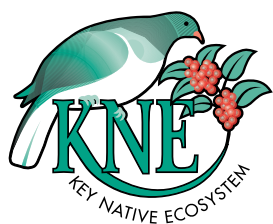


# Key Native Ecosystem Plan for Belmont-Korokoro

2016-2019



greater WELLINGTON  
REGIONAL COUNCIL  
Te Pane Matua Taiao





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## 1. The Key Native Ecosystem programme

The Wellington region's native biodiversity has declined since people arrived and the ecosystems that support it face ongoing threats and pressures. 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).

Greater Wellington Regional Council's (GWRC) Biodiversity Strategy (2016)<sup>1</sup> sets a framework that guides how GWRC protects and manages biodiversity in the Wellington region to work towards the vision below.

### GWRC's vision for biodiversity

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

The Strategy provides a common focus across the council's departments and guides activities relating to biodiversity under this overarching vision, which is underpinned by four operating principles and three strategic goals. Goal One drives the delivery of the Key Native Ecosystem (KNE) programme.

### Goal One

Areas of high biodiversity value are protected or restored

The KNE programme is a non-regulatory voluntary programme that seeks to protect some of the best examples of original (pre-human) ecosystem types in the Wellington region by managing, reducing, or removing threats to their ecological values. Sites with the highest biodiversity values have been identified and prioritised for management. 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.

KNE sites can be located on private or publically owned land. However, land managed by the Department of Conservation (DOC) is generally excluded from this programme.

KNE sites are managed in accordance with three-year KNE plans, such as this one, prepared by the GWRC's Biodiversity department in collaboration with the landowners and other stakeholders. These plans outline the ecological values, threats, and management objectives for sites and describe operational activities such as ecological weed and pest animal control. KNE plans are reviewed regularly to ensure the activities undertaken to protect and restore the KNE site are informed by experience and improved knowledge about the site.

## **2. Belmont-Korokoro Key Native Ecosystem site**

The Belmont-Korokoro KNE site (1,039ha) is located in the southern end of the western Hutt hills between the suburbs of Horokiwi to the west and Korokoro and Maungaraki to the east. The site contains most of the catchment of the Korokoro Stream, which flows into Wellington Harbour, and a portion of the adjacent Belmont Stream catchment, which flows into the Hutt River. It is one of five KNE sites which make up a string of forest fragments along the western Hutt hills.

Belmont-Korokoro KNE contains the largest remaining stand of rimu-rātā/tawa-kohekohe forest in the south-west of the Wellington region<sup>2</sup> and a large surrounding area of regenerating native forest. Various levels of legal protection are in place on land within the KNE site: 201ha are legally protected as scenic reserve, 587ha as recreation reserve and 3ha as other local purpose reserve (Esplanade or Maori Significance). A further 200ha are held by Hutt City Council (HCC) for waterworks purposes. The remaining 48ha are not legally protected. Most of the KNE site is managed by GWRC as part of Belmont Regional Park (see Appendix 1, Map 1).

### **3. Landowners, management partners and stakeholders**

GWRC works in collaboration with landowners, management partners and stakeholders where appropriate to achieve shared objectives for the site. GWRC also recognizes that effective working relationships are critical for achieving the management objectives for each KNE site. In preparing this plan GWRC has sought input from landowners, management partners and relevant stakeholders, and will continue to involve them as the plan is implemented.

#### **3.1. Landowners**

The land ownership, tenure and protection status of the Belmont-Korokoro KNE site is complex (see Appendix 1, Map 2). The majority of the site (1,011ha) is managed by GWRC as part of Belmont Regional Park. This area includes land owned by HCC (410ha), Wellington City Council (109ha) and the Department of Conservation (32ha). Management of Belmont Regional Park as a whole is guided by the GWRC Parks Network Plan<sup>3</sup>, and the Belmont Regional Park Sustainable Land Use Plan<sup>4</sup>. 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 plans. The Biodiversity and Parks departments work collaboratively to efficiently deliver the activities in these plans.

A small area of land (5ha) within the KNE site but outside of Belmont Regional Park is owned and managed by Hutt City Council, and a further 15ha are privately owned by fourteen separate landowners which include the Office of Treaty Settlements. These landowners grant access to their properties for the purpose of carrying out activities described within this plan.

#### **3.2. Management partners**

The management partners of this plan are the Biodiversity, Parks, Biosecurity and Environmental Science departments of GWRC. The Biodiversity department is the overarching lead department for GWRC on the coordination of biodiversity management activities and advice within the KNE site. The Parks department funds and manages some ecological restoration work within the KNE site and manages all recreational infrastructure and access to the part of the site that falls within Belmont Regional Park. The Biosecurity department coordinates and carries out pest control activities and the Environmental Science department coordinates monitoring of mammalian pests within the KNE site.

#### **3.3. Stakeholders**

The Korokoro Environmental Group (KEG) is a local community interest group that advocates for the protection and restoration of natural areas in the Korokoro area, including within the KNE site. Their activities within the KNE site have primarily involved control of ecological weeds and planting native trees in the lower Korokoro Valley. Since June 2009, they have undertaken the field work for rodent, hedgehog and mustelid population monitoring in the Korokoro Valley. The group has also been active in advocating for better protection of Korokoro Valley, lobbying for greater funding and scope of biodiversity management activities within the KNE site (eg, promoting the

installation of fish passage devices at the Woollen Mill Dam on the Korokoro Stream) and keeping the local community better informed about local environmental issues.

The Lower Hutt branch of the Royal Forest and Bird Protection Society (F&B) has a strong interest in the KNE site, and has identified it as a key site in the development of bush corridors for bird dispersal across the Wellington region. Their interest in the ecological health of the Korokoro Stream initiated investigations into options to enhance fish passage at the Woollen Mill Dam.

The GWRC Flood Protection department owns a debris arrester structure situated at the lower end of Korokoro Stream. The structure captures debris flowing down the stream that could cause a blockage further downstream during heavy rainfall events. The Flood Protection department is responsible for managing the structure and for maintaining full channel capacity downstream to reduce the likelihood of flooding of State Highway 2, local roads and industrial premises.

Toviewadream Farming Ltd (TFL) holds a grazing licence on about 30ha of land on the northern boundary within the KNE site. However, retirement from grazing of parts or all of this area will be explored during the term of this plan. TFL is required to maintain fences to ensure stock are excluded from the native bush within the KNE site.

The Friends of Belmont Regional Park community group has advocated strongly for the protection of the KNE site and other areas of the park from development. Friends of Maara Roa are working to restore regenerating bush in the Cannons Creek catchment on the northern side of Belmont Regional Park and seeking to restore a bush clad corridor linking the Cannons Creek and Korokoro Stream catchments. Belmont Area Mountain Bike Association (BAMBA) are working with GWRC to develop mountain bike tracks that benefit from the natural environment of the forest within the KNE site.



## 4. 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.

### 4.1. Ecological designations

Table 1, below, lists ecological designations at all or part of the Belmont-Korokoro KNE site.

**Table 1: Designations at the Belmont-Korokoro KNE site**

Designation level	Type of designation
National	Parts of the Belmont-Korokoro KNE site are designated as Scenic Reserve Parts of the Belmont-Korokoro KNE site are designated as Recreation Reserve
Regional	Parts of the Belmont-Korokoro KNE site are scheduled under GWRC's proposed Natural Resources Plan (PNRP) <sup>5</sup> as Ecosystems and Habitats with Significant Indigenous Biodiversity Values as: <ul style="list-style-type: none"> <li>Rivers with significant indigenous ecosystems: the Korokoro Stream/Te Korokoro o Te Mana and all of its tributaries (Schedule F1)</li> </ul>
District	Part of the Belmont-Korokoro site is designated as Significant Natural Resource in HCC's District Plan: <ul style="list-style-type: none"> <li>Korokoro Stream Bush</li> </ul> Part of the Belmont-Korokoro site is designated as an Ecosite by the Department of Conservation: <ul style="list-style-type: none"> <li>Korokoro Stream Bush</li> </ul>
Other	Part of the Belmont-Korokoro KNE site is scheduled under GWRC's PNRP as: <ul style="list-style-type: none"> <li>Ngā Taonga Nui a Kiwa: Korokoro Stream/Te Korokoro o Te Mana (Schedule B).</li> </ul> Parts of the site are gazetted for Waterworks purposes

### 4.2. Ecological significance

The Belmont-Korokoro KNE site is considered to be regionally important 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
- 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 has good connectivity to other important areas of indigenous ecosystems, and it is large enough to support large resident populations of most species of native forest birds

## Representativeness

The Singers and Rogers (2014)<sup>6</sup> classification of pre-human vegetation indicates that the KNE site would have originally comprised predominantly a mix of kohekohe, tawa forest (MF6) and tawa, kāmahī, podocarp forest (MF7) ecosystems. There may have also been a very small component of kāmahī, broadleaved, podocarp forest (MF8) at higher altitude. Only 16% and 22% of the pre-human extent of the first two of these forest types respectively remain in the Wellington region making them regionally at risk ecosystem types<sup>7</sup>. The Belmont-Korokoro KNE site still contains an approximately 80ha area of forest which is highly representative of these forest types, which would have once been common in this part of the Wellington region.

