REPORT

Tonkin+Taylor

Private Plan Change Request

Ecological Opportunities and Constraints Assessment

Prepared for
CCKV Maitai Dev Co LP and Bayview Nelson Limited

Prepared by
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Executive Summary

An ecological opportunities and constraints assessment was undertaken to assist in the planning of a proposed Private Plan Change Request (PPCR) at Maitahi and Bayview, Nelson. The PPCR is seeking to rezone land within the Kaka Valley and on Bayview to enable the development of a residential subdivision following a special Schedule of provisions including a Structure Plan.

Ecological constraints associated with terrestrial and aquatic biodiversity values are primarily associated with the clearance of the scrubland habitats and constraints associated with freshwater biodiversity of Kaka Hill Tributary that flows through the site, these include:

- The loss of indigenous vegetation;
- Loss of wetland habitat;
- Loss of habitat for indigenous fauna;
- Injury, mortality and/or changes to the indigenous fauna;
- Change in the flow regime;
- Loss and/or a change in aquatic habitat availability and condition; and
- Loss and/or a change in aquatic habitat connection.

Most terrestrial habitats within the site are highly degraded with an abundance of exotic plants and animal pests present. The exception is an area of mature kānuka forest on the elevated eastern side of the site, being the western face of Kaka Hill. Initiatives to reduce the abundance and influence of pests and increase the prevalence of indigenous flora and fauna have already, and will continue to, provide ecological and biodiversity gains across the site. These include:

- Pest plant and animal control.
- Indigenous planting and natural conversion back to forest.
- Stock exclusion from potential enhancement areas.

The protection of freshwater and ecological enhancement areas through vesting and/or consent notices and covenants could also be used to ensure on-going management of the natural habitats within the development. This includes protecting all identified wetlands, and if practical, connecting to any adjacent terrestrial and stream biodiversity enhancement areas.

The lower reaches of the Kaka Hill Tributary are intermittent and generally degraded aquatic ecology values. The lower reaches have been impacted by historical and current agricultural land use practices. The upper Kaka Hill Tributary has permanent flow with greater diversity and availability in aquatic habitat for freshwater fauna. Specific initiatives to increase aquatic habitat values for native species identified within Kaka Hill Tributary are included in the PPCR and will be implemented and secured at the time of subdivision and development. These include:

- A continuous riparian corridor that provides a natural buffer zone to the Kaka Hill Tributary will be retained, protected and managed. The corridor will generally be 40 m wide and follow the natural topography of the site (where road crossings are present it is acknowledged that width are likely to be lower). Management will comprise natural regeneration of indigenous species, restoration planting, weed control, monitoring of any threatened aquatic species and monitoring of biodiversity condition.
- Facilitating passage at all road crossings for native fish species known to inhabit the catchment.

- Excluding non-native fish from the catchment by designing and constructing intentional built barriers with the specific objective of limiting or preventing the movement of certain fish species (e.g. trout) into the Kaka Hill Valley catchment.
- Rehabilitating natural swale and marshy floodplain areas with native wetland flora species.
- Designing, constructing and maintaining a naturalised lower section of the Kaka Stream that is appropriately integrated into the developed environment so that catchment flora and fauna values are enhanced.

A draft structure plan for the PPCR for Maitahi and Bayview was assessed as part of this report. The draft structure plan proposes 'Residential' zoning in areas of lower ecological value (i.e. pasture and gorse scrub) and areas with higher ecological value (based on our preliminary assessments) will be zoned as either 'Open space', 'Rural' or 'Higher Density Small Holdings Area'. Some areas of value are currently included in the proposed 'Residential' areas and will require appropriate protection or mitigation to ensure any proposed development does not result in a net loss of ecological value. Any future development in 'Higher Density Small Holdings Area' should also be designed in a way that maintains any ecological value in these areas, i.e. avoids the removal of indigenous vegetation and habitat for indigenous fauna.

1 Introduction

This ecological opportunities and constraints report has been prepared as supporting material for an application for Private Plan Change (PPCR) to the Nelson Resource Management Plan under Schedule 1 of the Resource Management Act at Maitahi and Bayview, Nelson (hereafter called 'the site'). The PPCR is seeking to rezone land within the Kaka Valley and on Bayview to enable the development of a subdivision and development that provides for a wide range of development densities in response to site characteristics and values.

The purpose of this report is to inform a planning analysis of the ecological constraints and opportunities of the PPCR. This report is to inform the PPCR regarding:

- Current features within the site of ecological value.
- Areas of ecological value that may provide constraints on the design of future developments subsequent to the PPCR.
- Opportunities to enhance biodiversity and ecological value within the site.

1.1 Scope

The scope of this report is to assist the preparation of the PPCR, assess the ecological values of the site and discuss any associated ecological constraints and opportunities at the site. The outcomes of our assessment will provide information so that the PPCR can consider and adequately provide for ecological values within the site.

To assist in the planning and design stages of the PPCR across Maitahi and Bayview, a structure plan[1] has been prepared to show the zoning design (Appendix A; Figure A1.1). The structure plan contains new residential, small holdings, and open space zonings, along with an indicative road linkage. The structure plan identifies areas within the site that would be retained or become open space so that ecological values identified within the site can be retained and adequately managed.

[1] Rough & Milne Ltd. 2021. Proposed Structure Plan – Part of Schedule X.

2 Assessment methods

2.1 Desktop review

A desktop review was undertaken to assess ecological values of the area within the PPCR. Reviewed documents and databases included:

- Nelson Resource Management Plan (NRMP).
- Draft Whakamahere Whataku Nelson Plan (Oct 2020).
- Top of The South Maps.
- Department of Conservation Bioweb databases.
- Department of Conservation national bat database.
- New Zealand Plant Conservation Network Database (NZPCND).
- Ebird database.
- iNaturalist.
- New Zealand Freshwater Fish Database (NZFFD).
- Manaaki Whenua Landcare Research – Our Environment map series.
- Other primary literature sources.

2.2 Site visit

A site visit was undertaken by two Tonkin & Taylor Ltd (T+T) ecologists (terrestrial and freshwater) on 12 and 13 December 2019 and covered the valley floor and lower hillslopes of the Kaka Valley within Maitahi (Appendix A; Figure 1). This site visit was to verify the information obtained from the desktop review and assess the terrestrial and freshwater ecological values in this area. Assessments of areas outside those observed during the site visit are purely desktop based. The site visit included:

- High-level vegetation surveys to identify vegetation types within the area.
- General assessments of habitat for indigenous fauna (including indigenous birds, herpetofauna, bats and *Powelliphanta* snails and associated habitat) with a focus on species listed as nationally protected under the Wildlife Act 1953 and those classified as nationally 'Threatened' or 'At Risk'.
- An assessment of specific aquatic habitat types and the associated values was completed at multiple locations on the Kaka Hill Tributary.
- Assessments of the fish community within the Kaka Hill Tributary was in general accordance with New Zealand freshwater fish sampling protocols[2], however, some flexibility around sample reach/effort was incorporated to allow the sampling of specific habitats. This was undertaken to detect fish species and/or life stages with specific habitat requirements and/or patchy distributions within a stream or river.
- A qualitative assessment of aquatic macroinvertebrates was completed to provide a broad understanding of the macroinvertebrate community within Kaka Hill Tributary. The assessment included:
  - Sweep netting overhanging riparian vegetation and washing downs any large cobbles to dislodge macroinvertebrates into a 0.5 mm mesh net.
  - Any dislodged or sweep netted macroinvertebrates were identified in the field to family level where possible.

[2] Joy, M., David, B., Lake, M. 2013. New Zealand Freshwater Fish Sampling Protocols. Part 1: Wadeable Rivers and Streams. Massey University.

  - Additionally, any opportunistic bankside observations of macroinvertebrates within aquatic habitats were noted.
- Mapping flow characteristics for the Kaka Hill Tributary.

2.3 Structure plan

A review of the structure plan[1] was completed to determine whether the structure plan adequately recognises the ecological values identified within this report and whether sufficient area is provided so that any ecological values present on site can be protected and managed, and the applicants aspirations for positive enhancement can be practically be achieved.

2.4 Document review and specialist's workshop

In undertaking the assessment of the PPCR the following documents have been provided by the client for review:

- Preliminary Structure Plan Environmental Review. Maitahi and Bayview Development Privat Plan change Request. Prepared by Morphum Environmental Ltd. Dated March 2021. Herein referred to as the Preliminary Structure Plan Environmental Review
- Structure Plan Drawing Set (B1.1-B1.4 prepared by Rough and Milne, received 25 March 2021.
- Memorandum: Water quality survey of Kaka Stream. Prepared by Cawthron. Dated 20 November and 20 December 2020.

Additionally, a workshop was completed on 23 November 2020. The workshop was undertaken to ensure that a collaborative approach was used by integrating expert advice from flooding, infrastructure, and planning to achieve the best ecological and biodiversity outcomes possible from the development of the Structure Plan that informs the PPCR.

