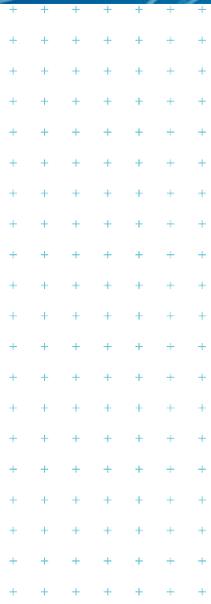
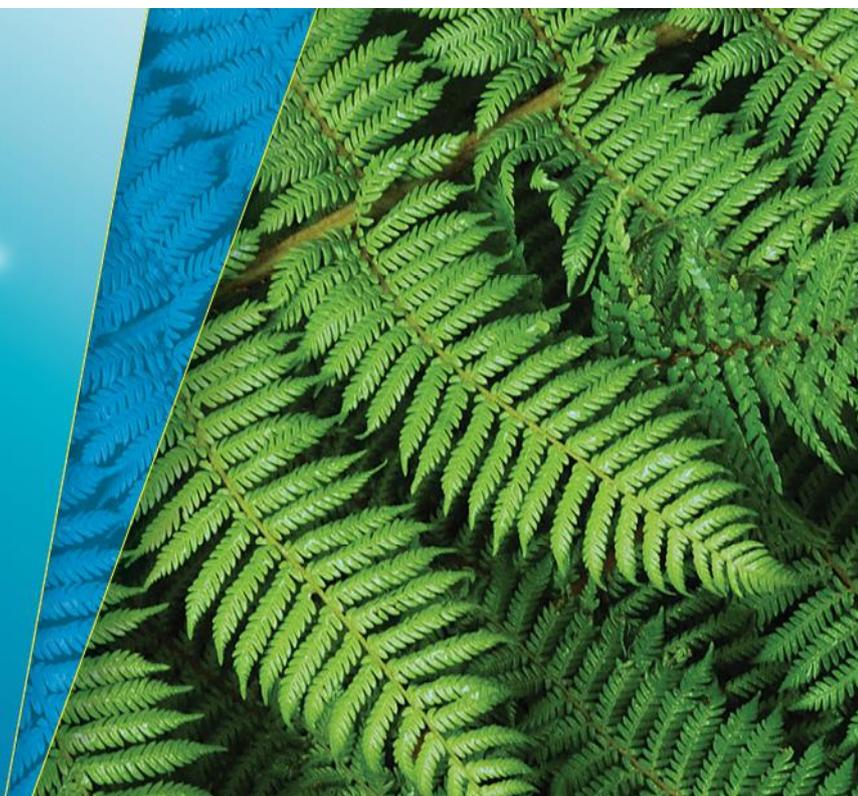




**Assessment of Ecological
Effects - Ōhuiarangi/Pigeon
Mountain Restoration**

Prepared for
Tūpuna Maunga Authority
Prepared by
Tonkin & Taylor Ltd
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1 Introduction

The Tūpuna Maunga Authority has engaged Tonkin & Taylor Ltd (T+T) to prepare an ecological assessment of Ōhūiarangi/Pigeon Mountain (Ōhūiarangi) to accompany an Assessment of Environmental Effects to support a Resource Consent Application for the removal of exotic trees and re-vegetation on the maunga.

This report provides an assessment of ecological effects associated with the proposed cultural restoration of Ōhūiarangi, Auckland. This report has three objectives, namely:

- Assess the ecological values of current vegetation and habitats present on Ōhūiarangi;
- Assess potential effects on these ecological values from proposed removal of exotic trees from Ōhūiarangi; and
- Recommend mitigation measures that will allow any potential negative effects on the ecological values to be avoided, remedied, or mitigated.

This Assessment of Ecological Effects report has been prepared in accordance with our services agreement dated 1 August 2018.

