Key Native Ecosystem Operational Plan for Queen Elizabeth Park

2021-2026

Contents

1. Purpose

The purpose of the five-year Key Native Ecosystem (KNE) Operational Plan for Queen Elizabeth Park KNE site is to:

- Identify the parties involved
- Summarise the ecological values and identify the threats to those values
- Outline the vision and objectives to guide management decision-making
- Describe operational activities to improve ecological condition (eg, ecological weed control) that will be undertaken, who will undertake the activities and the allocated budget

KNE Operational Plans are reviewed every five years to ensure the activities undertaken to protect and restore the KNE site are informed by experience and improved knowledge about the site.

This KNE Operational Plan is aligned to key policy documents that are outlined below (in Section 2).

2. Policy Context

Regional councils have responsibility for maintaining indigenous biodiversity, as well as protecting significant vegetation and habitats of threatened species, under the Resource Management Act 1991 (RMA)[1].

Plans and Strategies that guide the delivery of the KNE Programme are:

Greater Wellington Long Term Plan

The Long Term Plan (2018-2028)[2] outlines the long term direction of the Greater Wellington Regional Council (Greater Wellington) and includes information on all our major projects, activities and programmes for the next 10 years and how they will be paid for. This document outlines that Greater Wellington will actively manage selected high value biodiversity sites. Most of this work is undertaken as part of the KNE Programme.

Proposed Natural Resources Plan

The Proposed Natural Resources Plan for the Wellington Region (PNRP)[3] provides the high level strategic framework which sets out how Greater Wellington, Mana whenua partners and the community work together and includes

- Guiding Principles that underpin the overall management approach of the plan (eg, Kaitiakitanga)
- Sites with significant indigenous biodiversity values
- Sites of significance to mana whenua (refer Schedules B, C, Schedule D)

Toitū Parks Network Plan

Management of Queen Elizabeth Park as a whole is guided by Toitū Te Whenua Parks Network Plan[4] (Toitū Te Whenua). This plan identifies opportunities to protect biodiversity values in Queen Elizabeth Park, as well as guiding its recreational and amenity uses.

Greater Wellington Regional Pest Management Plan 2019-2039

The Regional Pest Management Plan[5] is an important driver for managing many of the pests that are prioritised in this KNE Operational Plan. Without active management of KNE sites, many native plants and animals in these ecosystems would struggle to thrive. The KNE programme aims to provide protection to maintain or restore the ecological function of these ecosystems as well as the native plants and animals they support. This is done mainly by managing threats such as harmful pests or introduced plants and animals.

Greater Wellington Biodiversity Strategy

The Greater Wellington Biodiversity Strategy[6] (the Strategy) is an internal document that sets a framework that guides how Greater Wellington protects and manages biodiversity in the Wellington region to work towards the Vision.

Vision

Healthy ecosystems thrive in the Wellington region and provide habitat for native biodiversity

Principles

Use best practice work with others Lead by example partner with mana whenua

Goal One drives the delivery of the KNE Programme.

Goal One

Areas of high biodiversity value are protected or restored

3. The Key Native Ecosystem Programme

The KNE Programme is a non-regulatory programme. The programme seeks to protect some of the best examples of original (pre-human) ecosystem types in the Wellington region. Sites with the highest biodiversity values have been identified and prioritised for management.

KNE sites are managed in accordance with five-year KNE plans prepared by Greater Wellington's Biodiversity department. Greater Wellington works with the landowners, mana whenua and other operational delivery providers to achieve mutually beneficial goals.

KNE sites can be located on private or publicly owned land. Any work undertaken on private land as part of this programme, it is at the discretion of landowners, and their involvement in the programme is entirely voluntary. Involvement may just mean allowing work to be undertaken on that land. Land managed by the Department of Conservation (DOC) is generally excluded from this programme.

Sites are identified as of high biodiversity value for the purposes of the KNE Programme by applying the four ecological significance criteria described below.

Representativeness	Rarity/ distinctiveness	Diversity	Ecological context
The extent to which ecosystems and habitats represent those that were once typical in the region but are no longer common place	Whether ecosystems contain Threatened/At Risk species, or species at their geographic limit, or whether rare or uncommon ecosystems are present	The levels of natural ecosystem diversity present, ie, two or more original ecosystem types present	Whether the site provides important core habitat, has high species diversity, or includes an ecosystem identified as a national priority for protection

A site must be identified as ecologically significant using the above criteria and be considered "sustainable" for management in order to be considered for inclusion in the KNE Programme. "Sustainable" for the purposes of the KNE Programme is defined as: a site where the key ecological processes remain intact or continue to influence the site and resilience of the ecosystem is likely under some realistic level of management

4. Queen Elizabeth Park Key Native Ecosystem site

The Queen Elizabeth Park KNE site (157 ha) comprises three separate areas located within Queen Elizabeth Park (QEP) that contain high ecological values. These areas contain a diverse range of ecosystem types including coastal dunes, recovering coastal swamp forest, streams and several types of wetlands (dune slacks, estuaries, swamps and a fen).

The coastal dune system within the site is the largest unmodified dune ecosystem in the Wellington Region. The forest remnant is a representative example of the original kahikatea-pukatea forest type that would have once clothed much of the Kāpiti plains[7]. Several of the ecosystems present are examples of nationally threatened or vulnerable uncommon ecosystem types[8].

The KNE site is located on the Kāpiti Coast between the townships of Paekākāriki and Raumati South (see Appendix 1, Map 1). The KNE site is mostly bounded by farmland within QEP and urban areas at its southern and northern extremities. Additionally there are areas flanking the KNE site where ecological restoration is being undertaken. There are ecological linkages between the KNE site and areas of native habitat within the local area such as Mataihuka/Raumati Escarpment and Whareroa Farm.

5. Parties involved

There are many organisations, groups and individuals that play important roles in the care of the KNE site.

5.1. Landowner/Land Manager

The whole of the KNE site, as with the rest of QEP in which it is located, is owned by the Crown. The Greater Wellington Parks department has the responsibility to manage the park under a Control and Management Agreement with DOC on behalf of the Crown. All of the KNE site is designated as Recreation Reserve under the Reserves Act 1977.

5.2. Operational delivery

Within Greater Wellington, four departments are responsible for delivering the various aspects of the KNE operational plan.

- The Biodiversity department is the overarching lead department for Greater Wellington on the longer term planning and coordination of biodiversity management activities and advice within the KNE site. The Biodiversity department's KNE budget funds the Biosecurity and Environmental Science departments to undertake management or monitoring activities that are part the KNE programme
- The Biosecurity department coordinates and implements ecological weed and pest animal controls measures at the KNE site
- The Environmental Science department coordinates small mammal monitoring
- The Parks department funds and manages some revegetation work within the KNE site and is the key contact for volunteer groups undertaking biodiversity restoration activities. The department also manages recreational access and maintains assets such as roads, tracks and amenity areas within the KNE site.

The volunteer community has provided immeasurable assistance to Greater Wellington through fundraising and restoration activities such as growing and planting native plants, weeding around plantings and trapping pests. As a result, large areas of QEP, both within and outside the KNE site, are being re-vegetated and protected from pests by the community.

Volunteer groups that contribute to the management of the KNE site are:

- Friends of QEP Trust
- QEP Restoration Group
- Kāpiti Coast Biodiversity Project
- Raumati South Residents' Association
- Friends of Paekākāriki Streams
- Local school groups and
- Corporate groups.

Greater Wellington will continue to support these groups in the continuation of their current projects. Greater Wellington will consider and evaluate new initiative proposed by volunteer groups based on their fit with the direction of Toitū Te Whenua Parks Network Plan.

5.3. Mana whenua partners

Ngāti Toa Rangatira (Ngāti Toa) and Te Ātiawa ki Whakarongotai (TAKW) are Greater Wellington's mana whenua partners in the Queen Elizabeth Park KNE site. Greater Wellington is committed to identifying ways in which kaitiakitanga can be strengthened by exploring opportunities on how mana whenua partners wish to be involved in the plan development or operational delivery of the KNE site.

Ngāti Toa has an association with Queen Elizabeth Park as outlined in the Statutory Acknowledgement from the Ngāti Toa Rangatira Claims Settlement Act 2014[9].

Areas of shoreline and stream within the KNE site hold significance to Ngāti Toa and TAKW. Tables 1 and 2 below list the values that particular areas hold for Ngāti Toa and TAKW as listed in Schedule C of the PNRP[10].

Table 1: Ngāti Toa Rangatira sites of significance in Queen Elizabeth Park KNE site[11]

Sites of significance	Mana whenua values
Whareroa shoreline	wāhi tapu, pā, urupā, tohu whenua, wāhi tūpuna, wāhi maumahara, rongoā, puna raranga, wāhi ahurea, kāinga, ara waka, taunga waka
Whareroa Steam	wāhi tapu, pā, urupā, tohu whenua, wāhi tūpuna, wāhi maumahara, wai ora, wai māori, rongoā, puna raranga, wāhi ahurea, kāinga, ara waka, taunga waka
Wainui Stream	pā, wai māori, wai ora, kai awa, rongoā, puna raranga, mahinga mataitai, nohoanga, taunga ika, wāhi tūpuna, wāhi maumahara

Table 2: Te Ātiawa ki Whakarongotai sites of significance in Queen Elizabeth Park KNE site[12]

Sites of significance	Mana whenua values
Whareroa coastal marine area	wai ora, wai tai, mahinga kai, Tauranga waka, papa kāinga, pā, kai moana
Whareroa Stream mouth	wai ora, mahinga kai, wai māori, ara waka, pātaka kai, papa kāinga, pā, wāhi tapu, urupā, rohenga
Whareroa stream (lower)	waka, rongoā, wāhi tapu, pā (defence), urupā, papa kāinga, whakatapu kai, whi tūpuna, mahi parekareka, raranga, mahinga kai (pā tuna), kai māori

5.4. Stakeholders

The following organisations operate at QEP in areas adjacent, and in some instances overlapping with the KNE site: Kāpiti Pony Club, Kāpiti Aeromodellers Club, Kāpiti Stables, Wellington Tramway Incorporated, Eventing Wellington and Paekākāriki Surf Lifesaving Club.

As they undertake their activities, the organisations must ensure that they don't cause any negative impacts on the biodiversity values of the KNE site and other natural areas of the Park. Some stakeholders have contributed to biodiversity management through planting and weed control.

6. Ecological values

This section describes the various ecological components and attributes that make the KNE site important. These factors determine the site's value at a regional scale and how managing it contributes to the maintenance of regional biodiversity.

6.1. Ecological designations

Table 3, below, lists ecological designations at all or part of the Queen Elizabeth Park KNE site.

