Moho pererū/Banded rail image courtesy of Imogen Warren

Wai Roa ō Kahu / Upper Harbour Pest Management Strategy

Prepared for the Wai Roa ō Kahu / Upper Harbour Community with funding from the Upper Harbour Local Board.

Written by Boffa Miskell Limited with support from Auckland Council and input from the Upper Harbour community.

17 July 2024

Upper Harbour Local Board
Auckland Council

Executive Summary

In 2022, the Upper Harbour Local Board resolved to support the development of a pest management strategy for the Upper Harbour Local Board area, also known as Wai Roa ō Kahu.

The purpose of this strategy is to support the Wai Roa ō Kahu / Upper Harbour community in prioritising and planning community-led pest animal and pest plant control projects that will enable the protection and restoration of local indigenous biodiversity.

Boffa Miskell Limited were engaged to workshop with the Wai Roa ō Kahu / Upper Harbour community, collate data, and provide specialist pest control advice to develop the strategy. This process incorporated input from Auckland Council staff, mana whenua and other interested parties. The document direction and content was shaped by Upper Waitematā Ecology Network (UWEN) and input gathered through workshops run by Boffa Miskell.

Pest plants and animals cause substantial damage by outcompeting, browsing and/or preying on native species, and efficient control leads to substantial indigenous biodiversity gains. A core objective of this strategy is to recommend pest control actions that are most likely to result in increased resilience of native ecosystems at a landscape scale.

This strategy presents existing local ecological values and pest control projects and summarises relevant regional and national pest control programs to be considered when planning or delivering pest control. This information then provides context to a range of Wai Roa ō Kahu / Upper Harbour conservation management opportunities that can inform and support optimal community-led pest control projects.

In summary, this strategy:

- Provides relevant background context; including a collation of existing policies, guidelines and conservation initiatives.
- Overviews potential partners and stakeholders and outlines roles and responsibilities.
- Presents an overview of the pest control efforts that have occurred across Wai Roa ō Kahu / Upper Harbour to date by a range of stakeholders including community.
- Uses multiple criteria to assess sites for ecological value and pest animal defendability across Wai Roa ō Kahu / Upper Harbour.
- Helps focus local community-led pest management through identifying priority areas and recommended control approaches for each area.
- Provides a framework to enable community to develop high level location-specific pest plant management plans, including “management units”, site-specific challenges and opportunities, suggested targets and objectives;
- Finally, the Wai Roa ō Kahu / Upper Harbour Pest Management Strategy outlines some key factors for community to consider in project planning, including project sustainability and the importance of a cohesive and coherent data management and reporting regime.

Contents

1.0 Introduction

1.1 Purpose and Target Audience

This strategy applies to the Wai Roa ō Kahu / Upper Harbour area (Map 1) and addresses threats to the area's ecosystems, notably from introduced pathogens, pest plants, and animals. These invasive species disrupt native ecosystems, leading to native species declines. The natural heritage of Upper Harbour has been diminished by pest species and impacts are exacerbated by habitat loss and the increasing impacts of a changing climate. Management is required to protect and restore Upper Harbour's remaining natural landscape.

The intended audience of this strategy is a range of community stakeholders and partners interested in indigenous biodiversity protection and pest plant and animal control, including the Upper Waitematā Ecology Network, volunteers, local businesses, education centres, landowners, other local charities, and community organisations that live, work, and visit Upper Harbour.

Boffa Miskell Limited was commissioned by the Upper Harbour Local Board, and developed a strategy based on a series of facilitated workshops with the Upper Waitematā Ecology Network (UWEN) and direction provided by Auckland Council's Environmental Services staff. The purpose of this strategy is to guide and articulate community-led efforts in pest management. Community stakeholders and mana whenua were engaged to enhance conservation outcomes through effective collaboration. Engagement with conservation stakeholders ensures strategic alignment with existing efforts while identifying opportunities for new work.

The strategy investigates both pest animal and plant control, however, a detailed operational control plan for plant pests was out of scope due to the complexity of pest plant ecology. Pest plants are addressed but with higher level guidance.


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Okura
Redvale
Long Bay
Dairy Flat
Torbay
Fairview Heights
Northcross
Albany Heights
Oteha
Browns Bay
Coatesville
Rothesay Bay
Pinehill
Murrays Bay
Riverhead
Lucas Heights
Albany
Mairangi Bay
Windsor Park
Rosedale
Paremoremo
Schnapper Rock
Sunnynook
Unsworth Heights
Totara Vale
Greenhithe
Bayview
Wairau Valley
Kumeu
Herald Island
Glenfield
Sunset Bay
Whenuapai
Catalina Bay
Hobsonville
Bomb Bay
Beach Haven
Birkdale
Charcoal Bay
Limeburners Bay
Brickbat Bay
Island Bay
Waipareira Bay
West Harbour
Westgate
Massey
Te Atatu Peninsula
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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors
Projection: NZGD 2000 New Zealand Transverse Mercator
LEGEND
Upper Harbour Region
UPPER HARBOUR PEST FREE STRATEGY
Upper Harbour Overview
Date: 28 August 2023 | Revision: 0
Plan prepared by Boffa Miskell Limited
Project Manager: Helen.Blackie@boffamiskell.co.nz | Drawn: HCo | Checked: HBl
Map 1

2.0 Background Context

This strategy aims to provide a local lens on how various local, regional, and national initiatives, relate or apply to the Wai Roa ō Kahu / Upper Harbour area, including both statutory requirements and aspirational programmes. These plans and initiatives are described in this strategy to give visibility for community to understand the alignment between their projects and requirements/goals, and to identify gaps that are not covered by other projects. Below are key plans and initiatives considered in developing the strategy.

2.1 Te Tiriti o Waitangi and Wai Roa ō Kahu / Upper Harbour Community

It is important that community acknowledges Tiriti o Waitangi (the Treaty of Waitangi) as it guides their relationships with and responsibilities to Ngā Iwi Mana Whenua o Tāmaki Makaurau.

Tāmaki Makaurau / Auckland's significance to Māori is profound, with the largest population residing here, including 19 mana whenua groups and many mataawaka. Māori identity and culture are integral to New Zealand's uniqueness, and community should be committed to supporting Māori aspirations through the delivery of their work.

In implementing community-led projects, it is essential to foster meaningful relationships with Māori/mana whenua, respecting their rights as iwi and kaitiaki over native species. By doing so, Te Tiriti o Waitangi is honoured.

Māori identity and culture is New Zealand's unique aspect providing a point of difference in the world. Through delivery of Māori outcomes, Auckland Council supports Māori aspirations. Māori outcome delivery is how Auckland Council responds to legislative obligations and it provides the foundation for engagement with Auckland's Māori communities.

2.2 Auckland Regional Pest Management Plan

The Auckland Regional Pest Management Plan 2020-2030 (RPMP) outlines control, guidance and restrictions on all flora and fauna regionally classified as pest species. It is a statutory document, purposed to identify harmful organisms, and outlines effective and efficient control measures that prevent, reduce, or eliminate adverse effects on indigenous biodiversity (Map 3), primary production and other values, according to a coordinated regional approach.

It is useful for community who are leading their own conservation projects to understand the RPMP, to see how pest control is prioritised and delivered at a regional scale by Auckland Council. Knowing where and how Auckland Council controls pest species can enable community to align their projects with regional outcomes, as well as identify gaps where Council-led control does not extend to Wai Roa ō Kahu / Upper Harbour.

The RPMP is divided into multiple 'programmes', each dedicated to an area or a land type. The programmes have different objectives for target species. Both the Whole Region programme (which includes all of Auckland's mainland and islands), and the Parkland with Significant Ecological Areas programme apply to the landscape of Wai Roa ō Kahu / Upper Harbour. Across Auckland, regional and local parks provide important areas for native vegetation (e.g. Pāremoremo Scenic Reserve) and how they are managed based on ecological value is identified in the RPMP.

Whole Region objectives

Possums, feral deer, feral goats, and cockatoo are designated Progressive Containment Animals. This means that, whilst eradication may not be possible in the short term, the populations of these species could be reduced across Auckland to far lower numbers than at the time the plan was created. Possums are the most relevant of these pests in Wai Roa ō Kahu / Upper Harbour. The RPMP's principal measures of achievement are focused on high priority biodiversity areas in rural land and includes 'Set up and maintain possum control in staged blocks, aiming for at or below 2-5% Residual Trap Catch'. At this stage no regional scale possum control is currently planned for the Upper Harbour local board area.

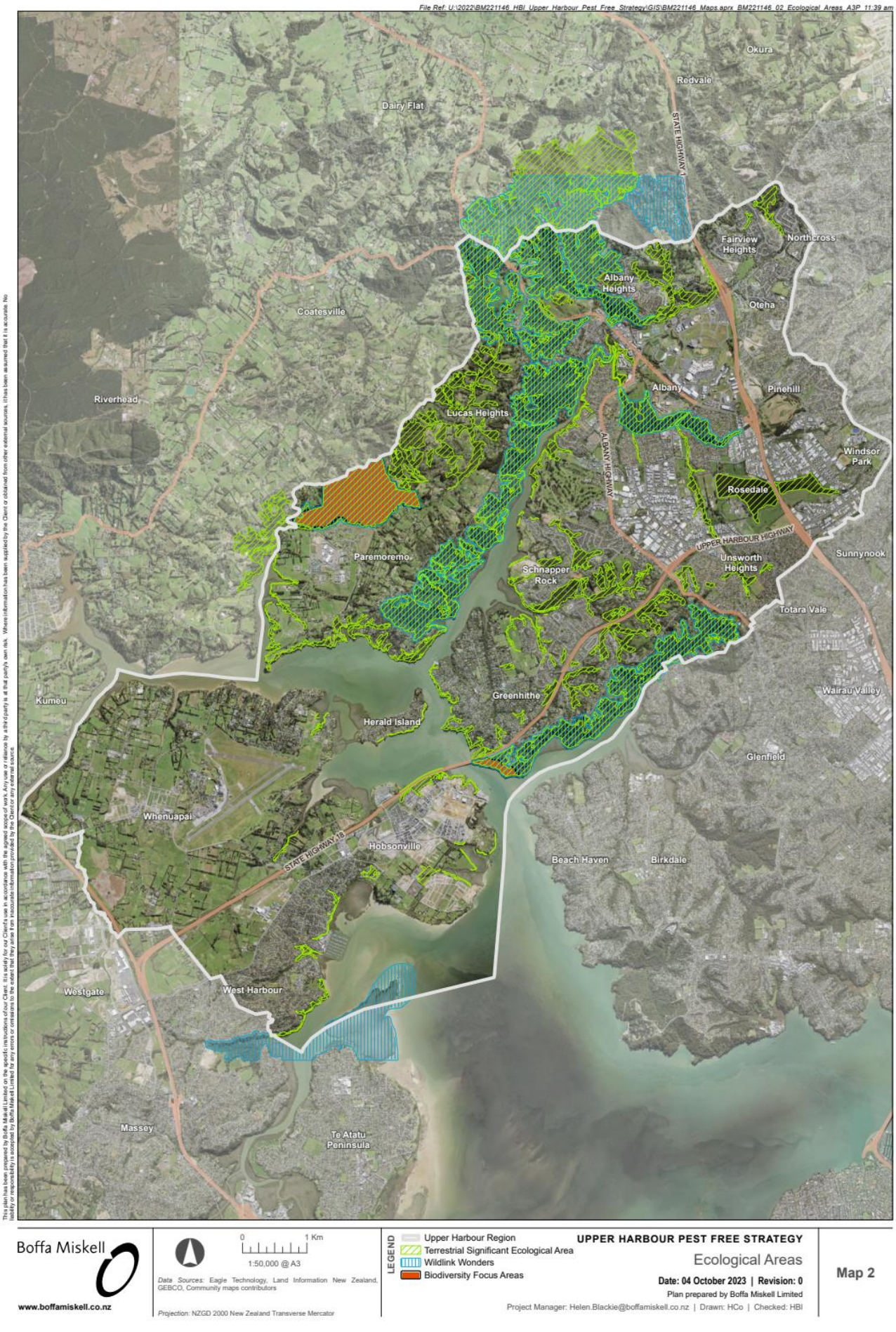
Unowned cats fall under Site-Led Animals. Auckland Council aims to conduct control of unowned cats at specific rural sites where threatened indigenous species are present, but no locations within Wai Roa ō Kahu / Upper Harbour currently meet the criteria.

All other mammalian, freshwater, reptilian and avian pests are designated for Sustained Control, whereby the objectives are for ongoing control to reduce the impacts of these animals on native biodiversity and human health. There are few targets described, with most species managed on a case-by-case basis. However, common themes include prioritisation of biodiversity focus areas and significant ecological areas (see Map 2), as well as supporting community to carry out pest control. A key element of this programme is preventing breeding and sales, implemented through inspections of nursery and pet industries.

Plant pest management is largely site-led, as eradication or region-wide control of most pest plants is not feasible. Nonetheless, around 30 pest plant species are targeted for eradication throughout the region, with some sites within the Wai Roa ō Kahu / Upper Harbour area. Improving public reporting of these species is a key priority. Auckland Council's Pest Plant Management Policy focusses on the method of delivery of pest plant control in a way that best protects the environment and empowers the community to manage pest plants in their local areas.

Public Parkland with Significant Ecological Areas objectives

This programme contains more stringent objectives for some pests, including mustelids, rats and feral pigs. The aim for mustelids and rats on certain specified parks with Significant Ecological Areas (Map 2) is to 'manage the pest animal in or around Significant Ecological Areas (SEA) on parkland to levels that enhance ecosystem function and resilience and protect the values of the parkland'.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ALBANY HIGHWAY
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Rosedale
UPPER HARBOUR HIGHWAY
Paremoremo
Schnapper Rock
Unsworth Heights
Sunnynook
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Kumeu
Greenhithe
Wairau Valley
Herald Island
Glenfield
Whenuapai
STATE HIGHWAY 16
Hobsonville
Beach Haven
Birkdale
Westgate
West Harbour
Massey
Te Atatu Peninsula
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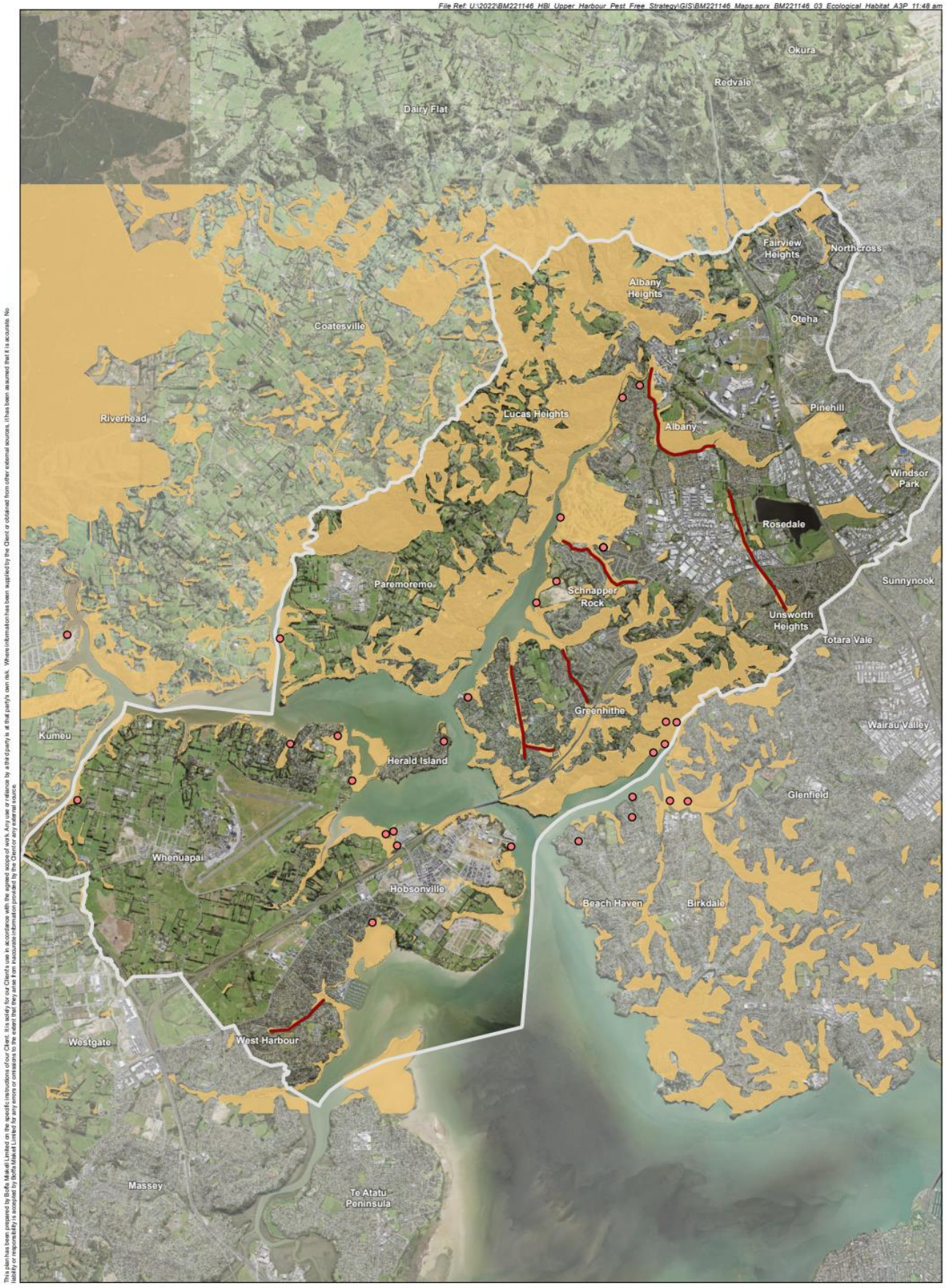
LEGEND
Upper Harbour Region
Terrestrial Significant Ecological Area
Wildlink Wonders
Biodiversity Focus Areas
UPPER HARBOUR PEST FREE STRATEGY
Ecological Areas
Date: 04 October 2023 | Revision: 0
Plan prepared by Boffa Miskell Limited
Project Manager: Helen.Blackie@boffamiskell.co.nz | Drawn: HCo | Checked: HBI
Map 2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Mohu Pereru (Evidence and Monitoring Sites)
Potential Inanga Site
Core Habitat for Kereru, Matuku, Pekapeka, Moho Pereru (connectivity analysis)
Upper Harbour Region
UPPER HARBOUR PEST FREE STRATEGY
Additional Ecological Values
Date: 28 August 2023 | Revision: 0
Plan prepared by Boffa Miskell Limited
Project Manager: Helen.Blackie@boffamiskell.co.nz | Drawn: HCo | Checked: HBl
Map 3

