



**Te Ngahere**  
Native Forest Management

**Ōwairaka/Te Ahi-kā-a-  
Rakataura Assessment of  
Ecological Effects**

# **Ōwairaka/ Te Ahi-kā-a- Rakataura Assessment of Ecological Effects**

Final 2<sup>nd</sup> of October 2018

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**Te Ngahere**

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Te Ngahere

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# 1 Introduction

Applicant(s):	Tūpuna Maunga Authority
Site address:	27 Summit Drive, Mount Albert, Auckland 1025
Legal description:	SEC 1 SO 454869
Site Area:	9.5470 Ha
Operative Plan:	Auckland Unitary Plan Operative in part (updated 13 <sup>th</sup> of July 2018) (Auckland Council, 2018a)
Zoning:	Open Space - Sport and Active Recreation Zone and Open Space-Conservation Zone
Overlay(s):	Significant Ecological Area (SEA_T_6016), Historic Heritage, Outstanding Natural Feature, Quality-Sensitive Aquifer Management Area, Regionally Significant Volcanic Viewshaft

Ōwairaka is managed by the Tūpuna Maunga Authority supported by Auckland Council. The maunga is a sacred place for mana whenua. Tūpuna Maunga Authority (2016) noted in reference to maunga Wairuatanga/ spiritual value that:

*"They are taonga tuku iho (treasures handed down the generations) and inspire reverence and aroha.*

*The Tūpuna Maunga are restorative nourishing places. This is an expression of the inherent connection between people and place.*

*Protection and enhancement of the mauri and wairu of the Tūpuna Maunga is paramount.*

*The tihi is the most sacred part of the maunga to mana whenua and this will be reflected in the nature of activities that are appropriate on different parts of the maunga."*

It is proposed that in order to restore the tihi/summit, removal of exotic trees is undertaken to open up sightlines in conjunction with native plantings in appropriate areas to increase native biodiversity values without impeding sightlines or effecting archaeological sites. This report covers the ecological effects of these proposed works on Ōwairaka/ Mount Albert outlined in:

1. *Owairaka / Mt Albert Tree Removal Methodology* ( Treescape Ltd, 2018)
2. *Ōwairaka/Te Ahi-kā-a-Rakataura Planting Plan 2018* (Te Ngahere, 2018a).

This report only covers ecological effects and does not cover amenity and arboricultural effects of exotic tree removal. A second AEE has been prepared by Bell 2018 covering herpetological effects *Assessment of Environmental Effects of tree removals and habitat restoration activities on lizards at Ōwairaka/ Mt Albert.*

## 1.1 Site description

Ōwairaka is located within the Albert/ Eden Local Board and is administered by the Tūpuna Maunga Authority with some adjoining government body land administered by Watercare (see Figure 1).

Land use includes cultural activities, sports facilities, underground reservoir/ infrastructure and leashed/ unleashed dog areas. Currently vehicles also have access to the road around the maunga (Tūpuna Maunga Authority, 2016).

The geology of the site includes main rock of basalt and scoria bassanite sub rocks (GNS Science, 2016). This volcanic rock was heavily quarried for railway ballast and roading material (Dunsford, 2016) on the northern side of Ōwairaka.

The site has no streams present with some over and underground flow paths and a flood area on the archery field (old quarry). Flow paths connect to two catchments Waititiko/ Meola Creek and Te Auaunga/ Oakley Creek (Watercare area). Both awa lead to the Waitematā harbour.

## 1.2 Methodology

A site visit was undertaken on the 30th of August and the 8th of September including a walkover survey of the whole site noting existing ecological values. A literature and botanical collections search, correspondence with Auckland Council and review of the Auckland Unitary Plan were also undertaken in order to assess the current and historical ecological values of the site.

## 2 Ecological values

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### 2.1 Historical vegetation

The vegetation of the maunga has been influenced historically by Māori land use, quarrying, planting and farming practices. This is reflected by the open nature of most of the site with a range of large exotic trees, dominance of kikuyu grass (*Cenchrus clandestinus*) and scattered areas of native trees and grasses present today.

Based on Auckland Council (2018a) the site has been broadly categorised as potential WF7 Pūriri, podocarp, broadleaf forest/ngahere prior to human influence. WF7 - Pūriri Ngahere is an ecosystem type present in highly fertile areas associated with volcanic and alluvial deposits, which is now classified as Critically Endangered in the Regional IUCN Threat Status (Singers et al., 2017). Three distinct variations of this ecosystem type occur, dependent on characteristics associated with differences in alluvial components and volcanic composition of the soil (Singers et al., 2017).

In all cases pūriri (*Vitex lucens*) is present as a significant component within the mixed broadleaf canopy. Other prominent species include kohekohe (*Dysoxylum spectabile*), karaka (*Corynocarpus laevigatus*), and taraire (*Beilschmedia taraire*), with additional species composition varying dependent on soil and site characteristics. Podocarps including kaihikatea (*Dacrycarpus dacrydioides*) and tōtara (*Podocarpus totara*) are present as secondary successional species along with a mix of smaller broadleaf species (Singers et al., 2017).

