Te Ngahere
Native Forest Management

Ōwairaka/Te Ahi-kā-a-Rakataura Planting Plan 2018

Ecological Restoration and Consultancy

Ōwairaka/ Te Ahi-kā-a-Rakataura
Planting Plan 2018

16th October 2018 version 3

Prepared on Behalf of:

Tūpuna Maunga Authority

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Te Ngahere

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Ōwairaka

1.1 Context

Maunga within Tāmaki Makaurau (Auckland) currently support a mix of native and exotic vegetation, ranging from small isolated patches of SEA (significant ecological area) ngahere (forest), to native and exotic specimen trees and significant environmental pest plants.

Historically vegetation in these areas was WF7 - Pūriri Ngahere, 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 however 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).

This planting plan for Ōwairaka focuses on the restoration of highly modified areas on the maunga through revegetation to a historically accurate ngahere ecosystem, and the development of suitable habitat to protect and preserve archaeologically significant terraces present at the site.

1.2 Restoration aims

Revegetation planting brings a number of positive outcomes for biodiversity, ecosystem function and amenity.

The aims of revegetation / restoration are outlined below:

- Use methods and species appropriate for archaeologically sensitive areas.
- Enhance the quality of habitat used by native fauna including skinks, ngā manu (birds), and native invertebrates.
- Prevent the re-establishment of weed species.
- Protect sites by reducing foot traffic through some areas.
- Promote species of appropriate heights to maintain historic defence sightlines where needed.
- Assist and promote natural ecological processes.
- Involve local schools and community in restoration.

1.3 Revegetation principles

Revegetation should follow best practice ecological restoration planting principles, including:

- Ensure plants and/ or methodologies are appropriate for the site and location considering substrate, sightlines, archaeology and slope.
- Ensure all planting material is eco-sourced from naturally occurring indigenous stock growing within the Tāmaki Ecological District or culturally appropriate.
- Plant size should be appropriate to location. 1.5 L and 2L (PB3 equivalent) are recommended wherever possible. These allow for quick establishment minimising need for ongoing follow up. Smaller sizes such as 0.5L/ root trainer grade are appropriate for very rocky slopes or sensitive areas where approved.
- Plant spacing of 1m for tree species is ideal for achieving rapid establishment of native vegetation cover, which in turn reduces competition from weed species. For lower growing species 0.5 to 0.75m spacing should be used. Larger tree species such as pūriri should be at 5m spacing.
- Planting should ideally take place during the months of May to August as long as soil conditions are suitable.
- Living mulch such as rye clover seed can be use around plantings if required to suppress weeds and cover the ground.
- Plants and any potting mix should ideally be sourced from a nursery undertaking plague skink management. Plants/ potting mix should be checked prior to arrival at site for the presence of eggs and any eggs found during planting contained and removed from site. Planting contractors or volunteer planting supervisors should be familiar with checking and identifying plague skink eggs.
- Planting maintenance is an important task to ensure successful establishment of plantings. This should be carried out for at least five years, ideally longer, with 2-3 visits a year. Regular visits are required to prevent annual plants and weeds suppressing the establishment and growth of plantings. Maintenance should be undertaken until canopy closure occurs (or once bare ground is covered for low growing plantings).

1.4 Planting areas

Proposed planting areas are outlined in sections 1.5 and 1.6. Recommendations for contractor site preparation and planting guides for a staged 5 year programme are outlined in the Appendix. These should be reviewed prior to planting preparation for each area to assess local conditions and amount of natural regeneration that has occurred.

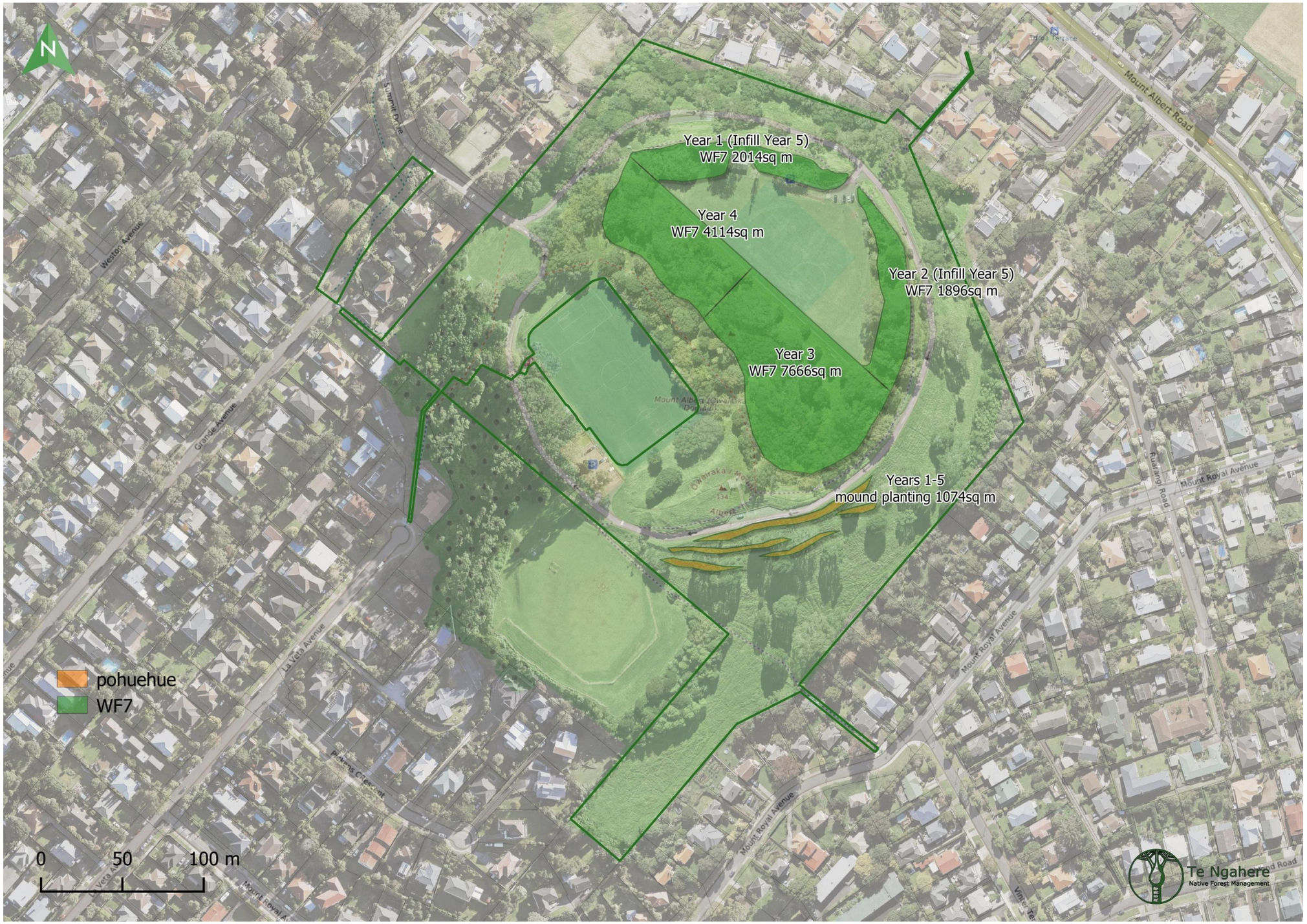


Figure 1: *Map indicating areas of proposed restoration planting on Ōwairaka.*

1.5 Pōhuehue/Mound planting

It is proposed that the banks between terrace formations include mound planting (to be trialled) as a no dig method to establish pōhuehue (*Muelhenbeckia complexa* var. *complexa)*.

Mound planting is a method that involves placing the plant on the soil surface potentially with additional soil medium added around the base of plant so as not to disturb the soil surface.

Mound planting is currently being trialled on other maunga in Auckland. Methodology used would need to be approved by Heritage New Zealand and likely to include:

1. Two spot sprays of kikuyu with green glyphosate or haloxyfop.
2. Placing root ball of plant on dead kikuyu in either a suitable biodegradable fabric plant bag or cutting the bottom of a plastic plant bag and removing the plastic after 1-2 years once roots have established.
3. Cover bag with dead kikuyu mulch to provide some protection. If necessary some minimal introduced soil ($15cm^3$) may also be used to protect the root ball or living mulch such as perennial rye grass or native grasses with toatoa (*Haloragus erecta*) if seed source available (species approved by Jones 2007) in bare areas.
4. Maintain site with haloxyfop (grass specific herbicide) to encourage further spread of mound plantings.
5. The whole process must be monitored by a qualified archaeologist including plant layout.