2.3 Natural Environment Targeted Rate Programme

The Natural Environment Targeted Rate (NETR) was created when Aucklanders supported the 10-year budget 2018-2028 that approved $311 million for council and community-led action to protect and restore priority native ecosystems and threatened species. Funding each year through the NETR supports regional priorities set out in the Auckland Plan 2050, the Auckland Council Indigenous Biodiversity Strategy 2012, and the Regional Pest Management Plan 2020-2030.

NETR has four key areas:

- Plant pathogen pest management
- Islands and marine environment
- Mainland environments
- Expanding community action

One of the objectives of the NETR is to 'provide tools, resources, advice and funding support to community conservation groups'. Auckland Council staff can support community in their project planning to consider alignment with potential NETR opportunities and support.

For more information about the NETR see https://www.aucklandcouncil.govt.nz/environment/what-we-do-to-help-environment/Pages/natural-environment-targeted-rate.aspx

2.4 Biodiversity Focus Areas

Biodiversity Focus Areas (BFAs) are regionally significant areas of indigenous biodiversity in Auckland. They are non-statutory and represent a range of indigenous species and ecosystems and are priority sites for management by Auckland Council.

Almost 40% of Auckland's indigenous ecosystem types are critically endangered, protecting BFAs will ensure the persistence of all current habitat types and species within them. BFAs are identified through their ecosystem values, species values, ecological sequence values or a combination. Current BFAs have been identified by subject matter experts within Auckland Council and mapped using spatial planning software.

For local community working on conservation projects in the Wai Roa ō Kahu / Upper Harbour area, understanding where BFAs are can provide insight into how to prioritise work and look for opportunities to collaborate with Auckland Council and protect these significant areas. Auckland Council staff can provide more information about BFAs in the Wai Roa ō Kahu / Upper Harbour area.

BFAs are included within the area prioritisation section of this strategy (section 5.5 onwards).

2.5 Predator Free 2050 Ltd and Predator Free New Zealand Trust

In 2016, the New Zealand Government announced its aspiration for the country to be 'Predator Free' by the year 2050, a major step towards allowing native wildlife to flourish. Predator Free 2050 Limited supports this goal, which currently applies to possums, rats and mustelids.

This initiative has been inspiring to many community conservation groups across the nation and is fuelling many community-led pest animal control project in Auckland and Wai Roa ō Kahu / Upper Harbour.

Predator Free 2050 Ltd is often confused with the Predator Free New Zealand Trust. The Predator Free New Zealand Trust is an independent charitable trust which was established to encourage, support and connect New Zealanders in getting involved in the predator free movement. The trust is commonly known as Predator Free NZ and provides a range of support to community-led predator control projects. Support opportunities include; technical advice, training videos, planning templates, grants and a place for inspiration and celebrating success stories. Predator Free NZ is a good resource for Wai Roa ō Kahu / Upper Harbour community members to utilise alongside this strategy.

2.6 Pest Free Auckland

Pest Free Auckland is Auckland Council's commitment to Predator Free 2050. This has enabled Council to support communities to connect and plan in their local area to build a movement that enables community-led conservation action.

Auckland Council's commitment to Pest Free Auckland has facilitated community support such as grants and resources to grow and sustain restoration initiatives. Conservation support linked to Pest Free Auckland in the Wai Roa ō Kahu / Upper Harbour area has enabled coordinators and volunteers to get hardware (traps and weeding tools) in action, training to help build technical skills and capacity, and to collaborate and share their stories.

The Pest Free Auckland initiative is inspiring and encouraging to community conservation groups across the region and enables a pathway of engagement and collaboration with other groups inspired to protect local biodiversity.

2.7 Upper Harbour Local Board Plans

The Upper Harbour Local Board Plan 2023 outlines the goals and objectives the Local Board aim to achieve over a three year period. The plan reflects community aspirations, provides a guide for local decision making, and indicates how the board will work with stakeholders such as community groups. Local Board Plans guide the Board's activities, funding, and investment.

The Upper Harbour Local Board Plan 2023 focuses on the social, economic, and environmental benefit of the local community through five key areas. This Wai Roa ō Kahu / Upper Harbour Pest Management Strategy gives effect to one of these "Tō Tātou Taiao/Our Environment".

The document outlines ways in which the board and community can work together to deliver important local initiatives. The local board supports community conservation initiatives delivery through funding aligned to the objectives of the plan, it provides a route in which Upper Waitemata Ecology Network and other community groups/initiatives could work with the local board.

The Upper Harbour Local Board Plan also aims to implement actions from the Upper Harbour Open Space Network Plan; a plan which recognises the importance of environmental restoration, pest management and the value of volunteers.

By aligning community led pest control projects to Local Board Plans and other supporting plans, community groups will increase potential opportunities for support such as funding, landowner approvals and recognition.

2.8 Upper Harbour Ecological Connectivity Strategy

The Upper Harbour Ecological Connectivity Strategy was funded through the Upper Harbour Local Board and produced by Boffa Miskell. It aims to enhance landscape-scale ecological restoration for habitat connectivity enhancement. The connectivity strategy was created in collaboration with mana whenua, council, and local communities, and aligns with the Northwest Wildlink project, Urban Ngahere Strategy and the Upper Harbour Open Space Network Plan.

Habitat connectivity potential was identified through ecological evaluation of four representative 'umbrella' species. The species used in the model include the banded rail (mohu-pererū) for estuarine margins, the Australasian bittern (matuku-hūrepo) for wetland habitats, the New Zealand wood pigeon (kererū) for forest ecosystems, and the long-tailed bat (Pekapeka-tou-roa) for mature forest. This data is shown in Map 3.

The strategy outlines where community can focus restoration activities to improve ecological connectivity across Wai Roa ō Kahu / Upper Harbour. There is opportunity to enhance the quality and connectivity of forest areas and protect estuarine margins.

Data from the Ecological Connectivity Strategy has been used to inform the ecological prioritisation section of this Wai Roa ō Kahu / Upper Harbour Pest Management Strategy.

2.9 North-West Wildlink Prioritisation Report

The North-West Wildlink was an early adopter of landscape scale thinking in Auckland. It was a network of groups and agencies which identified and advocated for habitat corridors that could facilitate species movements between the Hauraki Gulf Islands and the Waitakere Ranges. The North-West Wildlink Prioritisation Report identifies habitat corridors that facilitate species movement between conservation hotspots in the Hauraki Gulf Islands and the Waitakere Ranges (Fig. 1). The strategy has identified 'Wildlink Wonders', areas within the landscape that provide key biodiversity values such as food sources, safe refuges, or breeding areas and are priorities for conservation management. Wildlink Wonders are the key stepping-stones that allow species to easily travel across Auckland.

Wai Roa ō Kahu / Upper Harbour has multiple large reserves and habitat patches that play an important role in the North-West Wildlink (see Map 2). Several council-owned parks were classified as 'Wildlink Wonders', namely: Burnside Reserve, Fernhill Escarpment and Oteha Stream esplanades (Albany); Hellyers Creek Reserve, Kereru Reserve and Taihinui Historical Reserve (Greenhithe); Hosking Reserve and Lucas Creek west bank escarpment (Lucas Heights) and Pāremoremo Scenic Reserve (Pāremoremo). These core habitats form ecological corridors used by tui in transit from Tiritiri Matangi to the west coast and Goldie's Bush (as recorded from banded birds; Auckland Council, n.d.). Kaka have also been tracked from the Gulf Islands across Pāremoremo to Riverhead Forest and South Head.

The North-West Wildlink report previously guided community in prioritising conservation projects. Information and data were taken from the Wildlink Priroitisation Report to inform the prioritisation section in this Wai Roa ō Kahu / Upper Harbour Pest Management Strategy.

Figure 1: The North-West Wildlink, stretching from Tiritiri Matangi to Ark in the Park in the Waitakere Ranges

3.0 Roles, Responsibilities, and Existing Pest Management

Implementing a landscape scale strategy requires the co-operation of many involved groups and individuals within the Wai Roa ō Kahu / Upper Harbour community. The success of the Wai Roa ō Kahu / Upper Harbour Pest Management Strategy is reliant on nurtured relationships between stakeholders, to enable a unified approach to pest management. This may look like sharing learnings, allocating resources to priority sites, or working in ways that help neighbouring groups.

3.1 Government and Local Agencies

Upper Harbour Local Board

The Wai Roa ō Kahu / Upper Harbour Pest Management Strategy has been funded by the Upper Harbour Local Board to support and inform community in planning pest control projects in Wai Roa ō Kahu / Upper Harbour.

This strategy closely aligns to the Local Board Plan Tō Tātou Taiao/Our Environment's objective "Our indigenous and culturally valued biodiversity is improved and protected by preserving and enhancing the

habitats that support it". The Wai Roa ō Kahu / Upper Harbour Pest Management Strategy will support the Local Board to deliver on their key goal, to "support initiatives that deliver on the Upper Harbour Pest Management Strategy and Upper Harbour Ecological Connectivity". Throughout previous years the Upper Harbour Local Board have supported community conservation initiatives including ongoing support for Upper Waitemata Ecology Network projects and the development of the Upper Harbour Ecological Connectivity Strategy.

Auckland Council – Environmental Services

Environmental Services supports communities with technical advice on conservation management and identifies potential opportunities for resources from Council, as well as avenues for upskilling, networking, and collaboration with other stakeholders in the area and wider Auckland Region. Specific support that Environmental Services can provide reflects regional priorities and can be discussed with Environmental Services' Conservation Delivery staff.

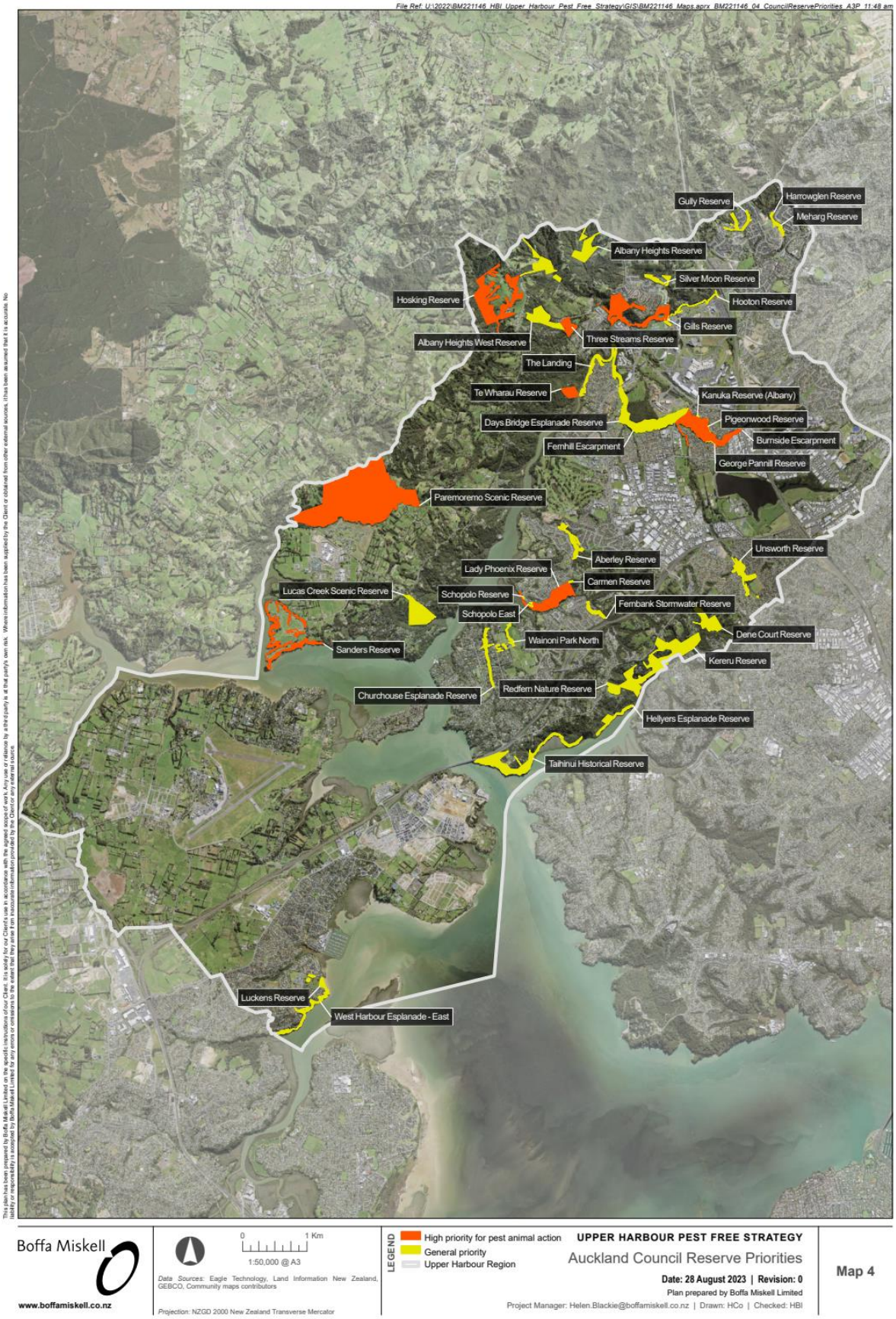
Auckland Council – Parks and Community Facilities

Auckland Council's Parks and Community Facilities department manages Auckland Council Local Parks reserves, including ecological management and supporting community volunteers. Community members can talk to their local Community Park Ranger for more detailed information about existing ecological management or undertaking community conservation work on Auckland Council reserves.

Current ecological management undertaken by Auckland Council on Local Parks is divided into two categories for management, including 'High Value' and 'General' sites. The control specifications for each of these site categories is outlined below in Table 1. The High Value and General sites present in Wai Roa ō Kahu / Upper Harbour are shown in Map 4.

Table 1: Pest animal and plant control regimes undertaken by Auckland Council contractors at 'High Value' and 'General' sites in the Auckland Region.

