

BEFORE THE INDEPENDENT HEARINGS PANEL

UNDER the Resource Management Act 1991 (RMA)

AND

IN THE MATTER of an application by Onoke Heights Limited for resource consents for a 93 lot residential subdivision on Dip Road, Whangarei

**STATEMENT OF EVIDENCE OF MADARA VILDE
ECOLOGY
31 OCTOBER 2023**

MAY IT PLEASE THE INDEPENDENT HEARING PANEL

INTRODUCTION

1. My full name is Madara Vilde. I am the Director and Principal Ecologist at Wild Ecology Ltd, an ecological consultancy specialising in ecological assessments and sustainable land use management. I have 6 years' professional experience as an ecologist, working primarily in ecological consulting and environmental research, with a particular focus on terrestrial and aquatic ecology and application of Geographical Information Systems (GIS). A statement of my qualifications and experience are included in **Attachment 1**.
2. This evidence is in respect of an application by Ōnoke Heights Ltd ("**the Applicant**") for subdivision and land use resource consent at Section 1 SO 65970, Dip Road, Kamo ("**the Site**"), to:
 - (i) create 93 residential allotments, drainage and recreational reserves to vest and other associated works described in the application material; and
 - (ii) establish retaining walls up to a maximum height of 5m within the setback of road and side boundaries.

(together "**the Proposal**")
3. My evidence will focus on the Site's baseline ecological values, potential ecological effects associated with the Proposal, and proposed ecological mitigation and enhancement to result as part of Site development works. My evidence should be read in conjunction with Ecology Memo¹ (dated 8th December 2022) and Draft Revegetation Planting Plan² dated October 2023.
4. Specifically, my evidence will address:
 - (i) my involvement with the Proposal;

¹ Refer to the application for resource consent for the Proposal, Appendix 18: Ecological Assessment.

² Refer to Attachment 2 (Draft Revegetation Planting Plan).

- (ii) a summary of Site's values in respect to terrestrial and freshwater ecology;
- (iii) assessment of potential effects of the Proposal on ecological values noted on Site;
- (iv) a summary of proposed ecological enhancement on Site;
- (v) relevant matters raised by submitters;
- (vi) relevant matters raised within the s42A Report;
- (vii) recommended conditions of consent; and
- (viii) a summary of key conclusions and recommendations.

CODE OF CONDUCT

5. Although this is not a hearing before the Environment Court, I confirm that I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2023. I have complied with the Code of Conduct in preparing this statement of evidence. Unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

SUMMARY OF EVIDENCE

6. My name is Madara Vilde. I am the Director and Principal Ecologist at Wild Ecology Ltd, an ecological consultancy specialising in ecological assessments and sustainable land use management.
7. Ōnoke Heights Ltd engaged Wild Ecology Ltd to advise on ecological values and effects in relation to a subdivision and land use consent application at Section 1 SO 65970, Dip Road, Kamo.
8. In my evidence, I summarise the relevant ecological values of the Site and immediate surrounds, address relevant matters outlined within the S42A report and raised by submitters, and provide a summary of my key recommendations and conclusions.

9. I have reviewed and considered the Council's s42A Report produced by Mr Alister Hartstone to the extent it relates to matters within my area of expertise. Mr Hartstone recommends that the Application is declined on the basis that it would result in unavoidable and unacceptable adverse effects on cultural values.³
10. Council's s42A report does not outline any specific concerns regarding potential ecological effects of the Proposal and Mr Hartstone agrees⁴ with the conclusion provided within the Ecological Memo⁵ that any effects on existing ecological values are assessed as less than minor, subject to a requirement for a revegetation planting plan to be prepared for the reserves to vest. Mr Hartstone considers that the revegetation planting on the proposed reserve land will potentially generate some positive ecological effects.⁶
11. I agree with Mr Hartstone's conclusion and consider that any potential adverse ecological effects associated with the Proposal can be avoided, minimised, mitigated or off-set through applying appropriate development controls and providing a sufficient revegetated buffer area between the development footprint and the Waitāua Stream⁷. Provided that they are implemented successfully during construction and operational phases of the development, the potential adverse ecological effects can be managed by applying effects management hierarchy to be negligible. The Proposal would, in my opinion, allow for appropriate off-set of proposed vegetation clearance and overall enhancement of the Waitāua Stream riparian corridor through revegetation planting and associated ongoing management delivering an overall environmental benefit.
12. I consider that the proposed Conditions of Consent⁸ offered by the Applicant, which include the recommended conditions of consent outlined under Para 118 of my evidence, sufficiently address the matters relating to potential adverse effects management, ecological mitigation and

³ Section 42A Report, at 116.

⁴ Section 42A Report, at 73.

⁵ Refer to the application for resource consent for the Proposal, Appendix 18: Ecological Assessment.

⁶ Section 42A Report, at 46.

⁷ Mr Carpenter's evidence refers to research indicating that it was known as the Otapapa Stream. While the name of the Stream is not material to my evidence, where I refer to Waitāua Stream I am referring to the stream adjoining the Site to the south.

⁸ Refer to the evidence of M McGrath, Attachment 2 (*Proposed Consent Conditions*).

enhancement of the Waitāua Stream riparian corridor. The conditions of consent commit the consent holder to undertaking a programme of ecological enhancement through revegetation planting and integrated pest plant and pest animal management which is described within the Draft Revegetation Planting Plan⁹. In my opinion, this will result in improved water quality and condition of Waitāua Stream and improve connectivity between existing ecological areas, and overall ecological functioning within the Site.

13. Overall, it is my professional opinion that the Proposal:
- (i) Has been shaped by a design-led approach to development that integrates the necessary infrastructure with the protection of the Waitāua Stream riparian corridor.
 - (ii) Illustrates how residential development and growth can be balanced with ecological enhancement through enhancement and protection of riparian margins.
 - (iii) Adopts the effects management hierarchy in relation to ecological matters.
 - (iv) Will improve the overall ecological health, structure, condition and function of Waitāua Stream and its riparian margins where they expand over the Site. It does this through stock exclusion from the stream and its margins in perpetuity, revegetation of riparian margins and comprehensive pest weed and pest animal control, strengthening ecological networks by protecting existing ecological features on site, creating new habitats and buffer areas, and improving the services provided by ecosystems and resulting in an overall environmental benefit to the indigenous habitats on site and associated indigenous wildlife within the Site boundaries and immediate area.
 - (v) Will result in negligible ecological effects and will deliver an overall positive ecological benefit to Waitāua Stream and its

⁹ Refer to Attachment 2 (Draft Revegetation Planting Plan).

riparian margins should the recommendations relating to best practice integrated design, erosion and sediment control guidelines provided in the associated expert reporting prepared for the Proposal are followed.

INVOLVEMENT WITH THE PROPOSAL

14. Wild Ecology Ltd was engaged by the Applicant in November 2022 to undertake an ecological assessment to identify and assess existing ecological values of the Site and outline opportunities, constraints and potential enhancement and mitigation strategies associated with the Proposal and associated site development works.
15. Since my engagement, I have visited the Site and surrounding area on several occasions during November 2022 and September 2023 to survey the freshwater and terrestrial habitats on the Site.
16. In producing this statement of evidence, I have reviewed the following evidence and materials:
 - (a) the original Whangārei District Council (“**WDC**” or “**the Council**”) application documents, including the Assessment of Environmental Effects (“**AEE**”), associated technical reports, s 92 requests for further information and responses and WDC’s s 95 notification decision;
 - (b) the application to the Northland Regional Council and associated technical reports, s 92 request for further information and responses and the decision;
 - (c) the s 42A hearing report (“**s42A Report**”) prepared by Alister Hartstone, planning consultant on behalf of WDC; and
 - (d) the expert evidence provided by the Applicant to support its case, including statements of evidence from:
 - (i) Aaron Holland (Three Waters and Geotechnical);
 - (ii) Dean Scanlen (Transport);
 - (iii) Charlotte Nijssen (Legal Survey and Subdivision Design);

- (iv) Jonathan Carpenter (Archaeology); and
- (v) Melissa McGrath (Planning).

ECOLOGICAL SUMMARY

Site description

17. The Site is located in Kamo and zoned as 'General Residential Zone' under the Whangarei District Plan (**WDP**). The Site is legally described as Section 1 SO 65970 and is approximately 6.8755 ha in size.
18. The Site is predominately in exotic pasture dominated by kikuyu (*Cenchrus clandestinus*) and contains no existing dwellings. The Site abounds the Waitāua Stream to the south, which meanders along the southern boundary of the Site. To the north and east, the Site abounds Ōnoke Scenic Reserve. Pockets of mixed indigenous and exotic vegetation encompass the southern boundary of the Site nearby Waitāua Stream. The Site also contains scattered mature trees located along the central aspect of the Site, and a small area of mamaku scrubland located generally along the north-eastern aspect of the Site (Figure 1).



Figure 1: Showing the general ecological features of the Site and immediate surrounds

19. Analysis of aerial imagery (1942-present day) (Figure 2) revealed that the Site has been subject to a long history of anthropogenic modification, primarily through vegetation clearance and improvement for agricultural and horticultural activities, as well as the likely modification of Waitāua Stream through channelisation and straightening. Grazing animal presence on Site was noted as early as 1940s and the Site and habitats contained within have since been subject to effects associated with unrestricted grazing pressures (i.e. erosion, accelerated sedimentation of the Waitāua Stream, inputs of organic matter to freshwater environments via urine and dung). It is noted that the single isolated trees within the central aspect of the Site are already distinguishable in this aerial imagery from 1942.
20. In the aerial imagery from 1942 it appears that the Waitāua Stream channel, while flowing along the southern aspect of the Site was much more meandering than it is at present day. It is assumed that over time, with increased development pressures the stream has been straightened and channelised to enable development to the south of the Site and reduce potential flood risk to the adjacent properties.

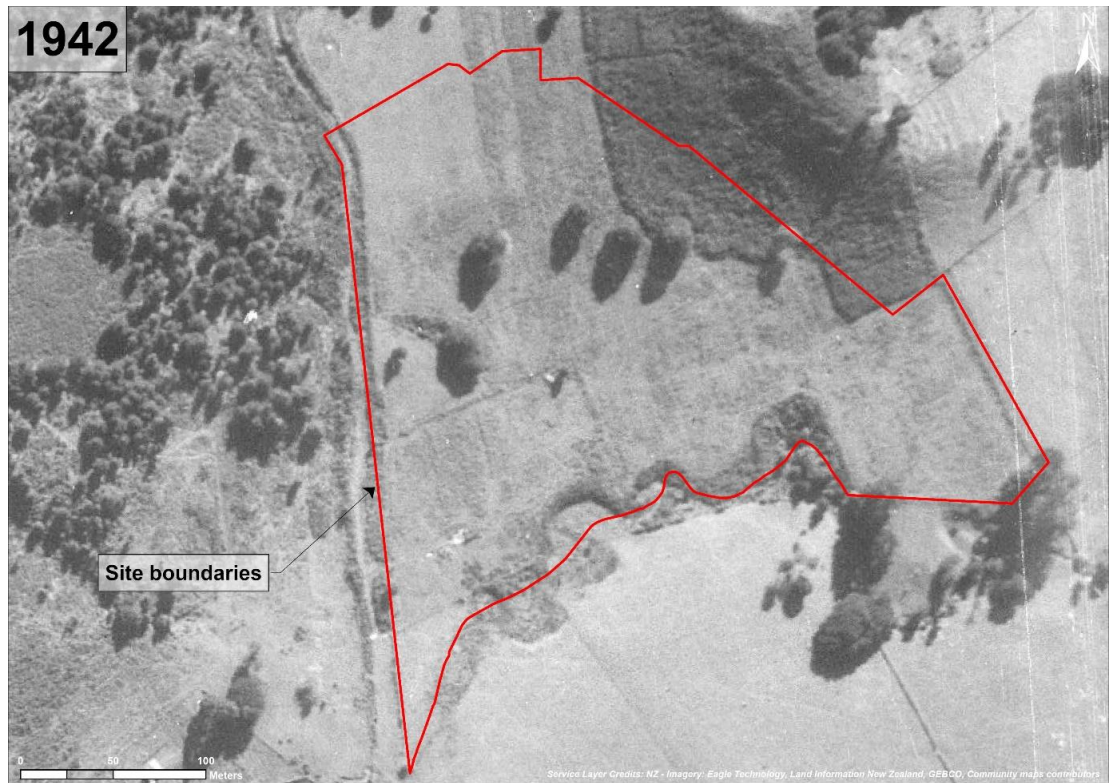


Figure 2: Showing the Site in earliest aerial imagery available for the Site from 1942 (Source: Retrolens)

21. From reviewing relevant ecological overlays of the WDP, no vegetation on site has been identified as 'Notable Tree' or is subject to any other protection mechanism.
22. No area within the Site boundaries has been identified as a proposed Significant Natural Area ("**SNA**"). The Site to the east, west and north abounds Part Section 23 Block VIII Purua SD (Figure 3), which is designated as a 'Scenic Reserve' (known as Ōnoke Scenic Reserve) and also has been earmarked as proposed SNA Hurupaki Cone W081. The vegetation in this area can be best described as regenerating Broadleaved species scrub and forest ecosystem (VS5) ('Least Concern'). High abundance of pest weeds and exotic mature trees including scattered Radiata pines (*Pinus radiata*) were noted which were prevalent along the immediate margins of the Ōnoke Scenic Reserve. An assemblage of common exotic and indigenous avifauna was noted utilising the Reserve. Signs of possum browse, and rat droppings were observed along the edges of the Reserve.



Figure 3: Looking north-east from the Site towards Part Section 23 Block VIII Purua SD – Ōnoke Scenic Reserve

Ecological field survey results

Terrestrial ecological values

23. To provide an assessment of the vegetation making up the relevant habitat types on site, the entire Site was investigated during a site walkover in November 2022. A rapid fauna survey was conducted to record the presence of avifauna and assess the potential habitat for ichthyofauna, herpetofauna and Chiroptera. These values were re-surveyed during a site visit in September 2023, with additional surveys undertaken for avifauna (5-MBC), and chiroptera (utilising manual bat detector). Only common mobile avifauna and domestic avifauna was noted during the site surveys in September 2023, and no bat presence on site was recorded. The outcomes of these assessments are described in more detail under Para 28 and Para 30.
24. The majority of the Site is predominantly in grazed pasture that is relatively uniform across the Site, dominated by kikuyu (*Cenchrus clandestinus*). The pasture area was dominated by common exotic grass and forb

species and supported the expected common mobile avifauna. The pasture areas did not contain or support any 'At-Risk' or 'Threatened' indigenous flora and fauna. The grazed pasture on Site is therefore deemed to be of low ecological value.

25. Along the central aspect of the Site five individual mature puriri (*Vitex lucens*) trees and one totara (*Podocarpus totara*) tree were recorded (Figure 4). The trees are contained in grazed pasture and generally were assessed as being of fair condition. The trees have been pruned historically and some contraction of the crown was noted, albeit the trees appeared to be successfully flowering and fruiting at the time of the survey visits in November 2022 and September 2023. Root zones of the trees were shallow and exposed and likely have suffered from continued grazing pressures, in particular root damage, ground pugging and stem damage over the years. Root zones are extensive and can extend up to 10m radius of each individual tree. While it is difficult to estimate the age, relying on the information provided within the Arboricultural Assessment of Effects and Tree Protection Plan prepared by Tree Consultancy Company¹⁰, the individual trees are estimated to be at least 100 years old. A copy of this report is **attached** as Attachment 2.

¹⁰ Arboricultural Assessment of Effects and Tree Protection Plan prepared by Tree Consultancy Company dated 7 July 2023.