3 Ecological values within the PPCR Footprint

3.1 Ecological context/site overview

The Maitahi and Bayview areas comprise approximately 287 ha of Kaka Valley and adjacent hills, which extends from flat to gently inclined Kaka Valley floor north of the Maitai River, to steeply inclined hills to the east and west flanking the valley (Appendix A; Figure 1). The site is located within the Bryant Ecological District and can be broadly divided into three sections:

- Ridgelines of the hills surrounding Kaka Valley, vegetated with open grassland on the western side of the valley and open matagouri scrubland on the eastern side of the valley.
- Moderate to steep hill country (generally between 22° and 40°) forming the upper slopes of Kaka Valley, vegetated in a mix of scrub, grass and scattered mature native and exotic trees.
- Rolling to strong rolling downlands, fan and hill country (generally between 5° and 22°) west and east facing slopes forming the sides of Kaka Valley and vegetated in a mixture of grass, and native and exotic scrub.
- Gently undulating to flat inclined slopes (generally less than 5°) forming the current flood-plain of the Maitai River and Kaka Hill Tributary. These areas are vegetated predominantly by grazed pasture grass with isolated exotic mature trees.

The gently undulating and flat slopes are typical of rural environments within the Nelson district where the loss of habitats for indigenous species has been greatest in the past. Agricultural land use within the valley has included grazing by sheep and beef, with sheep still being actively grazed in the lower historic floodplain. The historic and current land use has resulted in < 10 % of indigenous vegetation cover remaining and as a result the Kaka Hill Valley is characterised by little remaining indigenous biodiversity within these environments. In the steeper hill country slopes further up the Kaka Valley, approximately 20-30 % of indigenous cover remains. In these areas, habitats are very fragmented and indigenous biodiversity is likely reduced[3].

The Kaka Hill Tributary is a small stream with headwaters commencing in the upper slopes of Kaka Hill Valley. It flows through a relatively steep upper hill catchment that enters a flat historic meander floodplain at its downstream extent before its confluence with the Maitai River. The lower reach has been modified and is currently comprised of a shallow channel that flows intermittently over the floodplain to the eventual confluence with the Maitai River. Multiple other ephemeral overland flow paths occur through the floodplain, some of these are likely to still be active and may flow after sustained periods of rain.

A section of the Kaka Hill Tributary immediately upstream of the confluence with the Maitai River (and outside of the property boundary) is frequently inundated during high flow events. This small area appeared to have land water margins that support an ecosystem that has formed through the natural processes of recruitment by introduced naturalised plants.

3.1.1 Terrestrial habitat types and vegetation

The land within the Bayview and Maitahi areas contain a mix of grassland, scrubland, fernland, forest and wetland habitats[4]. A list of common plant species observed at the site during the site visit on 12-13 December 2019 is provided in Appendix C. Post the site visit it is understood that various sections of primarily gorse and exotic scrubland have been removed. The area totals defined in the

[3] Manaaki Whenua Landcare Research, Our Environment threatened environment classifications.
[4] As defined in Atkinson, I. A. E. (1985). Derivation of vegetation mapping units for an ecological survey of Tongariro National Park North Island, New Zealand. New Zealand Journal of Botany. 23:30, 361-379.

following sections are approximate totals for the vegetation that remains within the property and have been calculated using GIS software[5].

3.1.1.1 Scrubland

Scrubland composed of varying plant species covers the majority of the site (c. 139.5 ha). Gorse is a dominant component of the vegetation across a large portion of this vegetation type (c. 33.3 ha), particularly on the western and northern sections of the site (Appendix A). The remaining areas of scrub (c. 106.2 ha) are typically a mix of kānuka (*Kunzea ericoides*), barberry, hawthorn (*Crataegus monogyna*), gorse and māhoe (*Melicytus ramiflorus*) (Appendix A; Photograph Appendix B.2). Sycamore (*Acer pseudoplatanus*) trees, blackberry (*Rubus fruiticosus* agg.) and bracken (*Pteridium esculentum*) are also abundant in some areas and old man's beard (*Clematis vitalba*) is commonly smothering trees and shrubs.

Matagouri (*Discaria toumatou*) scrubland has formerly been identified on the eastern edge of the site[6] and forms part of Significant Natural Area 166 (Appendix D). Matagouri is classified as At Risk – Declining[7].

Due to the threat posed by myrtle rust on plants of the myrtle family, all indigenous species from this family are now classified as 'Threatened'[7]. As such, kānuka is now a classified as a 'Threatened' plant. However, due to kānuka being common across the landscape, the site should not be considered a Significant Natural Area solely due to the presence of kānuka[8].

Radiata pines (*Pinus radiata*) are scattered throughout the scrublands but are abundant in two areas on the eastern side of the site covering approximately 5.4 ha (Appendix A; Photograph Appendix B.1).

3.1.1.2 Grassland

Pasture grassland covers approximately 11.3 ha of the mapped valley floor, lower hillside and western ridgeline (Appendix A). Various specimen trees e.g. poplars, weeping willows and exotic conifers are planted irregularly across the pasture in the valley floor (Photograph Appendix B.1). Weeds such as gorse (*Ulex europaeus*), broom (*Cytisus scoparius*), soft rush (*Juncus effusus*) and barberry (*Berberis glaucocarpa*) are also common across the pasture (Photograph Appendix B.2). It is important to note that not all grassland has been mapped, especially the grazed pasture grass located in the Kaka Hill Tributary floodplain.

3.1.1.3 Forest

Mature kānuka forest is likely present in the eastern side of the site. This is based off significant natural area records[6] and aerial imagery. The kānuka forest is included in SNA 166 and is estimated to cover approximately 11.2 ha.

3.1.1.4 Fernland

Fernland dominated by native tree ferns such as mamaku (*Cyathea medullaris*) and ponga (*Cyathea dealbata*) is estimated to cover approximately 2.75 ha towards the eastern edge of the site (Appendix A).

[5] ArcGIS 10.5.1. by Esri. www.esri.com

[6] Nelson City Council. (2009). Ecological Significance Assessment Report. Site No. 166. Technical report prepared by Micheal North.

[7] de Lange, P., Rolfe, J., Barkla, J., Courtney, S., Champion, P., Perrie, L., Beadel, S., Ford, K., Breitwieser, I., Schönberger, I., Hindmarsh-Walls, R., Heenan, P. & Ladley, K. (2018). New Zealand Classification Series 22. Conservation status of New Zealand indigenous vascular plants, 2017. Department of Conservation, Wellington.

[8] Ministry for the Environment. (2019). Draft National Policy Statement for Indigenous Biodiversity.

3.1.1.5 Wetlands

Rautahi (*Carex geminata*), pureī (*Carex virgata*), buttercup (*Ranunculus repens*) and exotic rushes (*Juncus effusus* and *J. articulata*) cover an area of approximately 0.29 ha of wetland near the middle of the site on the western side of Kaka Valley (Appendix B; Photograph Appendix B.3).

A second wetland has been identified on the south eastern slopes of the lower valley during additional surveys completed by Morphum[9]. This wetland is dominated by pasture plant species and exotic rushes and is flanked by gorse and manuka scrub.

3.1.1.6 Indigenous planting

A small patch (c. 800 m^2) next to the current dwelling on the site has been planted with a variety of native trees and shrubs such as large-leaved kowhai (*Sophora tetraphylla*), akeake (*Dodonaea viscosa*), lemonwood (*Pittosporum eugenioides*), māhoe, kōhuhu (*Pittosporum tenuifolium*), cabbage tree (*Cordyline australis*), ribbonwood (*Plagianthus regius*) and mountain beach (*Fuscospora cliffortioides*) (Appendix A).

3.1.2 Birds

Nine indigenous species were observed across the site during the visits on 12 and 13 December 2019 (Table 3.1). These were all common species, none of which are classified as 'At Risk' or 'Threatened'[10]. Information gathered from desktop information identified a further 13 indigenous bird species that may utilise the habitats within the site but were not observed during the site visits (Table 3.2). These included several 'At Risk' and 'Threatened' species. The scrubland, wetland and stream habitats across the site may provide suitable habitat for these species for feeding, nesting, roosting and/or daytime layovers between two sites.

Table 3.1: List of indigenous bird species observed on site and the conservation status

Species name	Common name	Conservation status[10]
Larus dominicanus	Black backed gull	Not Threatened
Rhipidura fuliginosa	Fantail	Not Threatened
Gerygone igata	Grey warbler	Not Threatened
Circus approximans	Harrier	Not Threatened
Todiramphus sanctus vagans	NZ kingfisher	Not Threatened
Porphyrio melanotus	Pukeko	Not Threatened
Zosterops lateralis	Silvereye	Not Threatened
Prosthemadera novaeseelandiae	Tui	Not Threatened
Gallirallus australis	Western weka	Not Threatened

[9] Morphum Environmental Ltd. 2021. Preliminary Structure Plan Environmental Review. Prepared for Maitahi Development.

[10] Robertson, H., Baird, K., Dowding, J., Elliott, G., Hitchmough, R., Miskelly, C., MacArthur N., O'Donnell, C., Sagar, P., Scofield, P. & Taylor, A. (2017). New Zealand Threat Classification Series 19. Conservation status of New Zealand birds, 2016. Department of Conservation, Wellington.

Table 3.2: Indigenous bird species not observed during the site visits of 12 and 13 December 2019 but potential users of the habitats across the site

Species name	Common name	Conservation status[10]	Likelihood of being present at site	Suitable habitat on site
Anthornis melanura	Bellbird	Not Threatened	Possible	Scrubland and large trees
Hemiphaga novaeseelandiae	Kereru	Not Threatened	Possible	Scrubland and large trees
Ninox novaeseelandiae	Morepork	Not Threatened	Possible	Scrubland and large trees
Phalacrocorax carbo novaehollandiae	Black shag	At Risk – Naturally Uncommon	Unlikely	Riparian zones and streams
Phalacrocorax sulcirostris	Little black shag	At Risk – Naturally Uncommon	Unlikely	Riparian zones and streams
Phalacrocorax melanoleucos brevirostris	Little shag	Not Threatened	Unlikely	Riparian zones and streams
Falco novaeseelandiae	NZ falcon	At Risk - Recovering	Possible	Scrubland and large trees
Chrysococcyx lucidus	Shining cuckoo	Not Threatened	Possible	Scrubland and large trees
Petroica australis	South Island robin	At Risk - Declining	Unlikely	Scrubland and large trees

3.1.3 Lizards and frogs

No indigenous lizard or frog species were observed at the site during the site visits of 12 and 13 December 2019. Two indigenous lizard species have, however, been identified on databases as inhabiting the habitats across the site.