Parts of the KNE site including the above area of forest are on land environments that are classified as At Risk under the LENZ Threatened Environment Classification<sup>8</sup>, having only 20-30% of their indigenous vegetation cover remaining nationally (see Appendix 1, Map 3).

## Rarity/distinctiveness

The KNE site supports three nationally threatened plant species, two threatened bird species, three threatened lizard species and six threatened freshwater fish species (see Appendix 2). Three plant species are considered regionally threatened (see Appendix 3).

## Diversity

The KNE site also contains a variety of habitat types incorporating areas of coastal, riverine and lowland forest habitats. Natural ecotones exist between these different types of habitat forming an uninterrupted ecological sequence from near sea level to 457m altitude at Belmont Trig supporting greater species diversity.

## Ecological context

The KNE site forms part of an important ecological corridor for native bird dispersal and breeding as it is well connected to other forested areas of similar habitat on the Wellington Harbour escarpment, in the western hills of the Hutt Valley, and in the Takapu Stream and Cannons Creek catchments to the north. The large size of the KNE site itself is considered enough to allow prolific breeding of indigenous forest bird species responsible for native seed dispersal and plant pollination<sup>9</sup>. This makes it an important area within the Wellington City-Porirua City and Hutt Valley area.

### 4.3. Ecological features

The Belmont-Korokoro KNE site lies within the Wellington Ecological District which is characterised by steep, strongly faulted hills and ranges, and windy, wet and mild climates<sup>10</sup>.

#### Habitats (vegetation)

The emergent canopy trees are rimu (*Dacrydium cupressinum*), miro (*Prumnopitys ferruginea*), kahikatea (*Dacrycarpus dacrydioides*), northern rātā (*Metrosideros robusta*) and pukatea (*Laurelia novae-zelandiae*). The dominant canopy trees are tawa

(*Beilschmedia tawa*), kohekohe (*Dysoxylum spectabile*), rewarewa (*Knightia excelsa*), hīnau (*Elaeocarpus dentatus*) and tītoki (*Alectryon excelsus*)<sup>11</sup>. Large areas of regenerating bush, together with advanced regeneration in gullies of the upper catchment, are acting as a buffer for the remnant of original forest as well as extending the area of native vegetation.

## Species

### Birds

Most of the native bird species that have survived naturally in the Wellington region are present, including bellbird (*Anthornis melanura*), tomtit (*Petroica macrocephala*) and whitehead (*Mohoua albigilla*)<sup>12</sup>. Red-crowned parakeets (kākāriki, *Cyanoramphus novaezelandiae*) have been observed nesting in the area since being re-introduced to Matiu/Somes Island<sup>13</sup>. New Zealand falcon (*Falco novaeseelandiae*) and kākā (*Nestor meridionalis*) have been recorded in the area and are potentially using the KNE site foraging or nesting<sup>14</sup>.

### Reptiles

Six species of lizards have been observed either within the KNE site or within a few hundred metres of its boundary<sup>15</sup>. These are barking gecko (*Naultinus punctatus*), ngahere gecko (*Mokopirirakau* 'southern North Island'), raukawa gecko (*Woodworthia maculata*), northern grass skink (*Oligosoma polychroma*), ornate skink (*O. ornatum*) and brown skink (*O. zelandicum*). Three of these are threatened species (see Appendix 2).

### Fish

The Korokoro Stream is recognised for its high native fish values. Nine species of native fish have been recorded in the Korokoro catchment: longfin eel (*Anguilla dieffenbachia*) and shortfin eel (*A. australis*), giant kōkopu (*Galaxias argenteus*), banded kōkopu (*Galaxias fasciatus*), kōaro (*Galaxias brevipinnis*), inanga (*Galaxias maculatus*), bluegill bully (*Gobiomorphus hubbsi*), redfin bully (*Gobiomorphus huttoni*) and common bully (*Gobiomorphus cotidianus*)<sup>16</sup>. Six of these are nationally threatened species (see Appendix 2).

## 5. 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.

### 5.1. Key threats

Ecological weeds, pest animals and human activities are all impacting or have the potential to impact the Belmont-Korokoro KNE site. The most significant threats come from a suite of ecological weed and pest animal species, grazing stock, barriers to fish passage in streams, and the adverse effects of land use.

Numerous climbing, ground cover and woody weed species are present and widespread across the KNE site and are entrenched in some areas. Species posing the most significant threat to the KNE site are tradescantia (*Tradescantia fluminensis*), African club moss (*Selaginella kraussiana*) and old man's beard (*Clematis vitalba*) which are displacing native flora and preventing natural forest regeneration. Other species are present such as Darwin's barberry (*Berberis darwinii*), barberry (*Berberis glaucocarpa*), cathedral bells (*Cobaea scandens*), ivy (*Hedra helix*) and Chilean rhubarb (*Gunnera tinctoria*). If left uncontrolled these species will grow in density and distribution and alter the forest structure.

A number of pest animal species are present in the KNE site. The species that present the greatest threat if uncontrolled are possums (*Trichosurus vulpecula*), rats (*Rattus* spp.), mustelids (stoats (*Mustela erminea*) and weasels (*M. nivalis*)), hedgehogs (*Erinaceus europaeus*) and goats (*Capra hircus*).

Stock-grazing both within and beyond the boundary of the KNE site may cause elevated levels of sediment run-off into streams, adversely impacting the stream ecology within the KNE site by reducing water clarity and altering substrate composition. Grazing also prevents the regeneration of native forest in these areas.

Two significant structures within the Korokoro Stream severely restrict or totally prevent the movement of native fish upstream, preventing the completion of life-cycles and restricting the quantity of potential habitat available to native fish. The spillway of the lower dam (known as the Woollen Mills Dam), was undermined and destabilised during flooding in 2015, creating an even more significant barrier to fish passage. As a result, it is unlikely that any fish species can currently negotiate the dam in the up-stream direction. The locations of these structures in the lower reaches of the Korokoro stream means that a very large proportion of the catchment is inaccessible for most fish species.

The KNE site is actively managed for recreation which presents threats as a result of both the development of recreational opportunities, such as track construction, and actual recreational use. Some past track construction has caused disturbance and loss to plant communities and sedimentation of streams, while some recreational activities have the potential to introduce and spread ecological weeds. All operational activities at the site also have the potential to introduce and spread ecological weeds.

While the key threats discussed in this section are recognised as the most significant, a number of other threats to the KNE site's values have also been identified. Table 2 presents a summary of all known threats to the Belmont-Korokoro KNE site (including those discussed above), detailing which operational areas they affect, how each threat impacts on ecological values, and whether they will be addressed by management activities.

The codes alongside each threat correspond to activities listed in the operational plan (Table 3), and are used to ensure that actions taken are targeted to specific threats. A map of operational areas can be found in Appendix 1 (see Map 4).