Figure 4: Showing the isolated puriri trees scattered within pasture approximately within the central aspect of the Site - some crown contraction can be seen

26. The more contiguous indigenous vegetation on Site is largely contained to a small stand of mature indigenous vegetation encompassing the Waitāua Stream (Figure 5), which is limited to 2 x kauri (*Agathis australis*), 2 x totara (*Podocarpus totara*), 1 x pohutukawa (*Metrosideros excelsa*), 1 x taraire (*Beilschmiedia taraire*) with small, scattered stands of mamaku (*Sphaeropteris medullaris*) forming the mid-tier level. The understory of this small stand of vegetation was observed to be heavily grazed and pugged by cattle, and no understory or shrub layer was noted. Kauri and pohutukawa are listed as 'Threatened - Nationally Vulnerable' under (de Lange et al. 2018)¹¹ New Zealand Threat Classification List. These trees will be retained within the proposed recreational reserve (Lot 200).

¹¹ De Lange *et al.* (2017) - Conservation status of New Zealand indigenous vascular plants.



Figure 5: Showing the small, isolated stand of vegetation along the Site's south-western boundary adjacent to Waitāua Stream

27. The immediate margins of the Waitāua Stream are dominated by exotic pest weed species, some of which are likely 'garden escapees' from nearby residential properties. Weedy pest plant species included queen of the night (*Cestrum nocturnum*), purple cestrum (*Cestrum elegans*), lantana (*Lantana carnara*), woolly nightshade (*Solanum mauritianum*), Elaeagnus (*Elaeagnus x reflexa*), Taiwan cherry (*Prunus campanulata*), coral tree (*Erythrina x sykesii*) and Queensland poplar (*Homalanthus populifolius*) growing along the entirety of the Waitāua Stream riparian corridor. Jasmine (*Jasminum polyanthum*) and Black-eyed Susan vine (*Thunbergia alata*) were observed to grow in large thickets over the existing onsite vegetation. Weeds were also present in the ground tier including climbing asparagus (*Asparagus scandens*), canna lily (*Canna indica*), montbretia (*Crocasmia x crocosmiiflora*), onion weed (*Allium triquetum*), elephants' ear (*Alocasia brisbanensis*), Arum lily (*Zantedeschia aethiopica*), wild ginger (*Hedychium gardnerianum*), periwinkle (*Vinca major*), wandering willie (*Tradescantia fluminensis*) and nasturtium (*Tropaeolum majus*).



Figure 6: Showing the Waitāua Stream corridor encompassed by pest weed species

28. The bird species observed on site were representative of the modified and fragmented habitat types associated with urban areas. The most commonly abundant bird species on site were blackbird (*Turdus merula*), house sparrow (*Passer domesticus*) and myna (*Acridotheres tristis*). In fact, during a survey in September 2023, the area adjacent to Waitāua Stream (within the Site boundaries) was observed to be most heavily utilised by domestic chicken (*Gallus gallus domesticus*), likely having entered the Site from neighbouring properties. No 'At Risk' or 'Threatened' bird species were observed on site during survey visits.
29. Given the lack of suitable habitat on the Site 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 site visits in November 2022 and September 2023. No indigenous herpetofauna was observed to be present on site. 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.

30. A basic Chiroptera (bat) survey was undertaken, including both a visual assessment for potential roost sites and a presence/absence survey using a handheld bat detector (Batbox Duet Bat Detector) during a site visit in September 2023. No long-tailed bat activity was recorded during the survey which indicates that it is unlikely that there are any potential bat roosts on site and that no part of the Site is not currently utilised as a commuting route within the wider landscape.
31. While the Site is in proximity to areas (>1km) that are known to support 'At Risk' and 'Threatened' flora and fauna, the Site itself 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 terrestrial 'Threatened' or 'At Risk' fauna species.
32. Therefore, based on ecological field surveys and desktop research carried out by Wild Ecology in November 2022 and September 2023, it is considered that the Site contains some scattered mature trees of fair ecological condition and a small stand of remnant indigenous vegetation encompassing the Waitāua Stream, with its terrestrial ecological values compromised by long history of anthropogenic land improvements for agricultural purposes, grazing pressures and the incursion weedy pest plant species.

Freshwater ecological values

33. In terms of freshwater habitats, the Site's southern boundary is abounded by the Waitāua Stream¹². Based on observations made during field survey visits, the section of the Waitāua Stream while flowing through the Site is best described as a 'permanent stream' (identified in Figure 7 below). No other watercourses are present within the Site boundaries.

¹² Mr Carpenter's evidence refers to research indicating that it was known as the Otapapa Stream. While the name of the Stream is not material to my evidence, where I refer to Waitāua Stream I am referring to the stream adjoining the Site to the south.



Figure 7: Showing the general hydrological patterns of the Site

34. The Waitāua Stream flows along the southern aspect of the Site, entering the Site at its south-western boundary through a large culvert below Dip Road and flows in an easterly direction along the Site's southern boundary for approximately 350m. Flowing downstream, Waitāua Stream meanders through residential and industrial areas for approximately 7km where it enters the Hātea River and eventually discharges into the Whangārei Harbour.



Figure 8: Showing a typical cross section of the Waitāua Stream corridor while flowing along the Site's southern boundary

35. While flowing along the southern boundary of the Site the stream generally flows through flat to gently sloping topography. The streambed consists of a scoria gravel substrate with occasional large rocks, and free-flowing surface water was observed during both survey visits in November 2022 and September 2023. The Waitāua Stream channel was observed to be approximately 1m-2m wide, moderately shallow (<1m) with some deeper pool areas, with bank height averaging approximately 0.5m-1m. While no man-made in-stream structures apart from the large culvert below Dip Road were observed to have been established in the stream channel, some small footbridges from the properties adjacent to the south were observed crossing over the stream. Household rubbish (plastic and glass bottles) and other discarded items (including old tyres) were also recorded within this section of the stream.
36. Analysing historic aerial imagery, I have concluded that the immediate stream channel has been subject to historic modification through straightening and stabilisation of the stream banks by artificial means, likely to reduce potential flooding issues within the adjacent properties. There was no evidence of flood debris or streambank erosion to suggest

that the stream has been subject to higher than usual flows or flooding pressures in the weeks preceding the Site survey visits in both November 2022 and September 2023.

37. An environmental DNA (“**eDNA**”) survey of Waitāua Stream was conducted during the September 2023 site visit. The eDNA survey revealed record of a single native invertebrate species kōura (*Paranephrops planifrons*) as being present within this section of the Waitāua Stream flowing along the Site’s southern boundary. Kōura have relatively high tolerance levels to disturbance and can be found in a range of habitat types from indigenous bush to exotic forest to pastoral waterways.
38. The eDNA survey results did not indicate that any fish fauna is present within the stream, which can possibly be attributed to impassable barriers to fish passage further downstream from the Site. The downstream catchment of the Waitāua Stream meanders through residential and industrial areas where the stream has been significantly channelised, piped, culverted, diverted and it is possible that the lack of fish fauna in this upper catchment area can be at least partly attributed to the significantly modified ecological setting downstream.
39. Based on observations during the site survey visits I am of the opinion the existing baseline ecological setting of the section of the Waitāua Stream adjacent to the Site is already one that is compromised by past development and is highly modified from its natural state. The stream, while flowing along the Site’s southern boundary has been historically degraded through channelisation, straightening, and concreting of streambanks to aid flood protection of the neighbouring properties to the south and further downstream. The stream margins have been heavily invaded by weedy pest plants, some of which are likely garden escapees from neighbouring properties.
40. In terms of in-stream fauna, no fish fauna was recorded within the section of the Waitāua Stream flowing along the Site’s southern boundary and only one native invertebrate species which is known to be disturbance and modification tolerant was recorded within the eDNA sample, indicating that the Waitāua Stream, while providing habitat to some indigenous

freshwater fauna, is limited to supporting fauna that is adapted to the existing urbanised setting encompassing the stream immediately to the south and further downstream.

PROPOSED REVEGETATION PLANTING

41. As a part of the Proposal, the Applicant proposes enhancement through revegetation planting, pest weed and pest animal control of approximately 0.9567 ha of land (Figure 9) extending along the Waitāua Stream corridor abounding the southern boundary of the Site forming part of the proposed recreational reserve areas (Lot 200 and 201). This is described in more detail under Draft Revegetation Planting Plan¹³.
42. Appropriate revegetation planting with eco-sourced indigenous species is proposed to extend from the margins of the Waitāua Stream as part of ecological enhancement works and part mitigation planting to account for the loss of indigenous vegetation to be cleared as part of the proposed Site's development. In my opinion, these actions will ensure that the ecological values of the Site are maintained and enhanced as part of the proposed Site's development.

¹³ Refer to Attachment 2 (Draft Revegetation Planting Plan).

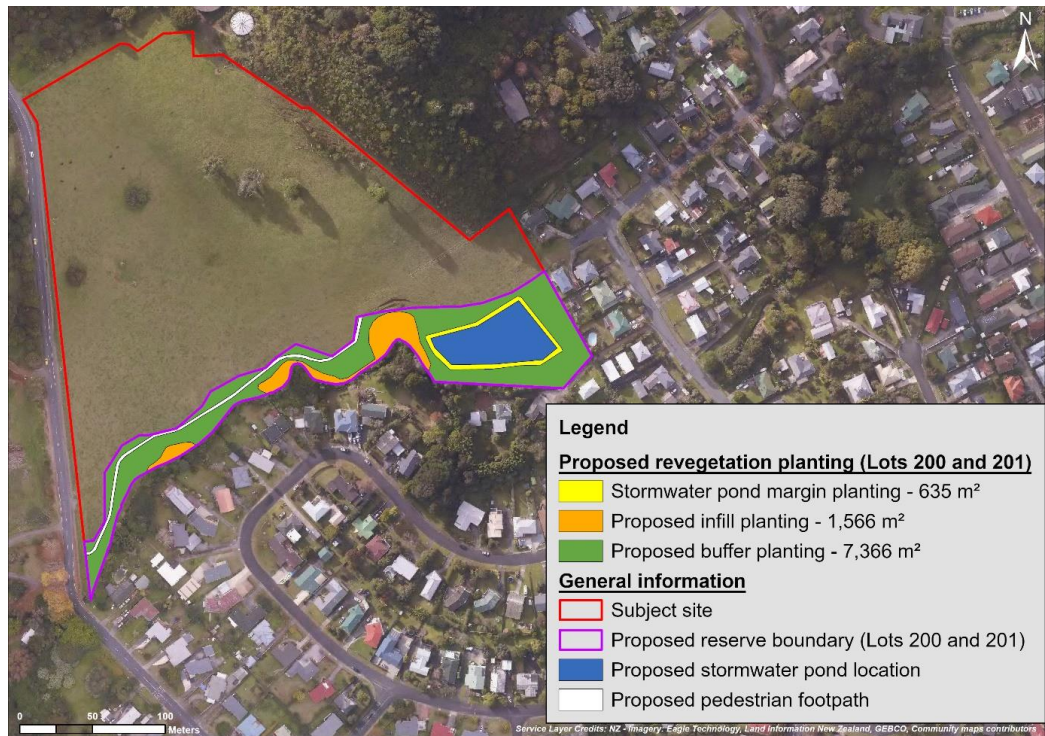


Figure 9: Proposed revegetation planting areas plan

43. Lots 200 and 201 are intended to be utilised as multipurpose reserves, promoting both ecological enhancement, and accessibility, with a pedestrian access track proposed through this area. The proposed recreational reserve areas contain pockets of existing mature indigenous vegetation, which will be protected in perpetuity and enhanced through permanent stock exclusion, appropriate indigenous revegetation planting, as well as ongoing pest animal and plant control.
44. Through implementation of the proposed revegetation and enhancement actions, the Proposal will enhance the Waitāua Stream environment through extensive weed control and replacement of weedy pest species with appropriate indigenous revegetation planting suited for the Site's locality and setting, which will establish ecological linkages and pathways throughout the Site and immediate surrounds to facilitate species movement and dispersal within the landscape.
45. The proposed recreational reserve areas will be revegetated with a mix of native species suited to the Site based on the ecosystem types noted in the immediate vicinity. In the short term (1-3 years following revegetation), the revegetation plantings will assist in sediment filtering of overland runoff, act as a natural erosion control agent, and extend habitat for some

more common mobile avifauna species. In the medium term (3-5 years), the enhancement areas will provide/extend physical habitat for a wider range terrestrial and aquatic fauna, and also provide water quality benefits through shading and by filtering overland run-off. In the longer term (>5 years), this enhancement will result in a net gain in ecological function for the existing terrestrial and aquatic habitats noted on site and surrounds and will allow for natural self-sustaining processes to begin including natural regeneration, shading out of any weedy species and increasing habitat complexity.

46. The benefits of the revegetation planting include the following:
- (a) protecting and enhancing approximately 0.95 ha of riparian margin of the Waitāua Stream;
 - (b) providing a vegetated buffer between the Waitāua Stream and the wider built development area;
 - (c) providing ecosystem regulating services such as carbon capture and storage, erosion control, nutrient cycling, climate regulation, and improvements of water quality within the Waitāua Stream catchment, among others;
 - (d) providing for an attractive place to visit for recreation and conservation – the proposed recreational reserve areas will provide for cultural ecosystem services, through establishing and connecting an area in which people may pursue improved health and wellbeing, learn about the biodiversity values of the area, and allow for interactions with nature;
 - (e) providing an enhanced habitat for wildlife including a source of food for indigenous fauna – provision of revegetation planting is to increase the proportion of seed and fruit bearing species on site and thus enhance species movement and dispersal on site and surrounds, with a particular focus on indigenous avifauna;
 - (f) retiring these areas from stock access in perpetuity – removing stock from the Site will result in benefits to both aquatic and terrestrial habitats noted on site and further downstream through

reduction of nutrient and sediment input into aquatic environments and cease of pugging of root zones of indigenous tree species; and

- (g) offering full protection and ongoing cohesive management at a functioning ecosystem level ensuring that the plantings within the recreation reserve areas are able to become self-sustaining functional areas following the initial ecological management efforts.
47. The proposed revegetation planting will strengthen ecological values within the local area which is vitally important to provide further functional and structural ecological connectivity for flora and fauna already present on the Site and immediate surrounds. The Proposal has been designed to protect and enhance the Waitāua Stream and its margins thus improving the overall ecological structure, composition and functions of the Site through providing appropriate vegetated buffer areas, and improving the services provided by ecosystems, without jeopardising existing biodiversity values.
48. In my opinion the overall design of the Proposal is focused on avoiding or reducing potential ecological effects, where practically feasible, and has appropriately integrated necessary infrastructure that, instead of serving a single function (i.e. stormwater retention), has been designed to integrate with the wider ecological context and serve multiple purposes, including increasing amenity values, habitat creation and provision of public access into much needed open space. I believe the Proposal illustrates how residential growth can be balanced with ecological restoration, and the creation of new public open space.

EFFECTS ASSESSMENT

49. I consider that the Proposal is in line with the relevant ecological requirements under the WDP and the Proposed Regional Plan for Northland.
50. Generally, the potential adverse effects can be divided into effects resulting from:

- (a) Direct effects resulting from the physical development of the Site (including initial land clearance, vegetation clearance, earthworks, construction, stormwater).
- (b) Secondary effects resulting from increased activities and habitat modification within the Site during the operational phase of the development once the Site is developed and new residents have occupied the Site.

