Key Native Ecosystem Plan for Whitireia Coast

2014-17

greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Contents

1. Key Native Ecosystem plans

New Zealand's indigenous biodiversity continues to decline nationally, and in the Wellington region. Major reasons for the decline are that native species are preyed on or outcompeted by invasive species and ecosystems and habitats are lost or degraded through human resource use and development. Active management to control threats is required to protect indigenous biodiversity. Regional councils have responsibility to maintain indigenous biodiversity, as well as to protect significant vegetation and habitats of threatened species, under the Resource Management Act 1991 (RMA).

Greater Wellington Regional Council's (GWRC's) vision for biodiversity is:

> *"The Wellington region contains a full range of naturally occurring habitats and ecosystems that are in a healthy functioning state and supporting indigenous biodiversity"*

GWRC's Biodiversity Strategy 2011-2021[1] provides a common focus across the council's departments, and guides activities relating to biodiversity. One of its goals is: High value biodiversity areas are protected.

In order to achieve this vision and goal, the Key Native Ecosystem (KNE) programme seeks to protect some of the best examples of ecosystem types in the Wellington region by managing, reducing, or removing threats to their values. Sites with the highest biodiversity values have been identified and then prioritised for management. Active management of KNEs can involve control of ecological weeds and pest animals, fencing to exclude stock, restoration planting and helping landowners to legally protect these areas.

KNEs are managed in accordance with three-year KNE plans, such as this one, prepared for each area by the GWRC's Biodiversity department in collaboration with the landowners and other stakeholders. These plans outline the ecological values and threats specific to each KNE, set out objectives for biodiversity management, and prescribe the operational actions and budget required to work towards achieving the objectives.

Much of the work planned in KNEs will be carried out by GWRC staff or contractors engaged by GWRC. For example, the Biosecurity department carries out ecological weed and pest animal control to achieve the objectives set out in KNE plans.

GWRC also recognizes that working relationships between the management partners are critical for achieving the objectives for the KNE. Under the KNE programme, GWRC staff also work with landowners and volunteer community groups involved in protection or restoration work within KNEs.

KNE plans are reviewed regularly to ensure the activities undertaken to protect and restore the KNE are informed by experience and improved knowledge about the site.

2. Whitireia Coast Key Native Ecosystem

The Whitireia Coast KNE is located entirely within Whitireia Park and is in the Cook Strait Ecological District[2]. Whitireia Park (254ha) is located within the city of Porirua and occupies the northern end of Whitireia Peninsula (see Appendix 1, Map 1). The Whitireia Coast KNE covers an area of approximately 95 hectares. It includes the western cliffs and coastal platform, the eastern and southern coastal escarpments, the dune lands, wetlands and estuary, the forest remnant, and Te Onepoto Stream riparian strip.

Landowner and stakeholders

GWRC takes a collaborative approach to managing Key Native Ecosystems. This means that we will seek to work with landowners and other interested parties (stakeholders) where appropriate, to achieve shared objectives for the site. In preparing this plan GWRC has sought input from landowners and relevant stakeholders, and will continue to involve them as the plan is implemented.

Landowners

Most of the KNE is Crown-owned Recreation Reserve for which control and management responsibility has been transferred from the Department of Conservation (DOC) to the Whitireia Park Board (see Appendix 1, Map 2). The Whitireia Park Board includes representatives of GWRC and Ngāti Toa, in anticipation of a Treaty Settlement under which Ngāti Toa will take ownership of some land within Whitireia Park. Final settlement is likely to occur in 2014. GWRC provides administrative services to the Board, and is responsible for the ongoing management of the Park. Te Onepoto Rd is a paper road that runs on the very south eastern edge of the KNE. This is owned by Porirua City Council but also managed by GWRC.

Management of Whitireia Park as a whole is guided by the Whitireia Park Management Plan (1978) with some further detail given by the Whitireia Park Sustainable Land Use Plan (Draft). The Management Plan for the Park is being reviewed in 2014. These plans guide the recreational and amenity uses of the park as well as identifying opportunities to protect biodiversity values. This KNE plan is consistent with the wider objectives and policies of these parks management plans. The Biodiversity and Parks departments work collaboratively to efficiently deliver activities in the KNE area.

Key stakeholders

The GWRC Biodiversity department coordinates biodiversity management in this KNE, the Parks department is responsible for the overall park management, and the Biosecurity department delivers the on-the-ground pest control operations.

The Whitireia Park Restoration Group (WPRG), formerly the Onehunga Bay Restoration Group, have been involved with the KNE since 2005. They have been actively involved in revegetation and have received several external grants which have allowed them to increase their restoration planting efforts. They have worked primarily in Onehunga Bay and Kaiaua Bay and, to a lesser extent, in the western cliff area. WPRG are also responsible for maintaining predator traps across the KNE and work collaboratively with the GWRC Parks department.

Ecological values

Ecological values are a way to describe indigenous biodiversity found at a site, and what makes it special. These ecological values can be various components or attributes of ecosystems that determine an area's importance for the maintenance of regional biodiversity. Examples of values are the provision of important habitat for a threatened species, or particularly intact remnant vegetation typical of the ecosystem type. The ecological values of a site are used to prioritise allocation of resources to manage KNEs within the region.

The Whitireia Coast KNE ranks as one of the highest value coastal sites in the Wellington region and has elements that are representative of the Cook Strait Ecological District[3]. There are several ecosystem types within the KNE: coastal cliffs and escarpments, rocky shore, dunelands, wetlands including an estuary, and a stream ecosystem. The KNE has been divided into five main operational areas (see Appendix 1, Map 3) containing all of the ecosystem types listed above.

Area A: Northwestern cliffs including the rocky shore

The natural environment in this operational area is characterised by strong and abrasive salt-laden winds and wave action on the rocky shore. This is particularly pronounced on the western cliffs where, along with poor soils, the exposed conditions create habitat for specially adapted native plants and animals. This area also includes small patches of coastal turf.

Grey scrub of mānuka (*Leptospermum scoparium*), mingimingi (*Leucopogon fasciculatus*) and tauhinu (*Ozothamnus leptophyllus*) is developing on the escarpment, with communities of silver tussock (*Poa cita*), taupata (*Coprosma repens*), *Coprosma propinqua*, whaririki (*Phormium cookianum* subsp. *cookianum*) and thick-leaved māhoe (*Melicytus crassifolius*) growing on the cliffs. On the western scarp nationally threatened pygmy button daisy (*Leptinella nana*) is found in two locations and other plants of note are *Pimelia prostrata* var. *seismica*, *Pimelia cryptica* and *Raoulia hookeri* subsp. *hookeri*.

The KNE contains a range of coastal birds including variable oystercatcher (*Haematopus unicolor*), white-faced heron (*Ardea novaehollandiae*), white heron (*Egretta alba*), royal spoonbill (*Platalea regia*), blue penguin (*Eudyptula minor*), little shag (*Phalacrocorax melanoleucas*), pied shag (*Phalacrocorax varius*), Australasian gannet (*Morus serrator*), pied stilt (*Himantopus himantopus*), red-billed gull (*Larus novaehollandiae*), Caspian tern (*Sterna caspia*), black-billed gull (*Larus bulleri*) and white-fronted tern (*Sterna striata*) (Robyn Smith, pers comm 2014).

Three lizard species are known from the coastal area of the KNE: common skink (*Oligosoma polychroma*), copper skink (*O. aeneum*) and common gecko (*Woodworthia maculata*)[4]. Other species may be present as there are historic records of spotted skink (*O. lineoocellatum*) in Titahi Bay, and brown skink (*O. zelandicum*) and Whitaker's skink (*O. whitakeri*) are present at nearby Pukerua Bay[5].