The starred gecko or Nelson green gecko (*Naultinus stellatus*) commonly inhabits forest and scrub including mānuka/kānuka shrublands. This species has been recorded within 1 km of the site and may inhabit the scrublands across the site. The starred gecko is currently classified as 'Threatened – Nationally Vulnerable'[11].

The common skink (*Oligosoma polychroma*) lives within sunny rock piles, tall rank grass and scrublands. This species has been recorded within 3 km of the site and may inhabit the scrublands and any fringe rank grass habitat across the site. Rocky outcrops were observed around the fringe of some scrubland habitats that could be suitable basking locations for common skinks. The common skink is currently classified as 'Not Threatened' but is protected under the Wildlife Act 1953.

3.1.4 Long-tailed bats

Several acoustic bat surveys have been completed in the area surrounding the site. The 'Threatened – Nationally Critical' long-tailed bat (*Chalinolobus tuberculatus*)[12] has been detected c. 13.5 km east of the site on the other side of the Bryant Range. This species is highly mobile and can have home

[11] Hitchmough, R., Barr, B., Lettink, M., Monks, J., Reardon, J., Tocher, M., van Winkel, D. & Rolfe, J. (2016). New Zealand Threat Classification Series 17. Conservation status of New Zealand reptiles, 2015. Department of Conservation, Wellington.

[12] O'Donnell, C, Borkin, K, Christie, J, Lloyd, B, Parsons, S & Hitchmough, R. (2018). Conservation status of New Zealand bats, 2017. New Zealand Threat Classification Series 21. Department of Conservation, Wellington.

ranges extending over 60 km^2 and could therefore be present within the proposed site. Larger trees located irregularly throughout the property may provide habitat suitable for roosting, e.g. within broken branches, crevices and flaking bark.

3.1.5 *Powelliphanta* snails

Powelliphanta is a genus of endemic, carnivorous land snail with approximately 63 species. Most *Powelliphanta* species are classified as either 'At Risk' or 'Threatened' and the Nelson and Tasman areas are the diversity hotspots for the genus. Most species are found in mid- to high altitudes, i.e. above 600 m above sea level but some exist in lowlands and coastal habitats.

No *Powelliphanta* snails or shells were encountered during the site visits on 12 and 13 December 2019. It is considered unlikely that *Powelliphanta* snails will be inhabiting the habitats within the site but there is a possibility that they are in the moist habitats across the site.

3.1.6 Freshwater habitat types

At the time of the site walkover, Kaka Hill Tributary had a flow that was considered typical for the time of year (e.g. fluctuations in flows due to early summer rainfall events). In the five days prior to the site assessment, approximately 23.2 mm of rain fell over a 48-hour period between 7 and 8 December 2019[13].

During the site walkover water levels were low in the Kaka Hill Tributary reaches that flow through the lower historic floodplain. Flow characteristics included dry reaches, pooled sections, and shallow-slow runs. Several potential overland flow paths within the floodplain were observed, however, during the time of the site visit no flow was observed. Stable flow appeared to be evident from 155 m downstream of the farmhouse culvert and consisted of slow runs and connected pool habitat (Appendix A, Figure 1).

Diversity in flow characteristics increased upstream of the farmhouse culvert, were pools, rock drops, riffle sections and shallow runs were observed. The stream reaches upstream of the culvert are expected to retain a persistent baseflow across the full year.

Overall, Kaka Hill Tributary can be split into two distinct sections. The largely intermittent lower reaches that flow through a historic floodplain downstream of the farmhouse culvert and the steeper permanently flowing upper reaches upstream of the farmhouse culvert.

3.1.6.1 Upper Kaka Hill Tributary

Aquatic habitat within the upper reaches of Kaka Hill Tributary was diverse, with a substrate consisting of a mixture of boulders, cobbles, and mixed gravels. Sediment cover of the stream bed was patchy, with isolated areas of increased sediment cover (> 70 %) in pools and slower flowing areas. Overall, the upper Kaka Hill Tributary provided relatively moderate habitat diversity and abundance for freshwater fauna when compared to the lower Kaka Hill Tributary. These habitats were generally composed of undercut banks, overhanging riparian vegetation, large woody debris, and a diversity in water/flow characteristics (including pools, backwaters, riffles and shallow runs).

Riparian vegetation cover consisted of a mixture of native and exotic scrubland species (see Section 3.1.1.1), that provided high shade (> 60 % in places) and an established leaf litter to aid in groundcover and runoff filtering. Stock and pest mammal (from goats) access was evident in some areas, where pugging and animal tracks were observed.

[13] Observations recorded at the Nelson Airport meteorological station (AWS-93546).

Algae growth comprised of patchy areas of *Phormidium sp* in low shade areas immediately upstream of the farmhouse culvert. While in areas with full shade the algae community was generally comprised by thin black and brown films.

3.1.6.2 Lower Kaka Hill Tributary

The lower Kaka Hill Tributary (downstream of the farmhouse culvert) generally contained high sediment cover (> 60 %) of the stream bed, with a substrate primarily composed of clay, sands, and muds. However, closer to the farmhouse culvert (where continual flow was observed) small gravel and cobble substrates were evident. Habitat diversity and abundance for freshwater fauna was low within the lower Kaka Hill Tributary, with only isolated areas of habitat providing potential refugia for freshwater fauna (e.g. from the pooled sections and the stable slow run habitat downstream of the farmhouse culvert).

Riparian cover consisted of mature rank pasture grass with isolated non-native large shrubs and/or trees along the riparian zone. The open pasture area provided no protection from stock access to the stream. The lower banks on both sides of these reaches were incised and relatively steep with some areas of bare exposed ground. Both banks appear to have a high potential for erosion, especially during higher flow events, although no evidence of bank slumping was observed.

3.1.7 Freshwater fauna

3.1.7.1 Fish community

Sampling of the fish community was completed at multiple survey reaches throughout the entirety of the Kaka Hill Tributary following the methodology described in Section 2.2. Survey results showed that the fish community was sparse with only shortfin eel (*Anguilla australis*), unidentified eel (including elver), and an unidentified climbing *Galaxiidae* sp (Table 3.3) observed in the upper Kaka Hill Tributary (i.e. upstream of the farmhouse culvert). Shortfin eel are currently listed as 'Not Threatened'[14] and are likely regionally common where appropriate habitats are present and accessible.

Of the native fish species observed two could only be partially identified. The unidentified eel (*Anguilla* sp. in Table 3.3) were either too small (e.g. elvers) or avoided capture by burrowing into the muds and undercut banks located within the surveyed reaches. While the unidentified climbing *Galaxiidae* sp. was too small to correctly identify, however, it is likely either kōaro (*Galaxias brevipinnis*or, an 'At risk – declining'[14] species) or banded kokopu (*G. fasciatus,* 'Not Threatened'[14] species).

An assessment of the NZFFD[15] showed that no historic records are available for fish communities within the Kaka Hill Tributary.

Of the native freshwater fish species observed within the Kaka Hill Tributary all are diadromous and must move between the freshwater and marine environments to complete their life cycle. Therefore, catchment access to downstream and upstream habitats is important for these species so that regional populations can be maintained. Likewise, as fish are mobile it is important that fish passage and connectivity to aquatic habitats within the Kaka Hill Tributary is maintained as the observed fish species may move between these habitats throughout the year.

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

[15] The NZFFD was accessed on 10 December 2020.

Table 3.3: List of indigenous freshwater fauna identified on site and associated conservation status

Species name	Common name	Conservation Status[14] [16]
Anquilla sp.	Unidentified eel/ elver	-
Anguilla australis	Shortfin eel	Not threatened
Galaxiidae sp	Unidentified climbing galaxiidae	-
Paranephrops planifrons	Northern freshwater crayfish/kōura	Not threatened

3.1.7.2 Macroinvertebrates

The qualitative sampling of the aquatic macroinvertebrate community showed that the lower Kaka Hill Tributary was characteristic of the pooled and slow run habitat available and predominantly composed of water boatmen (*Sigara sp*), back swimmers (*Anisops sp*), diving beetles (*Dytiscidae sp*) and non-biting midge (*Chironomidae sp*). Within the upper reaches of the Kaka Hill Tributary observed macroinvertebrate species include a number of cased caddisfly (e.g. *Pycnocentrodes sp, Hudsonema sp*), mayfly (e.g. *Deleatidium sp*) and black fly larvae (*Austrosimulium sp*).

In general, the species observed in the upper reaches are common in faster flowing, cobbled streams with a closed canopy, and are usually more sensitive to pollution and changes in land use than the species observed within the lower reaches[17].

During the fish community survey, the freshwater crayfish/kōura (*Paranephrops planifrons*) was also identified at one site. Kōura are a 'Not Threatened' [18] species and the presence of these within the Kaka Hill Tributary is consistent with the known habitat and distribution.