This planting would replace current grass cover and reduce foot traffic across these areas in addition to increasing amenity value. Establishing a low growing native cover will protect archaeology, limit erosion and damage, while not impacting any historic defensive sightlines. It would also create additional habitat for native fauna including invertebrates. Other species could also be added to increase the habitat diversity present through the area.

The extent of this restoration area will require further definition by an archaeologist to ensure no damage to significant features including archaeology occurs.

A proposed planting schedule is included in the appendix. It is recommended that plantings are undertaken over up to 5 years with the main planting in year 1 followed by infill planting and selective grass control to encourage growth as needed over a 5 year period.

Table 1: *Proposed species for mound planting*

Name	Botanical name	Amount (Number TBC)	Notes	Okay for archaeological sites based on Jones (2007)
Pōhuehue	*Muelhenbeckia complexa* var. *complexa*	+++	Would consist of the majority of the area. Copper butterfly breeding habitat.	Yes

Name	Botanical name	Amount (Number TBC)	Notes	Okay for archaeological sites based on Jones (2007)
Diversity				
Pukupuku, rasp fern	*Doodia australis*	+	May spread naturally. Potentially but may not survive mound planting would need to trial. Selected areas only for diversity.	No but similar in root habit (creeping rhizome) and form to *Cranfillia fluviatilis* (Synonym *Blechnum fluviatile*) and *Austroblechnum penna-marina (*Synonym *Blechnum penna-marina*).
Toetoe	*Austroderia fulvida*	+	Potentially but may not survive mound planting would need to trial. Selected areas only for diversity.	Yes
Whaririki, mountain flax	*Phormium cookianum* subsp. *hookeri*	+	Potentially but may not survive mound planting would need to trial. Selected areas only for diversity.	Yes

1.6 WF7 Pūriri Ngahere (forest)

WF7/ Pūriri Ngahere (Auckland Council, 2018) is likely to have been present across much of this site historically. This ecosystem type could be re-introduced on the inward slopes of the modified quarry area around the archery field. Taller species should be reserved for planting lower down the slope with lower growing species along near the top edge to preserve historic defensive sightlines from the tihi (Figure 1). Prior to planting, the extent of this restoration area shall be confirmed by an archaeologist to ensure unmodified areas and or in situ archaeology is not impacted.

Below is a proposed list of species for planting in WF7 habitat areas. Ideally these would be staged with coloniser species planted initially and diversity species added once some shelter has been established by the coloniser species. Where there is some existing vegetation diversity species could be included in the initial planting.

Some species from the pōhuehue planting list should also be included in these areas for around the edges of plantings to create open habitat for skinks where open habitat is to be reduced. In addition to this other low growing native ground covers such as the fern pukupuku (*Doodia australis*) have been included to be planted under existing canopy and included in infill planting to provide habitat to native copper skinks in shaded areas.

It is recommended that the quarry site, albeit at the discretion of the Tūpuna Māunga Authority is used as an opportunity to engage with the local community including schools as this site is safe and easily accessible. This could be staged over a five year period to allow for ongoing involvement with the community that could include planting, mulching and planting maintenance. A proposed planting schedule has been outlined in the appendix including four areas to be planted and 1 year of infill planting of more open areas once some shelter has been established.

Planting preparation area limits will need to be defined with the assistance of an archaeologist. Only species approved by Jones (2007) should be planted within 5m of any areas not considered to be quarried slopes (such as archaeological features or natural slopes).

Table 2: *Proposed WF7 species list*

Name	Botanical name	Amount (Number TBC)	Notes	Okay for archaeological sites based on Jones (2007)
Coloniser species				
Hangehange	*Geniostoma ligustrifolium* var. *ligustrifolium*	++	Understorey.	
Kānuka	*Kunzea robusta*	++	Canopy to provide some shelter for other species around edges.	Yes
Karamū or coastal karamū, large-fruited karamū	*Coprosma robusta & C macrocarpa* subsp. *minor*	+++	Understorey. Plant throughout slope.	
Māhoe	*Melicytus raimiflorus*	+++	Canopy and understorey. Plant throughout slope.	
Mānuka	*Leptospermum scoparium*	++	Lower slopes only to provide potential habitat for fungi species with type locale on Ōwairaka.	yes
Māpou	*Myrsine australis*	++	Understorey. Plant throughout slope.	
Shining karamū	*Coprosma lucida*	+	Understorey.	
Diversity species				
Karaka	*Corynocarpus laevigatus*	+	Canopy.	
kawakawa	*Piper excelsum* subsp. *excelsum*	+	Understorey.	Yes
Kohekohe	*Dysoxylum spectabile*	+	Canopy. Plant at minimum 2-3m spacing.	
Mangeao	*Litsea calicaris*	+	Canopy. Difficult to source - use local rock forest sites. Plant sparingly as not dominant part of canopy.	
Ponga	*Cyathea dealbata*	+	Plant in low number to provide potential habitat for fungi species with type local on Ōwairaka.	
Porokaiwhiri, pigeonwood	*Hedycarya arborea*	++	Understorey.	
Pūriri	*Vitex lucens*	++	Canopy. Plant throughout the slope, at minimum 3-5m spacing.	
Titokī	*Alectryon excelsus*	++	Canopy and understorey.	
Tōtara	*Podocarpus totara* var. *totara*	++	Canopy	

Name	Botanical name	Amount (Number TBC)	Notes	Okay for archaeological sites based on Jones (2007)
Species for skink habitat				
Forest sedge	*Carex lambertiana*	+	To be planted in understory of existing native canopy and in infill.	
Kiokio	*Parablechnum novae-zelandiae*	+	To be planted in understory of existing native canopy and in infill.	
Kowharahara	*Astelia solandri*	+	To be planted in understory of existing native canopy and in infill.	
Mingimingi	*Coprosma rhamnoides*	+	Along edges of WF7 and understory planting.	
Pōhuehue	*Muelhenbeckia complexa* var. *complexa*	+++	Along edges of WF7	Yes
Pukupuku, rasp fern	*Doodia australis*	++	May spread naturally. To be planted in understory of existing native canopy and in infill.	See above
Toetoe	*Austroderia fulvida*	+	Along edges of WF7	Yes
Whaririki, mountain flax	*Phormium cookianum* subsp. *hookeri*	+	Along edges of WF7	Yes

Figure 2: *Example of a WF7 understorey, Withiel Thomas Reserve.*

References

Auckland Council. 2018. *Auckland Council Geomaps.* [Retrieved 15/08/2018] https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html

Jones, K. L. (2007). *Caring for archaeological sites: Practical guidelines for protecting and managing archaeological sites in New Zealand.* Wellington: New Zealand Department of Conservation.

Singers N., Osborne B., Lovegrove T., Jamieson A., Boow J., Sawyer J., Hill K., Andrews J., Webb C. (2017). *Indigenous terrestrial and wetland ecosystems of Auckland.* Auckland: Auckland Council.