1.1 Site description

Ōhūiarangi (the 'site') is a volcanic cone situated within the Pakuranga Domain, an approximately 12 ha reserve, Half Moon Bay, Auckland. Ōhūiarangi is predominantly covered by an Auckland Council Outstanding Natural Features Overlay (Pigeon Mountain scoria cone, ID 156), part of which is also covered by a Historic Heritage Overlay (Pakuranga Pa 1289). This volcanic cone was returned to Māori in a 2014 Treaty settlement and is governed by the Tūpuna Maunga Authority under a co-governance arrangement legislated under the Ngā Mana Whenua o Tāmaki Makaurau Collective Redress Act 2014.

Ōhūiarangi has a geology typical of other basalt volcanic cones in the Auckland Volcanic Field, with basaltic rock outcrops, craters, scoria, and rock bombs present. It has been extensively quarried in the past, with the entire north side removed.

The site is dominated by grassland, with a variety of native plant species in small patches, and large mature native and exotic trees present across the maunga.

The diverse geology and flora onsite provides habitat and flora for a variety of native and introduced fauna species, but of particular note, native birds and lizards.

1.2 Proposed project

The applicant is applying to remove approximately 112 exotic trees over three metres in height within Ōhūiarangi. The approximate species break down of these exotic trees proposed to be removed is presented in Table 1.1.

Table 1.1: Exotic tree species on Ōhūiarangi to be removed

Tree species	Species Total
<i>Acmena smithii</i> , <i>Syzygium</i> - lilly pilly, monkey apple	13
<i>Agonis flexuosa</i> - willow myrtle, peppermint tree	1
<i>Araucaria cunninghamii</i> - hoop pine	1
<i>Callistemon</i> sp. - bottle brush	2

Tree species	Species Total
<i>Cedrus atlantica</i> - Atlas cedar, blue	1
<i>Crataegus laevigata</i> - English hawthorn	7
<i>Cryptomeria japonica</i> - Japanese cedar	1
<i>Cupressus macrocarpa</i> - Monterey cypress	4
<i>Eucalyptus</i> sp.	10
<i>Grevillea robusta</i> - silky oak	4
<i>Liquidambar styraciflua</i> - sweetgum	1
<i>Lophostemon conferta</i> - Queensland Box	3
<i>Pinus</i> sp.	56
<i>Populus</i> sp.	4
<i>Quercus ilex</i> - holm oak	4
Total	112

Two species identified on site are listed as pests in the regional pest management strategy (RPMS): *Acmena*/monkey apple (*Syzygium smithii*) is classified as an unwanted organism, English hawthorn (*Crataegus laevigata*) is classified as a Surveillance Pest Plant.

The exotic trees will be removed using a variety of methods to safely protect values present at the site, and be processed in flat areas¹. The exotic trees proposed to be removed, and their methods of felling, can be seen in *Figure 1-1*.

¹ Treescape Arboriculture Consultants 2018. Ōhūiarangi - Pigeon Mountain Arboriculture Operations Plan

