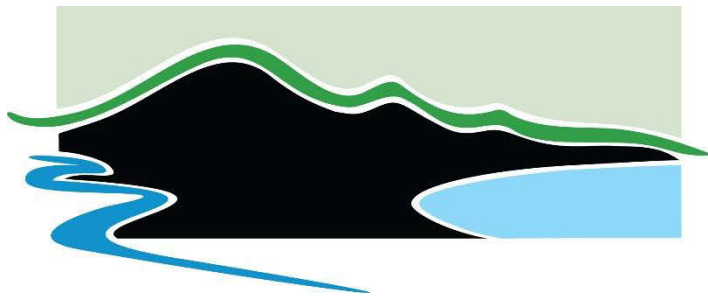


Appendix 11

Ecological Report



**RURAL
DESIGN** SINCE 1984

**ECOLOGICAL ASSESSMENT PERTAINING TO A PROPOSED
SUBDIVISION**

at

Lot 2 DP 99045 & Lot 3 DP 99045

131 & 189 Three Mile Bush Road, Kamo



September 2021

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1.0 INTRODUCTION

1.1 Background & Proposed Subdivision

Hurupaki Holdings Limited ('the Client') wish to conduct a subdivision on 131 & 189 Three Mile Bush Road (Lot 2 DP 99045 & Lot 3 DP 99045), Kamo ('the subject site'). Rural Design 1984 Limited (RDL) has been engaged by the Client to undertake an ecological assessment to identify and assess existing ecological values of the site, and outline opportunities, constraints and potential mitigation strategies associated with the proposed subdivision proposal.

The site is situated approximately 2 km west of Kamo town centre (Figure 1). The subject site is split between two separate titles being Lot 2 DP 99045 (total area 4.99 ha) (from herein referred to as 'Lot 2') and Lot 3 DP99045 (total area 8.98 ha) (from herein referred to as 'Lot 3') and is approximately 13.9825 ha in size across the two titles (Figure 2).

The subject site is accessed from Three Mile Bush Road, Kamo and is currently zoned a mixture of General Residential Zone (Lot 2) and Rural Production Zone (Lot 3) under Whangarei District Council District Plan (Appeals Version). The subject site contains an existing dwelling on each title and both titles are predominantly in pasture. The site abounds a residential subdivision development (The James) and the Hurupaki School to the east, Natural Open Space Zone to the north, Rural (Urban Expansion) Zone and Low-Density Residential Zone to the west, and Rural (Urban Expansion) Zone to the south.



Figure 1: Showing the subject site in relation to Kamo



Figure 2: Showing the separate titles making up the subject site

The site is proposed to be subdivided resulting in the creation of 76 lots, alongside several reserve areas, in accordance with the Scheme Plan (dated May 2021) provided by Blue Wallace Surveyors Ltd (Figure 3)



Figure 3: Scheme Plan for the proposed subdivision at 131 and 189 Three Mile Bush Road, Kamo (Blue Wallace Surveyors - May 2021)

2.0 ECOLOGICAL CONTEXT

2.1 Whangarei Ecological District

The subject site is situated within the Whangarei Ecological District (Northland Conservancy) and is abounded by Whangaruru Ecological District to the north and east, Tangihua Ecological District to the west and both the Tokatoka and Waipu Ecological district to the south. The Whangarei ED covers 81,800 hectares across the wider Northland Region.

Indigenous natural areas make up one fifth of the District (19%) but only 9 % of land if the Whangarei Harbour is excluded. Of the identified natural areas 43 % are forest, 9% are shrubland 47% estuarine and less than 1 % are freshwater wetlands. Almost the entire District has been modified and most notably the once extensive Hikurangi Swamp associated with the Wairua River flood plain. The main features of the district include the Whangarei Harbour, which is a large, drowned river estuarine ecosystem of international importance, distinctive volcanic broadleaf forest associated with rich volcanic soils of the scoria cones and surrounding flats. Pukenui Forest dominates the Whangarei landscape and is the largest forest tract remaining in the Ecological District which supports populations of long-tailed baits (Manning 2001).

There are 205 threatened species present in the Whangarei District. Forty-five are described as 'Threatened' and 160 'At Risk'. These include animals such as the New Zealand Fairy Tern, Brown Teal

(Pateke), North Island Brown Kiwi and Long-Tailed Bat, along with plants such as the kakabeak and Royal Fern.

National and regional state of the environment reports indicate a continuing loss of biodiversity. There are several main threats to biodiversity and reasons why it is in decline. The first of these is population growth and increased loss of indigenous habitat. Ecosystem degradation and habitat loss occurs as humans expand their activities and alter land uses (WDC 2020).

Considering the above circumstances, any land development proposal that works with the existing natural features present within the development footprint and aims to restore, strengthen, and protect habitats of ecological significance should be supported. The development proposal for the subject site presents an opportunity to reintroduce appropriate plant species that were once common in specific ecotypes, retire sensitive habitats from grazing pressures, and manage and eradicate problematic weeds and pest animal species.

2.2 Site background and ecological overview

The subject property is located on the urban fringe boundary of Kamo. The subject site is predominately in pasture, and contains pockets of remnant indigenous vegetation, primarily encompassing the Waitaua Stream, which flows through the central aspect of the site and acts as an ecological corridor through the subject site. To the north, the site adjoins Hurupaki Cone, which is noted for its geological, cultural, and ecological significance.

2.2.1 Changes in Land Use

Originally the site would have been a continuation of forestry sequence of the Hurupaki Cone and associated vegetation of the wider volcanic fields. Forestry, agricultural activities and, more recently urbanisation, have highly modified the native vegetation and hydrology paths through the removal of trees, channelized drainage, dams and intensive earth moving. By analysing historic aerial imagery from Retrolens it appears that subject property and surrounds was dominated by pasture and horticultural activities with scattered regenerating forest remnants in the most historic aerial imagery accessible 1942 (Figure 4). By 1981 further improvements in agricultural can be observed (Figure 5). Although the change is minimal between 1981 and 2017 (Figure 6) there appears to be some natural regeneration and expansion of some of the native forest remnants within the central aspect of the site.



Figure 4: Showing the subject property and surrounds in 1942 (Source: Retrolens)



Figure 5: Showing the subject property and surrounds in 1981 (Source: Retrolens)

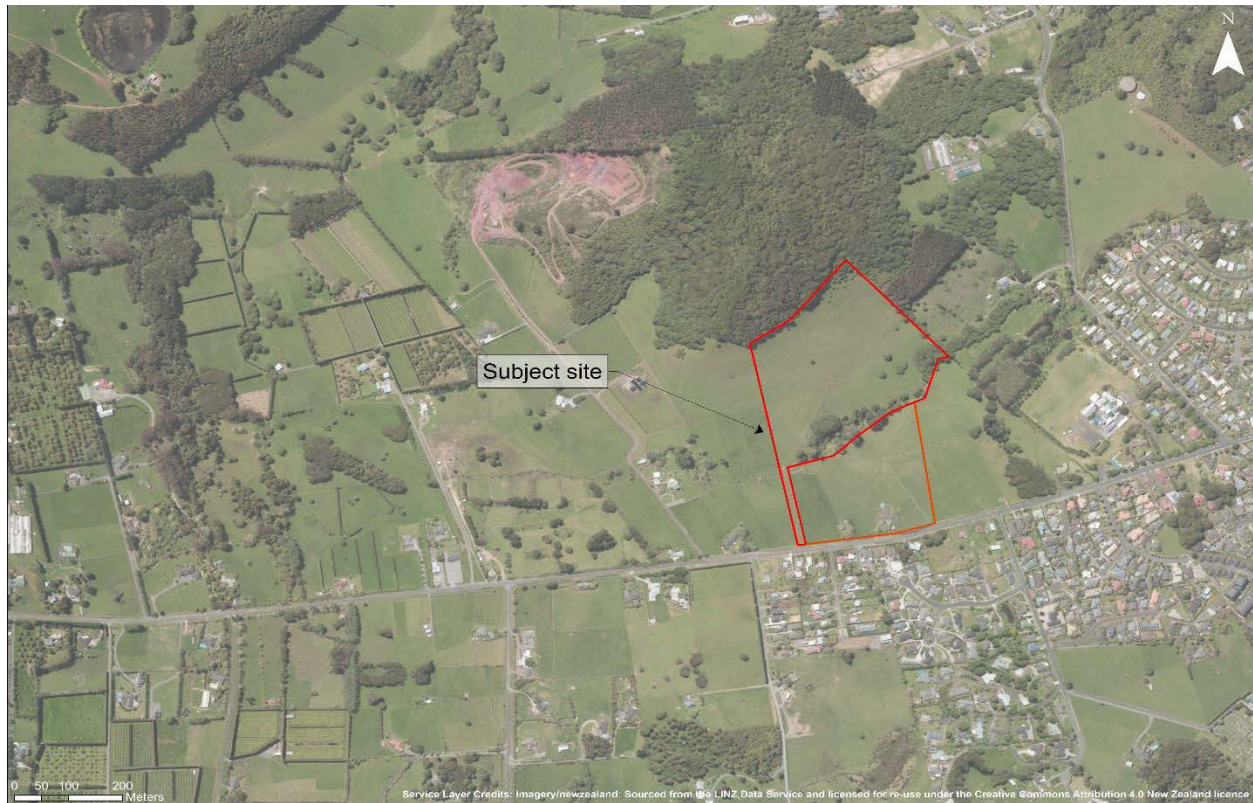


Figure 6: Showing the subject property and surrounds in the most recent aerial imagery for Northland 2017 (Source: LINZ)

The site and surrounds as described above have been largely modified, with most existing natural features on site having been modified by Maori and European settlement. At present day most of the site comprises of exotic grassland that is relatively uniform across the site, primarily dominated by kikuyu (*Cenchrus clandestinus*). Much of the native vegetation has historically been cleared with small, scattered remnants of native broadleaf forest, most notably large stands of puriri on the north-western edge of the Waitaua Stream running through the central aspect of the site (Figure 7). Of note was the presence of exotic specimen trees such as Radiata pine (*Pinus radiata*), Monterey cypress (*Cupressus macrocarpa*) and an abundance of exotic pest plants within the riparian margins of the Waitaua Stream, which have since been controlled, felled and removed as a part of the initial site weed control.



Figure 7: Showing the basic features of the site and surrounds

Under Land Environments of New Zealand (LENZ) the majority of the subject site and immediate surrounds is primarily within the 'Category 5 Threatened Land Environment', where there is >30% indigenous cover left, with >20% of it being protected, with a smaller portion of land on the southern boundary being identified as 'Category 1 Threatened Land Environment' with only 10-20% indigenous cover remaining (Figure 8). Indigenous biodiversity in these 'At Risk' environments are more at risk of loss and decline if little of the environment has formal protection for natural heritage purposes. As such, proposals to further protect and enhance indigenous vegetation in this area is a high priority.