[16] Grainger, N., Harding, J., Drinan, T., Collier, K., Smith, B., Death, R., Makan, T., and Rolfe, J. 2018. Conservation status of New Zealand freshwater invertebrates. New Zealand Threat Classification Series 28. 25 p.
[17] Stark JD, Maxted JR, 2007. A user guide for the Macroinvertebrate Community Index. Prepared for the Ministry for the Environment. Cawthron Report No.1166. 58 p.

4 Ecological constraints, opportunities and recommendations

The following sections provides a brief overview of the ecological constraints and opportunities for the site in respect of the PPCR.

High-level recommendations for future site development are also provided, which have been incorporated into the Schedule of rules and associated structure plan[1].

We have not undertaken a full assessment of Ecological Effects (AEcE), although we have identified broad options to manage identified constraints. Further detailed ecological assessments (of aquatic macroinvertebrates, fish, lizards, *Powelliphanta sp* and bats) are likely to be required to inform an AEcE relating to any specific subdivision development proposals and associated resource consent applications.

4.1 Potential constraints

This section summarises potential ecological constraints at the site and how they have been considered in the structure plan or whether they will need to be addressed in future development design.

4.1.1 Terrestrial ecology

Four ecological constraints have been identified within the structure plan area in terms of terrestrial biodiversity values. These are primarily associated with the clearance of the scrubland habitats identified in Appendix A. These include:

1 The loss of significant indigenous vegetation.

2 Loss of wetland habitat.

3 Loss of habitat for indigenous fauna.

4 Injury or mortality of indigenous fauna.

If the PPCR is accepted and development occurs, then these constraints will need to be managed appropriately in order to comply with the relevant legislation (e.g. Resource Management Act 1991 and Wildlife Act 1953).

Wherever possible, any actions resulting in these four outcomes should be avoided. This approach has been incorporated into the structure plan with respect to the loss of high-quality indigenous vegetation (e.g. kānuka forest and matagouri scrubland) and the loss of wetland habitats. The kānuka forest and matagouri scrubland will remain in 'Rural' zones and wetland habitats will be incorporated into an 'Open space' corridor running along the Kaka Valley tributary.

If avoidance is not possible then actions should be undertaken to minimise the extent of these four impacts. For example, the removal of ecologically valuable vegetation should be minimised. Any removal of vegetation that does occur should be undertaken following relevant fauna management plans to minimise the risk of the vegetation removal on indigenous fauna, e.g. vegetation removal should be undertaken outside of the peak breeding months of indigenous birds (November to January inclusive). Sufficient space is available for mitigation, offset or compensation within the site.

Based on the current structure plan and our preliminary desktop assessment, approximately 36.2 ha of vegetation with common or abundant indigenous plants will be converted from 'Rural' zoning to either 'Residential' (c. 18.7 ha) or 'Small Holdings Area' (C. 17.5 ha) zones. Some of this vegetation will inevitably be removed to make space for building platforms and gardens, etc., particularly in the 'Residential' zones. Additionally, low quality exotic vegetation (e.g. gorse scrub) can provide habitat for indigenous fauna and will also be removed (potentially up to 12 ha). There is, therefore, potential

for a large amount of indigenous vegetation and/or habitat for indigenous fauna to be removed as part of future developments.

Any future developments in these zones should consider the ecological impacts of removing vegetation and necessary mitigation, offset or compensation actions will need to be taken to ensure developments do not result in a net loss of ecological value. Examples of possible mitigation, offset or compensation actions include pest plant control, pest animal control, indigenous planting, and protection of identified valuable habitats across the site.

For any work that threatens to displace or injure indigenous fauna, the Department of Conservation (DoC) will need to be consulted with and a Wildlife Act Authority will likely need to be granted to allow the work to proceed. Currently, this process can take up to six months and it is therefore important to initiate this process well before the desired start date of any earthworks that may be proposed as part of development.

Additional targeted surveys of starred gecko, *Powelliphanta* snails and long-tailed bats are recommended to get a better understanding of the likelihood of these animals being present across the site. This will inform the level and likelihood of management required to avoid adverse impacts on these 'Threatened' and 'At Risk' species if future development occurs within the site.

Ecological and/or fauna management plans are likely to be a requirement of any resource consents granted and will provide details on how adverse ecological impacts will be avoided, minimised and/or mitigated through offset or compensation.

Based on preliminary assessments and the final structure plan, it is expected that there will be sufficient space available for mitigation, offset or compensation within the site, although comprehensive ecological surveys will need to be completed across the site and more detailed information on any proposed subdivision development would be needed for more detailed assessment

4.1.2 Freshwater ecology

Several freshwater ecological constraints have been associated with the PPCR in terms of the freshwater biodiversity of Kaka Hill Tributary that flows through the site and these include:

1 Adverse change in the flow regime.

2 Loss and/or an adverse change in aquatic habitat availability and condition.

3 Loss and/or an adverse change in aquatic habitat connection.

4 Injury, mortality and/or changes to the indigenous fish community.

These constraints will need to be managed appropriately to comply with relevant legislation (e.g. the Nelson Resource Management Plan (NRMP), the National Policy Statement on Freshwater Management (NPS-FM), and the National Environment Standards for Freshwater (NES-FW)). Actions resulting in these four outcomes have been avoided and/or minimised within the structure plan with respect to the alignment of an 'Open space' corridor that encompasses the Kaka Hill Tributary.

Any future development must align with the objectives and intent of the NPS-FM and NES-FW. Where any stream effects that may result in a change of flow regime, loss of aquatic habitat and connection, then the planning assessment within any proposed subdivision assessment of environmental effects (AEE) will need to demonstrate that there is a functional need for these effects. Once this has been confirmed then the application of the effects management hierarchy to avoid and minimise, and if necessary, mitigation or offset actions will need to be taken.

Any loss of freshwater biodiversity values would need to be managed through ecological enhancement initiatives such as the re-establishment or enhancement of stream reaches following current best practice guidelines. Based on the structure plan the 'Open space' corridor following

Kaka Hill Tributary and connecting the available space within the south – south western historic floodplain will offer various opportunities for ecological enhancement to address any potential adverse ecological effects on aquatic values from any future developments.

For any work that threatens to displace, injure, or kill indigenous fish fauna, the DoC and the Ministry for Primary Industries (MPI) will need to be consulted with and authority will likely need to be granted to allow the work to proceed. Permit processes with DoC and MPI can take up to six months and is therefore important to initiate well before the desired start date for and development related earthworks.

Stream restoration, stream channel design and fauna management plans are likely to be a requirement of any future specific subdivision development proposals and associated resource consent applications.

4.1.2.1 Realignment of lower Kaka Hill Tributary

The lower reach of Kaka Hill Tributary currently flows through a straightened and channelised section of the historic floodplain. Historically, the lower Kaka Hill Tributary is likely to have flowed through multiple channels spread throughout the lower floodplain especially during periods of higher flow.

The structure plan shows the planned realignment of the lower intermittent reaches of Kaka Hill Tributary. Any stream realignment should demonstrate that there is a functional need for the realignment and should be avoided if it results in the four outcomes outlined in Section 4.1.2. If avoidance is not possible, the effects management hierarchy should be followed to minimise and if necessary, mitigation or offset actions will need to be taken. For ecological reasons[18] the realignment should consider:

- The use of best practice guidelines for designing a natural stream channel (e.g. Tasman District Council Natural Channel Design Guidelines[19]).
- The new alignment should utilise (if available) appropriate historic or relict channels with areas of indigenous biodiversity values present (e.g. a vegetated riparian zone), that should not result in a loss of river extent or value.
- The timing of works to occur when the affected reaches are dry and in line with any approved fauna and channel restoration and design management plans.

Based on the preliminary site assessment and review of the structure plan[1] there will be enough area within the 'Open space' zone located within the south-west of the site to accommodate the realignment of the Kaka Hill Tributary. This 'Open space' zone will also provide additional area for any subsequent biodiversity enhancement associated with the realignment of the stream.

4.1.3 Nelson Resource Management Plan

The following sections provide an overview of any NRMP objectives that relate to the indigenous terrestrial and freshwater ecological values observed within the Kaka Hill Valley. Further detailed assessments of the objectives, policies and rules in the NRMP are likely to be required to inform an AEE relating to any specific subdivision development proposals and associated resource consent applications. The purpose of this section is to provide an overview of key ecological considerations that may need to be taken into account in future detailed assessments.

[18] Note: specific planning policies, objectives, and rules within the NRMP may need to be met or exceeded in addition to these ecological reasons.

[19] Tonkin + Taylor Ltd. 2019. Natural Channel Design Guidelines. Prepared for Tasman District Council.

4.1.3.1 Natural value

The natural value objective in the NRMP (objective DO5) outlines that where natural values are preserved and enhanced within the environment, they comprise an integral part of the natural setting. Areas with high natural value (Policy 5.1.1) have been identified in accordance with the criteria in Table DO5.1 (of the NRMP). If necessary, any identified areas of high natural value must be managed in such a way that protects and enhances those values. In the Kaka Hill Valley indigenous flora and faunal communities that may have priority for protection include freshwater wetlands and riparian forest.

Consideration within the structure plan has been given to policy DO5.1.2 which promotes the linkage of corridors between areas of natural vegetation. Generally, areas of indigenous vegetation are often too small to support viable populations of animal and plant species. Linking these small sections together can provide improvements to the biodiversity in any individual area. For example, the Kaka Hill Tributary, the Rautahi wetland and the riparian forest have been linked together to provide an opportunity for a continuous biodiversity corridor to the upper Kaka Valley.