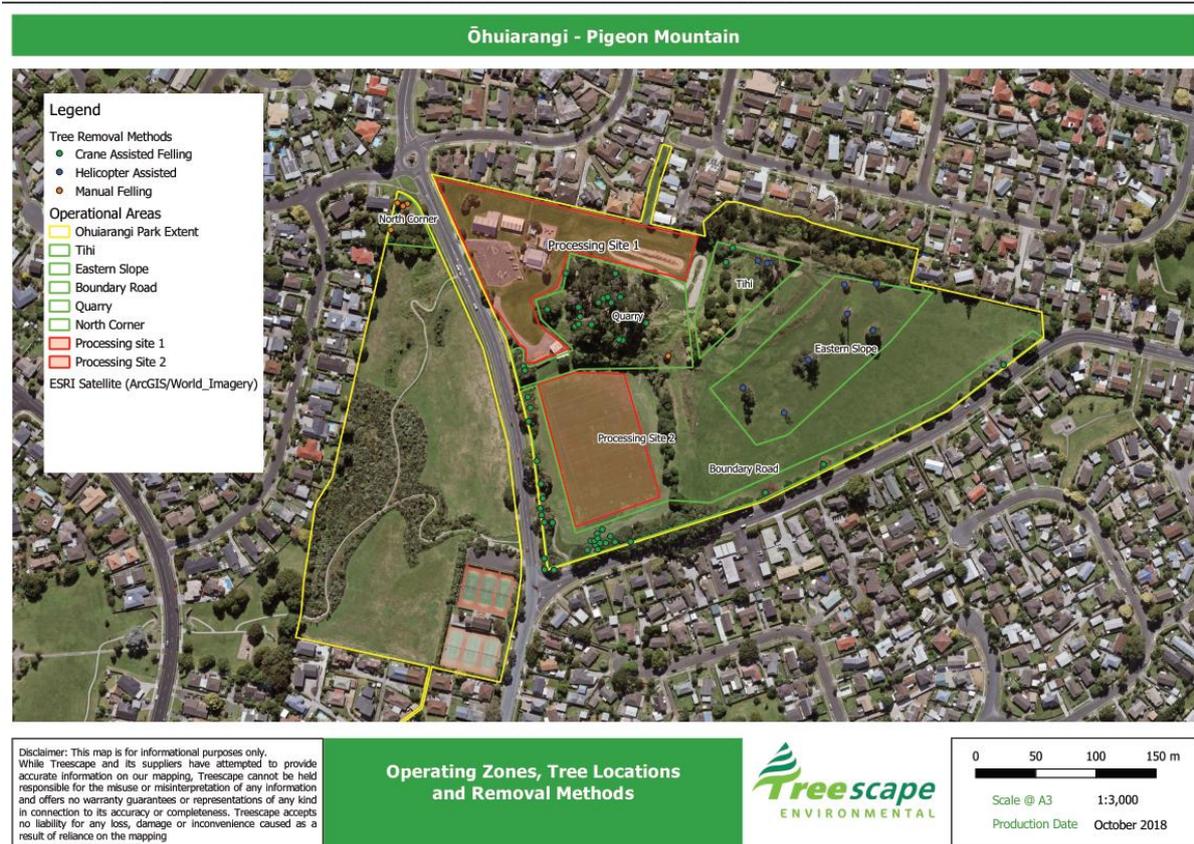


Figure 1-1: Proposed trees to be removed and the removal methods at Ōhūiarangi

The removal of the approximately 112 exotic trees from Ōhūiarangi is part of a project to restore cultural values and historic Māori defensive sightlines, protect archaeological values, and restore ecological values to the maunga. No native species are proposed to be removed from site.

1.3 Scope and methodology

The scope of this report is to present all ecological values considered relevant to this application, including biodiversity values, as well as to outline the potential magnitude of ecological effects (both positive and negative) associated with the proposed restoration project.

This report excludes the following assessments, as these will be dealt with by experts in those fields:

- Cultural values (e.g. cultural sites present)
- Historic values
- Landscape values (e.g. the visual value of the exotic trees proposed for removal).

The ecological assessment was conducted using the following methodologies:

- A desktop assessment of ecological data available from Auckland Council, Department Of Conservation, and other publicly available information;
- A site visit on the 28th of August 2018 to walkover Ōhūiarangi;
- A review of site assessment reports prepared by other specialists, including arborist, herpetofauna, bats, and draft planting plans.

2 Ecological assessment

This section provides an assessment of the ecological values present at Ōhūiarangi.

2.1 Terrestrial flora values

2.1.1 Pre-human

Much of the Auckland isthmus, including Ōhūiarangi, would originally have been covered in what is classified as the WF7 puriri forest ecosystem type prior to human arrival².

The entire WF7 puriri Forest has a regional IUCN threat status of ‘critically endangered’, with some sub-habitats of this ecosystem type, specifically WF 7.2 ‘rock forest’ present on basaltic volcanoes being even rarer.