**Table 2: Summary of all threats to ecological values present at the Belmont-Korokoro 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 weed species for control include tradescantia ( <i>Tradescantia fluminensis</i> ), African club moss ( <i>Selaginella kraussiana</i> ), Chilean rhubarb ( <i>Gunnera tinctoria</i> ) and periwinkle ( <i>Vinca major</i> ) (see full list in Appendix 4)	Entire KNE site
EW-2	Woody weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species include Darwin's barberry ( <i>Berberis darwinii</i> ), barberry ( <i>Berberis glaucocarpa</i> ) and wild cherry ( <i>Prunus</i> spp.) (see full list in Appendix 4)	Entire KNE site
EW-3	Climbing weeds smother and displace native vegetation often causing canopy collapse, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species include old man's beard ( <i>Clematis vitalba</i> ), cathedral bells ( <i>Cobaea scandens</i> ), ivy ( <i>Hedra helix</i> ), and Japanese honeysuckle ( <i>Lonicera japonica</i> ) (see full list in Appendix 4)	Entire KNE site
EW-4*	The aquatic weed <i>Lagarosiphon major</i> out-competes native aquatic species and chokes watercourses	Korokoro Stream, downstream of lake behind the Korokoro Dam
Pest animals		
PA-1*	House mice ( <i>Mus musculus</i> ) 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 <sup>17,18</sup>	Entire KNE site
PA-2	Rats ( <i>Rattus</i> 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 <sup>19,20</sup>	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-3	Possoms ( <i>Trichosurus vulpecula</i> ) browse palatable canopy vegetation until it can no longer recover <sup>21,22</sup> . This destroys the forest's structure, diversity and function. Possoms may also prey on native birds <sup>23</sup> and invertebrates	Entire KNE site
PA-4	Mustelids (stoats <sup>24,25</sup> ( <i>Mustela erminea</i> ), ferrets <sup>26,27</sup> ( <i>M. furo</i> ) and weasels <sup>28,29</sup> ( <i>M. nivalis</i> )) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions	Entire KNE site
PA-5	Hedgehogs ( <i>Erinaceus europaeus</i> ) prey on native invertebrates <sup>30</sup> , lizards <sup>31</sup> and the eggs <sup>32</sup> and chicks of ground-nesting birds <sup>33</sup>	Entire KNE site
PA-6*	Feral and domestic cats ( <i>Felis catus</i> ) prey on native birds <sup>34</sup> , lizards <sup>35</sup> and invertebrates <sup>36</sup> , reducing native fauna breeding success and potentially causing local extinctions <sup>37</sup>	Entire KNE site
PA-7*	Rabbits ( <i>Oryctolagus cuniculus</i> ) and hares ( <i>Lepus europaeus</i> ) graze on palatable native vegetation and prevent natural regeneration in some environments <sup>38</sup>	Recently retired grasslands and forest margins
PA-8*	Wasps ( <i>Vespula</i> spp.) adversely impact native invertebrates and birds through predation and competition for food resources. They also affect nutrient cycles in beech forests <sup>39</sup>	Entire KNE site
PA-9	Goats ( <i>Capra hircus</i> ) browsing affects the composition and biomass of native vegetation in the understory tiers of forest habitats, preventing regeneration of the most palatable understory species and reducing species diversity <sup>40</sup>	Entire KNE site
PA-10*	Brown trout ( <i>Salmo trutta</i> ) and rainbow trout ( <i>Oncorhynchus mykiss</i> ) prey on native fish and compete with them for food resources <sup>41</sup>	Streams
PA-11*	Eastern rosella parakeets ( <i>Platycercus eximius</i> ) 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 <sup>42,43</sup>	Entire KNE site
Human activities		
HA-1	Garden waste dumping often leads to ecological weed invasions into natural areas. Common weed species introduced at this KNE site include hydrangea ( <i>Hydrangea macrophylla</i> ) and plectranthus ( <i>Plectranthus</i> spp.)	Residential boundaries of KNE site
HA-2*	Recreational use such as tramping, mountain biking and horse riding can cause damage and disturbance to the native ecosystem. It is also likely to disturb native fauna and introduce ecological weeds	Entire KNE site
HA-3	Management activities such as track development, pest control and ecological monitoring can damage and destroy vegetation, and cause the accidental introduction of weed species through the carriage of seeds and plant fragments on machinery, equipment and clothing	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
HA-4	Barriers to native fish passage present in Korokoro Stream within the KNE site are preventing native fish from accessing all potential habitat and completing their life-cycle	Two dams located in the lower half of the catchment
HA-5*	Plantation forestry on adjoining land parcels to the KNE site have the potential to cause habitat loss or degradation, disturb native wildlife and increase sediment load in watercourses via surface run-off during harvesting operations	Adjacent plantations on the western and eastern boundaries
HA-6*	Grazing livestock can result in pugging soils, increasing nutrient content of soils and watercourses and grazing native vegetation inhibiting regeneration <sup>44</sup>	Adjacent farm land at top of KNE site
HA-7*	Poor water quality affects a range of species in the stream. Sedimentation of the stream is often caused by upstream land management such as development, forestry and agricultural practices, and road run-off	All adjacent land

\*Threats marked with an asterisk are not addressed by actions in the operational plan.

## 6. Management objectives

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

The following objectives will guide the management activities at the Belmont-Korokoro KNE site.

- 1. To improve the structure\* and function† of native plant communities**
- 2. To improve the habitat for native birds**
- 3. To improve the habitat for native freshwater fish**
- 4. To raise community awareness of the ecological values of the KNE site**
- 5. To engage the community in management of the KNE site**

\* The living and non-living physical features of an ecosystem. This includes the size, shape, complexity, condition and the diversity of species and habitats within the ecosystem.

† The biological processes that occur in an ecosystem. This includes seed dispersal, natural regeneration and the provision of food and habitat for animals.



## 7. Management activities

Management activities are targeted to work towards the objectives above (Section 6) by responding to the threats outlined in Section 5. The broad approach to management activities is described briefly below, and specific actions, with budget figures attached, are set out in the operational plan (Table 3).

It is important to note that not all threats identified in Section 5 can be adequately addressed. This is due to financial restrictions.

### 7.1. Ecological weed control

The aim of ecological weed control at the KNE site is to minimise the impact of ecological weeds on the integrity, vitality and regeneration of the native plant communities present.

Ecological weeds in the mid and lower Korokoro catchment were surveyed and mapped in 2001. Data from this survey was used to develop a pest plant control plan<sup>45</sup> which was implemented in 2005. Further surveys carried out in 2009 and 2013 updated the earlier data and extended knowledge to the whole KNE site (see Appendix 1, Map 6). Data from these surveys has been used to develop a focused and effective control regime targeting the most invasive and high impact weed species present in areas of highest ecological value. As a result, weed control will primarily focus on operational area A (see Appendix 1, Map 4) targeting the weed species listed in Appendix 4.

Due to its size and steep topography, controlling weeds within all of operational area A is considered unfeasible. Therefore, control operations will target easily accessible weed infestations and mature specimens producing large amounts of seed, which have been identified during previous control operations and through field survey data. Operational staff will use view-points, and potentially helicopter searches, to identify further infestations of target weeds during seasonal flowering periods.

In addition, targeted control of tradescantia and African club moss will also be undertaken within operational areas A and B. Initially this will involve only controlling patches of these species that are isolated from the large entrenched infestations that are located along stream banks and walking tracks. Once the isolated infestations have been controlled, then progressive control of the large infestations, working from the top of the catchment down, will be carried out.

Bridle trails will be monitored for new weed incursions in the course of carrying out other ecological weed control work. It is possible that horses being ridden in the KNE site could introduce new or spread existing weeds through the carriage of seeds in their hooves and droppings.

The GWRC Parks department has been managing an area of the KNE site where a pine plantation was harvested to allow it to naturally regenerate back to native forest (operational area C; see Appendix 1, Map 4). The Parks department will continue to carry out control of ecological weeds that may inhibit native regrowth in this area. Weed control carried out in 2015 and 2016 focussed on gorse and wilding pines. An assessment of the work and follow up control will be carried out in 2016/17, and assessments of the need for further work will be carried out in future years.

## **7.2. Pest animal control**

The aim of pest animal control is to increase native plant abundance, diversity and regeneration through the control of mammalian browsers, and to protect populations of native birds, lizards and invertebrates from mammalian predators.

Possoms and rats will continue to be kept at low levels in the middle and lower parts of the KNE site, (operational area A; see Appendix 1, Map 4) through a combination of poisoning and trapping. Possoms are trapped within the more remote parts of this area and poisoned using bait stations in the more accessible parts, while rats are poisoned using bait stations throughout the area. A small number of bait stations on private properties outside the southern KNE boundary are used as a buffer against migrating possoms in this very linear part of the site.

OSPRI (formerly the Animal Health Board) undertook a targeted possum control operation within operational areas B and C of the KNE site in 2015 (see Appendix 1, Map 4) as part of their TB-Free New Zealand programme. This control operation reduced the possum population to very low levels (below 2% residual trap catch (RTC)) however, given it is likely that possum numbers will increase again over time, OSPRI may carry out further possum control operations to achieve their bovine TB eradication targets.

Targeted control of hedgehogs will be implemented during the first year of this plan as monitoring has shown that there is a large hedgehog population present in the KNE site (at least 33% tracking tunnel index (TTI) between November 2011 and May 2014<sup>46</sup>) and it is therefore likely that populations of invertebrates and lizards are being impacted by hedgehog predation. The GWRC Biosecurity department will install traps at 100m intervals along the walking track network within operational area A, and members of KEG will check and re-bait the traps at regular intervals. It is likely that these traps will also control stoats and weasels to a greater extent than secondary poisoning (ie, animals dying as a result of preying on poisoned rats or mice, or scavenging the carcasses of poisoned possoms) is already achieving. Available resources don't allow hedgehog, mustelid or rat control to be carried out across the whole site so these activities are being concentrated on the area of the KNE site that contains the greatest biodiversity values (operational area A).

Goat numbers are extremely low as a result of annual culling carried out by ground hunters since 2001, and very few goats have been found in the KNE since August 2011. Goats will continue to be kept to low numbers by carrying out checks of radio-collared Judas goats and culls of goats. Goat culling operations will be carried out in 2016/17 and 2017/18. It is hoped that goat culling will need to be undertaken only every two years thereafter.