High Value Sites sites	General Sites
In High Value reserves, an assessment of existing plant and animal pests is conducted and then control methods put in place. High-value sites have an extensive list of plant pests which must be addressed, with these pests controlled to zero density. Possums are controlled to the point where they have no detrimental impact, and rats are also controlled via bait station networks.	General sites have a less stringent management regime, with a visit once per annum with the following plant species being controlled: – Moth plant *Araujia sericifera;* – Bushy asparagus, *Asparagus aethiopicus;* – Woolly nightshade (tobacco tree) *Solanum mauritianum;* – Buckthorn (rhamnus) *Rhamnus alaternus;* – Climbing asparagus *Asparagus scandens;* – Madeira vine (mignonette vine) *Anredera cordifolia;* – Wattle, brush *Paraserianthes lophantha;* – Alligator weed, *Alternanthera philoxeroides*; (Wetlands) – Japanese honeysuckle, *Lonicera japonica*; (Wetlands) – Ginger, Kahili *Hedychium gardnerianum*; – Ginger, yellow *Hedychium flavescens*; – Privet, Chinese *Ligustrum sinense*; – Privet, tree *Ligustrum lucidum*; – Juvenile Phoenix palms, *Phoenix canariensis*; – Pampas, *Cortaderia selloana*; (Wetlands) – Giant Reed, *Arundo donax*; (Wetlands) Additional plant species are addressed if issues arise. Pest animal monitoring is undertaken to assess possum and rat densities, with pest animal work undertaken if deemed necessary.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Gully Reserve
Harrowglen Reserve
Meharg Reserve
Albany Heights Reserve
Silver Moon Reserve
Hosking Reserve
Hooton Reserve
Gills Reserve
Albany Heights West Reserve
Three Streams Reserve
The Landing
Te Wharau Reserve
Kanuka Reserve (Albany)
Days Bridge Esplanade Reserve
Pigeonwood Reserve
Burnside Escarpment
Fernhill Escarpment
George Pannill Reserve
Paremoremo Scenic Reserve
Unsworth Reserve
Aberley Reserve
Lady Phoenix Reserve
Carmen Reserve
Lucas Creek Scenic Reserve
Schopolo Reserve
Fernbank Stormwater Reserve
Schopolo East
Dene Court Reserve
Wainoni Park North
Sanders Reserve
Kereru Reserve
Churchouse Esplanade Reserve
Redfern Nature Reserve
Hellyers Esplanade Reserve
Taihinui Historical Reserve
Luckens Reserve
West Harbour Esplanade - East
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LEGEND
High priority for pest animal action
General priority
Upper Harbour Region
UPPER HARBOUR PEST FREE STRATEGY
Auckland Council Reserve Priorities
Date: 28 August 2023 | Revision: 0
Plan prepared by Boffa Miskell Limited
Project Manager: Helen.Blackie@boffamiskell.co.nz | Drawn: HCo | Checked: HBl
Map 4

Department of Conservation

Department of Conservation (DOC) land in Wai Roa ō Kahu / Upper Harbour comprises Lucas Creek Scenic Reserve and Lucas Creek Marginal Strip (see Map 2); neither contain any formal visitor facilities (i.e. tracks). DOC have advised that currently they do not undertake any active management on the public conservation land in Wai Roa ō Kahu / Upper Harbour as it is not a priority ecosystem and priority threatened species are not known to be present. DOC would welcome community or other interested parties in undertaking conservation work in these areas i.e. pest animal or pest plant control. Proposals for future conservation work in Lucas Creek Scenic Reserve or Lucas Creek Marginal Strip should involve early liaison with DOC via the Senior Ranger, Community.

Royal New Zealand Airforce

Whenuapai is home to the largest and northernmost operational base of the Royal New Zealand Air Force (RNZAF). In consulting with RNZAF at the time of writing, the RNZAF Airfield Environmental Officer cited they were supportive of the Wai Roa ō Kahu / Upper Harbour community's vision for ecological restoration. The Airfield Environmental Officer enables effective land, flora and fauna management of Whenuapai Airfield and surrounding environments. The Airfield Environmental Officer confirmed both contractors and volunteers carry out pest animal control across Base Auckland and at the time of writing, they have indicated they are interested in further supporting the intent of the Pest Management Strategy and working with local community conservation groups.

3.2 Mana Whenua

It is important for community groups to honour and commit to giving effect to Te Tiriti o Waitangi and that mana whenua are seen as partners in planning and delivery of pest control projects. Through delivery of the Wai Roa ō Kahu / Upper Harbour Pest Management Strategy there is commitment to develop meaningful relationships with Māori, respect policy rights as iwi and as kaitiaki over taonga including native species.

Auckland Council staff contacted all iwi/hapu connected to the Wai Roa ō Kahu / Upper Harbour area as part of the partnership approach for engagement with mana whenua. Thirteen different iwi/hapu were identified to have connections with the whenua (land) of Wai Roa ō Kahu / Upper Harbour:

- Te Kawerau ā Maki
- Ngāti Whātua o Kaipara
- Ngāti Whātua o Ōrākei
- Ngāti Tamaoho
- Te Ākitai Waiohua
- Ngāti Maru
- Ngāti Tamaterā
- Ngāi Tai ki Tāmaki
- Te Runanga o Ngāti Whātua
- Ngaati Whanaunga

- Ngāti Te Ata Waiohua
- Ngāti Manuhiri
- Ngāti Paoa

Te Kawerau ā Maki were able to contribute to the development of the Wai Roa ō Kahu / Upper Harbour Pest Management Strategy (see following section). Ngāti Manuhiri and Ngāti Whātua o Kaipara expressed interest in the project, however unfortunately feedback was not able to be sought within the project timeframe.

Mana whenua engagement should be regarded as incomplete. Future work will continue to seek engagement with all iwi/hapu that have interest in the area, and active engagement will continue with the three iwi/hapu that expressed interest. Te Kawarau ā Maki, Ngāti Manuhiri, and Ngāti Whātua o Kaipara all have strong connections to the Upper Harbour local board area.

Te Kawarau ā Maki refers to Wai Roa ō Kahu as part of their heartland.

Mana whenua who expressed interest to engage with this project are generally supportive of pest management in conservation as it is an expression of kaitiakitanga - caring for te taiao (the natural world) and allowing for the benefit of taonga species. A holistic approach is important in connecting people with the whenua and te taiao. A whole landscape should be regarded as living for which mana whenua have kaitiakitanga responsibilities. However, the methods used by community groups and councils to achieve pest control do not always align with iwi tikanga (cultural protocols). For example, the use of toxins, particularly near waterways, may be regarded as harmful to mauri (life force). Whilst poisons can be a very effective tool for targeting pest plants and animals, tikanga must be considered and discussed with kaitiaki, especially in areas of high environmental sensitivity or cultural significance. Cultural sites of significance are important to protect, for example, pā, kainga and urupā. Additional time should be sought to allow for engagement with treaty partners of sites of cultural importance and to ensure you are being culturally safe when onsite and in any interactions with taonga.

3.3 Te Kawerau ā Maki

Te Kawerau ā Maki are a mana whenua iwi of Wai Roa ō Kahu / Upper Harbour. This includes but also extends beyond Upper Harbour Local Board boundaries (as iwi takiwa and rohe are based on whakapapa and tikanga). Te Kawerau ā Maki refer to Wai Roa ō Kahu / Upper Harbour as part of their heartland, though they recognise the shared interests of Ngāti Whātua and Ngāti Manuhiri (the latter in the northeast).

Edward Ashby (Board Member and CEO) of Te Kawerau ā Maki has provided locations of cultural sites of significance in Wai Roa ō Kahu / Upper Harbour, as well as sites of Treaty Assets. In addition, some key sites Te Kawerau ā Maki would like to see pest management activities focused on have been indicated. These include Significant Ecological Areas* at the following sites:

- Pāremoremo Bush,
- Greenhithe/Hellyers Creek,
- Albany Heights,
- Lucas Creek,
- Tahingamanu,

- The western section of Wai Roa ō Kahu (this specific location could not be identified by us and may need further consultation).

*Significant Ecological Areas are sites identified with high ecological value within the Auckland Unitary Plan.

These locations have been integrated into the development of Priority Pest Animal areas as outlined in Section 5 and included in a selection of priority areas identified in map 8.

3.4 Community Groups and Charities

Several volunteer conservation groups are well established in the Wai Roa ō Kahu / Upper Harbour community. Their work ranges from pest plant control including collecting moth plant seed pods, installing and servicing of pest animal trap lines, hosting restoration planting days, planting maintenance and planning. Map 5 presents the community groups who have been engaged during the research phase of this project. Engagement for the Pest Management Strategy involved workshops with consultants and community, and an online survey sent to known community conservation groups to gather feedback.

Information gathered indicates that community groups undertaking some level of pest animal and plant control are active across most of Wai Roa ō Kahu / Upper Harbour but are focused primarily on the coastal margins at the time of writing. The suburb of Greenhithe has the highest intensity of known pest animal traps/bait stations, whilst Sanders Reserve and eastern Whenuapai also have significant pest animal control networks deployed. Pest plant control is more challenging to assess given the changeable nature of this work and a lack of data collection, therefore it has not been mapped for the purposes of this strategy. However, many community groups host regular weeding days at local reserves and educate residents on how to remove pest plants from their own backyards.

There is an opportunity for community to fill a niche that is difficult for agencies to achieve, this is to grow engagement and recruitment of volunteers and target private landowners in areas of high biodiversity value and or strategically positioned for landscape scale pest-control.

3.5 Upper Waitematā Ecology Network

The Wai Roa ō Kahu / Upper Harbour Pest Management Strategy content and approach has been co-developed with a focus group of representatives from the Upper Waitematā Ecology Network (UWEN). UWEN is an established body of community leaders who provide a forum for collaboration across Wai Roa ō Kahu / Upper Harbour, the network is comprised of representatives from 11 local conservation groups.

UWEN aims to be an effective and sustainable network that is viewed as an environmental restoration force within the Upper Waitematā area. As UWEN is made up of organisations that are already valued in the community for their knowledge and ecological outcomes achieved to date, the group will serve a crucial role in refining strategies and assisting the wider community to take pest management action that aligns with the Pest Management Strategy.

UWEN's objectives are as follows:

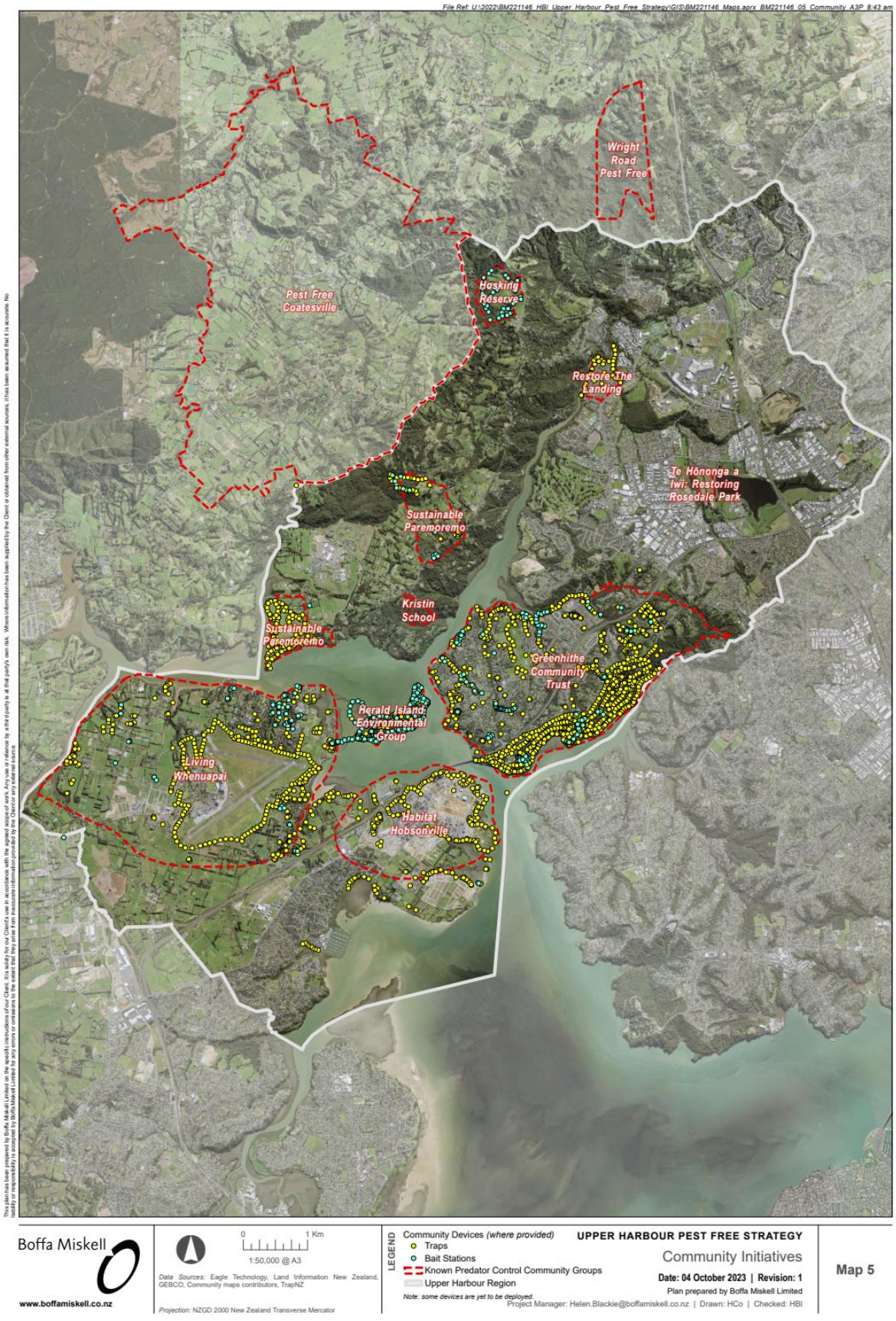
- To be an advocate and champion for Upper Waitematā ecology, and its role in delivery towards the North-West Wildlink concept.
- To create and leverage greater environmental impact through the synergistic activities of its members.

- To ensure the organisational development of the Network is sustainable.
- To be recognised as a co-operative and knowledge resource 'hub' for the Upper Waitematā Harbour.
- To be a member driven network working with other stakeholders for collective action.
- To ensure community-led environmental action is built into UWEN member strategies.
- To undertake capability building to support the development of UWEN members and enable affective delivery of their group projects.

At the time of writing, we are aware of the following community groups operating within the Wai Roa ō Kahu / Upper Harbour area (Table 2). All groups are associated with UWEN.

Table 2: Community Groups Operating within the Wai Roa ō Kahu / Upper Harbour Board area.

Community group name	Working area
Herald Island Environmental Group	Herald Island
Living Whenuapai	Whenuapai
Sustainable Pāremoremo	Pāremoremo
Greenhithe Ecology Network	Greenhithe
Habitat Hobsonville	Hobsonville
Kaipātiki Project	Kaipātiki, Nursery at Hobsonville Esplanade - Hobsonville Point, West Harbour/Marina Esplanade and Centorian Reserve
A Rocha (National Christian Working Group)	Unsworth Heights, Rosedale
Forest and Bird Youth	Hosking Reserve
Centorian Reserve Albany	Centorian Reserve
Restore the Landing	The Landing
Te Hōnonga a Iwi Project	Rosedale Park
Pest Free Coatesville (outside of the Upper Harbour Local Board area)	Coatesville


File Ref: U:\2022\BM221146_HBI_Upper_Harbour_Pest_Free_Strategy\GIS\BM221146_Maps.aprx, BM221146_05_Community, A3P, 8:43 am
Wright Road Pest Free
Pest Free Coatesville
Hosking Reserve
Restore The Landing
Te Hōnonga a Iwi: Restoring Rosedale Park
Sustainable Paremoremo
Kristin School
Sustainable Paremoremo
Greenhithe Community Trust
Herald Island Environmental Group
Living Whenuapai
Habitat Hobsonville
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0 1 Km
1:50,000 @ A3
Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors, TrapNZ
Projection: NZGD 2000 New Zealand Transverse Mercator
LEGEND
Community Devices (where provided)
Traps
Bait Stations
Known Predator Control Community Groups
Upper Harbour Region
Note: some devices are yet to be deployed.
UPPER HARBOUR PEST FREE STRATEGY
Community Initiatives
Date: 04 October 2023 | Revision: 1
Plan prepared by Boffa Miskell Limited
Project Manager: Helen.Blackie@boffamiskell.co.nz | Drawn: HCo | Checked: HBI
Map 5

3.6 Schools

The Wai Roa ō Kahu / Upper Harbour area contains several primary and secondary schools and is also home to Massey University's Albany campus. Students of all ages undertake courses with conservation themes, including practical assignments outside of the classroom. Some schools have traps on site that students or caretakers routinely check.