Construction phase

- 51. During the construction phase of the Proposal, I consider that potential ecological effects could primarily arise from physical habitat changes during the Site development process including but not limited to vegetation clearance of the individual mature trees located on the central aspect of the Site, earthworks and establishment of associated infrastructure (i.e. roading network, stormwater) and water quality and quantity changes related to discharges from impervious surfaces such as sealed roads. I understand that the potential adverse effects associated with the construction of the development are managed or will be managed through the implementation of a Construction Management Plan and an Erosion and Sediment Control Plan¹⁴.
- 52. Six individual mature indigenous trees (five puriri and one totara) and a small stand of mamaku present within the central aspect of the Site are proposed to be removed. The trees proposed to be felled are classified as 'Not Threatened' under the most recent New Zealand Threat Classification List (de Lange et al. 2018). From reviewing the WDP the trees have not been identified as 'Notable Trees' and are not subject to any other protection mechanism. There are no relevant policies or rules associated with indigenous vegetation clearance within the 'General Residential Zone' as per WDP.
- 53. The vegetation clearance is proposed to be off-set through replacing the puriri and totara trees at a ratio of 1:1 within the proposed recreational reserve areas (Lot 200 and 201). The off-set trees will be of a size/grade

¹⁴ Refer to the Statement of evidence of Melissa McGrath, 31 October 2023, at [81].

of minimum 160L or equivalent to achieve an instant impact and amenity value. I consider this being as an appropriate offset of the proposed tree clearance, taking into consideration that the entirety of the proposed recreational reserve areas (Lot 200 and 201) will also be further enhanced through additional revegetation planting.

54. I consider that the Proposal has given consideration to the National Policy Statement for Indigenous Biodiversity 2023 (**NPS-IB**) through applying the effects management hierarchy with appropriate avoidance, mitigation and off-set strategies employed to ensure that potential adverse ecological effects are appropriately managed to result in no overall loss of indigenous biodiversity. This is further discussed under Para 69-72 of my evidence.
55. In respect to potential effects on freshwater values, the construction phase of the development (if not appropriately managed through development controls) could result in potential addition of fine sediment to aquatic environments which can alter water chemistry, result in sediment build-up, increase turbidity and decrease light penetration that affects primary production and feeding for some aquatic species. I consider these effects to be acute, short-term effects that require sufficient controls to be put into place during the construction phase of the development to ensure that any associated environmental effects can be appropriately managed. I understand that such controls are proposed as outlined under evidence of Ms McGrath¹⁵ and Mr Holland¹⁶.

Operational phase (post-construction)

56. During the operational phase of the Proposal, once the Site has been developed and residents have occupied the new dwellings and the Site has become part of the urban landscape, potential adverse effects could comprise of increased levels of overall disturbance through increased levels of lighting, noise, human and pet animal presence on site. A potential increase in invasion of pest plant and animal species should also be considered to ensure that the existing baseline environment is not negatively affected by invasion of pest plants and an increased presence of pest animals. These effects can be managed through integrated pest

¹⁵ Refer to the Statement of evidence of Melissa McGrath, 31 October 2023, at [81].

¹⁶ Refer to the Statement of evidence of Aaron Holland, 31 October 2023, at [10].

animal management (proposed to be carried out as part of the Draft Revegetation Planting Plan programme) while the potential effects associated with pest plants can be managed through appropriate controls such as attaching the National Pest Plant Accord (**NPPA**) to the certificate of title. The new lot owners will be required to comply with the Northland Plant Pest Management Strategy (**NPPMS**) and NPPA and in so doing exclude, and where necessary, control all known plant pest species (in any category) that occur on their respective lot. This includes avoiding planting any pest species on the property as part of the landscaping, which could become future threats to the covenant area as 'garden escapees'. Dumping of garden waste into the recreation reserve areas (Lot 200 and 201) is to be prohibited.

57. These effects primarily relate to chronic low-level disturbance of indigenous habitats and common mobile fauna that are likely to be present on site or nearby areas, notably Waitāua Stream corridor extending along the southern aspect of the Site. It is recognised that the Site contains terrestrial habitats that are primarily comprised of single trees or groups of trees which are not considered to be of any notable ecological significance in reference to Appendix 5 of the Regional Policy Statement for Northland (**RPS**). The Site and immediate areas were observed to form habitat to common, mobile and largely exotic fauna associated with the wider urbanised land matrix and therefore it is deemed that the potential adverse effects associated with increased low-level disturbance are minimal.
58. The Proposal acknowledges and seeks to manage these effects through appropriate ecological planting and ongoing pest plant and pest animal management of the proposed Reserve areas identified as Lot 200 and 201 in the subdivision Scheme Plan which will provide a vegetated riparian buffer area between the proposed new dwellings and infrastructure and Waitāua Stream environment. The proposed revegetation planting will act as a vegetated buffer to Waitāua Stream environment and will ensure that the core stream environment will be subject to lower disturbance levels (both abiotic and biotic) once the Site is developed. Lower disturbance levels ensure these areas remain intact, promoting biodiversity and ecological balance. Reduced disturbance protects the habitats within the vegetated buffers, providing safe havens for various plant and animal

species. This fosters biodiversity by offering lesser disturbed nesting, breeding, and foraging sites, which is of importance to species moving within the wider urban and peri-urban land matrix. This approach ensures the protection of natural habitats, promotes biodiversity, and sustains the essential services provided by ecosystems for future generations.

Vegetation clearance

59. The five individual mature puriri and single totara tree proposed to be cleared located in the central aspect of the Site were assessed as being of fair condition. None of the trees have been identified as 'Notable Tree' or are subject to any other legal protection mechanism. The trees proposed to be cleared are classified as 'Not Threatened' under the most recent (de Lange *et al.* 2018) New Zealand Threat Classification List. I understand that a Certificate of Compliance ("**COC**") has been issued from WDC (Council reference CC2300005 and P35827) which authorises the removal of the trees.¹⁷ (I note that this is also referred to in the section 42A report.)
60. The individual tree ecological value and significance is low when assessed against ecological significance criteria under Appendix 5 of the RPS.¹⁸ The individual trees have suffered from ongoing pruning, exposure to abiotic factors and ongoing stock grazing pressures. The trees were not observed to support any 'Threatened,' 'At risk' or 'Regionally significant' flora and fauna. No bird nests or any bat activity was noted within the trees and no herpetofauna was noted. I do not consider that the isolated indigenous trees provide or contribute to an important ecological linkage due to their isolation in the landscape. Therefore, from an ecological perspective, these trees are not considered to meet any relevant ecological significance criteria. The removal of these trees will be off-set with large grade puriri and totara trees (of a grade no less than 160L or equivalent) at a 1:1 ratio within the proposed recreational reserve areas (Lots 200 and 201).
61. Indigenous climax tree species and, in particular, puriri trees are known for their extensive root zones (root zone spread often is 10m or more from the base of the tree) which are able to penetrate built surfaces, and thus they

¹⁷ Refer to the Statement of evidence of Melissa McGrath, 31 October 2023, at [64].

¹⁸ Appendix 5 of Regional Policy Statement for Northland.

are largely incompatible with a residential built environment. For example, there might not be enough space to accommodate the large root systems of mature trees without causing damage to nearby buildings, roads, or utilities. The roots of mature trees can potentially damage sidewalks, roads, and underground utility lines. This can lead to safety hazards and costly repairs.

62. The root zones of the existing trees on the Site were shallow and exposed and likely have suffered from continued grazing pressures which include root damage, ground pugging and stem damage over the years. As such, their health and long-term sustainability is already compromised.
63. To off-set the loss of the individual trees the Proposal includes revegetation planting within Lots 200 and 201 of over 4540 new native plantings. When the proposed re-vegetation is considered holistically, the removal of the trees currently on the Site will be off-set at a ratio of almost 250:1. That is, for each tree removed, 250 new trees will be planted in their place. In that regard, the replacement trees for the existing puriri and totara trees will be of a size/grade of 160L or equivalent to achieve an instant impact and amenity value within the proposed recreational reserve areas due to the large size of the replacement trees.
64. In my opinion, this represents significant compensation for the individual scattered tree loss, and the proposed revegetation planting will enhance the ecological and amenity values of the recreational reserve which will be maintained as an ecological feature for the future subdivision resident and wider area users' enjoyment.

Stormwater infrastructure and run-off

65. If not managed appropriately, new stormwater infrastructure and stormwater run-off can have adverse effects on stream ecology, both positive and negative. These effects depend on various factors including the design of the stormwater infrastructure, the surrounding land use, and maintenance practices. Some of the ways in which stormwater infrastructure can have potential effects on stream ecology include:
 - (a) Stormwater infrastructure, such as impervious surfaces and storm drains, can increase the volume and velocity of water entering

streams during storm events. This can lead to erosion of stream banks and streambeds.

- (b) Stormwater runoff can carry sediment and pollutants from roads and urban areas into streams. Sedimentation can smother aquatic habitats, reduce light penetration, and degrade water quality.
- (c) The modification of natural drainage patterns through stormwater infrastructure can alter the natural flow regime of streams.

66. However, it's important to recognise that the proposed stormwater infrastructure and stormwater run-off management practices associated with this Proposal have accounted for potential adverse ecological effects and have addressed these through best practice design. It is understood that the design of the pond is in accordance with best practice and TP10/GD01 (pond design guidelines published by Auckland Council)¹⁹. Sustainable stormwater management techniques such as use of stormwater detention pond, extended detention²⁰ and revegetation planting of riparian margins²¹ are proposed to be employed to appropriately manage the potential and actual effects of stormwater run-off.

67. I consider that the measures outlined in the Integrated Three Waters Report²² along with the recommendations made within the Ecology Memo²³ will be effective in filtering pollutants, reducing runoff volume and velocity, and mimicking natural hydrological processes. The provision of revegetation plantings encompassing the proposed stormwater pond will aid filtration and nutrient uptake, stabilise soil preventing erosion, and provide overall sediment reduction entering the pond and the Waitāua Stream. As outlined within the evidence of Mr Holland²⁴ the proposed stormwater pond will include an extended detention volume to an extended detention volume of 34.5mm for the Site to be released over a 24hr period. The slow-release volume will minimise stream erosion and increase water

¹⁹ Refer to the Statement of evidence of Aaron Holland, 31 October 2023.

²⁰ Refer to the Statement of evidence of Aaron Holland, 31 October 2023.

²¹ Refer to Attachment 2 (Draft Revegetation Planting Plan).

²² Refer to the application for resource consent for the Proposal, Appendix 5: Integrated Three Waters Report.

²³ Refer to the application for resource consent for the Proposal, Appendix 18: Ecological Assessment.

²⁴ Refer to the Statement of evidence of Aaron Holland, 31 October 2023, at [11].

quality in the pond. In my opinion, this will reduce any potential stream erosion and improve water quality in the pond for the runoff from all the individual lots and road reserve areas and will help improve the overall quality of the Waitāua Stream the pond will discharge to.

68. On the basis that the recommendations relating to best practice integrated design, erosion and sediment control guidelines provided in the associated expert reporting prepared for the Proposal will be implemented, in my opinion the potential effects on stream ecology can be appropriately reduced or mitigated.

NPS-IB (2023)

69. While not in effect at the time of the preparation of the original Ecology Memo prepared for the subdivision proposal (dated December 2022), I have considered the policies and objectives of the NPS-IB which came into effect August 4th, 2023. This is out of caution, given the Proposal will result in the clearance of the five individual scattered puriri, one totara and a small stand of mamaku within the proposed development footprint. I have considered the NPS-IB in the context of an ecological assessment and do not intend this to be considered a planning evaluation which is provided by Ms McGrath.
70. The objective of the NPS-IB is to maintain indigenous biodiversity across Aotearoa New Zealand so that there is at least no overall loss in indigenous biodiversity after the commencement date.
71. In my opinion, the Proposal gives effect to the objectives and policies of NPS-IB in the following ways:
- (a) The Proposal has been prepared through a careful design-led approach to development that integrates the necessary infrastructure of the Proposal with the core existing ecological context.
 - (b) Where indigenous vegetation clearance is required, significant off-set and mitigation is proposed to ensure no overall loss in biodiversity. While some isolated mature trees (six in total – five puriri, one totara) and a small stand of roughly twelve mamaku are required to be removed within the central aspect of the Site to enable safe and

practicable site development, the Proposal includes revegetation planting within Lots 200 and 201 of over 4540 new native plantings. Therefore, the tree loss on site have been off-set at a ratio of almost 250:1, where for each tree removed 250 new trees will be established in their place. The removed puriri and totara trees will be replaced in a size/grade of 160L or equivalent to achieve an instant impact and amenity value by planting larger trees within the proposed recreational reserve areas. In my opinion, this represents significant compensation of the individual scattered tree loss, and the proposed revegetation planting will result in net biodiversity gain. As such, there will be positive ecological outcomes resulting from the proposed development.

- (c) The Proposal illustrates how residential development and growth can be balanced with ecological restoration and protection of the Waitāua Stream environment.
 - (d) The Proposal will appropriately balance protecting and enhancing sensitive aquatic environment, and the development will be focused on areas with low existing ecological values or functionality.
72. The Proposal will ensure that potential adverse effects on indigenous biodiversity are avoided in the first instance, or where it is not feasible or practicable, that potential adverse effects are appropriately mitigated or off-set so that no overall loss of indigenous biodiversity occurs. The Proposal provides and promotes restoration of indigenous biodiversity through enhancement of Waitāua Stream riparian margins through appropriate revegetation planting.

NPS-FM

73. The core intent of the policies in the National Policy Statement for Freshwater 2020 (**NPS-FM**) is to provide stronger protection for freshwater bodies and wetlands. It also places a statutory responsibility on territorial and consenting authorities to give effect to Te Mana o te Wai by prioritising the health and wellbeing of our waterways.

74. I have considered the NPS-FM in the context of an ecological assessment and do not intend this to be considered a planning evaluation which is provided by Ms McGrath.
75. The Site abounds the Waitāua Stream which is permanent stream flowing along the Site's southern boundary. Based on observations during the site survey visits I am of the opinion the existing baseline ecological setting of the section of the Waitāua Stream adjacent to the Site is already one that is compromised by past development, ongoing grazing pressures and is highly modified from its natural state. The stream, while flowing along the Site's southern boundary has been historically degraded through channelisation, straightening, and concreting of streambanks to aid flood protection of the neighbouring properties to the south and further downstream. The stream margins have been heavily invaded by weedy pest plants, some of which are likely garden escapees from neighbouring properties.
76. The stream has also suffered from ongoing pressures associated with presence of stock. Stock have actively grazed this site for a number of decades resulting in the ongoing sedimentation, erosion and inputs of faecal matter into the Waitāua Stream systematically degrading water quality and habitat availability.
77. The Proposal avoids works within and near the Waitāua Stream by establishing appropriate setbacks between the limit of the works and the final built development. It is understood that other than the stream outlets and the at grade gravel walking track that is proposed alongside the stream all earthworks are separated by 10m or more from the Waitāua Stream²⁵. Where any earthworks are to take place near sensitive terrestrial or aquatic environments, best practice measures²⁶ have been put in place to ensure that the feature can be protected or enhanced as part of the Proposal.
78. In my opinion the Proposal will provide for an enhancement of the condition, water quality and overall stream health through:

²⁵ Refer to the Statement of evidence of Aaron Holland, 31 October 2023, at [13(b)].

²⁶ Refer to the Statement of evidence of Aaron Holland, 31 October 2023, at [13].

- (a) Stock exclusion in perpetuity resulting in improvements in water quality through reduced pollution from animal waste, cease of stream bank physical disturbance through pugging resulting in reduced sediment inputs into the stream, and reduction of physical habitat disturbance from stock movement.
 - (b) Weed control of the Waitāua Stream riparian margins. Weedy species can alter the natural flow patterns of water bodies as they often do not have the same root structure as native plants, leading to reduced stability of soil and increased erosion along riverbanks and streams. This erosion can contribute to sedimentation in water bodies. Pest plants might not provide the same level of water filtration as native vegetation, leading to poorer water quality downstream.
 - (c) Appropriate revegetation planting of indigenous species along Waitāua Stream which will aid erosion control maintaining the integrity of riverbanks, acting as a natural filter trapping pollutants, sediments, and nutrients before they reach the water. Increased riparian cover will provide for appropriate shade, which helps regulate water temperature. This is crucial for fish and other aquatic organisms that are sensitive to temperature changes. The planting will also deliver improvements to habitat provisioning services creating suitable green corridors for species migration, aiding in the movement of species through the Site.
 - (d) Comprehensive stormwater management practices²⁷ ensuring that any stormwater generated by the proposed development has been appropriately treated before entering the Waitāua Stream environment.
79. I consider that the Proposal will enhance the existing stream habitat through the management actions outlined above, which will result in improved habitat to freshwater species (including those considered as mahinga kai), noting that the only species recorded within the section of the stream abounding the Site was kōura.

