Absolutely Positively
Wellington City Council
Me Heke Ki Pōneke

4 July 2025

File Ref: IRC-8569

7(2)(a)

Tēnā koe 7(2)(a)

Thank you for your email dated 5 June 2025 to Te Kaunihera o Pōneke | Wellington City Council (the Council). Your request has been considered under the Local Government Official Information and Meetings Act 1987 (LGOIMA).

1. ***Any documentation, reports, meeting minutes, correspondence or internal briefings that informed or justified the decision to not pursue containment or eradication of Darwin's Barberry in Te Kopahou, Wrights Hill, or Polhill Gully.***

Decisions were made through staff knowledge of weed control theory and experience at an operational level. The Council does not hold documents, reports, minutes, correspondence or internal briefings specific to the decision to not pursue containment or eradication of Darwin's Barberry. This part of your request has been refused under section 17(e) of the Act that the document alleged to contain the information requested does not exist.

2. ***Any ecological assessments or vegetation surveys since 2010 that record or discuss the extent and impact of Darwin's barberry in these locations.***

Please see items below for reports and assessment of Darwin's Barberry.

Item	Document Name	Decision
1.	Polhill Gully George Denton Park Wildlands Ecological Management Plan 2010	Release with redactions under section 7(2)(a)
2.	Wrights Hill Reserve Wildlands Ecological Management Plan 2010	Release with redactions under section 7(2)(a)
3.	WCC SNA Botanical Ground-truthing of Wellington South Coast 2021-22	Release with redactions under section 7(2)(a)
4.	2019 August - Audit	Release
5.	2022 June - Audit	Release

3. ***Copies of work orders, operational plans, or contractor instructions addressing barberry—whether for monitoring, removal, or intentional omission from weed control efforts.***

The Council has accumulated up to 11 years of data on monitoring, removal, and weed control efforts. Due to the age of these documents and the various systems used over time, collating this information will be time-consuming and may divert officers from their daily duties. Below is an example of the type of information we hold. To assist us in fulfilling your

request, please specify the exact information you need, such as a particular document or a narrower time period. If the request cannot be refined, then the Council will need to refuse this part of the request under section 17(f) of the Act that the information requested cannot be made available without substantial collation or research.

Work orders and contractor instructions are given as geographic information system files, and operational maps. These are based on the areas of known infestations and historic contractor information.

Below are some examples of what is given annually to contractors.

Explanation of Item 7: Ops Map 24 September 2020.
This is an example of a combined work order in 2020. An explanation of how this should be interpreted is as follows:

a. Where contractors should go e.g. DB_1.
b. Where contractors have been e.g. NZBSL_tracks_19_20.
c. Where contractors have controlled Darwin's barberry e.g. 19 20 controlled points.

Instructions are that contractors revisit previous points and expand out into new areas as budget allows.

Below are copies in response to question 3

Item	Document Name	Decision
6.	Research Permit Application	Release with redactions under section 7(2)(a)
7.	Ops Map 24 September 2020	Release
8.	Ops Map 30 September 2021	Release
9.	Ops Map 2017	Release

4. ***Any evaluation by the Council of the role native birds play in propagating barberry into reserves, and what mitigation responses, if any, have been considered.***

The Council has not undertaken any evaluations on birds propagating Darwin's Barberry. No mitigation responses have been considered. This part of your request has been refused under section 17(e) of the Act that the document alleged to contain the information requested does not exist.

The Council does undertake Bird Monitoring across the city. There was an anecdotal reference to Darwin's barberry in the 2016 report. "In 2012, for instance relatively high numbers of tui encountered at bird count stations in southern and western parts of the city appeared to be linked to the prolific fruiting of Darwin's barberry (Berberis darwinii) at the time (McArthur et al, 2013a)." This report can be found online - Data, monitoring and reporting - Environment - Wellington City Council.