At the time of writing eight Wai Roa ō Kahu / Upper Harbour schools are actively involved in projects that connect them with their local streams, including water quality testing and biodiversity monitoring as part of the Wai Care programme.

Schools are important stakeholders in this project, and this strategy offers opportunities for learning and engagement about conservation and restoration of the natural environment, including providing a focus for field trips and outdoor activities.

Massey University

In 2023 Massey University hosted its first 'Albany BioBlitz' in Fernhill Escarpment bush, which borders the Oteha campus. A BioBlitz aims to use citizen science to identify as many plants as possible and animals present at a site within a given time frame using the ecology app iNaturalist. The event was open to the public and included expert speakers from Massey University providing information about local biodiversity and demonstrations of monitoring methods such as tracking tunnels.

The BioBlitz is an excellent initiative for increasing public awareness and interest in 'backyard ecology' whilst collecting data simultaneously. Future Bioblitz events would be a helpful means of engagement with the community to facilitate engagement with Wai Roa ō Kahu / Upper Harbour pest management initiatives, and to encourage interest and support for positive environmental outcomes.

4.0 Wai Roa ō Kahu / Upper Harbour Pest Management Objectives

Drawing from stakeholder engagement findings and the adjacent planning objectives outlined in Sections 2 and 3, five high level objectives have been developed for this strategy. They are intended to be broad, use accessible language and promote the benefits of committing to pest management.

1. Prioritise and protect; align to identified high-value ecological sites to prioritise for pest management projects and use site-specific attributes/aims to prioritise management actions within them.
2. Thriving ecosystems; work towards effectively controlling invasive species to levels that allows native biodiversity to thrive.
3. Standing together; foster ongoing relationships between iwi, community groups, organisations, businesses, and landowners. Share knowledge and work collaboratively to achieve the best possible outcomes.
4. Engage and educate; grow community involvement in both public projects and backyard conservation. Empower residents by working to increase their ecological literacy over time.

5. Sustainable future: seek opportunities for funding, utilise innovative new tools where possible, and adapt strategies to changing environmental conditions.

4.1 Desired Outcomes

In any community-led pest management project, a key objective should be to undertake pest control actions that are most likely to maximise biodiversity outcomes. Monitoring pest and biodiversity outcomes is important to measure project goals are reached and pest control is effective.

At a high-level, community-led projects need to consider what success will look like, and decide on goals for their projects, for example:

- Increase in abundance and distribution of native species.
- Decrease in abundance and distribution of pest species.
- Increase community support, ecological literacy, and participation related to pest control activities.
- Necessary workload decreasing in the long-term (i.e. reducing pests to levels that require less effort to maintain).

4.2 Developing Successful Workplans

As the Wai Roa ō Kahu / Upper Harbour Pest Management Strategy does not provide working level operating plans for pest management projects, community will need to develop these themselves using the guidance of this plan. Whilst every site will have different opportunities and constraints, there are key factors that should be incorporated into every project to maximise the likelihood of success.

A work plan that includes the following considerations will also be advantageous when applying for funding, to demonstrate that the project is viable and will achieve durable environmental benefits.

1. Setting specific, measurable goals.

   In making improvements to developing successful workplans, community in Wai Roa ō Kahu / Upper Harbour should work towards specific objectives, targets, and actions for planning their work. Explicit, measurable goals allow groups to work towards something tangible and assess whether progress is being made. Having clearly structured objectives with scheduled reviews provides the opportunity to celebrate wins and remain enthusiastic.

2. Scaling appropriately.

   Community projects can often grow to a scale beyond that which can be maintained over long periods of time. Funding and effort must be directed towards projects with a high level of sustainability. When exploring new opportunities, leaders should consider factors such as member recruitment that impact the future of a project; don't bite off more than the community can chew, or resources could be wasted.

3. Adaptive management.

   It is seldom the case that a perfect work plan is developed at the beginning of a project. Success is achieved when groups are flexible in the delivery of their plan, based on lessons learned over time.

To help with the development of workplans, the following two sections outline:

1. Pest animal work within Wai Roa ō Kahu / Upper Harbour, has been prioritised into management areas (Priority Areas) to enable community to collaborate and coordinate their efforts. To help focus management, a recommended control approach is provided for each Priority Area.
2. A framework to enable community groups to develop location-specific pest plant management plans. The Wai Roa ō Kahu / Upper Harbour area is divided into broad "management units" based on existing vegetation cover and land use. To assist with project scoping, an outline of site-specific challenges and opportunities for pest plant management is provided for each management unit, along with suggested targets and objectives.

5.0 Wai Roa ō Kahu / Upper Harbour Pest Animal Management

5.1 Impacts of Pest Animals

Introduced mammalian predators (including rats, mice, hedgehogs, possums, mustelids and cats) have a considerable impact on native flora and fauna in New Zealand. Reducing these impacts via predator management results in substantial benefits for native biodiversity. Effective pest control has an immediate benefit on native fauna, including decreasing predation of birds, lizards and invertebrates, increasing reproductive success due to lower instances of nest predation, and decreasing the impact of pest browse on native flora (increasing availability of food resources and plant survival).

Possums, rats, mice, unowned cats and stoats are well established and reasonably abundant in Wai Roa ō Kahu / Upper Waitematā area. The impacts of these species on biodiversity within this area is summarised below and in Table 3

Forest birds

Climbing mammals, particularly rats and mustelids, pose the biggest threat to forest birds in New Zealand as they can easily reach nests to prey on eggs and chicks. Possums and cats are opportunistic feeders and will prey on birds and eggs. Managing rats, mustelids and possums is key for protecting forest birds, particularly in the nesting season which runs from August to March.

There is a high level of social risk associated with controlling unowned cats. Any plans to consider unowned cat control should be discussed first with Auckland Council staff.

Coastal and wetland birds

Mustelids, rats, dogs, and cats are major predators of wetland birds. Coastal / wetland birds such as mātuku-hurepo / Australasian bittern and mohu pererū / banded rail are particularly vulnerable to predators as they nest on the ground. The majority of Auckland's freshwater wetlands have been drained, while much of the coastline has been modified to enable development to the coastal margin. Wetland birds are generally restricted to small habitat fragments that often provide little protection, particularly during nesting (between August and March).

In Wai Roa ō Kahu / Upper Harbour, control of rats and mustelids is a priority around wetlands to protect mātuku-hurepo/ Australasian bittern and mohu pererū/ banded rail. Dog owners must also be encouraged to keep their pets on leads in these areas, as their presence alone can cause stress and avoidance which further depletes areas of usable habitat.

The Rail Trail is a current community project that aims to restore mohu pererū/ banded rail habitat in Wai Roa ō Kahu / Upper Harbour as one of its objectives. Several community groups have deployed traps along the coastal margins of their respective areas to reduce pest pressure, and evidence of mohu pererū/ banded rail (actual birds or footprints) is also recorded by locals. Both traps and bird detection locations can be seen on Maps 3 and 5.

Inanga spawning sites

Inanga spawning occurs in the 'salt water wedge' of lowland rivers and streams, laying their eggs in the grassy vegetation of riverbanks where salt and freshwater meet. This is because inanga eggs must remain moist and protected from temperature fluctuations to survive. Mice and rats are known to eat inanga eggs. Potential inanga spawning sites are shown in Map 3.

Ways to help inanga breed successfully include;

- Control rodents. Due to mice being difficult to manage and requiring a high intensity of resources, we recommend that mice are only targeted in small, localised sites with high spawning potential.
- Prevent mowing of riverside grasses near spawning sites, which can destroy vital cover for eggs. Signs may need to be erected to inform the public of why an area looks neglected.
- Control pest plants. Blackberry, willow and other pest plant do not provide appropriate habitat and should be removed, after which natural succession of grasses should occur.
- Check fish passage. Obstructions such as culverts and dams can prevent fish from travelling between the ocean and their spawning sites/adult habitats. Structures impeding passage may be able to be removed or modified.
- Create new spawning sites/enhance existing sites. Haybales and other artificial habitat can be used in place of grass in the interim while suitable vegetation establishes.

Lizards

Rats, mice, cats, hedgehogs, mustelids and possums are all known to predate on New Zealand lizards. Larger lizard species tend to be more vulnerable to predators, as they are easier for pests to find and occupy bigger refuges where they are not as protected from predators. To protect native skink and gecko species in Wai Roa ō Kahu / Upper Harbour, it is important to control mice, hedgehogs, rats and mustelids.

Lizards are more active and conspicuous in the warmer months; however, they are vulnerable throughout the year. Lizards seek shelter during the colder months, and although they are more hidden, their lower body temperatures mean they cannot move as quickly. Pest control should occur year-round to effectively safe-guard lizards. Herpetofauna respond more quickly to pest control than birds, making lizard monitoring an effective tool for reviewing the effectiveness of a pest control programme.

Lizard habitat can also be created by planting mānuka, kānuka, tōtara or any complex, dense shrub cover such as coprosma spp. Piles of logs and debris also provide perfect protection for lizards.

Bats

Pekapeka-tou-roa/ long-tailed bats are active and feed at night. Bats roost in trees during the day, preferring old growth natives or exotics with flaky bark, cracked branches or holes to shelter in, and they also tend to change roost every day. Recent findings within the Auckland Region show long-tailed bats are also roosting in small bush fragments of young growth forest. The breeding season takes place in summer months, with most females giving birth to one pup and then congregating together in large maternity roosts. Rats, mustelids, cats and possums' prey on bats.

New Zealand bat species tend to avoid urban areas due to light and noise disturbance, therefore they are unlikely to be present across the full extent of Wai Roa ō Kahu / Upper Harbour. However, Riverhead Forest has a long-tailed bat population, and bats were detected in Whenuapai West in 2020 with acoustic surveys. They may also be utilising other areas of farmland for feeding or flight paths.

To protect bat habitat, potential roost trees, particularly those in northwest Wai Roa ō Kahu / Upper Harbour near Riverhead Forest, should not be felled without thorough surveys being undertaken. It is also important to reduce rat density to allow bat populations to recover. More bat surveys in Wai Roa ō Kahu / Upper Harbour would provide guidance on their potential distribution across the landscape.

Native vegetation

Ship rats, Norway rats and brushtail possums eat seeds, fruits, foliage and other parts of plants in indigenous forests and cause substantial damage to native vegetation through browsing. Possums strip vegetation systematically from trees, causing damage to the point that plants often cannot recover. Possum control benefits vegetation by increasing foliage and fruit production, and by reducing tree mortality. Controlling or excluding rabbits from restoration areas may be necessary at some sites to allow planting to establish.

*Table 3: Predation and browse risks to native flora and fauna from key introduced species known to be present in Wai Roa ō Kahu / Upper Harbour. Community can investigate which native species might utilise their local reserve and decide which animal pests to target to best protect these species. ✓= major predator, * = minor predator*

Species	Possums	Mustelids	Cats	Dogs	Rats	Mice	Hedgehogs	Wasps
Kererū	✓	✓	✓		✓	*		*
Banded rail / Moho pererū	*	✓	✓	✓	*	*	*	
Bittern / Matuku hurēpo	*	✓	✓	*	✓	*	*	
Tui	*		✓			*		*
Fantail / Pīwakawaka	*		✓			*		
Lizards	*	*	✓	*	*	✓	✓	*
Bats	*	*	✓		✓			
Inanga					✓	✓		
Native invertebrates	✓	*	✓		✓	✓	✓	✓
Germination / seedlings	✓				✓	✓		
Flowering / fruiting	✓				*			✓
Threatened plants	✓					✓		

5.2 Developing a Pest Animal Management Plan

This plan provides prioritised pest animal management areas for community to consider in project planning so they can:

- Make informed decisions about where to focus pest management actions
- Coordinate and align pest control activities between various stakeholders (including community groups)
- Identify appropriate and achievable goals and objectives for work in specific areas of interest
- Use this as a quick reference document to help guide decisions and stay on track.

Each priority area (Map 7) has specific pest management targets and objectives which are well aligned with biodiversity outcomes.

The community is encouraged to develop operational plans using the content of this Wai Roa ō Kahu / Upper Harbour Pest Management Strategy as a guideline.

For example, a community group can investigate what native species might utilise their local reserve, use Table three to decide which animal pests to target to protect those native species, and use Table five to set up a work schedule for their project. Individual landowners can also use these tools to inform pest management in their own backyards.

Operational plans should include a maintenance and monitoring component to ensure that pest suppression is sustained after the initial 'knock-down' phase. There are ethical considerations to killing animals, albeit for conservation purposes, and should be actively promoted throughout project delivery. Plans should also identify how the work fits within larger ecological restoration goals for the site and wider landscape, to ensure it is justifiable.

5.3 Terminology and Key Principles

Control of invasive species in New Zealand has moved increasingly into the spotlight since the announcement of the Predator Free 2050 initiative in 2016. Since then, a wide range of terminology has been used, sometimes incorrectly, in association with predator control, which has resulted in some confusion for both the public and those working in the conservation sector.

Understanding the meaning of pest-control jargon and using it correctly is particularly important for those in leadership roles, including community group facilitators in Wai Roa ō Kahu / Upper Harbour. Doing so will ensure that everybody is 'telling the same story'; framing realistic expectations for working groups and developing shared visions across landscapes. Long-term community motivation is maintained when we set achievable goals, articulate them clearly and communicate successes.

There are several key terms which can be used interchangeably within the context of predator control. While each of these terms are all aimed at reducing and removing predators, the approach, outcomes and meaning of each is subtly different, and need to be defined early in any project. These terms are being redefined, as this report is being written, by a national group and the meanings are yet to be finalised. For now, these terms are outlined below, using current Predator Free 2050 Ltd definitions.

Predator Eradication

Predator eradication is the complete removal of target predators from a defendable area (such as offshore islands or within fenced sanctuary's where the reinvasion risk is low), and the ongoing effort to maintain predator free status is manageable. With current technologies, predator eradication on the mainland is unfeasible (unless aerial toxins can be applied over areas with high defendability), as reinvasion is a constant threat without an exclusion fence or impassable geographic boundaries.

Predator Elimination

'Elimination' of predators is often a stepping stone towards eradication and requires the complete removal of target predators from a defined area, acknowledging that there is a high likelihood of reinvasion that can occur at any time. This requires robust surveillance and targeted response plans to manage incursions quickly. The addition of barriers (physical or virtual) can help to prevent or slow reinvasions.

Zero-density

The term 'zero density' is starting to be frequently used across the mainland, and relates to the target objectives of any eradication project. For example, a common pest control target is to use a variety of detection and monitoring tools to achieve zero density for possums, mustelids, and rats. This would suggest that within the boundaries of the probability of detection in using these monitoring tools, none of these pests have been detected. If a single detection is received using any surveillance tool, then immediate efforts to eliminate the individual will be undertaken. The concept of "control to zero density" is therefore more consistently applied, both on the mainland and offshore islands.

Core Principles

The three terms described above have similar core principles (Thorsen et al., 2019). These principles were developed for island eradications but are relevant for predator elimination and eradication projects on the mainland. These principles include:

- Meaningful support of key stakeholders is essential.
- There is ongoing commitment of resources to the very end (essentially in perpetuity on the mainland, or until the Predator Free New Zealand goal is achieved for each target species).
- Immigration of the target species cannot occur or can be effectively controlled.
- All target animals are at high risk of interacting with control devices.
- All team members believe success is possible and the right team is used in the right way.
- Non-target animals are not at risk.
- Suitable techniques are available, are used correctly and in the right sequence to detect and eradicate the target species.
- That the project maintains focus on the only objective: eradication, but has sufficient flexibility to respond to unexpected changes.
- Monitoring provides information to support the project delivery.

Predator suppression

Suppression of predators is the ongoing control of introduced predators using a range of tools and techniques to decrease (and hold) predator populations to low levels. Over larger landscapes predators can be suppressed to low population density, but without defendability and concentrated ongoing effort, predators will quickly re-establish, re-invade and re-populate these areas. Population suppression requires ongoing and repeat predator control activities to keep predator numbers low enough for biodiversity protection.

5.4 What Does 'Pest-Free' Mean for Wai Roa ō Kahu / Upper Harbour?

The objective of the pest management work is to continue with suppression targets for pest animal control programmes and examine the long-term feasibility of eliminating some species in high priority areas in the medium term. The longer-term goal is to consider feasibility of targeted control working towards 'zero density' in feasible and ecologically important areas.