Furthermore, any clearance of indigenous forest (not covered in the Conservation Overlay in the NRMP planning maps) must follow the specific rules outlined in the NRMP.

4.1.3.2 Riparian margins

The NRMP objective DO6 outlines that riparian margins are protected and enhanced where natural character, public access, natural functions, landscapes, heritage values, water quality and ecological values are present.

Objective DO6 applies to the Rural Zone of Kaka Hill Tributary which has been identified as having Esplanade Values (Table 6.2, Appendix 6 NRMP) and within the Riparian Overlay layer (NRMP planning maps). Esplanade Values for the Kaka Hill Tributary within the Rural Zone include conservation (i.e. aquatic habitat and water quality), public access along the river, recreation and hazard mitigation. Furthermore, the NRMP indicates that a 20 m strip on both river banks be included as an esplanade requirement.

The Rural Zone of the Kaka Hill Tributary is located approximately 766 m north of the confluence with the Maitai River. Therefore, within the current planning objective DO6 there is a gap that does not require any esplanade requirements between the Kaka Hill Tributary/ Maitai Confluence and the Kaka Hill Tributary Rural Zone. The structure plan[1] details that the 'Open Space' biodiversity corridor will encompass the entirety of the Kaka Hill Tributary located within the property boundary (from the Kaka Hill Tributary/ Maitai Confluence to the top of the Kaka Hill Valley). By connecting the esplanade requirements of the Kaka Hill Tributary to that of the Maitai River will provide a positive biodiversity outcome of the PPCR.

Further detailed design will locate the esplanade reserve and refine the riparian corridor; however, the structure plan shows that generally a 40 m corridor has been zoned as 'Open space' that follows the topographical contours of the Kaka Hill Tributary.

Activities on land that are to occur within an area identified within the riparian overlay layer and where esplanade values have been identified must follow the specific planning rules outlined in the NRMP. Therefore, a detailed assessment of these relevant policies, objectives and rules should be undertaken in any assessment of effects reporting.

4.1.3.3 Activities in the beds of rivers and lakes, and in wetlands

Objective DO17 of the NRMP outlines that activities, works or structures within the beds of lakes and rivers and their margins, and in wetlands, are undertaken or constructed in a way which avoids, remedies or mitigates adverse effects on freshwater bodies and their associated uses and values.

Specific policies within DO17 that may constrain development include policies DO17.1.1 through to DO17.1.11 and range from:

- Protecting the natural character of rivers, lakes and wetlands.
- Flood damage.
- Removal of and building of structures (including dams and reservoirs).
- Planting in, on or adjacent to rivers, lakes and streams.
- The deposition or removal of material; to
- Realignment and piping.

A detailed assessment of the policies and rules associated with objective DO17 should be undertaken during any future AEE/RCA reporting as a part of subdivision and development.

4.1.3.4 Freshwater abstraction and instream flows

Objective DO18 of the NRMP describes how flow regimes and water levels within the Nelson Region's water bodies are to be maintained and enhanced where necessary. This includes any diversion of water that results in the natural functioning of the ecosystem to be disrupted.

Therefore, any adverse changes to the flow regime of the Kaka Hill Tributary will have to meet or exceed the objectives outlined in DO18.

4.1.4 National Policy Statement on Freshwater Management

The following sections provide an overview of policies within the NPS-FM. These came into effect on 3 September 2020 and replace the NPS-FM 2017. Further detailed assessments of the objectives, policies and rules in the NPS-FM 2020 are likely to be required to inform an AEE relating to any specific development. The purpose of this section is to provide an overview of key ecological considerations that may need to be taken into account in future detailed assessments.

4.1.4.1 Natural Inland Wetlands

Policy 3.22 of the NPS-FM (2020) outlines that the loss of extent of natural inland wetlands is to be avoided, their values protected, and their restoration is promoted. Therefore, the structure plan has outlined that the two identified wetlands have been protected and are bordered by 'Open space'.

4.1.4.2 Rivers

The NPS-FM (2020) policy 3.24 outlines that the loss of river extent and values is avoided. Regarding the PPCR, the loss of extent of the Kaka Hill Tributary should therefore be avoided. In terms of the reinstatement of the natural alignment of the lower Kaka Hill Tributary the planning AEE should demonstrate that there is a functional need for the realignment and any effects on river extent and values should be manged by applying the effects management hierarchy (i.e. avoid, minimise, remedied, mitigate, and offset). The reinstatement of the lower Kaka Hill Tributary to a natural channel will provide an opportunity for biodiversity and ecological enhancement, the development of land, and to safely convey catchment flood flows through the lower part of the Valley.

4.1.4.3 Fish Passage

Policy 3.26 of the NPS-FM includes an objective outlining that fish passage is maintained, or improved, except where it is desirable to prevent passage of some fish species in order to protect desired fish species, their life stages, or their habitats. Therefore, any new road structures should meet the required criteria for allowing fish to pass. Likewise, the realignment and connection of the

lower Kaka Hill Tributary to the Maitai River will need to be managed so that undesirable fish species passage can be prevented.

4.1.5 National Environment Standards for Freshwater 2020

The following sections provide an overview of the regulations in Part 3 of the NES-FW (2020). These came into effect on 3 September 2020. Further detailed assessments of the regulations and standards in the NES-FW are likely to be required to inform an AEE relating to any specific subdivision development proposals and associated resource consent applications. The purpose of this section is to provide an overview of key ecological constraints that may need to be considered in future detailed assessments and planning.

4.1.5.1 Natural Wetlands

Subpart 3 (1) of the NES-FW outlines standards for activities that relate to natural wetlands. Specific standards within subpart 1 that may constrain development planning include:

- Construction of specified infrastructure.
- Drainage of natural wetlands.
- Other non-complying activities (e.g. activities that do not have a status under subpart 3 (1)).

As such the structure plan outlines that the two identified wetlands will be protected and bordered by 'Open space'.

4.1.5.2 Reclamation of Rivers

The NES-FW outlines in subpart 3 (2) that the reclamation of the bed of any river is a discretionary activity. Therefore, any reclamation of the Kaka Hill Tributary that is to occur will be at the discretion of the Council and in accordance with the relevant policies of the NRMP, the NES-FW and the NPS-FM.

4.1.5.3 Fish Passage

Subpart 3 (3) of the NES-FW outlines that the purpose of this subpart is to deal with the effects on fish passage from the placement, use alteration, extension, or reconstruction of any structures in, on, over, or under the bed of any river or connected area. Therefore, any new structure that is to be constructed that intersects the Kaka Hill Tributary must meet the standards outlined in subpart 3 of the NES-FW.

4.2 Potential opportunities

The opportunities outlined below aim to increase the native biodiversity and ecological functioning of the site, through planting or retaining specific vegetation. Seeking such opportunities would be expected to provide a range of ecological and biodiversity benefits for the Valley.

4.2.1 Terrestrial ecology

There are several opportunities available to allow for ecological and biodiversity gains across the site which form a part of the PPCR and would be achieved as a part of future subdivision and development.

Most habitats within the site are highly degraded with an abundance of exotic plants, and animal pests are present. Initiatives to reduce the abundance and influence of pests and increase the prevalence of indigenous flora and fauna would provide ecological and biodiversity gains across the site. These could include:

- Pest plant and animal control.
- Indigenous planting.
- Stock exclusion from enhancement areas.
- Protection of enhancement area.

Pest plants are prevalent in the scrubland vegetation across the site. Controlled removal of these plants while managing for the impacts on indigenous fauna and avoiding the removing of indigenous plants could provide a large ecological benefit to the site.

The control of pest animal species can help by reducing predation pressure on indigenous fauna and reducing browsing pressure on indigenous flora. Some pest control has begun over the site in the form of fencing and removing goats. Additional pest control of other species in areas of ecological value would help to further improve such areas.

There is a large opportunity for indigenous planting within the site. A minimum 40 m wide biodiversity corridor is planned in the structure plan, spanning from the Maitai River up to the head waters of the Kaka Valley Tributary, and following the north-east property boundary to connect to the kānuka forest located on the eastern edge of the property. Any additional planting of indigenous vegetation will provide ecological value to the site. To ensure the area maintains an acceptable level of terrestrial biodiversity, future developments should plan for a minimum of 10% indigenous vegetation cover across the total site being developed as this has been identified as the critical threshold of indigenous cover before a rapid decline in biodiversity is likely to occur[20].

Additionally, the protection of enhancement areas through vesting and/or consent notices and covenants could be used to ensure on-going management of the natural habitats within the development.

4.2.2 Freshwater ecology

There are several opportunities that will provide ecological and biodiversity gains for the Kaka Hill Tributary and potentially the Maitai River as a result of this proposed PPCR. Specific initiatives to increase aquatic habitat for native species identified within Kaka Hill Tributary should be considered. These may include:

- A continuous riparian corridor that provides a natural buffer zone to the Kaka Hill Tributary should be retained, protected and managed. The corridor will be a minimum of 40 m wide, follow the natural topography of the site and support:
  - Channel meanders and flood benches.
  - continuous riparian vegetation.
  - eco-system function and habitat.
  - Integrated stormwater wetlands.
  - Public access via well designed walking/cycling paths (no roads except at crossing points).

  Management of the riparian corridor should include the exclusion of all stock, the trapping and removal of pest animals, natural regeneration of indigenous species, restoration planting, weed control, monitoring of threatened aquatic species and monitoring of biodiversity condition.
- Allow greater passage at all road crossings for native fish species known to inhabit the catchment.