2.1.2 Māori occupation

Examinations of pollen in sediment cores in a nearby volcano³ indicate that the increase in light demanding/tolerant plant species is evidence of Polynesian arrival and modification of the maunga in Auckland. While WF7 forest continued to be the dominant vegetation, cutting and burning to ensure sight and defensive lines from the maunga, as well as terracing and gardens occurred.

2.1.3 European occupation

European settlement saw introduced exotic species become dominant on the maunga of Auckland, particularly pasture grasses associated with farming land use. A number of exotic timber, hedging, ornamental and food species arrive with European farming methods. Pine pollen has been used as an indicator of European arrival³ and is observed in Auckland volcano cores.

2.1.4 Current vegetation extent on Ōhūiarangi

The current vegetation on site is dominated by grassland, most of which is mown, although rank grass and weeds occur on boulder fields, quarried areas and steeper slopes. Specimen trees occur across Ōhūiarangi, with plantings concentrated around the road edge, slopes, and playing field edge.

Pines are a dominant landscape feature, being the largest trees present on the volcano flanks and near the tihi (Figure 2-1). Mature native trees present include puriri (*Vitex lucens*), pohutukawa (*Metrosideros excelsa*), totara (*Podocarpus totara*), kohekohe (*Dysoxylum spectabile*) and karaka (*Corynocarpus laevigatus*), these being consistent with the WF7 ecosystem type – note that no native species are proposed to be removed from the maunga.

Pohuehue (*Muehlenbeckia sp.*) is present around some basalt rocks on the maunga, but particularly on the terracing. Karamu (*Coprosma sp.*), kawakawa (*Piper excelsum*) and Hoheria (*Hoheria populnea*) are also present across the site.

The lower part of Ōhūiarangi, in the western edge of Pakuranga Domain, is a restored wetland complex.

No ‘At risk’ species are currently present on site.

² Singers, N.; Osborne, B.; Lovegrove, T.; Jamieson, A.; Boow, J.; Sawyer, J.; Hill, K.; Andrews, J.; Hill, S. and Webb, C. 2017. Indigenous terrestrial and wetland ecosystems of Auckland.

³ M. Horrocks, S. L. Nichol, D. M. D’Costa, P. Shane & C. Prior (2005) Palaeoenvironment and human impact in modifying vegetation at Mt St John, Auckland Isthmus, New Zealand, New Zealand Journal of Botany, 43:1, 211-221.



Figure 2-1: Vegetation types on Ōhūiarangi

2.2 Terrestrial fauna values

2.2.1 Herpetofauna

A desktop and habitat assessment⁴ of Ōhūiarangi herpetofauna values was conducted by EcoGecko, no formal survey for lizards was undertaken [REDACTED]

- [REDACTED]

⁴ Bell, T. 2018. Assessment of Environmental Effects of tree removals on lizards at Ōhūiarangi/Pigeon Mountain. Technical report prepared for Auckland Council by EcoGecko Consultants Limited, October 2018.

- [REDACTED]
- Plague skink (*Lampropholis delicata*) a widespread introduced pest species are likely to be present; and
- No native gecko species are thought to be present on the site due to habitat unsuitability.

[REDACTED]

[REDACTED]

2.2.2 Birds

Native birds encountered during the site walkover included at least three pairs of tui (*Prosthemadera novaeseelandiae*) and two grey warbler/riroriro (*Gerygone igata*) were heard. Pukeko (*Porphyrio melanotus*) were observed near the wetland area. Common introduced suburban species of birds such as blackbirds (*Turdus merula*) and a small flock of eastern rosella (*Platycercus eximius*) were also seen on site.

Based on previous bird surveys at other maunga in Auckland⁵ and habitat characteristics observed during the site walkover, other native avian species likely to be present on site include: silvereyes (*Zosterops lateralis*), sacred kingfishers (*Todiramphus sanctus*), New Zealand fantail (*Rhipidura fuliginosa*), black-backed gull (*Larus dominicanus*) and kererū (*Hemiphaga novaeseelandiae*).