Tāmaki Makaurau has had human occupation for around 1000 years (Tūpuna Maunga Authority, 2016). Historic management of the site would have included clearance of tall vegetation replaced with native grasslands such as *Microlaena stipoides* and *Rytidosperma* spp. in addition to cultivated areas with large gardens extending into surrounding fertile lands (Esler, 2004; Tūpuna Maunga Authority, 2016; Burns et al., 2013).

Esler (2004) discusses pasture management on Auckland maunga and notes that following European settlement many of Auckland's maunga were extensively quarried. Once these were returned to pasture, kikuyu and buffalo grass were often used to cover scars of mismanagement. Kikuyu spread across many of the maunga and cattle were used to control its spread and minimise the increased fire risk. In 1974 Ōwairaka pasture was predominantly *Microlaena*-ryegrass pasture with kikuyu on the archery lawn and reservoir and danthonia (*Rytidosperma* sp) on sunny faces. However by 2001 kikuyu was in most places with grazing saving the less palatable native grasses from being overwhelmed in the short term. Esler (2004) points out that a number of mistakes made on the maunga have led to the dominance of kikuyu and that grazing and plantings have tried to recreate cover the native *Microlaena* and *Rytidosperma* provided a century ago.

### 2.2 Existing vegetation

The vegetation of Ōwairaka is currently classified by Auckland Council (2018a) as Tree Land where tree canopy cover is between 20% and 80%. Based on the outline of trees from the Treescape Ltd (2018) 56% of the trees are native species making the site TL.2 variant *Mixed native/ exotic treeland* (25-75% native tree cover) (Singers et al., 2017). Treescape Ltd (2018) noted that native species consisted of 19% pōhutukawa, 17% tōtara, 7% pūriri and some mānuka, ngaio, and karaka.

The site also includes a number of existing native plantings. These have been outlined in Figure 1.



Figure 1 Outline of vegetation categories on Ōwairaka



## 2.3 Native plantings

Ōwairaka does not contain any remnant or mature native forest. However there are several native plantings with complete canopy cover such as native planting area 2 (Figure 2). Native plantings consist of three areas shown in Figure 1 and discussed below in Table 1.

These areas are of moderate ecological value.



**Figure 2 Photo of Native Planting Area 2.**

**Table 1 Existing Native Plantings on Ōwairaka**

Area	Native vegetation	Exotic vegetation
Native Planting Area 1	This area is the most mature of the native plantings and consists of primarily pōhutukawa ( <i>Metrosideros excelsus</i> ) and pūriri canopy with an understorey of regenerating native species including porokaiwhiri ( <i>Hedycarya arborea</i> ), karamū ( <i>Coprosma robusta</i> and <i>Coprosma robusta x macrocarpa subsp. minor</i> ) karaka ( <i>Corynocarpus laevigatus</i> ) karo ( <i>Pittosporum crassifolium</i> ) and <i>Microlaena stipoides</i> .	This area has large coastal banksia ( <i>Banksia integrifolia</i> ) along with and understorey weeds such as Jerusalem cherry ( <i>Solanum pseudocapsicum</i> ), panic veldt grass ( <i>Ehrharta erecta</i> ), <i>Carex divulsa</i> , viola ( <i>Viola odorata</i> ), stinking iris ( <i>Iris foetidissima</i> ), Chinese fan palm ( <i>Trachycarpus fortunei</i> ) and tradescantia ( <i>Tradescantia fluminensis</i> ).
Native Planting Area 2	This is a more recent planting and consists of a wide range of native species (many consistent with WF7) interspersed with larger established native and exotic trees (pre- planting) such as pūriri and olive. Key native species noted include kānuka ( <i>Kunzea robusta</i> ), turepo ( <i>Streblus banksii</i> ), tōtara ( <i>Podocarpus totara</i> ), whau ( <i>Entelea</i>	Olive ( <i>Olea europaea</i> subsp. <i>europaea</i> ), tradescantia, cotoneaster ( <i>Cotoneaster glaucophyllus</i> ), panic veldt grass, flame/ coral tree ( <i>Erythrina xskyeskii</i> ) and nasturtium ( <i>Tropaeolum majus</i> ).

