New Zealand the following 11 insect orders regularly come to light:

Aquatic :

- Caddisflies (Trichoptera)— both marine and freshwater species
- Stoneflies (Plecoptera)— particularly the genera Stenoperla and Megaleptoperla
- Dobsonflies (Megaloptera)
- Mayflies (Ephemeroptera)
- Bugs (Hemiptera)—a few families but not consistently, e.g. water boatmen and backswimmers on extremely hot nights.
- Lacewings (Neuroptera).

Terrestrial

- Wasps (Hymenoptera)—particularly some ichneumonids
- Moths (Lepidoptera)—most families with night-active adults, but particularly Geometridae, Noctuidae, Crambidae, Tortricidae and Hepialidae.
- Beetles (Coleoptera)—a few families only, particularly flighted scarabs, click beetles and longhorns
- Flies (Diptera)—many families
- Praying mantids (Mantoidea)—only on the warmest summer night.

While the change in lighting does not impact invertebrate communities' directly in the same way as habitat removal would, there can be perceived issues with "attraction" to light sources at night. That "attraction" does not necessarily result in a loss of fitness or death of the individuals, more often just disruption with flight which is self-resolving. However, in certain circumstances it can case a congregation which can become a focal point for predation.

Further, light does not "attract" insects — it confuses them and intercepts them from their chosen flight path (Patrick 2016[8]). Some insects fly repeatedly around the light, others simply settle at varying distances from the light and may fly off after varying times ([9]).

[8] Patrick 2016. Department of conservation: "Inventory and monitoring toolbox: invertebrates". DOCCM-286730.

[9] Reg Fry and Paul Waring, *A Guide to Moth Traps and Their Use*, vol. 24 (Amateur Entomologists' Society, 1996).

The distance of effect is typically considered to be around 1km (Patrick 2016) but depends on the topography and other light pollution.

Of the light sources that attract nocturnal insects, those that emit relatively large amounts of UV radiation (blue fluorescent lights, black lights, and mercury lamps), wave lengths < 500) exert the strongest attraction [10], but they see yellow and orange light (wave lengths over 550 nm) poorly and they cannot see red or infrared light (wave lengths over 600).

With regard to the mine plant and the surrounds the aquatic insects attracted/confused are minimal as there are no natural wetlands or streams with representative insect fauna within view of the proposed plant, the nearest being Tūwharewhare itself, which like the wetland is screened by the forested escarpment.

It is likely at the mine plant that seasonally nocturnal flighted forest insects (beetles, midges and moths) will be confused ("attracted") to the plant night lighting but that will depend on the wavelength (even with provisions to reduce light spread). Species such as huhu beetles, porina moth, Geometridae, Noctuidae, Crambidae, Tortricidae and Hepialidae moths and grass grub adults will be seasonally attracted. This is not of concern, as these species are common and are often attracted to housing and town lighting. It may even cause a congregation that will be a convenient resource for nocturnal insect predators such as ruru (or bats if present). However, we currently do not consider there are dangers at the plant should bats or ruru be present and hawk for the congregated insects. Where the light spread is reduced (as is proposed) then the magnitude of impact of light pollution will be minimised and we think that there is unlikely to be an adverse effect from the attraction of some insect groups, or to the wetland bird species which is screened and at least 500m distance.

7.2.4 Avifauna

There are two potential additional effects above light and noise on avifauna which are considered; habitat loss and resultant displacement and direct impacts of death during breeding (clearance while nesting is occurring). We do not consider direct human and machinery impacts and disturbances as these remain in the pastural areas and do not enter or affect the remaining habitats on site or adjacent. It is remotely possible weka or some of the long traveling coastal birds may land on and use the pastural areas and risk impact to vehicle movements, but this is the case under the current farming regime and our understanding is that truck movements will be slowed (see Traffic assessment).

General Comments

- All bird species recorded (or postnatally present) within the site, including those using forest fragments in pasture, are mobile and able to utilise similar habitat (which is locally abundant) over relatively large areas for food and breeding (home range). It is considered highly unlikely that any native bird species which utilise the affected habitat, are restricted to just that affected area, as species are not habitat limited locally. The indigenous vegetation and habitat being cleared, while having a total area of 4 ha, is highly fragmented and is both poor quality habitat, and comprises only a small percentage of native forest available as habitat within the wider protected area network of Māhinapua Lake Scenic Reserve and the Hokitika Ecological District. We note that in respect to the NPS IB and highly mobile fauna habitat that those listed in schedule 2 and present on the site are in the eastern wetland, not the pasture or pasture forest fragments. The magnitude of effect of loss of habitat and displacement is therefore considered to be at worst 'low' but probably 'negligible'. The values of the common native species associated with the forest fragments (e.g., fantail, pukeko,

[10] Thomas Cowan and Gerhard Gries, "Ultraviolet and Violet Light: Attractive Orientation Cues for the Indian Meal Moth, Plodia Interpunctella," *Entomologia Experimentalis et Applicata* 131, no. 2 (2009): 148–58.

western weka, grey warbler, tui, tomtit etc) are “low” (following EIANZ 2018). The level of effect is therefore ‘**very low’** (less than minor).

- Nest, egg and parent loss from canopy tree felling / clearance will be minimised and effects will be, if any, to a low number of common bush birds, and so we consider the magnitude of effect to be Negligible on “low” value species resulting in a “**very low level of effect**” – less than minor.

NZ Pipit

- While no pipit has been recorded on site, this is also the case for opportunistic “laybys” such as SIPO, or other species such as gulls in from the coast, any periodic presence in grazed and managed pasture does not cause an issue given the mine style, area of impact and rehabilitation plan.
- Pipit is not common in well managed and grazed pastures (if present on site). It is more likely present in areas of rough pasture and rank grassland-shrublands, and is therefore unlikely to be present. However, the area of pasture removal is a slow progressive operation with rehabilitation occurring as the trench progresses and the area of open trench (mine) is small, relative to the remaining pasture at any one time. We think it highly unlikely any pipit are present and could be adversely directly or indirectly affected or displaced by pasture removal.
- Similarly while exposed soils may attract a range of species or there will be times of traveling species resting on the pasture the extent of works limited as it will be to a 100m wide trench and low level of site disturbance in general should see more than sufficient areas where these birds can “rest” without conflict with the activity of the mine.

7.2.5 Herpetofauna

Geckos and skinks are not considered highly mobile, especially mature adults. The forest fragments have been isolated and diminished in quality over the last 70 years and it is reasonable to expect the skink populations once present, to have diminished or died out. This is borne out by the recent survey which found no taxa. There remains the potential that forest gecko is still within the canopy trees of the fragments. Whether they are present or not would be extremely difficult to detect if they occur at low abundance. Their presence would be determined by survey prior to commencement of works and if present, the management response would be to trap and transfer them and so avoid harm and any adverse effect to individuals.