Area B: Onehunga Bay and surrounds

This area comprises part of the coastal escarpment ecosystem as well as dunelands and rocky shore**.** Dunelands are uncommon in Porirua City and the best examples are

now located within the Whitireia Coast KNE. Several years of restoration work by the WPRG has re-established the key native sand binding species pīngao (*Ficinia spiralis*) and spinifex (*Spinifex hirsutus*) in the dunelands. A range of backdune plant species have been re-introduced into the Onehunga Bay area, including sand coprosma (*Coprosma acerosa*), sea spurge (*Euphorbia glauca*) and sand daphne (*Pimelia prostrata*)[6]. Wetland seeps enter through the dune areas and are located around this coastal zone. These seeps are ecologically important as they provide water for coastal turfs and habitat for native reeds and rushes.

The forest remnant at Onehunga Bay area is one of few forest remnants in the region within 100m of the ocean. Although less than a hectare in size, it has a representative assemblage of native species[7]. The predominant forest cover is tītoki (*Alectyron excelsus*), kohekohe (*Dysloxylum spectabile*), and ngaio (*Myoporum laetum*) with the non-local native karaka (*Corynocarpus laevigatus*) also present. The locally rare *Doodia australis* is present. Currently tūī (*Prosthoderma novaeseelandiae*) and fantail (*Rhipidura fuliginosa*) are the only native birds found in the remnant forest.

Area C: Eastern escarpment

This area has a coastal escarpment, dunelands and rocky shore with similar attributes to the Onehunga Bay and surrounds area discussed above. Dunelands in the eastern escarpment backdune areas at Kaiaua Bay are also being restored with native sand-binding species. Some of the gullies in the eastern escarpment have good patches of native regeneration which will return to mature native coastal forest in time.

Area D: Te Onepoto Estuary and Te Onepoto Stream

Located on the western edge of the Onepoto arm of the Porirua Harbour, Te Onepoto Estuary is part of the wider Porirua Harbour ecosystem, which is the largest estuary in the lower North Island[8]. Te Onepoto Estuary is home to salt marsh, an important habitat for wading birds such as variable oystercatcher, black-billed gull and red-billed gull.

Te Onepoto Stream is the most intact stream flowing into the Onepoto arm of the Porirua Harbour. The wetland and stream environment provides habitat for native fish including longfin (*Anguilla dieffenbachia*) and shortfin eels (*A. australis*), inanga (*Galaxias maculatus*) and banded kōkopu (*G. fasciatus*)[9]. These habitats also support well established communities of native rush, reed and sedge plant associations such as jointed rush (*Leptocarpus similis*), raupō (*Typha orientalis*) and three square (*Schoenoplectus pungens*).

Area E: Southern escarpment

This area faces the south-east and is protected from the strong salt influence found in the northern and western areas. Its vegetative cover is therefore lusher and less stunted by coastal forces. Currently dominated by māhoe (*Melicytus ramiflorus*), it is likely that this will return to coastal lowland forest dominated by kohekohe.

Of note in recognising the ecological values at Whitireia Coast are the following:

Threatened ecosystems: The Land Environment New Zealand (LENZ)[10] environmental classification system assesses a range of factors, and categorises types by threat status. The entire Whitireia Coast KNE is ranked as either Chronically Threatened or Acutely Threatened (see Map 4, Appendix 1).

Naturally uncommon ecosystems[11]***:*** Some ecosystems in the KNE are naturally uncommon in New Zealand and have been classified according to their threat status[12]. Those present at Whitireia Coast include coastal turf (Nationally Critical); active sand dunes (Nationally Endangered); shingle beach (Nationally Endangered); seepages and flushes (Nationally Endangered), and estuary (Nationally Vulnerable).

Threatened species[13]***:*** Threatened plant species surviving on the Whitireia Coast include the Nationally Critical pygmy button daisy and the Declining thick-leaved māhoe. The shore hebe (*H. elliptica*) is regionally rare[14]. There have been sightings of the Nationally Critical white heron (*Ardea modesta*) and shore plover (*Thinornis novaeseelandiae*). Naturally Uncommon royal spoonbill are also visitors to the KNE [15]. A list of threatened species is provided in Appendix 2.

Ecological Connections**:** Sited on a peninsula, Whitireia Coast KNE is surrounded by ocean on three sides and thus has good natural buffers to pest invasion. It is currently considered possum and hare free. It is contiguous with Rocky Bay and the Porirua Harbour and is close to Mana Island Scientific Reserve and the Porirua-Colonial Reserves KNE.

Key threats to ecological values at the site

Ecological values can be threatened by human activities, and by introduced animals and plants, that change the natural balance of native ecosystems. The key to protecting and restoring biodiversity as part of the KNE programme is to manage the threats to the ecological values at the site.

The KNE contains elements of what were once rich and dynamic ecosystems that have been substantially modified and depleted by human land use and activities. No original vegetation communities remain intact within the KNE and many native species that were once common are no longer present.

The main threats to the ecological values of Whitireia Coast KNE are ecological weeds and the typical suite of introduced mammalian browsers and predators. The risk of fire in the KNE is high, partly due to the growth of rank grass since grazing stock was removed in 2010. Recreational activities can also negatively affect sensitive coastal areas and the dumping of garden waste can lead to weed invasions.

The table below shows the identified threats at the site, which operational areas of the KNE they affect, and how the threats impact on ecological values. The codes alongside each threat correspond to activities listed in the operational plan (Table 2), and are used to ensure that actions taken are targeted to specific threats. A map showing operational areas can be found in Appendix 1 (Map 3).

Table 1: Key threats to ecological values present at Whitireia Coast KNE.

Threats	Impact on biodiversity in the KNE	Operational area
Ecological weeds		
EW-1	Boneseed (*Chrysanthenemoides monilifera*), boxthorn (*Lycium ferocissimum*), karo (*Pittosporum crassifolium*), broom (*Cytisus scoparium*), gorse (*Ulex europaeus*), kikuyu grass (*Pennisetum clandestinium*), cape ivy (*Senecio angulatus*), brush wattle (*Paraserianthes lophantha*), and other ecological weeds are displacing and out-competing native plant species.	A
EW-2	Boneseed, boxthorn, Spanish heath (*Erica lusitanica*), karo, pōhutukawa (*Metrosideros excelsa*), kikuyu, rank grass, and other ecological weeds are displacing and out-competing native plant species.	B
EW-3	Marram (*Ammophila arenaria*), blackberry (*Rubus fruticosus*), kikuyu grass and tall fescue (*Festuca arundinacea*) are displacing coastal plants. Marram in particular has the ability to change natural dune form and function.	C
EW-4*	Willow (*Salix* sp.), English ivy (*Hedera helix*), pampas (*Cortaderia selloana/ jubata*), hawthorn (*Crataegus mongyna*), karo, tall fescue, and blackberry out-compete local native plants, altering the composition of wetland/riparian communities.	D
EW-5*	The combined impact of the following species reduces integrity of naturally regenerating native plant communities: Boneseed, karo, pine (*Pinus radiata*), Agapanthus (*Agapanthus praecox*), Montbretia (*Crocosmia* x *crocosmifolia*), cherry (*Prunus* sp.), Japanese honeysuckle (*Lonicera japonica*) arum lily (*Zantedeschia aethiopica*), wandering willy (*Tradescantia fluminensi*), blue passionflower (*Passiflora caerulea*), climbing asparagus (*Asparagus scandens*) and periwinkle (*Vinca major*).	E
Pest animals		
PA-1	Possums (*Trichosaurus vulpecula*), rats (*Rattus* spp.) and mice (*Mus musculus*) reduce forest health by browsing vegetation and eating seed and can cause local extinction of palatable plant species. They also prey on lizards and invertebrates.	Whole KNE
PA-2	Stoats (*Mustela erminea*), ferrets (*M. putorius furo*), weasels (*M. nivalis*), and feral and domestic cats (*Felis cattus*) and hedgehogs (*Erinaceus europaeus occidentalis*) kill native animals and may have prevented burrowing seabirds from re-establishing.	Whole KNE
PA-3	Rabbit (*Oryctogalus cuniculis*) browsing can significantly impact the composition of the vegetation. They eat young native plants and can also ring bark trees.	Whole KNE
Human activities		
HA-1	Dumping of garden waste and rubbish (land and sea) in or near the KNE by members of the public can create habitat and food for rodents and increase weed invasion.	Whole KNE
HA-2	Recreational impacts including off-road vehicle use can destroy coastal plant communities and disturb shorebird species. People engaged in recreation activities (eg, biking and tramping) may damage sensitive native plants. Uncontrolled dogs could damage or disturb native animals.	A, B, D

Threats	Impact on biodiversity in the KNE	Operational area
HA -3	Fires can be very destructive for native plants and animals. They also expose soil, which could then erode and contribute to the excessive amounts of sediment entering Porirua Harbour. Particular risks are associated with the high fuel loads of gorse.	Whole KNE, in particular C
Other threats		
OT-1	Lack of seed sources prevents the re-establishment of plant species that have been lost from the area.	A, B, C

***Threats marked with an asterisk are not addressed by actions in the Operational plan. Not all threats can be adequately addressed. Threats might not be managed for a number of reasons including financial, legal, or capacity restrictions. However, in order to manage the KNE as a whole, it is important to be aware of all threats to ecological values.**

3. Objectives and management activities

Management objectives help to ensure that activities carried out at the site are actually contributing to improving biodiversity management.