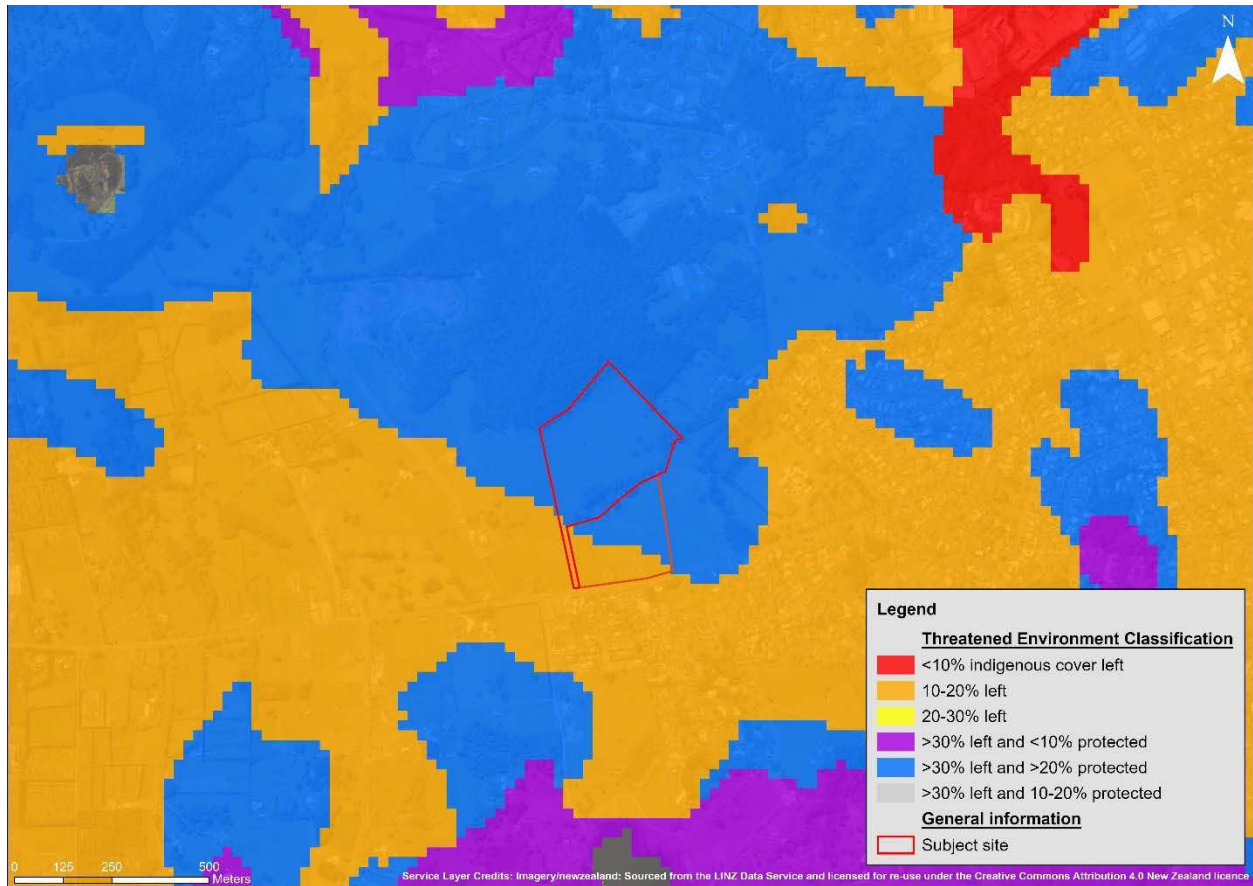


Figure 8: Showing the subject site and Threatened Environment Classification for New Zealand (2012)

The geology of the site and immediate surrounds is characterized by the Kerikeri Volcanic Group Pleistocene scoria/basalt of Puhipuhi -Whangarei Volcanic Field (GNS 2021). The soil type present on the property consists of orthic allophanic (LO) (Landcare Research 2021). The topography of Lot 2 is generally flat and falls away towards the Waitaua Stream at its northern extent. Lot 3 falls steeply away (>60m drop in elevation) from the northern boundary (Hurupaki Cone) down to the Waitaua Stream.



Figure 9: Showing the steep gradient downhill of the Hurupaki Cone

The Land Use Classes (LUC) on site (Figure 10) in the northern aspect encompassing the Hurupaki Cone as LUC Class 6 which is generally suitable for low production pastoral or forestry land. The sites eastern aspect and the remainder of the site has been identified as LUC Class 3 with moderate-low arable cropping suitability, and moderate pastoral grazing suitability (Landcare Research 2010).

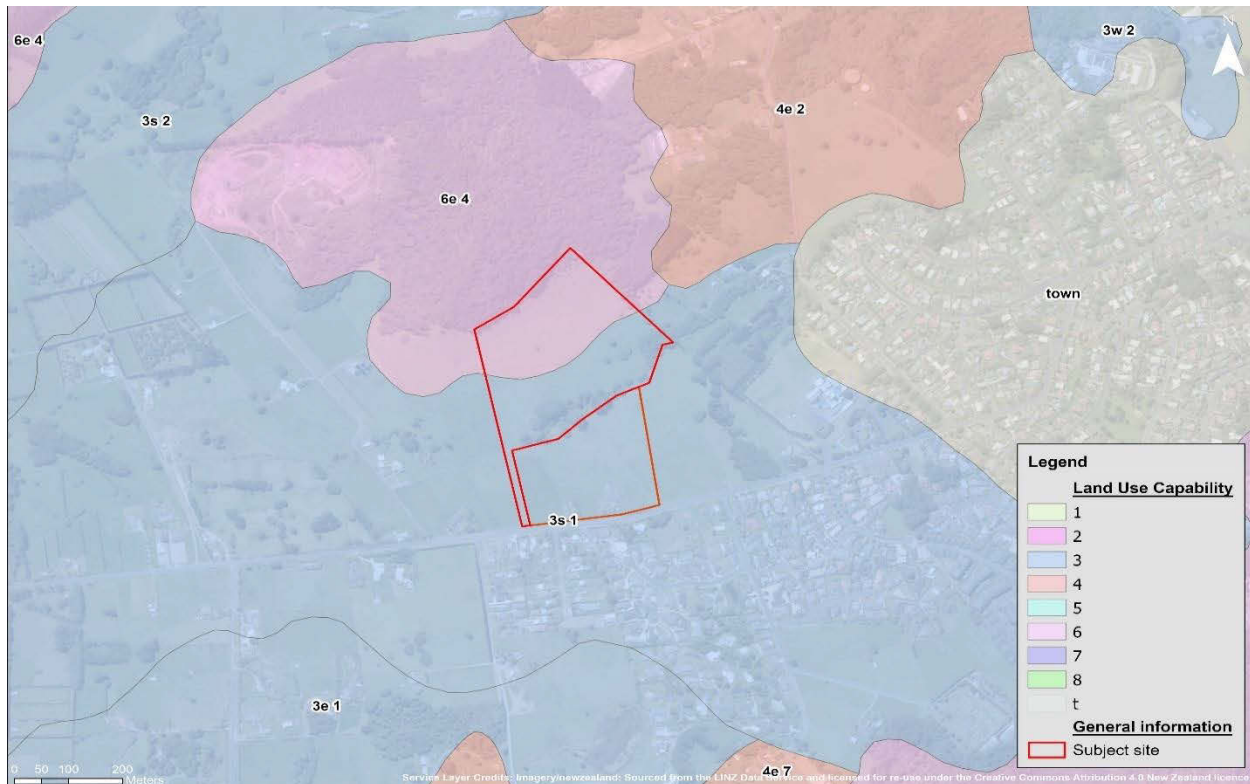


Figure 10: Showing the LUC classification for the site

2.2.2 Protected Natural Areas

The site directly adjoins and is in close vicinity to several Protected Natural Areas (PNAP's) as designated in the Natural Areas of Whangarei Ecological District Reconnaissance Survey Report (Mannin 2001). The northern most aspect of the site directly adjoins Hurupaki Cone (Q06163) and is located within 1km radius of Pukenui Forest (Q07022), Lake Ora (Q06165), Rotomate Road Volcanic Cones (Q06161), and Lower Whau Valley Forest (Q06164) (Figure 11). It is thought that historically all these areas would have formed an uninterrupted habitat sequence and have been modified and isolated by agricultural activities and urbanisation over time, as well as introduction of pest plant and animal species which has also resulted in modification and degradation of indigenous habitats on site and surrounds.

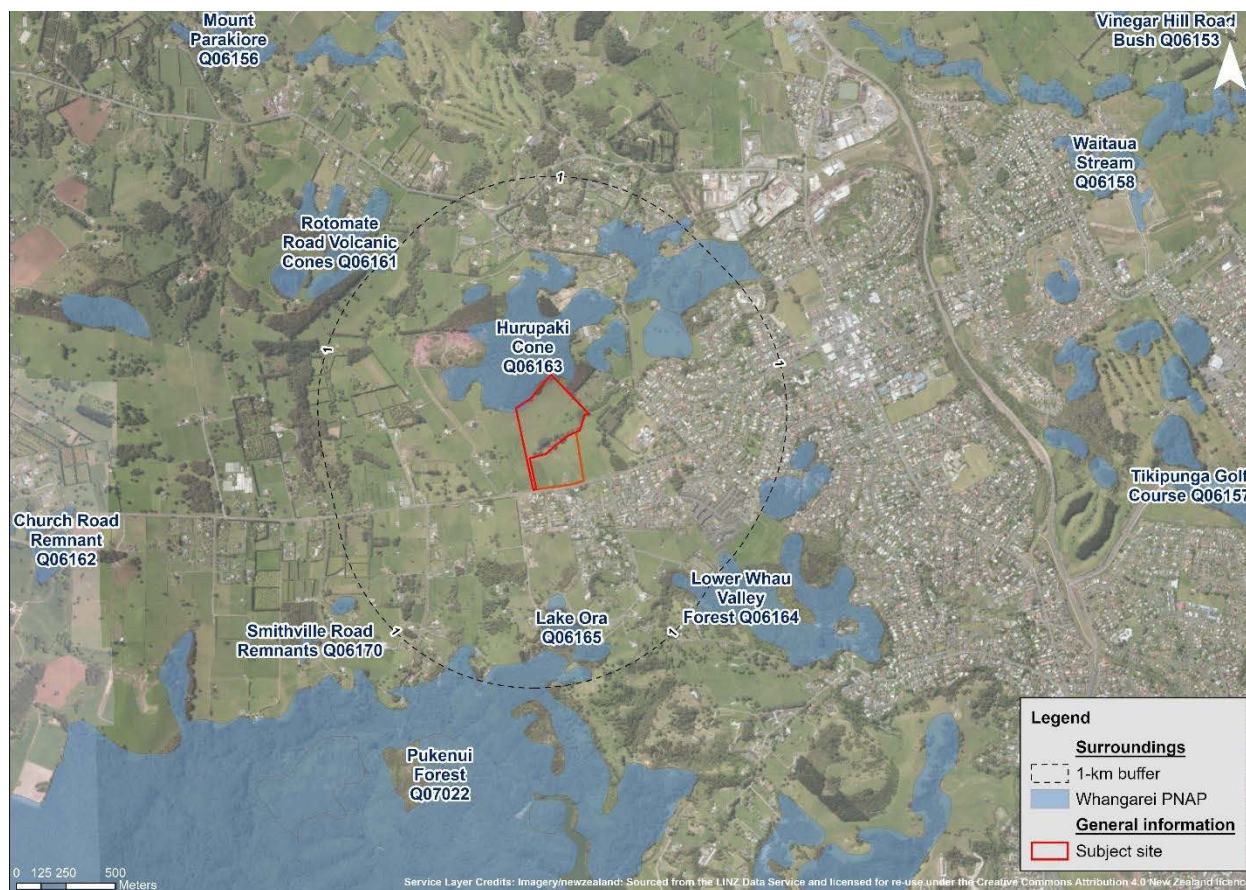


Figure 11: Map showing the subject property and PNAP areas as identified in Manning 2001