West coast green gecko

There is only a remote risk for the endemic West Coast green gecko to be living in the indigenous canopy vegetation (there is little ground and middle tier vegetation) of the forest fragments, although this species is typically found in kanuka and manuka shrublands rather than kamahi / kahikatea young canopy. While the impact of a death would be a high magnitude effect the risk is very very low and is minimised by the proposed pre-clearance salvage, consequently we consider the resultant risk of a high effect as very low. From a precautionary consideration, if any arboreal gecko or skink are salvaged and transferred to the eastern escarpment forest then we recommend that a lizard fence be installed along the base of the stock fence that is to demarcate the forest rehabilitation area, so as to stop lizards “wandering” back west.

Forest gecko

With respect to the Forest gecko, its presence cannot be ruled out and there is a chance if present, individuals would be killed through canopy tree felling in the absence of minimisation of that effect. There is no habitat shortage across the region for this species, indeed the biggest threat is introduced mammalian predators and not habitat loss. However, this species is listed as At Risk Declining and therefore any loss of an individual is considered important. Given this, and reflecting on the low risk of presence and low abundance if present, we consider the potential effect on Forest gecko, without effects management, to be ‘moderate’ magnitude on a

'high' value species and so a "high" level of effect. But as discussed under minimisation, a pre and during clearance salvage (following the faunal management plan and wildlife permits) can reduce this potential effect to zero or at worse greatly reduce the magnitude of effect to a low one and thus the level of effect to "Low".

7.2.6 Freshwater Fish

The 250m eastern drain ("B" Figure 13 holds a low abundance of banded kokopu and eel primarily in the southern (upper reach) 50m in a long deeper pool. While none of these fish are rare or uncommon, long fin eel still retain an 'At Risk – declining' classification (Dunn et al 2018) and it is possible to avoid native fish death through salvage and relocation. This is a simple process of isolate, trap and transfer. We recommend this process be undertaken prior to any drainage or forest clearance works associated with the channel and its vicinity and that those salvaged fish be returned to the lower cut / kahikatea swamp section of the waterway and an isolating net be in place at the cut confluence to prevent upward recolonisation during mining in the area. In this way effects to native fish will be avoided. A condition of consent should require a trap and transfer regime following the faunal site management plan.

7.2.7 Faunal Management Plan.

A draft fauna management plan has been prepared (Appendix 5) which ensures rescue of potentially affected species associated with the forest fragments to be cleared and drains requiring removal. That plan results in avoidance or at least minimisation of harm to valued species.

7.2.8 WCRP

With regard to the Regional Plan, in the following I discuss if this proposed activity adheres to RPS Policy 7.2, which is that:

Activities shall be designed and undertaken in a way that does not cause:

a) *The prevention of an indigenous species' or a community's ability to persist in their habitats within their natural range in the Ecological District, or*

The removal of common vegetation species in low abundance of poor condition which are abundant in the wider ED and local landscape will not challenge this provision.

b) *A change of the Threatened Environment Classification to category two or below at the Ecological District Level; or*

Again, noting spring surveys to come, nothing in the forest fragments has a classification of more than At Risk -Declining and those species (climbing rata and long fin eel) all remain abundant. If all these individuals were lost from the 4.2 ha of fragmented forest there would be no population effect or threat classification level change of the taxa.

c) *Further measurable reduction in the proportion of indigenous cover on those land environments in category one or two of the Threatened Environment Classification at the Ecological District Level; or*

The features are not on land environment categories one or two.

d) *A reasonably measurable reduction in the local population of threatened taxa in the Department of Conservation Threat Classification Categories 1 – nationally critical, 2 – nationally endangered, and 3a – nationally vulnerable.*

No taxa of this classification occur in the forest fragments to be cleared (spring surveys for bats & gecko pending).

7.3 Summary

Without the benefit of effects management, the activity will not cause:

a) The prevention of an indigenous species' or a community's ability to persist in their habitats within their natural range in the Ecological District, or

b) A change of the Threatened Environment Classification to category two or below at the Ecological District Level; or

c) Further measurable reduction in the proportion of indigenous cover on those land environments in category one or two of the Threatened Environment Classification at the Ecological District Level; or

d) A reasonably measurable reduction in the local population of threatened taxa in the Department of Conservation Threat Classification Categories 1 – nationally critical, 2 – nationally endangered, and 3a – nationally vulnerable.

The majority of potential adverse effects to value are avoided (no impact will occur to the escarpment forest or the scheduled wetlands). Otherwise effects are minimised to the point of less than minor. The effect that cannot be avoided or reduced to near none is the removal of the "forest" fragments, and while the effect of that loss is very low, (i.e. in RMA terms "less than minor")to assist Council in achieving new NPS IB section 1.7 directives – i.e. maintenance of indigenous biological diversity, we have recommended, and the Applicant is offering, an ecological package that ensures the effect is remedied -i.e. that no net loss of habitat occurs.

Furthermore, direct effects to special fauna are also avoided or minimised to near nil through recommended salvage practices (these are effects management approaches) following now standard practices which minimise or remove risk to: lizards, fish, birds and bats associated with the cleared habitat areas (See draft faunal management plan (Appendix 5)).

7.4 Remedy / Ecological Benefits Program proposed.

There is (after avoidance and remedy) no residual adverse ecological effect, and the remedy ensures the NPS IB directives of the maintenance of indigenous biodiversity (extent and value) is upheld. The remedy causes a range of pest management and protection when compared to what there is now, and in my opinion, a net gain occurs, especially when the fragments will continue to degrade over time under the current land use (even if fenced). These actions represent both a remedy of any adverse effects associated with the removal of the forest fragments, and also a positive effect over and above that remediation as there is a net gain in ecological outcomes or 'net ecological benefit'.

The following management actions are proposed which are a remedy and create a net ecological benefit.

Firstly, a new boundary of the escarpment bush will be developed (rehabilitated) and fenced which is 30m in width (and a little wider in the north) projecting out from the current western escarpment bush edge (Figure 20). This 30m area of land over approximately 1.7 km (summing to 5.1 ha (of which 4.75 ha will be forest)) will

be revegetated using salvaged plants and seed bank soil and wood from the pasture fragments to be cleared and additional nursery grown plants as required, with the goal of achieving quick canopy closure. In addition three wetland areas totalling approximately 2.37ha) are to be included, the central one in place of the current drain cut and the northern one (post mining) will be a substantive wetland as yet not detailed (Figure 20). From a technical aspect the wetlands are bonus ecological gains as no natural wetlands are being affected, but the inclusion of farming land use discharge filters (fully vegetated wetlands) regardless of their sizes prior to the Tūwharewhare and wetlands, makes good ecological sense.

The current concept results in approximately 5 ha of forest restoration and at least 3 substantive wetlands.

The ecological benefits program is consistent with the new directions of the NPS IB (to maintain indigenous biological diversity and policy 13 promote restoration of IB).