²⁷ Refer to the Statement of evidence of Aaron Holland, 31 October 2023, at [11].

80. Overall, it is my opinion that the Proposal will result in a positive ecological benefit to the water quality and condition of the Waitāua Stream where it abounds the Site boundaries. I consider that the proposed development controls and ecological management principles described within the Proposal will ensure that the health and well-being of the section of the Waitāua Stream flowing along the Site's boundaries will be improved from its existing degraded ecological state.

MITIGATION OF POTENTIAL ADVERSE ECOLOGICAL EFFECTS

81. The Applicant seeks to manage potential direct and secondary effects through a range of mechanisms, including by:
- (a) minimising vegetation clearance that is required to enable high quality residential development;
 - (b) avoiding or minimising physical disturbance of indigenous freshwater and terrestrial habitats on site²⁸;
 - (c) connecting the Site to existing public wastewater reticulation servicing to ensure there will be no adverse effects from the Site's wastewater management on freshwater ecology as described in the Integrated Three Waters Report²⁹;
 - (d) managing water quality and quantity effects by using best practice erosion and sediment controls, and stormwater management approaches as described under in the Three Waters Report;
 - (e) enhancing and creating vegetated buffers around Waitāua Stream riparian margin as described under the Draft Revegetation Planting Plan³⁰;
 - (f) enhancing the existing Waitāua Stream corridor thus facilitating species movement within the Site and immediate surrounds; and

²⁸ Refer to the application for resource consent for the Proposal, Appendix 18: Ecological Assessment.

²⁹ Refer to the application for resource consent for the Proposal, Appendix 5: Integrated Three Waters Report.

³⁰ Refer to Attachment 2 (Draft Revegetation Planting Plan).

- (g) containing active site development to areas deemed of 'low' existing or potential ecological significance (i.e. the Proposal concentrates subdivision in areas which are dominated by exotic pasture)
82. The current terrestrial and aquatic ecological baseline setting of the Site reflect the highly modified nature of the baseline environment. The Site contains minimal habitats or species of ecological significance with the primary ecological value associated with the Waitāua Stream and its margins, noting that the Waitāua Stream itself primarily flows to outside the Site's cadastral boundary.
83. It is my opinion that through the measures outlined above, the Proposal provides an appropriate off-set for the loss of the isolated mature trees required to be cleared to enable high quality residential development, while also providing for restoration, protection and enhancement of the ecological values associated with the Waitāua Stream riparian corridor. Overall, with the proposed measures in place, I consider that the Proposal will result in minimal (at worst "minor") adverse ecological effects both during construction and post-development.

COMMENTS ON SUBMISSIONS

84. A total of 29 submissions on the Proposal have been received. I have reviewed the submissions received.
85. Several submitters identified concerns related to ecological matters, which have already been covered in my preceding evidence. However, I briefly address the key points raised in the submissions, as follows.

Effects of increased human presence on site

86. The submissions raise a general concern relating to increased human presence on site and immediate surrounds.
87. In the context of potential ecological effects, human disturbance on site will presumably increase in proportion to the baseline conditions through disturbance of habitats noted on site and adjacent.
88. The Proposal aims to enhance public access within the proposed recreational reserve (being Lots 200 and 201), therefore increased human

disturbance is inevitable. The increase in human disturbance on site can be appropriately limited by establishing pedestrian access tracks within the proposed revegetation planting/reserve areas, and thus reducing the likelihood of informal paths being created in an ad-hoc manner.

89. Since no 'Threatened' or 'At Risk' fauna was recorded on site or immediate surrounds, with the majority of fauna recorded being common and mobile species, they are likely to either escape human attention or move elsewhere if they are disturbed.
90. I do not consider that the increased human disturbance on site will have any notable adverse effect on the adjacent Ōnoke Scenic Reserve. Ōnoke Scenic Reserve was observed to be fenced via 7-wire post and batten fencing along the interface of the Site, so the likelihood of both human and pet disturbance in Ōnoke Scenic Reserve will be limited by an existing physical barrier. No susceptible flora and fauna was noted as being present along the immediate interface between the proposed development and Ōnoke Scenic Reserve, with the interface generally being dominated by weedy pest plants.
91. I consider that human disturbance on ecological values will be limited through the provision of defined paths within the recreational reserve as well as revegetation planting, which will form a natural barrier for human movement along the Waitāua Stream corridor and therefore concentrate their impact to small, localised areas. No adverse effect on the neighbouring Ōnoke Scenic Reserve is anticipated. I consider the overall effect associated with increased human disturbance on site as being negligible.

Effects of residential pets

92. Cats and dogs kept as residential pets are predators of native wildlife. Cats are known predators of indigenous lizards and birds; while dogs, particularly unrestrained dogs, pose more of a threat to avifauna.
93. Given the Site's locality on residential edge of the suburb of Kamo, the existing baseline setting is one already inhabited by a wide range of domestic pets. I am not aware of any nearby developments that have been designed to be 'pet free,' and therefore the area is already one where

domestic pets are present. Indeed, a flock of domestic chicken were observed wandering into the Site via informal pedestrian bridges established over the Waitāua Stream from the adjacent properties to the south.

94. No ground nesting or susceptible avifauna or herpetofauna was noted as being present on site or the immediate surrounds during the site survey visits, with a large majority of the recorded species noted on site being common and mobile fauna, which are likely to move when/if disturbed by pet animals.
95. While it is outside my expertise, I am aware that pet owners have responsibilities imposed through other laws and regulations. Regardless, in my opinion the potential presence of domestic pets within the proposed residential development will have a negligible impact on ecological values associated with the Site.
96. The Proposal will also allow for integrated pest animal management to be carried out within proposed recreational reserves (Lot 200 and 201) which is to positively benefit all indigenous fauna present on site and immediate surrounds. The pest management will provide for ongoing control of species such as rabbits, possums, rats and mustelids, with proposed appropriate control mechanisms (taking into consideration the future residential setting of the Site) outlined within the Draft Revegetation Planting Plan.
97. Overall, I consider that any potential effects associated with increased pet animal presence on site on ecological values can be appropriately managed through responsible pet ownership and other regulations, particularly when considered in light of the proposed mitigation and offset measures. In short, any residual effects would be very low i.e., negligible.

Clearance of individual trees and effects on birdlife

98. Several submissions raise a general concern relating to the Proposal to clear individual trees located within the central aspect of the Site, loss of bird habitat and effect the Proposal would have on avifauna.

99. As explained above, no ground nesting or susceptible avifauna was recorded as being present on site or the immediate surrounds (including Waitāua Stream and Ōnoke Scenic Reserve) during the Site survey visits, with majority of the bird species noted on site being common, primarily exotic and mobile avifauna, which is reflective of the urbanised environment the Site abounds.
100. The six indigenous trees proposed to be removed (discussed above) were surveyed for birdlife during site surveys in November 2022 and September 2023. Only common mobile native and exotic species were recorded as being present within the trees. No nests were observed in the trees that are proposed to be cleared. In fact, isolated trees in the landscape are not preferred by bird fauna for nesting or roosting, with their nesting habitat preference being in mature forests with a relatively closed canopy, with high stem density and thick foliage cover. While birds may utilise single trees to commute and rest within the landscape before reaching their core habitat (being mature forest or thick scrub) they will seldom choose individual isolated trees for nesting due to higher risk of predators, and higher risk of nest failure associated with abiotic factors such as higher exposure to elements such as wind, sun and rain.
101. Therefore, in my opinion, the loss of the group of single isolated trees on Site along with exotic pasture habitat from an ecological perspective is of a low concern in regard to the potential loss to bird nesting, roosting and foraging habitat.
102. While the vegetation clearance is a permitted activity and a Certificate of Compliance (“COC”) has been issued from WDC (Council reference CC2300005 and P35827) which authorises the removal of the trees, as a precautionary measure and conservative approach to the construction works, it is recommended that prior to the removal of any vegetation on the Site as part of works for the consented development, the Applicant shall employ a suitably qualified and experienced ecologist to inspect all trees proposed to be cleared. The tree inspection should include assessment of active bird nests, indigenous lizard presence and assessment of bat roosts. Any vegetation clearance work should be undertaken outside of the bird breeding season (September - February). The consent holder shall employ a suitably qualified and experienced

ecologist, who must be onsite to supervise any vegetation removal. These recommendations have been included In the proposed Conditions of Consent³¹.

103. Additionally, the Proposal involves off-set mitigation of the individual tree loss, at a ratio of approximately 250:1, where for every tree removed, 250 new trees will be established within the proposed recreation reserve areas (lots 200 and 201). The loss of the existing puriri and totara trees is proposed to be off-set at a ratio of 1:1 through the planting of large grade replacement trees (being of grade of no less than 160L or equivalent) and enhancement and revegetation of the Waitāua Stream margins which will expand and connect existing habitat for birds and create habitat linkages between the Site and immediate surrounds. Creation of the stormwater pond to be established as part of the development Proposal over time will provide an excellent opportunity to provide habitat for waterfowl in the area.
104. The revegetation planting along with pest weed and animal control in the proposed recreational reserve areas is likely to positively support this area as potential bird habitat within the wider landscape.
105. Therefore, I conclude that the loss of the individual mature trees located within the central aspect of the Site, small stand of mamaku and exotic pasture habitat would have a negligible effect on bird nesting, foraging and roosting habitat and the proposed development of the Site would in fact actively enhance and extend potential habitat linkages and provisioning services for these species through appropriate revegetation of the proposed recreational reserve areas.

Effects on water quality and quantity

106. Some submissions outline their concerns relating to the potential effects on the water quality, quantity and overall habitat of Waitāua Stream.
107. In the context of ecology, there are a range of potential effects on freshwater systems that may be associated with development of previously undeveloped greenfield land. These effects primarily arise from physical

³¹ Refer to the Statement of evidence of Melissa McGrath, 31 October 2023, Attachment 2 (*Proposed Consent Conditions*).

habitat changes during the development and water quality and quantity changes related to discharges from impervious surfaces.

108. However, stormwater infrastructure can also play a significant role in improving stream health when properly designed and managed. By implementing effective stormwater management practices, potential adverse effects of urbanization and runoff on streams and waterways can be avoided.
109. According to the Three Waters Design Report, wastewater servicing for the development will be an extension to the existing public reticulation.³² As such, if the system is installed as per the recommendations outlined in the associated Integrated Three Waters Report prepared for the Site, and any associated technical guidance notes, no adverse effects on freshwater or terrestrial ecology relating to the wastewater management are anticipated.
110. According to the Integrated Three Waters Report the proposed stormwater pond will limit peak flows to predevelopment level for the 2-, 10- and 100-year storm events, with a 20% allowance for climate change, further reducing any potential negative environmental effects on Waitāua Stream.
111. Any works near Waitāua Stream or its margins will have to abide by strict sediment controls as outlined within the Integrated Three Waters Report to ensure that the release of fine sediment into the stream during construction phase is minimised. I understand that these requirements are included in the proposed conditions of consent³³.
112. When compared to the baseline environment, where stock have actively grazed this site for a number of decades resulting in the ongoing sedimentation, erosion and inputs of faecal matter into the Waitāua Stream systematically degrading water quality and habitat availability, in my opinion the Proposal will improve water quality within the catchment to a minor degree through stock exclusion in perpetuity.

³² Refer to the application for resource consent for the Proposal, Appendix 5: Integrated Three Waters Report.

³³ Refer to the Statement of evidence of Melissa McGrath, 31 October 2023, Attachment 2 (*Proposed Consent Conditions*).

113. Additional hydraulic inputs from the stormwater infrastructure being diverted into the Waitāua Stream are likely to result in a greater volume of water entering the freshwater environment to a minor degree, which will likely positively support the growth of hydrophytic vegetation along the riparian margins and therefore support habitat provision for instream fauna such as fish and invertebrates.
114. Therefore, I consider that the Proposal will not adversely affect the freshwater quantity, quality and general habitat values within the Waitāua Stream if recommendations relating to best practice integrated design, erosion and sediment control guidelines provided in the associated reporting prepared for the Proposal are followed. Revegetation planting of stormwater pond margins and Waitāua Stream margins within the proposed recreational reserve areas will provide for an additional vegetated buffer for any stormwater run-off from the development to be treated before entering the Waitāua Stream environment.

COMMENTS ON THE COUNCIL'S SECTION 42A REPORT

115. I have reviewed and considered the s42A Report to the extent it relates to matters within my area of expertise.
116. Council's s42A report does not outline any specific concerns regarding potential ecological effects of the Proposal and Mr Hartstone agrees with the conclusion provided within the Ecological Memo that any effects on existing ecological values are assessed as less than minor, subject to a requirement for a revegetation planting plan to be prepared for the reserves to vest. Mr Hartstone considers that the revegetation planting on the proposed reserve land will potentially generate some positive ecological effects.
117. I agree with Mr Hartstone's conclusion and consider that any potential adverse ecological effects associated with the Proposal can be avoided, minimised, mitigated or off-set through applying appropriate development controls and providing a sufficient revegetated buffer area between the development footprint and the Waitāua Stream. Provided that they are implemented successfully during construction and operational phases of the development, the potential adverse ecological effects can be managed by applying effects management hierarchy to be less than minor (or

negligible, as I have described such levels of effects in my evidence). The Proposal would, in my opinion, allow for appropriate off-set of proposed vegetation clearance and overall enhancement of the Waitāua Stream riparian corridor through revegetation planting and associated ongoing management delivering an overall environmental benefit.

PROPOSED CONSENT CONDITIONS

118. The following conditions have been included in the Proposed Consent Conditions where they relate to ecological aspects:

Prior to Commencing Any Works

- (a) Prior to the removal of any vegetation on the Site (except for the trees which are the subject of the Certificate of Compliance, as part of works for the consented development), the Consent Holder shall employ a suitably qualified and experienced ecologist to inspect all trees proposed to be cleared. The tree inspection should include assessment of active bird nests, indigenous lizard presence and assessment of bat roosts. Should any active bird nests, bat roosts or native herpetofauna be identified within the tree clearance footprint all works are to cease until appropriate Wildlife permits for salvage and relocation can be obtained. A summary of the vegetation pre-clearance assessment will be provided to Council within 7 working days of the date of the vegetation pre-clearance inspection.
- (b) The consent holder shall employ a suitably qualified and experienced ecologist, who must be onsite to supervise any vegetation removal. Should any active bird nests be identified during the pre-vegetation clearance survey, appropriate exclusion areas ($\geq 10\text{m}$) should be demarcated, nests monitored for fledging and vegetation clearance postponed until chicks have fledged.

That before the survey plan is certified pursuant to s 223 of the RMA, the following requirements are to be satisfied:

- (a) The Draft Revegetation Planting Plan (**RPP**) for lot 200 and 201 prepared by Wild Ecology (dated October 2023) is to be finalised

and submitted to Council's RMA Team Leader RMA Approvals and Compliance (or delegated representative) for approval.

- (b) The RPP shall as a minimum contain detail regarding site preparation for planting, eco-sourcing of plants, management of biosecurity and plant diseases, ongoing maintenance and monitoring, pest weed control, and pest animal control. Planting density shall be configured with a goal of achieving 90% canopy closure within five years of planting. Maintenance and monitoring shall be for a minimum of 5 years following the issue of 224(c) certificate.