5. ***An outline of the current prioritisation methodology used by Council in pest plant management, particularly how decisions are made to resource mammal eradication over invasive flora.***

Animal Pest Control and Ecosystem Weed Control receive equivalent funding of approximately $1m each. Both programmes of work have one full time FTE managing the respective programmes. While the funding allocations may have small variations year on year based on need and opportunities for partnership, collaboration or community requests, they are largely directed by previous Council decisions. For example, when Council decided to support Predator Free Wellington and community trapping, the funding for pest animals was increased to match that requirement, and that funding is set under that decision and funding agreement.

The Pest Animal Control Programme includes:

- WCC Predator Free Wellington contribution.
- The possum control programme delivered by Greater Wellington Regional Council (GWRC).
- The provision of traps, consumables and training for all community trapping across the reserve network.
- The hunting services for goats, pigs and deer.
- The control of rabbits.
- WCC Capital Kiwi contribution.
- Monitoring/tracking of pest animals.
- Cat management in collaboration with Public Health.

The impact and visibility of animal control efforts appear larger than the weed control space due to community participation, GWRC contribution, cost recovery programmes and national/philanthropic funding that support initiatives such as Predator Free Wellington.

A few years ago, we received increases to weed control funding which has allowed us to increase our level of service by using contractors and operations staff. The increased funding-built community weed control support and training programmes.

6. ***Any correspondence or memoranda of understanding with Forest & Bird or similar partners that relate to pest management prioritisation.***

There is a standard Memorandum of Understanding (MOU) with Forest and Bird and similar partners and community groups. The MOU is to recognise the partnership between the parties involved by clarifying the commitments, roles and responsibilities held. The MOU focuses on ensuring the Council supports our partners on habitat restoration, weed and animal pest control and protection of flora and fauna on project sites.

The MOU and correspondence with our partners do not specify pest management prioritisation. This part of your request has been refused under section 17(e) of the Act that the document alleged to contain the information requested does not exist or despite reasonable efforts to locate it cannot be found.

We can advise that the Council Rangers & Specialists will look at an area, identify what is there, and let partners know what would make the most impact. Community groups will determine their own course of action to take and in some cases the Council may provide tools and training to help.

7. ***Clear confirmation of whether any funded control or eradication efforts are planned for Darwin's barberry in the above reserves—and if so, when they will commence.***

Eradication is not a goal for the Council's weed control programme because of the prohibitive costs. There will be no funded control or eradication in Wrights Hill and Waimapihi.

In Te Kopahou, Darwin's barberry control is targeted to protect rare habitats such as the only significant area of *Dracophyllum filifolium* in the city. Containment occurs in some southern catchments where there are a very small number of individuals plants. Successful control at these sites has meant that the areas will next be revisited in 2027.

Some information has been redacted under section 7(2)(a) of the Act, to protect the privacy of the natural persons. As per section 7(1) of the LGOIMA, I do not consider that in the circumstances of this response, the withholding of this information is outweighed by the other considerations which render it desirable to in the public interest to make the information available.

Please note, we may proactively release our response to your request with your personal information removed.

You have the right, by way of complaint under section 28(1) of the LGOIMA, to request an investigation and review of the Council's decision by the Ombudsman. Information about how to make a complaint is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

If you require further information, please contact official.information@wcc.govt.nz.

Nāku noa, nā

Asha Harry
Official Information & Privacy
Wellington City Council

WEED CONTROL AND RESTORATION PLANTING IN POLHILL GULLY RESERVE AND GEORGE DENTON PARK, WELLINGTON CITY

OCTOBER 2010

Contract Report No. 2447d

Prepared for:

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CONTENTS

PROJECT TEAM

7(2)(a) - Site visit, report preparation.
7(2)(a) Report review.
7(2)(a)

Reviewed and approved for release by:

7(2)(a)

7(2)(a)
Director/Principal Ecologist
Wildland Consultants Ltd

1. INTRODUCTION

Wellington City Council (WCC) requires advice on the management of Polhill Gully Reserve and George Denton Park (including Waimapihi Reserve and Panorama Heights Reserve; hereafter referred to as 'Polhill Gully Reserve and George Denton Park' or 'the reserve'), in the form of advisory notes. The reserve covers 75 ha in two north-facing gullies containing the headwaters of the Waimapihi (Aro) Stream, in Aro Valley, Wellington. The reserve is contiguous with the Karori Sanctuary, forming "one of the largest expanses of indigenous vegetation in the Outer Green Belt and a major ecological hub for this part of the city" (WCC, 2003). The remaining reserve boundaries abut the suburban areas of Aro Valley, Mitchelltown, and Brooklyn. The reserve has been the subject of vegetation restoration work by WCC, and on an ad hoc basis by community groups for at least twenty years, particularly around access points and riparian areas.