[20] Hanski, I. (2015). Habitat fragmentation and species richness. Journal of Biogeography, 42, 989-993.

- Excluding non-native fish from the catchment by designing and constructing intentional built barriers with the specific objective of limiting or preventing the movement of certain fish species (e.g. trout) into the Kaka Hill Valley catchment.
- Rehabilitating natural swale and marshy floodplain areas with native wetland flora species.
- Pre-treatment of stormwater inflows to the Kaka Hill Tributary will be consistent with good management practices (see Morphum Environmental Ltd, 2021[9] for more detail).
- Design, construct and maintain the Lower Kaka Hill Tributary so that is correctly integrated into the environment so that catchment flora and fauna values are enhanced. Ecological outcomes should include:
  - A low flow channel for fish passage and temporal habitat availability.
  - Diversity in hydrological conditions (runs, pools, riffles) where appropriate.
  - Diversity and availability of habitat (shaded margins, woody debris, etc).

A summary of the potential ecological opportunities is provided in Appendix E.

5 Structure Plan

The following sections outline whether the structure plan[1] adequately provides for the ecological values and opportunities identified within this report and whether sufficient area is provided so that ecological values present on site can be adequately managed at the time of subdivision and development.

This assessment of the structure plan is based on desktop assessments and preliminary field observations. If the plan change is approved, ground-truthing with comprehensive vegetation and fauna surveys and specific assessment of the ecological value is recommended to inform future subdivision development proposals, any associated resource consent applications, and alongside detailed design processes.

5.1 Terrestrial values

The structure plan has focused potential developments in areas of lower ecological value and has minimal development planned in areas of higher ecological value.

Areas planned for 'Residential' zoning are currently mostly pasture and gorse scrub. There are, however, some residual areas of mixed exotic and indigenous scrub that may fall within the planned 'Residential' areas. The removal of this vegetation and habitat for indigenous fauna will require some further assessment and potentially, mitigation and appropriate management to ensure the development does not result in a net loss of ecological value within the area.

Areas of highest ecological value (e.g. kānuka forest, matagouri scrubland and wetlands) are proposed to be left as 'Rural' or rezoned into 'Open space' zones. This will avoid any loss of these habitats and provide good opportunities for ecological and biodiversity improvements in these areas.

This will allow for this higher quality vegetation and habitat to remain and provides opportunities for mitigation and enhancement through activities such as weed control, pest control, stock exclusion and native planting.

5.2 Freshwater values

The structure plan identifies a continuous corridor of land zoned as 'Open space' that connects the western and south western edge of the lower historic floodplain to the Kaka Hill Tributary and the upper Kaka Valley. This 'Open space' will provide a continuous corridor from the Maitai River to the source of the Kaka Hill Tributary at the top of the valley.

The Kaka Hill Tributary 'Open space' corridor will likely provide for the protection and enhancement opportunities for ecological values (i.e. aquatic habitat and water quality), within the riparian margins that were identified during the site visit and within the NRMP Esplanade Values (Table 6.2, Appendix 6 of the NRMP). Additionally, the 'Open space' corridor will connect the esplanade from the Kaka Hill Tributary Rural zone to the Maitai River/ Kaka Hill Tributary confluence. This will provide further opportunity to protect and enhance the freshwater values within the area.

The lower intermittent reaches of the Kaka Hill Tributary are planned to be reinstated to flow through a historic/relic channel that flows around the western edge of the historic floodplain. The intermittent flowing reaches of the lower Kaka Hill Tributary were of lower ecological value than upper permanently flowing reaches, but still maintain some (all be it low) ecological value and habitat for aquatic species. According to the structure plan[1] an area has been set aside in the western and south western historic floodplain to allow a natural channel to be designed and connected to the Maitai River. The realignment of this channel will require appropriate management and potentially mitigation measures through ecological enhancement (i.e. through offsetting and/or

compensation). However, the creation of this open space in the south – south western historic floodplain should provide sufficient area for the ecological enhancement of aquatic values.

Both the lower reinstated Kaka Hill Tributary and the upper reaches of the Kaka Hill Tributary should be linked through a continuous 'Open space' corridor (as shown in the structure plan). Further to this, the identified SNA on the upper eastern boundary of the valley should be connected into the Kaka Hill Tributary corridor. This will ensure that the corridor links smaller areas of indigenous biodiversity. Linking these small sections together can provide improvements to the biodiversity in the Kaka Hill area.

6 Applicability

This report has been prepared for the exclusive use of our client CCKV Maitai Dev Co LP and Bayview Nelson Limited, with respect to the particular brief given to us (including supporting material for an application for PPCR to the Nelson Resource Management Plan under Schedule 1 of the Resource Management Act) and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
	
.....	.....
Patrick Lees and Adam Purcell	Mark Foley
Freshwater and Terrestrial Ecologists	Project Director

Report reviewed by Josh Markham (Senior Terrestrial Ecologist) and Dean Miller (Principal Freshwater Scientist)

PALE
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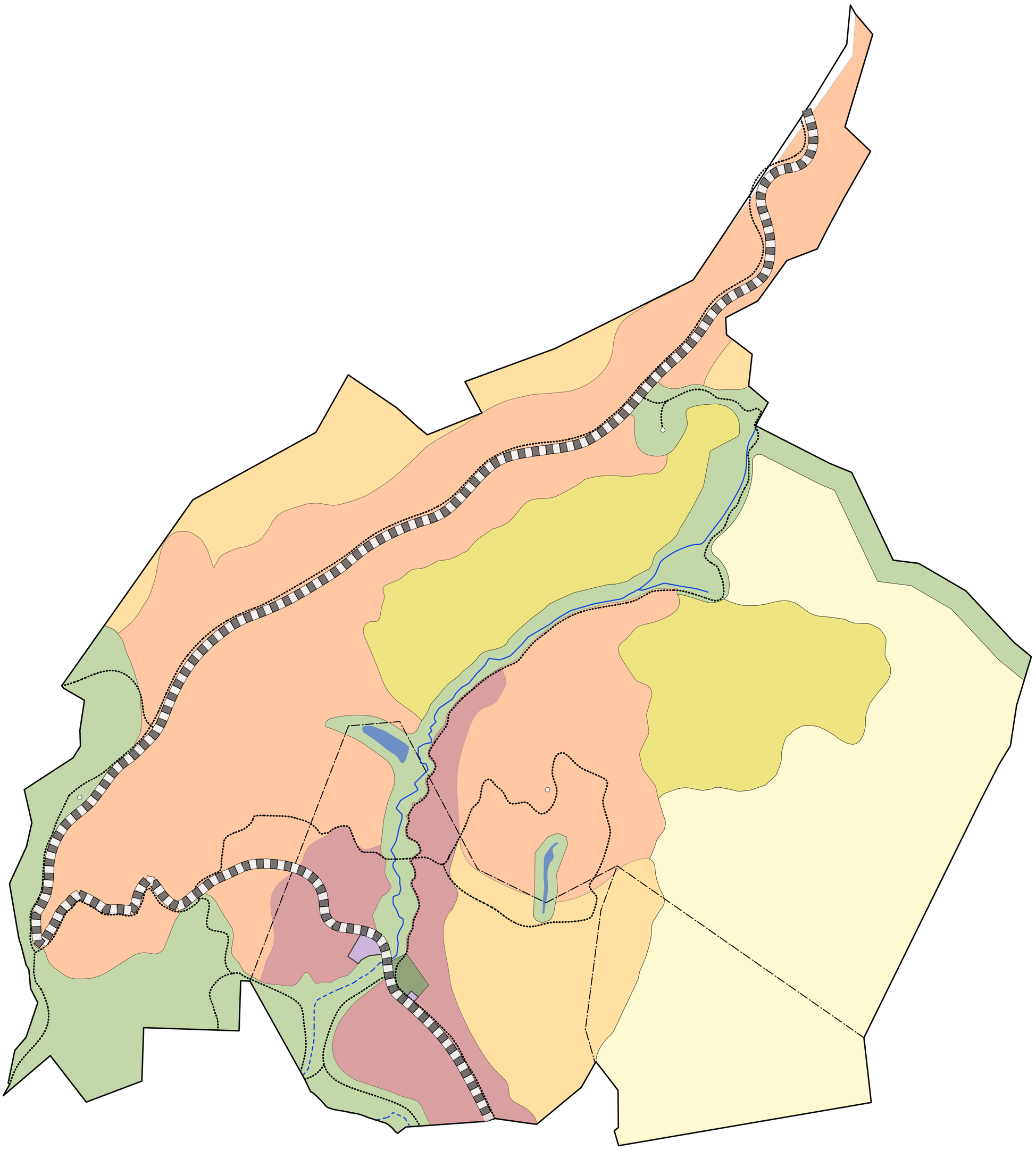
Appendix A: Structure Plan and Ecological Features Across the Proposed Private Plan Change Area

- **Figure A1.1 – Rough & Milne Ltd – Proposed Structure Plan – March 2021**
- **Figure 1 – Site plan of ecological features**

LEGEND

- Residential Zone
- Residential Zone Higher Density Area
- Residential Zone Lower DensityArea
- Open Space Recreation Zone
- Suburban Commercial Zone
- Rural Zone
- Higher Density Small Holdings Area
- Neighbourhood Reserve
- Indicative Road
- Indicative Walkway / Cycleway Link
- Indicative Lookout Locations
- Wetland
- Existing River
- Proposed River
- Site Boundary
- Internal Cadastral Boundaries