Table 3: Designations at the Queen Elizabeth Park KNE site

Designation level	Type of designation
Regional	Parts of the Queen Elizabeth Park KNE site are designated under GW's Proposed Natural Resources Plan (PNRP) as: • Rivers with Significant Indigenous Ecosystems – habitat for indigenous threatened or at risk fish species (Schedule F1): Whareroa Stream and all tributaries, Wainui Stream and all tributaries • Rivers with Significant Indigenous Ecosystems – habitat for six or more migratory fish species (Schedule F1): Whareroa Stream and all tributaries, Wainui Stream and all tributaries • Rivers and parts of the coastal marine area with īnanga spawning habitat (Schedule F1b): Whareroa Stream • Significant Natural Wetlands (Schedule F3) – Queen Elizabeth Park Railway Wetlands, Queen Elizabeth Park Bush and Wetlands and Poplar Ave Wetland • Sites with significant indigenous biodiversity values in the coastal marine area (Schedule F4): Whareroa Stream mouth/Estuary, Wainui Stream mouth/Estuary.
District	Most of the Queen Elizabeth Park KNE site has been identified by Kāpiti Coast District Council as Sites of Ecological Significance (SESs): • *K10 Queen Elizabeth Park* • *K10 QEII Park Bush and Wetlands* (Remnant forest, dune swamp, MacKay's and Marines wetlands) • *K18 Poplar Ave Wetland* (northern wetland). Most of the KNE site has also been identified by the Department of Conservation as Designated Ecological Sites and Recommended Areas for Protection (RAPs): • *RAP2 Queen Elizabeth Park* (most of the dunelands) • *DESs: Queen Elizabeth Park Dunes, Queen Elizabeth Park Bush (remnant forest), Railway Lakes* (Mackay's wetland).

6.2. Ecological significance

The Queen Elizabeth Park KNE site is considered to be of regional importance because:

- It contains highly **representative** ecosystems that were once typical or commonplace in the region
- It contains ecological features that are **rare or distinctive** in the region including several naturally uncommon ecosystems
- It contains high levels of ecosystem **diversity**, with several ecosystem types represented within the KNE site boundary
- Its **ecological context** is valuable at the landscape scale as it contains a variety of inter-connected habitats and it provides core habitat for threatened indigenous species.

Representativeness

The Singers and Rogers[13] classification of pre-human vegetation indicates that the KNE site would have originally comprised a mix of three broad vegetation types. The dune system would once have contained a mosaic of coastal sand dune vegetation types. Inland parts of the KNE site surrounding the wetlands would once have been characterised by tōtara, mātai, broadleaf dune forest (WF6). While the wetlands themselves would once have been part of a large swamp mosaic that would have included kahikatea, pukatea forest (WF8) (see Appendix 1, Map 2). Although only small resemblances of the mature states of these vegetation types survive today, much of the vegetation is on a trajectory back to states representative of the original types. This is important when considering that in the Wellington region there is only 2% and 1% of the original extents of the WF6 and WF8 forest types respectively remaining. This makes them critically endangered forest types in the region[14].

The Threatened Environment Classification system[15] indicates that most of the KNE site is in one of the two most threatened land environment categories; Acutely Threatened and Chronically Threatened (see Appendix 1, Map 3). Nationally these types of environment have only less than 10% and between 10% and 20% of their indigenous vegetation cover remaining respectively.

Rarity/distinctiveness

Several naturally uncommon ecosystem types[16] are present within the KNE site. These are estuaries (Vulnerable), ephemeral wetlands (Critical Endangered), and active sand dunes, stable sand dunes and dune slacks (all Endangered).

Wetlands are now considered an uncommon habitat type in the Wellington Region with less than 3% remaining of their original extent[17].

New Zealand's national threat classification system[18] lists three plant, fifteen bird and five freshwater fish species found within the KNE site as nationally Threatened or At Risk. Two plant species and eighteen bird species present have been listed as regionally Threatened or At Risk. Nationally Threatened species are listed in Appendix 2 and regionally Threatened species in Appendix 3.

Diversity

The KNE site contains a diverse range of ecosystem types including coastal dunes, several types of wetlands (dune slacks, estuaries, swamps and a fen), streams and coastal swamp forest. There are ecotones connecting ecosystems in some parts of the KNE site.

Ecological context

The KNE site's ecological context is important at a landscape scale. The several areas of varying habitat within the KNE site are in close proximity to other areas of native habitat beyond the KNE site such as Mataihuka/Raumati Escarpment and the nearby forest in the Waterfall Road area and at Whareroa Farm. This allows for the mutually beneficial dispersal of seed and pollination of plants between sites. It is also likely that these sites, along with Paekākāriki Escarpment, provide key stepping stones for native birds moving between Kāpiti Island and the Akatarawa Range.

The KNE site contains the largest unmodified dune ecosystem in the Wellington region. This dune ecosystem provides habitat for two At Risk plant species. As development of other coastal areas continues and habitat is lost in these areas, there is potential for the KNE site to provide a refuge for these and other coastal and wetland species.

6.3. Ecological features

The KNE site lies within the Foxton ecological district19 which is mainly characterised by:

- A long belt of Holocene sand-dune country, several estuaries, wetlands, dune lagoons and a few coastal swamp forest remnants
- Soils ranging from of un-weathered sand with very thin topsoil on unstable coastal dunes, through more weathered sand with deeper top soil on more inland dunes, to peaty soils in low-lying swamps
- Greatly modified dune vegetation with isolated patches of native plants; nikau, pukatea and kahikatea found in coastal swamp forest remnants.

Vegetation communities and plants

Prior to human habitation the KNE site would have contained a variety of ecosystem types. The fore-dunes would have been covered by complex communities of coastal grasses and shrubs. Dune-land forest and scrub grew in the dunes landward of the dynamic fore-dunes. Stands of wetland podocarp forest, mānuka forest and sedgeland/rushland wetlands inhabited the dune slack areas (depressions between dunes). A wide range of native birds, lizards, and fish were originally part of these ecosystems. More information about the native plant and animal communities that originally occurred in the KNE site can be found in the Queen Elizabeth Park Resource Statement (2007)[20].

Much of the original indigenous vegetation in the KNE site has been lost due to human activities. However, the remaining skeletal habitats and their diversity provide a valuable foundation from which to restore the types of ecosystems once common in the Foxton ecological district.

The KNE site can be separated into three main components, each containing differing ecosystem types. The operational activities described in this plan relate to these three different ecosystem types.

Fore-dunes and back-dunes

The dune ecosystem within the KNE site is the largest unmodified dune ecosystem in the Wellington Region[21]. It comprises distinguishable bands of dynamic fore-dunes, more stable fore-dune and back-dune areas. The dynamic fore-dune environment is characterized by rapidly fluctuating temperatures and strong winds that carry abrasive sands and deposit salt spray on the dune faces. Native plants that naturally occur in fore-dunes have adapted to these conditions. Tough-leaved, sand-binding plants such as spinifex (*Spinifex sericeus*), pīngao (*Ficinia spiralis*), shore bindweed (*Calystegia soldanella*) and New Zealand ice-plant (*Disphyma australe* subsp*. australe*) once thrived in this environment. However today, they only survive in patches amongst more dominant exotic species such as marram grass (*ammophila arenaria*) and exotic ice plant (*Carpobrotus* spp.).

The rest of the fore-dunes and back-dunes are more stable. The more inland they are, the more sheltered they are from the erosive force of the wind. The stable fore-dune areas would have originally been covered by scrub associations such as sand coprosma (*Coprosma acerosa*), sand daphne (*Pimelea villosa*) and tauhinau (*Ozothamnus leptophylla*). Coastal forest would have dominated the back-dunes further inland. Present native vegetation is characterized by patches of low-statured bracken (*Pteridium esculentum*), knobby club rush (*Ficinia nodosa*), and pōhuehue (*Muehlenbeckia complexa*), amongst associations of taupata (*Coprosma repens*), māhoe (*Melicytus ramiflorus*) and kawakawa (*Macropiper excelsum*), with some ngaio (*Myoporum laetum*), kānuka (*Kunzea ericoides*), flax (*Phormium tenax*) and toetoe (*Cortaderia fulvida*). However, exotic grasses and blackberry (*Rubus fruticosus*) dominate large areas of back-dune.

Wetlands

The wetland areas in the KNE site are not contiguous; they include the Northern Wetland and its associated ephemeral wetland (together also known as Poplar Avenue or Raumati South wetland), MacKay's Wetland, the Dune Swamp wetland, Marines Wetland and the estuaries of Whareroa and Wainui streams. The original wetlands in the area would have included a variety of wetland plant associations: mature stands of podocarp dominated wetland forest, mānuka/coprosma/olearia scrub wetlands, ephemeral wetland turf communities, and sedgeland/rushland associations in the wettest areas.

The Northern Wetland is in a dune slack which was grazed in the past but is now fenced and regenerating in native vegetation dominated by the sedges *Isolepsis prolifer* and *Carex virgata*, and *Juncus* and *Baumea* species. Mānuka (*Leptospermum scoparium*) and tangle fern (*Gleichenia dicarpa*) form close associations in the wetland. Planting around the ephemeral pond to the south started in 2003. Since 2010 the margins of the main wetland have been progressively planted with buffer species such as flax, toetoe, *Carex secta,* māhoe*,* taupata, ngaio, kānuka and kōhūhū (*Pittosporum tenuifolium*).

The MacKay's and Dune Swamp wetlands make up a complex of naturally wet areas and sites that have been excavated to create further wetland habitat. The nationally rare native grass *Amphibromus fluitans* has been recorded here as well as other uncommon species such as bamboo sedge (*Eleocharis sphacelata*), the watermeal

Wolffia Australiana, the buttercup *Ranunculus amphitrichus*, the milfoil *Myriophyllum propinquum* and a number of short turf plants. A large amount of native planting has been carried out across the wetlands in this area since 2001 to restore and enlarge the wetland habitat and link the wetlands to the forest remnant.

The Marines Wetland was created between 2003 and 2005 through the excavation of a large pond and then several small adjoining ponds. Major planting of the pond edges and surrounding areas was undertaken mostly from 2003 to 2008. Although this is a re-created wetland, the plant community and the shelter that has established now supports a wide array of wetland bird species. It is for this reason that this wetland has been included within the KNE site. For a comprehensive account of past planting activity within the KNE site see Restoration and revegetation sites in Queen Elizabeth Park 2009[22].

The estuaries of the Whareroa and Wainui streams are two of a small number of estuaries along the Kāpiti Coast that are in relatively good condition. These estuaries and streams provide habitat for various native fish species.

Forest remnant

The forest remnant is an example of the coastal broadleaf/podocarp forest type that was once widespread in the Foxton Ecological District. The remnant is one of only two remaining examples of this forest type on the Kāpiti Coast[23]. Although the remnant has been strongly impacted by human activities and invaded by exotic species it is still dominated by mature kahikatea (*Dacrycarpus dacrydioides*) and pukatea (*Laurelia novae-zelandiae*). Other canopy species present, although in fewer numbers are swamp maire (*Syzygium maire*), mataī (*Prumnopitys taxifolia*) and tawa (*Beilschmedia tawa*). Understory species include māhoe, kānuka, kawakawa and kaikōmako (*Pennantia corymbosa*).