Area	Native vegetation	Exotic vegetation
	<i>arboresens</i> ), māhoe ( <i>Melicactus ramiflorus</i> ), tītoki ( <i>Alectryon excelsus</i> subsp. <i>excelsus</i> ), kawakawa ( <i>Piper excelsum</i> subsp. <i>excelsum</i> ), kōhūhū ( <i>Pittosporum tenuifolium</i> ), tarata ( <i>Pittosporum eugenoides</i> ), karaka ( <i>Corynocarpus laevigatus</i> ), rimu ( <i>Dacrycarpus dacrydioides</i> ), nīkau ( <i>Rhopalostylis sapida</i> ), taraire ( <i>Bleischmiedia tarairi</i> ), kāramu and tawapou ( <i>Planchonella costata</i> ).	
Native Planting Area 3	This planting has complete canopy closure. Species noted include mānuka, māhoe, kawakawa, kōhūhū, karo, tarata, harakeke, kāramu, coastal tree daisy ( <i>Olearia solandri</i> ), tanguru ( <i>Olearia albida</i> ), Tī kōuka ( <i>Cordyline australis</i> ), kāpuka ( <i>Griselinia littoralis</i> ) and other likely self-established species including shaking brake fern ( <i>Pteris tremula</i> ) and pukupuku ( <i>Doodia australis</i> ). An older large pōhutukawa is also within the area.	Exotic species include tree privet ( <i>Ligustrum lucidum</i> ), Taiwan cherry ( <i>Prunus campanulata</i> ), onion weed ( <i>Allium triquetrum</i> ), forget-me-not ( <i>Myosotis</i> sp.), blue morning glory ( <i>Ipomoea indica</i> ), agapanthus ( <i>Agapanthus praecox</i> subsp. <i>orientalis</i> ), Japanese spindle ( <i>Euonymus japonicus</i> ), panic veldt grass, Italian arum ( <i>Arum italicum</i> ), bear's breeches ( <i>Acanthus mollis</i> ), tuber ladder fern ( <i>Nephrolepis cordifolia</i> ) and tradescantia
Watercare planting (outside of project scope area)	Native plantings include kānuka, mānuka, ngaio, karo, harakeke ( <i>Phormium tenax</i> ), kāramu, kōhūhū, māhoe, rewarewa ( <i>Knightia excelsa</i> ) and ngaio ( <i>Myoporum laetum</i> ).	Cotoneaster, Montpellier broom ( <i>Genista monspessulana</i> ), eucalyptus ( <i>Eucalyptus</i> spp.), brush wattle ( <i>Paraserianthes lophantha</i> ), boneseed ( <i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i> ), black passionfruit ( <i>Passiflora edulis</i> f. <i>edulis</i> ) (see section 2.6 ) and Japanese honeysuckle ( <i>Lonicera japonica</i> ).

## 2.4 Exotic tree land

Ōwairaka has been designated a current ecosystem by Auckland Council (2018a) as "Treeland" this is described by Singers et al. (2017) as "Tree canopy cover 20-80%, tree cover exceeding that for any other growth form, but tree canopy discontinuous above lower non-woody vegetation". This has been sub categorised in Figure 1 into two areas based on amount of native canopy cover. Within both areas there is a mixture of mature native and exotic species likely to be local sources for natural regeneration and provide habitat to both native and exotic fauna.

Kikuyu appears to be the dominant groundcover throughout these areas. However as Burns et al. (2013) found on other maunga native *Microlaena stipoides* grass appears to have persisted in some areas such as below tree cover on medium slopes, likely due to its wide light

tolerance, preference for low fertility soils, ability to compete with other species and low palatability.

These areas are of low ecological value.

### 2.4.1 Treeland 1

Categorised (TL.2 *Mixed native/ exotic treeland*) where there is 25-75% native tree cover. This area has a greater canopy cover and is interspersed by unmown (generally shaded) grass and naturally regenerating native and exotic plant species (Figure 1 & Figure 3). Exotic groundcovers include kikuyu, panic veldt grass, *Carex divulsa*, viola, jasmine (*Jasminum polyanthum*), pink-headed knotweed (*Persicaria capitata*) and cineraria (*Pericallis x hybrida*). Native ferns established in the area include shaking brake fern, pukupuku, New Zealand cliff brake (*Pellaea rotundifolia*) and rereiti (*Asplenium polyodon*).

Tree cover in this area includes:

1. Large proportion of native trees contributing to canopy cover. This includes pūriri, tōtara and pōhutukawa. Many are likely to have been self-established particularly tōtara as this withstands grazing. Other smaller naturally regenerating trees include māhoe, kāramu, kōhūhū and karo.
2. Exotic trees with Auckland Regional Pest Management Strategy (RPMS) designations including species to be researched (ARC, 2007) including monkey apple (*Syzygium smithii*), coastal banksia, Taiwan cherry and olive. Smaller exotic species include agapanthus, Japanese honeysuckle, climbing dock (*Rumex sagittatus*), tree privet and Chinese privet (*Ligustrum sinense*).
3. Other scattered exotic trees without RPMS designation include wonder tree (*Idesia polycarpa*), and eucalyptus. Please refer to Treescape Ltd (2018) for full list of trees over 3m in height.



**Figure 3 Photo example of Treeland 1**

## 2.4.2 Treeland 2

Catergorised (TL.3 *Exotic-dominated treeland*) where <25% native tree cover with exotic cover dominant (Figure 1 & Figure 4).

Scattered trees are interspersed with open areas of pasture that has been retired from grazing. Other occasional groundcovers include tradescantia (shaded sites), panic veldt grass and *Microlaena stipoides*. Within areas of rank kikuyu there are occasional plants that have naturally regenerated such as kāramu, mānuka, kāro and pōhutukawa along with exotic Japanese spindle, loquat (*Eriobotrya japonica*), Taiwan cherry and a single bougainvillea (*Bougainvillea glabra*).