Before a certificate is issued pursuant to s 224(c) of the RMA the following requirements are to have been satisfied:

- (a) That the RPP for lots 200 and 201 is implemented during the physical development of the Site to ensure that appropriate off-set mitigation planting and ecological enhancement of the Waitāua Stream corridor is carried out to deliver appropriate ecological outcomes.
- (b) All ecological planting, animal pest and weed management within lots 200 and 201 shall be implemented in accordance with the certified Revegetation Planting Plan. Evidence of compliance with this condition shall be provided to Council in writing from a suitably qualified and experienced ecologist prior to the issue of the s224(c) certificate.
- (c) Ongoing maintenance and monitoring including weed and pest animal control and plant replacement within lots 200 and 201 is to take place for minimum of 5 years following the issue of s224(c) certificate. Maintenance schedule is to follow the recommendations outlined within the certified Revegetation Planting Plan.
- (d) Upon the completion of the 5-year maintenance and monitoring period a Monitoring and Maintenance Completion Report prepared by a suitably qualified and experienced Ecologist and/or other evidence that demonstrates that ongoing maintenance has

been completed to the required standard, shall be provided to the satisfaction of Council's RMA Team Leader RMA Approvals and Compliance (or delegated representative).

- (e) The consent holder shall install signage at the public walkway entrance points to inform users that all dogs must be on leads at all times when entering these areas.

119. Overall, I consider that any adverse ecological effects of the Proposal can be sufficiently avoided, reduced or mitigated if the Proposed Consent Conditions are adopted and implemented.

CONCLUSION

120. In my opinion, the Proposal has been designed in a manner that recognises the existing ecological and environmental values and constraints of the Site. The Proposal follows the effects management hierarchy with appropriate avoidance, mitigation and off-set strategies employed to ensure that potential adverse ecological effects are negligible or, at worst, "minor" in RMA terms.

121. The Proposal aims to strengthen the ecological values of these features through establishing a recreational reserve along the Waitāua Stream margins, stock exclusion in perpetuity, appropriate revegetation planting and ongoing pest weed and pest animal control.

122. It is noted that individual tree clearance which are located in the central aspect of the Site is required to enable development of the Site in a coherent manner. The trees are not subject to any existing protection mechanisms, and I understand that their clearance is a permitted activity under WDP. The trees are generally considered to be of fair condition, albeit their ecological function in the landscape is limited to the provision of short-term resting grounds for common mobile avifauna. Significant off-set of the tree loss is proposed, and for every tree cleared approximately 250 new trees will be planted within the proposed recreational reserves (Lots 200 and 201) adjacent to the Waitāua Stream.

123. In my opinion, the Proposal presents a balanced outcome in relation to ecological matters, striking a balance between protecting and enhancing

areas of higher existing ecological values, while concentrating the potential future development within areas with minimal existing ecological values or functionality.

124. I consider that the potential adverse ecological effects of the Proposal can be secured through best practice sediment and erosion control measures and appropriate planning and development controls. Provided that they are implemented successfully, adverse effects on the environment would be negligible, and would, in fact, allow for the enhancement of Waitāua Stream corridor and its immediate margins and a delivery of a positive biodiversity gain.
125. In my opinion the Proposal will improve the overall ecological health, structure, condition and function of Waitāua Stream and its riparian margins where they expand over the Site. It does this through stock exclusion from the stream and its margins in perpetuity, revegetation of riparian margins and comprehensive pest weed and pest animal control, strengthening ecological networks by protecting existing ecological features on site, creating new habitats and buffer areas, and improving the services provided by ecosystems and resulting in an overall environmental benefit to the indigenous habitats on site and associated indigenous wildlife within the Site boundaries and immediate area.
126. It is my opinion that there are no ecological reasons to decline the application for consent.

DATED this 31st day of October 2023



.....
Madara Vilde

ATTACHMENT 1 - QUALIFICATIONS AND EXPERIENCE

1. My name is Madara Vilde. I am the Founder and Principal Ecologist at Wild Ecology, an ecological consultancy specialising in ecological restoration and sustainable land use management.
2. I have a BSc 1st Class Honours degree in Environmental Protection from University of Edinburgh (2017). I am also a member of the New Zealand Ecological Society (NZES).
3. I have 6 years' professional experience as an ecologist, working primarily in ecological consulting and environmental research, with a particular focus on terrestrial and aquatic ecology and application of Geographical Information Systems (GIS).
4. My professional work covers land and infrastructure development and my involvement in projects ranges from pre-purchase due diligence, preliminary ecological assessments/concept development design, resource consent applications, private plan change assessments, and implementation of monitoring and reporting of ecological effects and management.
5. My work primarily covers rural and greenfield sites and includes ecological surveys of freshwater and terrestrial values, assessment of their condition and value and interpretation of national, regional or district policies and rules regarding classification of ecological features, and management of potential adverse effects.
6. My project works spans across primarily Northland and Auckland Regions, including Kaipara District, where I conduct ecological surveys and assessments for resource consenting purposes. I also conduct peer reviews of resource consent applications for Kaipara District Council ("KDC") and Whangārei District Council ("WDC").

Examples of my experience relevant to this project are:

- (a) Advising private clients on a wide range of activities, including land development and subdivision proposals of all scales, with respect to the ecological aspects in relation to ecological enhancement as

well as avoidance, minimisation and mitigation of potential adverse effects.

- (b) Preparation of ecological reporting for private clients to form part of land use and resource consent applications, including ecological assessments, wetland and stream assessments, ecological management plans and completion of ecological works reports.
- (c) Carrying out wetland assessments for private clients utilising Wetland delineation protocols as per Ministry of Environment (MfE) 2022³⁴ for identifying and delineating wetlands based on vegetation, soils and hydrology in respect to meeting obligations of National Policy Statement on Freshwater Management 2020 (NPS-FM)³⁵ and National Environmental Standards for Freshwater Management 2020 (NES-FW)³⁶.
- (d) Representing private clients at resource consent and environment court hearings in Northland Region, including a resource consent hearing for Hurupaki Holdings Ltd in relation to assessment of ecological values, preservation and enhancement of biodiversity and adverse effects management.
- (e) Conducting ecological assessments (flora and fauna surveys) and preparation of ecological restoration/management plans for private landowners and local restoration groups including preparation of a Wetland Restoration Plan for Mangawhai Tracks Charitable Trust.
- (f) Providing ecological consulting services for Kaipara and Whangārei District Councils including the review of ecological reports, pest plant and animal management plans, and planting completion reports prepared for land use and resource consent applications.

³⁴ Ministry for the Environment. Wetland delineation protocols (2022).

³⁵ New Zealand Government (2020). National Policy Statement for Freshwater Management.

³⁶ New Zealand Government (2020). Resource Management (National Environmental Standards for Freshwater) Regulations 2020.

ATTACHMENT 2 – DRAFT REVEGETATION PLANTING PLAN



WILD ECOLOGY

DRAFT Revegetation Planting Plan

Section 1 SO 65970

Dip Road, Kamo

Prepared for
Onoke Heights Limited

October 2023

DOCUMENT QUALITY ASSURANCE

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Status:	DRAFT	
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CONTENTS

Document quality assurance	3
1.0 INTRODUCTION	3
1.1 Scope.....	3
1.2 Ecological enhancement proposal.....	3
1.3 Purpose and Objectives	5
2.0 REVEGETATION PLANTING PLAN.....	5
2.1 Vegetation pre-clearance survey	6
2.2 General controls	6
2.2.1 Changes to water levels or movement.....	6
2.2.2 Use of heavy machinery	6
2.2.3 Erosion/sediment controls.....	7
2.2.4 Avoidance of adverse effects	7
2.2.5 Weed control strategy	7
2.3 Timeframes.....	8
2.4 Site specific pest plant and weed control.....	11
2.5 Eco-sourcing	22
2.6 Biosecurity management.....	22
2.7 Disease prevention.....	22
2.7.1 Myrtle rust.....	22
2.7.2 Kauri dieback.....	23
2.8 Planting timeframes and specifications	24
2.9 Proposed planting detail	24
2.9.1 Infill planting.....	27
2.9.2 Buffer planting.....	27
2.9.3 Stormwater pond edge planting	28
2.10 Plant releasing.....	31
2.11 Blanking.....	32
2.12 Pest animal control.....	32
3.0 MONITORING.....	35
4.0 REFERENCES.....	36
APPENDIX 1 – REVEGETATION PLANTING PLAN.....	37
APPENDIX 2 – RECORD KEEPING FORMS.....	38

1.0 INTRODUCTION

1.1 Scope

Onoke Heights Limited ('the Applicant') have applied for a resource consent to undertake a 93 residential lot subdivision, along with other associated works at Section 1 SO 65970, Dip Road, Kamo.

This Revegetation Planting Plan (RPP) has been prepared in accordance with the recommendations contained within the Ecology Memo prepared by Wild Ecology dated December 2022 and details site specific management actions of the proposed revegetation planting proposal within the proposed recreational reserve areas (Lot 200 and 201), including revegetation planting using an appropriate mixture of eco-sourced pioneer and successional species including large grade trees to account for the proposed vegetation clearance, stock exclusion, pest animal and plant control, biosecurity and disease management and ongoing monitoring.

1.2 Ecological enhancement proposal

As part of the resource consent application the Applicant proposes revegetation planting, pest weed and pest animal control of approximately 0.9567 ha of land (Figure 1) extending along the Waitāua Stream corridor abounding the southern boundary of the site within proposed recreational reserve areas (Lot 200 and 201). Appropriate revegetation planting with eco-sourced indigenous species is proposed to extend from the margins of the Waitāua Stream as part of stream ecological enhancement works and off-set/mitigation planting to account for the loss of indigenous vegetation to be cleared as part of the proposed site's development. It is considered that these actions will ensure that the core ecological values of the Waitāua Stream are maintained and enhanced as part of the proposed sites development.

The proposal will provide for a wide variety of ecosystem services including habitat provisioning services, erosion protection, nutrient filtration, provision of habitat for indigenous fauna and associated ecosystem, cultural and recreational services. It will also enhance the amenity values for the residents of the future subdivision and neighbouring sites through large scale pest weed control and promote enjoyment of the existing ecological values on site.



Figure 1: Proposed revegetation planting areas plan

1.3 Purpose and Objectives

The overall objective of the revegetation planting proposal is to enhance the Waitāua Stream riparian corridor extending along the southern aspect of the site and provide for off-set/mitigation planting to account for the proposed vegetation clearance.

The ecological aims of the proposed ecological environmental benefit planting area are to:

- Provide enhancement of approximately 0.9567 ha of land directly adjoining Waitāua Stream riparian corridor;
- Provide for a planted buffer between the proposed new development areas and the Waitāua Stream through mitigation planting;
- Maintain and enhance ecological processes of regeneration and succession within the proposed revegetation planting area;
- Enhance the overall habitat availability and suitability for a variety of terrestrial fauna.

The practical management actions to achieve those aims are to:

- Reduce weedy pest plant incidence within the proposed revegetation planting areas to a practicable minimum;
- Achieve 90% canopy cover and 90% survivorship of revegetation plantings within 5 years from planting;
- Manage pest weeds on an ongoing basis to allow for successful establishment of the revegetation plantings;
- Control pest animals to a level where successful establishment of revegetation plantings is possible and natural regeneration processes can begin;
- Use eco-sourced and locally propagated plants suitable for the site conditions and locality to preserve genetic integrity of the vegetation present on site.

2.0 REVEGETATION PLANTING PLAN

Following the baseline ecological surveys carried out on site during November 2022 and September 2023 and preparation of Ecological Memo for the site's development proposal, this Revegetation Planting Plan (RPP) has been prepared to provide detail on how physical revegetation and ecological enhancement works within the proposed recreational reserve areas (Lot 200 and 201) can be carried out in a cohesive manner.

The overall area proposed for revegetation planting covers approximately 0.9567 ha. The proposed revegetation planting area encompasses and expands the Waitāua Stream riparian corridor, allowing to provide a wider revegetated buffer area between the proposed built development and Waitāua Stream.

The ecological management actions for the ecological enhancement and revegetation planting can be divided into the following:

- Initial vegetation pre-clearance surveys;
- Initial weed control within the proposed revegetation planting areas;
- Site preparation for planting;

- Conducting revegetation planting utilising appropriate eco-sourced species based on the sites locality and setting;
- Management of biosecurity risks, non-eco sourced plants and environmental pest weeds into the site;
- Initial set-up of a pest animal control network and ongoing management;
- Ongoing weedy species maintenance and plant replacement;
- Record keeping and monitoring.

The following sections detail site specific ecological management actions and outline suggested timeframes and frequency of any proposed maintenance and monitoring to be carried out.

2.1 Vegetation pre-clearance survey

It is recommended that a vegetation pre-clearance survey is conducted prior to any vegetation clearance taking place on site. While previous surveys of the individual trees proposed to be cleared have been carried out during November 2022 and September 2023 surveys and no susceptible fauna were observed utilising these trees for nesting or roosting, an additional vegetation pre-clearance survey should be carried out by a suitably qualified ecologist prior to vegetation clearance taking place to ensure that no nesting birds are present within the affected trees and that no bat roost activity in the trees is recorded.

2.2 General controls

2.2.1 Changes to water levels or movement

No changes to water level or movement are expected to occur as part of the proposed revegetation planting works. No water is proposed to be dammed or diverted as part of the revegetation planting works. All weed control and initial site preparation works are to be undertaken with manual low-impact hand-held machinery and no heavy machinery is to be used within the proposed revegetation planting areas.

All site preparation and weed control works are to take place during periods of extended dry weather forecast to ensure that sediment and erosion of the land is avoided. It is proposed that the initial site preparation works (weed control and site preparation for planting) take place during summertime or early autumn. If works are carried out as per the recommended site-specific control methodology (i.e. using only low-impact hand held tools) any soil disturbance is likely to be minimal.

2.2.2 Use of heavy machinery

2.1.2.1 Weed control

All weed control and initial site preparation works is to be undertaken with manual low-impact hand-held machinery and no heavy machinery is to be used.

Site preparation for planting is likely to require a blanket spray of suitable herbicide to ensure appropriate dieback of weedy pasture grasses that may interfere with planting is achieved. It is

deemed that good access from dryland slopes is available for a spray truck with an extendible hose attachment (100m) to be used for this work manned by a suitably qualified landscape contractor.

2.2.3 Erosion/sediment controls

The greatest risk of sedimentation/erosion related effects on site are likely to arise as part of the proposed initial weed control works. The overall risks can be minimised by using experienced landscape contractors for the works and carrying out weed control during optimal weather conditions (i.e. a period of forecasted dry weather). All weed control works undertaken on site will need to be supervised by a suitably experienced landscape contractor.

2.2.4 Avoidance of adverse effects

No 'At Risk' or 'Threatened' fauna were noted on site during site survey visits in November 2022 and September 2023. Some of the exotic trees and shrubs proposed to be removed/controlled within the Waitāua Stream corridor area provide optimal habitat for common indigenous and exotic avifauna nesting. To minimise potential adverse effects on susceptible avifauna, it is proposed that a suitably qualified ecologist inspects the area prior to the initial vegetation and pest weed clearance works.

2.2.5 Weed control strategy

Different plant species may be considered a weed in different locations, often depending on land use or the environment in which it is growing. For the purposes of this report, a 'weed' is defined as any exotic plant growing where it is not wanted, and which has an adverse effect on the natural environment it's growing in.

In Northland Region, Northland Regional Pest and Marine Pathway Management Plan 2017–2027 (Northland Regional Council 2017) (from hereinafter referred to as 'the Plan') sets out priorities and goals for managing animal and plant pests in Northland. Many of the pest plants in Northland Region are persistent in the environment and spread easily, therefore good site weed control is key to reducing the risk of further spread and ensuring that pest weeds do not detrimentally affect ecological values of high value natural environments.