## **7.3. Pest animal monitoring**

GWRC's Biodiversity department funds small mammal monitoring to indicate the effectiveness of the pest animal control network in the KNE site. This work is coordinated by the Environmental Science department in close collaboration with KEG volunteers. Tracking tunnels are used to monitor the presence and abundance of small mammal populations that are a threat to the biodiversity values of the KNE site, primarily mice, rats, hedgehogs and mustelids. Mice/rat monitoring is completed every

three months, and hedgehog/mustelid monitoring is completed every spring and summer.

Possum population monitoring was carried out in operational area A in 2010 which provided a result of 0% RTC (residual trap catch). This was well below the target of 5%, showing that the control regime at that time was effective. Since then the means of controlling possums throughout much of operational area A has been changed to be reliant on trapping rather than poisoning. This change was made to reduce the effort and time that was required for re-filling remote bait stations with bait. Further possum population monitoring will be carried out in 2018/19 to assess how effective the current control regime is.

#### 7.4. Revegetation

The aim of current revegetation work is two-fold; firstly to rehabilitate areas of the Korokoro Stream valley that were damaged as a result of severe flooding in 2015, and secondly to make up for the loss of native vegetation that has occurred during the re-development of walking tracks within the KNE site.

The GWRC Parks department will carry out plantings in degraded areas of stream terrace in the lower part of the Korokoro Stream valley. Appendix 1, Map 7 shows the area to be planted and Appendix 5 provides a list of appropriate plants for revegetation at the site. All plants will be eco-sourced from the Wellington Ecological District. Below is a summary of the revegetation work that will be undertaken in the Belmont-Korokoro KNE site during the term of this plan.

**Table 3: Summary of revegetation planting at the Belmont-Korokoro KNE site**

Timing	Total number of plants	Management requirements
Winter 2016	350	Post planting releasing
Winter 2017	500	Post planting releasing

Many sections of the stream corridor are currently vegetated with exotic grasses and some weeds, and would benefit from the planting of native trees, shrubs and sedges if funding and capacity to do so becomes available in the future.

#### 7.5. Community engagement

The purpose of community engagement is to raise awareness of the KNE site's ecological values and involve the community in management activities to protect those values. An effort will be made to raise awareness of the KNE site and raise the level of active involvement in its management by the local community by utilizing local media when opportunities arise.

Korokoro Environmental Group (KEG) has been a major contributor to biodiversity management in the KNE site through the planting, pest monitoring and advocacy that members of the group have carried out. GWRC will continue to support the group in the continuation of its current projects as well as the development of appropriate new initiatives that the group may propose. This could include supporting KEG in seeking new project funding opportunities, should they wish to do so.

## **7.6. Other activities**

### **Environmental care**

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

Biosecurity guidelines for checking and removing seeds and plant fragments from vehicles, equipment and clothing<sup>47</sup> will be used by all management staff when entering and working in the KNE.

### **Fish passage restoration**

The spillway of the Woollen Mills dam will be extended into the bed of the stream below the dam and then spat ropes will be attached to it to assist some of the stronger swimming native fish species to negotiate the dam. This work will be undertaken by the GWRC Parks department during the period of the KNE plan in conjunction with a larger project to stabilize the dam.

### **Grazing retirement**

GWRC's Parks department will explore the retirement from grazing of about 30ha of farmland near the northern boundary of the KNE site. This area of farmland, which is bisected by a well-used recreational route (Old Coach Road), is almost surrounded by gullies containing regenerating scrub. Retirement of some or all of this area would allow the head of the gullies to regenerate complete montane vegetation cover. The removal of stock would also benefit stream health and enhance recreational experiences.

## 8. Operational plan

The operational plan shows the actions planned to achieve the stated objectives for the Belmont-Korokoro KNE site, and their timing and cost over the three-year period from 1 July 2016 to 30 June 2019. The budget for the 2017/18 and 2018/19 years are indicative only and subject to change. A map of operational areas can be found in Appendix 1 (see Map 4).

**Table 4: Three-year operational plan for the Belmont-Korokoro KNE site**

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2016/17	2017/18	2018/19
1	EW-1, EW-2, EW-3, HA-1	Ecological weed control	A	GWRC Biosecurity department	Check all locations of previously controlled ecological weed infestations and control all remaining target ecological weeds present	All plants are controlled prior to seeding	\$7,000	\$7,000	\$7,000
1	EW-1, EW-2, EW-3, HA-1	Ecological weed control	A	GWRC Biosecurity department	Search for and control infestations of ecological weed species listed in Appendix 4. Search from tracks, routes and view-points, utilise seasonal flowering periods, and use helicopters when deemed efficient	Reduction in the density of ecological weeds	\$7,500	\$7,500	\$7,500
1	EW-1	Ecological weed control	A, B	GWRC Biosecurity department	Control isolated infestations of tradescantia and African club moss, then as resources allow control main infestations working from the top of the catchment down	Reduction in the density of ecological weeds	\$3,000	\$3,000	\$3,000
1	EW-2, EW-3	Ecological weed control	C	GWRC Parks department	Control ecological weeds in the area where the pine plantation was harvested	Minimal colonisation of ecological weeds	\$4,000+	\$3,000+	nil
1, 2, 3, 4	PA-2, PA-3	Pest animal control	A	GWRC Biosecurity department	Control possums and rats through three monthly bait station and trap servicing	Possums <5% RTC* Rats <10% TTI+	\$34,000	\$34,000	\$34,000

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2016/17	2017/18	2018/19
2, 3, 4	PA-4, PA-5	Pest animal control	A	GWRC Biosecurity department	Install DOC200 traps alongside walking tracks for hedgehog and mustelid control; 25 in year 1, 20 in year 2, and 35 in year 3	Traps installed	\$3,400	\$3,000	\$4,600
2, 3, 4	PA-4, PA-5	Pest animal control	A	KEG volunteers with training and guidance from GWRC Biosecurity and Biodiversity departments	Control hedgehogs and mustelids through regular trap servicing (two monthly from October to April each year)	Reduction in hedgehog populations as a result of trapping	\$400	\$400	\$400
1	PA-9	Pest animal control	A, B	GWRC Biosecurity department	Control goats by ground hunting	All goats apart from operational Judas goats are controlled	\$1,200	\$1,600	Nil
1, 2, 4	PA-3	Pest animal monitoring	A	GWRC Environmental Science department	Carry out possum population monitoring to assess effectiveness of control	Monitoring completed and reported	Nil	Nil	\$6,200
1, 2, 3, 4	PA-2, PA-4, PA-5	Pest animal monitoring	A	GWRC Environmental Science department with KEG volunteers	Carry out small mammal (rat, hedgehog and mustelid) population monitoring to assess effectiveness of control. Rat monitoring completed every three months, and hedgehog/mustelid monitoring completed every spring and summer.	Each monitoring event completed and reported	\$10,000	\$10,000	\$10,000
1, 2, 3, 4, 5	EW-1, EW-2, EW-3	Revegetation	Planting areas indicated in map 7	GWRC Parks department	Plant degraded areas of stream terrace in the lower part of the Korokoro Stream valley	The extent of native vegetation is increased	\$1,700+	\$2,400+	Nil

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2016/17	2017/18	2018/19
5	HA-4	Fish passage restoration	Woollen Mills Dam	GWRC Parks department	Extend the dam spillway into the bed of the stream below the dam and install spat ropes on the spillway in conjunction with dam stabilisation work	Works completed	++	++	Nil
1	HA-3	Environmental care	Entire KNE site	GWRC Parks, Biodiversity, Biosecurity & Environmental Science departments	Ensure pest plant biosecurity guidelines are adhered to while carrying out all management activities	Guidelines adhered to in all cases	Nil	Nil	Nil
1,2,3,4,5	HA-4	Environmental care	Entire KNE site	GWRC Parks department	Adhere to environmental impact assessment procedures when carrying out construction and maintenance of assets, and allowing use by others	Procedures adhered to in all cases	Nil	Nil	Nil
1,2,3	HA-6	Grazing retirement	Farmland adjacent to Old Coach Road	GWRC Parks department	Explore the retirement of parts or all of the grazed area within the KNE site	Options for retirement are investigated	+++	+++	+++
6,7		Community engagement	Entire KNE site	GWRC Parks and Biodiversity departments	Incorporate biodiversity information into community events and media	Increased community awareness of the values of the KNE site	Nil	Nil	Nil
<b>Total</b>							<b>\$72,200</b>	<b>\$71,900</b>	<b>\$72,700</b>

\*RTC = Residual Trap Catch.

\*\*TTI = Tracking Tunnel Index.

† = Funded by GWRC's Parks department.

†† = The cost of this activity is incorporated in the cost of the larger dam stabilisation project which will be funded by GWRC Parks department.