3.0 ECOLOGICAL SURVEY RESULTS

3.1 Flora & Fauna field survey methodology

A field survey was undertaken on the 22nd of April 2021 with a repeat site visit undertaken on August 17th, 2021 to observe the post weed control works. To provide an assessment of the vegetation making up the relevant habitat types the entire site was investigated. A rapid fauna survey was also conducted to record the presence of avifauna and assess the potential habitat for ichthyofauna, herpetofauna and chiroptera. The study of historic and recent aerial imagery, and ground truthing was utilised to delineate the ecosystem types and flora on the site and surrounds.

3.2 Existing vegetation

The varying underlying geology, soil types, anthropogenic activities have influenced the current vegetation composition and habitats found within the subject site and surrounds. The sites vegetation sits upon a combination of basalt and scoria (GNS 2021) and would have historically consisted of the broadleaved forest variant (WF7.2) 'rock forest' (Singer *et al.* 2017).

Lot 2 contains no indigenous forest remnants and has largely been reduced to a pastoral sward of kikuyu (*Cenchrus clandestinus*) with some landscape planting around the existing dwellings and some old shelter belts associated with the historic stone walls and paddocks (Figure 12).



Figure 12: Showing general vegetation composition of Lot 2

Lot 3 contains some examples of broadleaf forest remnants encompassing the Waitaua Stream, including a large significant stand of puriri (*Vitex lucens*) (Figure 13 & Figure 14) with scattered canopy trees such as karaka (*Corynocarpus laevigatus*), kohekohe (*Dysoxylum spectabile*), taraire (*Beilschmiedia taraire*), pohutukawa (*Metrosideros exsela*) and a single rimu (*Dacrydium cupressinum*).

The more degraded and anthropically induced vegetation near the eastern boundary is dominated by totara (*Podocarpus totara*). The native under canopy and shrub layer was sparse but typical broadleaf forest species such as kawakawa (*Piper excelsum*), hangehange (*Geniostoma ligustrifolium*), mahoe (*Melicytus ramiflorus*), pate (*Schefflera digitata*), mapou (*Myrsine australis*), whau (*Entelea arborescens*), pigeonwood (*Hedycarya arborea*), nikau (*Rhopalostylis sapida*) and mamaku (*Cyathea medullaris*) could be found.

The ground tier had largely been eliminated by historic browsing but on less accessible stream edges fern species such as rosy maiden hair fern (*Adiantum hispidulum*), small maidenhair (*Adiantum diaphanum*), rasp fern (*Doodia australis*), gully fern (*Pneumatopteris pennigera*), *Diplazium australe*, *Deparia petersenii* subsp. *congrua*, smooth shield fern (*Parapolystichum glabellum*), shaking break (*Pteris tremula*) and jointed fern (*Arthropteris tenella*) (Figure 15). Some ground tier species were noted including mercury bay weed (*Dichondra repens*) and basket grass (*Oplismenus hirtellus*).



Figure 13: Showing a large stand of puriri on the northern side of Waitaia Stream



Figure 14: Showing trunks of large puriri



Figure 15: Showing fern regeneration around steep sections of Waitaua Stream

Although the site does provide for some fine examples of broadleaf habitat, it has been degraded through historic vegetation clearance, grazing and the introduction of exotic pest plants. The bush remnants surrounding the Waitaua Stream contain a vast array and abundance of highly invasive pest plants. Of note the existing bush area contains several large old radiata pine (*Pinus radiata*) (>40m in height) (Figure 16) and Monterey cypress (*Cupressus macrocarpa*) (on Lot 3) with some more recently planted poplar (*Populus* sp.) (on Lot 2) surrounding an overland flow path.

Pest plants of concern that were dominating large areas of the existing vegetation included but were not limited to climbers including Mignonette vine (*Andrea cordifolia*), Elaeagnus (*Elaeagnus x reflexa*) (Figure 17) and moth plant (*Araujia sericifera*). A thick shrub layer being formed by queen of the night (*Cestrum nocturnum*), purple cestrum (*Cestrum elegans*), lantana (*Lantana camara*), woolly nightshade (*Solanum mauritianum*), Jerusalem cherry (*Solanum pseudocapsicum*) and Taiwan cherry (*Prunus campanulata*) was observed within the bush area (Figure 18). Weeds were also present in the ground tier including wild ginger (*Hedychium gardnerianum*), periwinkle (*Vinca major*) and wandering willie (*Tradescantia fluminensis*).

The large exotic pine trees and pest plants have been removed and/or controlled as a part of the initial pest plant control works, in preparation for enhancement planting. Ongoing pest weed control will be required as a part of the works, given the persistence and longevity of some of the weedy species noted above.



Figure 16: Showing large mature Radiata pine – these have since been felled and chipped on site



Figure 17: Showing an abundance of exotic pest plants dominated by Elaeagnus – these have since been controlled



Figure 18: Showing an abundance of exotic pest plants dominated by queen of the night – these have since been controlled

The remainder of the site rises steeply from the northern side of the bush edge up Hurupaki Cone. The small extent of the PNAP area of Hurupaki Cone within the site is largely dominated by pastoral species and has been grazed for some time. Some totara can be found dotted up the slope and become more common around the boundary of the Natural Open Space Zone (Figure 19). It appears the forested area of the Hurupaki Cone has been fenced for some time as it boasts a more diverse array of native broadleaved forest species in each tier and likely represents natural regeneration from Maori occupation (Figure 20). A complete overview of the general composition of the vegetation on site especially that surrounding the Waitaua Stream is depicted in Figure 21.



Figure 19: Showing the pastoral area looking north up the Hurupaki Cone



Figure 20: Showing the general forest composition of the southern side of the Hurupaki Cone



Figure 21: Showing an overview of the subject site looking south from Hurupaki Cone

3.3 Freshwater ecology

3.3.1 Habitat description

The subject site provides for an interesting study of hydrology and ecology. A section of the Waitaua Stream flows along the southern boundary of Lot 3, flowing through the natural depression in the land within the remnant bush area which was historically formed by volcanic activity and lava flows. The section of the Waitaua Stream, while flowing through the subject site, is best described as an intermittent stream (I1). An overland flow path (OFP1) was noted on Lot 2. The watercourses on the subject site were delineated using a handheld GPS, while the wider stream systems were obtained from LINZ Data Service. A basic overview of the hydrological features on the site is provided below in (Figure 22). No wetland habitats (as defined under the Resource Management Act 1991 (RMA) and National Policy Statement for Freshwater Management 2020 (NPSFM) were identified on site during the field surveys.



Figure 22: Showing the general hydrology of the subject site

A defined channel of the Waitaia Stream originates approximately 670 m west of the subject site and is likely fed by a combination of spring and several smaller tributary streams and overland flow paths. Waitaia Stream flows in an easterly direction through the sites existing bush remnant for approx. 400m and falls in elevation steeply though the site (approx. 29m drop in elevation between the sites western and eastern boundaries). The stream follows its course through a combination of bush remnants, grazed pasture, residential and industrial areas for approximately 7 km where it enters the Hatea River and eventually discharges into the Whangarei Harbour.

The stream at its western extent enters the subject site with a stream channel of approx. 1m in width moderately shallow (<0.3m), with several deeper pools (>0.4m), with the stream channel averaging 1-1.5m wide and bank height averaging approximately 0.3-0.5m (Figure 23). It was apparent that the stream has been historically modified though straightening of the channel. This upper section of stream has an existing 400m diameter concrete culvert crossing which services the existing dwelling (Figure 24). The stream also has been historically dammed to service a household hydro wheel. The section of stream is interesting in the fact that on its course approx. 50m from the western boundary the water seeps into the volcanic soil due to a rise in the topography before falling steeply away (approximately >10m drop). No apparent free flowing water was observed in the remainder of the course of the stream while flowing through the subject site in April 2021. This could be attributed to a range of factors including the high permeability of underlying soils and geology, and dry weather conditions prior to the survey. The stream was observed to have flowing water along its entirety during a site visit in August 2021, following a number of heavy inter rainfall events.



Figure 23: The western extent of the stream where it enters the western boundary of the subject site



Figure 24: Showing the existing stream crossing associated stream and where stream seeps into soil and drops for about 10-15m (yellow arrow)

The mid-section of the stream was observed to have a scoria gravel substrate with occasional large rocks, no free-flowing surface water (at the time of survey visit in April 2021), but there was evidence of debris and streambank erosion to suggest heavy flows in rain events (as observed during a repeat site visit in August 2021). The eastern extent of the stream consisted of a basalt stream bed. The stream channel is approx. 1.5m-3m in width with a series of small waterfall and associated pools (>0.4m) with bank height averaging approximately >5m (Figure 25).



Figure 25: Showing general stream morphology in the eastern extent during a repeat site visit in August 2021

A small overland flow path (OFP1) was observed within the northern aspect of Lot 2 near the Waitaua Stream (Figure 26). The overland flow path follows a small natural depression in the land and was completely dry at the time of the site visit. It is anticipated that in high rainfall events some overland surface water flows may occur. Currently the flow path is part of the open pastoral area dominated by kikuyu with sparse buttercup (*Ranunculus repens*) and has been more recently planted with poplar (*Populus* sp.).



Figure 26: Showing the overland flow path (OFP1) observed on site

3.3.2 Aquatic diversity

A quantitative search of the New Zealand Freshwater Fish Database (NZFFD, accessed April 2021) revealed records of five native fish and one native invertebrate species (Table 1) being present within the wider Waitaua Stream catchment.