We consider the appropriate remedial / benefit management actions to be the following:

- Protection of the high value eastern wetland and escarpment, including the forest / wetland restoration area (ca. 20 ha).
- Physical protection of the above systems via cessation of livestock access to the escarpment and wetland through fencing the forest/wetland restoration area off from the farm.
- Animal pest control in the escarpment forests (Ca 12 ha for possum, mustelids and feral cats) and new restored forest edges during the consent period.
- No “loss of extent” of forest through an equivalent area of new (replacement) forest of the same composition along the western edge of the of escarpment forest.
    - That forest will be created through direct transfer, use of nursery grown species and managed natural regeneration from the overhanging escarpment forest and salvage.
- There will be, due to the revegetation area, an increase in the resilience of the escarpment forest and increases of functional performance of that forest to buffer the eastern wetland.
- In addition, there is likely to be three new indigenous wetlands developed, summing around 2.37ha ha and involving the propagation and planting of four or five sedge taxa from nursery stock and translocation of raupo and harakeke from local sources.

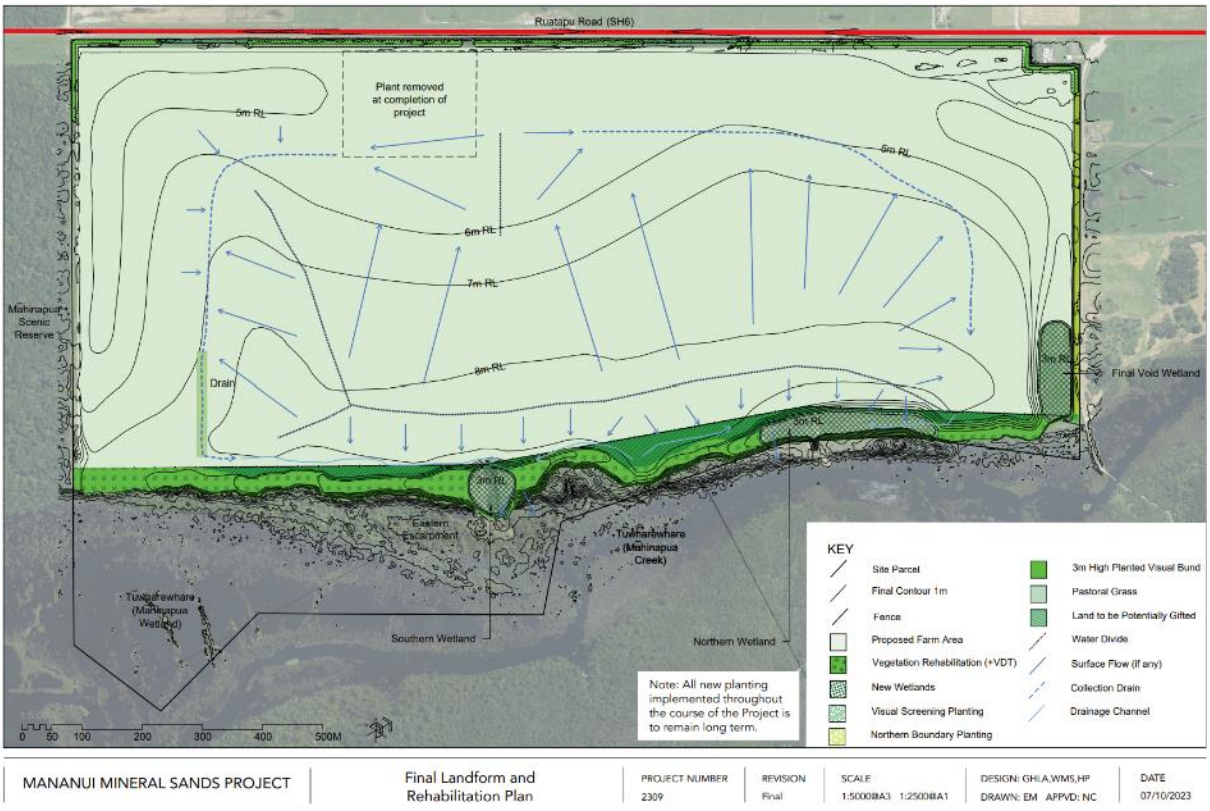

Figure 20. Restoration and recreation ecological concept plan.

8 Conclusion.

The application (following the ecological recommendations in this report) will result in a net ecological gain for the property and better secure the valuable significant eastern features (the hinau/kamahi and kahikatea escarpment forests and the scheduled natural inland wetlands). It is consistent with the NPS-FM, WRC RPS and NPS-IB, including application of the management hierarchy where required.

No inland natural wetlands were recorded west of the escarpment (in the pasture) while east a WCRC Land and water plan schedule 2 wetland was determined to be significant (schedule 1) and, with the adjoining schedule 1 wetlands of very high value, with high value fauna and of considerable size and quality located to the east of the site and outside the mining area.

The forest fragments proposed for removal (4.2 ha) in pasture, are all of low value and simple composition with missing ground and middle tiers and a canopy, while largely intact, of a stem size and count suggestive of a young remnant (or remnant of larger tree felling). These fragments were not significant following the WRC RPS or NPS IB significance criteria. The fragments could potentially (but unlikely) contain two arboreal lizards with conservation status and NZ bats, although the surveys have not found this, and in any case there are acceptable management techniques in management plans should they be found to be present.

The loss of 4.2 ha of pasture forest fragments is judged to be of negligible magnitude (at the local or ED level) and the resultant overall effect “Very low” or less than minor.

A faunal management plan is proposed to ensure all arboreal gecko & bats (if found to be present), birds and fish are salvaged and translocated from the cleared habitat. Wildlife permits for some of those activities will be required.

There is one naturalising drainage channel (a 250m intermittent system (with 50m of perennial) of low value and not significant habitat to indigenous fauna, and several other drains on the property. The naturalising drain is within the largest forest fragment and only has a 50m length of stable habitat. Three fish species were recorded in low abundance, they will be rescued.

A planned restoration of at least 4.75 ha of broadleaf/podocarp forest, around 2.37 ha of wetland is advanced along the western boundary of the avoided escarpment forest. This escarpment forest is critical as a buffer to the significant eastern wetland and the proposed revegetation creates a wider forest with better resilience and removes the current livestock access. Two additional and volunteered indigenous species wetlands are proposed to add to this restored forest edge and these will improve longer term land use water quality discharged to the wetland. A restoration plan is recommended to ensure the goals are achieved within reasonable time frames (a draft has been prepared by the landscape expert).

With the effects management proposed (fauna salvage and remedial rehabilitation) in this report the effects of habitat disturbance will be managed to a very low impact (less than minor) and in the longer term through the remediation, to a net ecological gain. The result of the application will be a proposal consistent with planning and policy provisions and result in a net ecological gain.

Consent conditions should be in place to ensure the fauna management plan and its requirements, and to cause the rehabilitation recommended in this report and as outlined in the proposed rehabilitation plans with monitoring of success of each stage of the rehabilitation.

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Appendix 1: Vegetation species present on site.