††† = The cost and timing of any retirement actions are not known at this time. Retirement actions would be funded by GWRC Parks department.

## 9. Funding contributions

### 9.1. Budget allocated by GWRC

The budget for the 2017/18 and 2018/19 years are indicative only and subject to change.

**Table 5: GWRC allocated budget for the Belmont-Korokoro KNE site**

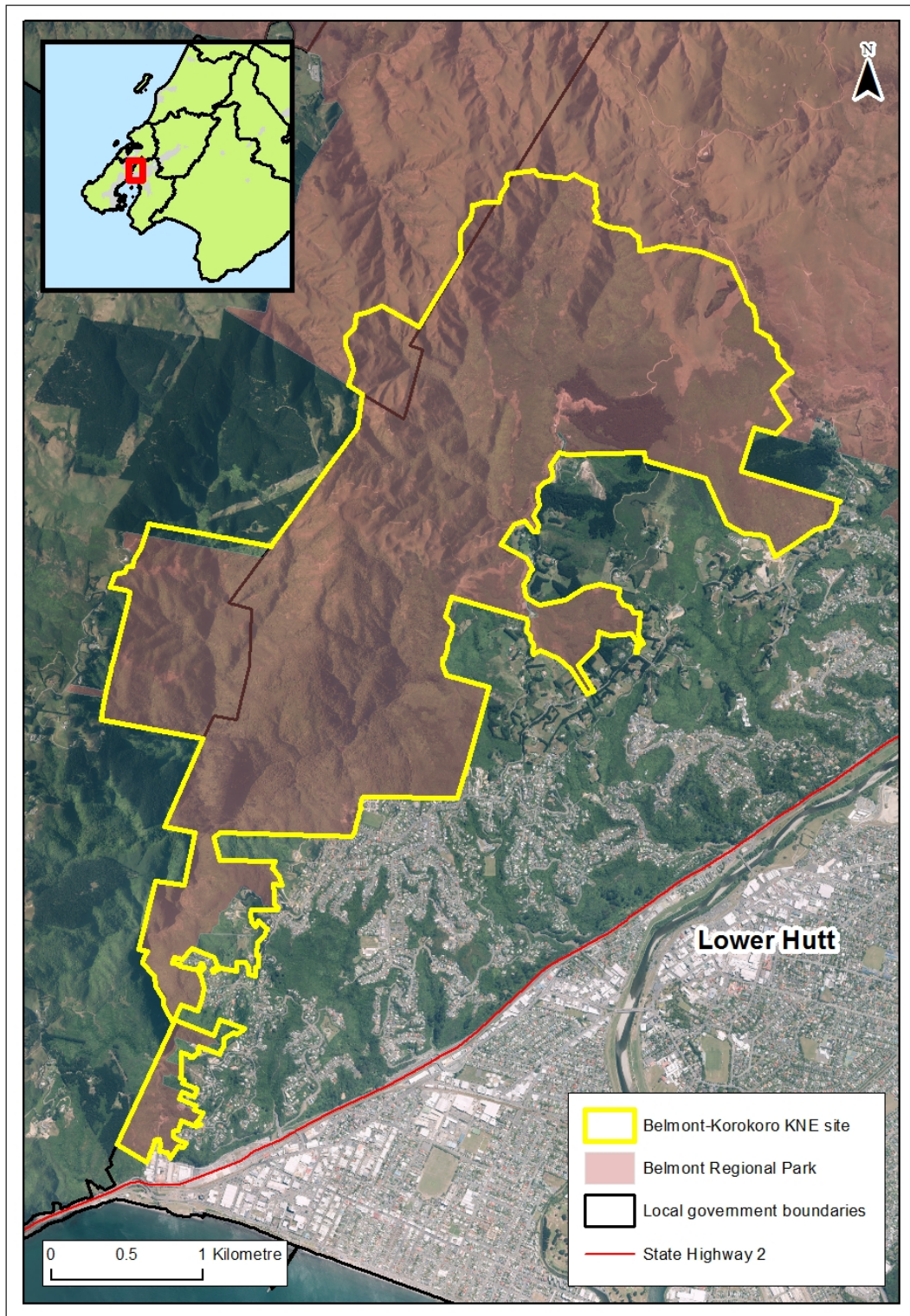
Management activity	Timetable and resourcing		
	2016/17	2017/18	2018/19
Ecological weed control	\$21,500	\$20,500	\$17,500
Pest animal control	\$39,000	\$39,000	\$39,000
Monitoring	\$10,000	\$10,000	\$16,200
Revegetation	\$1,700	\$2,400	Nil
Fish passage restoration	††	††	††
Grazing retirement	†††	†††	†††
<b>Total</b>	<b>\$72,200</b>	<b>\$71,900</b>	<b>\$72,700</b>

†† = The cost of this activity is incorporated in the cost of the larger dam stabilisation project which will be funded by GWRC Parks department.

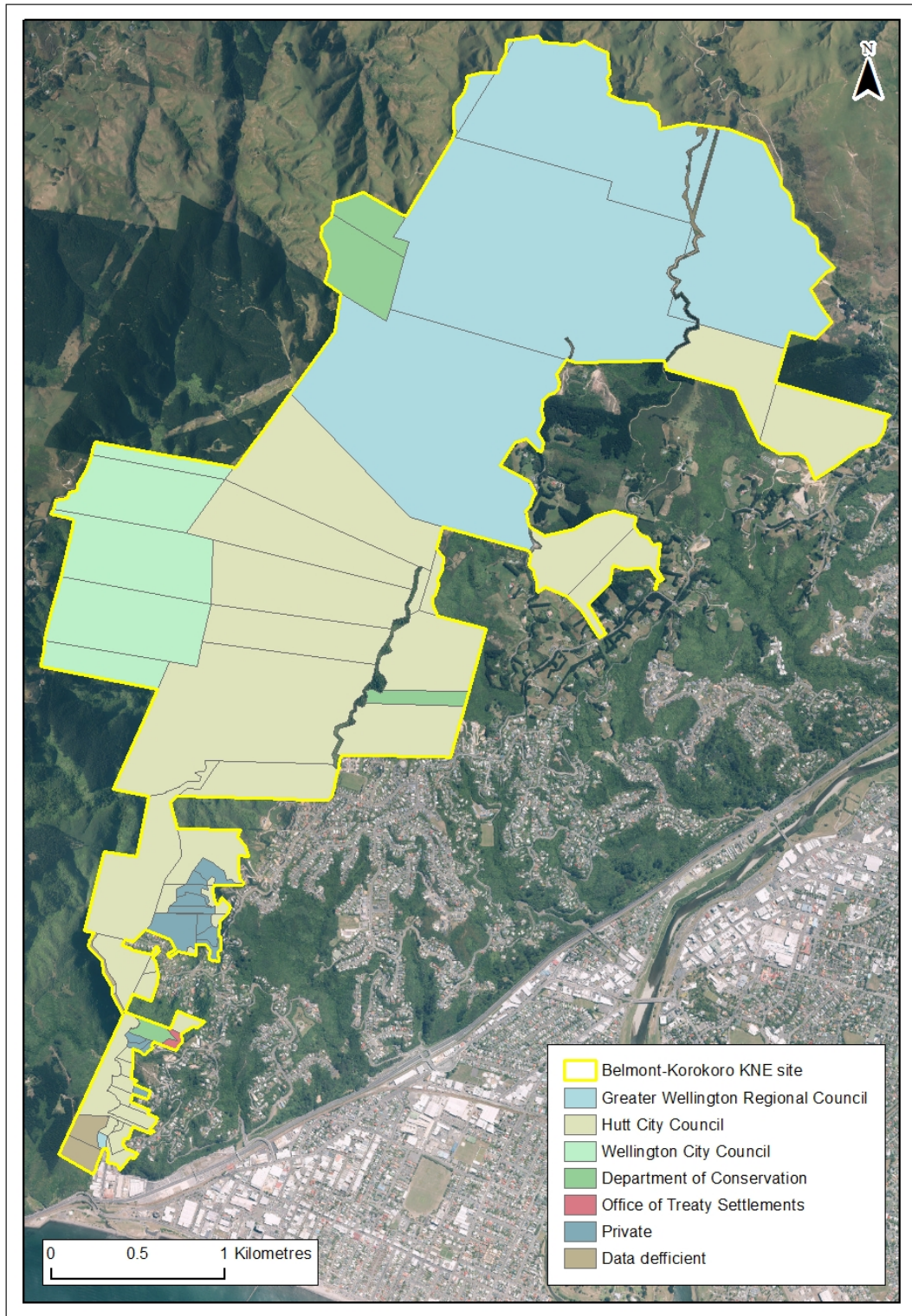
††† = The cost and timing of any retirement actions are not known at this time. Retirement actions would be funded by GWRC Parks department.