5.5 Prioritise and Protect: deciding what to do and where to do it

Due to limited resources and mixed land usage, it is not possible to intensively manage every pest animal across the landscape of Wai Roa ō Kahu / Upper Harbour. However, it is possible to make meaningful biodiversity gains by focusing community resources on key sites and targeting key species. Prioritisation also reduces the risk of pest control programmes failing to achieve long-term goals, by providing for focus areas where community effort and resources can be best allocated long term.

There are many factors to consider when making decisions regarding how to prioritise areas, and whilst ecological values are vital, they cannot always be the key decider. For example, even the highest quality native bush reserve will not be a priority for community projects if the terrain renders it inaccessible on foot.

Throughout this project comprehensive spatial data for Wai Roa ō Kahu / Upper Harbour was collected and is presented in maps (Maps 2-6). Spatial overlap analysis was also carried out using ArcPro GIS, to determine areas with high intensity of significant values, based on the following outlined layers (Map 6). A total of nine layers were input into the overlap analysis with equal weighting, these were BFAs, SEAs, DOC Conservation Land, Wildlink Wonders, connectivity analysis habitats, Auckland Council reserves, and key Te Kawerau ā Maki cultural sites. Areas where at least two of these layers overlapped were mapped (Map 7), and ultimately used to inform the selection and extent of priority areas (Map 8). Point and line features were unable to be used in the overlap analysis, so a manual check that all significant sites were covered (such as inanga spawning locations), was also undertaken.

The above overlap analysis and data summarised in Table 4 were used to assess the following features of each site:

Areas of significance

- Is the site designated as a Biodiversity Focus Area or Significant Ecological Area?
- Does it contain threatened or rare ecosystems?
- Is it a key site in a relevant ecological plan (i.e. a Wildlink Wonder, or core connectivity habitat)?

Cultural heritage

- Is the site identified by Te Kawerau ā Maki as a key cultural site?

Accessibility

- Is the site on public or private land?
- Is the terrain too challenging for volunteers?
- What are the health and safety risks?
- Have tracks been closed due to kauri dieback or for another reason?

Connectivity

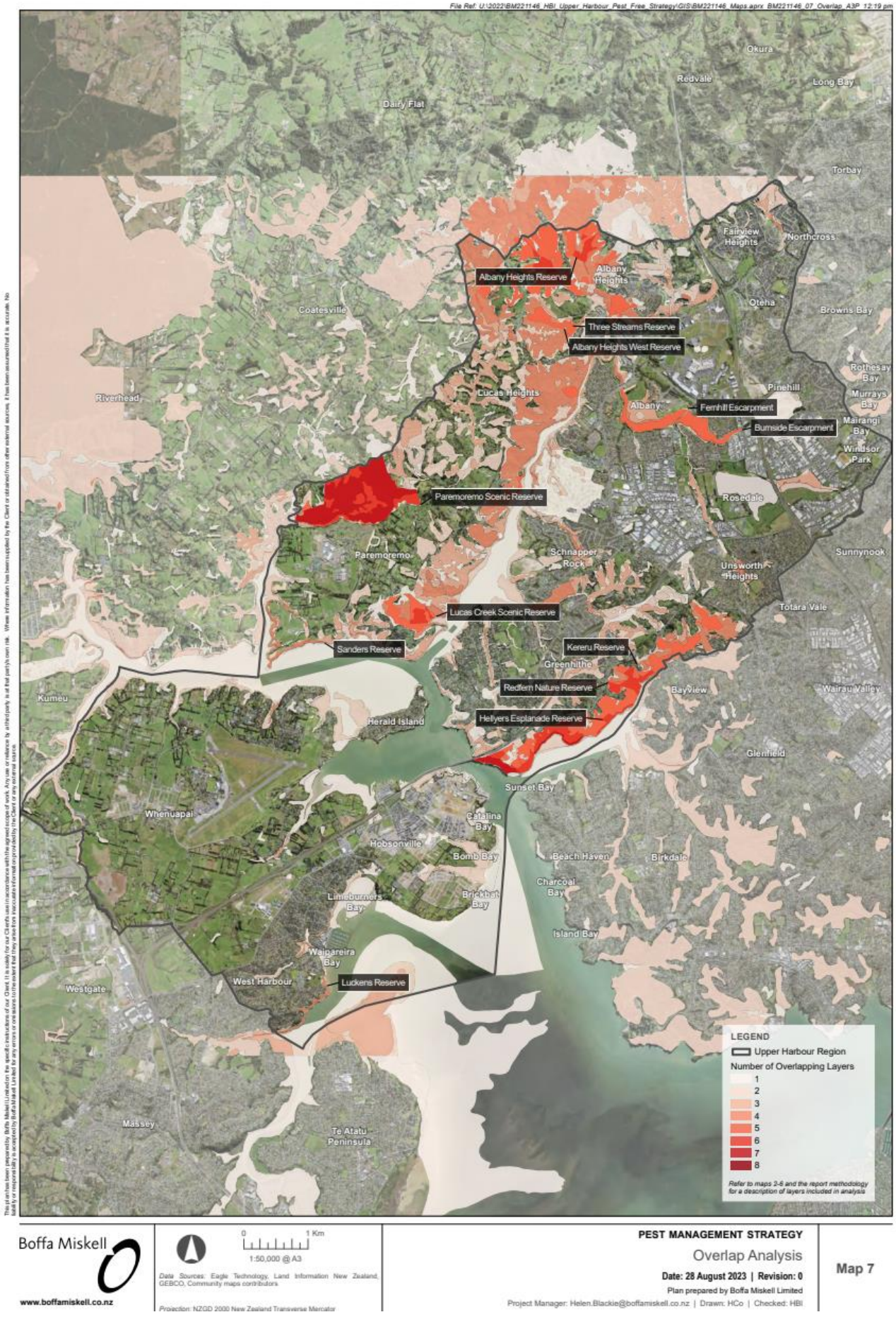
- How does the site fit into the wider context of the landscape?
- Is it an isolated fragment or does it provide an important linkage between other habitat patches?

Feasibility and defendabilty

- Does the site have barriers that make it more defendable against pest reinvasion (e.g. water boundaries)?
- What species could realistically be reduced to very low densities, if any?

Current control work

- Is current control occurring on the site? And if so, by whom (e.g. Council or community led)?
- Is there existing control infrastructure at the site (e.g. traps and bait stations)?
- Are local residents supportive of the work?
- Are there any funding opportunities for this site?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Okura
Redvale
Long Bay
Dairy Flat
Torbay
Fairview Heights
Northcross
Albany Heights Reserve
Albany Heights
Oteha
Browns Bay
Coatesville
Three Streams Reserve
Albany Heights West Reserve
Rothesay Bay
Pinehill
Murrays Bay
Riverhead
Lucas Heights
Albany
Fernhill Escarpment
Mairangi Bay
Burnside Escarpment
Windsor Park
Paremoremo Scenic Reserve
Rosedale
Paremoremo
Schnapper Rock
Sunnynook
Unsworth Heights
Totara Vale
Lucas Creek Scenic Reserve
Sanders Reserve
Kereru Reserve
Greenhithe
Redfern Nature Reserve
BayView
Wairau Valley
Kumeu
Herald Island
Hellyers Esplanade Reserve
Glenfield
Sunset Bay
Whenuapai
Catalina Bay
Hobsonville
Bomb Bay
Beach Haven
Birkdale
Charcoal Bay
Limeburners Bay
Brickhat Bay
Island Bay
Waipareira Bay
West Harbour
Luckens Reserve
Westgate
Massey
Te Atatu Peninsula
LEGEND
Upper Harbour Region
Number of Overlapping Layers
1
2
3
4
5
6
7
8
Refer to maps 3-6 and the report methodology for a description of layers included in analysis
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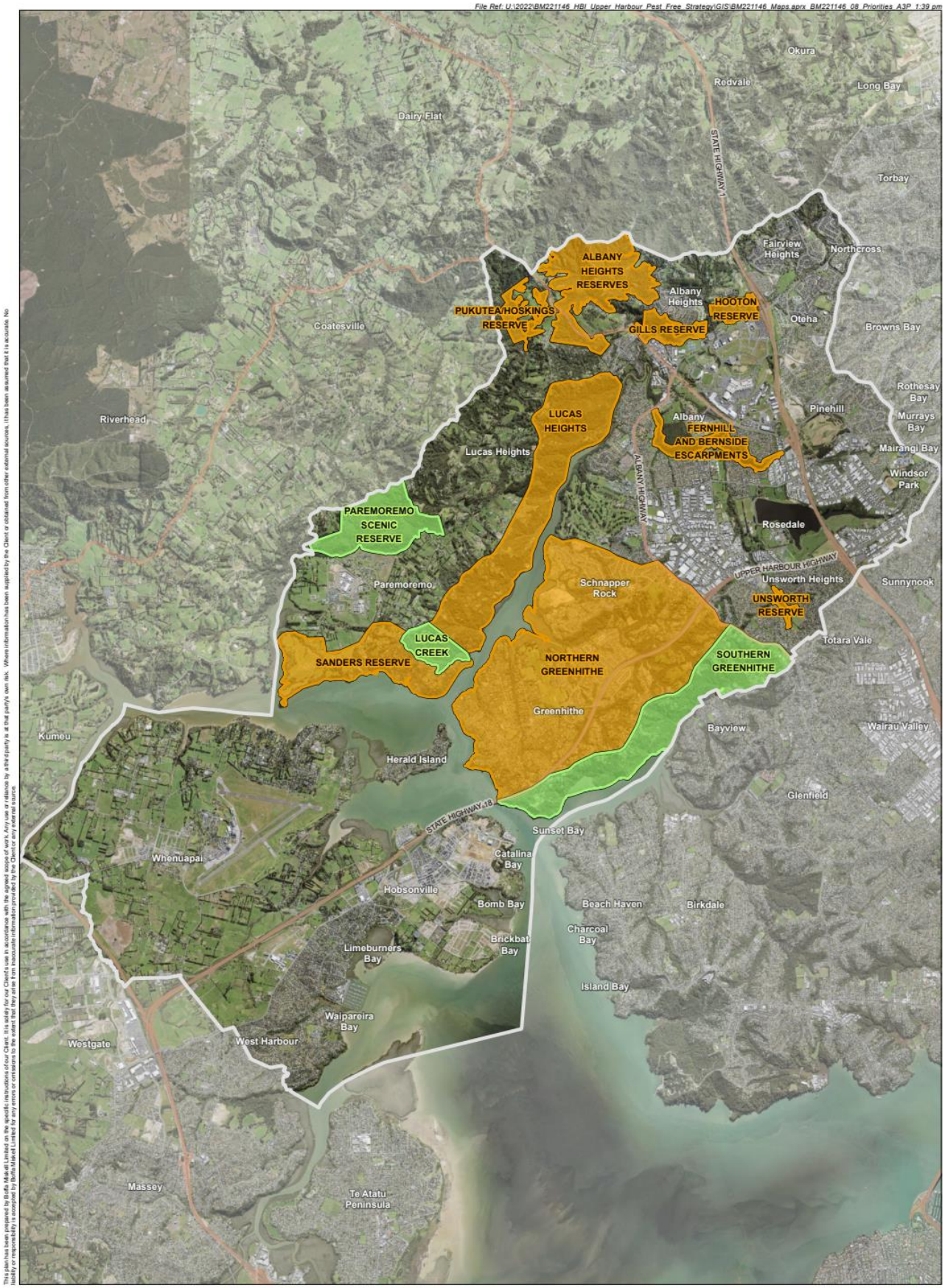
Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors
Projection: NZGD 2000 New Zealand Transverse Mercator
PEST MANAGEMENT STRATEGY
Overlap Analysis
Date: 28 August 2023 | Revision: 0
Plan prepared by Boffa Miskell Limited
Project Manager: Helen.Blackie@boffamiskell.co.nz | Drawn: HCo | Checked: HBl
Map 7


File Ref: U:\2022\BM221146_HBI_Upper_Harbour_Pest_Free_Strategy\GIS\BM221146_Maps.aprx BM221146_08_Priorities_A3P 1:39 pm
Okura
Redvale
Long Bay
Dairy Flat
STATE HIGHWAY 1
Torbay
Fairview Heights
Northcross
ALBANY HEIGHTS RESERVES
Albany Heights
HOOTON RESERVE
PUKUTEA/HOSKINGS RESERVE
GILLS RESERVE
Oteha
Browns Bay
Coatesville
Rothesay Bay
Pinehill
Murrays Bay
Riverhead
LUCAS HEIGHTS
Albany FERNHILL AND BERNSIDE ESCARPMENTS
Lucas Heights
Mairangi Bay
ALBANY HIGHWAY
Windsor Park
PAREMOREMO SCENIC RESERVE
Rosedale
UPPER HARBOUR HIGHWAY
Unsworth Heights
Sunnynook
Paremoremo
Schnapper Rock
UNSWORTH RESERVE
LUCAS CREEK
Totara Vale
SANDERS RESERVE
NORTHERN GREENHITHE
SOUTHERN GREENHITHE
Greenhithe
Bayview
Wairau Valley
Kumeu
Herald Island
Glenfield
STATE HIGHWAY 18
Sunset Bay
Whenuapai
Catalina Bay
Hobsonville
Bomb Bay
Beach Haven
Birkdale
Charcoal Bay
Brickbat Bay
Limeburners Bay
Island Bay
Waipareira Bay
Westgate
West Harbour
Massey
Te Atatu Peninsula
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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors
Projection: NZGD 2000 New Zealand Transverse Mercator
LEGEND
Upper Harbour Region
Recommended Pest Management Priority Areas
Priority 1
Priority 2
All other areas within the Upper Harbour Region are classed as Priority 3
UPPER HARBOUR PEST FREE STRATEGY
Recommended Priority Areas
Date: 28 August 2023 | Revision: 0
Plan prepared by Boffa Miskell Limited
Project Manager: Helen.Blackie@boffamiskell.co.nz | Drawn: HCo | Checked: HBl
Map 8

5. 6 Priority One Areas

Priority One Areas (POA's), as shown in Map 8, are generally sites where:

a) the likelihood of pest management success is high.

b) there are sufficient ecological values to provide for high biodiversity gain (i.e. a high return on investment).

c) Te Kawerau ā Maki have identified the area as a key site of importance.

Restoring these areas will also benefit Wai Roa ō Kahu / Upper Harbour's biodiversity across the landscape, as they form part of wider landscape initiatives (e.g. BFA's, areas identified in the connectivity analysis, or Wildlink wonders). Further details about these areas are provided below.

Southern Greenhithe

Greenhithe is a suburb on the eastern side of the Waitemata Harbour. It is split southwest to northeast by State Highway 18 and the parallel Upper Harbour Drive, with the Albany Highway running longitudinally on the eastern side. We will refer to the area south of Upper Harbour Drive and North of the harbour inlet as Greenhithe South.

The estuarine margin provides valuable habitat for coastal species, including mohu pererū, of which there were several sightings in Greenhithe during 2021 surveys. A large extent of the area is core habitat for pekapeka and kererū, whilst smaller coastal patches are core habitat for mohu pererū.

Most of Greenhithe between Upper Harbour Drive and the harbour has been designated as a Wildlink Wonder, whilst two coastal forest segments are Biodiversity Focus Areas. All of the area is a terrestrial Significant Ecological Area, and it borders marine Significant Ecological Areas. Several Cultural Heritage Inventory sites are located in Greenhithe South, most on the southwest peninsula, and it was identified by Te Kawerau ā Maki as a key site of cultural importance. Eight of the nine potential layers of significance overlap within this area.

There is already extensive pest plant and animal control occurring in the area, with several well-established groups branching from Greenhithe Community Trust. The trust has been working since 2018 and currently has a paid facilitator, as well as over 200 active members.

The combination of two motorways and the water boundary of the harbour, makes Greenhithe South (the extent south of Upper Harbour Drive), a more defendable area against pest animal reinvasion. These boundaries encompassing an area of high biodiversity make Greenhithe South an obvious Priority One Area in which low pest densities can be achieved/maintained. With extensive community pest management already occurring in Greenhithe, the site has a high chance of long-term protection/sustainability if these projects continue to grow.

Pāremoremo Scenic Reserve

Pāremoremo Scenic Reserve is a 102 hectare public reserve located in Pāremoremo, on the northwest boundary of Wai Roa ō Kahu / Upper Harbour. It is the largest forest/scrub vegetated reserve on the North Shore of Auckland, and a key site as identified by Te Kawerau ā Maki. Lifestyle blocks comprise most of the surrounding landscape, with forest fragments on the northeast side and a school to the south.