Species

Birds

The diverse ecosystems of the KNE site would once have supported a multitude of bird species, including wetland, forest and coastal species. Today most of the native bird species present are those that are commonly found in regenerating scrub and coastal areas of the region. These include tūī (*Prosthemadera novaeseelandiae*), kererū (*Hemiphaga novaeseelandiae*), korimako/bellbird (*Anthornis melanura*), tōrea pango/variable oyster-catcher (*Haematopus unicolor*) and tarāpunga/red-billed gull (*Larus novaehollandiae*). Some less common species that are present include pīhoihoi/New Zealand pipit (*Anthus novaeseelandiae*), pāteke/brown teal (*Anas chlorotis*), weweia/New Zealand dabchick (*Poliocephalus rufopectus*), tara/white-fronted tern (*Sterna striata*) and taranui/Caspian tern (*Hydropogne caspia*).

Kōtuku ngutupapa/royal spoonbill (*Platalea regia*) and kārearea/New Zealand falcon (*Falco novaeseelandiae*) are seen in the KNE site on occasion. These species are likely to be vagrant visitors rather than resident or breeding in the KNE site. A kākā was observed at the southern end of the KNE site in 2020[24], one of very few observations of kākā on mainland Kāpiti Coast in recent history. It is thought that kākā seen on mainland Kāpiti Coast are vagrant visitors from Kāpiti Island.

Reptiles

The only lizard species recorded from the KNE site in recent times is northern grass skink (*Oligosoma polychroma*). During surveys undertaken in 2009-10[25] and 2016-18[26] low to moderate numbers of northern grass skink were found. One record of a copper skink from 1996 and one record of a barking gecko from 2001 exist for locations within about 500 m of the KNE site.

It appears that lizard populations at the KNE site are still in recovery from the effects of predatory pests such as mice, rats, mustelids and hedgehogs. Where habitat exists it appears that lizards are finding it hard to re-establish. With low numbers of lizards present, and poor habitat connectivity, it is difficult for colonisation and rapid population expansion.

It appears that the sand dune habitat has proven challenging for lizards to persist in. Sand provides a lack of secure retreats, such as ground crevices, and it is also possible that during winter months, predatory pests are able to detect and dig out semi-hibernating lizards that are too cold to be able to escape[27].

Fish

Several surveys of native fish have been undertaken in both streams that flow through the KNE site; the Whareroa and Wainui streams. During surveys undertaken within the KNE site and within 500 m up-stream of it, nine species of native fish have been recorded in the Whareroa Stream and eleven in the Wainui Stream, comprising a total of thirteen species. Eight of the species recorded are identified as Nationally Threatened or At Risk in New Zealand's national threat classification system[28].

Table 4 lists native fish species recorded in or within 500 m up-stream of the Queen Elizabeth Park KNE site and identifies which of the two streams that flow through the KNE site they were recorded in. Nationally Threatened and At Risk native fish species recorded at the site are listed in Appendix 2.

Table 4: Native fish species recorded at or within 500 m up-stream of the Queen Elizabeth Park KNE site

Scientific name	Common name	Stream recorded in
Anguilla australis	Shortfin eel	Whareroa, Wainui
Anguilla dieffenbachii	Longfin eel	Whareroa, Wainui
Galaxias argenteus	Giant kokopu	Whareroa, Wainui
Galaxias brevipinnis	Koaro	Whareroa, Wainui
Galaxias maculatus	Inanga	Whareroa, Wainui
Gobiomorphus cortidianus	Common bully	Whareroa, Wainui
Gobiomorphus huttoni	Redfin bully	Whareroa, Wainui
Chimarrichthys fosteri	Torrentfish	Wainui
Galaxias postvectis	Shortjaw kokopu	Wainui
Gobiomorphus gobioides	Giant bully	Wainui
Rhombosolea retiaria	Black flounder	Wainui
Galaxias fasciatus	Banded kokopu	Whareroa

Gobiomorphus hubbsi	Bluegill bully	Whareroa

7. Threats to ecological values at the KNE site

Ecological values can be threatened by human activities, and by introduced animals and plants that change ecosystem dynamics. The key to protecting and restoring biodiversity as part of the KNE Programme is to manage threats to the ecological values at each KNE site.

While the key threats discussed in this section are recognised as the most significant, it is important to note that not all threats can be adequately addressed. This can be for a number of reasons including financial, legal, or capacity restrictions. A number of other threats to the KNE site's values have also been identified. Appendix 4 presents a summary of all known threats to the Queen Elizabeth Park KNE site (including those discussed below), detailing which operational areas they affect, how each threat impacts on ecological values, and whether they will be addressed by operational activities.

7.1. Key threats

The key threats to ecological values at the KNE site come from the impacts of ecological weeds, pest animals and human activities. Ecological weeds are present throughout the KNE site and many of the species present are vigorous colonisers that would out-compete native species for space if they weren't controlled. Unfortunately many introduced plant species thrive and multiply in the coastal environment more successfully than the local native species do. If these species weren't controlled in the KNE site they would quickly tip the balance of the native ecosystem causing further degradation and preventing recovery.

Prior to intensive control of ecological weeds commencing in 2003, dense infestations existed of species such as boneseed (*Chrysanthemoides monilifera*), pampas (*Cortaderia selloana*), boxthorn (*Lycium ferocissimum*), boobialla (*Myoporum insulare*), karo (*Pittosporum crassifolium*) and Cape ivy (*Scenecio angulatus*). These infestations would return quickly if control was not maintained. Other species such as blackberry (*Rubus fruticosus*) and marram grass (*Ammophila arenaria*) are still widespread and dense across some parts of the KNE site, causing significant habitat modification.

Mustelids (weasels (*Mustela nivalis*), stoats (*M. erminea*) and ferrets (*M. furo*)), rats (*Rattus norvegicus* and *R. rattus*), hedgehogs (*Erinaceus europaeus*), possums (*Trichosurus vulpecula*) and feral cats (*Felis catus*) are all present within the KNE site and are likely to be preying on native birds, lizards and invertebrates, inhibiting the recovery of these fauna. Domestic cats and dogs (*Canis lupus familiaris*) also pose a threat to native animals. Some native species such as little penguin (*Eudyptula minor*) are at particular risk from uncontrolled dogs.

Rabbits (*Oryctolagus cuniculus cuniculus*) are present throughout most of the dune system. They are impacting native plant regeneration and hampering efforts to revegetate areas of the KNE site by feed on native seedlings and plants that have been planted to supplement natural regeneration. Possums and rats are present in lower numbers but their browsing of native foliage, flowers and fruits is also likely to be impacting regeneration in this sensitive environment.

Water quality in the streams is generally good. However, a study of ecological health undertaken in the Whareroa Stream close to the KNE site from 2014 to 2018 showed poor ecological health based on macroinvertebrate populations[29]. Macroinvertebrates were used to calculate the Macroinvertebrate Community Index (MCI) which provides a long term indicator of water quality as driven by nutrient enrichment[30]. The survey indicated that some parts of the stream were at times severely to extremely polluted with organic enrichment[31]. Further study would need doing to determine where the enrichment originates from. The catchment of the stream includes farms, forestry, lifestyle blocks, State Highway 1 and at the time of the study included initial Transmission Gully works.

Storm surges and sea level rise resulting from climate change pose a significant and increasing threat to coastal areas of the KNE site. Predictions of future climate change and its resultant affects indicate that storms that have the potential to cause damage to coastal land are likely to become more frequent and severe. In recent years, severe storms including cyclone Gita in 2018 have caused dune erosion and collapse resulting in habitat loss. As a result, the fore-dune has become narrower and populations of key and threatened plant species have been lost.

8. Vision and objectives

8.1. Vision

'The Queen Elizabeth Park KNE site comprises healthy and resilient coastal, wetland and swamp forest ecosystems. The vegetation communities are dominated by native species and support thriving native fauna populations'

8.2. Objectives

Objectives help to ensure that operational activities carried out are actually contributing to improvements in the ecological condition of the site.

The following objectives will guide the operational activities at the Queen Elizabeth Park KNE site.

1. Improve the condition, diversity and dominance of the native plant communities

2. Protect and improve the habitat for native birds, lizards and invertebrates

3. Protect and expand the distribution of rare and threatened native plant species

4. Build resilience and connection of ecosystems

9. Operational activities

Operational activities are targeted to work towards the objectives above (Section 8). The broad approach to operational activities is described briefly below, and specific actions, with budget figures attached, are set out in the operational delivery schedule (Table 5).

9.1. Ecological weed control

The aim of ecological weed control is to improve the condition and increase the dominance of native plant communities in the KNE site. By suppressing the otherwise continual spread and concentration of ecological weeds, competition is removed for regenerating native understory and more native and representative ecosystems are allowed to recover and at a faster pace.

The pest plant control plan for Queen Elizabeth Park[32] developed in 2011 is used to help guide ecological weed control within the KNE site. This plan lists the large suite of ecological weed species present in the KNE site and describes the level of threat, distribution and abundance of each species.

A good level of success has been achieved with ecological weed control efforts during recent years. The suppression of Cape and German ivy in southern parts of the KNE site and blackberry in the surrounds of the northern wetland has been maintained.

It appears that a new approach to the control of key woody weed species such as boneseed, brush wattle and evergreen buckthorn, has brought them under better control across the KNE site. Densities of these species were beginning to increase despite control. However, a new approach was initiated in 2018-19 which appears to be providing better results. This approach is to undertake searches for woody weeds at a coarse scale across the whole of the dune system (operational areas A and B; see Map 4, Appendix 1) every year. This is opposed to finer scale searches that were taking three years to cover the same area. The intention of the new approach is to find and control only maturing plants about to set seed, rather than finding every last plant of any size. Some key non-woody species such as pampas and isolated areas of tradescantia are also controlled during this work.

The control of climbing species such as Cape and German ivy will also continue within the dune system. The approach to this work is to maintain low levels of these ecological weeds in areas where they have previously been controlled; mostly in operational area A (see Map 4, Appendix 1), and progressively move control in to new areas of the dune system where they are present (within operational area B).

The control of ecological weeds such as blackberry, Japanese honeysuckle and beggar's ticks within and in surrounding areas of the northern wetland (operational area C) will also continue. As the northern wetland is scheduled as a regionally significant wetland in the Proposed Natural Resources Plan, the protection of this area from ecological weeds is considered a priority. The control of beggar's ticks within the Marines wetland (operational area D), an area that was added to the KNE site in 2017, will also continue. Comprehensive control of blackberry in Mackay's Wetland (operational area E) will commence in 2021-22. Small amounts of control have been undertaken in this area by volunteers in recent years. However, the blackberry infestations are too large

to be controlled by volunteer effort alone and the wetland's value makes it worthy of better protection.

Secondary weed control priorities that could be initiated if resources are freed up in time are: multi species control in the remnant forest (operational area F) and weed control in various small areas of wetland and riparian habitat within the KNE site.

9.2. Pest animal control

The aim of pest animal control is to protect native birds, lizards and invertebrates from predation and to improve the condition and diversity of the native plant communities present by reducing the browsing of native foliage and seeds by pest animals.

The control of weasels, stoats, hedgehogs, rats and possums has continued to be undertaken successfully in recent years. Two volunteers undertake this work, one of them having done the work since it was started in 2008 and the other joining the effort in 2019.