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Attachment B1.1:

Maitahi Bayview Structure Plan - Part of Schedule X

Scale 1:10,000 @ A3

rough & milne landscape architects

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Tel +64 3 366 3268
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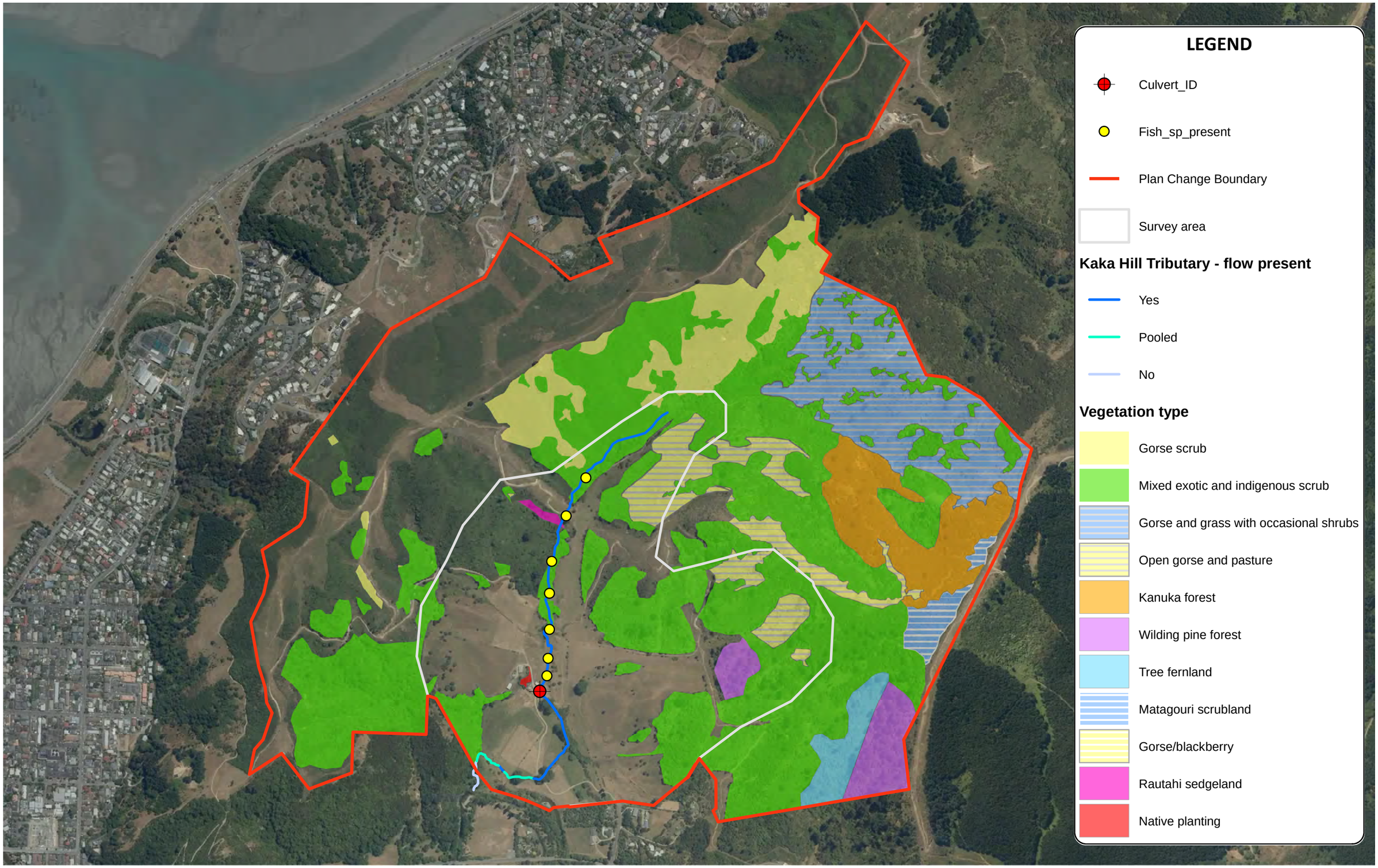
info@roughandmilne.co.nz



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Notes: Aerial photograph sourced from LINZ under CC4.0.
Property boundary indicative only and shoudl not be used for legal purposes.
Vegetation extent is approximate only

A3 SCALE 1:10,000

0 0.1 0.2 0.3 0.4 0.5 (km)

N

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DRAWN	PALE	Feb.21
CHECKED		
APPROVED		
ARCFILE	20210127_KakaHill_ecology	
SCALE (AT A3 SIZE)	1:10,000	
PROJECT No.	1012397.1000	

CCKV Maitai Dev Co LP

Maitai/ Bayview Subdivision, Maitai Valley, Nelson

Site plan of ecological features

FIGURE No. Figure 1.

Rev. 0

Appendix B: Site Photos

B1 Terrestrial

Photograph Appendix B.1: Photograph facing east with pasture grassland in the foreground surrounded by gorse dominated scrub. Kānuka-gorse-barberry-hawthorn-māhoe scrubland can be seen going up the hillside in the background with a stand of radiata pines amongst the scrub.

Photograph Appendix B.2: Wet pasture in the foreground with a scattering of rushes. In the background, scrubland dominated on the western boundary of the property. Kānuka, māhoe and old man's beard are also common in the scrubland.

Photograph Appendix B.3: Wetland habitat dominated by rautahi, pureī, buttercup and exotic rushes in the north of the site.

B2 Freshwater

Photograph Appendix B2.1: Dry sections of Kaka Hill Tributary located upstream of the Maitai Confluence.

Photograph Appendix B2.2: Pooled sections of the lower Kaka Hill tributary.

Photograph Appendix B2.3: Nuisance algal blooms (Phormidium) identified within open canopy mid – upper reaches of Kaka Hill tributary. Areas on large cobbles where bubbles are evident on show algae community presence.

Photograph Appendix B2.4: Upper reaches of Kaka Hill tributary.

Photograph Appendix B2.5: Short fin eel (Anguilla australis) captured within the upper reaches of Kaka Hill tributary.

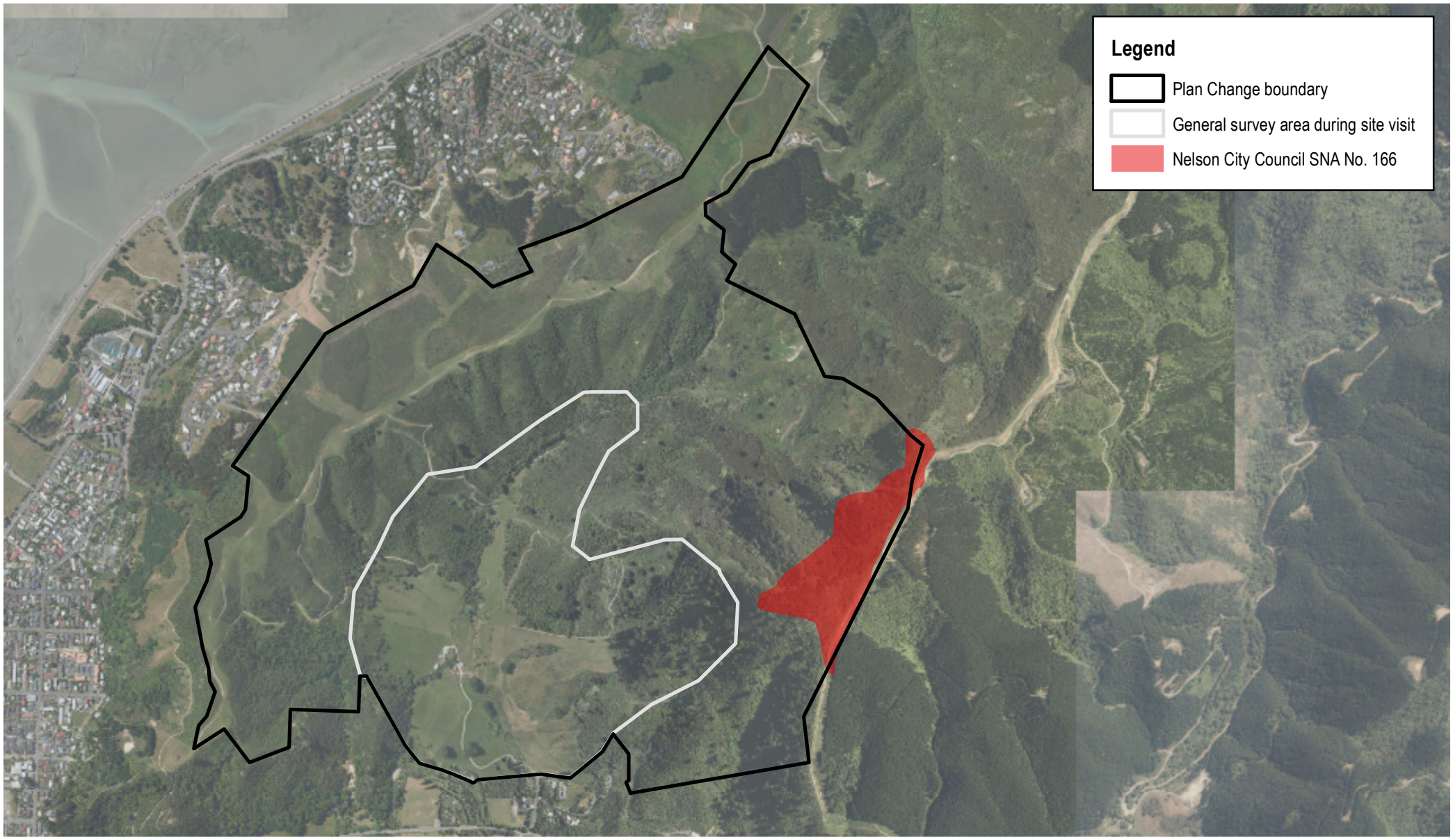
Photograph Appendix B2.6: Unidentified galaxiid captured within the upper reaches of Kaka Hill tributary.