Objectives

The following objectives will guide the management activities at the Whitireia Coast KNE.

1. **To increase native plant dominance**
2. **To increase populations of threatened plants**
3. **To increase populations of threatened native birds**
4. **To engage the community in management of the KNE**

Management activities

Management of biodiversity is achieved most effectively across landscapes. The management activities set out in this Plan have been developed in the context of other biodiversity management activities being carried out in the wider ecological landscape, which provide benefits for the management of biodiversity within the KNE. Relevant management plans are referred to under the individual sections below. In implementing this Plan, the Biodiversity department will integrate activities that contribute to the objectives of other management plans where possible.

Management activities are targeted to work towards the achievement of the objectives above by responding to the threats outlined in Table 1. The management activities are described briefly below, and specific actions, with budget figures attached, are set out in the operational plan (Table 2).

Ecological weed control

A strategic approach to ecological weed management will be taken across the landscape. The Draft Whitireia Park Sustainable Land Use Plan 2012[16] and Whitireia Pest Plant Control Plan (2007-12)[17] provide some direction for this.

Control of ecological weeds in the next three years (2014-17) will focus on the north-western cliff area, starting at the western end and working towards Onehunga Bay. Follow-up of areas previously controlled for ecological weeds will be undertaken every second year to avoid regrowth of any untreated plants and to deplete the seed bank of weed species. Two non-local natives have been targeted as part of operations. Karo (*Pittosporum crassifolium*) has the potential to dominate vegetation composition on the western cliffs and escarpments and karaka (*Corynocarpus laevigatus*) is altering the structure of the forest remnant[18].

Due to their high ecological value and sensitivity, existing populations of rare and threatened plants require fine scale management (eg. hand weeding or use of selective herbicides) as opposed to the less sensitive broad-scale weed control methods used elsewhere. Monitoring the effectiveness of methods used will enable the development of best practice for threatened species management at this site.

Pest animal control

Whitireia Coast KNE is currently possum and hare free. To maintain this status and reduce the combined impacts of other pest animals, a multi-species animal control programme is in place. The bait station and trap network system was installed by GWRC Biosecurity staff and is maintained by the WPRG (see Appendix 1, Map 5). This work targets possums, as well as mustelids, hedgehogs and rats. Night searches with firearms are undertaken at three monthly intervals to monitor and maintain the possum and hare free status of the KNE and wider park.

An extra 26 bait stations will be installed around the coastal escarpments over two years and be placed alongside the existing predator control network. The aim is to further reduce rat numbers which threaten coastal birds and lizards. The first 13 stations will be installed by Biosecurity staff in 2015/16 in the north-western escarpment and Te Onepoto Bay and surrounds. In 2016/17 the next 13 stations will be installed in the eastern escarpment and Onehunga Bay (see Appendix 1, Map 6).

Rabbits need to be controlled to protect threatened plant species, and to ensure the survival of naturally regenerating plants and community plantings. Rabbit control methods include poisoning and fumigating burrows where possible. Consultation and agreement of partners and stakeholders is necessary before this is undertaken.

Revegetation

The WPRG will plant an estimated 2350 native plants over the three years of this plan. Six areas are targeted for planting in the north-western escarpment, Onehunga Bay and surrounds, and eastern escarpment operational areas (see Appendix 3, Maps 7 and 8). A total of 34 different native species will be planted, including several species locally extinct in the KNE. This will directly improve the diversity of the native flora as well as contribute to the objective of increasing native dominance.

As part of the Porirua Harbour and Catchment Project six planting sites have been identified around the wetlands and estuary in the Te Onepoto Bay operational area (see Appendix 4, Maps 9 and 10). Eighteen native species will be planted at these sites.

Management of the critically threatened plant species pygmy button daisy will occur in the north-western cliff area. WPRG will work closely with the contractors in the fine-scale weed control operations needed to manage these fragile populations.

Human activities

To reduce the risk of fire across the KNE and the wider Park, GWRC will remove large areas of highly flammable gorse. This control will target large, dense areas of gorse, and work with nature by assisting natural regeneration. The GWRC Parks department will take a strategic approach to controlling gorse, to reduce fire risk and dominance of exotic vegetation. Where planting occurs in high fire-risk areas, low flammability plant species may be selected for planting[19].

The illegal dumping of rubbish and garden waste will be addressed through engagement with landowners directly adjoining the southern escarpment part of the KNE. A survey of this practice along the boundary of the KNE will be undertaken and a letter outlining the threats rubbish and garden waste pose to biodiversity values will be sent to residents in 2014/15.

Issues regarding dog control and stock grazing in Whitireia Park will be addressed as part of the Whitireia Park Management Plan review, which is expected to start in 2014.

Community engagement

GWRC will undertake a letter-box drop to residents surrounding the KNE outlining the value of the KNE and suggesting how residents can contribute to the project. This letter will also highlight the threat posed to the KNE by illegal dumping of garden waste.

Special project

GWRC, WPRG and the Dune Restoration Trust of New Zealand are currently participating in nation-wide backdune restoration trials which are funded for three years (2012/13-2014/15) by the Ministry for the Environment. The purpose of this project is to enhance the capacity of local communities and councils to restore indigenous biodiversity in coastal backdune environments. The project involves an extensive review of existing knowledge and experience, set-up of demonstration areas and monitoring sites, and provision of practical guidelines for coastal groups, iwi, management agencies and the wider community.

Planting of backdune sites at Whitireia Park was completed in 2013/14. Monitoring of the plants will continue for the first two years of this plan and will be undertaken by GWRC Biodiversity staff and members of WPRG. The monitoring data will then be analysed by the Dunes Restoration Trust.

4. Operational plan

The operational plan (Table 2) shows the actions planned to achieve the stated objectives for Whitireia Coast KNE and their timing and cost over the three-year period from 1 July 2014 to 30 June 2017. The budget for the 2015/16 and 2016/17 years are indicative only and subject to change as a result of the 2015-25 Long Term Plan process. A map showing operational areas can be found in Appendix 1 (Map 3).

Table 2: Three-year operational plan for Whitireia Coast KNE.