Generally, a good weed control strategy will take an integrated approach to weed management and involve the following 5 phases:

- **Initial control** – control mature pest plant species through felling, drilling & filling or stump cutting & painting which can be carried out during any time of the year;
- **Manual control** – minimise agrichemical use where possible through manual control of weeds – raking, digging, pulling out smaller seedlings, can be carried out all year round;
- **Foliar spray** – efficient way to target larger areas of pest plants, and is well suited to dense shrubs, grasses and vines, usually applied from a backpack sprayer, or in larger infestations a vehicle such as a spray truck or tractor. Aimed at controlling all target species using targeted spray to control specific weed species, generally undertaken between spring and autumn for best results;

- Seedling control – focuses on control of any new germinating species or species invading from surrounding sites until seedbank is exhausted. Generally undertaken all year round;
- Ongoing maintenance – this is aimed at ensuring that reinvasion of weedy species is minimal and action is taken as soon as newly germinating seedlings reappear. Generally, should be undertaken a minimum biannually during spring and autumn.

Weed control should be undertaken by suitably qualified/trained horticultural technicians, as on the ground decisions are essential for long-term successful weed management on the site. Using experienced contractors will ensure that herbicides are handled correctly, and that necessary precautions are undertaken and that herbicides are applied with accordance of industry best practice, and during appropriate weather conditions. Agrichemical applicators should be GrowSafe certified and wear suitable PPE. All agrichemical use including (but not limited to) transport, storage, disposal, training, notification of use, use near waterways and application shall comply with the industry standard NZS 8409:2004 and relevant standards included in the Proposed Regional Plan for Northland (Appeals – June 2023).

Erosion, vegetation disposal and boundary issues are other key considerations to take into account when designing a site-specific weed control strategy especially in areas that contain susceptible aquatic environments. A mix of manual and chemical-based control methods for such areas is advised, combined with a revegetation programme that follows shortly after initial weed control efforts to ensure that erodible slopes are revegetated as quickly as possible.

2.3 Timeframes

A 5-year management plan has been prepared to achieve the ecological outcomes for the proposed revegetation planting areas (see Table 1). The plan should be adjusted during implementation based on the results of monitoring, surveys, and overall progress with implementation.

Table 1 below provides a basic breakdown of tasks/milestones to be achieved as part of the ecological works. Proposed target timeline for restoration planting for Year 1 is to be between April and September.

Site preparation for revegetation planting and weed control should be carried out a minimum 2 weeks prior to revegetation planting to suppress weedy species presence within the proposed planting areas to an appropriate level. Initial establishment of pest animal control network is to take place following establishment of the revegetation plantings. Target completion date for Year 1 restoration efforts is October–September from which ongoing maintenance should commence for a total duration of 5 years. A Completion of Ecological Works report is to be submitted to WDC following the initial works completion.

Once initial planting, weed and pest animal control has been established, ongoing weed control/revegetation planting maintenance should occur twice a year during Years 1, 2 and 3, and once a year during Years 4 and 5. For pest animal control, ongoing monthly maintenance and monitoring for 5 years is recommended. Example maintenance and monitoring forms can be found under Appendix 2.

Regarding monitoring, evidence of compliance with the RPP is required to be submitted to Council five (5) years from the date of approval of the Completion of Ecological Works report. This will detail the yearly management effort and ensure that the ecological restoration detail as described under the RPP has been sufficiently implemented and a minimum of 90% canopy cover and 90% survivorship of indigenous revegetation plantings have been achieved by Year 5.

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Table 1: Revegetation Planting Management Plan for Lots 200 and 201 Dip Road Kamo (Section 1 SO 65970) – 5 Year Schedule of Works

Revegetation Planting Management Plan for Lots 200 and 201 Dip Road, Kamo (Section 1 SO 65970) – 5 Year Schedule					
ITEM	(YEAR 1)	(YEAR 2)	(YEAR 3)	(YEAR 4)	(YEAR 5)
Weed control/site preparation for planting/ongoing maintenance	2 weeks - 1 month prior to planting & 1 x Nov-December	1 x Feb-March & 1 x Nov-December	1 x Feb-March & 1 x Nov-December	1 x Feb-March	1 x Feb-March
Revegetation planting	April-September				
Infill planting/blanking		April-September	April-September (if required)	April-September (if required)	April-September (if required)
Initial pest trap and bait station supply & install	Post revegetation planting and initial weedy species control efforts				
Pest trap monthly check, rebait and monitor	October/November ongoing (monthly)	January - ongoing (monthly)	January - ongoing (monthly)	January - ongoing (monthly)	January - ongoing (monthly)
Monitoring report submitted to WDC (prepared by a suitably qualified ecologist)	Upon completion of physical ecological restoration works				Five years from the date of Council approved Completion of Ecological Works report

2.4 Site specific pest plant and weed control

The majority of the proposed revegetation planting area is currently comprised of exotic weedy species, with a small remnant of indigenous trees comprising of 2 x kauri (*Agathis australis*), 2 x totara (*Podocarpus totara*), 1 x pohutukawa (*Metrosideros excelsa*), 1 x taraire (*Beilschmiedia taraire*) with small scattered stands of mamaku (*Sphaeropteris medullaris*) (Figure 2).

The majority of the immediate margins of the Waitāua Stream are dominated by exotic pest weed species (Table 2), some of which are likely 'garden escapees' from nearby residential properties. Weedy species (Figure 3) included a dense sward of queen of the night (*Cestrum nocturnum*), purple cestrum (*Cestrum elegans*), lantana (*Lantana camara*), woolly nightshade (*Solanum mauritianum*), Elaeagnus (*Elaeagnus x reflexa*), Taiwan cherry (*Prunus campanulata*), coral tree (*Erythrina x sykesii*) and Queensland poplar (*Homalanthus populifolius*) were observed extending along the entirety of the Waitāua Stream riparian corridor. Jasmine (*Jasminum polyanthum*) and Black-eyed Susan vine (*Thunbergia alata*) were observed to grow in large thickets over the existing onsite vegetation. Weeds were also present in the ground tier including climbing asparagus (*Asparagus scandens*), canna lily (*Canna indica*), montbretia (*Crocasmia x crocosmiiflora*), onion weed (*Allium triquetum*), elephants' ear (*Alocasia brisbanensis*), Arum lily (*Zantedeschia aethiopica*), wild ginger (*Hedychium gardnerianum*), periwinkle (*Vinca major*), wandering willie (*Tradescantia fluminensis*) and nasturtium (*Tropaeolum majus*).

Some of the weeds on site are designated as 'Sustained Control' plants in Northland Regional Pest and Marine Pathway Management Plan 2017-2027 (NRPMPMP) or have known tendency to naturalise and impede growth of indigenous revegetation plantings or natural regeneration processes. Long-term management (5-years from initial weed control efforts) over the proposed revegetation planting area will be required to reduce the weedy pest plant species to a practicable minimum and allow for successful establishment of the revegetation plantings.

It is considered that the weed control within the proposed revegetation planting area is largely within the initial control and foliar spray phases which requires for all weeds to be sufficiently controlled prior to planting. It is proposed that the weed control work within this area takes place as a combination of selective manual control (pulling, grubbing, cutting, felling) and use of selective backpack spray/spray truck (during appropriate weather conditions and only using chemical approved for the use nearby water). Selective spray of scrambling and shrubby species is proposed for control of kikuyu, blackberry, exotic grass species. Generally, herbicide selection and dose will be determined by the weed control contractor following the manufacturers guidelines.

Herbicides should only be applied during periods of active growth and during suitable weather conditions (little to no wind in order to minimise spray drift). If weather conditions are not suitable, spraying should be delayed until weather conditions improve. Spray marker dye should be added to all spray solutions to ensure full coverage of all weed infestations is achieved and agrichemical use is efficient.



Figure 2: Showing the general composition of the small remnant of indigenous trees near Waitāua Stream



Figure 3: The majority of the riparian margins of the Waitāua Stream are dominated by exotic pest plants










Figure 4: The majority of the riparian margins of the Waitāua Stream are dominated by exotic pest plants









Figure 5: A number of garden escapees such as Swiss cheese plant were observed growing along the immediate stream margins





Table 2: Weedy species observed on site and their proposed control mechanism

Botanical name	Common name	Photo ID	Designation according to the NRPMPMP	Recommended control technique
<i>Allium triquetum</i>	Onion weed		Not a legally declared pest plant	<ol style="list-style-type: none"> 1. Dig out small patches (all year round): dispose of at refuse transfer station, burn or bury. 2. Overall spray: metsulfuron-methyl 600g/kg (3g/10L).
<i>Alocasia brisbanensis</i>	Elephant's ear		Sustained Control	<ol style="list-style-type: none"> 1. Hand pull small seedlings in high light areas. 2. Slash tops, Leave on site to rot down. Dig out tubers, bury deeply, or dispose of at a refuse transfer station. 3. Stump paint: Slash near ground level and treat fresh stumps with metsulfuron-methyl 600g/kg (1g) + glyphosate (100ml) + penetrant per 1L. 4. Spray: metsulfuron-methyl 600g/kg (3g) + glyphosate (150ml) + penetrant per 10L.
<i>Asparagus scandens</i>	Climbing asparagus		Not a legally declared pest plant	<ol style="list-style-type: none"> 1. Dig out tubers. Dispose of at a refuse transfer station, burn or bury. Other plant material can be left on site to rot down. 2. Spray (spring-early summer only): glyphosate (20ml/L). Do not add penetrant when spraying against tree trunks. Spray lightly, avoiding runoff, total coverage not required. 3. Spray (autumn and winter in frost free areas and on healthy growth): glyphosate (10ml/L). Infestations of plants taller than 60cm should be cut at a height of 30-60cm then this lower vegetation can be carefully sprayed. The remaining cut material will die without the need for treatment. Spot spray any missed plants within 30-60 days.





<p><i>Canna indica</i></p>	<p>Canna lily</p>		<p>Not a legally declared pest plant</p>	<p>1. Dig out scattered plants (all year round): Remove all roots and rhizomes and dispose of at a refuse transfer station. 2. Cut stems and paint: metsulfuron-methyl 600g/kg (1g) + glyphosate (50ml) + penetrant per 1L water, or a 3-5mm layer of picloram gel. Mulch the leaves and dispose of seeds at a refuse transfer station. 3. Overall spray (spring-summer): metsulfuron-methyl 600g/kg (2g) + glyphosate (100ml) + penetrant per 10L water.</p>
<p><i>Cestrum elegans</i></p>	<p>Purple cestrum</p>		<p>Not a legally declared pest plant</p>	<p>1. Pull out small plants (all year round), leave on site to rot down. 2. Cut down and paint stump (all year round): a product containing 100g picloram+300g triclopyr/L (100ml/L) or triclopyr 600 EC (100ml/L) or triclopyr 120g/L (500ml/L). 3. Spray (spring-summer): triclopyr 600 EC (30ml/10L) or triclopyr 120g/L (15ml/L).</p>
<p><i>Cestrum nocturnum</i></p>	<p>Queen of the night</p>		<p>Sustained Control</p>	<p>1. Pull out small plants (all year round), leave on site to rot down. 2. Cut down and paint stump (all year round): a product containing 100g picloram+300g triclopyr/L (100ml/L) or triclopyr 600 EC (100ml/L) or triclopyr 120g/L (500ml/L). 3. Spray (spring-summer): triclopyr 600 EC (30ml/10L) or triclopyr 120g/L (15ml/L).</p>
<p><i>Crocasmia crocosmiiflora</i></p>	<p>x Montbretia</p>		<p>Not a legally declared pest plant</p>	<p>1. Dig out very small sites. Usually futile in large spots as corms resprout. Dispose of corms at a refuse transfer station, or by burning or by deep burial. 2. Spray (full leaf stage): glyphosate (10ml/L) + metsulfuron-methyl 600g/kg (4g/10L + penetrant).</p>


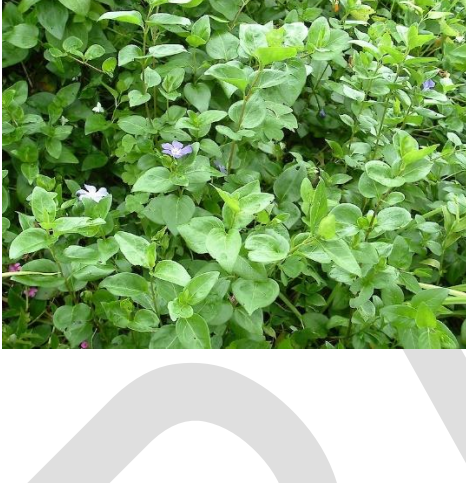

<i>Delairea odorata</i>	German ivy		Not a legally declared pest plant	<p>1. Hand pull small plants, or dig out roots (all year round). Leave on site to rot down.</p> <p>2. Stump swab (all year round): glyphosate (100ml/L) or metsulfuron-methyl 600g/kg (1g/L). Leave on site to rot down.</p> <p>3. Cut stems below waist height, spray below this point (spring-summer to actively growing plants): glyphosate (10ml/L (knapsack) or 2L/100L (spraygun)) or metsulfuron-methyl 600g/kg (2g/10L (knapsack) or 20g/100L (spraygun)) or a product containing 100g picloram+300g triclopyr/L (60ml/10L) or a product containing 200g 2,4-D+100g dicamba/L (12ml/L) or dicamba 50g/L (24ml/L) or amitrole (150ml/15L (knapsack) or 2L/100L (spraygun)). Add penetrant to all mixes.</p>
<i>Elaeagnus x reflexa</i>	Elaeagnus		Not a legally declared pest plant	<p>1. Dig out with machinery wherever possible. Dry and burn roots and stems or bury deeply.</p> <p>2. Stump swab (ground level): glyphosate (250ml/L) or a product containing 100g picloram+300g triclopyr/L (undiluted) or picloram gel. Follow up likewise on suckers. Dispose of cut stems at a refuse transfer station, burn or bury deeply to prevent resprouting.</p> <p>3. Injection (best in autumn): drill holes sloping into the sapwood at regular intervals around the tree. As each hole is drilled place glyphosate (250ml/L) or metsulfuron-methyl 600g/kg (20g/L) or a product containing 100g picloram+300g triclopyr/L (undiluted) into the hole.</p> <p>4. Frilling: use a sharp chisel or axe and make deep cuts into the sapwood at regular intervals around the base of the tree, taking care not to ring-bark the plant. Immediately apply glyphosate (250ml/L) or a product containing 100g picloram+300g triclopyr/L (undiluted) to the cuts using a paintbrush or a squeeze bottle.</p> <p>5. Spray: glyphosate (300ml/15L (knapsack) or 2L/100L (spraygun)) or metsulfuron-methyl 600 g/kg (5g/10L on small plants and regrowth). Treatment may need to be repeated.</p>
<i>Eriobotrya japonica</i>	Loquat		Not a legally declared pest plant	<p>1. Hand pull or dig small seedlings (all year round). Leave on site to rot down.</p> <p>2. Ringbark large trees (all year round), leave to die standing.</p> <p>3. Cut down big plants close to ground (all year round). Leave on site to rot down.</p> <p>4. Cut and squirt (all year round): make 1 cut per 100 mm around trunk diameter, apply 1g metsulfuron-methyl 600g/kg per cut.</p> <p>5. Spray (spring-summer): metsulfuron-methyl 600g/kg (5g/10L).</p>