The reserve is popular with local residents for walking and mountain-biking, and a network of tracks allows access from Aro Street, Holloway Road, Mount Pleasant Road, and Ashton Fitchett Drive. New tracks are currently being constructed, primarily for the use of mountain-bikers. These are scheduled for completion by the end of 2010 (WCC 2010).

The site was visited on 28 July 2010. This report outlines the ecological values of Polhill Gully Reserve and George Denton Park, and provides an outline of requirements for weed management and restoration planting. Management requirements, and a work programme and schedule, are provided.

2. ECOLOGICAL VALUES AND MANAGEMENT ISSUES

In order to set priorities for restoration efforts across all Wellington City Council Reserves, it is important to understand the ecological processes and values within the areas of interest. This section outlines the values of Polhill Gully Reserve and George Denton Park and describes the habitats and vegetation types present.

Polhill Gully Reserve and George Denton Park comprise approximately 75 ha of secondary indigenous forest. This includes *c*.4 ha of rewarewa (*Knightia excelsa*) and exotic conifer-dominated forest separated from the main part of the reserve by Aro Road. The secondary forest established after historical heavy grazing. The canopy is dominated largely by mahoe (*Melicytus ramiflorus* subsp. *ramiflorus*), although tawa (*Beilschmiedia tawa*), titoki (*Alectryon excelsus* subsp. *excelsus*), and rewarewa are also evident. The vegetation in more exposed parts of the reserve comprises exotic conifers (*Pinus* spp.) and mahoe-gorse (*Ulex europaeus*)-Darwin's barberry (*Berberis darwinii*) scrub. The Reserve provides indigenous vegetation cover for the headwaters of Waimapihi (Aro) Stream (NIWA 2007).

The reserve has ecological features and values that are regarded as important in Wellington City. These are listed below:

- Includes a primary forest remnant (Park 1999);
- Conservation site 3c in the WCC District Plan;

- Partially buffered by indigenous vegetation;
- Riparian areas are primarily indigenous vegetation;
- The area contains and protects multiple streams[1].

The area is also contiguous with the Karori Wildlife Sanctuary, buffering it and forming part of an extended foraging habitat for its high conservation value bird species.

The main management issues for Polhill Gully Reserve and George Denton Park are similar to other forest reserves in Wellington City, and include pest animals, existing and potential pest plants, stream water quality, and development pressure on adjoining land. The reserve has adequate legal protection, but the indigenous vegetation on some adjacent properties is not legally protected. This adjoining vegetation provides an important buffering function to the reserve, and the overall health of the reserve could be detrimentally affected if this buffering vegetation was to be removed. The advisory notes in this report address all of these issues.

3. VEGETATION AND HABITATS

3.1 Overview

Three main habitat types have been identified: forest, riparian vegetation, and exposed sites. Within these habitats, eight broad vegetation types are described, based on vegetation structure and composition, underlying landforms, and weed management issues. Habitats and vegetation types are mapped in Figure 1, with descriptions of all types provided below. A species list is provided in Appendix 1.