Objectives	Threat	Activity	Operational areas	Delivery	Description/detail	Target	Timetable and resourcing		
							2014/15	2015/16	2016/17
1	EW-1, EW-2	Weed control	A, B	GWRC Biosecurity department	Gun and hose spray of kikuyu grass, gorse, broom, Spanish heath and boxthorn. Stump treatment of various woody weeds.	Reduction in distribution and density of target species	$12,000	$9,000	$9,000
3	PA-1	Possum	Whole KNE	GWRC Biosecurity department and WPRG	Maintenance of bait stations.	Area maintains possum free status	$1,000	$1,000	$1,000
3	PA-1	Rat control	A,B,C,D	GWRC Biosecurity department and WPRG	Extension and maintenance of bait station control network.	Rats <10%TTI	Nil	$500	$500
3	PA-2	Predator control	Whole KNE	GWRC Biosecurity department	Maintenance of existing predator control network.	Mustelids <1% TTI*	$500	$500	$500
1	PA-3	Rabbit control	Whole KNE	GWRC Biosecurity department	Periodic response-based rabbit shooting/ poisoning/fumigation control works.	<3 on Modified McLean Scale	$3,000	$2,500	$2,500
4	HA-1	Community engagement	Whole KNE	GWRC Biodiversity and Parks departments	Letter-box drop to residents of properties adjoining KNE.	Letters sent out by 30 June 2015	Nil	Nil	Nil
1	HA-3	Gorse control	A, B, C	GWRC Biodiversity and Parks departments	Progressively roll back gorse from areas of high fire risk.	Reduction in total gorse cover	Nil	$2,000	$2,000

Objectives	Threat	Activity	Operational areas	Delivery	Description/detail	Target	Timetable and resourcing		
							2014/15	2015/16	2016/17
1,2,4	OT-1, EW-3	Revegetation planting and weed control	B, C	WPRG	Site preparation, planting and protection of native species.	>80 % success rate in native plant establishment	$6,000	$6,000	$6,000
1	EW-3	Backdune planting trial	C	GWRC Biodiversity department and WPRG	Monitoring for survival and growth of plants in 2014/15 and 2015/16.	Report findings to the Dunes Trust	$2,000	Nil	Nil
2	OT-2	Planting and fine scale weed control	B, C	GWRC Biosecurity department and WPRG	Fine-scale weed control and propagation and planting of native threatened species.	Increase in distribution and abundance of rare/ threatened plant species	Nil	$1,000	$1,000
						Total costs	**$24,500**	**$22,500**	**$22,500**

*** TTI = Tracking tunnel index. The control regime has been created to control mustelids to this level but monitoring will not be undertaken. Experience in the use of this control method indicates this target will be met.**

5. Funding summary

GWRC budget

The budget for the 2015/16 and 2016/17 years are indicative only and subject to change as a result of the 2015-25 Long Term Plan process.

Table 3: GWRC allocated budget for Whitireia Coast KNE.

Management activity	Timetable and resourcing		
	2014/15	2015/16	2016/17
Ecological weed control	$12,000	$12,000	$12,000
Rare and threatened plant recovery			
Pest animal control	$4,500	$4,500	$4,500
Re-vegetation	$6,000*	$6,000*	$6,000*
Total	**$22,500**	**$22,500**	**$22,500**

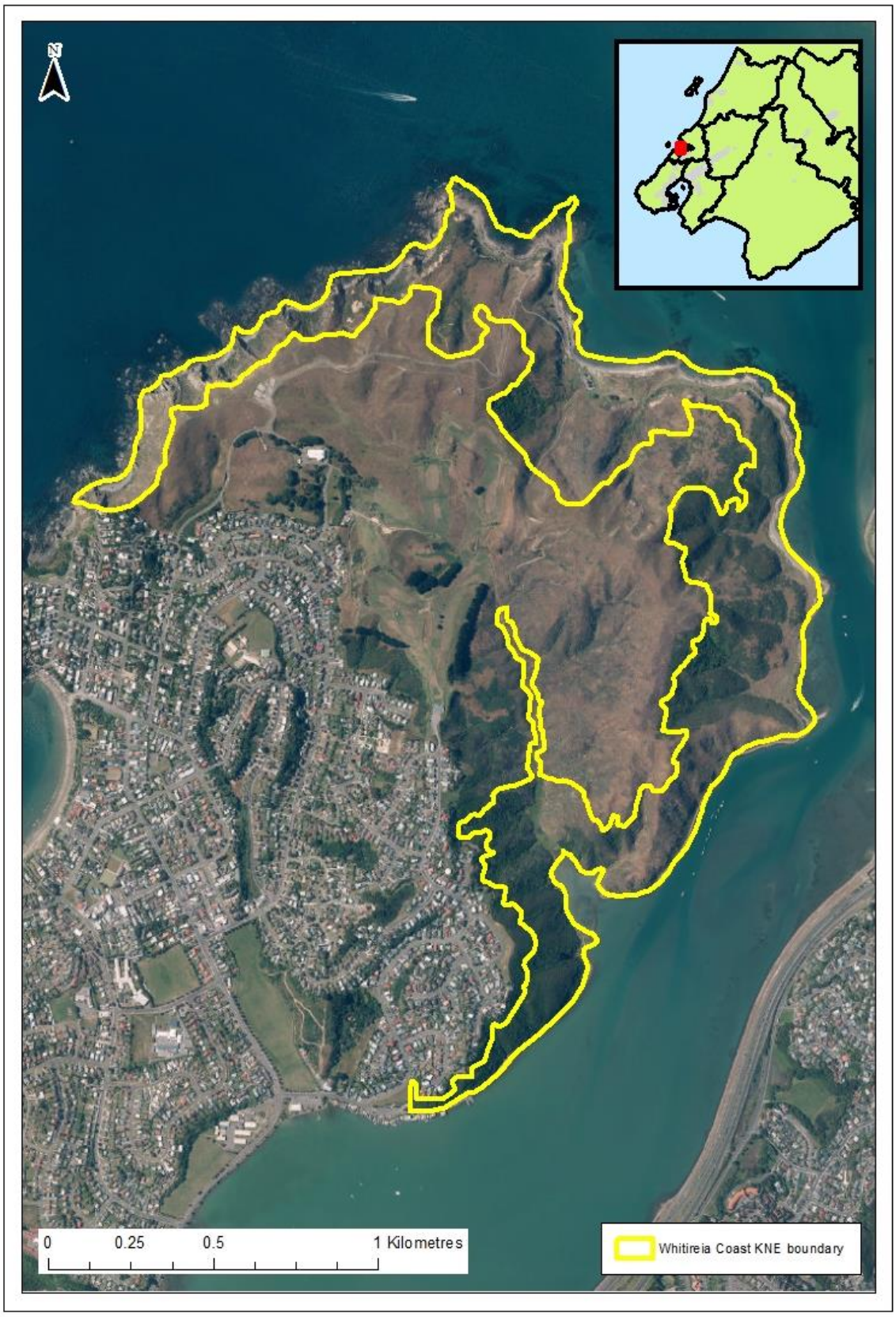
***includes $3000 from GWRC Parks department**