Table 1: Freshwater fish and invertebrate species recorded within the wider Waitaua Stream catchment

Scientific name	Common name	Conservation status
<i>Anguilla australis</i>	Shortfin eel	Endemic and Not Threatened
<i>Anguilla dieffenbachii</i>	Longfin eel	Native & Declining (At risk)
<i>Galaxias fasciatus</i>	Banded kokopu	Endemic and Not Threatened
<i>Gobiomorphus basalis</i>	Cran's bully	Native and Not Threatened
<i>Gobiomorphus cotidianus</i>	Common bully	Native and Not Threatened
<i>Paranephrops</i> spp.	Koura	Native & Declining (At risk)

The records show that two Native & Declining (At risk) aquatic fauna species have been previously recorded within the wider Waitaua Stream catchment, and some are likely to also be present within the onsite stream during periods of heavy rainfall. It should be noted that during the initial site visit the stretch of the Waitaua

Stream running through the subject site was almost completely dry during site visit in April 2021 apart from some deep pool areas towards the sites lower lying eastern boundary.

Some suitable habitat for native ichthyofauna is present on site, albeit the streams freely draining geomorphology and associated volcanic geology would limit the species presence to periods of heavy winter flows, which could potentially be suitable for more adaptable species such as banded kokopu.

3.4 Avifauna

The birds observed on site are representative of the modified and fragmented habitat type representative of urban and peri-urban areas. Some common introduced and native bird species such as house sparrow (*Passer domesticus*) and myna (*Acridotheres tristis*) were observed in abundance throughout the pastoral areas. Several New Zealand fantail (*Rhipidura fuliginosa*) and kingfisher (*Todiramphus sanctus*) were observed along the riparian margin of the Waitaua Stream. Grey warbler (*Gerygone igata*) and silvereye (*Zosterops lateralis*) were observed feeding on the Mignonette vine within the onsite bush area. Flocks of Eastern rosella (*Platycercus eximius*) were observed flying overhead. Other common species utilizing the pasture area were pukeko (*Porphyrio melanotus*) and paradise shelduck (*Tadorna variegata*). A few swamp harriers (*Circus approximans*) were observed flying over the site during site visits. It is thought that they are likely to be nesting within the wider area.

Reviewing data from the PNAP Report some other noteworthy species to consider that have been previously recorded within 1km of the site are kereru (*Hemiphaga novaeseelandiae*) recorded from the Hurupaki Cone, North Island (NI) brown kiwi (*Apteryx mantelli*), NI kaka (*Nestor meridionalis*), kakariki (*Cyanoramphus novaezelandiae*), NI tomtit (*Petroica macrocephala toitoi*) along with other more common bird species being recorded from the nearby Pukenui Forest. It is likely that some of these species may periodically rest within the onsite bush area or the adjacent Hurupaki Cone while moving within the wider landscape. It is noted that while population of NI brown kiwi is present within 1km radius from the site within Pukenui Forest, there are no known habitat linkages between the subject site and the Pukenui forest, therefore it is unlikely that kiwi would be present or utilising the subject site for commuting within the wider area.

The only avifauna species recorded at Hurupaki Cone previously is kereru (Mannin 2001). Kereru is classified as 'Not Threatened' under the NZ Threat Classification System (Hugh *et al.* 2016). During a brief walkover survey within Hurupaki Cone, no kereru were observed or recorded within the area.

Weed and pest control within the onsite bush area in addition to revegetation planting is likely to enhance the habitat for the above-mentioned species and act as a 'stepping stone' for other bird species. Stepping stone and corridor features such as the Waitaua Stream corridor and onsite bush area on the subject property and surrounds already provide key feeding, breeding and resting areas for indigenous bird species, and the proposed habitat enhancement on the subject site will allow to protect this area in perpetuity and provide for enhanced connectivity within and allow for uninterrupted movement within the landscape.

3.5 Herpetofauna

No quantitative lizard survey was undertaken although a diurnal habitat search inspecting areas likely to be utilized by native lizards for sheltering or foraging (e.g., beneath dense vegetation, logs, boulders, and manmade objects) was conducted.

During the initial site visit several rainbow skinks (*Lampropholis delicata*) were observed basking along the edge of the onsite bush area. All lizards, except for the introduced rainbow skink are legally protected under an amendment to the Wildlife Act 1953 and their habitats by the Resource Management Act 1991 (Anderson *et al.* 2012). A significant component of our lizard fauna (~85%) are recognised as 'Threatened' or 'At Risk' in Threat Ranking Lists (Hitchmough *et al.* 2015).

Records held in the PNAP Report (Manning 2001) indicate that the Hurupaki Cone adjacent to the north is habitat to Auckland green gecko (*Naultinus elegans*). Records from iNaturalist database within 5 km of the site includes the following native lizards - copper skink (*Oligosoma aeneum*), and forest gecko (*Hoplodactylus granulatus*).

Given the lack of suitable habitat on the subject site and isolated nature between the Hurupaki Cone and the proposed development area it is not anticipated the development would have an impact on native herpetofauna. The current ecological value for native herpetofauna on the site itself is therefore considered to be low, this is associated with a long history of land disturbance, land clearance, predation and habitat fragmentation. It is deemed that a comprehensive pest management plan and restoration of indigenous habitats will significantly improve the sites potential to support viable herpetofauna populations. Consultation and working alongside adjacent landowners will be key to ensure a coordinated and thorough program for pest management.



Figure 27: Species likely to be present within the wider area (note rainbow skink easily confused used with the native copper skink)

3.6 Chiroptera (Bats)

New Zealand has two extant native bat species, the long-tailed bat (*Chalinolobus tuberculatus*) and the lesser short-tailed bat (*Mystacina tuberculata*), both of which are endemic microbat species. Long-tailed bats is listed as “Nationally Critical” (Donnell *et al.* 2017). The subject site lies within vicinity (<2km) from confirmed recent records of long-tailed bats in Pukenui Forest. In addition, long-tailed bat activity in 2019 was also recorded nearby Onoke Scenic Reserve, approximately 500m east of the subject site (Carr 2019).

During the primary site walkover on April 22nd, some suitable habitat for bat commuting and roosting (primarily old growth native and exotic trees), was noted on site, therefore both a visual assessment for potential roost sites and a preliminary presence/absence survey using an Automatic Bat Monitor (ABM) was undertaken.

Trees on site were assessed for their potential to support bat roosts during the initial site visit on April 22nd, and again on a repeat site visit on May 4th, 2021. The assessment comprised a ground based visual inspection using binoculars to identify any features potentially suitable for roosting bats. Such features may

include holes, frost cracks, deadwood, knot holes and limb wounds. The site contains a number of mature/over-mature/dead puriri and Radiata pine and Monterey cypress trees within the boundaries of the site which have features with the potential to support roosting bats, including branch splits, knot holes, and lifted bark. Therefore, a further assessment using an ABM was undertaken. The ABM is able to register any bat activity approximately 50m from the recording station, so this would ensure good coverage of the entire bush feature on site.

An ABM was set on the subject site between the period April 22nd and May 4th, 2021. The ABM was programmed to begin recording 30 minutes before sunset and continue to record until 30 minutes after sunrise. No long-tailed bat activity was recorded during the survey period which indicates that it is unlikely that there are any potential bat roosts on site and the bush/riparian corridor is not currently utilized as a commuting route within the wider landscape.

While autumn would generally be considered 'shoulder season' to survey bat activity, the weather conditions (night-time temperature over >10°C, low wind and no rain) during the time of deployment was seen as suitable and therefore the preliminary data obtained during the survey can be treated as a good indicator relating to species absence from the subject site.

The mature exotic pine trees have since been felled and chipped as a part of the initial pest weed control works. Felling was undertaken during the active bat season to avoid possible impacts to hibernating bats.

It should be noted that the proposed ecological enhancement works on site to result as a part of the development is likely to enhance both roosting and foraging habitat suitability for bats through the retention of mature puriri trees and comprehensive pest animal control, which will be complementary to the habitat enhancement works already undertaken within the nearby Pukenui Forest.

4.0 ECOLOGICAL EFFECTS

4.1 Potential ecological effects

While there are ecological benefits that would arise as a part of the subdivision application, consideration needs to be given to the potential adverse effects associated with increased human pressures. We believe that these impacts can be appropriately avoided or mitigated through comprehensive planning controls and creation of an integrated subdivision proposal largely focused on the protection and enhancement of natural features on site and surrounds.

Generally, the potential adverse effects can be divided into negative effects resulting from

- Direct effects (resulting from physical development of the application area including land clearance, earthworks, construction, stormwater).
- Secondary effects (resulting from increased activities and the operational phase (resulting from increased activities and habitat modifications within the application area and the surrounding area, following proposed development).
- Cumulative effects (resulting from future development that might occur, and additional to the effects that can be expected to have already occurred as a result of development of the wider area which will also increase in the future

During the construction phase of the proposed works, the adverse impacts of the development will comprise habitat loss and potential disturbance of the existing native habitats on site. The subject site contains several highly modified habitats and is adjacent to Hurupaki Cone, an area considered to be of ecological significance. It is understood that the proposed layout of the new lots resulting from the proposed subdivision aims to concentrate the development on the flatter sections of the site which is dominated by exotic pasture considered to be of low ecological value. The species that utilise the open exotic grassland habitat on site (e.g., spur-winged plover and pukeko) are highly mobile and common.

Mature pine trees along with several exotic weedy plant species within the proposed enhancement areas have been removed as a part of the initial weed control works. None of the trees on the subject site are identified as protected trees under the District Plan. Additionally, no long tailed bat presence was recorded on the subject site during the initial survey period, all trees were inspected for roosting potential prior to felling. Given that this area is to be enhanced through enhancement planting, we did not have any concerns relating to the initial pest weed control works.

In terms of the existing habitats of ecological value on site (existing bush remnant and intermittent stream habitat), an extensive integrated ecological enhancement is proposed for this area including pest weed and animal control, revegetation using native species which were once common and are adjacent to the site, and that any proposed stream crossings will be conducive of fish passage both up and downstream.

During the operational phase of the proposed works, adverse impacts will comprise potential increased levels of disturbance through increased levels of lighting, noise and human presence. The increase of traffic and human presence within the site may also result in increased mortality of common fauna present on site (e.g. pukeko) due to road traffic collisions and predation by domestic cats and dogs.

When considering cumulative effects, there are a few practical and policy barriers to be considered. It is difficult to predict and assess cumulative effects with a high degree of certainty, due to complex ecological interactions, the lack of environmental baseline data, and the scale at which District and Regional Councils plan. However, consideration of existing and reasonably foreseeable activities must be given to ensure that standalone effects of the proposal will not result in “tipping the balance” in the wider ecological context.