			Pasture forest plots		Escarpment		Pasture forest	Escarpment		Pasture forest plots		DOC forest	Pasture forest	Escarpment
Scientific name	**Common name(s)**	**Conservation status**	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**	**Plot 8**	**Plot 9**	**Plot 10**	**Plot 11**	**Plot 12**
Acaena anserinifolia	Bidbid	Not threatened									yes			
Agrostis stoloniferia	Creeping bent	Not threatened	Yes	Yes							Yes			
Alsophila smithii	katote, Smith's tree fern, soft tree fern	Not Threatened							Yes	Yes	Yes	Yes	Yes	
Aristotelia serrata	makomako, wineberry	Not Threatened									Yes			
Asplenium bulbiferum	Hen and chicken	Not threatened				Yes				Yes			Yes	
Asplenium flaccidum	drooping spleenwort, hanging spleenwort	Not Threatened			Yes	Yes		Yes	Yes	Yes		Yes		Yes
Asplenium lyallii	Lyall's spleenwort	Not threatened	Yes				Yes					Yes		
Asplenium polyodon	sickle spleenwort	Not Threatened									Yes			
Astelia fragrans	bush flax, bush lily, kakaha	Not Threatened			Yes	Yes								
Astelia solandri	perching lily, kowharawhara	Not Threatened									Yes	Yes		
Blechnum fluviatile	Kiwakiwa	Not threatened									Yes			
Carex uncinata	bastard grass, hook sedge, kamu, matau-a-maui	Not Threatened			Yes									Yes
Carpodetus serratus	putaputaweta, marbleleaf	Not Threatened									Yes		Yes	Yes
Cirsium vulgare	Scotch thistle	Not threated									Yes			
Coprosma arborea	Mamangi	Not threatened						Yes						Yes

Coprosma areolata	Thin-leaved coprosma	Not threatened	Yes		Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes
Coprosma foetidissima	hupiro, stinkwood, shit shrub	Not Threatened			Yes									
Coprosma grandafolia x robusta		Not Threatened				Yes								
Coprosma lucida	karamu, shining karamu	Not Threatened				Yes	Yes		Yes	Yes			Yes	
Coprosma propinqua	Mingimingi	Not threatened					Yes							Yes
Coprosma rhamnoides		Not Threatened	Yes											
Coprosma rotundifolia		Not threatened			Yes	Yes								
Coprosma rubra		Not threatened												Yes
Cranfillia fluviatilis	kiwikiwi, kiwakiwa, creek fern	Not Threatened		Yes										
Dacrycarpus dacrydioides	kahikatea, white pine	Not Threatened	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dacrydium cupressinum	rimu, red pine	Not Threatened				Yes								
Dicksonia squarrosa	wheki, rough tree fern, harsh tree fern	Not Threatened				Yes	Yes		Yes		Yes			Yes
Digitalis purpurea	Foxglove	Not threatened	Yes								Yes			
Elaeocarpus dentatus var. dentatus	Hinau	Not Threatened	Yes									Yes	Yes	
Freycinetia banksii	kiekie	Not Threatened										Yes		
Fuchsia excorticata	kotukutuku, tree fuchsia	Not Threatened					Yes							
Galium divaricatum	Slender bedstraw	Exotic - not threatened					Yes				Yes			

Griselinia littoralis	broadleaf, kapuka, papauma	Not Threatened			Yes									
Griselinia lucida	puka, akapuka	Not Threatened	Yes		Yes	Yes				Yes				
Hedycarya arborea	porokaiwhiri, pigeonwood	Not Threatened			Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Holcus lanatus	Yorkshire fog	Not threatened		Yes										
Hymenophyllum flabellatum	filmy fern	Not Threatened			Yes	Yes								Yes
Hymenophyllum lyallii	filmy fern	Not Threatened							Yes				Yes	Yes
Hymenophyllum nephrophyllum	kidney fern, konehu, kopakopa, raurenga	Not Threatened												Yes
Hymenophyllum rarum	filmy fern	Not Threatened				Yes		Yes	Yes				Yes	
Hymenophyllum revolutum	filmy fern	Not Threatened			Yes			Yes						
Hypnodendron comosum	Umbrella moss	Not threatened			Yes									
Juncus effusus var. effusus	Soft rush	Not threatened		Yes										
Lastreopsis hispida	hairy fern	Not Threatened	Yes		yes	Yes	Yes		Yes				Yes	
Lichen					Yes									
Lolium perenne	Rye grass	Not threatened	Yes	Yes										
Lomaria discolor	crown fern, petipeti, piupiu	Not Threatened				Yes								
Melicytus ramiflorus	Mahoe, hinahina, whitey wood	Not Threatened			Yes		Yes				Yes	Yes	Yes	Yes
Metrosideros fulgens	climbing rata	Threatened - Nationally Vulnerable	Yes		Yes					Yes		Yes	Yes	Yes
Metrosideros perforata	Akatea	Threatened - Nationally vulnerable			Yes	Yes	Yes		Yes	Yes	Yes	Yes		Yes

Microlaena avenacea	bush rice grass, oat grass	Not Threatened			Yes									Yes
Moss						Yes		Yes	Yes					
Myrsine australis	red mapou, red matipo, mapau, red maple	Not Threatened			Yes					Yes				
Parablechnum novae-zelandiae	kiokio, horokio, palm leaf fern	Not Threatened		Yes	Yes		Yes							Yes
Parsonsia heterophylla	New Zealand Jasmine	Not threatened							Yes		Yes			Yes
Pectinopitys ferruginea	miro, brown pine	Not Threatened	Yes			Yes	Yes							Yes
Pittosporum eugenioides	Lemonwood	Not threatened			Yes									
Podocarpus Totara	Totara	Not threatened			Yes									
Pseudopanax crassifolius	horoeka, lancewood	Not Threatened			Yes	Yes								
Pseudowintera colorata	red horopito, mountain horopito, alpine peppertree	Not Threatened			Yes	Yes								
Pterophylla racemosa	kamahi, tawheo, tawhero, tawherowhero	Not Threatened	Yes		Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Pyrrosia elaeagnifolia	leather-leaf fern, pyrrosia	Not Threatened	Yes		Yes									
Quintinia acutfolia	Westland Quintinia				Yes	Yes							Yes	Yes
Ranunculus repens	buttercup	Not Threatened	Yes	Yes							Yes			
Ripogonum scandens	supplejack, kareao, pirita	Not Threatened			Yes	Yes			Yes	Yes		Yes	Yes	Yes
Rubus australis	tataraoa, bush lawyer, swamp lawyer	Not Threatened											Yes	
Rubus cissoides	tataramoa, bush lawyer	Not Threatened									Yes			

Rubus fruticosus	Blackberry	Not threatened	Yes								Yes			
Rumex obtusifolius	Broad-leaved Dock	Not threatenend	Yes	Yes										
Schefflera digitata	patate, pate, seven-finger	Not Threatened				Yes								Yes
Tarazacum officinale agg.	Dandelion	Not threatened									Yes			
Tree moss									Yes			Yes	Yes	Yes
Ulex europaeus	Gorse	Not threatened	Yes								Yes			
Zealandia pustulata subsp. pustulata	hound's tongue, kowaowao, paraharaha	Not Threatened			Yes	Yes		Yes						

Appendix 2: Transect results collected in the field.