Most of the pest animal control is achieved through the regular checking and re-baiting of traps located throughout the KNE site and in areas of QEP buffering the KNE site. Map 5 in Appendix 1 shows the network of traps and bait stations located in the KNE site and the wider area of QEP. Traps used are DOC200 style traps, Good Nature A24 traps and Timms traps. Several of the DOC200 style traps and all of the Good Nature traps were provided by the Kāpiti Coast Biodiversity Project (see separate section about this project below). Two bait stations are located within the forest remnant to control rats and possums in that area. The Greater Wellington Biodiversity department funds the bait for all traps and bait stations.

The Biodiversity department also funds an annual safety audit of the trap and bait station network to ensure that the traps and bait stations are operating and being operated in a safe manner. The Biosecurity department undertakes the safety audit by inspecting about a third of the traps and bait stations each year. Map 5 in Appendix 1 shows these areas and what year each will be audited. Following an audit undertaken in 2019, a large number of traps that were no longer operating effectively were replaced and some were repositioned for more appropriate spacing.

Rabbit and hare control is undertaken from time to time to reduce damage to native plants planted as part of revegetation efforts caused by these animals, and to reduce their browsing of native seedlings in areas of regenerating bush. Parks staff identify particular areas of concern and undertake most control themselves through night shooting. If fumigating of rabbit burrows is required, Biosecurity staff are engaged to undertake this.

Magpies are controlled to reduce the impacts of their harassing behaviour on native birds. Control is undertaken by volunteers through the use of a trap.

9.3. Small mammal monitoring

Monitoring of populations of rats and mice is undertaken in the dune system to improve current understanding of pest animal dynamics in coastal environments and to assess whether rat control is being successful. The monitoring field work is undertaken by the long-standing volunteer who undertakes the pest animal control.

The Greater Wellington Environmental Science department analyses and reports on the data. Monitoring is funded by the Biodiversity department and is undertaken at three-monthly intervals.

9.4. Revegetation

There are large parts of the KNE site where the natural recovery of native ecosystems will be very slow due to the areas being heavily degraded through past land use practices and weed infestation. An important aspect of biodiversity management at the KNE site is accelerating the recovery of some of these degraded areas through active revegetation with appropriate native plant species.

The aims of carrying out active revegetation at the KNE site are to:

- Restore appropriate native dominated ecosystems to areas that they are absent from
- Expand, connect and build resilience of existing areas of native ecosystems
- Add diversity of species and structure to existing native ecosystems
- Establish protective buffer zones of native vegetation adjacent to wetlands and streams
- Expand the distribution of rare and threatened native plant species
- Assist dune recovery following the erosive impacts of storms and sea-level rise.

The Parks and Biodiversity departments plan, fund and implement most of the revegetation work within the KNE site. The Queen Elizabeth Park Restoration Group (the restoration group), who are volunteers, provide input into planning and play a significant role in the implementation by growing many of the plants used for planting and by supervising and participating in planting events. Additionally, the restoration group plans and undertakes the planting of successional species, a project that they lead. Plants used in revegetation works are all eco-sourced from the Foxton ecological district.

Below are the details of the revegetation work that will be undertaken in the Queen Elizabeth Park KNE site. Map 6 in Appendix 1 shows the locations where some of the revegetation work will be undertaken.

The variable conditions of areas within the KNE site present challenges for plant survival, so adaptive management in regards to species selection and planting methodology is used. The restoration group uses a closely managed planting approach to restore some extreme sites where plantings have previously failed. In recent years the Parks department has trialled a range of planting methods within dune habitat and a new and economical method of planting has been developed[33]. It is expected that these new approaches will help to accelerate and progress more successful revegetation.

Planting has the potential to affect archaeological remains such as human bones and shell middens. To avoid damaging archaeological remains planting is not done in locations where burial sites are known to exist and controls are followed when remains are discovered during planting. The protocol which describes these controls in contained in Appendix 5.

Dune Swamp

Revegetation work has been undertaken within the forest remnant-Dune Swamp-Mackay's Wetland area since 1999. The Dune Swamp part of this area will continue to be a focus of planting efforts during the term of this plan with the intention of connecting ecosystems and building resilience to previous plantings. Areas of recently retired pasture between the areas of more intact native ecosystems will be planted as part of an approved Low Carbon Acceleration Fund project. This will be guided by a wetland and terrestrial restoration plan currently under development. Weed control will be required as a first step as large concentrations of gorse, lupin and blackberry cover the site.

Northern wetland

Revegetation at the northern wetland has been underway for many years, much of it made possible through fundraising and a high level of support from the Raumati South Residents' Association. The aim of the revegetation at this site is to return native coastal forest to the slopes surrounding the wetland to enhance the wetland ecosystem and buffer it against weed incursion. Initial planting of the surrounding slopes is likely to be completed during the term of this plan. The revegetation plan for the northern wetland produced in 2009[34] will continue to be used to guide the progression of revegetation in this area.

Fore-dunes

Areas of the fore-dune are being planted with sand-binding plants to increase resilience to the erosive impacts of storms and sea-level rise through assisting the natural process of dune re-building. Planting is undertaken with native dune species, in particular spinifex and pīngao, which capture wind-blown sand to form stable, low profiled dunes. Dunes of this nature are more resilient to high tides and storms than steep faced dunes[35].

Planting is undertaken following recommendations in the Restoration Plan for QEP Dunes, prepared in 2010[36]. Planting is focused on stretches of the fore-dune where the front face is not steep or over about two meters high. Some mechanical reshaping of the crest of the dune may be undertaken to lower the profile of the dune prior to planting. Planting will be preceded by the control of exotic weeds that won't assist the natural recovery process, such as marram and ice plant.

Planting of areas of the fore-dunes has been undertaken in the past with some success. Many plants grew well and the fore-dunes in planted areas accreted. However, most of the recovered areas were washed away during unusually damaging storms in 2015 and then cyclone Gita in 2018. It is accepted that this could occur again to future plantings and that damaging weather events may occur more often in the future due to climate change. However, it is considered that planting is beneficial despite such losses occurring at times.

A large amount of dune planting will be required following planned re-location of coastal infrastructure at the southern end of the KNE site which is being undertaken due to damage and risk from coastal erosion. This project is described in full in section 9.6.

Back-dunes

With erosion and climate change affecting the coastline and the fore-dunes, attention needs to be paid to ensuring the resilience of the wider dune ecosystem. As areas of fore-dune are lost and areas of mobile sand move inland, the back-dune habitat might become confined and lost also. This issue and whether a form of habitat extent monitoring can be instigated will be investigated. Planting of back-dune species further inland is an action that could be taken to mitigate losses.

Te Ara Whareroa

Planting of the margins of Te Ara Whareroa Trail which runs the length of QEP skirting the KNE site in several places, will be continued. As the initial plantings become more established additional emergent species will be added. This planting will make Te Ara Whareroa more attractive to users, while also bolstering native back dune vegetation.

Successional planting

Most of the restoration planting that has been undertaken within the KNE site, and in other parts of Queen Elizabeth Park, has been pioneer planting – planting using only species that are likely to survive well in the exposed, nutrient poor and grass dominated conditions present in restoration sites. Consequently the range of species growing in past and present restoration sites is limited and often poorly represents what a natural plant community would have originally resembled at the KNE site. To increase the diversity of species within restoration sites, additional planting is undertaken using successional species and other endemic species that should occur in the KNE but have been lost. These are species that are integral to a fully functioning ecosystem, but are not planted early on in revegetation efforts as they generally require sheltered conditions which sites don't provide until initial plantings have matured somewhat. The restoration group will lead this work.

9.5. Kāpiti Coast Biodiversity Project

In 2015 the Friends of Queen Elizabeth Park Trust in collaboration with the Guardians of Whareroa Farm and Ngā Uruora Kāpiti Project were successful in gaining substantial funding from the Ministry for the Environment to undertake a three-year landscape scale biodiversity conservation project. The aims of the project were to reduce predators and improve habitat for birds, lizards, wētā, dune plants and freshwater fish. The project undertook a number of activities that have augmented biodiversity outcomes within the KNE site. These comprised six focus areas:

- Native birds – monitoring forest bird numbers and protecting little penguins through installing nesting boxes and undertaking community education
- Native wētā – determining the presence of wētā within the project areas
- Native lizards – determining the presence of native skinks and gecko
- Native dune plants – increasing the abundance of threatened native dune plants
- Freshwater fish habitat – assessing the comparative ability of various plant species to provide shading to streams

- Pest animal control – bolstering the level of pest animal control within and between the three individual project areas to support the above activities

The funding for this project came to an end in March 2018. However, many of the focus area projects have continued on a voluntary basis such as forest bird counting, lizard audits and planting. Within Queen Elizabeth Park, the project volunteer group continues to plant sections of the Whareroa Stream and a tributary drainage channel, and will begin planting the margins of Waterfall Road Stream in 2021, all of which flow into the KNE site.

The group currently has funding for surveys and monitoring of kororā/little penguin (*Eudyptula minor*) on all of the Kāpiti Coast, including the coastal stretch within the KNE site. The dune restoration plan[37] that will go hand in hand with the coastal retreat project described below may include provision for kororā nest boxes and the group will contribute its knowledge and experience to this as needed.

Currently Kāpiti Coast Biodiversity Project are investigating the feasibility and value of establishing a predator-proof fence within the KNE site. The aim of this project is to determine an environmentally and economically sustainable way to support and grow currently missing, rare and threatened lizard populations on the Kāpiti Coast. Central to this is exploring the role a predator-proof fence could play in achieving this goal.

Further information covering many of the projects that the group has undertaken since 2015 can be found on the project's website[38]. The website is designed to provide information and raise awareness of the flora and fauna on public land on the Kāpiti Coast, and to give the community, including school groups, a broader understanding of the biodiversity values of public land such as found in the KNE site.

9.6. Coastal retreat project

The coastal edge of the KNE site is a dynamic landscape, vulnerable to erosion and the effects of climate change. These effects include sea level rise, more extreme rainfall events and increasing frequency and intensity of storm events[39]. The low elevation of the coastal edge in the southern part of the KNE site is particularly vulnerable to these effects. This was evident when storms and cyclones during this last few years washed away a pedestrian bridge across the Wainui Stream and eroded metres of fore-dune leaving the park road very vulnerable.

In response to this increasing threat, the Parks department is currently undertaking a large coastal retreat project at the southern end of the KNE site. The key objectives of the plan are:

- Withdraw existing visitor facilities and infrastructure that lie within a 40 m erosion zone
- Relocate visitor facilities and infrastructure outside the erosion zone
- Carry out fore-dune restoration
- Provide opportunities for people to access, enjoy and recreate in this part of the park
- Highlight and interpret park heritage and the natural environment.

A detailed dune restoration plan[40] has been developed to guide the re-shaping and planting of the fore-dunes. Re-shaping will require widespread spraying of existing exotic vegetation and earthworks to remove resulting dead vegetation, roots and seed bank and to restore the desired natural frontal dune shape. The project is expected to take until 2025 to complete.

9.7. Environmental Protocols

To help protect the natural resources of the site from the potential impacts of human activities, the following procedures are followed in the course of managing the KNE site as part of overall park management.

Environmental care

Greater Wellington's operational staff follow procedures to identify and avoid damage to biodiversity values such as plant and animal communities. Procedures may include assessments of environmental effects of planned works. This limits risks to biodiversity values that could otherwise occur while planning and carrying out the construction and maintenance of assets, and when permitting the use of the KNE site by other users.