Other contributions

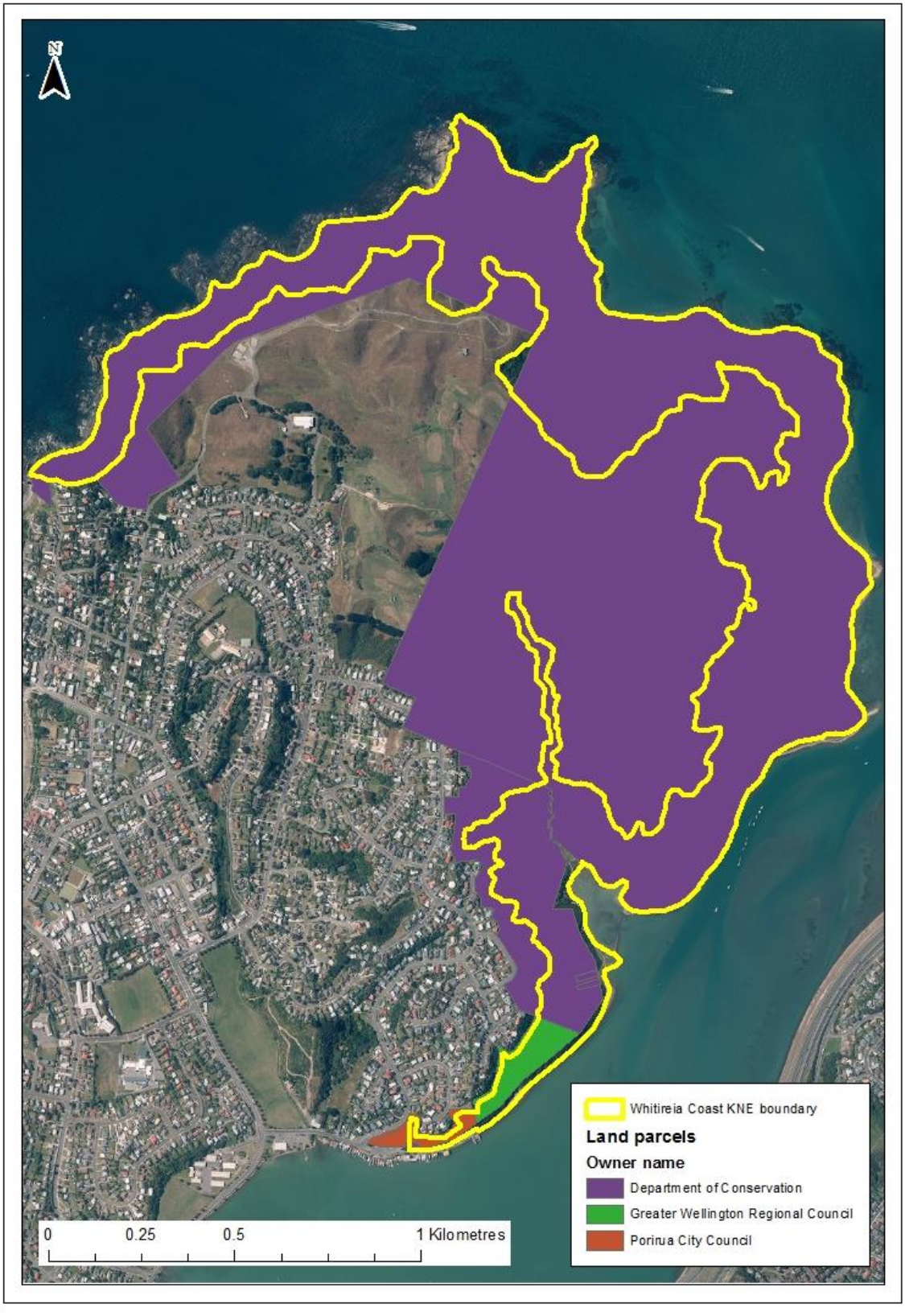
Table 4: Additional allocated budget for Whitireia Coast KNE from other management partners.

Management activity	Timetable and resourcing		
	2014/15	2015/16	2016/17
Back dune trial (Ministry for the Environment)	$2,000		
Total	**$2,000**		