Transect 1 results:

Tree species	Tree circumference (M)
Kamahi	0.4
	0.9
	0.9
	1
	1.1
	1.1
	0.5
	0.8
	0.8
	0.7
	0.6
	1.7
	1.2
	0.7
	0.8
Hinau	1.9
Westland Quintinia	0.6
Rimu	0.75
Kahikatea	1
	1.1
	1.2
	1
	1
	1.1
	0.8
	1.1
	0.8
	0.8
	0.7
	0.8
	0.9

	1
	0.9
	1.7
Average tree circumference	0.95

Transect 2 results:

Tree species	Tree circumference (M)
Rimu	1.5
	1.1
	1
Lancewood	0.55
Kamahi	0.7
	0.35
	0.7
	0.7
	0.6
	0.8
	0.4
	0.3
	0.3
	0.3
	0.4
	0.5
	0.4
	0.3
	1
	0.5
	0.4
	0.3
	0.3
	0.7
	0.4
	0.4
	0.9
	0.6
	0.8
	0.7

Appendix 2: Transect results collected in the field.

	0.5
	0.9
	0.7
	0.6
	0.9
	0.55
Kahikatea	0.55
	0.6
	0.9
	0.5
	0.7
	0.6
	1
	0.9
	0.8
	0.6
	1.1
	0.5
	0.7
	0.8
	1.3
	1.2
	0.8
	0.6
	1.1
	0.4
	1.1
	1.1
	0.7
	0.6
	0.5
	0.8
	1
	1.1
	0.9
	1
	0.6

Westland Quintinia	0.8
Average tree circumference (M)	0.7

Appendix 3: Site Photos

Photo 8: Vegetation community present in plots one and two where the subcanopy is damaged by pasture grazing (Figure 1 map # 12).

Photo 2. Pasture forest fragment just north of the cut (Map # 13)

Photo 3 Thin remnant forest fragment under tiers (Map # 8).

Photo 4 within in-pasture fragment forest- missing middle and ground tiers

Photo 9: upper escarpment, south end, where stock access is more pronounced.

Photo 6. Vegetation present in plot 9, the open track between map units # 8, 10 and 12.

Photo 7: An example of the vegetation communities presents in plots three and four (young escarpment kahikatea).

Photo 8: inundated older Kahikatea wetland present in the south-east of the site.

Photo 9 lower end of cut channel as it enters the older kahikatea forest.

Photo 10. Ground and middle tier of the lower escarpment forest.

Photo 11. Ground cover in southern lower escarpmenmt prior to wetland

Photo 12. One of the larger lower escarpment kahikatea

Photo 13 Eastern wetland

Photo 14 eastern wetland -oioi tangle fern

Photo 15. Eastern wetland swamp shrubland and scatered kahikateas

Photo 16. Eastern wetland, oioi

Photo 17. DoC forest boundary, southern edge

Southern-west most fragment - edge

Southern-west most fragment, internal

Southern-west most fragment, internal

Appendix 4: Criteria for identifying areas that qualify as significant.

West Coast RPS criteria, Terrestrial:

Indigenous vegetation or habitat(s) of indigenous fauna is significant if it meets any one or more of the following criteria:

Note: These criteria are intended to be applied by suitably qualified and experienced ecologists with a good understanding of the local and national context and its associated ecological tools.

1. Representativeness
    a) Indigenous vegetation or habitat of indigenous fauna that is representative, typical or characteristic of the indigenous biological diversity of the relevant ecological district. This can include degraded examples where they are some of the best remaining examples of their type, or represent all that remains of indigenous biological diversity in some areas.
    b) Indigenous vegetation or habitat of indigenous fauna that is a relatively large example of its type within the relevant ecological district.

2. Rarity/Distinctiveness
    a) Indigenous vegetation or habitat of indigenous fauna that has been reduced to less than 20% of its former extent in the region, or relevant land environment, ecological district, or freshwater environment.
    b) Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened, at risk, or uncommon, nationally or within the relevant ecological district.
    c) The site contains indigenous vegetation or an indigenous species at its distribution limit within the West Coast region or nationally.
    d) Indigenous vegetation or an association of indigenous species that is distinctive, of restricted occurrence, occurs within an originally rare ecosystem, or has developed as a result of an unusual environmental factor or combinations of factors.
3. Diversity and Pattern
    a) Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of indigenous ecosystem or habitat types, indigenous taxa, or has changes in species composition reflecting the existence of diverse biological and physical features or ecological gradients.
4. Ecological Context
    a) Vegetation or habitat of indigenous fauna that provides or contributes to an important ecological linkage or network, or provides an important buffering function.
    b) Indigenous vegetation or habitat of indigenous fauna that provides important habitat (including refuges from predation, or key habitat for feeding, breeding, or resting) for indigenous species, either seasonally or permanently.

Ecological criteria for identifying significant wetlands

A wetland is ecologically significant if it meets one or more of the following criteria:

Ecological Context
The ecological context of the wetland has one or more of the following functions or attributes:
    (a) It plays an important role in protecting adjacent ecological values, including adjacent and downstream ecological and hydrological processes, indigenous vegetation, habitats or species

populations; or
(b) Is an important habitat for critical life history stages of indigenous fauna including breeding/spawning, roosting, nesting, resting, feeding, moulting, refugia, or migration staging points (as used seasonally, temporarily or permanently); or
(c) It makes an important contribution to ecological networks (such as connectivity and corridors
for movement of indigenous fauna); or
(d) It makes an important contribution to the ecological functions and processes within the wetland.

Representative wetlands

A representative wetland is one that contains indigenous wetland vegetation types or indigenous fauna assemblages that were typical for, and has the attributes of, the relevant class of wetland as it would have existed circa 1840.

3. This criterion will be satisfied if the wetland (not including pakihi wetlands) contains either:
(a) Indigenous wetland vegetation types that have the following attributes:
(i) The indigenous wetland vegetation types that are typical in plant species composition and structure; and
(ii) The condition of the wetland is typical of what would have existed circa 1840 in that:
- Indigenous species dominate; and
- Most of the expected species and tiers of the wetland vegetation type(s) are present for the relevant class of wetland; or

(b) (i) The wetland contains indigenous fauna assemblages that:
- Are typical of the wetland class; and
- Indigenous species are present in most of the guilds expected for the wetland habitat
type.

A pakihi wetland is a representative wetland where:
(a) It is greater than 40 hectares in area; and
(b) It is dominated by a mixture of sedges, ferns, restiads, rushes, mosses and manuka (Leptospermum scoparium) of which Baumea spp, Sphagnum spp, Gleichenia dicarpa, and Empodisma minus are the main species.