Research and the collection of natural materials

Research activities and the collection of native plants and animals in the KNE site is managed by a permit system run by the Environmental Science department. The system aims to prevent adverse impacts on native flora and fauna occurring as a result of these activities.

Fire risk

To reduce the risk of uncontrolled fires occurring in the KNE site, Toitū Te Whenua[41] identifies that open fires and camping are not permitted in Queen Elizabeth Park beyond the bounds of the camping ground. This policy is communicated to users through the Queen Elizabeth Park information brochure and on signage.

Dog control

Dogs that roam through the dunes can cause erosion, particularly when in pursuit of rabbits. Rabbits on their own cause a degree of erosion; however, dogs pursuing them exacerbate the problem by excessive tracking and digging at the entrances of rabbit burrows. Dogs allowed to roam through the dunes might also attack and kill nesting penguins. At times when rabbit numbers are high and dog roaming becomes a problem, instructional signs will be installed at strategic locations within the dune system to encourage dog walkers to prevent their dogs from roaming off-track. The Biodiversity and Parks departments will collaborate on sign design and installation.

10. Future opportunities

10.1. Remediating fish passage

There are two weirs in the Wainui Stream within the KNE site that present barriers to fish passage. The lower weir is located immediately downstream of the vehicle bridge at the Wellington Road entrance to QEP, about 250 m from the stream mouth. The upper weir is located about 350 m further inland. The results of numerous fish surveys appear to indicate that both weirs restrict the passage of some native fish species and that there is about 1 km of habitat upstream of the weirs that could be utilised by species currently restricted. Thorough baseline fish surveys above and below each structure could provide more confirmation of the extent to which these structure pose a barrier to fish passage.

The removal of structures that present a partial or complete barrier to fish passage is considered preferable over remediating structures for fish passage, as stated in the NZ Fish Passage Guidelines[42]. However, if the removal of these weirs is not a viable option, then the impedance presented by both weirs could be remediated by the construction of full width 'nature-like' rock ramp fish-ways, which would be consistent with the NZ Fish Passage Guidelines.

Undertaking such remediation works would offer Greater Wellington a valuable opportunity to trial and properly monitor the effectiveness of this type of remediation option. The New Zealand Fish Passage Advisory Group is looking for suitable sites that are easily accessible for people that can demonstrate good fish passage management. Provided that good information is gained including pre and post installation fish monitoring, the upper weir could be particularly suitable for this purpose as there is a good chance of enhancing fish passage there. This could also be an opportunity for Greater Wellington to show case efforts in improving fish passage on land it manages.

11. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the Queen Elizabeth Park KNE site, and their annual costs. The budget is subject to change for years 2022/23 to 2025/26. Maps of operational areas can be found in Appendix 1 (see Maps 4 and 5).

Table 5: Operational delivery schedule for the Queen Elizabeth Park KNE site

Objective	Activity	Actions	Operational area	Intended outcome	Implementing party	Annual resourcing
1	Ecological weed control	Control woody ecological weeds through coarse searches	A, B (whole dune system)	Improved condition and increased dominance of native plant communities	Greater Wellington Biosecurity department	$27,000
1	Ecological weed control	Control climbing and ground-covering ecological weeds – progressively expanding control to new areas (operational area B), while maintaining control in previously controlled areas (operational area A)	A, B (whole dune system)	Improved condition and increased dominance of native plant communities	Greater Wellington Biosecurity department	$4,000
1, 2	Ecological weed control	Control beggar's ticks	C, D (northern and Marines wetlands)	Improved condition and increased dominance of native plant communities	Greater Wellington Biosecurity department	$1,000
1, 2	Ecological weed control	Control blackberry	E (MacKay's wetland)	Improved condition and increased dominance of native plant communities	Greater Wellington Biosecurity department	$3,000

Objective	Activity	Actions	Operational area	Intended outcome	Implementing party	Annual resourcing
1, 2	Pest animal control	Control possums, rats, mustelids and hedgehogs by checking and re-baiting all traps at monthly intervals, and all bait stations at three monthly intervals	Whole of QEP	Minimal browsing of native vegetation, and predation of native fauna, by target pest species is occurring. The rat population is kept to below 5%TTI.	Volunteers	$3,500
1, 2	Pest animal control	Undertake a safety audit of the pest animal control network, checking a third of the traps/bait stations each year	G, H, I	No injuries occur as a result of operating traps or bait stations, and the control remains effective	Greater Wellington Biosecurity department	$1,000
1, 2	Pest animal control	Control rabbits and hares where they are likely to impact native plantings or natural seedling regeneration	Whole KNE site	Minimal impact by rabbits on planted or naturally regenerating native plants	Greater Wellington Parks and Biosecurity departments	$1,000*
2	Pest animal control	Control magpies through trapping	Wherever magpies are inhabiting	Native birds can forage and breed unhindered	Volunteers	Nil
1, 2	Small mammal monitoring	Monitor rat and mouse populations using tracking tunnels	A, B (whole dune system)	Information is gained that can help inform management decision making	Volunteers and Greater Wellington Environmental Science department	$4,038
3, 4	Revegetation	Plant sand binding plants in low sections of fore-dune, preceded by spraying of marram and other weeds, and mechanical re-shaping of the dune crest	Fore-dune	Improved resilience of dunes to erosion and greater dominance of native dune species	Greater Wellington Biodiversity department	$4,800

Objective	Activity	Actions	Operational area	Intended outcome	Implementing party	Annual resourcing
1	Revegetation	Maintain plantings by controlling blackberry, cherry, Japanese honeysuckle and other ecological weeds	C (northern wetland)	Improved condition and increased dominance of native plant communities	Greater Wellington Biodiversity department	$1,500
1, 2, 4	Revegetation	Plant native pioneer plants in areas surrounding wetlands and track edges	Northern Wetland, Dune Swamp, Te Ara Whareroa	Enhanced and better protected wetland habitat, and restored native dune forest habitat	Greater Wellington Parks department	**
1, 2, 3, 4	Revegetation	Plant successional and missing native plant species within existing revegetation sites and regenerating native forest	Whole KNE site	Improved condition and diversity of native plant communities	Queen Elizabeth Park restoration group	**
1, 2, 3	Ecological monitoring	Monitor forest birds and penguin nesting boxes Monitor wētā hotels Monitor planted threatened plants	Various locations	Ecological knowledge is gained	Kāpiti Coast Biodiversity Project	Nil
1, 2, 4	Coastal retreat	Implement coastal retreat plan, including dune restoration	Southern end of dune system	Infrastructure and people are protected, and the coastal ecosystem is made more resilient to sea-level rise and storms	Greater Wellington Parks department	**
1, 2	Environmental protocols	Install signs at strategic locations requesting dog owners prevent their dogs from roaming through dunes	A, B	No erosion or damage to native plant communities, or harm to penguins is caused by dogs	Greater Wellington Parks and Biodiversity departments	**

Objective	Activity	Actions	Operational area	Intended outcome	Implementing party	Annual resourcing
1, 2	Environmental protocols	Follow environmental impact assessment procedures when carrying out construction and maintenance of assets, and when allowing potentially impacting activities to be undertaken by others	Whole KNE site	No negative impact on the native ecology is caused by management and recreational activities	Greater Wellington Parks department	**

* Funded by Greater Wellington Parks department
** Funding requirement cannot be defined at this time

12. Funding contributions

12.1. Budget allocated by Greater Wellington

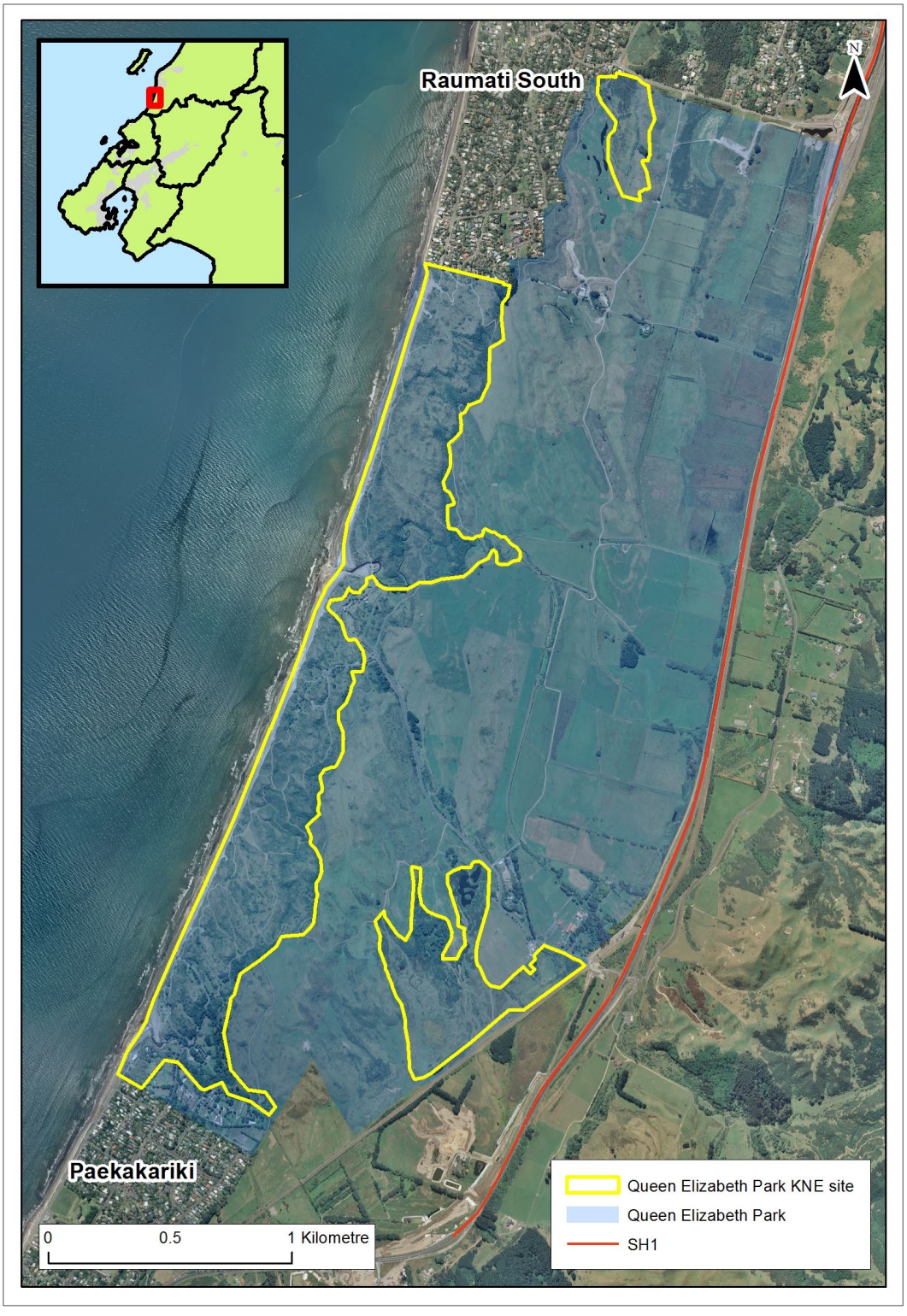
The budget is subject to change for the years 2022/23 to 2025/26.