Large scattered trees include a mix of species such as:

1. Native pūriri, karaka, tōtara and pōhutukawa.
2. Exotic trees with Auckland Regional Pest Management Strategy (RPMS) designations including species to be researched (ARC, 2007) such as monkey apple, Taiwan cherry, Norfolk Island hibiscus (*Lagunaria patersonii*) and willow (*Salix* sp.).
3. Other scatted exotic trees without RPMS designation including a *Eucalyptus* spp., holm oak (*Quercus ilex*) and macrocarpa (*Cupressus macrocarpa*). Please refer to Treescape Ltd (2018) for full list of tree species.

It should also be noted that the stone wall beside the soccer field which is present below a mix of large exotic trees included several weed species growing among the rocks such as Mexican daisy (*Erigeron karvinskianus*) and tuber ladder fern, in addition to the regionally threatened native fern (*Pellaea calidirupium*).



**Figure 4 Photo example of Treeland 2**

## 2.5 Threatened plant species

Ōwairaka does not contain any threatened ecosystems, however a number of plant species have been noted that have a national or regional threat status (Table 2).

**Table 2 Summary of threatened vascular plant species of Ōwairaka**

Name	National threat status (de Lange et al., 2017)	Regional threat status (Stanley et al., 2005)	Notes
Kānuka ( <i>Kunzea robusta</i> )	Species now considered Threatened (Nationally Vulnerable) due to the unknown potential effect of Myrtle Rust. Qualifiers include designated and data poor.		Plantings 2, 3 and Watercare area. (Planted)
Kōwhai ( <i>Sophora microphylla</i> )	Not Threatened	Regionally at Risk (Sparse)	Historical recording of seedlings. Mature tree located in nearby street. No seedlings noted on site.
Mānuka ( <i>Leptospermum scoparium</i> var. <i>scoparium</i> )	Species now considered At Risk (Declining) due to the unknown potential effect of Myrtle Rust. Qualifiers include designated and data poor.		Watercare and Native Planting Area 2. (Planted and naturally regenerating).
Pōhukukawa ( <i>Metrosideros excelsus</i> )	Species now considered Threatened (Nationally Vulnerable) due to the unknown potential effect of Myrtle Rust. Qualifiers include designated and data poor.		Throughout, likely a mix of planted and self-established.
[REDACTED]		[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]		[REDACTED]

Name	National threat status (de Lange et al., 2017)	Regional threat status (Stanley et al., 2005)	Notes
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

## 2.6 Auckland Unitary Plan

The area has a Significant Ecological Area overlay across the whole site from the Auckland Unitary Plan (Auckland Council, 2018b). The designation is SEA\_T\_6016, qualifier 5.d "Supports species of type locality for taxon". A type locality is a site where material was used to describe a species. Ōwairaka is the type locality for two species of fungi:

### 1. *Nectaria manuka*

This species is native to New Zealand and was found on *Leptospermum scoparium* (Mānuka) habitat on an unknown host (Dingley, 1951). It has also been recorded elsewhere in association with tree ferns *Cyathea dealbata* and *C.medullaris* (Manaki Whenua Landcare Research, 2018).

Within the site there are no areas of mānuka or tree fern canopy. Two areas of plantings beside the boundaries (Native planting areas 2 and 3) of Ōwairaka have been planted mixed natives including a small portion of mānuka and ponga (*Cyathea dealbata*). Mānuka can also be found on the adjoining governing body land (Watercare) on the planted slopes outside the scope of these works.

### 2. *Microdochium passiflorae* (syn. *Monographella passifloraea*)

This species is exotic (Manaki Whenua Landcare Research, 2018) despite New Zealand being the type locality and has been found on dead stems of *Passiflora edulis* (black passionfruit) (CABI, 2018). One black passionfruit was found on the adjoining governing body land (Watercare) outside the scope of these works.

## 2.7 Fauna

### 2.7.1 Birds

Four native bird species were observed during site visits: riroriro/grey warbler (*Gerygone igata*), tūi (*Prosthemadera novaeseelandiae novaeseelandiae*), pīwakawaka/fantail (*Rhipidura fuliginosa placabilis*) and kōtare/kingfisher (*Todiramphus sanctus vagans*). These species are listed as not threatened (Robertson et al., 2017). Two introduced species; eastern rosella (*Platycercus eximius*) and blackbird (*Turdus merula*) were also observed. Additional urban native and exotic species will also use this site.

### 2.7.2 Bats

A frequency compression automatic bat recorder was set up to remotely record echolocation calls at a potential foraging site at the edge of vegetation in the southwest of the maunga (Te Ngahere, 2018b). The recorder was set up to record between 20:00 to 08:00 New Zealand Daylight Savings Time (NZDT) and left in place over 14 nights (2/02/2018-16/02/2018). Recordings were analysed using BatSearch 3.05. A brief walkover survey was undertaken to assess the suitability of habitat.

The recorder did not record any evidence of the presence of long-tailed bats. There is minimal habitat suitable for communal bat roosts (maternity roosts). Given the marginal habitat and distance to known colonies it is also unlikely that bats use these sites as solitary roosts or to forage. Therefore the effects of any removal of trees at these sites are considered to be nil. However, surveying for bats in New Zealand is difficult because they occur in low numbers and have cryptic behaviours (Sedgeley et al., 2012). They are also highly mobile and use different habitats and many different roost sites throughout the year (O'Donnell, 2001; O'Donnell and Sedgeley, 1999). Therefore bats can use sites where their presence is not recorded.