Appendix: Outline of planting preparation, proposed planting schedule and recommended planting guides

Table 3: *Proposed planting schedule for years 1-5.*

Common name	Botanical name	Plant Size	Ōwairaka Mound Planting Years 1-5	Ōwairaka Years 1-3 Quarry underplanting	Ōwairaka Year 1 Quarry Planting	Ōwairaka Year 2 Quarry Planting	Ōwairaka Year 3 Quarry Planting	Ōwairaka Year 4 Quarry Planting	Ōwairaka Year 5 Quarry Planting
forest sedge	Carex lambertiana	0.5 Litre		500					
forest sedge	Carex lambertiana	1 Litre							50
hangehange	Geniostoma ligustrifolium var. ligustrifolium	1 Litre			20	20	45	55	
kānuka (Auckland)	Kunzea robusta	1 Litre			140	150	360	200	
karaka	Corynocarpus laevigatus	2 Litre					20	10	10
karamū	Coprosma robusta	1 Litre			150	150	585	360	
kawakawa	Piper excelsum subsp. excelsum	2 Litre					30	40	30
kiokio	Blechnum nova-zelandiae	0.5 Litre		500					
kiokio	Blechnum nova-zelandiae	1 Litre							30
kohekohe	Dysoxylum spectabile	2 Litre					55	40	80
Kowharahara, perching lily	Astelia solandri	0.5 Litre		300					
māhoe	Melicytus ramiflorus	1 Litre			160	150	540	360	
mangeao	Litsea calicaris	2 Litre					10	10	

Common name	Botanical name	Plant Size	Ōwairaka Mound Planting Years 1-5	Ōwairaka Years 1-3 Quarry underplanting	Ōwairaka Year 1 Quarry Planting	Ōwairaka Year 2 Quarry Planting	Ōwairaka Year 3 Quarry Planting	Ōwairaka Year 4 Quarry Planting	Ōwairaka Year 5 Quarry Planting
mānuka	Leptospermum scoparium var. scoparium	1 Litre			80	80	90	75	
māpou	Myrsine australis	1 Litre			80	80	450	280	
mingimingi	Coprosma rhamnoides	0.5 Litre		300					
mingimingi	Coprosma rhamnoides	1 Litre			50	30	30	20	
pigeonwood / porokaiwhiri	Hedycarya arborea	2 Litre					55	45	60
pōhuehue	Muehlenbeckia complexa	0.5 Litre	700						
pōhuehue	Muehlenbeckia complexa	1 Litre			450	450	650	450	
ponga/ silver fern	Cyathea dealbata	2 Litre					30	20	20
pukupuku/ rasp fern	Doodia australis (syn Blechnum parrisiae)	0.5 Litre	100	1000					
pukupuku/ rasp fern	Doodia australis (syn Blechnum parrisiae)	1 Litre							100
pūriri	Vitex lucens	2 Litre					75	55	50
shining karamū	Coprosma lucida	1 Litre			50	50	270	180	
tītoki	Alectryon excelsus	2 Litre					45	45	50
toetoe	Austroderia fulvida	0.5 Litre	100						
toetoe	Austroderia fulvida	1 Litre			100	100	120	80	
tōtara	Podocarpus totara	2 Litre					55	45	50

Common name	Botanical name	Plant Size	Ōwairaka Mound Planting Years 1-5	Ōwairaka Years 1-3 Quarry underplanting	Ōwairaka Year 1 Quarry Planting	Ōwairaka Year 2 Quarry Planting	Ōwairaka Year 3 Quarry Planting	Ōwairaka Year 4 Quarry Planting	Ōwairaka Year 5 Quarry Planting
whararikī (mountain flax)	Phormium cookianum	0.5 Litre	100						
whararikī (mountain flax)	Phormium cookianum	1 Litre			50	50	70	50	
wharawhara	Astelia banksii	1 Litre							30
Total			**900**	**2600**	**1280**	**1260**	**3460**	**2325**	**480**

Table 4: *Recommended contractor site preparation.*

Planting location	Location notes	Preparation
Owairaka Mound Planting Years 1-5	This planting does not involve any digging but will rely on placing native species with a biodegradable approved pot/bag onto the soil among existing grass. Species would need to be tested for survival with this method either here or on other maunga.	Weed control as needed. Maintain grass groundcover and spot spray plant over several years to minimise disturbance. Planting is recommended to be undertaken by contractors. Only includes the slopes above pits.
Owairaka Years 1-3 Quarry underplanting	This planting should be undertaken in year 1 in areas of existing native canopy throughout the quarry area. Sourcing large numbers of ferns may require ordering 2 years in advanced from nurseries if possible.	Some minor spot spraying with haloxyfop (grass specific herbicide).
Owairaka Year 1 Quarry Planting	Planting should be followed up with a living mulch such as rye clover over any bare areas to avoid erosion.	Minimum of two green glyphosate sprays prior to planting for invasive grass species and other groundcover weeds such as Tradescantia and onion weed. Maintain noninvasive groundcovers wherever possible especially native *Microlaena stipoides*.

Planting location	Location notes	Preparation
Owairaka Year 2 Quarry Planting	Planting should be followed up with a living mulch such as rye clover over any bare areas to avoid erosion.	Minimum of two green glyphosate sprays prior to planting for invasive grass species and other groundcover weeds such as Tradescantia and onion weed. Maintain noninvasive groundcovers wherever possible especially native *Microlaena stipoides*.
Owairaka Year 3 Quarry Planting	Includes diversity species as there is enough shelter from existing native trees. Planting should be followed up with a living mulch such as rye clover over any bare areas to avoid erosion.	Minimum of two green glyphosate sprays prior to planting for invasive grass species and other groundcover weeds such as Tradescantia and onion weed. Maintain noninvasive groundcovers wherever possible especially native *Microlaena stipoides*.
Owairaka Year 4 Quarry Planting	Includes diversity species as there is enough shelter from existing native trees. Planting should be followed up with a living mulch such as rye clover over any bare areas to avoid erosion.	Minimum of two green glyphosate sprays prior to planting for invasive grass species and other groundcover weeds such as Tradescantia and onion weed. Maintain noninvasive groundcovers wherever possible especially native *Microlaena stipoides*.
Owairaka Year 5 Quarry Planting	Infill of open planting sites with diversity species once shelter has established.	None if adequate maintenance has been undertaken on Stage 3 and 4 plantings.

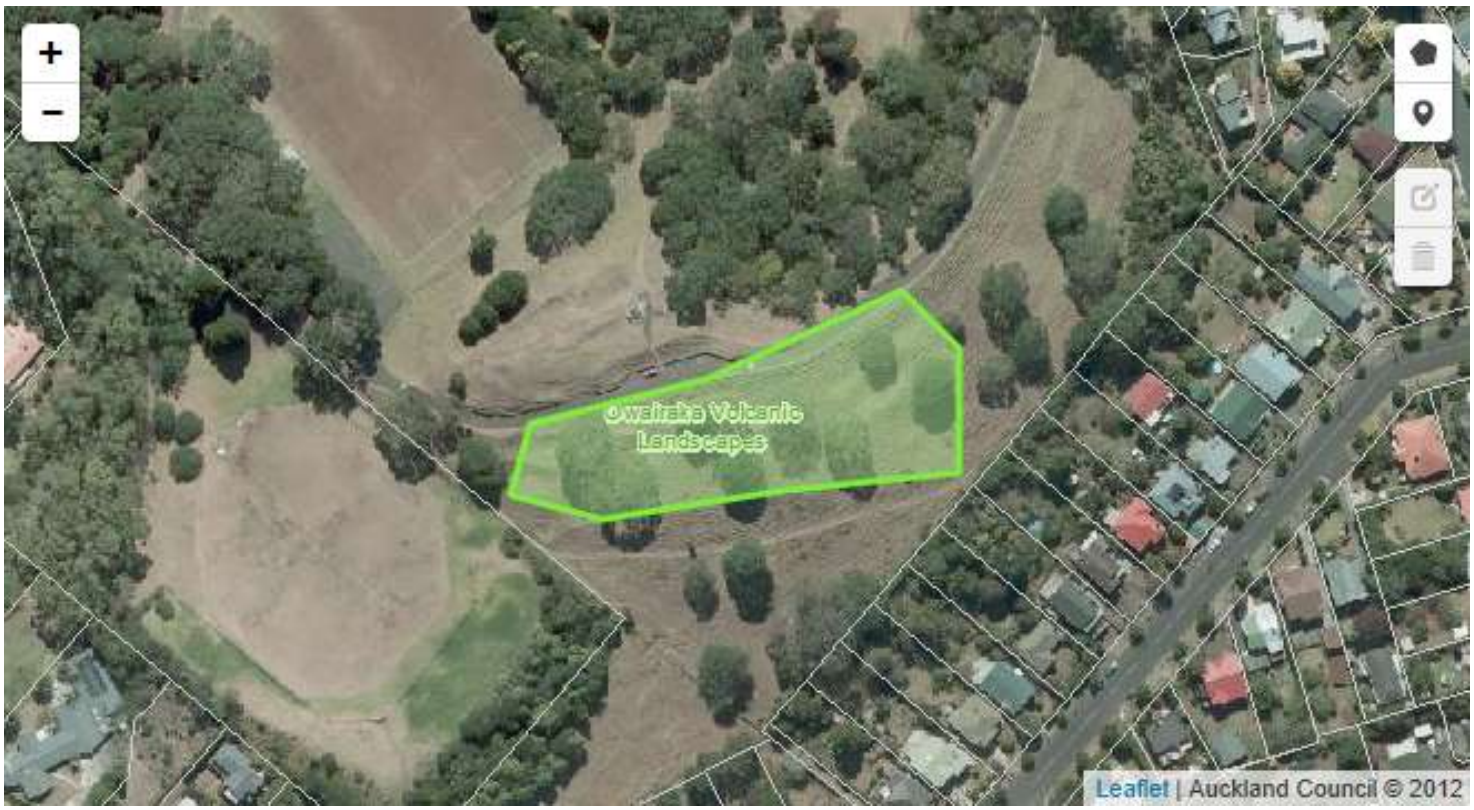
Planting

Reference:

4222 - Owairaka - Owairaka Mound Planting Years 1-5

Te Ngahere

This planting does not involve any digging but will rely on placing native species with a biodegradable approved pot/bag onto the soil among existing grass. Species would need to be tested for survival with this method either here or on other maunga.



pōhuehue *(Muehlenbeckia complexa)*

To be main component to minimise access to the pits and promote native habitat. Should also be trialled initially before whole areas is planted. Infill over 5 years as needed.

Dry - Damp | Full Sun - Semi Shade

Coloniser | forest/coastal | Suitable for Archaeological Sites

700

0.5 Litre

rasp fern / pukupuku *(Doodia australis (syn Blechnum parrisiae))*

Trial species for any rocky habitat. Infill over 5 years as needed if good estabishment rates.

Dry - Damp | Full Sun - Semi Shade

Enrichment | forest/coastal | Suitable for Archaeological Sites

100

0.5 Litre

toetoe *(Austroderia fulvida)*

Trial species for road edge. Infill over 5 years as needed if good estabishment rates.

Dry - Damp | Full Sun

Coloniser | riparian/forest edge | Suitable for Archaeological Sites

Plant in groups. Coastal to inland. Wet places, stream, lake and forest margins, and disturbed hillsides.

100

0.5 Litre

whararikí (mountain flax)
(Phormium cookianum)

Trial species for road edge. Infill over 5 years as needed if good establishment rates.

Dry - Damp

Full Sun

Coloniser

coastal/forest edge

Suitable for Archaeological Sites

Very hardy, tolerant of salt exposure. Grows in a range of conditions. Suitable for planting up to the cliff edge

100

0.5 Litre

Totals by Container

1000 0.5 Litre

Total Plant 1000

Planting

Reference:

4222 - Owairaka - Owairaka Year 1-3 Quarry underplanting

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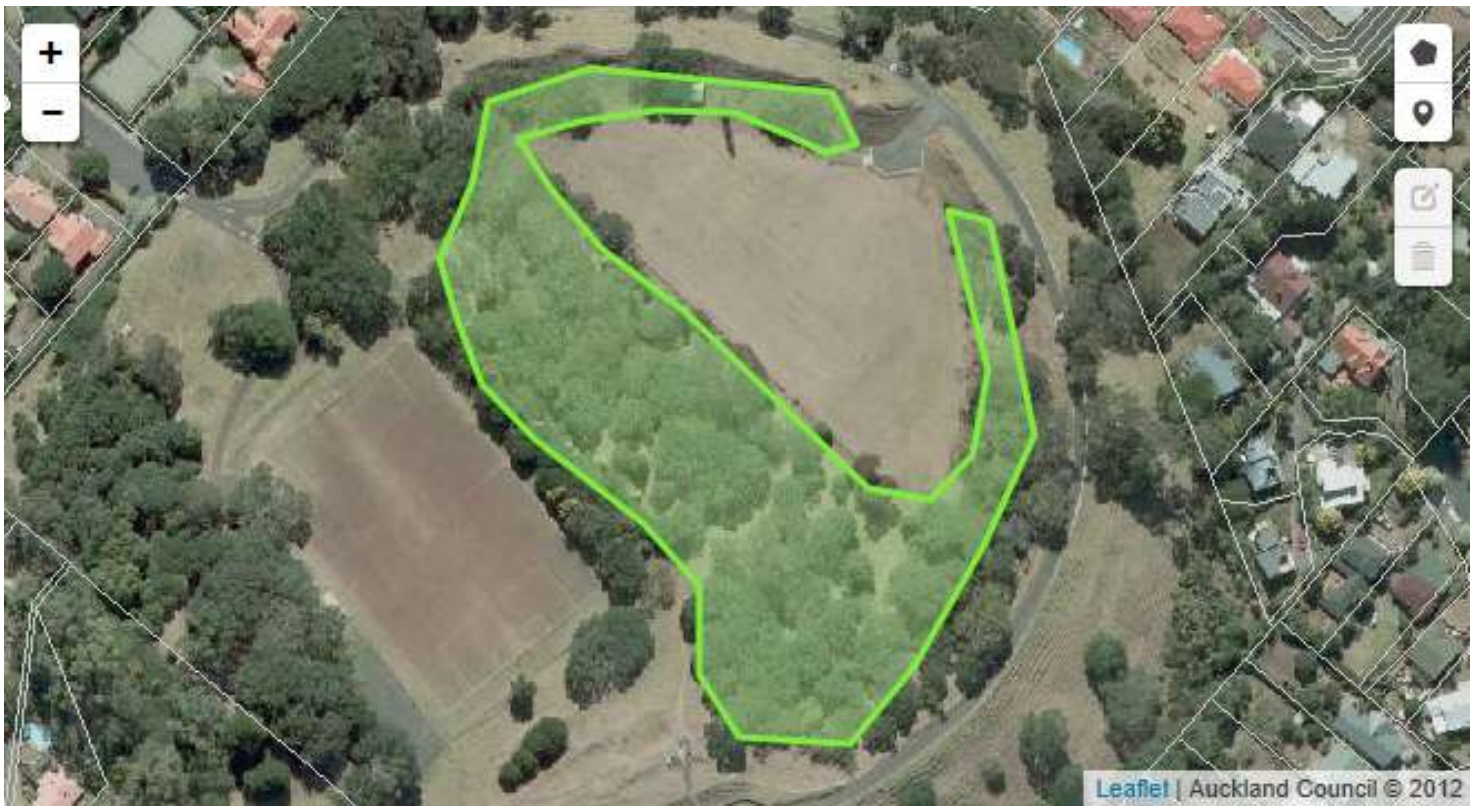
This planting should be undertaken in year 1 in areas of existing native canopy throughout the quarry area. Sourcing large numbers of ferns may be difficult so infill planting can be undertaken years 2 to 3 to make up the numbers.



forest sedge *(Carex lambertiana)* Plant in groups below existing native canopy

Dry - Damp

Semi Shade - Shade

Enrichment riparian/wetland

Does not like wet feet

500

0.5 Litre

kiokio *(Blechnum nova-zelandiae)* Plant in groups below existing native canopy

Dry - Wet

Full Sun - Shade

Enrichment riparian/forest

Plant in groups

500

0.5 Litre

Kowharahara, perching lily *(Astelia solandri)* Rocky areas below existing native canopy

Dry - Damp

Full Sun - Shade

Enrichment forest

300

0.5 Litre

mingimingi *(Coprosma rhamnoides)*

Below existing native canopy

Dry - Damp

Full Sun - Shade

Coloniser

forest/coastal

300

0.5 Litre

rasp fern / pukupuku *(Doodia australis (syn Blechnum parrisiae))*

Plant in groups below existing native canopy

Dry - Damp

Full Sun - Semi Shade

Enrichment

forest/coastal

Suitable for Archaeological Sites

1000

0.5 Litre

Totals by Container

2600 0.5 Litre

Total Plant **2600**

Planting

Reference:

4222 - Owairaka - Owairaka Year 1 Quarry Planting

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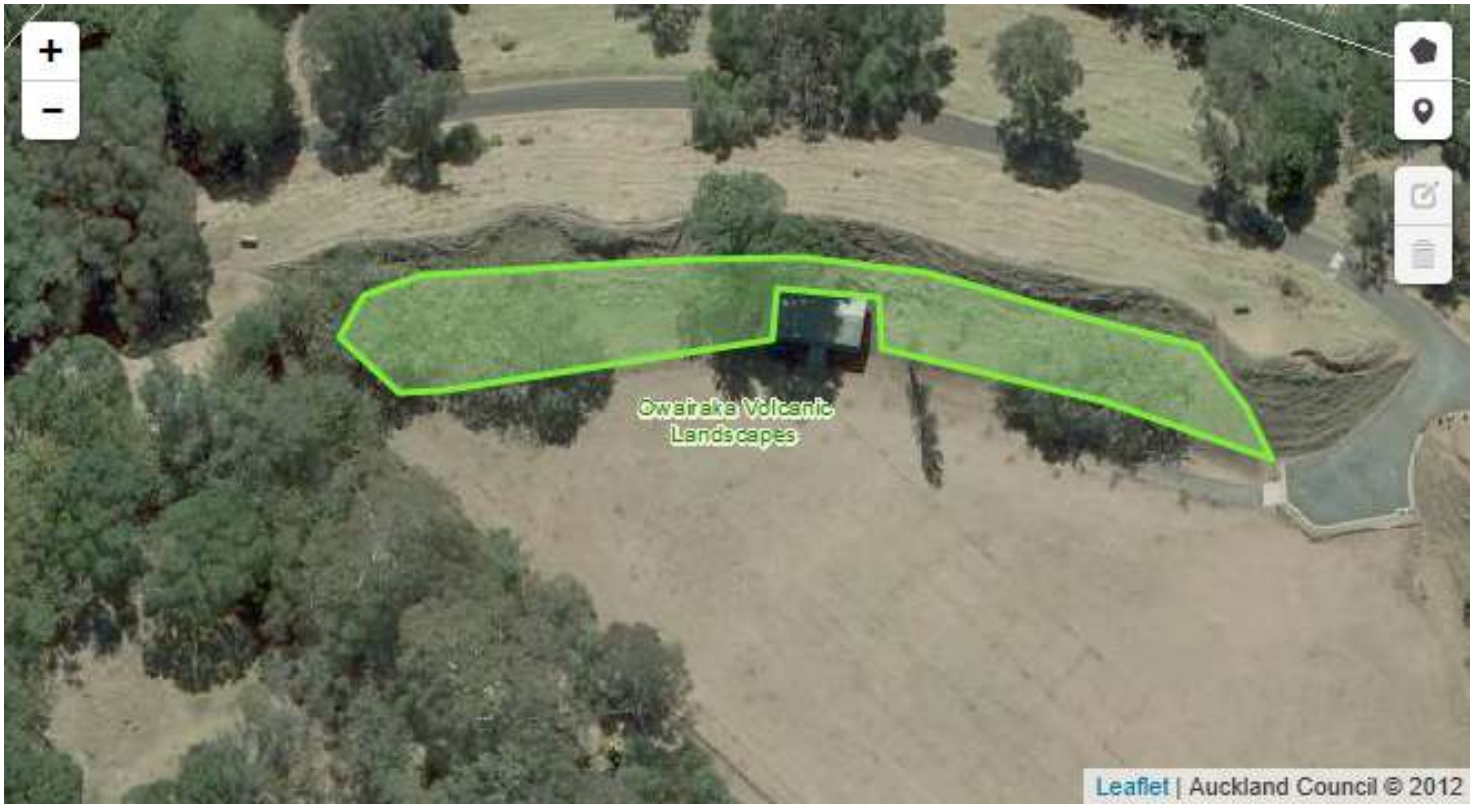
Planting should be followed up with a living mulch such as rye clover over any bare areas to avoid erosion.



hangehange *(Geniostoma ligustrifolium var. ligustrifolium)*

Keep to sheltered areas such as behind building

Dry — Full Sun - Semi Shade

Coloniser — riparian/forest edge

prefers forest edge where it can get lots of light, yet is sheltered from exposure to strong winds. Grows best in soils rich and moist, but not too wet.

20

1 Litre

kānuka (Auckland) *(Kunzea robusta)*

Dry — Full Sun

Coloniser — forest

Suitable for Archaeological Sites

soft to touch. Hardy tree prefers drier sunny sites.

140

1 Litre

karamū *(Coprosma robusta)*

Dry - Wet — Full Sun - Shade

Coloniser — forest

150

1 Litre

māhoe *(Melicytus ramiflorus)*

Dry - Damp

Full Sun - Semi Shade

Coloniser forest

good at stabilising banks

160

1 Litre

mānuka *(Leptospermum scoparium var. scoparium)*

Keep to lower slopes/ flat areas

Dry - Damp

Full Sun

Coloniser forest

Suitable for Archaeological Sites

prickly to touch. Very hardy. Sunny position, dry to moist soils

80

1 Litre

māpou *(Myrsine australis)*

Dry - Damp

Full Sun - Semi Shade

Coloniser forest/coastal

80

1 Litre

mingimingi *(Coprosma rhamnoides)*

Can include some in edge of plantings

Dry - Damp

Full Sun - Shade

Coloniser forest/coastal

50

1 Litre

pōhuehue *(Muehlenbeckia complexa)*

.5m spacing top and bottom edge of planting area only to create dense low habitat

Dry - Damp

Full Sun - Semi Shade

Coloniser forest/coastal

Suitable for Archaeological Sites

450

1 Litre

shining karamū *(Coprosma lucida)*

Dry - Damp

Full Sun

Coloniser coastal

50

1 Litre

toetoe *(Austroderia fulvida)*

.75m spacing top and bottom edge of planting area only to create dense low habitat

Dry - Damp

Full Sun

Coloniser riparian/forest edge

Suitable for Archaeological Sites

Plant in groups. Coastal to inland. Wet places, stream, lake and forest margins, and disturbed hillsides.

100

1 Litre

whararikí (mountain flax)
(Phormium cookianum)

Top and bottom edge of planting area only to create dense low habitat

Dry - Damp

Full Sun

Coloniser coastal/forest edge

Very hardy, tolerant of salt exposure. Grows in a range of conditions. Suitable for planting up to the cliff edge

Suitable for Archaeological Sites

50

1 Litre

Totals by Container **Total Plant 1330**

1330 1 Litre

Planting

Reference:

4222 - Owairaka - Owairaka Year 2 Quarry Planting

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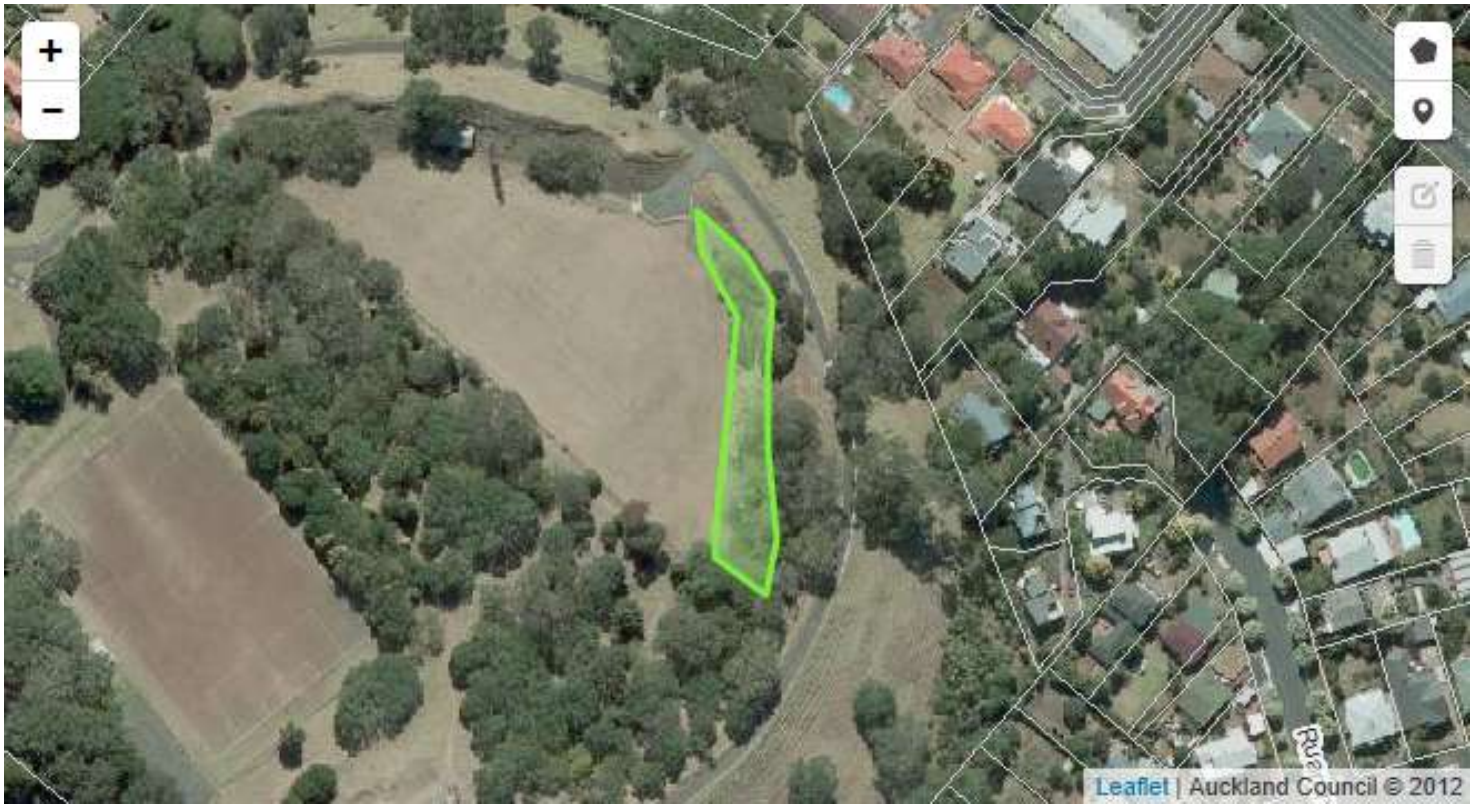
Planting should be followed up with a living mulch such as rye clover over any bare areas to avoid erosion.



hangehange *(Geniostoma ligustrifolium var. ligustrifolium)*

Keep to sheltered areas such near existing native trees

Dry

Full Sun - Semi Shade

Coloniser riparian/forest edge

prefers forest edge where it can get lots of light, yet is sheltered from exposure to strong winds. Grows best in soils rich and moist, but not too wet.

20

1 Litre

kānuka (Auckland) *(Kunzea robusta)*

Dry

Full Sun

Coloniser forest

Suitable for Archaeological Sites

soft to touch. Hardy tree prefers drier sunny sites.

150

1 Litre

karamū *(Coprosma robusta)*

Dry - Wet

Full Sun - Shade

Coloniser forest

150

1 Litre

māhoe *(Melicytus ramiflorus)*

Dry - Damp

Full Sun - Semi Shade

Coloniser forest

good at stabilising banks

150

1 Litre

mānuka *(Leptospermum scoparium var. scoparium)*

Keep to lower slopes/ flat areas

Dry - Damp

Full Sun

Coloniser forest

Suitable for Archaeological Sites

prickly to touch. Very hardy. Sunny position, dry to moist soils

80

1 Litre

māpou *(Myrsine australis)*

Dry - Damp

Full Sun - Semi Shade

Coloniser forest/coastal

80

1 Litre

mingimingi *(Coprosma rhamnoides)*

Include some within edge areas

Dry - Damp

Full Sun - Shade

Coloniser forest/coastal

30

1 Litre

pōhuehue *(Muehlenbeckia complexa)*

0.5m spacing top and bottom edge of planting area only to create dense low habitat

Dry - Damp

Full Sun - Semi Shade

Coloniser forest/coastal

Suitable for Archaeological Sites

450

1 Litre

shining karamū *(Coprosma lucida)*

Dry - Damp

Full Sun

Coloniser coastal

50

1 Litre

toetoe *(Austroderia fulvida)*

0.75m spacing top and bottom edge of planting area only to create dense low habitat

Dry - Damp

Full Sun

Coloniser riparian/forest edge

Suitable for Archaeological Sites

Plant in groups. Coastal to inland. Wet places, stream, lake and forest margins, and disturbed hillsides.

100

1 Litre

whararikí (mountain flax) Top and bottom edge of planting area only to create dense low habitat
(Phormium cookianum)

Dry - Damp

Full Sun

Coloniser coastal/forest edge

Very hardy, tolerant of salt exposure. Grows in a range of conditions. Suitable for planting up to the cliff edge

Suitable for Archaeological Sites

50

1 Litre

Totals by Container **Total Plant 1310**

1310 1 Litre

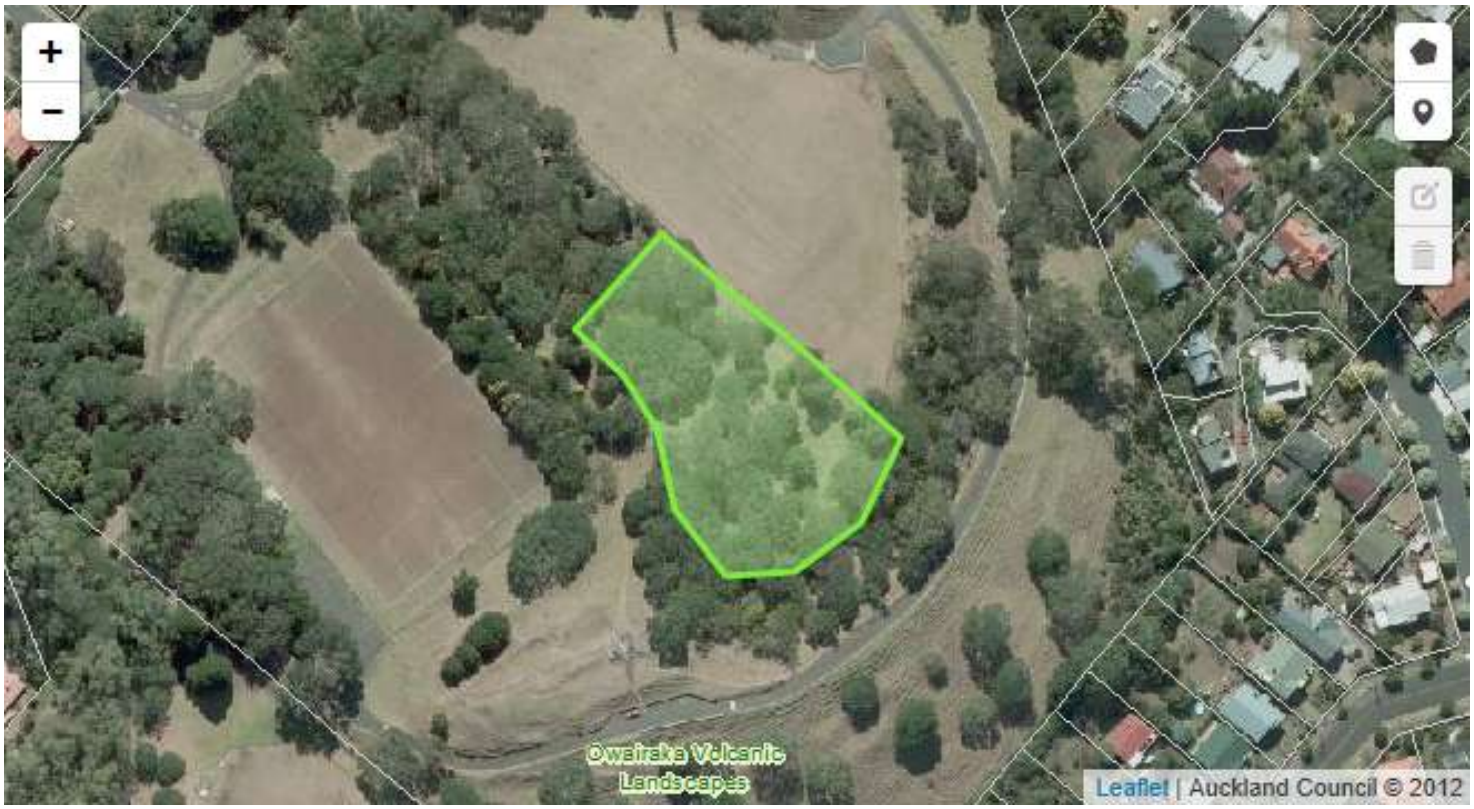
Planting

Reference:

4222 - Owairaka - Owairaka Year 3 Quarry Planting

Te Ngahere

Includes diversity species as there is enough shelter from existing native trees. Planting should be followed up with a living mulch such as rye clover over any bare areas to avoid erosion.



hangehange *(Geniostoma ligustrifolium var. ligustrifolium)*

Keep close to sheltered positions such as existing native trees

Dry

Full Sun - Semi Shade

Coloniser riparian/forest edge

prefers forest edge where it can get lots of light, yet is sheltered from exposure to strong winds. Grows best in soils rich and moist, but not too wet.