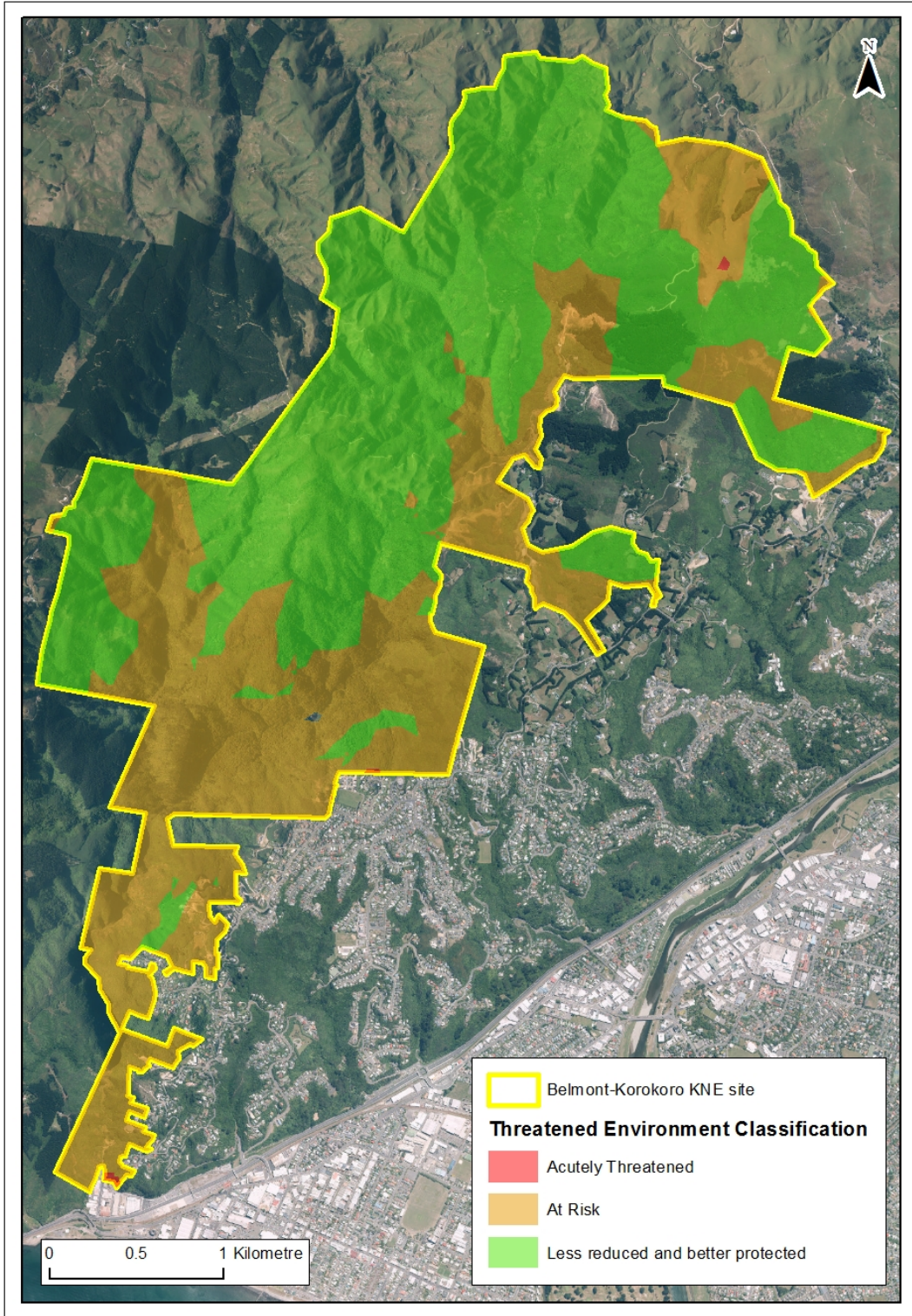
## Appendix 1: Site maps



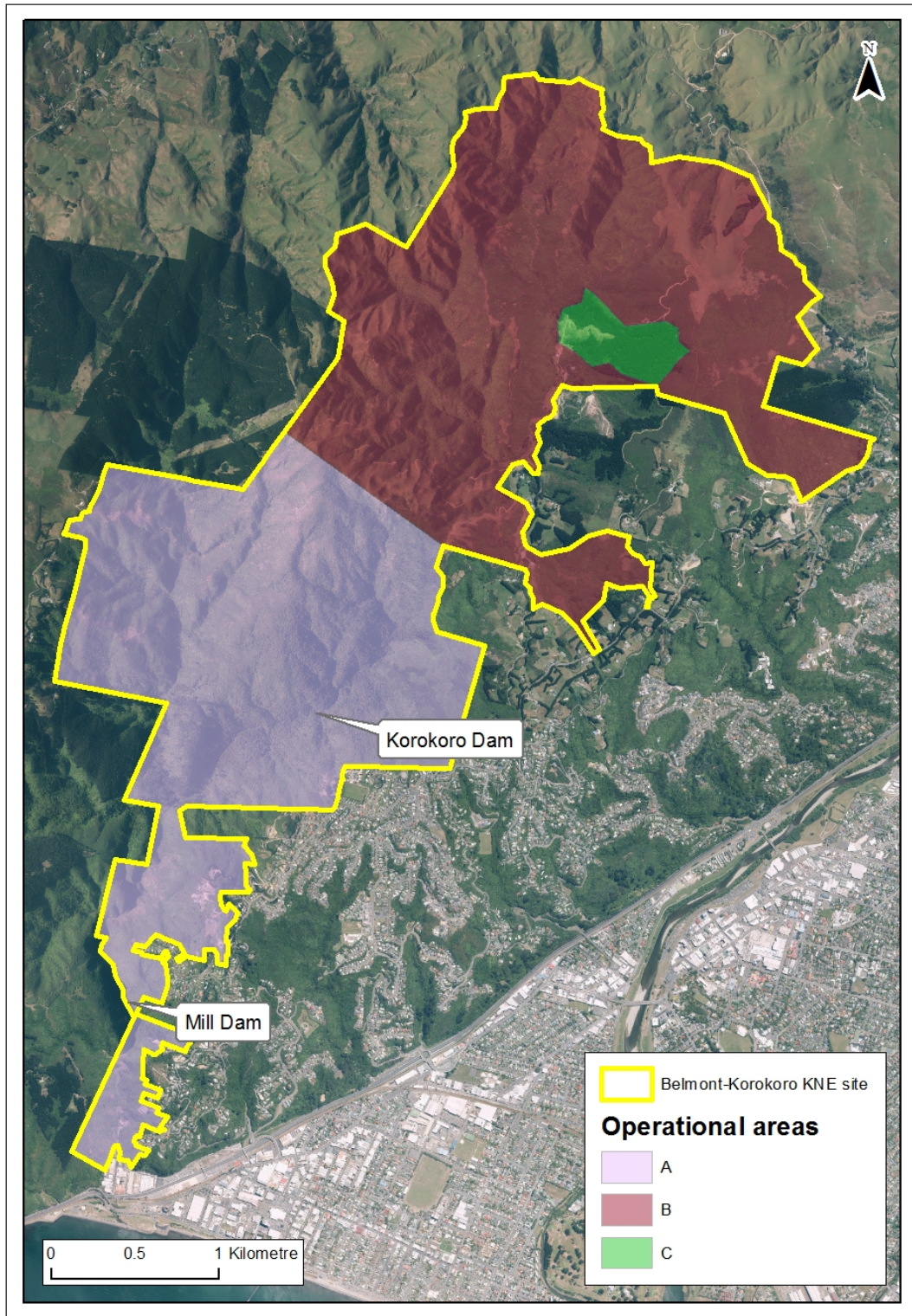
Map 1: The Belmont-Korokoro KNE site and Belmont Regional Park boundaries