<i>Erythrina x sykesii</i>	Coral tree		Not a legally declared pest plant	<p>1. Bore and fill (all year round): Make 1 hole every 150 mm around the trunk and fill or saturate each hole with metsulfuron-methyl 600g/kg (3g mixed with water) or 20ml of a product containing 100g picloram+300g triclopyr/L (undiluted).</p> <p>2. Cut and squirt (all year round): Make 1 cut every 100mm around the trunk and fill or saturate each cut with metsulfuron-methyl 600g/kg (2g mixed with water) or 15ml of a product containing 100g picloram+300g triclopyr/L (undiluted).</p> <p>3. Frilling (all year round): Ensure complete frill achieved and paint frills thoroughly with metsulfuron-methyl 600g/kg (5g /L + penetrant) or a product containing 100g picloram+300g triclopyr/L (200ml/L).</p>
<i>Hedychium gardnerianum</i>	Wild ginger		Sustained Control	<p>1. Cut down and paint stump (all year round): cut above pink 'collar' at base and apply picloram gel or glyphosate (250ml/L) or metsulfuron-methyl 600g/kg (1g /L) or metsulfuron gel. Leave stems and leaves on site to rot down.</p> <p>2. Dig or pull out small plants (all year round). Don't compost, leave on site to rot down or hang rhizomes in trees, as they survive indefinitely. Dispose of rhizomes at a refuse transfer station or by drying out and burning.</p> <p>3. Spray (all year round): metsulfuron-methyl 600g/kg (5g/10L knapsack). Add penetrant in winter. For dense patches keep spray away from roots of vulnerable plants. Don't replant sprayed sites for 6 months.</p>
<i>Homalanthus populifolius</i>	Queensland poplar		Not a legally declared pest plant	<p>1. Grub out seedlings (all year round).</p> <p>2. Cut and stump paint larger plants: picloram gel.</p> <p>3. Spray smaller plants: metsulfuron methyl 600g/kg (5g/10L).</p>

<i>Impatiens sodenii</i>	Sod's balsam		Not a legally declared pest plant	<ol style="list-style-type: none"> 1. Dig out: dispose of all parts at refuse transfer station, bury or burn. 2. Spray: glyphosate (150ml/15L + penetrant (knapsack) or 10ml/L + penetrant (spraygun spray)) or metsulfuron-methyl 600g/kg (4g/15L + penetrant (knapsack) or 20g/100L + penetrant (spraygun)). Avoid spray runoff.
<i>Jasminum polyanthum</i>	Jasmine		Sustained Control	<ol style="list-style-type: none"> 1. Stump swab (all year round): metsulfuron-methyl 600g/kg (5g/L) or a product containing 200g/litre 2,4-D plus 100g/litre dicamba (200ml/L) or dicamba 50g/L (400ml/L). Add penetrant to all mixes. Dispose of all cut stems at a refuse transfer station, or burn or bury deeply. 2. Spray (regrowth): glyphosate (150ml/15L + penetrant (knapsack) or 1L/100L + penetrant (spraygun)) or metsulfuron-methyl 600g/kg (5g/10L + penetrant (knapsack) or 40g/100L + penetrant (spraygun)) or a product containing 200g 2,4-D+100g dicamba/L (120ml/L) or dicamba 50g/L (24ml/L).
<i>Lantana carnara</i>	Lantana		Progressive containment	<ol style="list-style-type: none"> 1. Spray (best Nov-Dec): glyphosate (100ml/10L + penetrant). 2. Cut down and paint stump (all year round): glyphosate (200ml/L). 3. Dig out. Generally not recommended as roots resprout unless all fragments removed. Use only on small plants and where herbicides cannot be used. Leave on site to rot down.
<i>Ligustrum lucidum</i>	Tree privet		Sustained Control	<ol style="list-style-type: none"> 1. Pull or dig seedlings (all year round). Leave on site to rot down. 2. Cut and paint stump (within 15 minutes of cutting): glyphosate (200ml/L) or metsulfuron-methyl 600g/kg (5g/L + penetrant) or a product containing 100g picloram+300g triclopyr/L (200ml/L) 3. Frilling: make deep cuts into the sapwood at regular intervals around the base of the tree, taking care not to ring-bark the plant, immediately saturate the cuts with metsulfuron-methyl 600 g/kg (5g/10L + penetrant) or a product containing 100g picloram+300g triclopyr/L (undiluted) . 4. Injection method: Drill sloping holes into the sapwood at regular intervals around the tree, immediately saturate with metsulfuron-

				<p>methyl 600 g/kg (5g/10L + penetrant) or a product containing 100g picloram+300g triclopyr/L (undiluted).</p> <p>5. Spray (spring-autumn): metsulfuron-methyl 600g/kg (5g/10L + penetrant).</p>
<i>Monstera deliciosa</i>	Swiss cheese plant		Not a legally declared pest plant	<p>1. Stump swab (all year round): metsulfuron-methyl 600g/kg (5g /L). Best for aerial vines. Use a paint brush to liberally cover the cut surfaces within 15 minutes of cutting and all stem bases where exposed.</p> <p>2. Spray (summer): glyphosate (10ml/L) or metsulfuron-methyl 600g/kg (5g/10L (knapsack) or 40g/100L (spraygun)) or a product containing 100g picloram+300g triclopyr/L (60ml/10L). Add penetrant to all mixes. Do not use for ivy growing against trees.</p>
<i>Prunus sp.</i>	Cherry and plum trees (ornamental)		Not a legally declared pest plant	<p>1. Pull (all year round): pull out seedlings and small plants. Mulch.</p> <p>2. Cut and stump treat (all year round): paint freshly cut stump with metsulfuron-methyl 600g/kg (5g/L) or a product containing 100g picloram+300g triclopyr/L (100ml/L). Mulch cut branches and leaves.</p> <p>3. Cut and inject (all year round): cut a notch in the trunk on a downward angle and inject with 2ml metsulfuron-methyl 600g/kg (20g/L) or 10ml of a product containing 100g picloram+300g triclopyr/L (undiluted).</p> <p>4. Drill and inject (all year round): drill holes around trunk at 5 cm intervals and inject with 2ml of metsulfuron-methyl 600g/kg (20g/L) or 10ml of a product containing 100g picloram+300g triclopyr/L (undiluted).</p> <p>5. Ringbark and inject (all year round): cut a complete ring around the trunk on a downward angle and inject with metsulfuron-methyl 600g/kg (20g/L) or a product containing 100g picloram+300g triclopyr/L (100ml/L).</p> <p>6. Overall spray (summer): metsulfuron-methyl 600g/kg (5g/10L) or a product containing 100g picloram+300g triclopyr/L (6ml/L).</p>

<p><i>Rubus fruticosus</i> Blackberry agg</p>		<p>Not a legally declared pest plant</p>	<p>1. Dig out small patches (all year round): Dispose of root crowns and rhizomes at a refuse transfer station or burn or bury deeply. 2. Stem scrape and paint with undiluted glyphosate immediately. Small patches only. 3. Cut and paint stumps: glyphosate (200ml-500ml/L). Small patches only. 4. Spray (summer-autumn, before leaves become brittle): metsulfuron-methyl 600g/kg (7.5g/15L) or a product containing 100g picloram+300g triclopyr/L (60ml/15L) or triclopyr 600 EC (60ml/15L).</p>
<p><i>Solanum mauritianum</i> Wooley nightshade</p>		<p>Sustained Control</p>	<p>1. Pull up all small plants (easiest in winter). Leave on site to rot down. 2. Cut and squirt (all year round): make cuts at regular intervals around the trunk, apply 1.5ml of a product containing 100g picloram+300g triclopyr/L (undiluted) per cut.</p>
<p><i>Thunbergia alata</i> Black eyed Susan vine</p>		<p>Not a legally declared pest plant</p>	<p>1. Pull roots up (all year round): Cut off above ground or tie stems in air to prevent them forming roots on contact with soil. 2. Cut trunk and paint stump (all year round): cut trunk near to the ground, and swab freshly cut stump with metsulfuron-methyl 600g/kg (1g/L) or a product containing 100g picloram+300g triclopyr/L (100ml/L) or triclopyr 600g/L (100ml/L) or a product containing 200g 2,4-D+100g dicamba/L (200ml/L).</p>
<p><i>Tradescantia fluminensis</i> Wandering willie</p>		<p>Not a legally declared pest plant</p>	<p>1. Rake and roll up (usually small spots only, to minimise initial spray). Best in drought period. Work towards centre. Dispose of at a refuse transfer station, burn or bury. Usually spray follow up. Major disposal problem, dropped fragments can spread infestation. 2. Spray: triclopyr 600 EC (6ml/L + penetrant) or triclopyr 120g/L (30ml/L + penetrant) or triclopyr 300 EC (12ml/L). 90+% kill. Follow up quickly (2-3 months) before plant recovers. 2-3 treatments needed for total control. 3. Spray: glyphosate (20ml/L + penetrant) or triclopyr 600 EC (3ml/L + penetrant) or triclopyr 120g/L (15ml/L + penetrant). Follow up quickly (2-3 months) before plant recovers. 2-3 treatments needed for control.</p>

<p><i>Tropaeolum majus</i></p>	<p>Nasturtium</p>		<p>Not a legally declared pest plant</p>	<ol style="list-style-type: none"> 1. Pull up all vegetation (all year round). Dispose of at a refuse transfer station or burn or bury deeply. 2. Spray (spring-summer): glyphosate (10ml/L + penetrant).
<p><i>Vinca major</i></p>	<p>Periwinkle</p>		<p>Sustained Control</p>	<ol style="list-style-type: none"> 1. Dig out very small sites. Dispose of plant material at a refuse transfer station or burn. Check for regrowth. 2. Spray (all year round): glyphosate (20ml/L + penetrant). Requires constant follow up. 3. Spray (all year round): glyphosate (20ml) + metsulfuron-methyl 600g/kg (1g) per 10L water. Avoid use within drip line of susceptible species. 4. Mowing: For level, easily accessed land, mow with lawnmower on very low setting, 2-3 times a year. As it regrows, follow up by grubbing remaining roots with grubber or shovel. Leave on site to rot down. Takes 1-2 years to eradicate. 5. Smothering: use black plastic or weedmat. Cover sites as they are, or rake into big rolls and then cover (6+ months). Hand-remove surviving plants.
<p><i>Zantedeschia aethiopica</i></p>	<p>Arum lily</p>		<p>Sustained Control</p>	<ol style="list-style-type: none"> 1. Slash tops: Leave on site to rot down. Dig out tubers, dry and burn or bury deeply. 2. Cut down and paint stump: metsulfuron-methyl 600g/kg (1g) + glyphosate (100ml) + penetrant per L water. Leave on site to rot down. stems and leaves. 3. Spray: metsulfuron-methyl 600g/kg (3g) + glyphosate (150ml) + penetrant per 10L water.

2.5 Eco-sourcing

All plant material to be utilised for revegetation planting should be where feasible, practicable and affordable, eco-sourced from the Whangārei Ecological District preferably within proximity to the site (<25 km). Eco-sourcing conserves natural, genetic and phenotypic diversity in local native plant populations. These plants are also more likely to adapt to local growing conditions. Plants should be propagated utilising seed or cuttings, where appropriate, and only by certified practitioners.

Considerations associated with eco-sourced plants include:

- the availability of eco-sourced plant stock commercially available;
- lead in times required for the collection of seed, and plant propagation to meet project requirements;
- eco-sourcing from within the ecological district from multiple parent individuals is the approach advocated to ensure genetic characteristics of a local population are not overwhelmed by the mass introduction of a remotely occurring relatives.

All plants should be hardy and healthy nursery stock, free of disease, pests and without any physical damage.

2.6 Biosecurity management

Plant material shall only be sourced from plant nurseries with strict biosecurity protocols in place to avoid the introduction of diseased plants (e.g. myrtle rust) or unwanted organisms such as rainbow skinks (*Lampropholis delicata*) and Argentine ants (*Linepithema humile*) into the subject site.

It is recommended that the plant nursery providing the eco-sourced plant material is a certified member (or as a minimum registered) of the New Zealand Plant Producers Incorporated (NZPPI) Plant Pass Scheme. Plant Pass is a certification scheme that is designed to help plant producers identify, control, manage or avoid biosecurity hazards in their nurseries. It aims to identify, control, manage or avoid pest and biosecurity hazards in the nursery and production processes, protecting the producer, their customers, the environment and the New Zealand economy from the inadvertent introduction and dispersal of a pests.

2.7 Disease prevention

2.7.1 Myrtle rust

Myrtle rust is a plant disease caused by the fungus *Austropuccinia psidii*. It produces powder-like spores that can be easily spread through direct contact or by the wind. Once established on a host tree or shrub, it destroys new growth and soft tissues, eventually killing the plant.

Myrtle rust can be dispersed by:

- movement of infected plant material (nursery stock, cut flowers, plant cuttings, germplasm)
- movement of contaminated equipment (secateurs, chainsaws)
- wind, water (wind-driven rain, irrigation) and gravity
- animals and insects, including bees, birds, other wildlife and pets
- humans (on clothing)
- vehicles.

Best practice for preventing the spread of myrtle rust caused by *Austropuccini psidii* shall be adhered to when working with plants within the *Myrtaceae* family e.g. manuka.

- Visually check all plants for signs and symptoms of myrtle rust before entering site.
- Inspect plants of planting and first flush of new growth
- Undertake regular inspections of *Myrtaceae* on maintenance inspections
- Do not transport plants or green waste you suspect to be infected with myrtle rust (or any other pest).
- If you need to treat or remove infected plants or material, follow the advice on myrtlerust.org.nz
- After working on *Myrtaceae*, sterilise tools and equipment with methylated spirits or 5-10 per cent bleach. Cover and contain clothes in plastic if moving them between the site and laundry. Wash exposed clothing in hot water.
- Contact Ministry for Primary Industries if Myrtle rust is suspected.

2.7.2 Kauri dieback

Kauri dieback is a plant disease caused by the microscopic soil borne pathogen *Phytophthora agathidicida* (PA). Spores from the pathogen infect kauri roots and damage the tissues preventing the uptake of water and nutrients causing tree death. It can kill kauri of any age and location. Preventing the movement of soil and plant material by any means is fundamental to the management of kauri dieback. Hygiene around footwear, equipment and vehicles is vital. Removal of all soil is the key to success.

Two kauri trees are present within the proposed revegetation planting area. Strict hygiene protocols should apply during site preparation, weed control, planting and maintenance works around isolated kauri trees and within a kauri hygiene area (KHA).

The following are key points which will have to be employed during the site preparation for planting and revegetation planting when carrying out activities or work within a KHA:

- Treat all kauri trees as potentially being infected with PA.
- Always carry a hygiene kit.
- Take a change of footwear to your activity to put on clean afterwards.
- Place dirty footwear in boot bag after activity.
- Avoid working nearby kauri trees during the activity not identified in the planning process.

- Remove all dirt from surfaces.
- Maintain a high level of hygiene when entering and exiting indigenous forested ecosystems.
- Take enough supplies of methylated spirits and water for the whole activity.
- During summer do not introduce water into a dry environment when cleaning down.
- Ensure boots are dry from cleaning before entering into the site.

2.8 Planting timeframes and specifications

The revegetation planting should be undertaken during the winter season (late April–early September) to ensure successful plant establishment and growth rates are achieved. Work shall only be undertaken when the weather is suitable i.e. mild, dull and moist.

All plants shall be spaced and planted to replicate naturalness in the landscape, following natural contours. Planting in straight rows should be avoided and generally, no more than five specimens of the same species shall be located together in a single cluster. The exception to this is where conditions of a particular site are suited to only one or a few individual species within the mix. For example, the larger grade puriri trees that will be utilised for off–set mitigation planting will be located at an appropriate distance from any built structures such as retaining walls and footpaths to ensure that the root system of the planted trees does not interfere with built infrastructure in the future. Plants within specified planting zones are to be distributed randomly and in small clusters, as they would occur naturally. It is recommended that an experienced Landscape Contractor oversees the implementation of the works.