The representative wetland criterion applies to the whole or part of the wetland irrespective of land tenure;

6. Each wetland is to be assessed at the ecological district and freshwater bio-geographic unit scale.

Rarity

The wetland satisfies this criterion if:
(a) Nationally threatened species7 are present; or
(b) Nationally at risk species or uncommon communities or habitats are present and either:
- The population at this site provides an important contribution to the national population and its distribution;
- There are a number of at risk species present; or
- For mobile species such as kotuku, this requires some assessment of the importance of the site for the species i.e. the intention is not to include areas such as wet pasture where these birds are foraging.

- The wetland provides an important contribution to the national distribution and extent of uncommon communities or habitats;

(c) Regionally uncommon species are present; or

(d) Is a member of a wetland class that is now less than 30% of its original extent as assessed at the ecological district and the freshwater bio-geographic unit scales; or
(e) Excluding pakihi, it contains lake margins, cushion bogs, ephemeral wetlands, damp sand plains, dune slacks, string mires, tarns, seepages and flushes or snow banks which are wetland classes or forms identified as historically rare by Williams et al (2007).

Distinctiveness

The wetland satisfies the distinctiveness criterion if it has special ecological features of importance at the international, national, freshwater bio-geographic unit or ecological district scale including:

(a) Intact ecological sequences such as estuarine wetland systems adjoining tall forest; or
(b) An unusual characteristic (for example an unusual combination of species, wetland classes, wetland structural forms, or wetland landforms); or
(c) It contains species dependent on the presence of that wetland and at their distribution limit or beyond known limits.

Explanation
The wetland classes may be determined in a number of ways including the classification index of Johnson and Gerbeaux (2004).
Wetland indigenous vegetation types are identified with reference to the dominant plant species that are present, the structural class, wetland class and hydrosystem (see for example Johnson and Gerbeaux (2004) or similar method).
The three freshwater bio-geographic units in the West Coast region are the Northwest Nelson, Paparoa, Grey-Buller and Westland units (Leathwick et al 2000).
Ecological districts are described and mapped in McEwen (1987). The maps of the ecological districts on the West Coast region have been refined by David Norton and Fred Overmars for use at the 1:50,000 scale and are available from the Department of Conservation (West Coast Conservancy).

NPS IB (2023)

Criteria for identifying areas that qualify as significant natural areas

1 Direction on approach

(1) This appendix sets out the criteria for identifying significant indigenous vegetation or significant habitats of indigenous fauna in a specific area, so that the area qualifies as an SNA.

(2) An area qualifies as a significant natural area if it meets any one of the attributes of the following four criteria:

(a) representativeness:

(b) diversity and pattern:

(c) rarity and distinctiveness:

(d) ecological context.

2 Context for assessment

(1) The context for an assessment of an area is:

(a) its ecological district; and

(b) in the context of the rarity assessment only, its land environment.

3 Manner and form of assessment

(1) Every assessment must include at least:

(a) a map of the area; and

(b) a description of its significant attributes, including for each criterion a description of the attribute (as specified below) that applies; and

(c) a description of the indigenous vegetation, indigenous fauna, habitat, and ecosystems present; and

(d) additional information such as the key threats, pressures, and management requirements.

(2) An assessment under this appendix must be conducted by a suitably qualified ecologist (which, in the case of an assessment of a geothermal ecosystem, requires an ecologist with geothermal expertise).

A Representativeness criterion

(1) Representativeness is the extent to which the indigenous vegetation or habitat of indigenous fauna in an area is typical or characteristic of the indigenous biodiversity of the relevant ecological district.

Key assessment principles

(2) Representativeness may include commonplace indigenous vegetation and the habitats of indigenous fauna, which is where most indigenous biodiversity is present. It may also include degraded indigenous vegetation, ecosystems and habitats that are typical of what remains in depleted ecological districts. It is not restricted to the best or most representative examples, and it is not a measure of how well that indigenous vegetation or habitat is protected elsewhere in the ecological district.

(3) Significant indigenous vegetation has ecological integrity typical of the indigenous vegetation of the ecological district in the present-day environment. It includes seral (regenerating) indigenous vegetation that is recovering following natural or induced disturbance, provided species composition is typical of that type of indigenous vegetation.

(4) Significant indigenous fauna habitat is that which supports the typical suite of indigenous animals that would occur in the present-day environment. Habitat of indigenous fauna may be indigenous or exotic.

(5) The application of this criterion should result in identification of indigenous vegetation and habitats that are representative of the full range and extent of ecological diversity across all environmental gradients in an ecological district, such as climate, altitude, landform, and soil sequences. The ecological character and pattern of the indigenous vegetation in the ecological district should be described by reference to the types of indigenous vegetation and the landforms on which it occurs.

Attributes of representativeness

(6) An area that qualifies as an SNA under this criterion has at least one of the following attributes:

(a) indigenous vegetation that has ecological integrity that is typical of the character of the ecological district:

(b) habitat that supports a typical suite of indigenous fauna that is characteristic of the habitat type in the ecological district and retains at least a moderate range of species expected for that habitat type in the ecological district.

B Diversity and pattern criterion

(1) Diversity and pattern is the extent to which the expected range of diversity and pattern of biological and physical components within the relevant ecological district is present in an area.

Key assessment principles

(2) Diversity of biological components is expressed in the variation of species, communities, and ecosystems. Biological diversity is associated with variation in physical components, such as geology, soils/substrate, aspect/exposure, altitude/depth, temperature, and salinity.

(3) Pattern includes changes along environmental and landform gradients such as ecotones and sequences.

(4) Natural areas that have a wider range of species, habitats or communities or wider environmental variation due to ecotones, gradients, and sequences in the context of the ecological district, rate more highly under this criterion.

Attributes of diversity and pattern

(5) An area that qualifies as a significant natural area under this criterion has at least one of the following attributes:

(a) at least a moderate diversity of indigenous species, vegetation, habitats of indigenous fauna or communities in the context of the ecological district:

(b) presence of indigenous ecotones, complete or partial gradients or sequences.

C Rarity and distinctiveness criterion

(1) Rarity and distinctiveness is the presence of rare or distinctive indigenous taxa, habitats of indigenous fauna, indigenous vegetation or ecosystems.

Key assessment principles

(2) Rarity is the scarcity (natural or induced) of indigenous elements: species, habitats, vegetation, or ecosystems. Rarity includes elements that are uncommon or threatened.

(3) The list of Threatened and At Risk species is regularly updated by the Department of Conservation. Rarity at a regional or ecological district scale is defined by regional or district lists or determined by expert ecological advice. The significance of nationally listed Threatened and At Risk species should not be downgraded just because they are common within a region or ecological district.

(4) Depletion of indigenous vegetation or ecosystems is assessed using ecological districts and land environments.

(5) Distinctiveness includes distribution limits, type localities, local endemism, relict distributions, and special ecological or scientific features.