3.2 Forest habitats

Mahoe Forest (51.4 ha)

Regenerating mahoe-dominated forest to *c*.6 m tall (Plates 1 & 2), with a range of other common species in the canopy, such as tawa, titoki, rewarewa, mapou (*Myrsine australis*), kohekohe (*Dysoxylum spectabile*), porokaiwhiri (pigeonwood, *Hedycarya arborea*), tarata (lemonwood, *Pittosporum eugeniodes*), and whauwhaupaku (fivefinger, *Pseudopanax arboreus*). Other species present in the understory include nikau (*Rhopalostylis sapida*), ngaio (*Myoporum laetum*), manuka (*Leptospermum scoparium*), kanuka (*Kunzea ericoides*), rangiora (*Brachyglottis repanda*), and karamu (*Coprosma robusta*). Pohuehue (*Muehlenbeckia australis*), karaeo (supplejack, *Ripogonum scandens*) and bush lawyer (*Rubus* spp.) are present as lianes. Gorse, Darwin's barberry, and tree lucerne (*Chamaecytisus palmensis*) are scattered throughout.

[1] Streams are listed as one of Wellington's threatened ecosystems (Wellington City Council 2007).

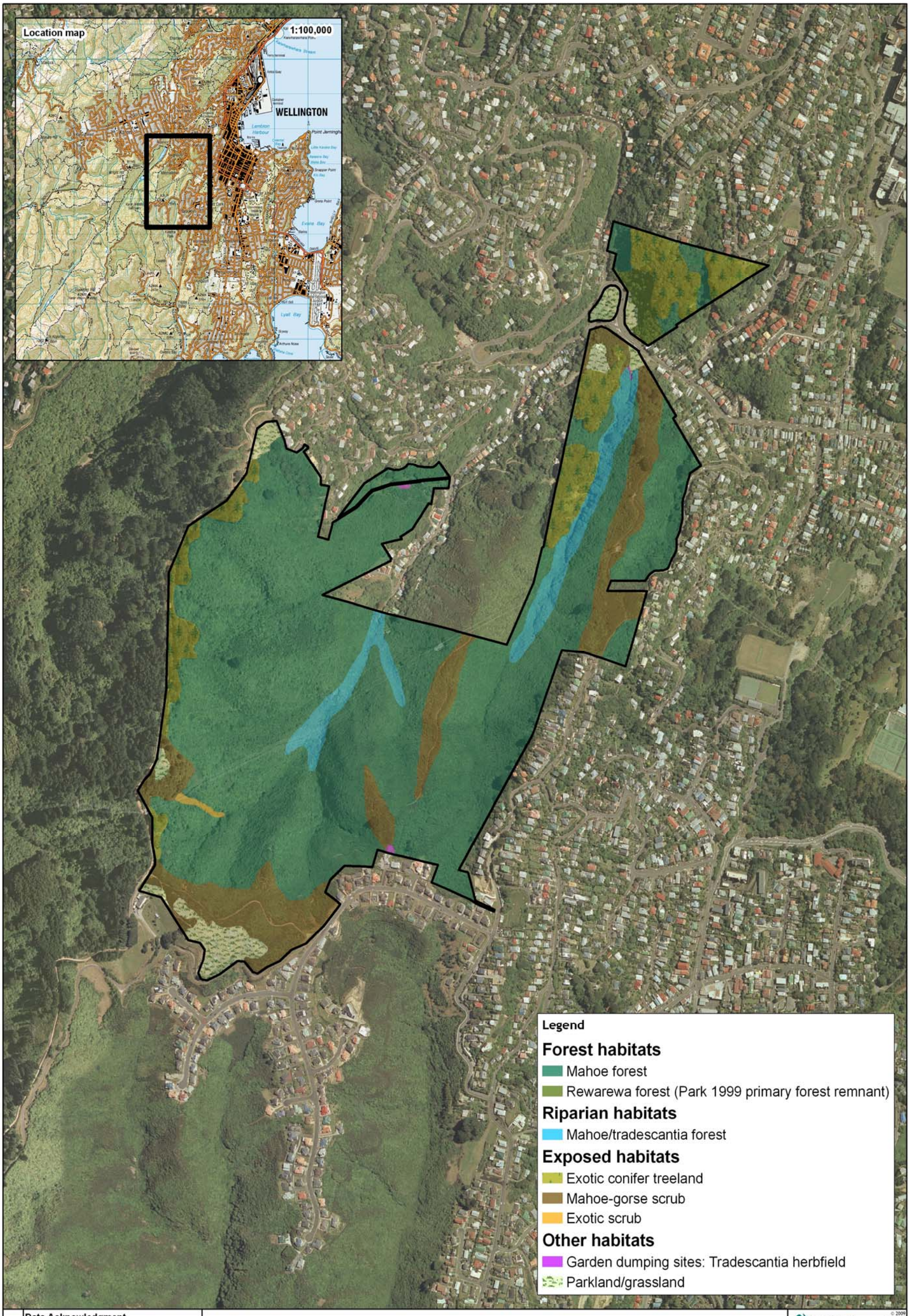

Figure 1. Polhill Reserve management units

Rewarewa Forest (Park 1999 primary forest remnant) (0.7 ha)

This type comprises a small area of primary forest dominated by rewarewa, with mahoe and mamaku (*Cyathea medullaris*) in the understory. This area was listed as a primary forest site by Parks (1999).

3.3 Riparian habitats

Mahoe/Tradescantia Forest (3.75 ha)

The riparian areas shown in Figure 1 approximately follow the headwaters of Waimapihi (Aro) Stream, and contain intact mahoe-dominated forest, to *c*.3 m tall, as described above. Within the riparian areas, there are scattered woody weeds such as poplar (*Poplus* spp.), brush wattle (*Paraserianthes lophantha*), and karo (*Pittosporum crassifolium*). Significant parts of the understorey are dominated by pest plants, including tradescantia (*Tradescantia fluminensis*), montbretia (*Crocosmia* ×*crocosmiiflora*), and blackberry (*Rubus fruiticosus* agg.). Additionally, some parts of the canopy are covered by climbing pest plants such as old man's beard (*Clematis vitalba*) and Japanese honeysuckle (*Lonicera japonica*).

3.4 Exposed habitats

Exotic Conifer Treeland (6.48 ha)

Mature exotic conifers, mainly radiata pine (*Pinus radiata*), but also macrocarpa (*Cupressus macrocarpa*), line the ridges in the reserve (Plate 3). Mixed broadleaved-gorse scrub forms the understory.