All plants shall be planted in hand dug holes. All dryland pioneer terrestrial plantings are to be spaced at 1.4m (pioneer species) – 5m (climax species) spacings. Where infill planting of existing bush areas is proposed spacings are to follow natural patterns with trees planted within existing light gaps. Generally, all plants to be utilised within the proposed revegetation pioneer planting should be a minimum of 0.5L grade to achieve sufficient coverage and canopy closure to be achieved within a 5–year period from planting. Plants to be utilised for off–set planting to account for the loss of the trees proposed to be cleared shall be of a grade no less than 160L (or equivalent).

The planting holes for individual plants shall be broken up / roughened with double spade cut and be large enough to contain the plants roots without distortion. All holes for plants shall be hand dug with the sides and the bottom of the hole well loosened to remove glazing and to allow root penetration. All plant species planted within drier areas away from the wet areas should be planted with a controlled release (2–year) general fertilizer. If required, a further dressing of general slow–release fertiliser should be undertaken approximately 6 months following the initial planting in the first year of maintenance. All fertiliser is to be applied as per manufacturer’s recommendations based on plant size.

2.9 Proposed planting detail

The proposed revegetation planting areas are shown under Figure 6 and Appendix 1. The proposed revegetation plant lists incorporate suitable pioneer and climax revegetation plants suited for the locality of the site. The total indigenous tree count to be cleared is 18 (including the small stand of

roughly 12 mamaku), of which 6 are considered to be large emergent forest trees (being 5 puriri and a single totara). The proposal is for the cleared puriri and totara trees to be off-set at a 1:1 ratio (replaced) in a grade of no less than 160L. As shown under Table 4 the total number of plants required to achieve sufficient coverage of the revegetation planting area is 4540 which significantly exceeds the mitigation planting requirements delivering an approximately 250:1 ratio off-set, where for any tree lost 250 new trees are planted, thus delivering a net increase in indigenous vegetation cover across the site.

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Figure 6: Proposed revegetation planting areas plan

2.9.1 Infill planting

A small stand of indigenous trees is present nearby the Waitāua Stream riparian margin. It contained minimal understory or ground tier vegetation and was observed to be heavily suffering from stock grazing pressure. To enhance the ecological complexity of the existing vegetation, provide for appropriate mitigation planting and ensure that sufficient canopy cover can be achieved following weed control, infill planting with appropriate dryland/shade tolerant climax species is proposed. Given that the area currently contains continuous indigenous vegetation, spacing for climax plants is proposed at 2.5m–3m while shade tolerant pioneer species can be infilled at 1.4m–2m spacings. Weed control prior to planting will be required. Plant species specifications are outlined under Table 3.



Figure 7: Showing an area of existing indigenous vegetation which is proposed to be infill planted

2.9.2 Buffer planting

Buffer planting is proposed extending along the Waitāua Stream riparian margin. Generally, the planting will utilise tight spacing of 1.4m of pioneer revegetation species mix to ensure canopy cover is achieved within 3–5 years. The larger grade (160L+) off-set climax species are to be planted primarily nearby the Waitāua Stream margin to ensure that during their growth cycle these trees do not interfere with the future built development, such a footpaths and retaining walls. The use of larger grade trees will achieve instant amenity impact. This area is to be planted with appropriate indigenous species mix as per plant species specifications are outlined under Table 3. The proposed species list for the areas which currently comprise of exotic grassland is aimed at ensuring that suitable ground coverage is achieved through dense

planting, which will aid weedy species suppression, manage soil erosion by providing some surface stability through vegetation cover and soil binding roots and enhance the natural character and ecological values of the site. The plantings will allow for a more complex pest weed free core riparian ecosystem to naturally develop over time.



Figure 8: Showing proposed buffer planting area adjacent to Waitāua Stream

2.9.3 Stormwater pond edge planting

The immediate margins of the proposed stormwater pond area to be constructed as part of the site's development proposal are proposed to be planted with indigenous sedges and grasses which will aid water quality improvement through the natural ability of plants to filter, trap and absorb pollutants such as sediments, nutrients, heavy metals, and hydrocarbons from stormwater runoff before they enter the pond and, ultimately the Waitāua Stream. Riparian vegetation will also help reduce nutrient loading by absorbing excess nutrients, which can help prevent issues like algal blooms and eutrophication. Plant roots will stabilize the soil along the pond's edge, preventing erosion caused by the force of flowing water during storm events. In addition, the pond edge planting will provide habitat and food sources for a variety of wildlife, including birds, insects, and amphibians, enhancing local biodiversity.

Table 3: Proposed revegetation planting species detail

Eco-sourcing region		Whangārei ED														
Stakes required		Yes														
Planting timeframes		April–September														
Fertiliser required		Recommended														
Irrigation		Only should planting occur within shoulder season (i.e. March/October)														
Scientific name	Common name	Buffer planting – 7,366 m ²					Infill planting – 1,566 m ²					Stormwater pond margin planting – 635 m ²				
		% mix	Grade	Spacing (m)	Zone	Plant #	% mix	Grade	Spacing (m)	Zone	Plant#	% mix	Grade	Spacing (m)	Zone	Plant#
<i>Beilschmiedia tarairi</i>	Taraire	5%	1L	2.5m	Near stream margin	68	10%	1L	2.5–3m	Within light gaps	28					
<i>Carex lessoniana</i>	Rautahi											25%	0.5L	0.75m	Pond margins	300
<i>Carex virgata</i>	Pukio											25%	0.5L	0.75m	Pond margins	300
<i>Carex secta</i>	Purei											25%	0.5L	0.75m	Pond margins	300
<i>Coprosma robusta</i>	Karamu	10%	0.5L	1.4m	Throughout	370										
<i>Cordyline australis</i>	Ti kouka	10%	0.5L	1.4m	In clusters	370										
<i>Corynocarpus laevigatus</i>	Karaka	3%	1L	2.5m	Throughout	40	20%	1L	2.5–3m	Within light gaps	56					
<i>Cyperus ustlatus</i>	Giant umbrella sedge											25%	0.5L	0.75m	Pond margins	300
<i>Dodonea viscosa</i>	Akeake	5%	0.5L	1.4m	Throughout	180										
<i>Dysoxylum spectabile</i>	Kohekohe	5%	1L	2.5m	Near stream margin	68	30%	1L	2.5–3m	Within light gaps	86					
<i>Kunzea robusta</i>	Kanuka	20 %	0.5L	1.4m	Throughout	750	5%	0.5L	1.4m	Within light gaps	40					

<i>Leptospermum scoparium</i>	Manuka	15%	0.5L	1.4m	Throughout	560	5%	0.5L	1.4m	Within light gaps	40					
<i>Meliclytus ramiflorus</i>	Mahoe	5%	0.5L	1.4m	Throughout	180										
<i>Metrosideros excelsa</i>	Pohutukawa						5%	1L	2.5-3m	Within light gaps	14					
<i>Myrsine australis</i>	Mapou	5%	0.5L	1.4m	Throughout	180										
<i>Phormium tenax</i>	Harakeke	5%	0.5L	1.4m	Throughout	180										
<i>Podocarpus totara</i>	Totara	1%	160L or equivalent	5m	Near stream margin	1										
<i>Podocarpus totara</i>	Totara						5%	1L	2.5-3m	Within light gaps	14					
<i>Rhopalostylis sapida</i>	Nikau						5%	0.5L	1.4m	Within light gaps	14					
<i>Sophora chathamica</i>	Kowhai	3%	1L	2.5m	Near stream margin	20	5%	1L	2.5-3m	Within light gaps	14					
<i>Sphaeropteris medullaris</i>	Mamaku						5%	0.5L	1.4m	Within light gaps	14					
<i>Vitex lucens</i>	Puriri	1%	160L or equivalent	5m	Near stream margin	5	5%	1L	2.5-3m	Within light gaps	14					
<i>Vitex lucens</i>	Puriri	3%	1L	2.5m	Near stream margin	20	5%	1L	2.5-3m	Within light gaps	14					
Total plants required						4540										

2.10 Plant releasing

Ongoing maintenance including weed control and plant replacement is to take place for minimum of 5 years following the completion of initial planting effort. Maintenance should be carried out bi-annually during Years 1–3 and annually during Years 4 & 5 for a minimum period of five years following planting in spring and late summer. Should maintenance be undertaken with this frequency by Year 5, 90% canopy closure of the revegetation plantings should be achieved.

Plant releasing can be conducted either through hand/manual releasing, or spray releasing with selective herbicide. Hand/manual releasing can involve the use of a scrub bar or hand tools to cut back grass and weed growth around plants which have or are at risk of becoming suppressed. This method is labour intensive but low risk to plant health. The use of selective herbicide is often more effective given that the primary species to be controlled typically is a mixture of kikuyu and other suppressive exotic pastoral weeds. It is recommended that a mixture of manual releasing and chemical spray are utilised for this site to achieve best results.

Plant releasing is an essential maintenance requirement of releasing young plants primarily from competitive grass, forbs and exotic shrub dominance until the revegetation plantings have sufficiently established and achieved a minimum of 90% canopy closure.

Revegetation plants should be released using the following methods:

- Hand/manual releasing, which can involve the use of a scrub bar or hand tools to cut back grass and weed growth around plants which have or are at risk of becoming suppressed. This method is labour intensive but low risk to plant health.
- Spray releasing with herbicide, this method depends on the herbicide to be used and the skill of the contractor. Typically, selective herbicides such as haloxyfop are able to be applied safely around/over most native species (excluding monocots such as cabbage tree, flax and *Carex* and *Cyperus* species). In the instance where spray releasing can reduce labour, incompatible species can be manually cleared as per manual release above.
- Non-selective herbicides (such as glyphosate) will not be used via foliar spray due to the high risk of spray drift and associated non-target mortality.

If spray releasing with herbicide is the method selected, the methodology in Table 2 will be applied.

To measure the effectiveness of the ecological management programme it is important that good quality records are maintained to track weed control and ongoing revegetation efforts and site outcomes. Basic maintenance schedule is described under Table 1 and example record forms to be utilised for maintenance purposes are attached under Appendix 2. These should be filled in during each round of maintenance and saved for submission to Council during yearly monitoring report completion stage.

Maintenance will ensure that the appropriate management is undertaken in a timely manner and in accordance with the specifications contained in this document. The main focus of maintenance visits will be checking for any regrowth of pest plants, success of the revegetation planting (including assessment for any plant replacement) and ensuring that the restoration area overall is performing in line with the expected outcomes as outlined under Section 1.3 of this RPP.

2.11 Blanking

A 5–10% mortality rate during Years 1–3 of initial ecological restoration effort can be expected in revegetation plantings due to natural causes such as insect damage, frosts and drought along with mortality from animal pest damage and spray drift. Therefore, plant blanking (replacement) is likely to be required during Years 2 and 3 following the planting. Plant species replacement is to be consistent with the original planting schedule under Table 3.

2.12 Pest animal control

The site and wider area are likely to be inhabited by an array of common animal pest species such as possum (*Trichosurus vulpecula*), Norway rat (*Rattus norvegicus*), ship rat (*Rattus rattus*), brown hare (*Lepus europaeus occidentalis*), European rabbit (*Oryctolagus cuniculus*), mustelids (*Mustela* spp.), and hedgehog (*Erinaceus europaeus*). Animal pest management is proposed to be implemented within the proposed ecological enhancement area.

Given the residential setting of the site and a high risk of injury and/or poisoning of small pet animals and/or children, it is proposed that a pest animal control is carried out through appropriate pest trap and bait network that are sufficiently elevated above ground or are inaccessible to pet animals/children. A network utilising a mixture of primarily automated kill traps and bait stations is proposed to be implemented following the revegetation planting establishment on site. For a revegetation planting area of this size, keeping in mind the locality of the site the following specifications are made:

- 1 x DoC 200/250 kill trap (suitable for ferrets, stoats, hedgehogs and rats) placed within the revegetation planting area for the control of stoats/mustelids. Can be baited with pilchard, egg or rabbit. Dry baits can be obtained by various suppliers;
- 1 x AT220 automatic possum traps baited with supply bait coated apple placed near an existing mature tree;
- 5 x Pindone Bait stations raised off the ground 750mm minimum baited with pindone placed 100 metres apart the along the proposed revegetation planting area on the interface with pasture to maximise bait uptake by both rabbits and possums;
- 10 x Goodnature A24 Rat & Mouse Trap (or similar) – placed in an approximately 50m x 50m grid within the revegetation planting area.

Animal pest control and monitoring can generally be undertaken in conjunction with weed control efforts, albeit ideally regular (monthly) maintenance and monitoring is recommended especially during bird breeding season (September and March). Generally, animal pest control is most effective when undertaken in perpetuity, albeit 1–2 years of intensive control often allow

to reduce the pest animal density to a level where natural regeneration processes can successfully begin.

A suitably qualified pest control operator should be engaged to set up the initial pest trap/bait station network in general accordance with the specifications outlined in the pest animal bait station/trap management plan outlined under Figure 9 below. Following this, monitoring, rebaiting and resetting of traps could be carried out by the consent holder or a suitably qualified pest control operator. Example forms to be utilised for record keeping are attached under Appendix 2.

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Figure 9: Showing indicative pest animal control point layout within the proposed revegetation planting areas (i.e. Lots 200 and 201)

3.0 MONITORING

For this Revegetation Planting Plan to be successful, keeping up to date records of pest plant and animal control efforts, and monitoring of general planting establishment success rates are key to determine the success of ecological works effort.

It is proposed that at the time of physical ecological works completion (site preparation, first round of pest weed control and revegetation planting implemented, and pest animal control network set up) the consent holder informs Whangārei District Council that the restoration works as described in this RPP have been completed in full through the provision of a Completion of Ecological Works report. Weed, pest animal control and revegetation planting shall be demonstrated to the satisfaction of the Team Leader Compliance Monitoring or similar position.

It is recommended that the consent holder keeps up to date records showing clear evidence of weed and pest animal maintenance, infill planting is being carried out in accordance with the specifications outlined within the body of this RPP.

In regard to future monitoring, following the initial 5-year maintenance period evidence of compliance (Monitoring Completion Report) will be required to be submitted to Council five (5) years from the date of approval of Completion of Ecological Works. Should a minimum of 90% canopy cover and 90% survivorship of indigenous revegetation plantings be achieved prior to the 5-year monitoring period, the consent holder may choose to provide a Monitoring Completion Report earlier than the standard 5-year period, and it will be at the Council's discretion as to whether they deem that monitoring can then be ceased at that time.

The Monitoring Completion Report should include, but not be limited to the following:

- Record plant health, noting any indicators of pest, insect or disease damage.
- Record canopy closure of revegetation plantings.
- Assess pest plant incursions and potential invasion risks in the future.
- Comment on the general condition of the revegetation planting areas.
- Comments regarding any obvious breaches in RC conditions relating to ecological matters (e.g., dumping of green waste etc.)

Note: The Monitoring Completion Report should also make recommendations on any follow-up maintenance required in terms of the above, i.e., weed control, plant disease control.

It is also recommended that a simple monitoring system of photo points should be established to monitor changes in vegetation structure and composition over time. Photo points should be installed at appropriate locations prior to the commencement of any physical works and should be rephotographed annually for the duration of monitoring (5 years).

4.0 REFERENCES

Manning D. (2001). *Natural Areas of Whangārei Ecological District (Northland Conservancy) Reconnaissance Survey Report for the Protected Natural Areas Programme*. Retrieved from <https://www.doc.govt.nz/about-us/science-publications/conservation-publications/land-and-freshwater/land/northland-conservancy-ecological-districts-survey-reports/natural-areas-of-whangarei-ecological-district/>

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APPENDIX 1 – REVEGETATION PLANTING PLAN



ADDITIONAL OBSERVATIONS (Green waste disposal, exclusion pest plants noted in garden areas, rubbish in planting areas etc.)