There are several key ecosystems within Pāremoremo Scenic Reserve which would benefit from low pest numbers. These include, WF12 “Kauri, podocarp, broadleaved, beech forest ecosystem” classified as Endangered, MF4 Kahikatea Forest ecosystem classified as critically endangered, and WL1 Māunka, gumland grass tree- Machaerina scrub and sedgeland ecosystem (WL1) both Critically Endangered.

The full extent of the reserve is a Biodiversity Focus Area, a terrestrial Significant Ecological Area, a Wildlink Wonder and represents Connectivity Core Habitat for kererū. It also provides potential bat habitat. Eight of nine layers of significance overlap in this reserve.

Pāremoremo Scenic Reserve has been chosen as a Priority One site because it contains a significant portion of Wai Roa ō Kahu / Upper Harbour’s remaining forest/scrub habitat, including threatened ecosystems, making it a valuable area to protect for native terrestrial fauna and flora. It is a key area of habitat in the North-West Wildlink and, if restored, ecological benefits are likely to reach beyond the reserve itself. Community action combined with Council contractor support will allow considerable ecological gains to be made in Pāremoremo Scenic Reserve. A challenge is that the site is not easy to defend, and therefore predator control programmes should include an intensive halo of perimeter control. Kauri dieback risk also needs to be assessed and addressed.

Lucas Creek

The Pāremoremo (Lucas Creek Bush) to Albany Heights pest control project was started in 2008 by Forest & Bird and Sustainable Pāremoremo. The project works directly with landowners to help control rats, possums and stoats on private properties (see Map 5 for current control infrastructure).

This programme now has over a hundred property owners signed up, many of whom are beginning to see an increase in birdlife, including tui, pukeko and fantails. One homeowner said her property “was eerily quiet before intensive pest control began and now it’s full of native birds, including kererū”.

Lucas Creek is the only DOC conservation area in Wai Roa ō Kahu / Upper Harbour, and an approach could be made to work with DOC on pest animal management. It is also a Wildlink wonder, Significant Ecological Area and overlaps with the Rail Trail. The Council already undertakes pest plant control at this site, and there are active community groups in the area (including Kristin School who undertake work in the reserve). The Significant Ecological Area along Lucas Creek was also identified as a key cultural site by Te Kawerau ā Maki. It is not easily defendable, however, it does have wider work undertaken in the immediate area which would act as a ‘buffer’ to safeguard gains.

5.7 Priority Two Areas

Priority Two areas (as shown on Map 8) are generally sites with several features that support successful, ongoing pest management but with one or more drawbacks. For example, a Priority Two site may have high ecological values and good accessibility, but poorly defendable boundaries and little current infrastructure. We recommend that Priority Two areas receive a lesser proportion of available community funding/resources than Priority 1 areas, but that protection of them is accounted for in all future Wai Roa ō Kahu / Upper Harbour pest control work.

Lucas Heights and Sanders Reserve

In addition to Lucas Creek, the stretch along the coast from Sanders Reserve in the south to the northernmost extent of the Lucas Heights suburb is recommended as Priority Two. This area is split by the Priority One area surrounding Lucas Creek Scenic Reserve. This stretch of land is coastal and therefore more easily defendable, with existing community work being carried out by Sustainable Pāremoremo with willing and involved landowners. The area is also highly ecologically valuable, being mostly covered by a Significant Ecological Area, connectivity habitat and identified as a Wildlink Wonder. While the size of the area is large, significant biodiversity gains are likely to be made with an increased intensity of pest control.

Northern Greenhithe

The area around Northern Greenhithe is Priority Two primarily because it is defendable with relatively good access. Importantly, it would provide an excellent buffer for Southern Greenhithe, and with the water boundaries it would be possible to look at a more ambitious pest control target for this area (such as elimination of possums). Although the area mostly comprises residential land, it has been assessed as important due to the reasonably even distribution of Biodiversity Focus Areas, Significant Ecological Areas, valuable habitat and reserves it holds, in addition, the area includes three streams with potential for inanga, as well as known moho pererū locations.

Albany Heights Reserve

This area includes Albany Heights Reserve and Albany Heights West Reserve. It contains a Significant Ecological Area with Biodiversity Focus Area adjacent (on the border of Upper Harbour), identified as a Wildlink Wonder and holds important connectivity habitats. Furthermore, it is identified as a key cultural site. Other Auckland Council reserves are also in proximity (Hosking, Gill, Hooton, Silver Moon). This site would, however, be more difficult to defend and support from neighbouring landowners would be key to success.

Hosking Reserve

This reserve contains a Significant Ecological Area, is a Wildlink Wonder, holds relevant connectivity habitat and is adjacent to other Auckland council reserves. Pest animal and pest plant control work is already occurring here through Auckland Council, as well as existing community work through the Hosking Reserve group.

Gills and Hooton Reserves

These reserves fall partially within the Wildlink Wonders. They are also Biodiversity Focus Areas and Significant Ecological Areas, and Auckland Council is undertaking work in the reserves to control some pest animals. However, the more suburban nature of this reserve is likely to make gains harder to maintain.

Fernhill and Bernside Escarpments

This priority area encompasses five connected Auckland Council reserves. Fernhill Escarpment is a high priority site for council, with pest animal control and pest plant control undertaken by contractors. The other four reserves within the recommended boundary are general priority for council led pest plant control

including Fernhill Escarpment Kanuka Reserve, Pigeonwood Reserve, and George Pannil Reserve. This area also holds potential Inanga sites, is a Significant Ecological Area and is a Wildlink Wonder.

Unsworth Reserve

This reserve has been included for its potential as an inanga breeding site (although this is to be confirmed). It is also a Significant Ecological Area and Biodiversity Focus Area, and an A Rocha community group is doing pest plant control work at the site. Auckland Council also delivers pest plant control once a year. However, the site is relatively small and closely surrounded by suburban areas

Table 4: Sites within Wai Roa ō Kahu / Upper Harbour, and their areas of significance, accessibility and existing pest management works at the time of writing. Green Y = Yes, yellow S = Some, red N = No.

Site	BFA	Wildlink Wonder	SEA	Rail Trail overlap	Existing community work	Existing council work	Highly defendable area	Accessible	Sig. areas of public land	Connectivity Strategy core habitats	Potential bat habitat	Potential inanga spawning sites
Pāremoremo scenic Reserve	Y	Y	Y	N	N (but halo project soon)	Y	N	N	Y	Y (kererū)	Y	N
Lucas Creek Scenic Reserve and Esplanade	N	Y	Y	Y	Y	S	N	Y	Y	Y (kererū, mohu pererū)	Y	N
Sanders Reserve	N	N	Y	Y	Y	Y	Y	Y	Y	Y (kererū, mohu pererū)	Y	N
Greenhithe SE of Upper Harbour Dr	Y	Y	Y	Y	Y	S	Y	S	S	Y (kererū, mohu pererū)	Y	N
Greenhithe NW of Upper Harbour Dr	N	N	Y	Y	Y	Y	S	S	S	Y (all 3, one tiny bittern patch)	S	Y
Hobsonville Point	S (small saline area)	N	Y	Y	Y	N	S	S	S	Y (all 3, not much for kererū)	S	N
Whenuapai	N	N	S	Y	Y	N	S	S	N	Y (all 3, very little for kererū)	S	N
Herald Island	N	N	Y	Y	Y	N	Y	Y	S	Y (mohu pererū)	S	N

Site	BFA	Wildlink Wonder	SEA	Rail Trail overlap	Existing community work	Existing council work	Highly defendable area	Accessible	Sig. areas of public land	Connectivity Strategy core habitats	Potential bat habitat	Potential inanga spawning sites
Fernhill / Burnside escarpment	N	Y	Y	Y	Y (Massey BioBlitz, Albany senior school)	Y	N	Y	Y	Y (all 3)	Y	Y
Hosking Reserve	N	Y	Y	N	Y (Forest and Bird Youth)	Y	N	S	Y	Y (kererū)	Y	N
Lady Phoenix reserve	N	N	Y	Y	N	Y	Y	S one track closed for Kauri dieback	Y	Y (kererū and mohu pererū)	Y	N (close-by but not in reserve)
Rosedale Park	N	N	Y	N	Y	N	Y (ponds + highways + urban)	Y	Y	Y (kererū and bittern)	Y	N?
West Harbour coast (incl. Luckens Reserve)	N	N	Y	Y	N	S (Pest plants)	S	S	Y	Y (all 3)	Y – but not high quality	Y but poor access
Albany Heights Reserve	N	Y	Y	N	N	S (Pest plants)	N	S	Y	Y	Y	N
Three Streams Scenic Reserve	N	Y	Y	N	N	Y	N	S E half closed for Kauri dieback	Y	Y	Y	N
Gills/Anaharta/ Oteha Valley/ Hooton Reserves	Y	Y	Y	N	N	Y	S (highway)	S W half of Gills closed for Kauri dieback	Y	Y (kererū and bittern)	Y	N
Unsworth Heights and Reserve	Y	N	Y	N	Y	S	N	Y	Y	Y (kererū and bittern)	Y	S

5. 8 Determining Specific Pest Animal Management Approaches

The first considerations when planning a pest animal management plan are as follows:

Current situation

Describe current circumstances within the site/ area of interest. Answer the following questions:

- Is the site under an existing pest management regime?
- If so, what is the current pest control infrastructure at the site? Who owns and operates this infrastructure?
- Who are the landowner/s? And what restrictions may be in place for pest management activities (e.g. can toxins be used? Are pets present and potentially at risk?)
- What are current levels of support for pest animal management activities? Are community groups active in the area? Are Department of Conservation or Auckland Council undertaking pest management activities?
- Where are likely corridors of reinvasion (e.g. nearby vegetated areas)? Can reinvasion be managed via more defendable boundaries (e.g. waterbodies for possums, urban areas for stoats), or can control work extend into potential corridors?
- What are the current pest densities of the site? Understanding the current densities of the target pests is important to:
    - Customise pest methods to best suit current pest densities (e.g. if there are high densities of particular pests, higher toxic baits and baiting frequencies are likely to be needed at the start of the project to achieve an initial knockdown).
    - Ensure the proposed pest management actions will have a positive benefit on biodiversity by focusing on achieving specific pest targets (e.g. possums maintained at less than 5% chew card index).
    - Facilitating adaptive management to achieve optimum biodiversity outcomes.
    - Enable groups/stakeholders to measure the impact of their pest control activities and respond to spikes in pest numbers.

Goals and objectives

Establish clear objectives of what you want to achieve in biodiversity protection. For example, what are the key biodiversity values of the site which need protection from predators (e.g. protection of, and population increases in mātuku-hurepo and mohu pererū) and use this to inform management approaches (e.g. target predators at key times of the year).

Outcomes

Choose explicit, measurable outcomes that can be achieved within a definite timeframe (e.g., 1 - 5 years).

- Use standardised, best-practice pest monitoring methods (e.g. chew cards, tracking tunnels or trail cameras) to measure pest control outcomes (trap catch should not be used as an estimate of pest population densities).

- Biodiversity monitoring (e.g. 5 minute bird counts, photo points, lizard surveys using tracking cards), can also be used to measure the success of pest control regimes.

Once the goal and objectives have been established and tested against site specific opportunities and constraints, a detailed implementation plan can be developed. This will include annual objectives and workplans, breaking down the work into stages and tasks, and set out in a project schedule.

Resources

What do you require to undertake activities to reach nominated objectives (e.g., additional traps, bait stations, monitoring equipment, labour etc). Identify where support from Auckland Council or other sources is needed (such as the provision of new control tools).

CHECKPOINT: Are the pest animal targets feasible and well understood? Are the necessary resources available? Do you have a good understanding of potential obstacles? What areas do you need help with to achieve goals?

The checkpoint analysis may be an iterative process of reviewing and re-prioritising the scope of work to match resource availability. Once this stage is complete, the next step is to determine how progress will be measured and assessed, and to schedule and assign tasks.

ANNUAL REVIEW: It is important that pest animal management is adaptive, with control and monitoring regimes updated as pest populations change, and new control tools emerge. An annual review of progress against project schedule should be undertaken to determine what worked and what didn't. Were objectives and resources well matched? Is the same level of resourcing available next year? How can learnings be shared with all stakeholders and wider community groups?

5.9 Proposed Management Framework

Table 5 sets out a high-level recommended management approach for each Priority Area (1-3), as well as potential targets and objectives. This management framework is intended as a guideline to assist community as they start planning their own initiatives. Ultimately, each Priority Area (and reserve/s within those areas) should have a site-specific management plan developed

Table 5: Summary of site characteristics and pest animal management approach for different management classes.

Priority area	Approach	Objectives	Examples of pest targets and thresholds
Priority One Areas			
Priority One Areas are sites in which a) the likelihood that pest management being successful is high, b) there are sufficient ecological values to provide for high biodiversity gain (i.e. a high return on investment) and c) they are key sites of cultural significance.	Priority for this management class is to suppress target pest animals intensively, aiming towards zero density. Community are encouraged to manage Priority One sites year-round and ongoing to protect native birds, invertebrates and lizards. Council staff roles that work directly with community and landowners, (e.g. Conservation Advisors and Community Park Rangers) can support with community development and review of project plans. Follow Council advice to protect healthy kauri trees and prevent the spread of kauri dieback.	• Develop site-specific management and operational plans. Including identification of target species depending on desired biodiversity outcomes and community capacity. • Establish pest monitoring protocols so that progress can be tracked over time. E.g., lines of chew cards (CCI) to estimate possum and rat abundance. Camera trap protocols1 to monitor mustelids and cat presence. • Permanent lines reused each year. • Four monitoring rounds per year in February, May, August, and November to track progress and inform management. • Deploy control tools to suppress target species, including rats, possums, mustelids and hedgehogs. Use a mix of toxins and traps if the area allows. • Reduce rat and possum numbers to less than 5% tracking while birds are on the nest until the chicks fledge. (early spring to late summer). • For coastline areas, run two parallel trapping lines set c. 50m apart, with traps capable of catching rats and hedgehogs. Possum traps can be set every 100m. Mustelid traps, one trap per 6 hectares. To intercept predator movement along the coast. • Rat trap every 50m along wetlands/estuary margins, and a possum and stoat trap every 100m. Make sure your traps aren't too near to the water and therefore in danger of being submerged.	Reduce possums to 5% chew-card index (CCI) year round. If CCI >10% implement targeted possum control (e.g. increase trap checks/rebaiting, investigate toxin use). To support bird breeding, reduce rats to <5% CCI (Sep – Feb), and <10% CCI for the reminder (Mar – Aug), for wider biodiversity gains. Set-up camera monitoring for mustelids (particularly stoats), and if detected, increase trap checks and lure changes. Aim to maintain mustelids at 0% density (i.e. if detected, initiate a response), particularly around coastal and wetland margins which hold especially vulnerable birds. Monitor for feral cats with support from Auckland Council. Use the Auckland Community Ecological Monitoring Guide to help select and plan monitoring methodology.

[1] See the Department of Conservation interim camera trapping protocol for guidance.

		• Over time, deploy perimeter traps/bait stations around Priority One Area's to reduce and address reinvading pests. Optimally control devices 25m apart, on 1-2 lines around the perimeter of high-value sites. • Traps checked, rebaited or cleared every fortnight (at a minimum), to ensure they are available for pests to enter, and lures remain attractive. More frequently at the start of the project or if numbers increase. Increase trap-check frequency during bird breeding season. • Use the Auckland Council Pest Animal Control Guidelines to help plan control methodology. • Encourage nearby landowners to keep pet cats at home and follow dog owners' rules as per the Auckland Council Policy on Dogs. • Community to work with Auckland Council staff to ensure dog access signage is up to date and record any areas where rules are not appropriate for assessment when the policy is reviewed. • Minimise reinvasion into Priority One Areas by maximising the use of waterways or busy roads. • Encourage participation from neighbouring urban areas, by encouraging residents to trap in their backyards. E.g., one rat and possum trap in every 3-4 gardens. • In areas where replanting, suppress possums and rabbits (if present) to ensure high plant survival.	