Crewther (2016) modelled the distribution of long-tailed bats for Auckland Council. Ōwairaka is located within an area considered not to be suitable habitat under the model. The model considers distance to roads and rivers, temperature, land cover, population density, elevation and precipitation.

### 2.7.3 Reptiles/ Herpetofauna

No formal survey of herpetofauna has been undertaken yet. Bell 2018 has identified [REDACTED] no invasive plague skink (*Lampropholis delicata*). please refer to this for more details.

### 2.7.4 Invertebrates

No surveys were undertaken. However is likely that due to the historical habitat loss on the site and dominance of kikuyu as pasture that diversity would be low especially within open areas.

### 2.7.5 Animal pests

Animal pests are present on the maunga including rats (*Rattus* spp.) and possums (*Trichosurus vulpecula*) and volunteer and contractor control is undertaken (see section 3.2.2).

## 2.8 Biosecurity

The Tūpuna Maunga Authority has a programme of environmental weed control and animal pest control (as discussed on pages 15 and 20).

Myrtle rust (*Austropuccinia psidii*) is a risk for the site as a significant proportion of the vegetation is established pōhutukawa trees. Some risk will be reduced through the removal of exotic myrtle species such as eucalyptus and monkey apple. However there is also a risk to

the site through the introduction of new nursery stock of mānuka and kānuka in the proposed restoration plantings.

Kauri dieback (*Phytophthora agathidicida*) is not a risk for the site as no kauri (*Agathis australis*) are present.

Plague skink are also a risk to the site if none are found to already be present as they will compete for habitat with native species. These could potentially be introduced or spread further within the site by the introduction of plants from nurseries where they are present.



## 3 Assessment of Ecological Effects

### 3.1 Proposed works

The proposed works on Ōwairaka have been initiated to restore the sightlines to and from the tihi and enhance the ecological values of the site. This includes the removal of exotic trees that inhibit tihi sightlines and selective restoration planting where sightlines and archaeological sites will not be disturbed.

#### 3.1.1 Exotic tree removal

Proposed exotic tree removal from the site includes up to 345 exotic trees within the Tūpuna Maunga Authority administered areas of Ōwairaka Domain. Key species are outlined below in Table 3 and their Regional Pest Management Strategy status (ARC, 2007) noted. The RPMS species are currently under review by Auckland Council so are subject to possible status change as more species are added. For a full list see Treescape Ltd (2018).

**Table 3 Key exotic trees including those noted by Treescape Ltd (2018) and RPMS status (ARC, 2007)**

Botanical Name	Common Name	RPMS (ARC, 2007) Status
<i>Banksia integrifolia</i>	Coastal banksia	Surveillance
<i>Callistemon rigidus</i>	Bottle brush	
<i>Cotoneaster</i> sp.	Cotoneaster	Surveillance
<i>Cryptomeria japonica</i>	Japanese cedar	
<i>Cupressus macrocarpa</i>	Macrocarpa	
<i>Erythrina</i> sp.	Flame/ coral tree	No but can be weedy
<i>Eucalyptus</i> sp.	Gum, eucalyptus	
<i>Fraxinus</i> sp.	Ash	
<i>Grevillea robusta</i>	Silky oak	
<i>Ilex</i> sp.	Holy	
<i>Jacaranda</i> sp.	Jacaranda	
<i>Lagunaria patersonii</i>	Norfolk island hibiscus	Surveillance
<i>Ligustrum lucidum</i>	Tree privet	Surveillance
<i>Magnolia grandiflora</i>	Evergreen magnolia	
<i>Olea europaea</i> subsp. <i>europaea</i>	European olive	Species to be researched
<i>Plantanus x acerifolia</i>	London plane	
<i>Populus x euramericana</i> ( <i>P. nigra</i> x <i>P. deltoides</i> )	Lombardy polar	
<i>Prunus</i> sp (Possibly <i>Prunus campanulata</i> and <i>P. serrulata</i> )	Taiwan cherry and Japanese hill cherry	Species to be researched (Taiwan cherry)
<i>Quercus coccinea</i>	Scarlet oak	
<i>Quercus ilex</i>	Holm Oak	
<i>Quercus robur</i>	Oak	
<i>Salix</i> sp.	Willow	(Surveillance if found to be <i>Salix fragilis</i> or <i>S. cinerea</i> )
<i>Syzygium smithii</i>	Monkey apple	Surveillance

Treescape Ltd (2018) has considered a range of assessment factors in determining trees for removal and proposed methods including natural features, archaeological sensitivity, physical

features, tree factors, regulatory and cost. Methods include manual dismantling and helicopter or crane assisted dismantling (see Treescape Ltd (2018) for full list and descriptions).

Under the Auckland Unitary Plan (Operative in Part) the exotic tree removal within the SEA area is a Discretionary Activity (Table E15.4.2 Vegetation and Biodiversity Management in Overlays (A43) any vegetation alteration or removal not otherwise provided for).