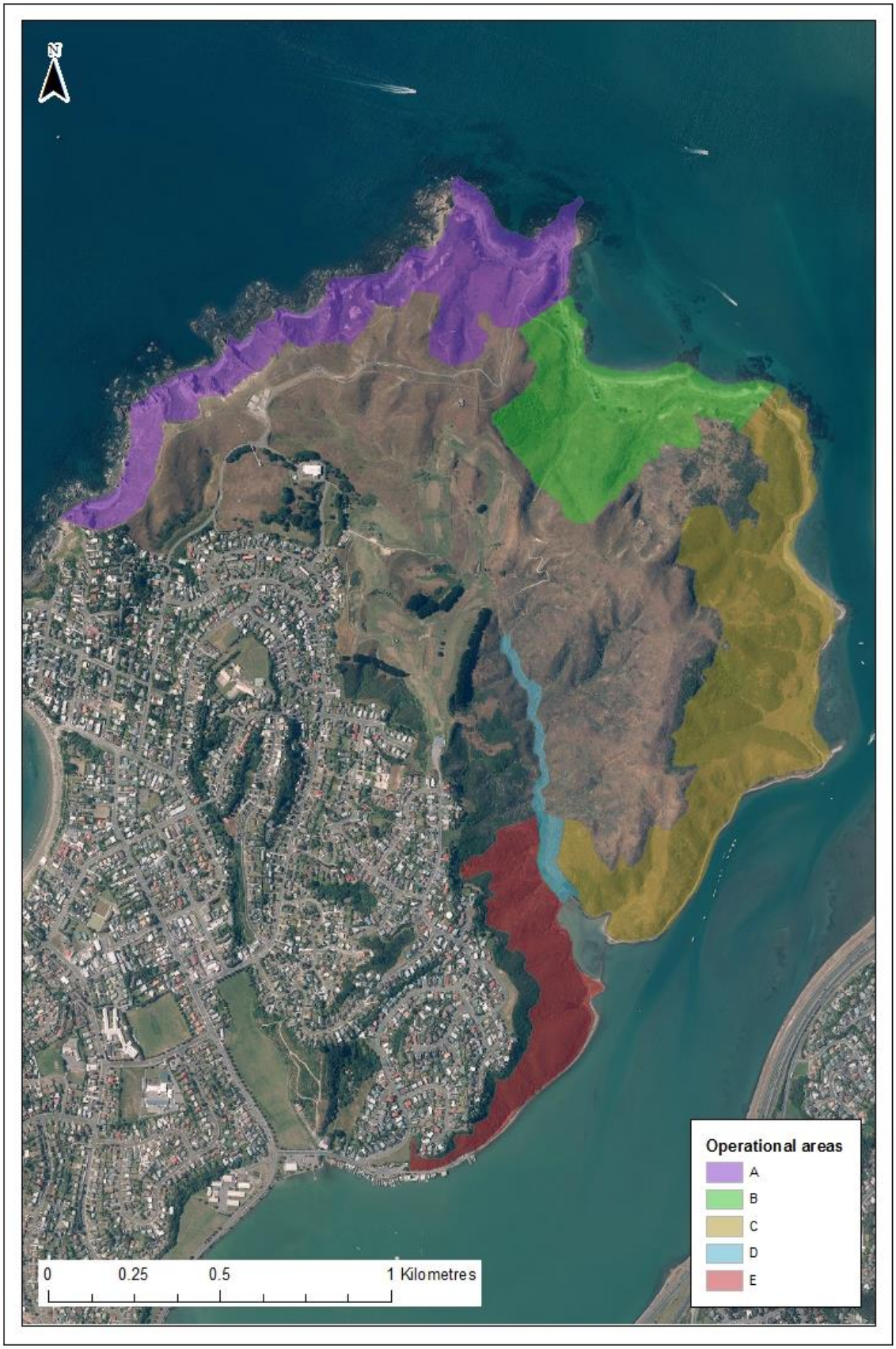
Appendix 1: Site maps



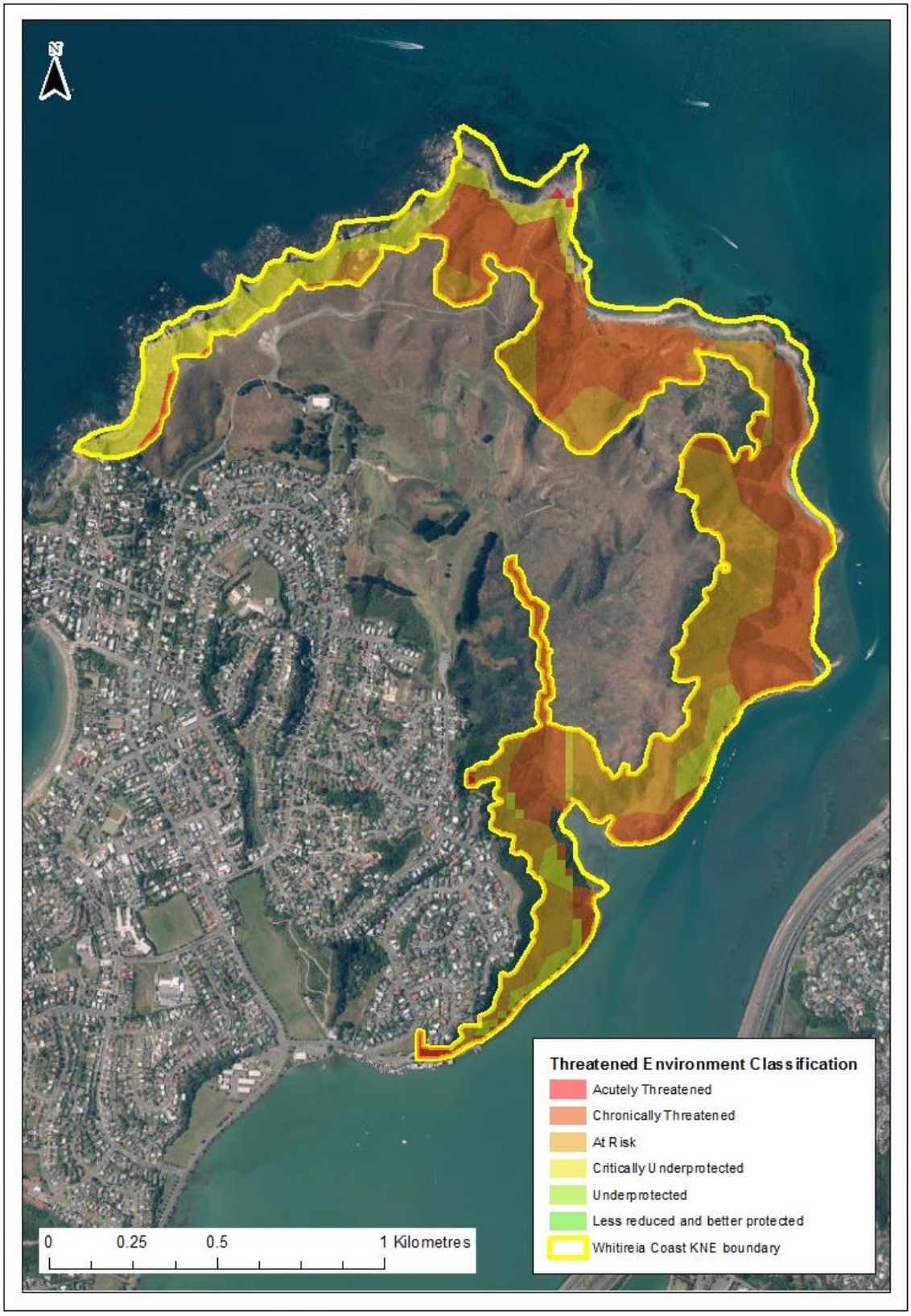
Map 1: Whitireia Coast KNE boundary.



Map 2: Land ownership at Whitireia Coast KNE.



Map 3: Operational areas at Whitireia Coast KNE.



Map 4: LENZ Threatened Environments at Whitireia Coast KNE.

Map 5: Current pest animal control in Whitireia Coast KNE.

Map 6: New pest animal bait stations to be installed at Whitireia Coast KNE.

Appendix 2: Threatened species list

The standard method for classification of threatened species in New Zealand was developed by the Department of Conservation[20]. The Regional Policy Statement for the Wellington Region considers all species within the 'Threatened' category, and all species classified as 'Declining', 'Relict', and 'Recovering' within the 'At Risk' category as threatened species[21]. The protection of habitat of threatened species is listed as a key action in GWRC's Biodiversity Strategy 2011-21, and is a key consideration when preparing KNE plans. This contributes to the statutory function of regional councils under the Resource Management Act 1991 to protect significant habitats for plants and animals[22].

The following table lists threatened species that are known to live within the KNE.

Table 5: Threatened species at Whitireia Coast KNE.

Scientific name	Common name	Threat status	Source
Plants(vascular)[23]			
Coprosma acerosa	Sand coprosma	Declining	NZPCN (March 2014)
Euphorbia glauca	Sea spurge	Declining	NZPCN (March 2014)
Leptinella nana	Pygmy button daisy	Nationally Critical	Robyn Smith, GWRC, personal observation 2013
Melicytus crassifolius	Thick-leafed māhoe	Nationally Vulnerable	Robyn Smith, GWRC, personal observation 2013
Birds[24]			
Ardea modesta	White heron	Nationally Critical	Robyn Smith, GWRC, personal observation 2013
Thinornis novaeseelandiae	Shore plover	Nationally Critical	Wayne Boness, GWRC, personal observation 2013
Freshwater fish[25]			
Anguilla dieffenbachii	Longfin eel	At risk: Declining	New Zealand Freshwater Fish Database[26]

Appendix 3: Whitireia Park Restoration Group planting plan 2013-16

Over the next three years, the WPRG wishes to concentrate its efforts supporting the KNE plan on the north-western escarpment and beaches at Kaiaua Bay and Onehunga Bay. Site preparation will be carried out up to two years prior on woody weeds such as gorse, karo, pōhutukawa seedlings, boneseed, boxthorn, lupin and broom. Some of these can be sprayed out, while others will need to be cut and stump treated. Non-woody weeds such as exotic grasses will be sprayed in the summer prior to planting.

The group will arrange for volunteers, school groups, students and corporate groups to assist on the planting days. Follow-up spraying and hand-weeding to release the plants from weeds will be carried out by the group.

All seed will be collected by the WPRG and sent to various nurseries for growing. Not all native species are available each year due to nursery availability and/or lack of viable seed.

North-western escarpment

Five areas have been identified to plant in the north-western escarpment (see Map 7). The size of each planting area and total plant numbers are:

Area A (1,300 m²): 200 plants

Area B (1,600 m²): 250 plants

Area C (1,600 m²): 250 plants

Area D (5,000 m²): 750 plants

Area E (3,000 m²): 450 plants

Plants for these planting areas will be chosen from the following species:

Aciphylla squarrosa
Carex cf. *testacea* (“raotest”)
Carmichaelia australis
Clematis forsteri
Discaria toumatou
Euphorbia glauca
Hebe stricta
Melicytus aff. obovatus
Melicytus crassifolius
Muehlenbeckia astonii
Muehlenbeckia complexa
Myoporum laetum
Olearia paniculata
Olearia solandri
Phormium cookianum
Pimelea cryptica
Pimelea prostrata subsp seismica
Poa billardierei
Poa cita
Tetragonia tetragonioides

Kaiaua Bay

One area has been identified for planting at Kaiaua Bay (see Map 8). The size of the planting area and total number of plants are:

Area F (2,500 m²): 400 plants

Plants will be chosen from the following species:

Acaena pallida
Austroderia toetoe
Carex secta
Carex testacea
Carex virgata
Coprosma acerosa
Coprosma propinqua
Cyperus ustulatus
Euphorbia glauca
Olearia solandri
Pimelea arenaria
Poa billardierei
Tetragonia implexicoma

Onehunga Bay

Two planting areas at Onehunga Bay and surrounds require infill planting (see Map 8).

Area G (5,000 m²): 450 plants

Plants for Area G will be chosen from the following species:

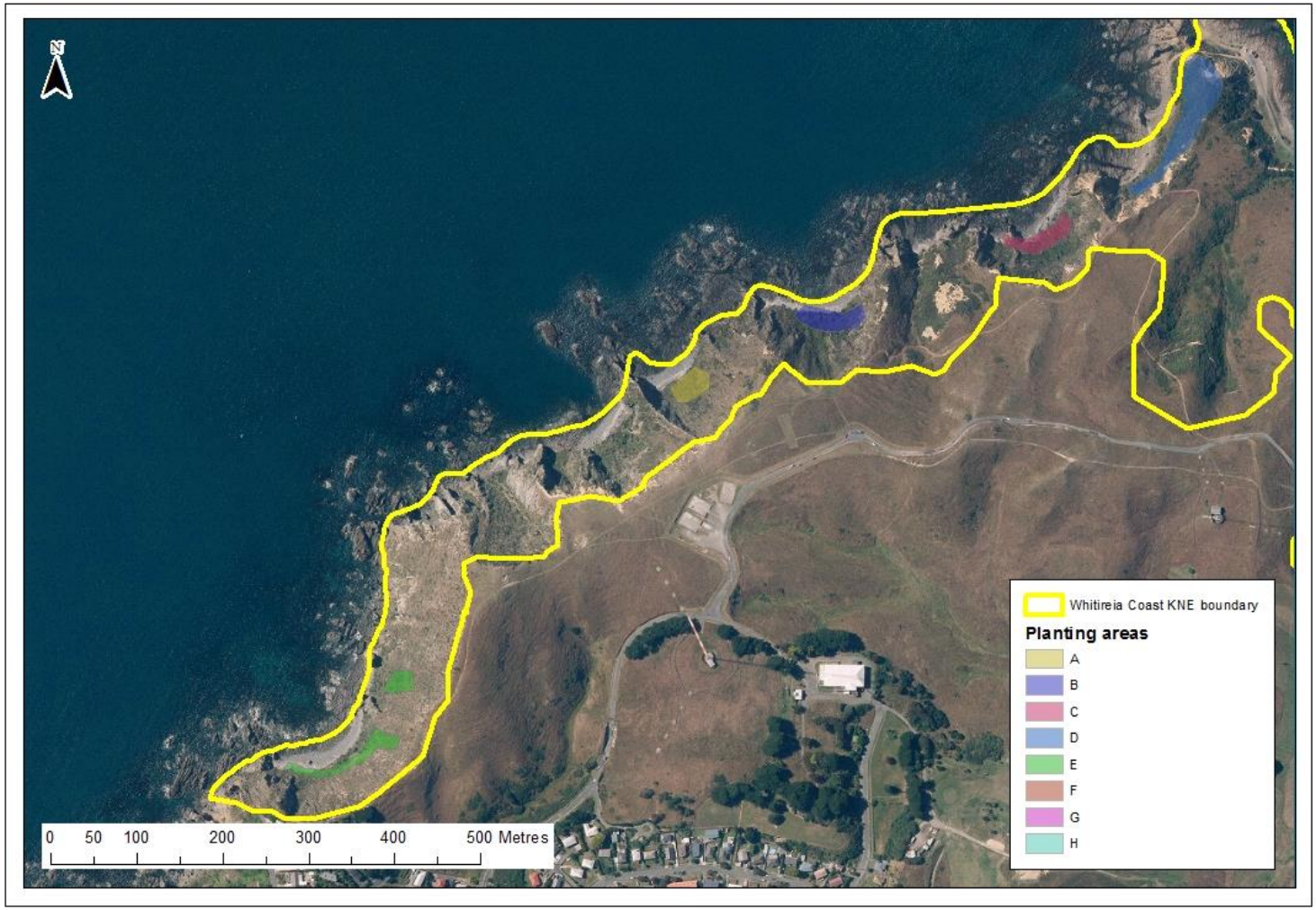
Apodasmia similis
Austroderia fulvida
Carex testacea
Coprosma acerosa
Coprosma propinqua
Euphorbia glauca
Melicytus crassifolius
Muehlenbeckia complexa
Olearia solandri
Pimelea arenaria
Poa billardierei
Tetragonia implexicoma

Area H (600 m²): 300 plants

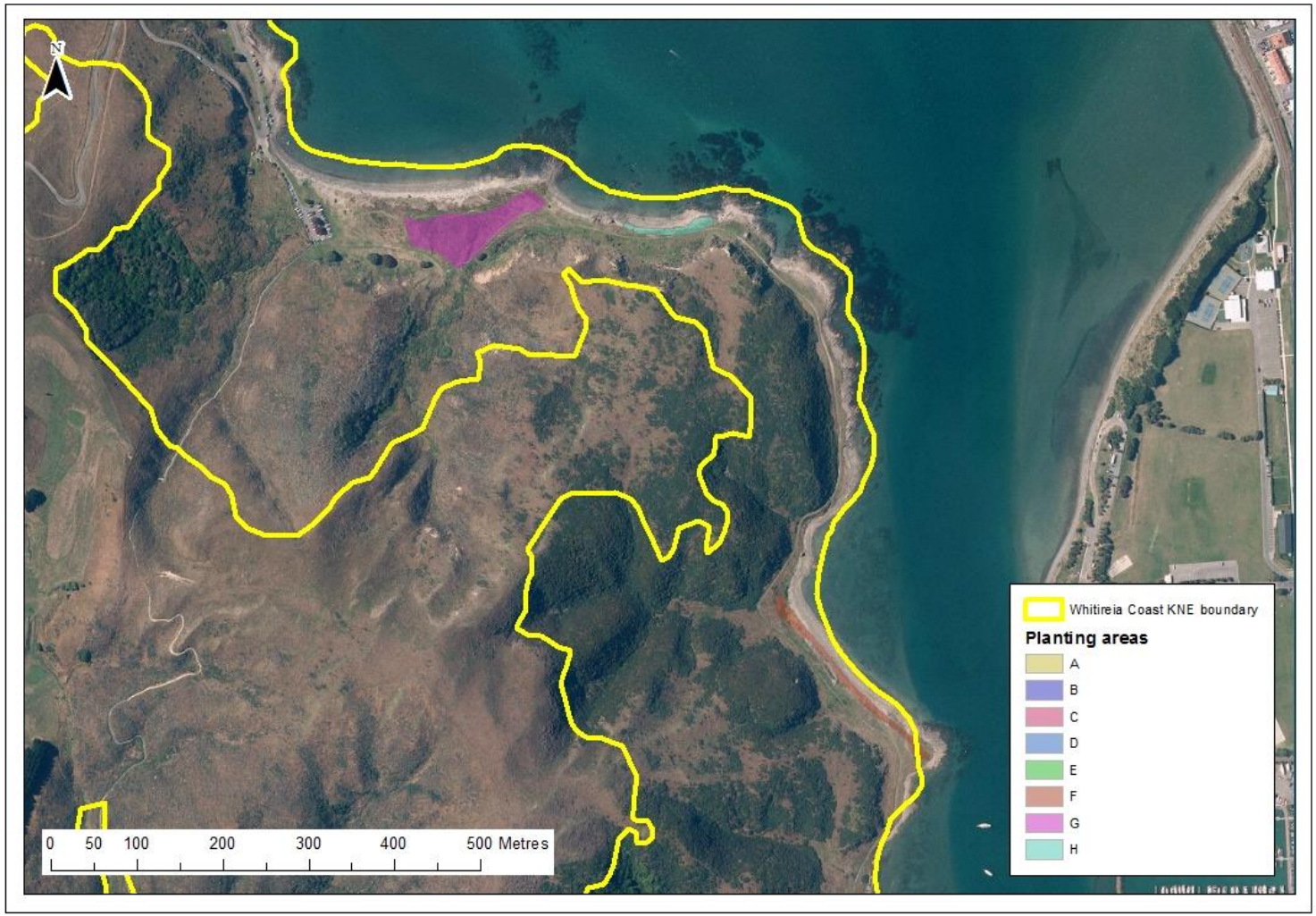
Kikuyu grass needs to be controlled for at least 2 years prior to planting.

Species to be planted in Area H include:

Spinifex hirsutus
Ficinia spiralis



Map 7: Whitireia Park Restoration Group planting areas A-E.



Map 8: Whitireia Park Restoration Group planting areas F-H.

Appendix 4: Te Onepoto Bay restoration plan 2013-16

Te Onepoto Bay is located on the North West side of the Te Onepoto arm of Porirua Harbour. The land is owned by Porirua City Council (PCC), and the Crown. The Wetland area is a part of the Whitireia Park which is managed by GWRC, and co-managed with Ngāti Toa Rangatira through the Whitireia Park Board.

Site background

Te Onepoto Bay and the wetland in the lower reaches of Te Onepoto Stream have been identified as high value biodiversity areas. They are recognised in the Porirua Harbour Estuary Restoration Options Report as a priority for restoration which has the support of Ngāti Toa. This plan will be led by the GWRC Biodiversity department in partnership with the GWRC Parks department and iwi. This site will be used for school engagement and community participation activities.

There are multiple ecosystem types in the area including a freshwater stream and associated wetlands, estuarine saltmarsh and coastal scrubland. These areas range in ecological quality.

The coastal scrubland is highly modified, having been burnt numerous times and grazed. Most of this area has been regenerating for many years with māhoe dominating; however there are many weed species including the highly invasive, non-local native, karo. Much of this area was severely affected by a fire in 2010.