⁵ Landers et al, 2018. Avian biodiversity across Auckland's volcanic cone reserves.

Both the mature exotic and native trees are likely to be providing roosting, nesting and feeding habitat on site.

2.2.3 Bats

It is considered unlikely that either of the extant species of native bats are present on this site, based on modelled predictions of long tailed bat presence across Auckland⁶.

Although the site could theoretically contain the 'Threatened – Nationally Critical' long tailed bats (*Chalinolobus tuberculatus*), it is considered unlikely they are present. The nearest known populations of long tailed bats in urban areas are approximately 27 km west of this site in vegetated areas in urban park and woodland areas near the edge of the Waitakere Ranges.

There is a limited range of tree specimens on site which are large enough and sufficiently mature to provide specialised cavities suitable for the roosts required for long tailed bats. Long tailed bats are known to have very large home ranges, but the sparse availability of foraging and roosting sites between Ōhūiarangi and known populations make their presence highly unlikely.

2.3 Terrestrial ecological value

The ecological value of the terrestrial habitats is assessed using criteria described in the Ecological Impact Assessment guidelines (EclA) produced by the Environment Institute of Australia and New Zealand (EIANZ 2018)⁷ (Table 2.1). These include representativeness, rarity or distinctiveness, diversity and patterns, and ecological context of the native plants and ecosystem on site. Ecological values are assigned a level on the scale of Low, Moderate, High or Very High based on the values of species, communities, and habitats identified. Table 2.1 characterises the ecological values of vegetation of the site for each assessment criteria.

Table 2.1: Terrestrial ecological valuation

Criteria for assessment	Description for exotic trees on site	Score
Representativeness	Exotic species proposed for removal are represented widely across the landscape.	Low
Rarity/distinctiveness	The exotic species scheduled to be removed are neither rare nor distinctive.	Low
Diversity and pattern	The exotic species proposed to be removed are of a low diversity, being dominated by pine. The pattern is driven mostly by European planting.	Low
Ecological context	While exotic, the 112 trees proposed to be removed provide important ecological functions such as habitat for birds, and stepping stones to other habitats across the wider area. They also provide necessary ecosystem services such as slope stability and soil erosion protection, reducing air pollution, and taking up CO ₂ and producing oxygen.	Moderate

The terrestrial ecological value found for the 112 exotic trees proposed to be removed from the site is described overall as **Low**.

⁶ K Crewther 2016. Report on modelled distributions of long-tailed bats across Auckland, for Auckland Council.

⁷ Environment Institute of Australia and New Zealand Inc. (EIANZ). 2018. Ecological Impact Assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems.

2.4 Assessment of magnitude of ecological effects

The second step in the assessment of ecological effects is to determine the magnitude of the effect that the project has on ecological values and is rated from positive, negligible, low, moderate, high to very high (EIANZ 2018). The magnitude of the proposed vegetation clearance are described in Table 2.2.

Table 2.2: Assessment of magnitude of ecological effects

Proposed works	Ecological effects	Magnitude of effect
Vegetation clearance	Loss of trees (direct and permanent effect)	The loss of 112 exotic trees from the site will have a moderate magnitude of effect due to the loss of bird habitat and ecosystem services. Conversely, removing the exotic trees from site will also have a positive magnitude of effect due to removing unwanted plants and their seed sources from the site (although this positive effect is limited due to the presence of exotic species in close proximity).
	Loss of habitat for native birds (direct and permanent effect)	The loss of habitat for native birds is assessed as having a low magnitude of effect due to the proportion of large trees being removed from site.
	Loss of stepping-stone function to SEAs and other habitats in wider area (indirect and permanent effect)	The loss of stepping-stone function is assessed as having a low magnitude of effect as mature native trees will be retained on site.
	Noise from felling and processing (indirect, temporary effect)	While the noise of exotic tree removal operations is likely to impact native species on site, this will be only temporary and at a small scale, therefore the magnitude of effect is assessed to be low.