These may include:

- Earthworks and associated sediment discharges
- Stormwater and wastewater management
- Increased human disturbance
- Predation by domestic pets
- Increased invasion of pest species
- Increased noise
- Increased light
- Increased fire risk

4.1.1 Earthworks

Earthworks associated with the development of the site have the potential to result in sediment runoff to the Waitaua Stream. The addition of fine sediment to stream environments during construction phase of the development has the potential to alter water chemistry, increase turbidity and decrease light penetration

that affects primary production and feeding for some fish species. The deposition of sediment can also smother instream surfaces and decrease the amount of suitable habitat available for benthic invertebrates.

It is proposed that all earthworks on site and carried out in accordance with best practice erosion and sediment control plans. This should ensure that any sediment/erosion related effects on water quality and habitat in the downstream receiving environment will be negligible (i.e., minimal sediment mobilization). With the implementation of appropriate silt controls during the construction phase, the effects of earthworks on water quality in the receiving environment during construction will be avoided and the overall level of effect is assessed as low.

4.1.2 Wastewater management

According to the Three Waters Design Report prepared for the development by Land Development & Engineering Ltd (dated 24 August 2021) wastewater servicing for the development will be an extension to the existing public reticulation. As such, if the system is installed as per the recommendations outlined in the associated Three Waters Report prepared for the site, and any associated technical guidance notes, no adverse effects on freshwater ecology relating to the wastewater management on site are anticipated.

4.1.3 Stormwater management

Discharges of contaminants to freshwater environments can severely impact ecosystem health values through acute (short-term) effects and chronic (long-term) effects. The cumulative effects of multiple contaminants being discharged to an aquatic environment may also be highly significant; some contaminants discharged in isolation may have little influence on ecosystem health but when discharge alongside other contaminants, can have serious consequences.

According to the Three Waters Design Report prepared for the development by Land Development & Engineering Ltd (dated 24 August 2021) it is proposed to construct 3 stormwater ponds within the subdivision to provide attenuation and water quality treatment for runoff from the development. To achieve this, the ponds have been designed to meet the requirements of Auckland Council's GD01.

Having reviewed the Three Waters Design Report and associated subdivision Scheme Plan, it is deemed that an integrated stormwater management is proposed within the application site to manage any potential negative environmental effects (both source and cumulative). Stormwater management on site will utilise a number of methods to manage surface water in a holistic way which aims to mimic nature and typically manage rainfall close to where it falls. The stormwater network for the development has been designed to transport surface water, slow runoff down before it enters watercourses, provide areas to store water in natural contours and can be used to allow water to soak (infiltrate) into the ground or evaporated from surface water and lost or transpired from vegetation.

All of the stormwater networks will be appropriately integrated within the wider landscaping proposal. In addition, the proposed landscape and ecological enhancement plantings on site will provide further reduction in the total runoff from the site entering the Waitaua Stream.

It is understood that all three waters infrastructure will be designed in accordance with relevant Whangarei District Council's and NZ engineering standards and flows from the development will be reduced to below predevelopment levels for up to a 1% AEP and will include a 20% rainfall increase for climate change, further reducing any potential negative environmental effects on the existing identified ecological values on

site and further downstream. Any works near Waitaua Stream or its margins will have to abide by strict sediment controls to ensure that the release of fine sediment into the stream during construction phase is minimised.

Therefore, the potential for adverse effects relating to the implementation of the proposed stormwater network are low. In fact, the proposed new stormwater ponds are likely to provide habitat for common native avifauna species moving within the landscape such as pukeko, and paradise shelduck, among others.

4.1.4 Provision of fish passage

According to Scheme Plan prepared by Blue Wallace Surveyors (Appendix 1) access into the proposed lots to the north of Waitaua Stream will require a stream crossing. It is expected that as a part of the installation of the proposed access road an appropriate structure that is conducive of fish passage both up and downstream will be installed below the access road. The structure should ideally incorporate the stream bed and allow movement of in stream biota up and down stream (Figure 28). While no fish species were recorded as being present within this section of the stream during the initial assessment, maintaining sufficient fish passage on site will be beneficial for common fish such as eels, and banded kokopu, which are likely present within the wider Waitaua Stream catchment.

These works will need to be confirmed and in be accordance with Whangarei District Council, Northland Regional Council Environmental Engineering Standards and the New Zealand Fish Passage Guidelines (Franklin *et al.* 2018).



Figure 28: Order of preference for road crossing design, based on the degree of connectivity (left), and (right) showing an example of a stream simulation culvert design (most preferable option)

4.1.5 Increased human disturbance

The proposal is reflective of the surrounding land use which has become increasingly urbanised and developed since the early 2000's. A number of residential subdivision proposals are in the process or have been recently consented within the immediate area. Additional people in the area are likely to have an impact on the wildlife in the area through disturbance of feeding, breeding and nesting areas unless appropriate management measures and controls are put in place. While the subject site itself is not thought to provide significant breeding or nesting habitat for any threatened avifauna due to significant anthropogenic modification and disturbance by current land use activities, the Hurupaki Cone is known to support kereru. Kereru are tree nesting species (as opposed to ground nesting) therefore the chick survival would be less affected by increased presence of pet animals such as dogs.

The proposal aims to enhance public access and connectivity within the development proposal, with an extensive network of pedestrian walkways proposed throughout the site and leading up to the Hurupaki Cone. Increased human disturbance to the Hurupaki Cone area and the proposed Waitaua Stream enhancement zone is therefore inevitable, however will be somewhat limited by the steep topography of these areas. Human disturbance on wildlife values will be limited through the provision of defined paths within the areas, as well as revegetation planting which will form a natural barrier for human and pet movement within the wider core landscape and therefore concentrate their impact to small, localised areas.

4.1.6 Predation by domestic pets

Domestic pets are some of the main predators for native fauna species, in particular avifauna and herpetofauna. Other more uncommon domestic pets include mustelids (e.g. stoats and ferrets) which are known predators of indigenous herpetofauna as well as birds and their eggs. Wild mustelids, while common within the area, are prohibited from being kept as pets in New Zealand, therefore an increased abundance of mustelids as a part of the subdivision process poses a lower risk.

It is proposed that the impacts of the likely increase of domestic pets resulting from land development on site and within the immediate area are managed through appropriate controls, such as informative signage and controls on dogs (e.g. keeping dogs on lead) within the proposed ecological/landscape enhancement areas. No susceptible ground nesting bird species were identified as being present during the initial survey period, therefore the potential effects on breeding success are assessed as low.

4.1.7 Increased invasion of pest species

Whilst the subject site and surrounds contains some invasive pest plant species, the proposed development could become another source of pest weeds through planting of exotic plants within garden areas or as screen planting. Dumping of garden waste is also an aspect which should be considered, given the sites close proximity to natural areas. It is believed that this can be addressed through appropriate controls such as prohibiting the cultivation of invasive weed species listed under the National Pest Plant Accord (NPPA) and Northland Regional Pest Management Strategy (NRPMS).

4.1.8 Noise

Increases of anthropogenic noise has the potential to negatively affect bird fitness as it may interfere with communication and for instance, decrease predator detection or breeding activity. Regular exposure to high levels of anthropogenic noise may cause changes in bird communities and influence local distribution

patterns. There are extremely limited number of studies investigating the impacts of changes in anthropogenic noise on bird fitness and breeding success in New Zealand. Factors that should be taken into consideration when assessing likely impacts of anthropogenic noise on bird species should be directly related to the nature of the proposed development project. It is thought that due to the scale of the proposed development it is likely to contribute to increase noise levels to a moderate level.

It is thought that this can be mitigated through a sustainable design of the subdivision and limiting anthropogenic noise through buffer planting and the provision of diversity of vegetation cover throughout the site. This will expand the habitat available for birds to freely move within the landscape with low noise effects anticipated.

4.1.9 Light

The potential adverse effects from light on the surrounding habitats and species using these areas are considerable. Many New Zealand avifauna, herpetofauna and insects are fully or partially nocturnal. Introduction of increased unrestricted light levels within the area are likely to disrupt species movements. Impacts may relate to changes in flight patterns, extension of “day-light” hours through introduction of street lights which has been shown to affect timing of mating behaviours and reproduction in birds. Invertebrates may also be negatively affected through disorientation, and thus may cause changes in species movements within the wider landscape. The potential impacts of the effects of artificial lighting can be significantly minimised through the use of using appropriate lighting with longer wavelengths, at the orange-red end of spectrum, which is now standard practice for Councils.

4.1.10 Fire

Fire risk has to be considered when introducing residential dwellings into an area that contains existing mature vegetation. By reviewing the Landscape Plan prepared by Littoralis Landscape Architecture for the proposal it is understood that the boundary of residential lots grading into the proposed Hurupaki Cone buffer planting area are to be planted using low flammability species to reduce fire risk. To protect ecological values identified on site and the immediate surrounds, building setbacks and buffer areas are proposed between the new lot boundaries and the existing vegetation and proposed new enhancement planting.

5.0 MITIGATION AND ENHANCEMENT STRATEGY

5.1 Ecological enhancement areas

Following the ecological assessment, basic mapping of the ecological values on site two main areas have been identified that benefit from enhancement as part of the subdivision process, being the Waitaua Stream Corridor Enhancement Areas and Hurupaki Cone Enhancement area (Figure 29). The Waitaua Stream Corridor Enhancement area will span across approximately 1.13 ha, while the Hurupaki Cone Enhancement Area would extend over approximately 3.85 ha. These are to serve as multipurpose reserves, promoting both ecological linkage and pedestrian access in the process.

The benefits of this proposal include the following:

- Provide an enhanced stream linkage and habitat for wildlife including a source of food for bird life;
- Retire these areas from stock access;
- Enhance the riparian corridor of an upper catchment area of the Waitaua Stream;
- Provide a buffer area between the proposed development footprint and the adjacent Hurupaki Cone;
- Enhance habitat for native flora and fauna across the site;
- Enhance this area in perpetuity through revegetation, pest plant and animal control.