Te Onepoto Stream was, up until the 2010 fire, completely shaded by native vegetation. Although some native species have regenerated since then, most of the margins are now dominated by exotic grass species. The stream has good native fish values.

The wetlands in the lower reaches of the stream are dominated by *Carex geminata*; any palatable species have been eaten by cattle. These extensive areas of wetlands filter sediments that would otherwise enter the estuary during high rainfall events.

The saltmarsh in the estuary is a good example of the gradation of salt tolerant species represented in estuaries in the lower North Island.

Management activities

Project vision and objectives

The vision is: To have a healthy, functioning wetland and estuary edge ecosystem.
To achieve this, the objectives are:

- To restore saltmarsh and wetland habitat types that are underrepresented in the Porirua Harbour area, and provide habitat for indigenous fauna.
- To improve edge stability and reduce sediment and nutrients discharging into the harbour from high rainfall events in the catchment of Te Onepoto Stream.

Restoration planting

This restoration project covers three years and the site has been separated into manageable areas. The estuary edge (Area 1) will be planted in year one: 2014. The wetland will be planted in 2015 and 2016 and will be planted in manageable nodes. Areas 2 and 3 will be planted in 2015, and Areas 4 and 5 in year 2016 (see Maps 9 and 10).

Area 1 – Estuary edge

This area is on the harbour edge of Te Onepoto Bay. It is dominated by exotic grass and fennel which runs between the beach gravels and the walking path around the coast. There is some erosion of the edge occurring during storm events combined with high tides and a small steep bank has formed where the vegetation meets the harbour beach gravels. Improving the bank stability by planting should help alleviate erosion.

The saltmarsh area has some glasswort (*Sarcocornia quinqueflora*) but can be enhanced with native coastal species including oioi (*Juncus kraussii*) and sea rush (*Apodasmia similis*) for protection from erosion. The coastal edge will have a strip of saltmarsh species closest to sea, and then suitable coastal species up to the track. 80% will be low growing species and 20% taller species clumped together to retain the estuary's views.

Areas 2, 3, 4 and 5 – Te Onepoto wetland

The wetland is dominated by cutty grass (*Carex geminata*) and tall fescue (*Schedonorus arundinaceus*) which are the only vegetation type remaining after grazing from stock. The lower reaches of the stream broadens into a much wider, wetland area close to the estuary. Nodes or whole areas for planting will be sprayed prior to planting and wetland species will be planted to introduce a wider range of local wetland species.

Site preparation and maintenance

Site preparation will include two applications of weed-killer before planting. The first application for Area 1 (estuary edge) will target the fennel and the second will prepare the site for planting (with either blanket or spot sprays). The wetland nodes will also have two applications before planting in winter.

Site maintenance will include two release sprays. There will be one release in spring after planting and another the following autumn. Additional spray releases will occur if necessary. Some physical removal of fennel may also be required.

Planting programme

Pest plants and animals, harsh salt environments and lack of rain are the main threats to the plants establishing. The plants will be planted in winter so should get enough water over winter and spring to establish ready for the summer. Combi-guards will be used which can help to reduce the effects of desiccation from wind and the woollen mat helps to retain moisture in the soil. They also assist in reducing the effects of frost, will suppress competing weeds and make it easier to identify and assess the plants whilst weeding. If school groups are unable to hand weed, contractors will be engaged

to release the plants when they are preparing the site for the following year's plantings. Photopoints will be established to monitor plants.

Planting plan for Te Onepoto Bay three-year restoration plan 2013-16

Estuarine edge/Area 1 (2014)

The estuarine edge planting area has been sectioned into 2 zones.

Zone 1 Saltmarsh: 62m² at 0.5m spacing

The seaward strip will be planted with 5 species (see table below). *Juncus kraussii* and *Apodasmia similis* will be planted closest to the beach with *Ficinia nodosa, Plagiantus divaricate* and *Carex testacea* in the next row back.

Zone 1 plant species

Scientific name	Common name	Number of plants
Juncus kraussii	Sea rush	80
Apodasmia similis	Jointed wire rush, oioi	80
Ficinia nodosa	Clubby knob rush	80
Plagianthus divaricatus	Saltmarsh ribbonwood	60
Carex testacea	Sedge	80
	Total	**330**

Zone 2 Coastal species: 470m² at 1m spacing

Eight coastal plant species will be planted in the strip above the saltmarsh species (see table below). The taller species (*Ozothamnus leptophyllus, Cordyline australis,* and *Olearia solandri*) will be clumped together in small pockets, and the majority of the area will be planted with low-growing species.

Zone 2 plant species

Plant	Common name	Number of plants
Phormium cookianum	Flax	100
Muehlenbeckia complexa	Pōhuehue	110
Coprosma propinqua	Mingimingi	110
Austroderia toetoe	Toetoe	100
Carex flagellifera	Sedge	110
Ozothamnus leptophyllus	Cottonwood	20
Cordyline australis	Cabbage tree	20
Olearia solandri	Coastal tree daisy	20
	Total	**590**

Te Onepoto Wetland/Areas 2, 3, 4 and 5 (2015 and 2016)

The wetland nodes will be planted with the following 9 species. The drier areas will be planted with the marked species (*), the wetter areas planted with the remaining species.

Wetland node species

Scientific name	Common name
Phormium cookianum	Flax *
Cordyline australis	Cabbage tree *
Austroderia toetoe	Toetoe *
Coprosma robusta	Karamū *
Schoenoplectus tabernaemontani	Kuāwa
Cyperus ustulatus	Giant umbrella sedge
Carex secta	Sedge
Apodasmia similis	Oioi
Coprosma tenuicaulis	Hukihuki

Wetland summary

Year	Node	Area	Number of plants
2015	1	289m2	370
	2	201m²	260
2016	3	150 m²	191
	4	251 m²	310

All plants will be eco-sourced from the Porirua area. The plants will not have mulch spread around them as this may wash into the harbour when it rains. Instead combi-guards, which include a plant protector and woollen weedmat, will be used on trees and shrubs (not sedges or flaxes) to help protect against the harsh environment and pest animals. One slow-release fertiliser tablet will also be used to help each plant on the bank (not plants on the gravel beds) to get established.

Budget summary for Te Onepoto Bay three-year restoration plan 2013-16

Year 1 (2013/14)

Site preparation	$800
Plants	$3000
Site maintenance	$600
Plant miscellaneous (combi-guards, fertiliser, etc)	$600
	$5,000

Year 2 (2014/15)

Site preparation	$800
Plants	$3000
Site maintenance	$600
Plant miscellaneous (combi-guards, fertiliser, etc)	$600
	$5,000

Year 3 (2015/16)

Site preparation	$800
Plants	$3000
Site maintenance	$600
Plant miscellaneous (combi-guards, fertiliser, etc)	$600
	$5,000

Map 9: Te Onepoto Bay restoration planting: In 2014 Area 1 (Estuary edge) will be planted.

Map 10: Te Onepoto Bay restoration planting: In 2015 Areas 2 and 3 will be planted, and in 2016 Areas 4 and 5 will be planted.

Restoration calendar for Te Onepoto Bay three-year restoration plan 2013-16

Planting areas	2013	2014			2015			2016			2017
	Spring	**Autumn**	**Winter**	**Spring**	**Autumn**	**Winter**	**Spring**	**Autumn**	**Winter**	**Spring**	**Autumn**
Estuarine edge Area 1 (550m²)	1st site preparation	2nd site preparation including spot sprays	Planting	Site maintenance – release spraying	Site maintenance – release spraying		Site maintenance – release spraying (if necessary)				
Wetland nodes Area 2 & 3 (490m²)				1st site preparation	2nd site preparation	Planting	Site maintenance – release spraying	Site maintenance – release spraying		Site maintenance – release spraying (if necessary)	
Wetland nodes Area 4 & 5 (400m²)							1st site preparation	2nd site preparation	Planting	Site maintenance – release spraying	Site maintenance – release spraying

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