Table 6: Greater Wellington allocated budget for the Queen Elizabeth Park KNE site

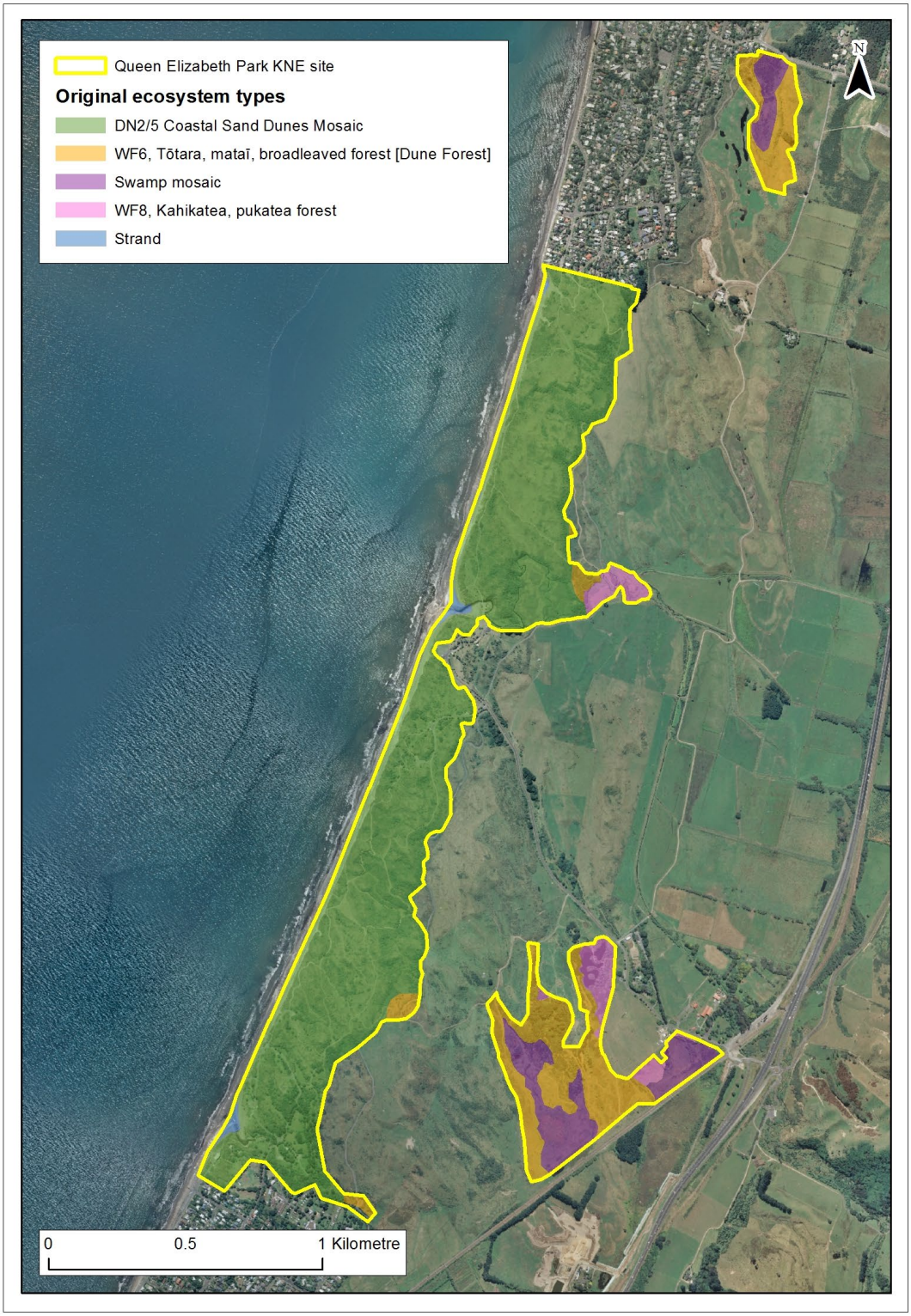
Management activity	Annual budget
Ecological weed control	$35,000
Pest animal control	$5,500*
Small mammal monitoring	$4,038
Revegetation	$6,300
Total	**$50,838***

* Incudes $1,000 funding from Greater Wellington Parks department

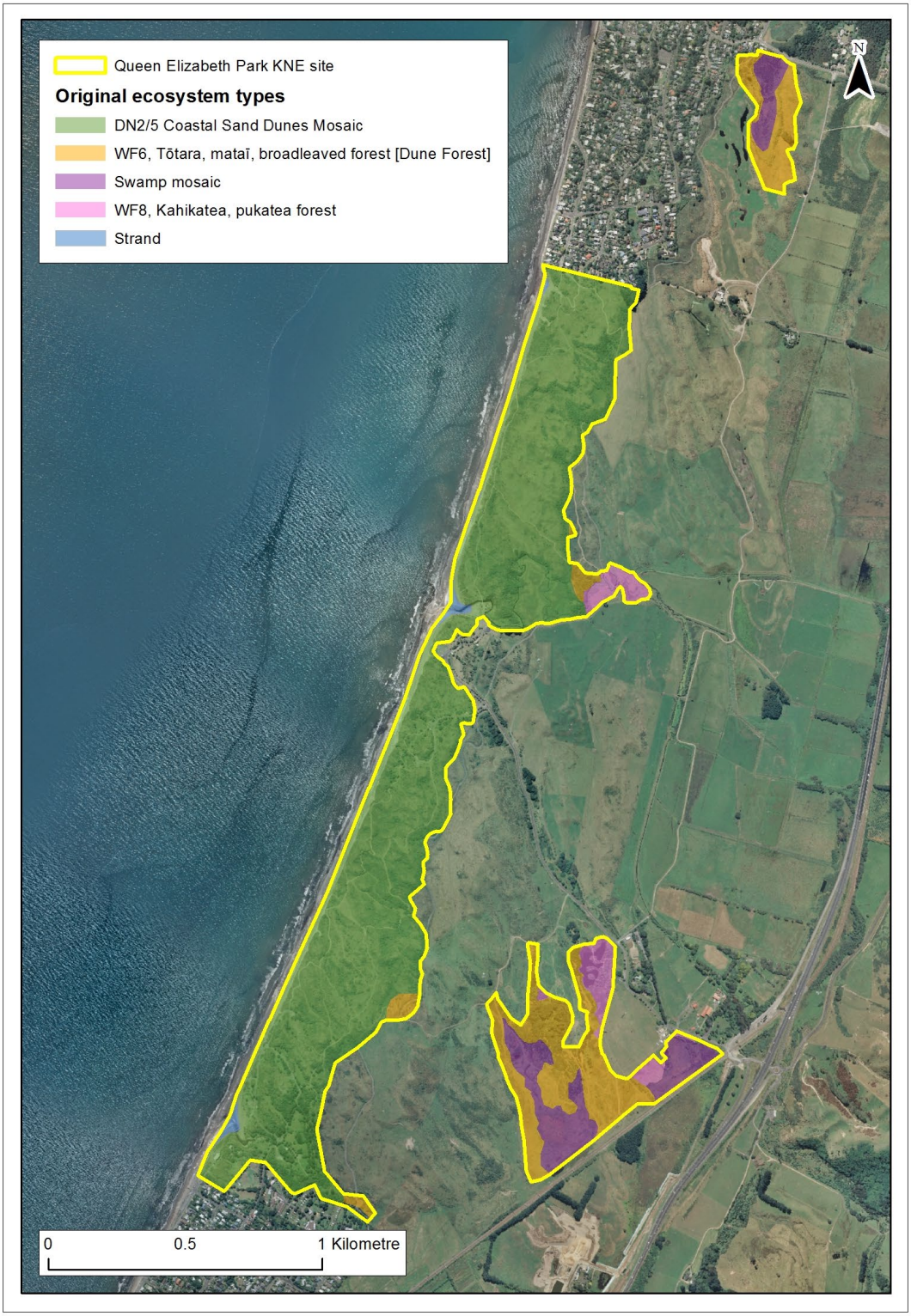
Appendix 1: Site maps



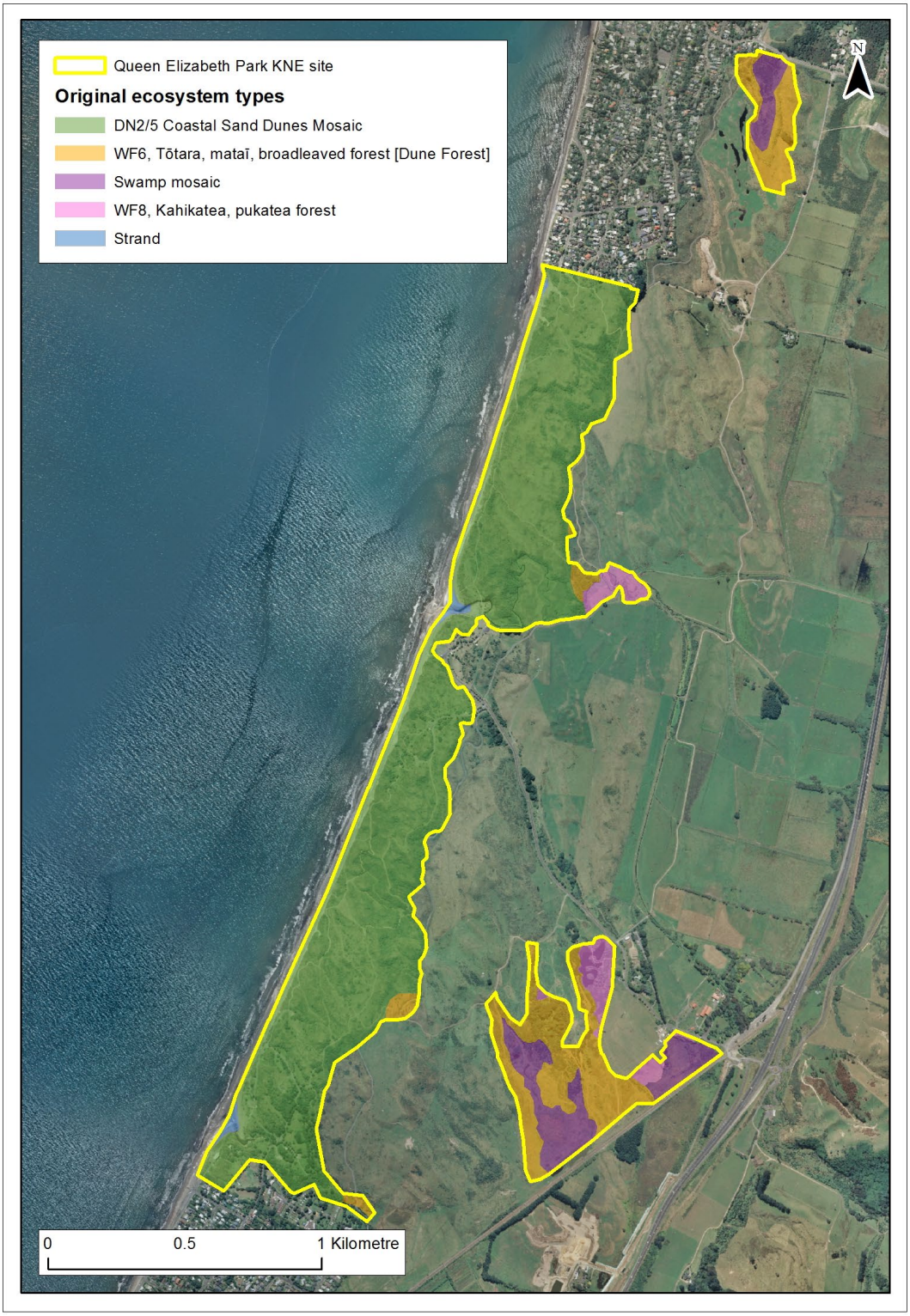
Map 1: The Queen Elizabeth Park KNE site boundary