### 3.1.2 Planting plan

The restoration planting plan (Te Ngahere 2018a) includes:

- WF7: this includes the slopes of the old quarry area including among existing established native trees and on bare slopes. Species include those that could facilitate or recreate the WF7 forest type Pūriri Ngahere/ Forest which is now classified as Critically Endangered in the Regional IUCN Threat Status (Singers et al., 2017). Planting also includes some low ferns to provide shelter to skinks.
- Pohuehue: this includes some low native plantings on slopes to be trialled above archaeological features using a no dig methodology. This methodology is currently being trialled on Ōhuitarangi.
- Some of the low planting species mix is also included along the edges of the WF7 (normal planting methodology) to provide good edge habitat for skinks.

These areas are outlined below in Figure 5. Conservation planting is a permitted activity (Auckland Council, 2018b). Only indigenous species have been listed for planting for ecological restoration purposes. The planting plan requires eco-sourcing and/ or culturally appropriate plants to be used.



**Figure 5 Proposed planting areas on Ōwairaka**

## 3.2 Existing ecological restoration works on Ōwairaka

The Tūpuna Maunga Authority already undertakes ecological restoration activities on Ōwairaka including the following:

### 3.2.1 Environmental weed control programme

This includes the targeting of RPMS weed species (below 4m in height) across the Ōwairaka area (excluding the Watercare area).

### 3.2.2 Animal pest programme

Ongoing animal pest control is being undertaken on Ōwairaka. This includes:

- Rabbit control (one night shoot and fumigation) which has been successful (S. Gibbs, pers. comm., September 2018).
- Possum control is undertaken using tree-mounted timms traps and have been serviced by volunteers and contractors over several rounds annually.
- Rat control is undertaken by Ōwairaka ratbaggers using bromadiolone and diphacinone baits in August, November, January and April.
- Please see Bell 2018 for information on more pest recommendations.

## 3.3 Ecological effects

### 3.3.1 Effects on vegetation and fungi

The removal of exotic vegetation and the planting of two types of native habitat will have a positive benefit to the vegetation of the site in the following ways:

1. Increasing the available habitat for a native *Nectaria manuka* a fungal type specimen of Ōwairaka through the planting of suitable habitat (mānuka and tree ferns).
2. Increase in diversity and connectedness of native plant habitat through the introduction of a larger WF7 planting and low pohuehue plantings.
3. Increase in native seed source for the surrounding area.
4. Reduced seed source of RMPS weed species.

Possible adverse effects include:

1. Potential damage to existing large native trees such as pōhutukawa, pūriri and tōtara through the removal process of exotic trees.

### 3.3.2 Faunal effects

Fauna within the site includes native and exotic invertebrates and bird species. No bats have been recorded (Te Ngahere, 2018b) and herpetofauna will be surveyed separately. The removal of exotic vegetation and the planting of two types of native habitat will have a positive benefit to the fauna of the site in the following ways:

1. Increase in habitat availability for native fauna including birds and invertebrates through an increase in habitat heterogeneity including low open native habitat preferred by some species of native invertebrates (such as native butterflies) and skinks. Along with WF7 habitat increasing quality and amount of habitat for species

that prefer more shaded native forest through the establishment of a more continuous area of vegetation.

2. Increase in phenology diversity (fruiting and flowering seasons) through the introducing of a wider range and area of native plant species.

Possible adverse effects include:

1. Loss of exotic habitat including fruit/nectar availability and nesting sites until plantings establish.
2. Disturbance during bird breeding season.

### 3.4 Biosecurity considerations

The Treescape Ltd (2018) also includes the removal of exotic myrtle species (eucalyptus and monkey apple) that could be potential host plants for myrtle rust reducing the potential inoculum within the area. There is potential for mānuka and/ or kānuka plantings to be infected with myrtle rust however pōhutukawa is a more susceptible species and has therefore not been included within the planting plan. Sourcing should be from nurseries that follow the MPI nursery protocols for Myrtle rust. No kauri are present onsite or included in the planting plan.

Planting also could introduce/ further spread plague skink. The introduction of any plants or potting mix (for mound planting) should be this is detailed in Te Ngahere 2018 including:

- Checking prior to transporting.
- Where possible source plants or potting mix from a supplier outside of plague skink distribution or that are undertaking skink management where possible.
- Only use mulch from trees on site.