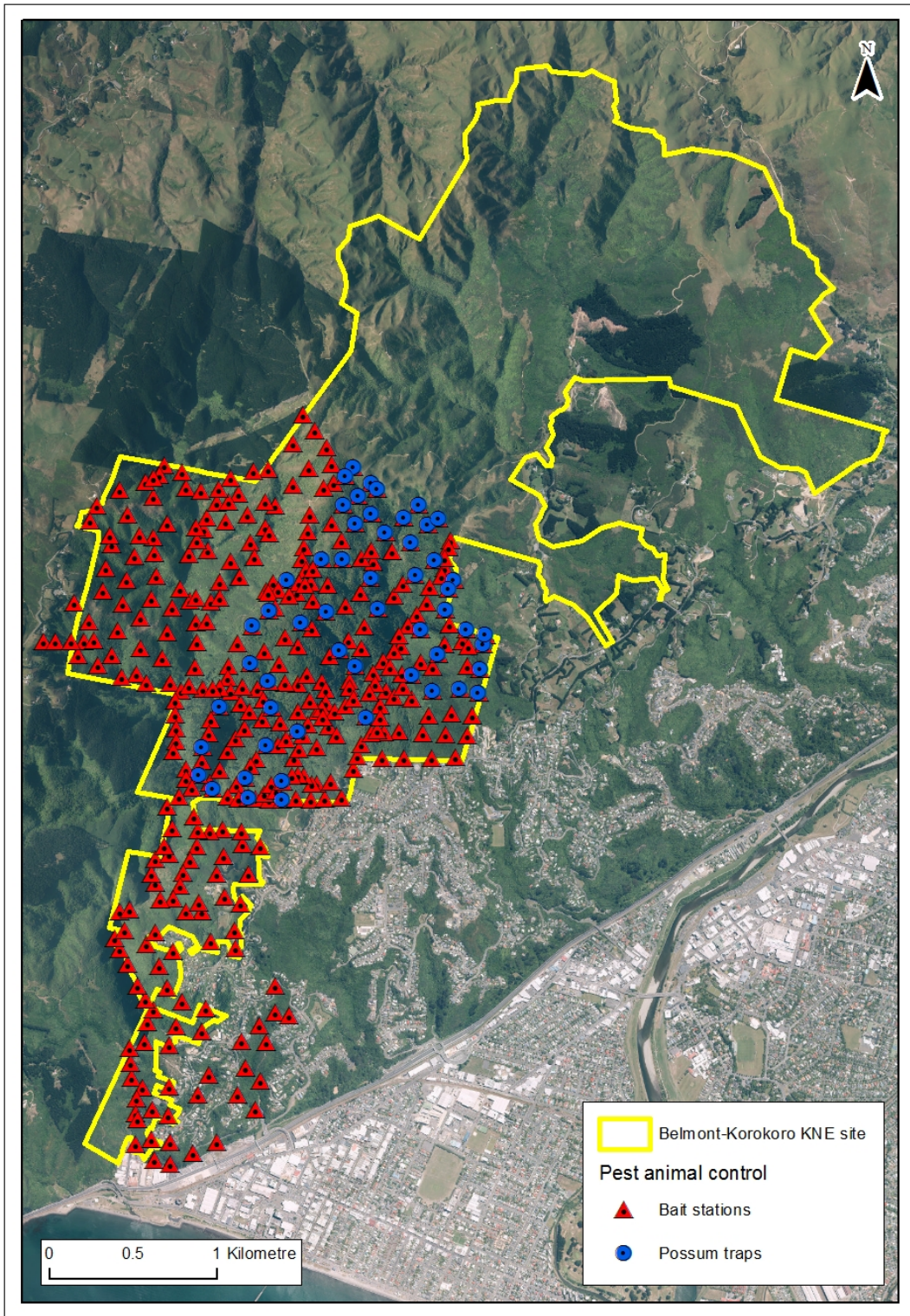
Map 2: Owners of land within the Belmont-Korokoro KNE site



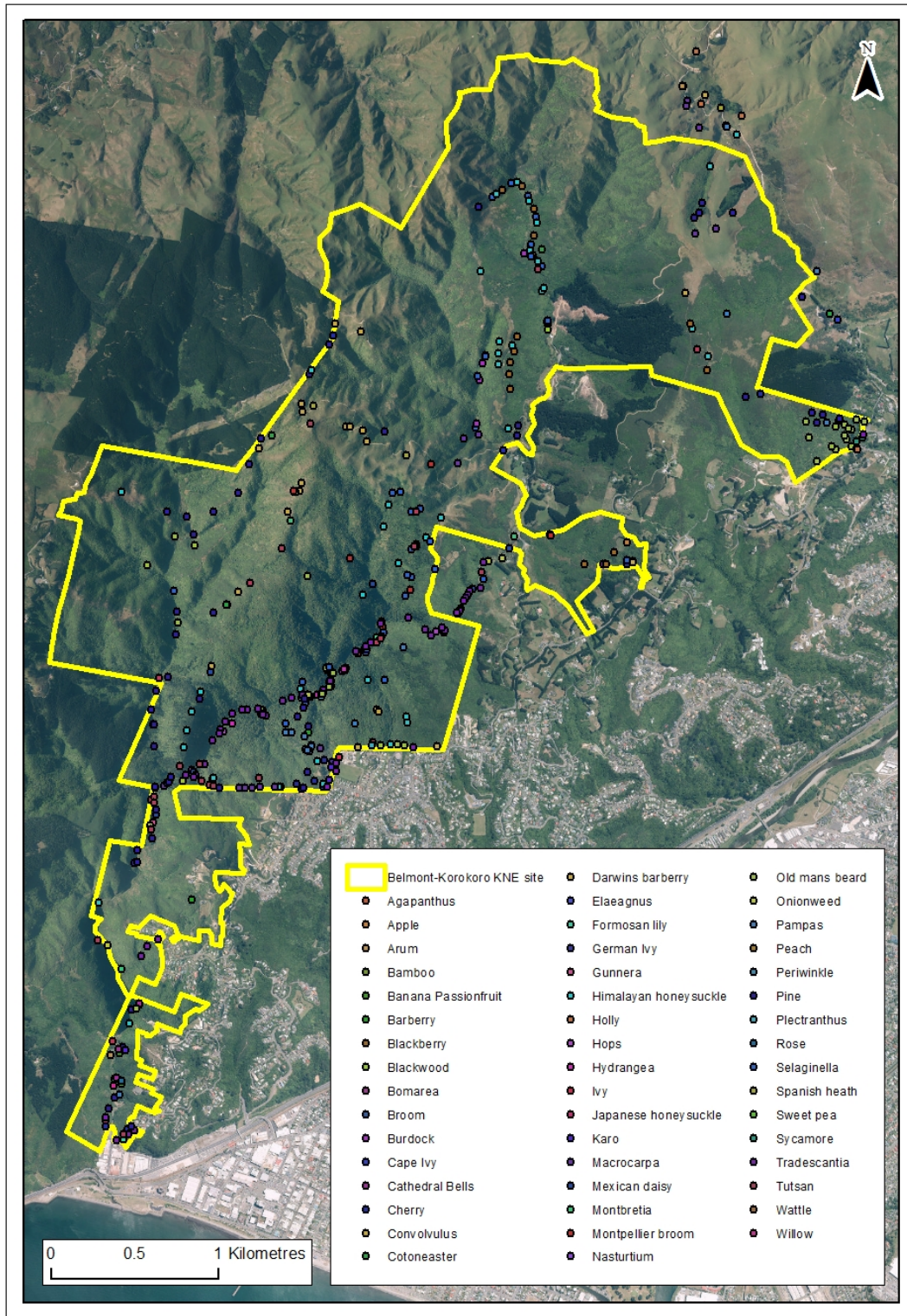
Map 3: Land Environment New Zealand threat classifications for the Belmont-Korokoro KNE site