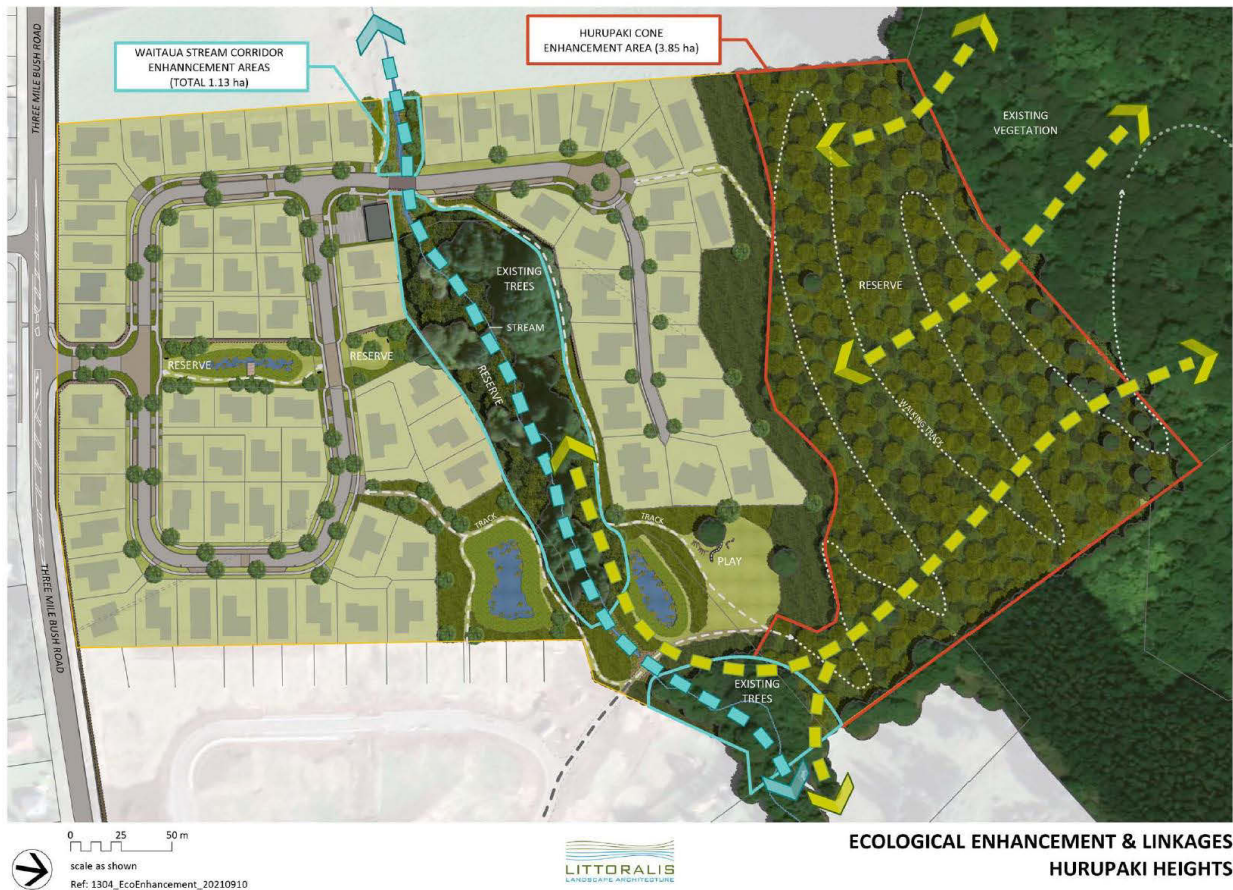


Figure 29: Showing the proposed Waitaua Stream Corridor Enhancement Area and Hurupaki Cone Enhancement Area (plan prepared by Littoralis Landscape Architecture)

It is proposed a standalone document such as an Ecological and Landscape Enhancement Plan, that sets out delineation of ecological planting requirements, as well as overall management of these areas, is to be conditioned as a part of the Resource Consent.

5.1.1 Waitaua Stream Corridor Enhancement

The Waitaua Stream Corridor Enhancement area would extend over approximately 1.13 ha, noting that the area will act as a multipurpose reserve, promoting both ecological enhancement, and accessibility, with several interconnected pedestrian access tracks proposed through this area.

As a part of the development proposal, it is proposed to protect and enhance the existing native vegetation and associated Waitaua Stream corridor. Initial weed and mature exotic tree clearance has already taken place, and it proposed that ongoing pest plant maintenance takes place, and a pest animal control network is established. The exotic weed control works have opened up gaps in canopy where enhancement planting is to take place. The planting is to serve multiple purposes from enhancing the riparian and bush habitat, to stabilising soils and reducing erosion risk within this area. Over time the proposed planting will develop a more diverse understory and reduce edge effects, enhancing the habitat for both flora and fauna alike.

The exact management actions along with a site-specific planting schedule should be addressed in a standalone Ecological and Landscape Enhancement Plan to be conditioned as a part of the consent.

5.1.2 Hurupaki Cone Enhancement

The Hurupaki Cone Enhancement area would extend southwards from Hurupaki Cone and extend over approximately 3.85 ha. This area would connect the Cone with the wider pedestrian access tracks among landscape and ecological enhancement planting.

To enhance the ecological values of the adjacent Hurupaki Cone, this area is planted using appropriate native revegetation species. This will ensure that a suitable buffer area is provided between the development and the core bush area and thus reduce any potential impacts of the proposed development on any susceptible species present within the Hurupaki Cone.

The removal of livestock, exotic species paired with the planting of suitable native species will quickly enhance this area and assist natural regeneration. It is proposed to utilise a basic mix of plans consistent with the more intact existing vegetation. There is suitable seed source available in the Hurupaki Cone to ensure natural regeneration and viability of the planting in the long term. A robust weed control and pest management programme will enhance this area for species already utilising the area for feeding, resting and breeding. Protection and ongoing management will ensure these values are enhanced and extended.

The exact management actions along with a site-specific planting schedule should be addressed in a standalone Ecological and Landscape Enhancement Plan to be conditioned as a part of the consent.

5.2 Pest animal management

Evidence of rat species (*Rattus sp*) and possum (*Trichosurus vulpeca*) presence was observed within the bush area during the field work. It is likely that other common mammalian pest species are present on the site and surrounds, including European rabbit (*Oryctolagus cuniculus*), mustelids (*Mustela spp.*), wild cat (*Felis catus*) and hedgehog (*Erinaceus europaeus*).

Possums and rodents disrupt ecological processes therefore can impact entire forest ecosystems (Cowan, 2001). Possums are selective feeders and deplete species like pohutukawa, rata and kohekohe and interfere with flowering and fruiting periods. This subsequently can have negative impacts on seed dispersers such as New Zealand pigeon. Meanwhile rodents can have severe negative impact on populations of invertebrates, lizards, some birds. Possums and rodents also feed on seeds and seedlings on the ground, therefore depleting food availability for native fauna.

Goats, rabbits, hares, and grazing livestock can impact on native plant assemblages and native regeneration generally. Where livestock are allowed to graze in forest remnants and riparian areas, it results in the destruction of vegetation preventing regeneration as well as negatively impacting riparian and aquatic habitats.

Mustelids (ferret, stoat, and weasel), cats and uncontrolled dogs can have severe negative impacts on a variety of native species. For ground nesting birds to breed successfully, effective control of mustelids and rats is key.

Introduced lizards, such as rainbow skink recorded on site during a manual habitat search, could have adverse effects on indigenous fauna but their impacts are generally less known than those of introduced mammals.

A control programme including a combination of trapping and poisoning should be carried out on the subject site. It is recommended that given the sites proposed residential nature and likelihood of pet animal presence on site, where possible, automated predator traps (such as AT220 for possum and rat control), are used.

It is advised that a trapping, baiting and monitoring program is developed within the Ecological and Landscape Enhancement Plan to ensure continued pest control operation over a longer period of time. The above should include location of traps and bait stations, types of baiting and poison with a record template sheet for monitoring purposes.

5.3 Pest plant management

Weeds identified under the National Pest Accord, Northland Regional Pest and Marine Pathway Management Plan (2017) or those known to pose a potential invasive threat were recorded. Due to the riparian features found within the proposed enhancement area it is proposed to utilize both manual and chemical controls of weeds.

A range of weeds are present on the subject property, primarily within the existing bush area and along the Waitaua stream channel. See an indicative list of pest plant species present in these areas under Section 3.2 of this report. It is proposed that the preparation of a comprehensive Ecological and Landscape Enhancement Plan is prepared for the site to address the eradication and control of these species in more detail including identification of pest plants and animals, control techniques, and ongoing monitoring to ensure ongoing eradication efforts of pest species over the entire subject site.

5.4 Boundary issues

Reinvasion of pest plants and animals from adjacent areas is likely, especially from adjacent properties and roadside verges that are not controlled. In addition, streams often act as a vector for weed spread between sites. The only way to address this issue is by cooperative working with the proprietors of the adjacent properties, interest groups, WDC, NRC and DoC.

5.5 Summary

The current terrestrial and aquatic ecological values of the subject site reflect the highly modified nature of the environment. The proposed development proposal for the site provides the opportunity to restore, protect and enhance the current ecological values. Implementing the recommendations set out in Section 6 of this report will enhance and extend ecological values within the subject site and immediate surrounds.

6.0 PLANNING CONSIDERATIONS

6.1 Whangarei District Plan (Operative)

This section addresses the following objectives and policies relating to the proposed development and any associated ecological or environmental effects under the Whangarei District Plan (Operative):

- Chapter 11 – Riparian and Coastal margins
- Chapter 12 – Waterbodies
- Chapter 17 – Indigenous Vegetation and Habitat

OBJECTIVE	POLICY	DISCUSSION
Chapter 11 – Riparian and Coastal margins		
<p>11.3.1 Preservation of the natural character of riparian margins and the coastal environment.</p> <p>11.3.2 Protection of Significant Ecological Areas, Built Heritage, Sites of Significance to Māori, riparian habitats and Outstanding Landscapes and natural features, within the coastal environment and alongside rivers and streams.</p> <p>11.3.3 Maintain and enhance public access, where appropriate, to and along the coast and rivers.</p> <p>11.3.4 Recognise and protect riparian margins and the coastal environment as natural hazard buffers.</p> <p>11.3.5 The relationship of tangata whenua with their sites and other taonga is enhanced</p>	<p>11.4.1 Riparian Management To avoid the adverse effects of land use activities on the natural character and functioning of riparian margins of water bodies and the coast.</p> <p>11.4.2 Separation Distances To ensure that land use activities avoid, remedy or mitigate adverse effects on water quality, by means which may include separating land use activities from water bodies and coastal waters and by encouraging the retention and enhancement of riparian vegetation as buffer areas.</p> <p>11.4.4 Allotments Less than Four Hectares To set aside esplanade reserves or strips on the subdivision of allotments of less than four hectares where the land involved will serve one or more of the purposes of esplanade reserves or strips set out in Section 229 of the Resource Management Act 1991.</p>	<p>The proposal works within the natural confines of the site and aims to reduce any adverse effects on freshwater habitats and their margins identified on site through sustainable design principles and incorporating any freshwater bodies noted on site within the proposed landscape or ecological enhancement areas.</p> <p>Any stream crossings proposed to be installed as a part of the development seek to avoid freshwater and riparian margin habitat loss, whilst ensuring that crossings are fit for purpose. The crossings are proposed to be in designed in accordance with WDC Environmental Engineering Standards and New Zealand Fish Passage Guidelines.</p> <p>The proposal has been designed in a manner that promotes and enhances the natural features of the site. Development setbacks are considered appropriate to avoid any adverse effects on water quality.</p> <p>Sufficient sediment and development controls are proposed that are in line with industry best practice to limit erosion processes and sediment inputs into the aquatic environments.</p> <p>The proposal will result in approximately 7.5 ha of land (including proposed Lots 200, 201, 202, 203, 204, and 205) to be vested as Local Purpose Reserves, including the riparian margins of the Waitaua Stream.</p>
Chapter 12 - Waterbodies		
<p>12.3.1 The preservation of the natural character of water bodies and their margins, and the protection of them from the adverse effects of inappropriate subdivision, use and development.</p>	<p>12.4.1 Adverse Effects To ensure that the adverse effects of subdivision, use and development adjoining water bodies or the coastal marine area, or activities on the surface of water bodies or the coastal marine area, on water quality and</p>	<p>The proposal aims to preserve and enhance the Waitaua Stream corridor flowing through the subject site through enhancement and revegetation planting, and ongoing pest plant and pest animal control.</p> <p>Site preparation and development is to be carried out as per technical reports prepared for the proposed development, and if best practice</p>