Mahoe-Gorse Scrub (9.82 ha)

The ridgelines are exposed to the wind and have a more recent history of disturbance, such as fire and vegetation clearance, than do the lower slopes. The indigenous vegetation is correspondingly at a less advanced stage of re-establishment and development. Canopy height ranges from 2-4 m and consists of mahoe, mapou, ngaio, gorse, Darwin's barberry, and broom (*Cytisus scoparius*) (Plate 4). The dominance of each species varies between locations.

Exotic Scrub (0.14 ha)

A slip has been re-colonised by exotic scrub dominated by blackberry and broom (Plate 6).

3.5 Other habitats

Garden Waste Dump Sites: Tradescantia Herbfield (0.07 ha)

Garden waste dump sites are shown in Figure 1, and it is possible that there are more sites around the edge of the reserve. Key weed species here include tradescantia, agapanthus (*Agapanthus praecox*), purple ragwort (holly-leaved senecio, *Senecio*

glastifolius), and kiwifruit (*Actinidia delicosia*). Other weed species may establish as a result of the garden waste dumping.

Parkland/Grassland (2.58 ha)

These areas are maintained as open exotic grassland for amenity or access reasons. In some instances, native species have been planted around the margins as restoration planting, or to create open treeland.

4. OVERVIEW OF MANAGEMENT REQUIREMENTS

These advisory notes deal with the management of pest plants, which are considered to be the most significant threat in the reserve, and restoration planting. The weed management section, below, summarises and prioritises requirements for weed surveys and control operations. Restoration planting is required in small parts of the reserve, mainly to prevent the further establishment of invasive weeds. All management requirements have been outlined in Section 8 and these are summarised in Table 4.

5. WEED MANAGEMENT

Pest plants pose the greatest short- and long-term threat to the ecological values of Polhill Gully Reserve and George Denton Park and therefore have the highest management priority. This section outlines which weed species occur within the reserve, and then prioritises requirements for further weed surveys and control operations. The weed control already undertaken by WCC has reduced the distribution of several species and contained the spread of others, but further control work is required.