The overall magnitude of effects for tree removal without mitigation is **Moderate**. This is based on a conservative threshold approach where a moderate magnitude of effects has been triggered, leading to the effects being described as moderate, although low and positive effects are also assessed.

2.5 Assessment of level of effects

The overall level of effect is assessed using a matrix presented in Table 2.3 based on the ecological value of the site (Table 2.1) and magnitude of ecological effects (Table 2.2). The level of effects will be used further to determine if mitigation measurements are required to mitigate any residual effects.

Table 2.3: Assessment of level of effects

Ecological Value → Magnitude ↓	Very high	High	Moderate	Low	Negligible
Very high	Very high	Very high	High	Moderate	Low
High	Very high	Very high	Moderate	Low	Very low
Moderate	High	High	Moderate	Low	Very low
Low	Moderate	Low	Low	Very low	Very low
Negligible	Low	Very low	Very low	Very low	Very low

Ecological Value → Magnitude ↓	Very high	High	Moderate	Low	Negligible
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

The terrestrial ecological value of exotic trees proposed for removal on site at Ōhūiarangi, has been assessed as **Low** following the EclA guidelines. The level of potential ecological effects for the proposed removal of 112 trees at Ōhūiarangi is described as **Moderate**. The overall level of the ecological effect is **Low** based on the ecological values and magnitude of effects.

The residual potential ecological effects require mitigation so that no net loss of biodiversity will result from the proposed development on site. Mitigation measures are proposed in the following chapter.

3 Mitigation and other positive benefits

The proposed project to remove exotic trees over three metres tall on Ōhūiarangi demonstrates avoidance of potential negative effects, as well as other mitigation measures to ensure that no net loss of biodiversity values occur. The project aims to restore cultural values to the maunga, which will in turn have ecological benefits.

3.1 Avoidance – Felling methodology

The proposed tree felling methodology has been devised by arborists to have no drop of felled trees or limbs directly on the ground except for areas previously modified and where there will be no impact on archaeological and ecological values. Outside of these areas limbs will be machine, crane or helicopter assisted before being processed in flat modified areas of little ecological value.

3.1.1 Herpetofauna

The proposed tree felling methodology should avoid crushing injuries and mortality of native lizards during works. The movement of heavy machinery should be restricted to areas of low herpetofauna value, avoiding native skink habitats such as rank grass, as will be determined by the project herpetologist.

3.1.2 Birds

As no native species are being removed from the maunga, the loss of habitat is restricted to the approximately 112 exotic trees proposed to be removed. To avoid impacts on vulnerable nesting native birds and their eggs or chicks, no felling in bird breeding season should occur. If felling is required during bird breeding, trees should be checked for active nests by a suitably qualified ecologist prior to works.

3.1.3 Bats

As the likelihood of bats being present at this site is extremely low (2.2.3), no avoidance or mitigation methods are required to deal with bats at Ōhūiarangi. Given the insufficient quantity and quality of habitat in the area to support a population of long-tailed bats there would be no benefit in undertaking tree felling protocols for bats.

3.2 Mitigation

3.2.1 Native vegetation restoration

The proposed restoration⁸ of a native WF7 puriri forest ecosystem as infill planting, will help mitigate the loss of approximately 112 exotic trees from Ōhuiarangi while increasing biodiversity values at the site. In areas where sightlines will not be compromised by mature trees and archaeological constraints allow, in future, cultural gardens may be restored to what would have been present during Māori occupation eras, contributing to ecological values. This restoration program will have positive benefits on both flora and fauna values at the site.

The proposed restoration of low stature native plantings around the tihi and boulder fields will help mitigate for the loss of exotic trees from the maunga as it will provide an increase to biodiversity values, enhance habitat, provide food sources for native fauna, while retaining sightlines.