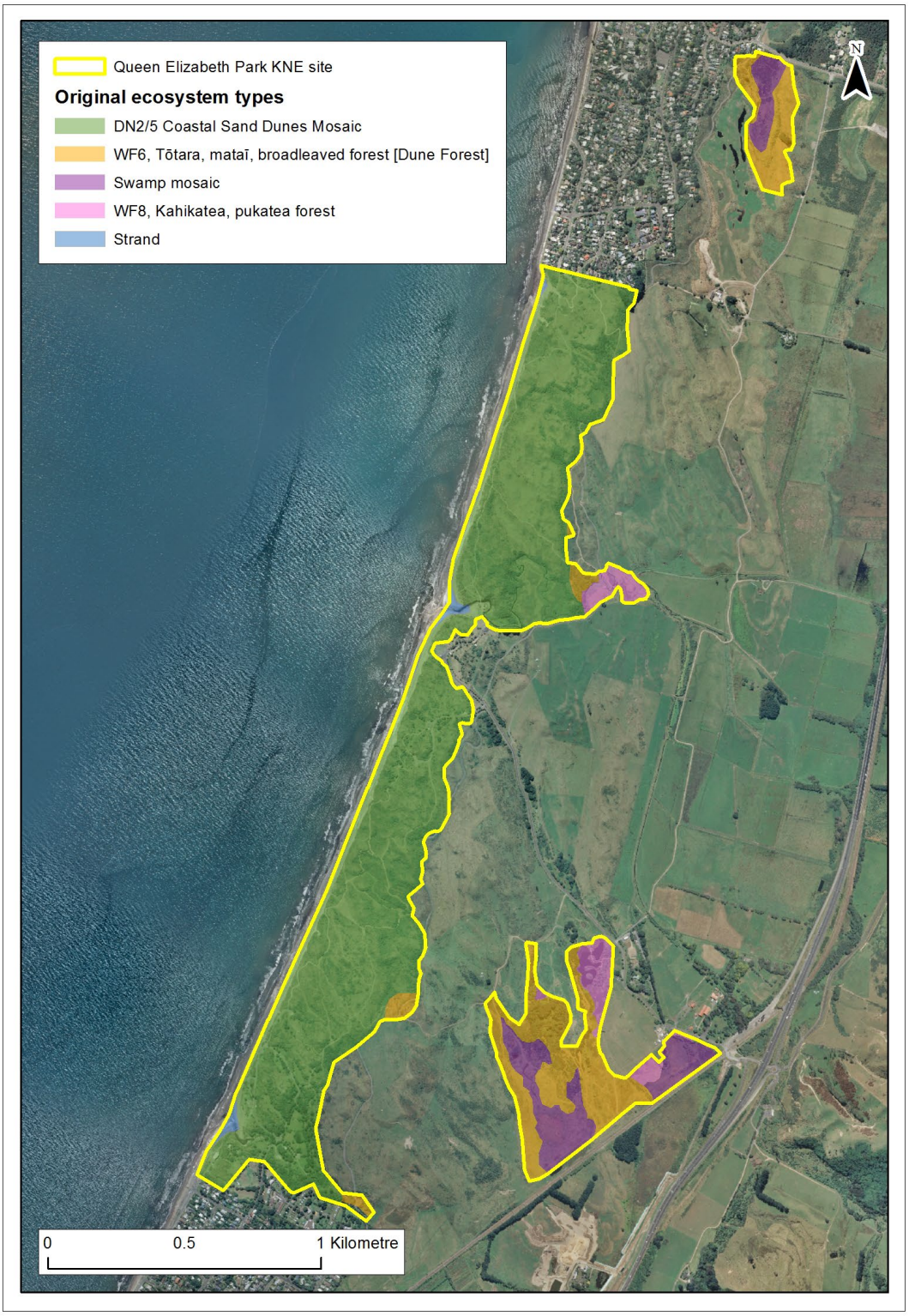
Map 2: Singers and Rogers classification of pre-human vegetation types for the Queen Elizabeth Park KNE site



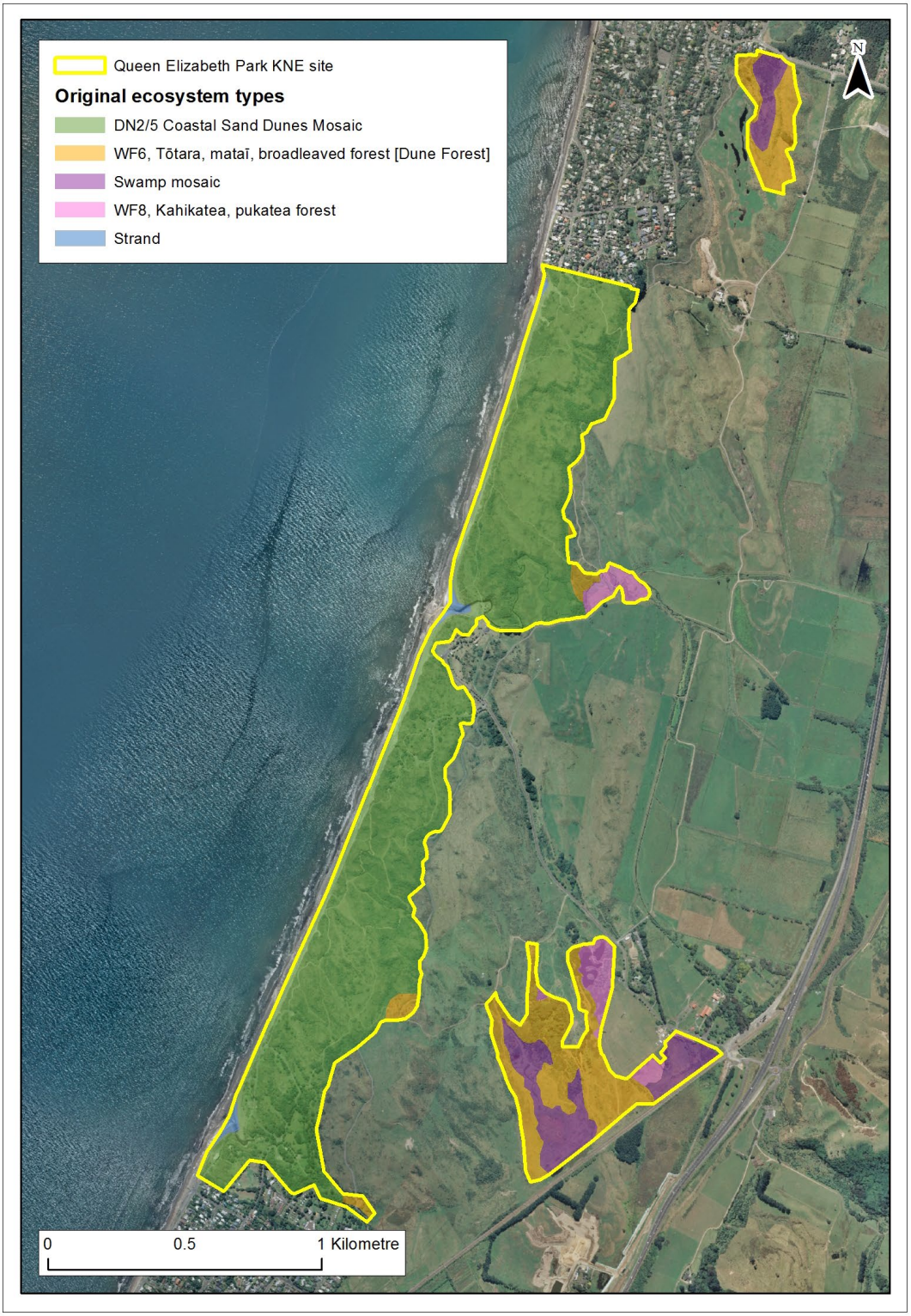
Map 3: Land Environment New Zealand threat classifications for the Queen Elizabeth Park KNE site



Map 4: Operational areas for ecological weed control in the Queen Elizabeth Park KNE site



Map 5: Pest animal control in the Queen Elizabeth Park KNE site



Map 6: Revegetation areas in the Queen Elizabeth Park KNE site

Appendix 2: Nationally threatened species list

The New Zealand Threat Classification System lists species according to their threat of extinction. The status of each species group (plants, reptiles, etc.) is assessed over a five-year cycle[43]. Species are regarded as Threatened if they are classified as Nationally Critical, Nationally Endangered or Nationally Vulnerable. They are regarded as At Risk if they are classified as Declining, Recovering, Relict or Naturally Uncommon. The following table lists Threatened and At Risk species that are resident in, or regular visitors to, the Queen Elizabeth Park KNE site.

Table 7: Threatened and At Risk species at the Queen Elizabeth Park KNE site

Scientific name	Common name	Threat status	Observation
Plants(vascular)[44]			
Amphibromus fluitans	Water brome	Threatened – Nationally Endangered	Greater Wellington 2007[45]
Coprosma acerosa	Sand coprosma	At Risk – Declining	Greater Wellington 2007
Facinia spiralis	Pingao, golden sand sedge	At Risk - Declining	Broad K, pers obs. 2021
Birds[46]			
Anas chlorotis	Brown teal	At Risk – Recovering	McArthur N. 2021[47]
Anas superciliosa	Grey duck	Threatened – Nationally Critical	McArthur N. 2021
Anthus novaeseelandiae	New Zealand pipit	At Risk – Declining	McArthur N. 2021
Falco novaeseelandiae	New Zealand falcon	At Risk – Recovering	McArthur N. 2021
Fulica atra	Eurasian coot	At Risk – Naturally Uncommon	McArthur N. 2021
Haematopus finschi	South Island pied oystercatcher	At Risk – Declining	McArthur N. 2021
Haematopus unicolor	Variable oystercatcher	At Risk – Recovering	McArthur N. 2021
Hydropogne caspia	Caspian tern	Threatened – Nationally Vulnerable	McArthur N. 2021
Larus novaehollandiae	Red-billed gull	At Risk – Declining	McArthur N. 2021
Phalacrocorax carbo	Black shag	At Risk – Naturally Uncommon	McArthur N. 2021
Phalacrocorax sulcirostris	Little black shag	At Risk – Naturally Uncommon	McArthur N. 2021
Phalacrocorax varius	Pied shag	At Risk - Recovering	McArthur N. 2021
Platalea regia	Royal spoonbill	At Risk – Naturally Uncommon	McArthur N. 2021

Scientific name	Common name	Threat status	Observation
Poliocephalus rufopectus	New Zealand dabchick	At Risk – Recovering	McArthur N. 2021
Sterna striata	White-fronted tern	At Risk – Declining	McArthur N. 2021
Freshwater fish[48]			
Anguilla dieffenbachia	Longfin eel	At Risk – Declining	Greater Wellington 2007
Cheimarrichthys fosteri	Torrentfish	At Risk – Declining	Greater Wellington 2007
Galaxias argenteus	Giant kōkopu	At Risk – Declining	Greater Wellington 2007
Galaxias postvectis	Shortjaw kokopu	Threatened – Nationally Vulnerable	NZ Freshwater Fish Database (accessed 18/11/2020)
Gobiomorphus huttoni	Redfin bully	At Risk – Declining	Greater Wellington 2007

Appendix 3: Regionally threatened species list

The following table lists regionally threatened species that have been recorded in the Queen Elizabeth Park KNE site.