Attributes of rarity and distinctiveness

(6) An area that qualifies as an SNA under this criterion has at least one of the following attributes:

(a) provides habitat for an indigenous species that is listed as Threatened or At Risk (Declining) in the New Zealand Threat Classification System lists:

(b) an indigenous vegetation type or an indigenous species that is uncommon within the region or ecological district:

(c) an indigenous species or plant community at or near its natural distributional limit:

(d) indigenous vegetation that has been reduced to less than 20 per cent of its pre-human extent in the ecological district, region, or land environment:

(e) indigenous vegetation or habitat of indigenous fauna occurring on naturally uncommon ecosystems:

(f) the type locality of an indigenous species:

(g) the presence of a distinctive assemblage or community of indigenous species:

(h) the presence of a special ecological or scientific feature.

D Ecological context criterion

(1) Ecological context is the extent to which the size, shape, and configuration of an area within the wider surrounding landscape contributes to its ability to maintain indigenous biodiversity or affects the ability of the surrounding landscape to maintain its indigenous biodiversity.

Key assessment principles

(2) Ecological context has two main assessment principles:

(a) the characteristics that help maintain indigenous biodiversity (such as size, shape, and configuration) in the area; and

(b) the contribution the area makes to protecting indigenous biodiversity in the wider landscape (such as by linking, connecting to or buffering other natural areas, providing 'stepping stones' of habitat or maintaining ecological integrity).

Attributes of ecological context

(3) An area that qualifies as an SNA under this criterion has at least one of the following attributes:

(a) at least moderate size and a compact shape, in the context of the relevant ecological district:

(b) well-buffered relative to remaining habitats in the relevant ecological district:

(c) provides an important full or partial buffer to or link between, one or more important habitats of indigenous fauna or significant natural areas:

(d) important for the natural functioning of an ecosystem relative to remaining habitats in the ecological district.

Appendix 5 - Fauna management Plan

For habitat clearance the following are considered as requiring management to reduce / remove harm to individuals if present.
Fish, birds, bats, lizards.

9.1 Fish management

Three artificial channels are required to be removed during the [rocess pof minnng. One, the south eastern branch boudared by pne pof the fprest fragments was found to have low numbers of banded kokopu and eel. To ensure that there is no loss to the local population of long fin eel (but also banded kokopu) a standard fish salvage is to be ubndertaken priuor to the decommissioning of the drainage channel.

9.2 Fish rescue - General Requirements.

The objective of the condition is to ensure the work site is clear of fish during dewatering and bed removal. The basic principles of fish salvage are as follows:

- All relevant permits (MPI) will be obtained for the capture, holding and transfer of fish.
- As many fish as practicable will be removed from the pools and channel prior to instream channel works to reduce the risk of fish burrowing into the substrate and becoming unfishable as the channel is dewatered.
- Removal will involve passive trap netting and active removal. We advise that night spotting and netting will be the most effective procedure in the system present and that EFM is unlikely a suitablre mthod given the substrate and flow.
- The channel to be removed should have a lower system exclusion barrier prior to fish salvage to ensure new “colonists “do not enter the channel.
- Fishing effort (the amount) will be informed by comparing results of each previous catch effort and is the responsibility of the experienced ecologist.
- Eel salvaged will be held, prior to release, separately from bully and galaxiid.
- All capture and relocation shall be completed (or supervised) by a suitably qualified person (aquatic ecologist).
- The species, number and size of all fish caught in each stage will be recorded.
- No fish will be held for more than 1 hour before being released.
- All fish will be released in the Mahinapua Creek.
- Any pest fish found shall be removed from the catchment and disposed of appropriately and humanely.
- The Manager, Environmental Regulation, WCRC shall be advised when the relocation of fish has been completed.

9.3 Nesting Bird Management.

The pasture forest fragments have a simple canopy of generally younger trees with minimal epiphytic growths and many are pole kahikatea. Therefore, the species and areas of nesting will be minimal

compared to the DoC reserve south and the eastern escarpment. There could never the less be grey warbler, tui, tom tit and fantail nesting, and if these then also shinning cuckoo.
If vegetation clearance occurs outside of the general avian breeding season i.e. August to February then no precautionary avian action is required and the species present are mobile and will remove themselves prior to disturbance. The issue of breeding interference and potentially indigenous bird death will only occur where clearance is within the breeding season.
The fragments are not habitat of highly mobile fauna as listed in the NPS IB, Appendix 2.
Where vegetation clearance is proposed to occur between August and February (inclusive) then there must be a thorough nest survey to determine if and where species are nesting. That survey must be undertaken by a suitable qualified and experienced avian ecologist.
Where nests are located in vegetation wished to be cleared there are three options.

In order of preference these are:

1. Delay clearance until the nesting has been completed, either the young fledged or the nest failed.
2. Clear a round the nest but not within 20m or any tree touching the nest tree.
3. Salvage and translocate the nest.

This latter option contains substantive risk to the nest and young and may fail. If it is chosen as the course of action then failure should result in compensation, in this case by way of predator control in the rehabilitation area and eastern escarpment forest such that there is a reasonable chance other nests are successful where they may have failed due to predation.

9.4 Lizard management

The two potentially present gecko (we exclude consideration of skink given the state of the ground tier in the forest fragments) are the West Coast green gecko and the forest gecko. The west coast forest geckos are diurnal and tend to be tree-dwelling, and favour shrubland and forest habitats, were as the forest gecko is nocturnal.
The following process and conditions come from accepted protocol of the AUP
Prior to the commencement of any vegetation removal works the Consent Holder must present to Council, information (based on industry best practice survey methods), from a suitably qualified and experienced ecologist/herpetologist employed by the consent holder and who has been approved by the council or DoC, that identifies whether there are sufficient numbers of native lizards, geckos or skinks (or both) present on site to trigger a requirement that a Lizard Management Plan (LMP) be prepared, certified and implemented.

A LMP will need to be prepared if the survey results in the detection of:

- 1 or more individuals of a threatened native lizard species or;
- 3 or more individuals of a common native lizard species.

Scouting & Rescue

The capture and relocation of lizards is also controlled by the Wildlife Act 1953 and any person undertaking such work must be certified by the Department of Conservation.
Lizards can be both nocturnal and diurnal, so it is important that spotlighting is done at night so that the nocturnal tree geckos can be captured and released. Skinks and occasionally some geckos live in ground foliage and will be captured during daytime habitat removal and using ACO's and/or pitfall trapping and physical searching etc.

The consent holder must employ a suitably qualified and experienced ecologist/herpetologist acceptable to the council, who must carry out the following actions prior to the commencement of removal of vegetation from the site:

Gecko rescue

i. spotlight for a minimum of three (check with your expert ecologist) night(s) in climatic weather conditions that the expert considers are appropriate; or
ii. undertake any other scouting/surveying method agreed with the Team Leader Compliance Monitoring.

Geckos able to be removed must be relocated to a suitable location on site.
Following the salvage process required above, if any native lizards are found to be present on site, a suitably qualified and experienced ecologist/herpetologist acceptable to the council, must be onsite to supervise any vegetation removal in order to search for and rescue any native lizards found and to relocate them to the alternative location(s) on the site.
The translocation will be to the eastern escarpment forest.