The proposed restoration planting areas (Figure 3-1) will have weed management which will provide additional mitigation by removing unwanted plants that compete with native species.



Figure 3-1: Proposed restoration planting at Ōhuiarangi

3.2.2 Predator control

The implementation of a comprehensive introduced predator control programme will have a positive effect on both native flora and fauna values at the site.

The herpetology report recommends comprehensive predator control to mitigate for any potential impacts of the exotic tree removal on native lizards. Additionally, the predator control programme

⁸ Ōhuiarangi Mountain Planting Plan, Te Ngahere, October 2018.

currently undertaken on site to control rats (*Rattus sp.*) and possums (*Trichosurus Vulpecula*) will mitigate for potential impacts of the tree removal on birds as competition for food sources and predation pressures will be reduced. Pest control programs are good practice in mitigation packages as removing pest species from a site leads to greater biodiversity gains.

Possums and rats will continue to be controlled across the site, which will greatly benefit ecological values at the site by removing predation pressures on native fauna and allow for native seed regeneration.

Importantly, mice (*Mus musculus*) will be controlled in pulses in targeted high-value skink habitat areas [REDACTED] to ensure that the mouse population doesn't explode after the removal of rats which would have a detrimental effect on native lizards. Hedgehogs (*Erinaceus europaeus*) and mustelids (if present) likewise should also be controlled in targeted areas identified as high value skink habitat to minimise skink predation.

3.2.3 Herpetofauna

While native skinks are unlikely to be impacted at the site due to the works methodology (as above), the proposed restoration and mitigation will have a positive effect on the herpetofauna values present at Ōhūiarangi.

The low stature native restoration plantings will have a positive effect on native skinks present by enhancing habitat complexity and availability, as well as providing increased food sources to support the populations. As part of the habitat enhancement, [REDACTED] suitable native vegetation will be protected to ensure habitats remain favourable to native skinks, with numerous refugia and basking spots. An abundance of suitable skink habitat should help native species co-exist with the introduced plague skink (which there is currently no way of eradicating). Where planting cannot be undertaken around lizard habitat due to archaeological constraints, native low stature plants (such as pohuehue) will be encouraged over time through selective weed control instead.

The pest control to be implemented on the maunga will be of a positive benefit to native skinks by reducing the predation pressure. Importantly, the control of all predators and the targeting of mice in favourable skink habitat will benefit lizards as rat control only can lead to an explosion of the mouse population that can decimate lizards.

3.2.4 Birds

The restoration plantings (both WF7 and low stature) will help mitigate any potential negative effects on native birds by providing improved habitat and food sources for birds. The proposed restoration will have a positive effect on native birds at the site as the habitat diversity will be increased, while the native species proposed to be used provide greater sources of food. The native restoration plantings will aid in increasing stepping stones for birds to other habitats within the wider area.

The pest control programme will mitigate for the loss of tree habitat and have a positive effect on native birds at the site by reducing predation pressure on birds, chicks and eggs.

3.3 Biosecurity

Myrtle rust was discovered within the Auckland region over the last 12 months.

Native Myrtaceae include species such as manuka (*Leptospermum*), kanuka (*Kunzea*), pohutukawa / rata (*Metrosideros*) and ramarama (*Lophomyrtus*).

Exotic Myrtaceae include species such as gum (*Eucalyptus*) and monkey apple (*Acmena* and *Syzygium*). Removal of exotic Myrtaceae species, such as monkey apple, on Ōhūiarangi would

remove a potential myrtle rust host on this site, and therefore may assist to slow spread to this site. As myrtle rust is spread by wind, however, any beneficial effects from removing monkey apple on what is a relatively small site (in the context of myrtle rust spread) would be minor.