Table 8: Regionally threatened species recorded in the Queen Elizabeth Park KNE site

Scientific name	Common name	Threat status	Observation
Plants[49]			
Amphibromus fluitans	Water brome	Endangered	Greater Wellington 2007[50]
Facinia spiralis	Pingao, golden sand sedge	Vulnerable	Broad K, pers obs. 2021
Birds[51]			
Anas chlorotis	Brown teal	Regionally Critical	McArthur N. 2021[52]
Anas gracilis	Grey teal	At Risk – Recovering	
Anas superciliosa	Grey duck	Regionally Critical	McArthur N. 2021
Anthus novaeseelandiae	New Zealand pipit	Regionally Vulnerable	McArthur N. 2021
Aythya novaeseelandiae	New Zealand scaup	Regionally Vulnerable	
Falco novaeseelandiae	New Zealand falcon	Regionally Critical	McArthur N. 2021
Fulica atra	Eurasian coot	Regionally Critical	McArthur N. 2021
Haematopus unicolor	Variable oystercatcher	Regionally Vulnerable	McArthur N. 2021
Hemiphagas novaeseelandiae	New Zealand pigeon	At Risk - Recovering	McArthur N. 2021
Himantopus	Pied stilt	Regionally Vulnerable	McArthur N. 2021
Hydropogne caspia	Caspian tern	Regionally Critical	McArthur N. 2021
Larus novaehollandiae	Red-billed gull	Regionally Vulnerable	McArthur N. 2021
Phalacrocorax carbo	Black shag	Regionally Critical	McArthur N. 2021
Phalacrocora melanoleucos	Little shag	Regionally Vulnerable	McArthur N. 2021
Phalacrocorax sulcirostris	Little black shag	Regionally Vulnerable	McArthur N. 2021
Phalacrocorax varius	Pied shag	Regionally Vulnerable	McArthur N. 2021
Poliocephalus rufopectus	New Zealand dabchick	Regionally Vulnerable	McArthur N. 2021
Sterna striata	White-fronted tern	Regionally Endangered	McArthur N. 2021

Appendix 4: Threat table

The following table lists all known threats to the Queen Elizabeth Park KNE site, detailing which operational areas they affect, how each threat impacts on ecological values, and whether they will be addressed by operational activities.

Table 9: Summary of all threats to ecological values present at the Queen Elizabeth Park KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Ecological weeds		
EW-1	Ground covering ecological weeds smother and displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key ground covering ecological weed species at the KNE site include: pampas (*Cortaderia selloana*), tradescantia (*Tradescantia fluminensis*), blackberry (*Rubus fruticosus*), marram grass (*Ammophila arenaria*), ice-plant (*Carpobrotus edulis*) and arum lily (*Zantedeschia aethiopica*)**.	Whole KNE site
EW-2	Woody ecological weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key woody ecological weed species at the KNE site include: boneseed (*Chrysanthemoides monilifera*), brush wattle (*Paraserianthes lophanta*), boobialla, evergreen buckthorn (*Rhamnus alaternus*), karo (*Pittosporum crassifolium*), sweet cherry (*Prunus avium*) and elderberry (*Sambucus nigra*)**.	Whole KNE site
EW-3	Climbing ecological weeds smother and displace native vegetation often causing canopy collapse, inhibit indigenous regeneration, and alter vegetation structure and composition. Key climbing ecological weed species at the KNE site include: Cape ivy (*Senecio angulatus*), German ivy (*Senecio mikanioides*) Japanese honeysuckle (*Lonicera japonica*), climbing dock (*Rumex sagittatus*) and convolvulus (*Convolvulus arvensis*)**.	Whole KNE site
EW-4	Aquatic weeds out-compete native aquatic species and choke watercourses. Key aquatic weed species at the KNE site include: beggar's ticks (*Bidens frondosa*) and water celery (*Apium nodiflorum*).	Streams and wetlands
Pest animals		
PA-1	Possums (*Trichosurus vulpecula*) browse palatable canopy vegetation until it can no longer recover[53,54]. This destroys the forest's structure, diversity and function. Possums may also prey on native birds and invertebrates[55].	Whole KNE site
PA-2	Rats (*Rattus* spp.) browse native fruit, seeds and vegetation. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates, lizards and native birds[56,57].	Whole KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-3	Mustelids (stoats[58,59] (*Mustela erminea*), ferrets[60,61] (*M. furo*) and weasels[62,63] (*M. nivalis*)) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions.	Whole KNE site
PA-4	Hedgehogs (*Erinaceus europaeus*) prey on native invertebrates[64], lizards[65] and the eggs[66] and chicks of ground-nesting birds[67].	Whole KNE site
PA-5*	House mice (*Mus musculus)* browse native fruit, seeds and vegetation, and prey on invertebrates. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates, lizards and small eggs and nestlings[68,69].	Whole KNE site
PA-6*	Pest and domestic cats (*Felis catus*) prey on native birds[70], lizards[71] and invertebrates[72], reducing native fauna breeding success and potentially causing local extinctions[73].	Whole KNE site
PA-7	Rabbits (*Oryctolagus cuniculus*) and hares (*Lepus europaeus*) graze on palatable native vegetation and prevent natural regeneration in some environments[74]. Rabbits are particularly damaging in sand dune environments where they graze native sand binding plants and restoration plantings. In drier times hares especially, will penetrate into wetland forest areas browsing and reducing regenerating native seedlings.	Whole KNE site
PA-8*	Wasps (*Vespula* spp.) adversely impact native invertebrates and birds through predation and competition for food resources. They also affect nutrient cycles in beech forests[75].	Whole KNE site
PA-9*	Brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) prey on native fish and compete with them for food resources[76].	Whole KNE site
PA-10*	Eastern rosella (*Platycercus eximius*) parakeets are known to out-compete native red-crowned parakeets for nest-sites and are a vector of avian diseases. The continued presence of eastern rosella in the KNE site could limit the ability of red crowned parakeets to establish functional populations[77,78].	Forest remnant
PA-11	Australasian magpies are known to modify the behaviour of native birds which could inhibit the ability of native birds to feed and breed.	Bush margins
Human activities		
HA-1	Recreational pursuits such as walking, biking and horse riding can cause damage and disturbance of the dunes and other native ecosystems in the KNE site. They might also disturb native fauna and introduce ecological weeds.	Whole KNE site
HA-2*	Barriers to native fish passage are present in streams within the KNE site. These might be preventing migrating fish from completing their life-cycle.	Wainui and Whareroa streams

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
HA-3*	Poor water quality affects a range of species in the estuaries and streams at the KNE site. High nutrient levels, sediment and contaminants within the watercourses are caused by upstream land management practices and pollution events including road construction, agricultural and forestry practices, development practices, sceptic tank leakages, and road run-off and storm water entering the watercourses.	Wainui and Whareroa streams
HA-4*	Dogs (*Canis lupus familiaris*), if uncontrolled/unleashed can disturb or kill nesting birds and chicks, and lizards within the KNE site, particularly in close proximity to walking tracks[79]. Dogs also cause erosion by tracking through sand dunes and digging at rabbit burrow entrances.	Whole KNE site
HA-5*	White baiting depletes native fish numbers and can introduce aquatic weed species to waterways.	Wainui and Whareroa stream mouths
Other threats		
OT-1	Storm surges and sea level rise cause dune erosion and collapse resulting in habitat loss. Populations of threatened plant species can be lost in the process.	Fore-dunes of A and B
OT-2*	Small forest remnants are effected by environmental impacts on their edges such as changing environmental conditions (eg, soil moisture or temperature levels), changing physical environment (eg, different plant assemblages compared to the interior) and changing species interactions (eg, increased predation by invasive species)[80,81].	Whole KNE site

* Threats marked with an asterisk are not addressed by actions in the operational delivery schedule

** A full list of the ecological weed species present in the KNE site can be found in the pest plant control plan for Queen Elizabeth Park prepared in 2011[82]

Appendix 5: Archaeological remains accidental discovery protocol

The following protocol is followed in the event of finding archaeological remains, including kōiwi tangata (human remains), during planting.

NATIVE REVEGTATION PLANTING PROTOCOL

- The Principal or Park Ranger will discuss potential for encountering archaeological material during on-site briefings for planting volunteers
- Planters will be requested to report any suspected archaeological finds, such as bone or shell midden, to the Principal or Park Ranger who in turn will contact the Project Archaeologist and mana whenua representatives to the project
- Planting shall be directed away from the immediate area of the find
- The Project Archaeologist will carry out limited testing of the area using a probe and/or hand auger to determine the archaeological nature or the area and the extent of the deposit
- If the deposit is deemed archaeological the Park or Principal Ranger shall notify the Parks Manager, Greater Wellington Regional Council
- If it is not possible to exclude the extent of the archaeological site from planting, the Project Archaeologist shall sample and record the site before any further planting is undertaken.

KŌIWI TANGATA (HUMAN REMAINS) PROTOCOL

- Work is to cease immediately in the immediate area (within 20 m of the discovery). The work supervisor must shut down machinery, secure the immediate area and advise the Park or Principal Ranger and the Project Archaeologist
- Project Archaeologist to determine if the bones are human or animal bones. If the bones are of human origin the Park or Principal Ranger shall notify mandated Iwi representatives to determine what further actions are appropriate to safeguard the site or its contents
- If the bones are of human origin the Park or Principal Ranger will also notify each of the following of the discovery if not already on site: Heritage New Zealand, NZ Police, and the Public Health Unit
- Site is to be marked with a cordon by the Project Archaeologist and no works are to resume within that cordon until Heritage New Zealand, NZ Police, Public Health Unit and mana whenua representatives have been given a reasonable timeframe in which to respond and have made an inspection if deemed necessary

- Works in other areas may resume provided the kōiwi tangata are not further disturbed.

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Greater Wellington Regional Council:

Wellington office
PO Box 11646
Manners Street
Wellington 6142

T 04 384 5708
F 04 385 6960

Upper Hutt office
PO Box 40847
Upper Hutt 5018

T 04 526 4133
F 04 526 4171

Masterton office
PO Box 41
Masterton 5840

T 06 378 2484
F 06 378 2146

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