	quantity (including ground water), natural character, and cultural and ecological values of water bodies and the coastal marine area, are avoided, remedied or mitigated.	is followed, no more than minor ecological effects are anticipated on the stream habitat noted on site.
	<p>12.4.2 Water Margins To ensure that land use activities avoid, remedy or mitigate more than minor adverse effects on water quality, by means which may include separating land use activities from water bodies and coastal waters and by encouraging the retention and enhancement of riparian vegetation as buffer areas.</p>	<p>The sites topography largely dictates the natural setbacks between the development and Waitaua Stream. Sufficient controls relating to erosion, surface water runoff and sediment management will need to be adhered to during construction phase of the development to avoid any adverse effects on the stream environment.</p> <p>The proposed enhancement planting will strengthen riparian protection, provide for a buffer area to protect core values identified on site, and further elevate its functionality as a 'stepping stone corridor' feature within the landscape for species that have larger home ranges and require functional and structural habitat linkages within the wider hostile countryside and urbanised areas. Protection and management will ensure these values are linked and extended and that the bush remnant, aquatic environment and associated riparian zones are enhanced as a result of the sites development.</p>
Chapter 17 – Indigenous Vegetation and Habitat		
<p>17.3.1 Maintenance and enhancement of the life-supporting capacity of ecosystems, and the biodiversity of the District.</p> <p>17.3.2 Protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna from inappropriate subdivision, use and development.</p>	<p>17.4.1 Significant Indigenous Vegetation and Significant Habitats of Indigenous Fauna</p> <p>To recognise as significant, and provide protection for, indigenous vegetation and habitats of indigenous fauna, including indigenous wetlands, which are of Moderate, Moderate-High, High and Outstanding value using the criteria set out in Schedule 17A.</p>	<p>The current terrestrial and aquatic ecological values of the subject site reflect the highly modified nature of the environment. The proposed development proposal for the site provides the opportunity to restore, protect and enhance the current ecological values through appropriate revegetation planting, and ongoing pest weed and pest animal control.</p> <p>The site directly adjoins Hurupaki Cone, which is classified as a Protected Natural Area in the Whangarei ED, and the development proposal will allow for the values of the Hurupaki Cone to be further protected through buffer planting, and provision of wider vegetated corridor linkages in the wider landscape thus enhancing connectivity and undisturbed species movement. Pest plant and pest animal control proposed as a part of the development will further enhance the habitat for local fauna.</p> <p>No indigenous wetland habitats are present on the subject site.</p>

	<p>17.4.2 Significant Ecological Areas</p> <p>To maintain the ecological values of significant indigenous vegetation and the significant habitats of indigenous fauna in the Low Density Residential and Open Space and Recreation Zones.</p>	<p>Ecological values over the entire site will be enhanced as a result of the development proposal.</p> <p>Two areas are proposed for Ecological Enhancement being the Waitaua Stream Enhancement Zone and Hurupaki Cone Enhancement Zone, these areas are proposed to be vested as Local Purpose Reserves.</p>
	<p>17.4.3 Enhancement</p> <p>To promote the enhancement of areas of significant indigenous vegetation and significant habitats of indigenous fauna that have been, or may be, degraded by inappropriate subdivision, use and development.</p>	<p>The entirety of the subject site has been highly modified from its former ecosystem. The proposal will allow for the remaining areas of ecological significance to be enhanced through appropriate revegetation planting and comprehensive pest weed and pest animal controls.</p>
	<p>17.4.4 Effects</p> <p>To avoid, remedy or mitigate the adverse effects of land use activities on areas of indigenous vegetation and significant habitats of indigenous fauna, including areas of value to tangata whenua, as determined by Schedule 17A , so as to maintain its ecological values.</p>	<p>The development proposal has been designed in a manner that has been largely designed to work around the natural features identified on site and aims to promote and enhance the existing ecological values.</p> <p>Overall, it is considered that if appropriate stormwater, wastewater and associated earthworks controls are imposed during site development as per current WDP (OP) controls and associated best practice, the potential for adverse effects on the environment are assessed as no more than minor.</p>

6.1.1 Net Environmental Benefit

Lot 3 is currently zoned as Rural Production Zone (Lot 3 DP 99045) under Whangarei District Council District Plan (Appeals Version). Therefore, brief consideration was given to the potential 'Net Environmental Benefit' that could be achieved as a part of development of the site.

It is considered that the development of the site is generally consistent with the objectives of the WDCCDP, as it would enable rehabilitation of ecological and biodiversity values and allow for additional protection of adjacent areas of ecological significance.

The proposal would allow for buffer planting to be established extending south of Hurupaki Cone. The revegetation planting will provide for multiple ecosystem services through reducing erosion risk on the steep hillslope extending southwards from Hurupaki Cone, reducing edge effects of the Cone's core bush area, enhancing habitat connectivity within the subject site and surrounds, and extending habitat availability for avifauna.

The proposal would also allow to exclude stock from the proposed enhancement areas in perpetuity and with that result in positive flow on effects in terms of reducing erosion pressures on steep, erodible land. A comprehensive long-term management of pest plant and pest animal species is proposed for the area, which would benefit biodiversity values on the site as well as immediate surrounds, which include the directly adjacent Hurupaki Cone to the north of the site.

The ecological enhancement area will be protected via legal protection mechanism through vesting the area as Local Purpose Reserve.

This will ensure that regulating, supporting and cultural ecosystem services are to be enhanced as a part of the development proposal.

6.2 National Environmental Standards for Freshwater Regulations (NESF 2020)

No 'natural inland wetlands' as defined under the National Environmental Standards for Freshwater Regulations (2020) were identified on site.

The term "natural wetland" is defined as follows (at [3.21]):

natural wetland means a wetland (as defined in the Act) that is not:

- a) wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or
- b) geothermal wetland; or
- c) any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain derived water pooling.

6.3 National Policy Statement for Freshwater Management (NPSFM 2020)

The Essential Freshwater package, including the National Environmental Standards for Freshwater (NESF), Freshwater National Policy Statement for Freshwater Management (NPSFM) and Stock Exclusion Regulations, that came into force in September 2020 introduced strong new policies and regulations to protect natural wetlands on a national scale.

The NPSFM sets out the objectives and policies for freshwater management under the Resource Management Act 1991. It came in effect on 3 September 2020 and replaces the National Policy Statement for Freshwater Management 2014 (amended 2017).

The development proposal is largely in line with Policies 1-15 of the National Policy Statement for Freshwater Management (NPSFM 2020), ensuring that natural and physical resources on site are managed in a way that prioritises the health and well-being of water bodies and freshwater ecosystems, the health needs of people, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future. The following is a generalist assessment relating to the development proposal under the key policies of the NPSFM (detailed under Policies 1-15 of the Freshwater NPS) as follows:

Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai.

Each community will decide what Te Mana o te Wai means to them at a freshwater management unit scale, based on their unique relationship with fresh water in their area or rohe. While Northland Regional Council has published a small memo outlining the programme for implementing the National Policy Statement for Freshwater Management (dated March 2018) as far as we are aware of, Northland Regional Council has yet to publish a region wide Freshwater Management Plan other than what is already provided in the proposed Northland Regional Plan. This is outside the scope of this application.

Policy 2: Tangata whenua are actively involved in freshwater management (including decision making processes), and Māori freshwater values are identified and provided for.

Every local authority must actively involve tangata whenua (to the extent they wish to be involved) in freshwater management (including decision-making processes), however this is out-with the scope of this application.

Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.

The proposal involves protection and enhancement of terrestrial and aquatic ecosystems within the boundaries of the subject site. Stock exclusion from sensitive land and aquatic environments, as well as protection and enhancement of riparian areas is proposed. It also provides protection and enhancement of habitat for instream fauna. The onsite riparian areas on site have been subject to historic unrestricted stock access. Therefore, we are protecting a water feature that is already in a precarious state and will be enhanced following weed control and enhancement planting. Stock exclusion will allow for natural regeneration to take place once more, and with that enhance canopy cover for the Waitaua Stream. This will help to moderate water temperatures, act as an important food source for instream organisms, reduce sedimentation, and form an important buffer for diffuse pollution from the surrounding landscape.

Policy 4: Freshwater is managed as part of New Zealand's integrated response to climate change.

The proposal is largely in line with the collective efforts of reducing the impacts of climate change. The proposed sensitive land and aquatic environment retiring from grazing coupled with enhancement planting will result in environmental benefits to the existing habitats noted on site.

Policy 5: Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.

Currently the Waitaia Stream flowing through the subject site and the wider Whangarei Harbour catchment is subject to several diffuse pollution sources notably from urban development with enhanced levels of sediment and contaminant run-off. The enhancement of upper catchment as a part of the development proposal is an example of managing diffuse pollution.

If appropriate design and engineering guidelines are followed during the establishment and operational stages of the proposed development of the site, the associated environmental effects are deemed as no more than minor. The overall proposal will in fact result in a net positive environmental benefit through appropriate revegetation, pest plant and animal control and stock exclusion in perpetuity.

Policy 6: There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.

The site does not contain any wetland habitats.

Policy 7: The loss of river extent and values is avoided to the extent practicable.

No loss in river extent is proposed as a part of this application.

Policy 8: The significant values of outstanding water bodies are protected.

No outstanding waterbodies have been recorded on the subject site. For a waterbody to be considered as 'outstanding', it would need to contain a mixture of outstanding ecological, landscape, recreational and spiritual values. Generally speaking, the water body should be located in a catchment where there is currently little or no development and would have a combination of values (rather than being deemed outstanding on the basis of a single value such as ecological significance).

Policy 9: The habitats of indigenous freshwater species are protected.

The proposal involves protection and revegetation of degraded freshwater ecosystems within the boundaries of the subject site, and with that the protection of any freshwater species contained within these habitats. The proposal seeks stock exclusion, pest plant and animal control, and revegetation planting which will result in increased habitat quality indigenous freshwater species.