Map 4: Operational areas in the Belmont-Korokoro KNE site

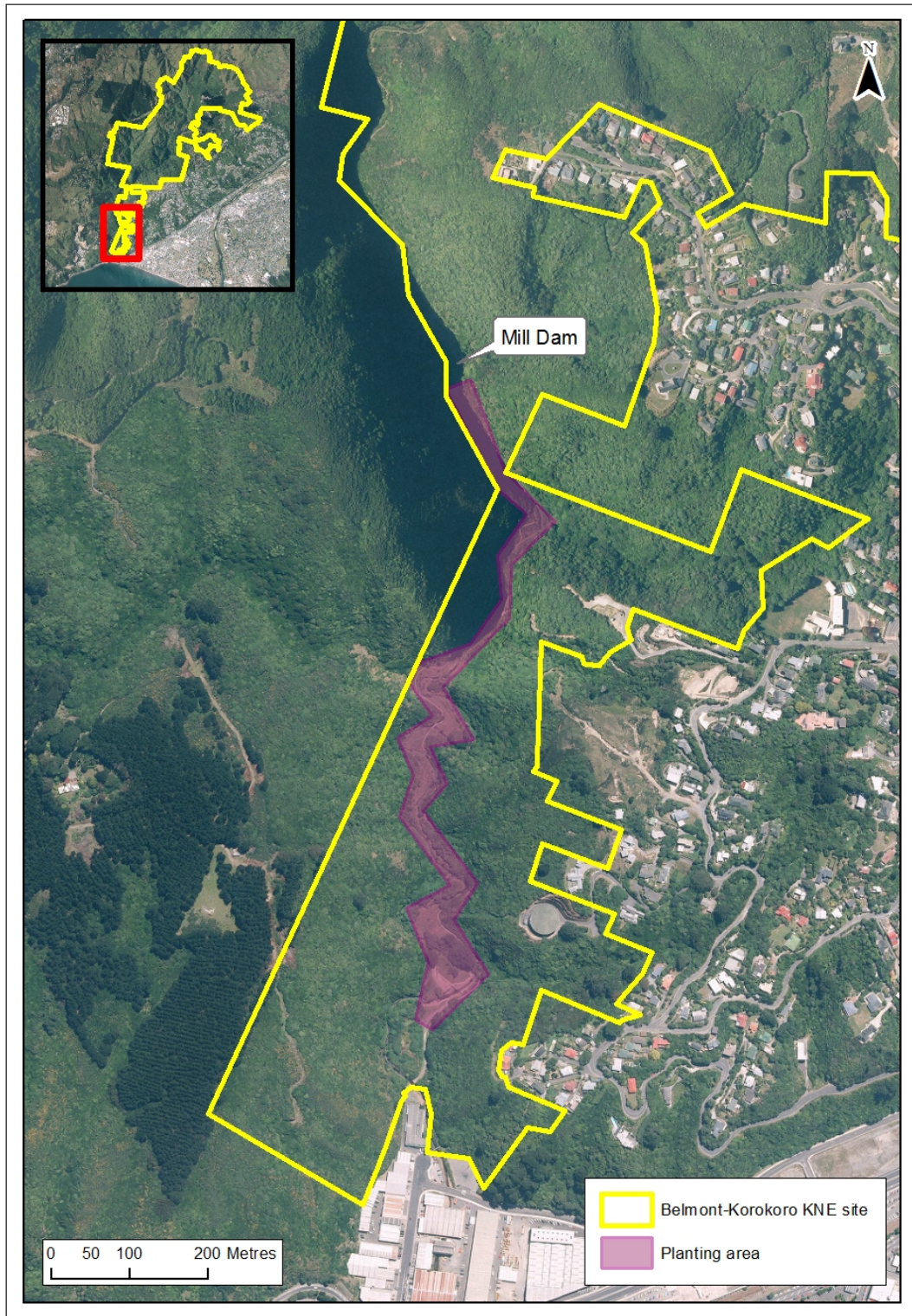


Map 5: Pest animal control in the Belmont-Korokoro KNE site



**Map 6: Ecological weeds in the Belmont-Korokoro KNE site**

This map was created using data collected during an ecological weed survey undertaken in 2013, and provides an indication of the diversity and distribution of ecological weeds at the KNE site. Appendix 4 lists those species that will be controlled during the term of this plan.



Map 7: Revegetation areas in the Belmont-Korokoro 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 three-year cycle<sup>48</sup>, with the exception of birds which are assessed on a five-year cycle<sup>49</sup>. 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 Belmont-Korokoro KNE site.

**Table 7: Threatened and At Risk species at the Belmont-Korokoro KNE site**

Scientific name	Common name	Threat status	Observation
Plants(vascular) <sup>50</sup>			
<i>Brachyglottis kirkii</i> var. <i>kirkii</i>	Kirk's tree daisy	At Risk - Declining	Pat Enright, pers comm 2014
<i>Trichomanes colensoi</i>	Bristle fern	At Risk - Naturally Uncommon	Pat Enright, pers comm 2014
<i>Pterostylis foliata</i>		At Risk - Naturally Uncommon	Pat Enright, pers comm 2014
Birds <sup>51</sup>			
<i>Cyanoramphus novaeseelandiae</i>	Red-crowned parakeet /kākāriki	At Risk - Relict	<a href="http://ebird.org/content/newzealand/">http://ebird.org/content/newzealand/</a> (accessed 22/01/2014)
<i>Falco novaeseelandiae</i>	New Zealand falcon	Threatened - Nationally Vulnerable	<a href="http://ebird.org/content/newzealand/">http://ebird.org/content/newzealand/</a> (accessed 22/01/2014)
Reptiles <sup>52</sup>			
<i>Naultinus punctatus</i>	Barking gecko	At Risk - Declining	GWRC 2010 <sup>53</sup>
<i>Oligosoma ornatum</i>	Ornate skink	At Risk - Declining	GWRC 2010
<i>Oligosoma zelandicum</i>	Brown skink	At Risk - Declining	GWRC 2010
Freshwater fish <sup>54</sup>			
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk - Declining	GWRC 2007 <sup>55</sup>
<i>Galaxias argenteus</i>	Giant kōkopu	At Risk - Declining	GWRC 2007
<i>Galaxias brevipinnis</i>	Kōaro	At Risk - Declining	GWRC 2007
<i>Galaxias maculatus</i>	Inanga	At Risk - Declining	GWRC 2007
<i>Gobiomorphus hubbsi</i>	Bluegill bully	At Risk - Declining	GWRC 2007
<i>Gobiomorphus huttoni</i>	Redfin bully	At Risk - Declining	GWRC 2007



### Appendix 3: Regionally threatened plant species list

The following table lists regionally threatened species that have been recorded in the Belmont-Korokoro KNE site. Native plant species have been identified in the Plant Conservation Strategy, Wellington Conservancy 2004-2010<sup>56</sup>.

**Table 8: Regionally threatened plant species recorded in the Belmont-Korokoro KNE site**

Scientific name	Common name	Threat status	Observation
Plants <sup>57</sup>			
<i>Brachyglottis kirkii</i> var <i>kirkii</i>	Kirk's tree daisy	Serious decline	Pat Enright, pers comm 2014
<i>Trichomanes colensoi</i>	Bristle fern	Sparse	Pat Enright, pers comm 2014
<i>Pterostylis foliata</i>		Sparse	Pat Enright, pers comm 2014

## Appendix 4: Ecological weed species

The following table lists key ecological weed species that have been recorded in the Belmont-Korokoro KNE site. All plants are Priority 1.

**Table 9: Ecological weed species recorded in the Belmont-Korokoro KNE site**

Scientific name	Common name	Weed type
<i>Acer pseudoplatanus</i>	Sycamore	Woody
<i>Arundinaria</i> spp.	Bamboo	Woody
<i>Buddleja davidii</i>	Buddleia	Woody
<i>Clematis vitalba</i>	Old man's beard	Climber
<i>Cobaea scandens</i>	Cathedral bells	Climber
<i>Cortaderia selloana</i>	Pampas	Ground cover
<i>Cotoneaster glaucocarpa</i>	Cotoneaster	Woody
<i>Crataegus monogyna</i>	Hawthorn	Woody
<i>Eleagnus x reflexa</i>	Eleagnus	Climber
<i>Erica lusitanica</i>	Spanish heath	Woody
<i>Gunnera tinctoria</i>	Chilean rhubarb	Ground cover
<i>Hedera helix</i>	Ivy	Climber
<i>Humulus lupulus</i>	Hops	Climber
<i>Hydrangea macrophylla</i>	Hydrangea	Woody
<i>Lonicera japonica</i>	Japanese honeysuckle	Climber
<i>Paraserianthes lophantha</i>	Brush wattle	Woody
<i>Passiflora</i> spp.	Banana passionfruit	Climber
<i>Pinus radiata</i>	Pine	Woody
<i>Pittosporum crassifolium</i> *	Karo	Woody
<i>Prunus</i> spp.	Plum and cherry	Woody
<i>Sambucus nigra</i>	Elder	Woody
<i>Selaginella kraussiana</i>	African club moss	Ground cover
<i>Tradescantia fluminensis</i>	Tradescantia	Ground cover
<i>Vinca major</i>	Perewinkle	Ground cover

\* Denotes a New Zealand native plant that is not local to the KNE site

## Appendix 5: Revegetation plant list

Plants from the following table will be used in any revegetation planting as per Section 7.4.

**Table 10: Revegetation plant list for use within planting area identified in Appendix 1, Map 7**

Scientific name	Common name
<i>Aristotelia serrata</i>	Wineberry
<i>Austroderia fulvida</i>	Toetoe
<i>Coprosma propinqua</i>	Mingimingi
<i>Coprosma robusta</i>	Karamu
<i>Griselinia littoralis</i>	Broadleaf
<i>Kunzea robusta</i>	Kanuka
<i>Leptospermum scoparium</i>	Manuka
<i>Melicope ternata</i>	Wharangi
<i>Melicytus lanceolatus</i>	Narrow-leaved mahoe
<i>Melicytus ramiflorus</i>	Mahoe
<i>Myrsine australis</i>	Red mapou
<i>Olearia paniculata</i>	Akiraho
<i>Phormium cookianum</i>	Mountain flax
<i>Pittosporum eugenioides</i>	Lemonwood
<i>Pittosporum tenuifolium</i>	Kohuhu
<i>Veronica stricta</i>	Koromiko

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The Greater Wellington Regional Council's purpose is to enrich life in the Wellington Region by building resilient, connected and prosperous communities, protecting and enhancing our natural assets, and inspiring pride in what makes us unique

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