Priority area	Approach	Objectives	Examples of pest targets and thresholds
Priority Two Areas			
Priority Two areas (as shown on Map 7) are sites with several features that support successful, ongoing pest management but with one or more drawbacks	Priority for this management class is to suppress pests on a wider scale while also providing a 'buffer zone' around Priority One Areas. Priority two areas also focus on moving towards a 'Peninsula wide approach', particularly for the Greenhithe Peninsula. This peninsula is well suited to ambitious pest targets in the future (e.g. a pest or possum free Greenhithe would be an ambitious, but potential initiative), as the presence of water bodies on three sides will slow reinvasion. Possums are the easiest of the key pest species to remove and restrict reinvasion. Management in these areas should be year-round or, if resources are more limited, focused immediately prior to and during the bird breeding season (e.g. Sep – Feb). Community are encouraged to engage with landowners to include properties in "buffer zones" when developing site-based management plans with groups of adjacent landowners. Council staff roles that work directly with community and landowners, (e.g. Conservation Advisors and Community Park Rangers) can support community development and review of project plans.	• Develop site-specific management and operational plans. Including identification of target species depending on desired biodiversity outcomes and community capacity. • Establish pest monitoring protocols so that progress can be tracked over time. E.g., lines of chew cards to estimate possum and rat abundance. Camera trap protocols used to monitor mustelid and cat presence. • Two monitors per year, August (immediately prior to bird breeding), and December, to track progress and inform management practices. • Deploy tools to suppress pest species, including rats, possums, mustelids and hedgehogs. Identify areas where the use of toxins may be possible, or deploy a permanent trapping matrix. • Consider pulsing traps and/or bait stations if volunteer capacity is low. See the Auckland Council Pest Animal Control Guidelines for more detail on pulsing regimes. • Reduce rat and possum numbers in coastline, estuarine and forested areas while birds are on the nest until fledging. I.e. early spring to late summer. • Encourage participation from urban areas. E.g., one rat trap in every 4-5 gardens, one possum trap in every 10 gardens. • Minimise reinvasion by maximising the use of waterways or busy roads and establish 'perimeter' control devices around forested sites or potential movement corridors. • In forested ecosystems, aim for 1-2 rat traps per ha, one possum trap per ha and 1 mustelid trap per 6 ha.	To assist with successful bird breeding, reduce rats and possums to 5 – 10 % CCI (Sep – Jan) on public lands. Target inanga spawning sites for rat control from January to June, reduce rats to 5% CI within 50-100m of spawning sites. Set-up camera monitoring for mustelids (particularly stoats), and if detected increase trap baiting and checks. Also monitor for cat presence to determine whether cats are present and problematic. Talk with Auckland Council staff about whether control for unowned cats is possible or seek advice on advocating for responsible pet ownership. Longer-term, aim for zero-density of key pests (e.g. possums) from defendable areas such as the Greenhithe Peninsula. Use the Auckland Community Ecological Monitoring Guide to help select and plan monitoring methodology.

Priority area	Approach	Objectives	Examples of pest targets and thresholds
Priority Three Areas			
Priority three areas are all remaining areas within Wai Roa ō Kahu / Upper Harbour, many of which still have pest management occurring, but may not have high ecological values when compared to other sites. However, work in these sites is still valuable and should be continued and supported when possible.	Management for Priority Three sites should focus on establishing pest management activities over the longer-term. Community groups and landowners are encouraged to coordinate control efforts and consider the development of site-based management plans. Council staff roles that work directly with community and landowners, (e.g. Conservation Advisors and Community Park Rangers) can support community development and review of project plans.	• Develop management plans for sites as resources and time allow, focus on key species targeted for protection. • Establish pest monitoring protocols so that progress can be tracked over time. • Two monitors per year in August (immediately prior to bird breeding), and December, to track progress and inform management practices. • Wherever possible, use tools to suppress key pest species, including rats, possums, and mustelids. • Aim for 1-2 rat traps per ha, one possum trap per ha and 1 mustelid trap per 20 ha. • Encourage participation from urban areas, particularly those which are adjacent to areas of native habitat or known locations of key species under protection.	Work to establish specific pest targets based on the protection of selected native species (e.g. to suppress mustelids and rats in identified bird breeding sites). Use the Auckland Community Ecological Monitoring Guide to help select and plan monitoring methodology.

6.0 Wai Roa ō Kahu / Upper Harbour Pest Plant Management

6.1 Overview

Outside of Crown land and council-managed parkland, community-led initiatives are the backbone of ecosystem protection and restoration. Pest plant management is a key component of this work. However, pest plant species are resilient, fast-growing and opportunistic, so control work needs to be well planned and strategic to ensure results are enduring and achieve effective progress towards ecological restoration goals.

Pest plant management is typically divided into "site-led" and "pest plant-led" approaches. Broadly speaking, a site-led approach focuses on removing pest plants from a defined site. In contrast, a pest plant-led approach targets specific pest plant species wherever they may occur throughout the management area.

"Pest plant-led" management also includes awareness-raising about nominated pest plant species to highlight pest plant threats, and to encourage community support and participation in their control or eradication. Examples include community surveillance, removal of infestations from residential gardens, collection and disposal of pest plant flowers and fruits to reduce spread, etc.

6.2 Purpose

Community needs to be able to determine the most efficient, effective and ecologically beneficial approach to pest plant management within their project areas, based on the specific needs of the locality, appropriate land-manager or landowner approval and level of resource available.

The purpose of this plan is to provide a framework for community so they can:

- Identify appropriate and achievable goals and objectives for work in specific areas of interest.
- Decide on the suitable size and scope of work appropriate to a given site and/or group.
- Use it as a quick reference document to help guide decisions and stay on track.
- Document a pest plant management plan, including target goals, objectives and achievable actions aligned to these targets.
- Ensure there is an engagement element of the pest plant management plan to work towards collaboration with public landowner(s) or private landowner(s).

6.3 Approach

The first considerations when planning a pest plant management initiative are as follows:

Current situation

Describe current circumstances within the site/ area of interest. Answer the following questions:

- Why are there pest plant problems here? What will happen if you do nothing?
- Which pest plants have specific management requirements under the Regional Pest Management Plan?
- Will removing pest plants have any negative outcomes? For example, wholesale removal of vegetation can cause soil erosion; removing a weedy canopy can cause loss of stream shade which degrades in-stream habitat; some pest plants provide habitat for native fauna in the absence of native vegetation cover.
- What is the likelihood of the pest plant growing again from seed or fragments? How long does the pest plant take to mature and produce seed? Can the regrowth be managed?
- Where are the sources of reinvasion? Can reinvasion be managed?
- What conditions do the target pest plants require to grow, e.g., lots of light, little light, bare ground? Could revegetation effectively suppress reinfestation? Is that appropriate here?

Goal

What do you want to achieve, beyond "getting rid of pest plants"?

Objectives

Choose explicit, measurable outcomes that can be achieved within a definite timeframe (e.g., 5 years).

CHECKPOINT: Is pest plant control the right approach? Does the pest plant control objective need to sit within a wider restoration management plan to achieve your ultimate goal?

Once the goal and objectives have been established and tested against site specific opportunities and constraints, a detailed implementation plan can be developed. This will include:

Annual objectives and actions

Break down the work into stages and tasks and set out in a project schedule.

Resources

What activities and resources do you need to undertake to reach the nominated objectives (e.g., herbicide control, spray units, labour etc). Identify where support from Auckland Council or other sources is needed (pest plant disposal, signage, educational materials).

CHECKPOINT: Is the goal feasible with the resources available? Do we have a good understanding of potential obstacles? What areas do we need help with to achieve our goals?

The checkpoint analysis may be an iterative process of reviewing and re-prioritising the scope of work to match resource availability. Once this stage is complete, the next step is to determine how progress will be measured and assessed, and to schedule and assign tasks.

Action plan

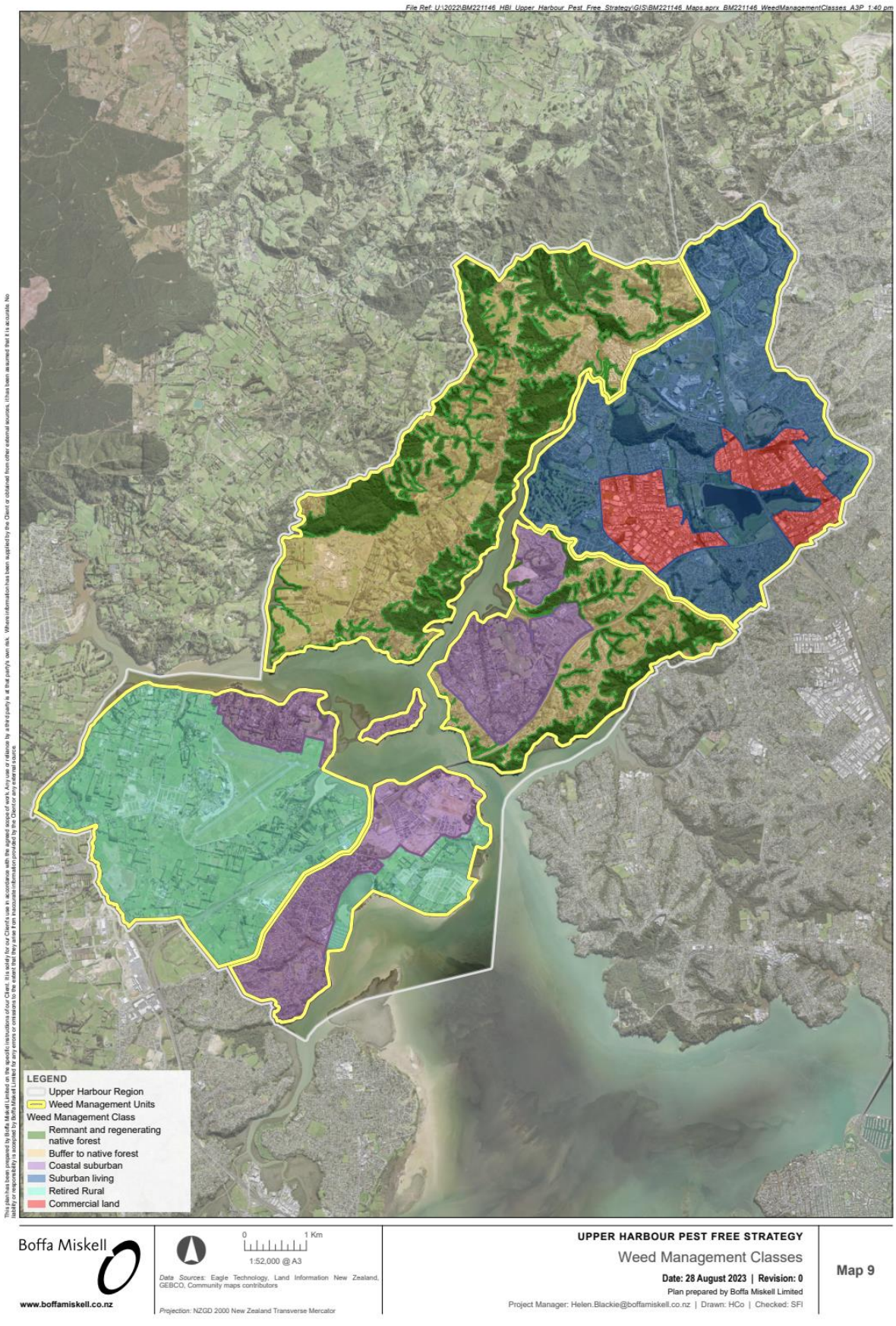
- Choose and plan monitoring methods (e.g., physically mark or geo-reference locations and/or boundaries of infestations at the commencement of each control season; establishing photo points may also be helpful).
- Choose performance indicators (outcomes that indicate efforts are successful) (e.g., infested areas have been reduced in size/ all new infestations within control area are treated/ no new infestations detected within control area/ etc.)
- List targets, actions, who will undertake the actions and when the actions will be undertaken.

ANNUAL REVIEW: Review progress against project schedule. What worked? What didn't? Were objectives and resources well matched? Is the same level of resourcing available next year?

6.4 Management Units and Classes

As a preliminary scoping exercise, this plan divides the Wai Roa ō Kahu / Upper Harbour management area into 6 management units (Maps 9 and 10) and identifies management classes within each management unit based on the broad characteristics of the area (land use, location and ecological features). The Regional Pest Management Plan has been considered in development of the Wai Roa ō Kahu / Upper Harbour Pest Management Strategy through framing of pest plant management advice. Table 6 below sets out a high-level summary of characteristics, management approach, targets and objectives identified for each management class.

The management framework set out in table 6 is intended as a guideline to assist community as they get started with planning their own initiatives, and as an illustration of how the approach to pest plant control is context dependent. The boundaries for management units and classes are approximate and can be modified and adapted to suit the practicalities of each project.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LEGEND
Upper Harbour Region
Weed Management Units
Weed Management Class
Remnant and regenerating native forest
Buffer to native forest
Coastal suburban
Suburban living
Retired Rural
Commercial land
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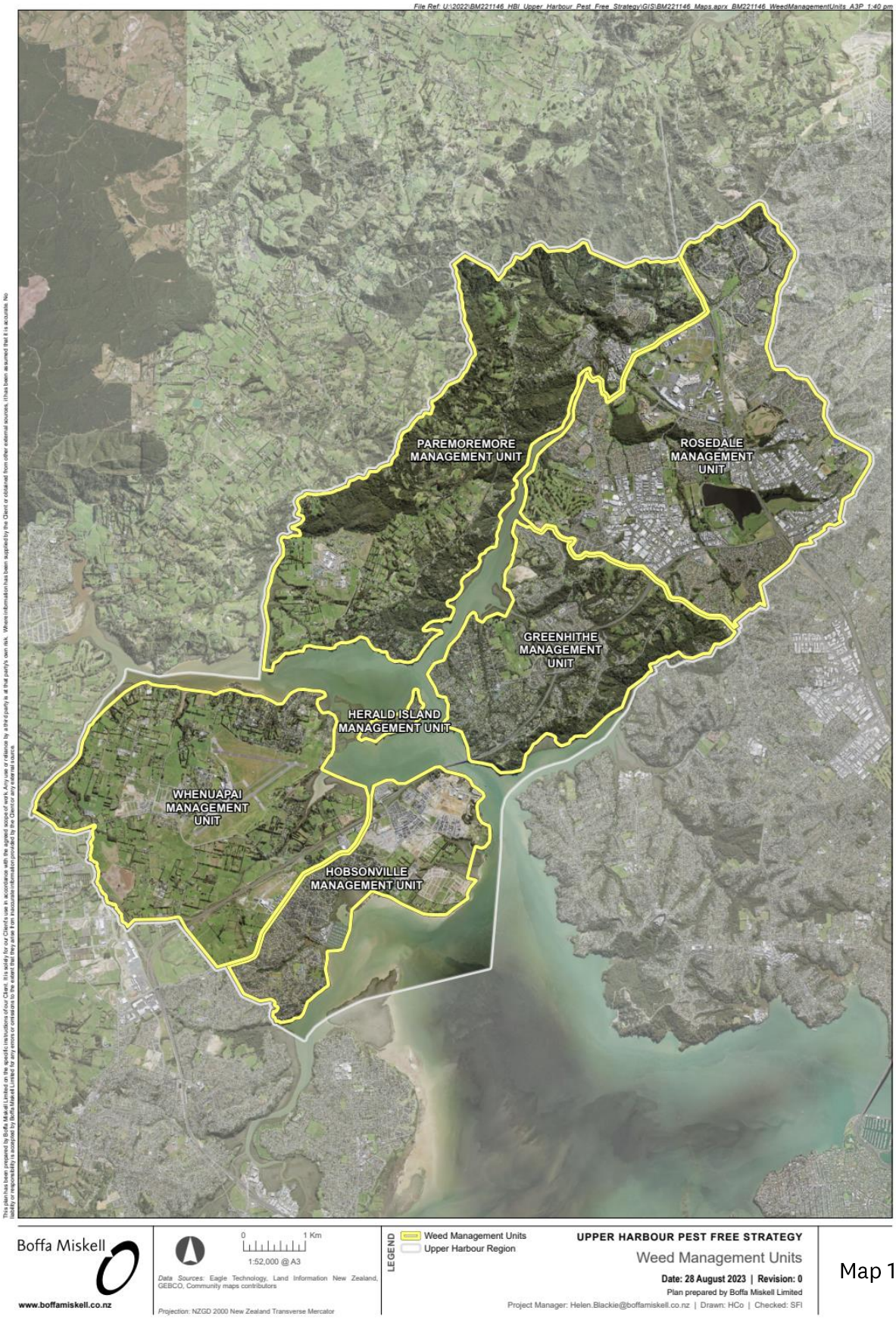
Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors
Projection: NZGD 2000 New Zealand Transverse Mercator
UPPER HARBOUR PEST FREE STRATEGY
Weed Management Classes
Date: 28 August 2023 | Revision: 0
Plan prepared by Boffa Miskell Limited
Project Manager: Helen.Blackie@boffamiskell.co.nz | Drawn: HCo | Checked: SFI
Map 9


File Ref: U:\2022\BM221146_HBI_Upper_Harbour_Pest_Free_Strategy\GIS\BM221146_Maps.aprx_BM221146_WeedManagementUnits_A3P 1:40 pm
PAREMOREMORE MANAGEMENT UNIT
ROSEDALE MANAGEMENT UNIT
GREENHITHE MANAGEMENT UNIT
HERALD ISLAND MANAGEMENT UNIT
WHENUAPAI MANAGEMENT UNIT
HOBSONVILLE MANAGEMENT UNIT
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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors
Projection: NZGD 2000 New Zealand Transverse Mercator
LEGEND
Weed Management Units
Upper Harbour Region
UPPER HARBOUR PEST FREE STRATEGY
Weed Management Units
Date: 28 August 2023 | Revision: 0
Plan prepared by Boffa Miskell Limited
Project Manager: Helen.Blackie@boffamiskell.co.nz | Drawn: HCo | Checked: SFI

Map 10

Table 6: Summary of site characteristics and pest plant management approach for different management classes.