45

1 Litre

kānuka (Auckland) *(Kunzea robusta)*

Dry

Full Sun

Coloniser forest

Suitable for Archaeological Sites

soft to touch. Hardy tree prefers drier sunny sites.

360

1 Litre

karaka *(Corynocarpus laevigatus)*

Diversity species; keep to sheltered areas. Is currently also spreading naturally

Dry - Damp

Full Sun - Shade

Enrichment forest/coastal

Suitable for sheltered and exposed situations, common naturally regenerating under shade so should be planted in places where this is unlikey to occur.

20

2 Litre

karamū *(Coprosma robusta)*

Dry - Wet

Full Sun - Shade

Coloniser forest

585

1 Litre

kawakawa *(Piper excelsum subsp. excelsum)*

Diversity species; keep to sheltered areas. Is currently also spreading naturally

Dry - Damp

Full Sun - Shade

Coloniser forest

Suitable for Archaeological Sites

Usually an important understorey species in coastal forest

30

2 Litre

kohekohe *(Dysoxylum spectabile)*

Diversity species; keep to sheltered areas.

Dry - Damp

Semi Shade - Shade

Enrichment forest

sometimes dominant or co-dominant tree of coastal to lowland forest

55

2 Litre

māhoe *(Melicytus ramiflorus)*

Dry - Damp

Full Sun - Semi Shade

Coloniser forest

good at stabilising banks

540

1 Litre

Mangeao *(Litsea calicaris)*

Diversity species, keep to sheltered areas. Difficult to source and needs ongoing pest control in the areas to establish.

Damp

Semi Shade - Shade

Enrichment forest

plant sparingly, can be difficult to establish

10

2 Litre

mānuka *(Leptospermum scoparium var. scoparium)*

Keep to lower slopes.

Dry - Damp

Full Sun

Coloniser forest

Suitable for Archaeological Sites

prickly to touch. Very hardy. Sunny position, dry to moist soils

90

1 Litre

māpou *(Myrsine australis)*

Dry - Damp

Full Sun - Semi Shade

Coloniser forest/coastal

450

1 Litre

mingimingi *(Coprosma rhamnoides)*

Lower edge beside sports field only to create dense low planting

Dry - Damp

Full Sun - Shade

Coloniser forest/coastal

30

1 Litre

pigeonwood / porokaiwhiri *(Hedycarya arborea)*

Diveristy species; keep to shelterd areas.

Dry - Damp

Semi Shade

Enrichment forest

55

2 Litre

pōhuehue *(Muehlenbeckia complexa)*

.5m spacing lower edge beside sports field only to create dense low planting

Dry - Damp

Full Sun - Semi Shade

Coloniser forest/coastal

Suitable for Archaeological Sites

650

1 Litre

ponga/ silver fern *(Cyathea dealbata)*

Diversity species; keep to shelterd areas.

Dry - Damp

Full Sun - Shade

Enrichment forest

30

2 Litre

pūriri *(Vitex lucens)*

Diversity species; keep to shelterd areas.

Dry - Damp

Full Sun - Semi Shade

Enrichment forest

prefers rich fertile soils. frost tender when young.

75

2 Litre

shining karamū *(Coprosma lucida)*

Dry - Damp

Full Sun

Coloniser coastal

270

1 Litre

tītoki *(Alectryon excelsus)*

Diversity species; keep to sheltered areas.

Dry - Damp

Full Sun - Semi Shade

Enrichment forest

Needs some shade to establish, prefers fertile volcanic or alluvial sites

45

2 Litre

toetoe *(Austroderia fulvida)*

0.75 m spacing onlower edge beside sports field only to create dense low planting

Dry - Damp

Full Sun

Coloniser | riparian/forest edge | **Suitable for Archaeological Sites**

Plant in groups. Coastal to inland. Wet places, stream, lake and forest margins, and disturbed hillsides.

120

1 Litre

tōtara *(Podocarpus totara)*

Diversity species; plant in open areas.

Dry

Full Sun - Shade

Enrichment | lowland forest

55

2 Litre

whaririki (mountain flax) *(Phormium cookianum)*

Lower edge beside sports field only to create dense low planting

Dry - Damp

Full Sun

Coloniser | coastal/forest edge | **Suitable for Archaeological Sites**

Very hardy, tolerant of salt exposure. Grows in a range of conditions. Suitable for planting up to the cliff edge

70

1 Litre

Totals by Container

3210	1 Litre
375	2 Litre

Total Plant **3585**

Planting

Reference:

4222 - Owairaka - Owairaka Year 4 Quarry Planting

Te Ngahere

Includes diversity speces as there is enough shelter from existing native trees. Planting should be followed up with a living mulch such as rye clover over any bare areas to avoid erosion.

hangehange *(Geniostoma ligustrifolium var. ligustrifolium)*

Keep close to sheltered positions such as existing native trees

Dry

Full Sun - Semi Shade

Coloniser riparian/forest edge

prefers forest edge where it can get lots of light, yet is sheltered from exposure to strong winds. Grows best in soils rich and moist, but not too wet.

55

1 Litre

kānuka (Auckland) *(Kunzea robusta)*

Dry

Full Sun

Coloniser forest

Suitable for Archaeological Sites

soft to touch. Hardy tree prefers drier sunny sites.

200

1 Litre

karaka *(Corynocarpus laevigatus)*

Diversity species; keep to sheltered areas.Is currently also spreading naturally

Dry - Damp

Full Sun - Shade

Enrichment forest/coastal

Suitable for sheltered and exposed situations, common naturally regenerating under shade so should be planted in places where this is unlikey to occur.

10

2 Litre

karamū *(Coprosma robusta)*

Dry - Wet

Full Sun - Shade

Coloniser forest

360

1 Litre

kawakawa *(Piper excelsum subsp. excelsum)*

Diversity species; keep to sheltered areas. Is currently aslso spreading naturally

Dry - Damp

Full Sun - Shade

Coloniser forest

Suitable for Archaeological Sites

Usually an important understorey species in coastal forest

40

2 Litre

kohekohe *(Dysoxylum spectabile)*

Diversity species; keep to sheltered areas.

Dry - Damp

Semi Shade - Shade

Enrichment forest

sometimes dominant or co-dominant tree of coastal to lowland forest

40

2 Litre

māhoe *(Melicytus ramiflorus)*

Dry - Damp

Full Sun - Semi Shade

Coloniser forest

good at stabilising banks

360

1 Litre

Mangeao *(Litsea calicaris)*

Diversity species; keep to sheltered areas. Difficult to source and needs ongoing pest control in the areas to establish.

Damp

Semi Shade - Shade

Enrichment forest

plant sparingly, can be difficult to establish

10

2 Litre

mānuka *(Leptospermum scoparium var. scoparium)*

Keep to lower slopes.

Dry - Damp

Full Sun

Coloniser forest

Suitable for Archaeological Sites

prickly to touch. Very hardy. Sunny position, dry to moist soils

75

1 Litre

māpou *(Myrsine australis)*

Dry - Damp

Full Sun - Semi Shade

Coloniser forest/coastal

280

1 Litre

mingimingi *(Coprosma rhamnoides)*

Lower edge beside sports field only to create dense low planting

Dry - Damp

Full Sun - Shade

Coloniser forest/coastal

20

1 Litre

pigeonwood / porokaiwhiri *(Hedycarya arborea)*

Diveristy species; keep to sheltered areas.