Equipment used to fell trees should be cleaned prior to use on site to avoid spreading pathogens, including potentially myrtle rust, to Ōhūiarangi via felling equipment. Contractors should also observe standard biosecurity hygiene practices (e.g., vehicles and tyres free of mud, mulch and other debris) used to manage spread of other pathogens, such as kauri dieback.

We strongly recommend the following best practice protocols are implemented when and where plants are sourced:

Prior to any Myrtaceae species being delivered to the site, a signed Myrtle Rust Nursery Management Declaration that certifies that the plan producer has implemented the New Zealand Plan Producers Incorporated (NZPPI) Myrtle Rust Nursery Management Protocol must be obtained.

By following the NZPPI protocols industry members will be meeting the requirements set out in MPI's legal direction. This declaration will be proof that any Myrtaceae species have been grown and treated according to best practice protocols to reduce the spread of Myrtle rust.

3.4 Recommendations

The restoration on site and tree felling methodologies to avoid impacts on fauna is proposed as mitigation in order to offset the residual ecological effects of the removal of approximately 112 exotic trees from Ōhūiarangi. The following ecological management actions are recommended:

- 1 All vegetation shall be removed outside of bird breeding season (bird breeding season is September to January inclusive). If vegetation clearance is undertaken within the bird breeding season, woody vegetation must be confirmed clear of nesting birds by a suitably qualified ecologist. This should ensure no nesting birds, eggs, or chicks are harmed.
- 2 An Adaptive Lizard Management Plan for the site shall be prepared by a suitably qualified herpetologist and provided to Auckland Council for approval prior to vegetation clearance commencing. This shall include, but not be limited to, the following:
 - Tree felling and associated works methodologies and restrictions based on the Ecogecko Herpetology report;
 - Project herpetologist and permit details;
 - Specific targeted pest control in any areas of high-value skink habitat;
 - Habitat enhancement including any specific weed management in identified high value skink habitat areas.
- 3 The finalised planting plan shall be prepared by a suitably qualified ecologist and provided to Auckland Council for approval prior to tree felling, for all restoration areas within the site. The final planting plan shall include, but not be limited to, the following:
 - Plant species, spacing, planting zones (if required), plant numbers and specification on plant size as described in this assessment report;
 - Planting methodology including staging (required for the effective control of weeds prior to planting, and enhancement species to be used for infill planting once the initial planting has established) in order to promote a WF7 rock forest habitat type;
 - Plant maintenance and weed management until canopy closure (for a minimum of five years); and
 - Monitoring and reporting.

- 4 A comprehensive predator management plan targeting potential habitat of native lizard and bird species shall be provided to and approved by Auckland Council. The predator control relating to native lizards shall be implemented at sites identified as high-value lizard habitat. The comprehensive predator management plan will mitigate for any residual impacts on native lizards and birds.

With the adoption of the above recommendations, in our opinion the extent of potential adverse ecological effects of the proposed exotic tree removal will be negligible and in turn will provide a positive enhancement of Ōhūiarangi and result in a net gain of biodiversity.

4 Conclusion

The proposed removal of approximately 112 exotic trees over three metres tall from Ōhūiarangi has been based on a minimal-impact approach avoiding negative effects on native flora and fauna. The proposed restoration of the maunga with low-stature native vegetation near the tihi, with WF7 forest ecosystem on lower areas, and enhanced skink habitat areas will have a positive ecological effect on the site, and in conjunction with a comprehensive pest management programme will produce a net gain of biodiversity values. It is considered that the exotic tree removal and restoration package will result in a net ecological benefit with a greater biodiversity value compared to the site's current state. The above recommendations have been made to manage any adverse ecological effects of the proposed development, and if these recommendations are adhered to, any potential ecological effects will be adequately managed and mitigated.

5 Applicability

This report has been prepared for the exclusive use of our client Tūpuna Maunga Authority, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Report prepared by:



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Kathryn Longstaff

Ecologist

Authorised for Tonkin & Taylor Ltd by:



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Jenny Simpson

Project Director

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