Description	Approach	Objectives and targets	Examples of target species
Management Class: Remnant and regenerating native forest			
Large patches of native forest and scrub that extend across multiple private properties, as well as areas of reserve land (including BFAs). Vegetation types include: • mature kauri, podocarp, broadleaf forest remnants. • early successional and mature kānuka scrub and forest. • fire-induced manuka 'gumland' heath on depleted soils.	Priority for this management class is direct management of high biodiversity areas. Pest plant management within BFAs is encouraged to be prioritised in council reserves. Follow Council advice to protect healthy kauri trees and prevent the spread of kauri dieback	Objectives include: • Suppress species that invade closed forest environments (generally shade tolerant, bird dispersed species) and forest margins (e.g., climbers). • In scrub and heathland, also target 'ecosystem engineer' species that invade and dominate low stature/ early successional communities and alter successional pathways. • Minimise reinfestation across property boundaries into pest plant -managed areas. • Control targets: • Prevent pest plants from reaching reproductive maturity. • Remove pest plants that reproduce via vegetative fragments from high-disturbance areas (such as stream margins) to limit ongoing spread. • Prioritise removal of small outlier populations.	**Shade tolerant forest invaders** Brush cherry (*Syzygium* spp.) Privet (*Ligustrum lucidum, L. sinense*) Japanese spindle (*Euonymus japonicus*) Taiwan cherry (*Prunus campanulatus*) Wild ginger (*Hedychium* spp.) Tradescantia (*Tradescantia fluminensis*) **Forest edge smotherers** English ivy (*Hedera helix*) Climbing asparagus (*Asparagus scandens*) Blue morning glory (*Ipomoea indica*) Madeira vine (*Anredera cordifolia*) Moth plant (*Araujia sericifera*) Japanese honeysuckle (*Lonicera japonica*) Elaeagnus (*Elaeagnus x reflecta*) **Colonisers of open/ early successional habitats** Hakea (*Hakea sericea, H. salicifolia*) Coastal banksia (*Banksia integrifolia*) Pampas (*Cortaderia selloana, C. jubata*) Wattles (*Acacia* spp.) Wilding pine (*Pinus* spp.) Spanish heath (*Erica lusitanica*)

Description	Approach	Objectives and targets	Examples of target species
Management Class: Buffer to native forest			
Semi-rural countryside living, surrounding, and connecting large native forest patches. Pockets of higher density residential development. Most land in private ownership. Remnant native forest and scrub in riparian corridors, surrounded by grassland interspersed with shelterbelts and hedgerows.	Priority for this management class is maintenance of a buffer zone around high biodiversity areas. Liaise with landowners to include properties in "buffer zone" when developing site-based management plans with groups of adjacent landowners. Follow Council advice to protect healthy kauri trees and prevent the spread of kauri dieback	Objectives include: • Suppress species that invade closed forest environments (generally shade tolerant, bird dispersed species) and forest margins (e.g., climbers). • Minimise reinfestation across property boundaries into pest plant -managed areas. • Targets: • Prevent pest plants from reaching reproductive maturity. • Remove pest plants that reproduce via vegetative fragments from high-disturbance areas (such as stream margins) to limit ongoing spread.	***Shade tolerant forest invaders*** Brush cherry *(Syzygium* spp.*)* Privet *(Ligustrum lucidum, L. sinense)* Japanese spindle *(Euonymus japonicus)* Taiwan cherry *(Prunus campanulatus)* Wild ginger (*Hedychium* spp.) *Tradescantia (Tradescantia fluminensis)* ***Forest edge smotherers*** English ivy *(Hedera helix)* Climbing asparagus *(Asparagus scandens)* Blue morning glory *(Ipomoea indica)* Madeira vine *(Anredera cordifolia)* Moth plant *(Araujia sericifera)* Japanese honeysuckle *(Lonicera japonica)* *Elaeagnus (Elaeagnus x reflecta)*

Description	Approach	Objectives and targets	Examples of target species
Management Class: Coastal suburban			
Urban density residential communities adjoining coastal margins and associated green corridors, some of which are public esplanade reserves. Vegetation comprises remnant native forest and scrub, mainly confined to coastal and riparian margins. While many coastal habitats are degraded and pest plant infested, the coastal fringe provides an important ecotonal transition from terrestrial to intertidal habitat. Coastal and riparian communities are vulnerable to pest plant invasion by 'ecosystem engineer' species due to high rates of natural disturbance.	Pest plant infestations in degraded coastal habitats may be best managed as part of a wider restoration plan. Coastal sites are particularly susceptible to reinfestation, may be difficult to access safely, and native fauna such as moho-pererū (banded rail) may utilise these areas, so management needs to incorporate maintenance of habitat values. Follow Council advice to protect healthy kauri trees and prevent the spread of kauri dieback	Objectives include: • Site-led pest plant management to enable restoration of coastal fringe habitat. • Develop awareness-raising campaigns and signage to educate community residents about the values of nearby habitats and pest plant species that pose a threat. Targets: • Increased engagement and awareness of ecological values and conservation activities in the local community. • Reduce dominance and extent of 'ecosystem engineer' species that smother or change the structure of coastal habitat. • Infill plant open patches in vegetation cover to prevent opportunities for reinfestation and facilitate development of high-quality coastal habitat.	**Coastal invaders** Boneseed (*Osteospermum moniliferum)* Bear's breeches *(Acanthus mollis)* Pampas *(Cortaderia selloana, C. jubata)* Wattles (*Acacia* spp.) Wilding pine (*Pinus* spp.) English ivy *(Hedera helix)* Climbing asparagus *(Asparagus scandens)* German ivy *(Delairea odorata)* Privet *(Ligustrum lucidum, L. sinense)* Jasmine *(Jasminum polyanthum)* Evergreen buckthorn *(Rhamnus alaternus)* *Elaeagnus (Elaeagnus x reflecta)*

Description	Approach	Objectives and targets	Examples of target species
Management Class: Retired rural			
Rural land that has been retired from production but is largely undeveloped. Vegetation mainly comprises unmanaged rank grassland interspersed with shelterbelts and hedgerows. Minimal remnant native vegetation.	Liaise with landowners to promote responsible management of infestations on unoccupied land. In some circumstances the RPMP 'Good Neighbour Rule' may apply where pest plant control is being undertaken on adjacent properties or esplanade reserves. Auckland Council Regional Management Plan link: aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/topic-based-plans-strategies/environmental-plans-strategies/docsregionalpestmanagementstrategy/auckland-regional-pest-management-plan-2020-2030.pdf	Objectives include: • Landowners are contacted and provided with advice and support to improve responsible land management practice. Targets: • Reduce dominance and extent of species that seed prolifically and disperse widely and can quickly establish in large swathes. • Contain and reduce potential weed infestation 'sources' in the vicinity of higher value habitats (e.g., coastal, riparian).	***Large infestations*** Pampas *(Cortaderia selloana, C. jubata)* Climbing asparagus *(Asparagus scandens)* Privet *(Ligustrum lucidum, L. sinense)* Wild kiwifruit *(Actinidia* spp.*)* Woolly nightshade *(Solanum mauritianum)* Japanese honeysuckle *(Lonicera japonica)*
Management Class: Suburban living			
Urban density residential communities. High proportion of landcover in residential land use, natural areas are mainly in riparian corridors.	Community-led awareness-raising campaigns to educate residents about the values of nearby habitats and pest plant species that pose a threat.	Objectives include: • Develop community surveillance and support networks to provide pest plant management education, advice, and resources to residents. Targets: • Increased engagement and awareness of ecological values and conservation activities in the local community. • Reduce prevalence of species that disperse widely (e.g., via wind/ riparian corridors). • Contain and reduce potential pest plant infestation 'sources' in the vicinity of higher value habitats (e.g., coastal, riparian).	Brush cherry *(Syzygium* spp.*)* Privet *(Ligustrum lucidum, L. sinense)* Wild ginger (*Hedychium* spp.) *Tradescantia (Tradescantia fluminensis)* English ivy *(Hedera helix)* Climbing asparagus *(Asparagus scandens)* Moth plant *(Araujia sericifera)* Japanese honeysuckle *(Lonicera japonica)*

Description	Approach	Objectives and targets	Examples of target species
Management Class: Commercial			
Light commercial development with minimal green space. Pest plant infestations may establish on boundary fences, unmanaged amenity areas, and neglected riparian corridors adjoining commercial property where access is difficult.	Engage with commercial landowners/ occupiers (with Council support if appropriate) to raise awareness and request that pest plant control be undertaken as part of general site maintenance.	Objectives include: • Incorporate commercial landowners/ occupiers into community surveillance and support networks to promote pest plant management related education and advice. Targets: • Increased engagement and awareness of ecological values and conservation activities in the local community. • Reduce prevalence of species that disperse widely (e.g., via wind/ riparian corridors). • Contain and reduce potential pest plant infestation 'sources' in the vicinity of higher value habitats (e.g., coastal, riparian).	***Boundary fence climbers*** Moth plant *(Araujia sericifera)* English ivy *(Hedera helix)* Climbing asparagus *(Asparagus scandens)* ***Neglected garden invaders*** Woolly nightshade *(Solanum mauritianum)* Pampas *(Cortaderia selloana)* Privet *(Ligustrum lucidum, L. sinense)* ***Riparian Pest Plants*** Wild ginger (*Hedychium* spp.) *Tradescantia (Tradescantia fluminensis)*

7.0 Creating a Sustainable Future

7.1 Community Engagement and Recruitment

A growing, engaged, and activated community is needed to deliver the aims of the Wai Roa ō Kahu / Upper Harbour Pest Management Strategy. Whilst opportunities for new projects are exciting and can make significant contributions to the cause, they also require more hands to do the work. Community groups commonly suffer from issues such as:

- Lack of succession planning; key group members leave and take with them knowledge/skills that have not been shared with the next cohort of leaders.
- Diminishing member numbers.
- Minimal ability to engage with a range of ethnicities.

Communities remain engaged if they can see results. Prioritising pest management projects in easily accessible public areas yield results that speak for themselves.

Massey University and schools within Wai Roa ō Kahu / Upper Harbour are vital stakeholders who can help to assist with longer-term sustainability. There are already excellent initiatives occurring, such as the BioBlitz conducted by Massey University each year, which is a great initiative for increasing public awareness and interest in their backyard whilst collecting data simultaneously. Involving children in protecting and enhancing their local environment is an invaluable tool for future-proofing conservation efforts and driving long-term cultural shifts.

Groups within Wai Roa ō Kahu / Upper Harbour also need to consider how to appeal to a changing social demographic and strive for an inclusive approach towards conservation practices and education. E.g. working with a full demographic of community leaders can help to engage with new audiences.

7.2 Funding

A critical component of ensuring sustainability of restoration programmes within Wai Roa ō Kahu / Upper Harbour is to have a thorough understanding of where potential funding may be sourced. Every fund has different focus areas and priorities, and applications should be tailored to each grant's priorities. Some may focus on mana whenua led projects, new technology or ecological outcomes, and some support administration of groups, strategic planning and or wages for leaders. Grants may require funds to be matched or sourced from multiple funders. To secure funding in the future, it is recommended that community groups focus on some key aspects of work which will increase the chances of these funding scenarios being successful. These may include (depending on the fund):

- Breaking down a project into areas or phases help to identify realistic funding goals and opportunities. It is important to specify if the application is part of a bigger project and how that will be resourced (e.g. the creation of the Priority One areas could be one such standalone project).
- Maintaining clear objectives and milestones, which clearly link to strategic and operational plans so these can be used in obtaining grants. Focus on measurable outcomes, so the success of funding can be monitored.
- Actively engaging the wider community and co-designing the project with mana whenua; as well as linking with other restoration projects.

- It is important to remain focused on achieving key priorities (such as protection of priority areas), so that continued benefits occur despite potential changes in available funds/resources between years.

Every grant (including Auckland Council and external) has different priorities and it is important to understand and align to these when writing an application. E.g., a particular grant application could be focused on innovative technologies, strategies and tools to reach goals (such as the trialling of new pest control and monitoring systems), while others may avoid new technologies based on risk.

7.3 Reporting and Review of Pest Animal and Pest Plant Management Data

It is important that community conservation projects enter their control data (for pest animals, including both trapping and toxic control), as well as all monitoring data, into a data management system. TrapNZ is a recommended platform for pest animal control, and is widely used by community groups across New Zealand. The program is user friendly, and can record spatial distribution of traps and catches.

Community undertaking pest control should record all trapping data on a shared system. This will enable consistency and accessible information that reflects the outcomes and success of the project. All participants will need an account and to be upskilled on how to enter data.

Each trap check, should be accurate and include the following information at a minimum:

- Date of trap servicing & time taken to complete trap/bait station servicing.
- Name of the trap servicer.
- Device location, unique identifier, model type and model name.
- Lure type and whether the lure was refreshed.
- Whether the trap has been triggered (trap status).
- Trap catch (species); and if possible/relevant: sex and age of individual, number of individuals, or record trap catch as zero if nothing is caught.
- Bait type and quantity deployed (for bait stations).
- General comments (e.g. if trap needs fixing or replacing, if bait is gone).

Maintaining accurate and precise records of both pest animal control and pest animal monitoring is important to evaluate the success of predator control at each site. Spatial and temporal trends in pest populations and catch rates can be identified in the analysis of this data, which will inform future pest management decisions and actions.

Production of an annual pest animal management report by community groups is beneficial, with results shared and disseminated to encourage joint learnings. This could include a summary of all pest control (animal and plant) activities undertaken within the area in the preceding 12 months, detailing dates, and methods of each control activity:

- Maps of control devices/area, labelled by type.
- Summaries of trap catch statistics by species (both target and any non-target catch), including by trap type, trap location, lure type as well as monitoring results of rats, possums, and mustelids, with comparison to management targets and thresholds for additional control.
- Summaries of results of toxic control operations, including target species, bait type and bait take.

- Any trends in the data, such as high-catch/high bait-take locations, the main species caught and comparisons to previous years.
- Any challenges/issues encountered in undertaking control or monitoring, and how these difficulties were overcome or if they remain ongoing.

Pest plant management monitoring

As identified in Section 6, monitoring methods to assess pest plant control progress should be incorporated into pest plant management plans, and a well-defined, repeatable monitoring framework should be established prior to commencement of work so there is a clear baseline to assess progress against.

The specific monitoring method used will depend on the nature of the pest plant infestation. For example, the boundaries of large pest plant patches can be marked out with waratah fence posts and monitored with photo points. Sparse, scattered infestations throughout a patch of native vegetation can be monitored by counting observations within a specified distance (e.g., 5 m either side) along a set number of 50 m transects. Performance indicators should be measurable and repeatable, and the methods must be able to detect trends across the management area (for example, a single monitoring plot is not a good method for detecting changes in the population with a sparse, patchy distribution).

7.4 Incorporating New Tools/Methods

Pest control tools, technologies, and methods are evolving at a rapid rate, with many new tools coming onto the market. These new tools will greatly enhance the efficiency of predator control regimes for community-led conservation initiatives. It is recomended that a review of emerging pest management tools and technology be undertaken annually, and shared amongst all groups and stakeholders.

Any new tools should be incorporated into the following years' pest management practice if suitable.

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Upper Harbour Local Board
Auckland Council