### 3.5 Summary of ecological effects and proposed mitigation

**Table 4 Summary of Assessment of Ecological Effects**

Issue	Ecological Effect without mitigation	Recommended avoidance, remediation or mitigation to reduce adverse effects
Vegetation clearance of exotic trees throughout the site	This will be low with: <ul style="list-style-type: none"> <li>• Temporary loss of vegetation cover and habitat for native and exotic wildlife (e.g. birds and lizards). Mature native trees and existing plantings will be available for refuge.</li> <li>• Removal of some RPMS species removing weed seed sources.</li> <li>• Potential disturbance to surrounding native vegetation.</li> </ul>	Overall there will be a positive effect with: <ul style="list-style-type: none"> <li>• Minimising damage through tree removal methodology including the use of helicopters, cranes and manual dismantling of the exotic trees ensures minimal damage to surrounding native vegetation.</li> <li>• Continued weed and animal pest control throughout wider site to restore and enhance habitat.</li> <li>• Restoration planting (as per the scope of works) to replace lost vegetation and improve habitat.</li> </ul>
Restoration planting	This will be negligible with potential introduction of myrtle rust (already present within the Auckland Region).	Overall there will be a positive effect with: <ul style="list-style-type: none"> <li>• Any myrtle species being planted (such as mānuka or kānuka) must be checked prior to planting for myrtle rust symptoms.</li> <li>• Increase in native vegetation to provide habitat for native fauna and flora will have a positive effect.</li> <li>• Creation of more continuous larger habitat area that can support a greater diversity of native species than current open vegetation (i.e. those that require more forest cover for breeding or feeding).</li> </ul>
Disturbance to lizards	Please refer to Bell, (2018).	Please refer to Bell (2018).
Disturbance to bats	Nil effects. No bats recorded on site in 2018 survey (Te Ngahere, 2018b). Unlikely to be present.	None
Disturbance to birds from tree removal	Negligible. Only temporary loss of bird habitat and disturbance during breeding season.	Overall there will be a positive effect with: <ul style="list-style-type: none"> <li>• Where possible minimise noise and construction activities to outside the peak of the breeding season (August-January).</li> <li>• Continue to carry out animal pest control to support the establishment of native bird populations. This could be increased before, during and after exotic tree removal.</li> <li>• Restoration planting (as per the scope of works) to replace lost vegetation and improve habitat.</li> <li>• Existing native vegetation on the site is to be retained and will provide some refuge.</li> </ul>

<sup>1</sup>Note: This report does not cover amenity and arboricultural effects of exotic tree removal.

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## 4 Summary

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The proposal by the Tūpuna Maunga Authority to undertake exotic tree removal and restoration planting on Ōwairaka does not include any notable residual ecological effects and will have an overall positive effect on the existing ecological values of the site.

Some potential adverse effects have been noted, and it is recommended that the following is undertaken in addition to the recommendations of the Treescape Ltd (2018) *Owairaka/ Mt Albert Tree Removal Methodology* and Te Ngahere (2018a) Planting Plan to minimise these potential effects:

- Continue the existing environmental weed control programme.
- Continue the Animal pest control throughout the site and include additional animal pest control for rats and possums if tree removal occurs outside the months of August, November, January or April.
- Limit the works to outside the main bird breeding season of August – January.

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## Appendix 1 Native Plant Species Inventory

Latin name	Common name(s)
<b>Gymnosperm trees and shrubs</b>	
<i>Dacrydium cupressinum</i>	Rimu
<i>Podocarpus totara</i>	Tōtara
<b>Monocotyledonous trees and shrubs</b>	
<i>Cordyline australis</i>	Ti kōuka, cabbage tree
<i>Rhopalostylis sapida</i>	Nīkau
<b>Dicotyledonous trees and shrubs</b>	
<i>Alectryon excelsus</i> subsp. <i>excelsus</i>	Tītoki
<i>Beilschmiedia tarairi</i>	Taraire
<i>Coprosma macrocarpa</i> subsp. <i>minor</i>	Coastal karamū, large-fruited karamū
<i>Coprosma robusta</i>	Karamū
<i>Corynocarpus laevigatus</i>	Karaka
<i>Dysoxylum spectabile</i>	Kohekohe
<i>Entelea arborescens</i>	Whau
<i>Griselinia littoralis</i>	Pāpāuma, paraparauma, kāpuka, broadleaf
<i>Hedycarya arborea</i>	Porokaiwhiri, pigeonwood
<i>Hoheria populnea</i>	Hohere, lacebark
<i>Knightia excelsa</i>	Rewarewa
<i>Kunzea robusta</i>	Kānuka
<i>Leptospermum scoparium</i> var. <i>scoparium</i>	Mānuka
<i>Melicytus ramiflorus</i>	Māhoe
<i>Meryta sinclairii</i>	Puka
<i>Metrosideros excelsa</i>	Pōhutukawa
<i>Myoporum laetum</i>	Ngaio
<i>Myrsine australis</i>	Māpou, red matipo
<i>Meryta sinclairii</i>	Pukanui
<i>Olearia albida</i>	Tanguru
<i>Olearia solandri</i>	Coastal tree daisy
<i>Piper excelsum</i> subsp. <i>excelsum</i>	Kawakawa
<i>Pittosporum crassifolium</i>	Karo
<i>Pittosporum eugenioides</i>	Tarata, lemonwood
<i>Pittosporum tenuifolium</i>	Kōhūhū, black matipo
<i>Planchonella costata</i>	Tawapou
<i>Pseudopanax arboreus</i>	Whauwhaupaku, five finger
<i>Streblus banksii</i>	Turepo
<i>Vitex lucens</i>	Pūriri
<b>Ferns</b>	
<i>Asplenium polyodon</i>	Petako, sickle spleenwort
<i>Austroblechnum lanceolatum</i> (syn. <i>Blechnum chambersii</i> )	Rereti, lance fern
<i>Cyathea dealbata</i>	Ponga, silver fern
<i>Doodia australis</i> (syn. <i>Blechnum parrisiae</i> )	Rasp fern, pukupuku