Policy 10: The habitat of trout and salmon is protected, insofar as this is consistent with Policy 9.

No trout or salmon have been identified as being present within the site or surrounds, therefore this is not applicable.

Policy 11: Freshwater is allocated and used efficiently, all existing over-allocation is phased out, and future over-allocation is avoided.

This is outside the scope of the application, and this is the role of local and regional authorities.

Policy 12: The national target for water quality improvement is achieved.

The national target is to increase proportions of specified rivers and lakes that are suitable for primary contact to at least 80% by 2030, and 90% no later than 2040, but also to improve water quality across all categories. It is not envisioned any of the waterbodies within the subject site would be utilized for primary contact. The on-site stream will become stabilized through natural regeneration, revegetation, and permanent stock exclusion. It is likely that the proposal will make a small incremental positive change for primary contact activities such as swimming downstream.

Policy 13: The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.

This is outside the scope of the application and this is the role of local and regional authorities. We are not aware that detailed monitoring records or bottom-line targets are available from either the Whangarei District Council or Northland Regional Council for this freshwater unit.

Policy 14: Information (including monitoring data) about the state of water bodies and freshwater ecosystems, and the challenges to their health and well-being, is regularly reported on and published.

This is outside the scope of the application, and this is the role of local and regional authorities.

Policy 15: Communities are enabled to provide for their social, economic, and cultural wellbeing in a way that is consistent with this National Policy Statement.

This is outside the scope of the application, and this is the role of local and regional authorities.

7.0 CONCLUSION

An ecological field survey was undertaken at a proposed subdivision site at 131 & 189 Three Mile Bush Road (Lot 2 DP 99045 & Lot 3 DP 99045), Kamo. The sites and immediate surrounds existing ecological characteristics and significance were reviewed, surveyed, mapped and analyzed.

Based on the field assessment and desktop research it was established that much of the native vegetation on site has historically been cleared with only a small section of what could be best described as broadleaf

habitat with severe pest plant encroachment extending along the Waitaua Stream along the central aspect of the site. Initial pest plant control within the proposed enhancement zone has been complete in preparation for revegetation enhancement planting.

The site is primarily used by common native and introduced fauna, with no indication of the site being used as a commuting or roosting habitat by any 'Threatened' or 'At Risk' species such as long-tailed bats or NI brown kiwi. Given the lack of suitable habitat on site it is unlikely that any native herpetofauna is present within the site itself or the development footprint. It is likely that the onsite stream system is habitat to several common ichthyofauna and aquatic invertebrates.

It is proposed to protect and enhance two areas identified for ecological enhancement, being the Waitaua Stream Corridor Enhancement Areas and Hurupaki Cone Enhancement Area. The Waitaua Stream Corridor Enhancement area will span across approximately 1.13 ha, while the Hurupaki Cone Enhancement area would extend over approximately 3.85 ha. These areas will be enhanced through comprehensive pest plant and animal control and planting of suitable indigenous species. The proposed enhancement will strengthen ecological values within the local area which is vitally important to provide further habitat for wildlife and food for native birdlife.

The proposed development of the site has been designed to incorporate and promote ecological enhancement of the site. The development and associated infrastructure has been designed in a manner that recognizes the existing ecological and environmental values and constraints of the site and immediate surrounds and aims to strengthen the ecological values of these features through appropriate revegetation planting and ongoing pest weed and pest animal control.

In conclusion, it is considered that the potential adverse effects of the associated subdivision proposal can be secured through best practice sediment and erosion control measures, and comprehensive ecological and landscape design principles, as well as appropriate planning and development controls. Provided that they are implemented successfully during construction and operational phases of the development, adverse effects on the environment would be minimised, and would, in fact, allow for the enhancement of the habitats identified on site and immediate surrounds.

8.0 RECOMMENDATIONS

It is considered that the proposed management actions described within the body of this report will minimise adverse effects associated with the development proposal on the habitats and species recorded on site and immediate surrounds. The proposal will, in fact, enhance the overall ecological habitat complexity and quality across the site, through enhancement of the existing riparian margins and associated indigenous vegetation, as well as through the extension of the values of the adjacent Hurupaki Cone.

In relation to the proposal, the following recommendations are made:

- That a standalone Ecological and Landscape Enhancement Plan (ELEP) is prepared and submitted to the Council for approval (in a certifying capacity) considering the recommendations outlined within the body of this report and any subsequent addendum reports to ensure long term environmental benefit objectives are achieved. The ELEP shall, as a minimum, contain or provide for the following:

(i) Prior to planting, the removal or management of all invasive weed species and their replacement with native, eco-sourced species considering the recommendations made within this report.

(ii) A revegetation maintenance and pest control programme to be undertaken annually for at least five years, to include weed maintenance, inspection of plants for losses and replacement planting during the planting season.

(iii) Works undertaken for maintenance should include weed control, cultivation, control of pests and diseases, removal of litter, checking of stakes and ties, trimming, pruning, and other works required to ensure planting maintains healthy growth and form.

- The measures to be adopted to achieve, as far as is practicable 90% survivorship of planted species.

(iv) The identification and control of pests (including but not limited to rats, mustelids, possums and freshwater pests) to ensure, as far as practicable, that the ecological gains achieved via the EREP are not compromised.

(v) A planting hygiene protocol to be imposed while all planting is being undertaken to ensure that plant diseases e.g. kauri dieback and myrtle rust are not brought to the site.

- All plant material to be used in the ecological enhancement planting works should be eco-sourced from the Whangarei Ecological District and within proximity to the site. Growing in advance is highly recommended given the limited availability of some species recommended. It is advised that a planting hygiene protocol is drawn up to ensure that the plants are free of disease and pathogens such as myrtle rust and kauri dieback (PTA).
- That any works requiring stream crossings are to be in accordance with Whangarei District Council and Northland Regional Council Environmental Engineering Standards and the New Zealand Fish Passage Guidelines (Franklin *et al.* 2018) to ensure that fish passage on site is maintained.
- That appropriate signage is erected at the public walkway entrance points into the proposed Ecological Enhancement Areas to inform users that all dogs must be on leads at all times when entering these areas.
- In relation to the Ecological Enhancement Area protection in perpetuity the owners (or their successors) of the newly created titles as a part of the subdivision consent shall:
 - Preserve the native vegetation and wildlife habitats and the natural landscape within the Ecological Enhancement Area where they abound their lot boundaries;
 - Not (without the proper consent of the Council and then only in strict compliance with any conditions imposed by the Council) cut down, damage or destroy, or permit the cutting down, damage or destruction of the vegetation or wildlife habitats within the Ecological Enhancement Areas;
 - Not do anything that would prejudice the health or ecological value of the Ecological Enhancement Area, their long term viability and/or sustainability;
 - Ensure dogs are on lead when entering these areas.

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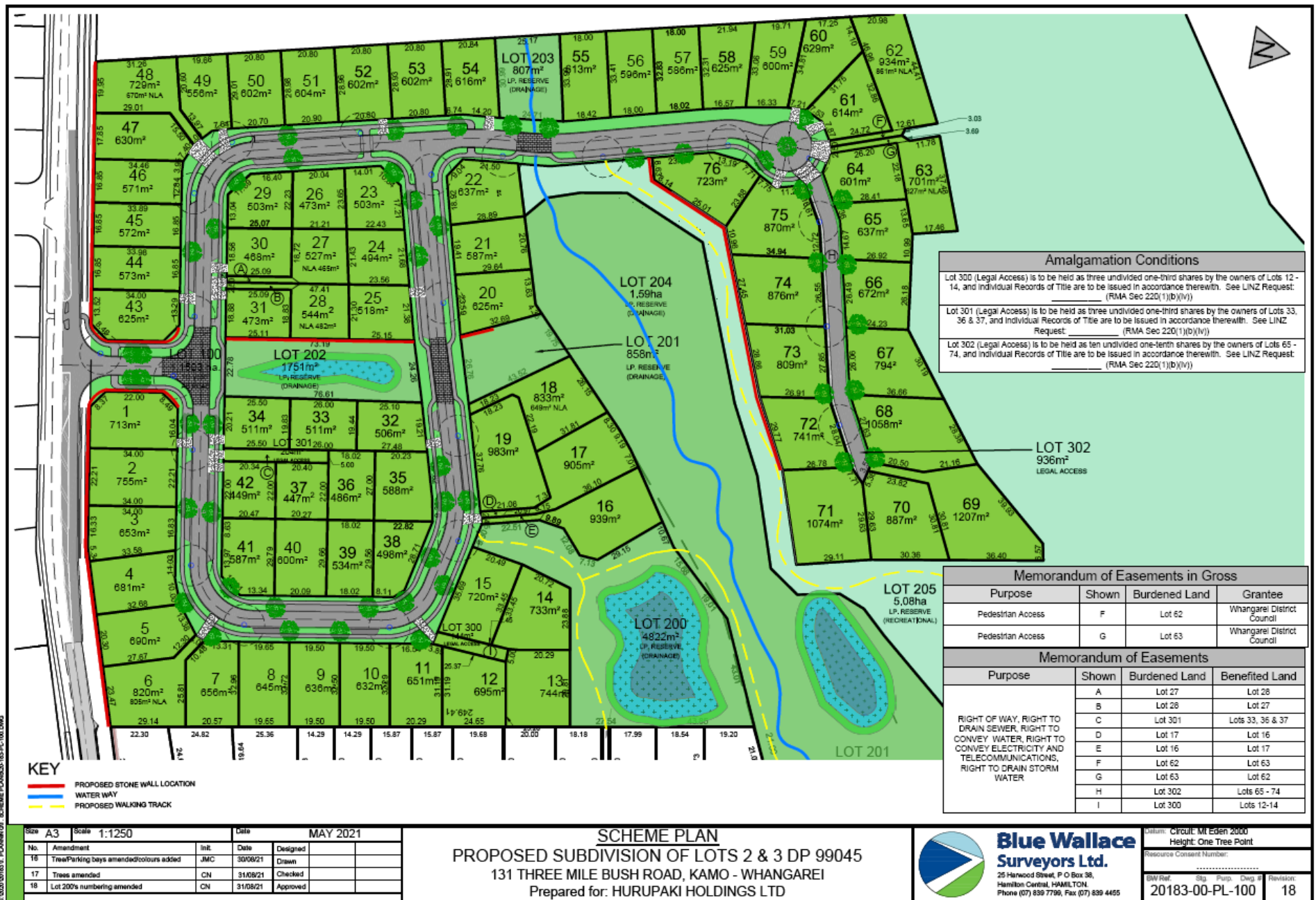
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APPENDIX 1 – SUBDIVISION SCHEME PLAN PREPARED BY BLUE WALLACE SURVEYORS



APPENDIX 2 – ECOLOGICAL ENHANCEMENT AND LINKAGES (LITTORALIS LANDSCAPE ARCHITECTURE)