9.5 Bat management

DoC have produced an industry standard Protocols for minimising the risk of felling bat roosts (DoC 2021). Obviously the use of these protocol will depend on the outcomes of the bat survey, which is about the detection of bats and the assessment of the forest as potential bat roosts.
The protocol does not eliminate the risk to bats of death or injury because bats or active bat roosts can be missed. It seeks to at least minimise the effect.
Whenever vegetation removal is proposed in areas where bats are potentially present (and this depends of the extensiveness of any survey) there is a guide to what sort of action should be undertaken.
None of the methods of inspecting roosts described below eliminates the risk of failing to identify bats when they are present. Therefore, techniques such as filling in cavities with expandable foam are not supported as a tool. This is because there is a risk of trapping bats that have not been detected within cavities. In addition, this method removes roosts from the landscape that bats are dependent on.
A tree climber may be required to check all potential bat roost features:

Step 1: Does the bat roost protocol apply to my project?	**Response**	**When**
b) Are bats present in the Project Area?	If Yes, go to step c If unknown, undertake comprehensive survey if bats are likely to be present. If no bats are present after comprehensive survey, you do not need to follow protocol.	Acoustic surveys to determine presence should be undertaken when bats are most active and environmental conditions are suitable (October 1st to April 30th)8. Surveys undertaken at other times of year are considered less reliable for determining absence.
c) Is the tree known to provide a roost location for bats? (Previous knowledge).	c) If yes, go to step 3 If no (but bats are present in the project area), go to step 2.	

Step 2. Does the vegetation proposed to be removed have potential bat roost characteristics?	**Response**	**When?**
a) Is the tree ≥15 cm DBH (Diameter at Breast Height)?	If yes, further assessment is required (2b). If no, the vegetation can be removed at any time.	Any time
b) On visual inspection, does the tree (dead or alive) have features that indicate roost potential? These features include: • hollows • cavities • knot holes • cracks • flaking, peeling, and decorticating bark • epiphytes • broken or dead branches or trunk •cavities/hollows/shelter formed by double leaders	If yes go to step 3 If unsure, further assessment is required. This may include climbing the tree. If no potential roost features are present, the vegetation can be removed at any time.	Visual inspections can occur at any time. If there are **NO** potential roost features, felling can occur at any time of year.

Step 3. Does the tree have to be removed entirely?
If yes, continue to step 4

Step 4. Are there bats currently roosting in the tree? (Follow a or b or c or a combination)	**Response**	**When**

a) Are potential features being used by roosting bats? A tree climber may be required to check all features. If roost is occupied repeat 4a another day until roost is vacated.	If yes, **THE TREE MUST NOT BE FELLED UNTIL BATS HAVE VACATED IT**. If no, the tree can be removed on the day of the tree inspection. If bats continue to use the roost, then the tree must not be cut down until the bats leave the roost. At this point re-consider again	October 1st to April 30th when the temperature is 7oC or greater at official sunset in the South Island or 10 oC or greater in the North Island
b) Is bat activity recorded at any time during two consecutive, valid survey nights preceding tree felling? At least two nights are required as it is possible for bats to enter or leave a roost without echolocating, or to not leave the roost for a night.	If yes (bats are detected), survey must continue on subsequent nights14 until no bat activity is recorded for two consecutive nights (to indicate bats have left the area) prior to felling. **OR** roost features of each tree must be visually assessed via climbing as in 3. If bat activity is consistent in the area and 2 nights with zero bat passes cannot be obtained, Go to 4c or 4a. If no bats are detected for two consecutive nights, the vegetation can be removed on the day immediately following the survey nights.	October 1st to April 30th and when conditions meet the requirements for standard ABM weather conditions (see 4b notes).
c) Are bats observed entering the vegetation? This involves watching vegetation to identify bats returning to or exiting roosts. It should only be used in combination with previous ABM monitoring (4b) (see notes 4c for method). At least two nights are required as it is possible for bats to enter or leave a roost without being detected, or to not leave the roost for a night.	If yes (bats are seen at either watch), it is a confirmed roost. Removal of a roost should be avoided to minimise effects of vegetation removal on bats. Techniques used previously to ensure previously active roosts are no longer active have included the following: Watches must continue on subsequent nights until no bats are observed entering or exiting the roost for two consecutive nights (to indicate the roost is no longer active) prior to felling. If no bats are observed entering or exiting for two consecutive nights, the vegetation can be removed on the day immediately following the survey nights.	Between October 1st and April 30th only **AND** when weather parameters meet the roost watch requirements.

Step 5. Fell the tree if no bats present

NB: Vegetation removal must take place on the day of tree inspection or the day immediately following night surveys that confirm that there are no bats present.

a) If you have undertaken a visual inspection of the vegetation (following step 4a, then the vegetation can be removed **ONLY ON THE DAY OF INSPECTION** and meets the valid weather conditions (defined in notes 4c) at official sunset the day prior to inspection. If you have undertaken ABM surveys or roost watches 4b or 4c the vegetation can be removed **ONLY ON THE DAY IMMEDIATELY FOLLOWING SURVEY COMPLETION** (i.e., if the survey ends in morning the tree can be felled the same day only). Trees must be inspected for signs of bats once felled and before removing from the site, if safe to do so. Follow Appendix 1 if bats are detected during vegetation removal.	When the inspection method chosen allows	

Appendix 1. If bats are detected during tree relocation or removal

People inspecting trees should be familiar with the Bat Care Advice document shown in footnote[11] and able to check/inspect tree for signs of bats once felled.

If during the felling of a tree bats are detected, felling of that tree must stop immediately if safe to do so, and DOC and an approved bat ecologist at Competency Level 2.1 must be consulted.

If bats do not fly away or are potentially injured/found on the ground, felling can only re-start once permission has been obtained from DOC after consultation with an approved bat ecologist at Competency Level 2.1.

If bats are detected once the tree has been felled**,** all further work must stop, and DOC and an approved bat ecologist at Competency Level 2.1 must be contacted. The felled tree must be thoroughly inspected by the approved bat ecologist for further bats**.**

If any bats are found on the ground or in the tree once felled, place the bat in a cloth bag in a dark, quiet place at ambient (or slightly warmer) temperature and take to a veterinarian for assessment as soon as possible. A maximum of two bats should be kept in one bag. After delivering the bat to the vet, contact an approved bat ecologist at Competency Level 2.1 in consultation with the vet and DOC (0800 DOC HOT, 0800 362 468).

Bats must be kept for three days under observation and must be kept out of torpor for this time. Additional detail is found at the links provided in this footnote23. Vets must euthanise bats whose injuries are causing suffering and are not likely to heal sufficiently to allow rehabilitation and return to the wild. The approved bat ecologist at Competency Level 2.1 and vet must consult with DOC to consider appropriate rehabilitation options where suffering is minimal and chances of return to the wild are high.

Euthanised bats or any dead bats (or bat parts) found must be handed to DOC.

[11] https://cdn.ymaws.com/www.nzva.org.nz/resource/resmgr/docs/other_resources/Bat_Care_Advice.pdf

Appendix 6 Avian Survey

Appendix 7: Lizard survey

Appendix 8 Bat survey