Latin name	Common name(s)
<i>Parablechnum novae-zelandiae</i> (syn. <i>Blechnum novae-zelandiae</i> )	Kiokio
<i>Pellaea calidirupium</i>	
<i>Pellaea rotundifolia</i>	New Zealand cliff brake
<i>Pteris tremula</i>	Shaking brake, tender brake
<i>Pyrrosia eleagnifolia</i>	Leather-leaf fern
<b>Monocotyledonous herbs (other than orchids, grasses, sedges, and rushes)</b>	
<i>Phormium tenax</i>	Harakeke, flax

## Appendix 2 Exotic Plant Species Inventory

Latin name	Common name(s)	RPMS status (ARC, 1997)
<b>Gymnosperm trees and shrubs</b>		
<i>Cupressus macrocarpa</i>	Macrocarpa	
<b>Monocotyledonous trees and shrubs</b>		
<i>Trachycarpus fortunei</i>	Chinese windmill palm	To be researched
<b>Dicotyledonous trees and shrubs</b>		
<i>Banksia integrifolia</i>	Coastal banksia	Surveillance
<i>Cotoneaster glaucophyllus</i>	Cotoneaster, large-leaved cotoneaster	Surveillance
<i>Eriobotrya japonica</i>	Loquat	
<i>Erythrina</i> sp.	Flame/ Coral tree	
<i>Eucalyptus</i> spp.	Eucalyptus	
<i>Euonymus japonicus</i>	Japanese spindleberry	Surveillance
<i>fbonseed</i>	Montpellier broom	Surveillance
<i>Hydrangea macrophylla</i>	Hydrangea	
<i>Idesia polycarpa</i>	Wonder tree	
<i>Lagunaria patersonii</i>	Norfolk Island Hibiscus	Surveillance
<i>Ligustrum lucidum</i>	Tree Privet	Surveillance; Community Initiatives
<i>Ligustrum sinense</i>	Chinese privet	Surveillance; Community Initiatives
<i>Olea europea</i>	Feral olive	To be researched
<i>Paraserianthes lophantha</i>	Brush wattle	Surveillance; Community Initiatives
<i>Prunus campanulata</i>	Taiwan cherry	To be researched
<i>Prunus serrulata</i>	Japanese hill cherry	
<i>Quercus ilex</i>	Holm oak	
<i>Solanum mauritianum</i>	Woolly nightshade	Containment (boundary); Community Initiatives
<i>Syzygium smithii</i>	Monkey apple	Surveillance; Community Initiatives
<i>Ulex europaeus</i>	Gorse	Community Initiatives
<b>Dicotyledonous lianes and related trailing plants</b>		
<i>Hedera helix</i>	English ivy	Surveillance
<i>Ipomoea indica</i>	Blue morning glory	Surveillance; Community Initiatives
<i>Jasminum polyanthum</i>	Jasmine	Surveillance; Community Initiatives
<i>Lonicera japonica</i>	Japanese honeysuckle	Surveillance; Community Initiatives
<i>Passiflora edulis</i> f. <i>edulis</i>	Black passionfruit	
<i>Rumex sagittatus</i>	Climbing dock	Surveillance
<b>Ferns</b>		
<i>Nephrolepis cordifolia</i>	Tuber ladder fern	Surveillance; Community Initiatives
<b>Grasses</b>		
<i>Cenchrus clandestinus</i>	Kikuyu grass	

Latin name	Common name(s)	RPMS status (ARC, 1997)
<i>Ehrharta erecta</i>	Panic veldt grass	
<b>Sedges</b>		
<i>Carex divulsa</i>	Grey sedge	
<b>Monocotyledonous herbs (other than orchids, grasses, sedges, and rushes)</b>		
<i>Agapanthus praecox</i> subsp. <i>orientalis</i>	Agapanthus	Surveillance
<i>Allium triquetrum</i>	Three-cornered garlic, onion weed	
<i>Arum italicum</i>	Italian arum	Surveillance
<i>Crocasmia x crocosmiiflora</i>	Montbretia	Surveillance
<i>Iris foetiissima</i>	Stinking iris	
<i>Polygonum capitatum</i>	Pick headed knotweed	
<i>Tradescantia fluminensis</i>	Tradescantia	Surveillance; Community Initiatives
<b>Dicotyledonous herbs - Composites</b>		
<i>Pericallis x hybrida</i>	Cineraria	
<b>Dicotyledonous herbs - other than Composites</b>		
<i>Acanthus mollis</i>	Bear's breeches	To be researched
<i>Myosotis</i> sp.	forget-me-not	
<i>Solanum pseudocapsicum</i>	Jerusalem cherry	
<i>Solanum nigrum</i>	Black nightshade	
<i>Tropaeolum majus</i>	Nasturtium	
<i>Viola odorata</i>	Viola	