Appendix C: Native and Exotic Vegetation Identified Within the Site

Native vegetation		Exotic vegetation	
Species name	**Common name**	**Species name**	**Common name**
Dodonaea viscosa	Akeake	*Berberis glaucocarpa*	Barberry
Calystegia sp.	Bindweed	*Rubus fruiticosus* agg.	Blackberry
Pteris esculentum	Bracken	*Cytisus scoparius*	Broom
Kunzea ericoides	Kānuka	*Ranunculus repens*	Buttercup
Corynocarpus laevigatus	Karaka	*Cirsium arvense*	Californian thistle
Pittosporum crassifolium	Karo	*Prunus* sp.	Cherry tree
Pittosporum tenuifolium	Kōhuhu	*Ligustrum sinense*	Chinese privet
Sophora fulvida	Kōwhai	*Galium aparine*	Cleavers
Sophora microphylla	Kōwhai	*Asparagus scandens*	Climbing asparagus
Sophora tetraphylla	Large-leaved kōwhai	*Salix fragilis*	Crack willow
Pittosporum eugenioides	Lemonwood	*Digitalis purpurea*	Foxglove
Melicytus ramiflorus	Māhoe	*Ulex europaeus*	Gorse
Cyathea medullaris	Mamaku	*Crataegus monogyna*	Hawthorn
Coprosma linariifolia	Mikimiki	*Ilex aquifolium*	Holly
Fuscospora cliffortioides	Mountain beech	*Populus nigra*	Lombardy poplar
Schefflera digitata	Patē	*Lotus pedunculatus*	Lotus
Muehlenbeckia australis	Pohuehue	*Populus nigra*	Necklace poplar
Cyathea dealbata	Ponga	*Clematis vitalba*	Old man's beard
Carex virgata	Pureī	*Pinus radiata*	Radiata pine
Carex geminata	Rautahi	*Juncus effusus* var. *effusus*	Soft rush
Plagianthus regius	Ribbonwood	*Acer pseudoplatanus*	Sycamore
Pellaea rotundifolia	Round-leaved fern	*Juglans regia*	Walnut
Polystichum neozelandicum subsp. *zerophyllum*	Shield fern	*Salix babylonica*	Weeping willow
Codyline australis	Tī kōuka, cabbage tree	*Daucos carrota*	Wild carrot

Appendix D: Nelson City Council SNA 166

- **Figure D1.1**



Notes:
Aerial photography sourced from LINZ under CC4.0
Property boundary indicative only and should not be used for legal purposes.

A4 SCALE 1:16,000

0 0.15 0.3 0.45 0.6 0.75 (km)

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DRAWN	ADPU	Aug.20
CHECKED		
APPROVED		
ARCFILE	KakaHill_ecology_ADPU.mxd	
SCALE (AT A4 SIZE)	1:16,000	
PROJECT No.	1012397.1000	

CCKV Maitai Dev Co LP

Kaka Subdivision, Maitai Valley, Nelson
Nelson City Council SNA No. 166

FIGURE No. Appendix D - Figure D1.1

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Appendix E: Overview of Ecological Constraints and Opportunities

E1 Terrestrial

Item	Description	Constraints/ Opportunity	Consequence
1	Clearance of mixed indigenous/exotic scrub	C O	Loss of indigenous plants such as kānuka, mahoe, lancewood, shield fern, rautahi and pureī. Will require some level of mitigation planting to balance out the loss. Mitigation planting can provide potential ecological enhancement and connectivity
2	Loss of wetland habitat	C O	Loss of ecosystem services provided by wetlands such as water filtration, water storage, flood protection and habitat provision. the enhancement of existing wetland habitat or creation of new wetland habitat will be required. Wetland habitat identified within the property have been zoned as 'Open Space'
3	Loss of habitat for indigenous fauna: 1. Birds 2. Lizards 3. Bats 4. Snails	C O	1 10 indigenous bird species were observed onsite and a further 12 species which may use the habitats onsite have been recorded nearby. Works across the subdivision will impact how these species use the area. 2 Kānuka is a key habitat of indigenous geckos, and skinks may live amongst the leaf litter and debris of the scrub proposed for clearance. 3 Indigenous bats may use the larger trees on the property for daytime roosting and/or feed over the wetlands and streams on the property. 4 *Powelliphanta* snails may inhabit the scrub proposed for clearance. If any of these are present, especially if any 'Threatened' or 'At Risk' species are found, some of these risks will require considerable effort to mitigate and offset the loss of indigenous habitat. For example, if a threatened gecko is found on site this will change the outcomes of how the loss in vegetation is approached. It may not be just a case of recommending the enhancement of remaining habitat and replacement of lost habitat will be required to mitigate and offset the loss of habitat for indigenous fauna. Integrating the four outcomes above into specific management plans so that any effects on species are avoided and or minimised.

Item	Description	Constraints/ Opportunity	Consequence
4	Injury or mortality of indigenous fauna	C	Potential mortality of indigenous birds, lizards, bats and *Powelliphanta* snails. Earthworks and construction works will need to be planned and undertaken to avoid and minimise the impact on indigenous fauna and activities to offset any unavoidable impacts will need to be carried out. These will need to be outlined in relevant management plan(s). Consultation with DOC may be required before any work can be carried out. A note of caution would be appropriate now to highlight that in some cases significant effort will be needed to achieve agreement with DOC; this might be survey effort, or mitigation effort, or both.
5	Habitat enhancement 1. Pest plant control 2. Indigenous planting 3. Pest animal control 4. Stock exclusion	O	1. Reduction of pest plants such as gorse, hawthorn, barberry, blackberry, crack willow, broom, thistle, bindweed, sycamore. 2. Increase in the ecological quality of vegetation across the property. 3 & 4. Increase in the quality of the habitat on the property for indigenous fauna. This will assist with offsetting the loss of indigenous plants, the loss of habitat for indigenous fauna and any injury or mortality of indigenous fauna.
6	Protecting enhancement area through a covenant	O	Ensures the on-going management (pest plant and animal control, indigenous regeneration, stock exclusion) of natural habitats within the subdivision. As above, this will assist with offsetting the loss of indigenous vegetation, the loss or habitat for indigenous fauna and any injury or death of indigenous fauna.

E2 Freshwater

Item	Description	Constraint/ Opportunity	Consequence
1	Change in flow regime, channel realignment of lower reaches of Kaka Hill tributary, loss of aquatic habitat	C O	Increase in habitat to non-native predatory fish species (trout), loss of refugia for fish species when Maitai River is in high flow. Loss of wetted habitable area, stream characteristics & change in natural character. Specific design considerations to provide adequate habitat to native species identified within Kaka Hill tributary. Continue to exclude non-native predatory fish from the catchment (built barrier). Maintain high flow connection to Maitai to provide refugia during flooding flows. Increase in aquatic habitat value, ecosystem function and natural character.

Item	Description	Constraint/ Opportunity	Consequence
2	Change in flow regime to upper catchment	C	Loss in wetted habitat, change in species distribution and assemblage. Development of stormwater retention dam may restrict fish passage, change water habitat types, loss of water connection to downstream habitats. Removal of vegetation during construction, and other impacts associated with works.
3	Fish passage barriers/culverts	C O	Removal of fish barriers may allow non-native predatory fish to move into the upper catchment. Could lead to predation impacts on current low numbers of native fish populations. Incorrectly designed, installed and maintained culverts may restrict movement of all aquatic species currently known to inhabit the Kaka Hill tributary. May divert water away from downstream environments. Potential to look into novel fish passage techniques which will allow native species (i.e. climbers) to continue to move into catchment, whilst restricting non-native predatory fish (e.g. trout). Allow greater access at all road crossings for indigenous fish species known to inhabit the catchment. Correctly designed, installed, and maintain culverts within the property
4	Fish species at risk of habitat destruction, altered predation, deaths or increased probability of harm during construction.	C O	Direct mortality during construction. Habitat destruction – reduce population size and connectivity of habitat. Develop an indigenous fish management plan to avoid and/or minimise any construction effects on freshwater fauna
5	Increase in the proliferation of periphyton species	C	Designing and creating stream channels that have permanent water flow/level, minimal shading is likely to see an increase in nuisance periphyton species that are present within the catchment particularly in the downstream reaches.
6	Habitat enhancement - aquatic	O	Riparian fencing, restoration planting, monitoring of aquatic habitat and fauna condition. Rehabilitating natural swale and marshy floodplain areas with native wetland flora species. Habitat enhancement for aquatic species in downstream 'flood plain' area and newly developed lower Kaka Hill Tributary channel.
7	Indigenous fish management plan	O	Monitoring programmes, relocations and pest control.
8	Establishing a covenant or protecting the upper Kaka Hill Tributary in perpetuity	O	A management area that ensures the exclusion of all stock; trapping and removal of pest animals; natural regeneration of indigenous species; restoration planting; weed control; monitoring of threatened aquatic species; and monitoring of biodiversity condition.

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