Dry - Damp

Semi Shade

Enrichment forest

45

2 Litre

pōhuehue *(Muehlenbeckia complexa)*

0.5m spacing ower edge beside sports field only to create dense low planting

Dry - Damp

Full Sun - Semi Shade

Coloniser forest/coastal

Suitable for Archaeological Sites

450

1 Litre

ponga/ silver fern *(Cyathea dealbata)*

Diversity species; keep to sheltered areas.

Dry - Damp

Full Sun - Shade

Enrichment forest

20

2 Litre

pūriri *(Vitex lucens)*

Diversity species; keep to sheltered areas.

Dry - Damp

Full Sun - Semi Shade

Enrichment forest

prefers rich fertile soils. frost tender when young.

55

2 Litre

shining karamū *(Coprosma lucida)*

Dry - Damp

Full Sun

Coloniser coastal

180

1 Litre

tītoki *(Alectryon excelsus)*

Diversity species; keep to sheltered areas.

Dry - Damp

Full Sun - Semi Shade

Enrichment forest

Needs some shade to establish, prefers fertile volcanic or alluvial sites

45

2 Litre

toetoe *(Austroderia fulvida)*

.75m spacing lower edge beside sports field only to create dense low planting

Dry - Damp

Full Sun

Coloniser

riparian/forest edge

Suitable for Archaeological Sites

Plant in groups. Coastal to inland. Wet places, stream, lake and forest margins, and disturbed hillsides.

80

1 Litre

tōtara *(Podocarpus totara)*

Diversity species; plant in open areas.

Dry

Full Sun - Shade

Enrichment

lowland forest

45

2 Litre

whaririki (mountain flax) *(Phormium cookianum)*

Lower edge beside sports field only to create dense low planting

Dry - Damp

Full Sun

Coloniser

coastal/forest edge

Suitable for Archaeological Sites

Very hardy, tolerant of salt exposure. Grows in a range of conditions. Suitable for planting up to the cliff edge

50

1 Litre

Totals by Container

2110	1 Litre
310	2 Litre

Total Plant **2420**

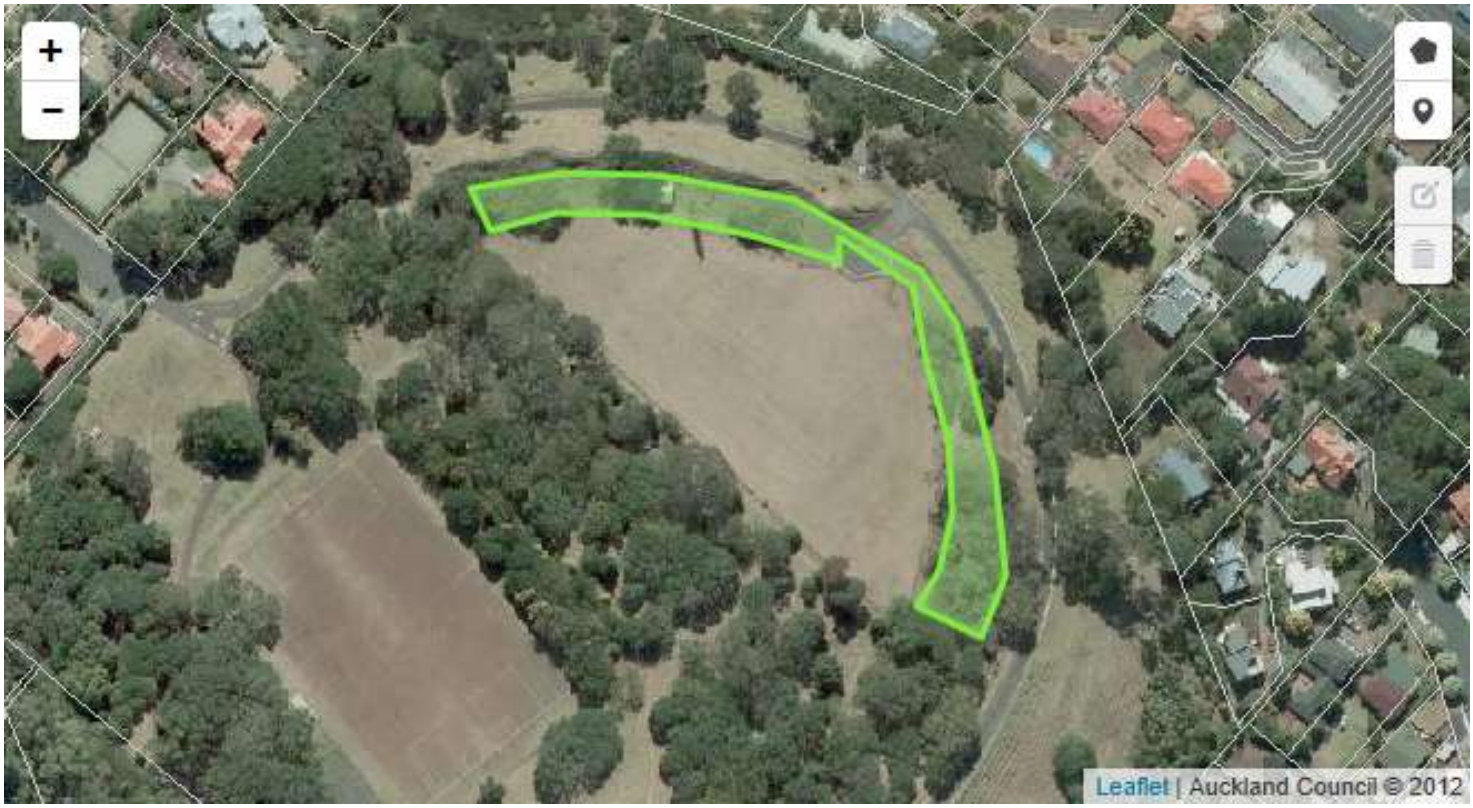
Planting

Reference:

4222 - Owairaka - Owairaka Year 5 Quarry Planting

Te Ngahere

Infill of open planting sites with diversity species once shelter has established.



forest sedge *(Carex lambertiana)* Plant in groups

Dry - Damp

Semi Shade - Shade

Enrichment riparian/wetland

Does not like wet feet

50

1 Litre

karaka *(Corynocarpus laevigatus)*

Dry - Damp

Full Sun - Shade

Enrichment forest/coastal

Suitable for sheltered and exposed situations, common naturally regenerating under shade so should be planted in places where this is unlikey to occur.

10

2 Litre

kawakawa *(Piper excelsum subsp. excelsum)*

Dry - Damp

Full Sun - Shade

Coloniser forest

Suitable for Archaeological Sites

Usually an important understorey species in coastal forest

30

2 Litre

kiokio *(Blechnum nova-zelandiae)* Plant in groups

Dry - Wet

Full Sun - Shade

Enrichment riparian/forest

Plant in groups

30

1 Litre

kohekohe *(Dysoxylum spectabile)*

Dry - Damp

Semi Shade - Shade

Enrichment forest

sometimes dominant or co-dominant tree of coastal to lowland forest

80

2 Litre

pigeonwood / porokaiwhiri *(Hedycarya arborea)*

Dry - Damp

Semi Shade

Enrichment forest

60

2 Litre

pongal silver fern *(Cyathea dealbata)*

Dry - Damp

Full Sun - Shade

Enrichment forest

20

2 Litre

pūriri *(Vitex lucens)*

Dry - Damp

Full Sun - Semi Shade

Enrichment forest

prefers rich fertile soils. frost tender when young.

50

2 Litre

rasp fern / pukupuku *(Doodia australis (syn Blechnum parrisiae))*

Plant in groups

Dry - Damp

Full Sun - Semi Shade

Enrichment forest/coastal

Suitable for Archaeological Sites

100

1 Litre

tītoki *(Alectryon excelsus)*

Dry - Damp

Full Sun - Semi Shade

Enrichment forest

Needs some shade to establish, prefers fertile volcanic or alluvial sites

50

2 Litre

tōtara *(Podocarpus totara)*

Dry

Full Sun - Shade

Enrichment lowland forest

50

2 Litre

wharawhara *(Astelia banksii)* Rocky areas

Dry

Semi Shade - Shade

Enrichment coastal/forest edge

30

1 Litre

Totals by Container **Total Plant** **560**

210 1 Litre

350 2 Litre