5.1 Weeds present in Polhill Gully Reserve and George Denton Park

Most weeds are located along stream banks, in sites with less indigenous canopy cover, and around the outer edges of the reserve, particularly at access sites. Twenty-six environmental pest plant species have been recorded in the reserve. Each species has been assigned to one of six weed risk classes (refer to Table 2) based on the degree of threat to ecological values, the vulnerability of the vegetation and habitats, and the size of the infestations in the reserve. The species distribution information was obtained from city-wide surveys undertaken in 1998 and 2008 (Wildland Consultants 1998 and Te Ngahere 2009 respectively), and during a site visit.

5.2 Weed control priorities

This section briefly describes the rationale for assigning weed species to one of six weed risk classes.

1. Class One

Class One species are Suppression pests identified in the Wellington City Council Pest Management Strategy (WCC 2004). All species listed under Class One should be controlled to eradication. Old man's beard (*Clematis vitalba*) was recorded as a new infestation by Te Ngahere (2009); ongoing control with the aim of eradication of this species should be a top priority. Banana passionfruit (*Passiflora tripartite* var. *mollissima*) was not recorded in the 2008 survey. Additional surveys should be undertaken to determine whether this species still occurs in the reserve and, if found, it should be eradicated.

2. Class Two

There are eight Class Two species, and these should all be controlled. They are listed in priority order in Table 2. These species are present in low numbers or are restricted to smaller infestations, or their population status is uncertain. Control should be instigated before these species spread and this control should be prioritised by habitat type (Table 1).

3. Class Three

There are three Class Three species which threaten the ecological integrity of the study area and the long-term viability of the ecologically valuable vegetation. Infestations of these species are generally sizeable and would require substantial effort to control, and should, therefore, be prioritised by infestation type.

4. Class Four

These are environmental pest plant species that are present in moderate to large infestations around the reserve boundaries, but pose a lesser threat to ecological processes or values in the reserve. These should be controlled as resources allow, or if they begin to threaten the indigenous vegetation of the reserve. Blackberry is currently the only pest plant in this class.

5. Class Five

These are small infestations of pest plants which do not threaten ecological processes, and control is not advocated at present. There are nine species in Class Five.

6. Class Six

Species listed under Class Six are not recommended for control, because they either pose little threat to ecological values, or seem unlikely to spread significantly. There are three species in this class. Gorse will need to be controlled to fulfil RPMS requirements; however it poses little ecological threat. Broom will need to be monitored to ensure that it doesn't spread or hinder succession to indigenous vegetation.

Control efforts should concentrate on Class One to Class Three environmental pest plants. However, other control priorities may also be important. For instance, a small area of a newly-arrived weed is a high priority to prevent it from becoming established, and because the cost of eradication in the early stages is much cheaper then when a species is more established and widespread. In addition, site-led priorities such as the value of habitats present are also important considerations (Table 1). Table 2 prioritises weed infestations by species risk class, species (within risk classes), and habitat type (using the priorities in Table 1).

Table 1: Priorities for weed control by habitat type, Polhill Gully Reserve and George Denton Park, Wellington City.

	Highest Priority	**Medium Priority**	**Lowest Priority**
Habitat type	High value, least disturbed	Medium value, moderately disturbed	Low value, highly disturbed
Example	Pre-1840 forest, Park 1999 primary forest remnants.	Mahoe forest, Riparian, Ridgelines.	Garden waste dump sites.

It should be noted that budget limitations, the size the infestations and range of species involved, will likely mean that weed control will need to be managed over a multi-year work programme.

5.3 Weed survey priorities

Weed surveys enable the distribution of all weed species present to be assessed. They are required to help prioritise species and sites, to monitor the success of weed control operations, and to ascertain if new species and infestations have established. The weed survey information available for Polhill Gully Reserve and George Denton Park is a result of city-wide surveys in 1998 and 2008 (Wildland Consultants 1998 and Te Ngahere 2009 respectively). These reports provide very useful information but they have some limitations, as outlined below. Ongoing, preferably annual (or maximum of five-yearly intervals), weed surveys are required to assess the success of weed control operations, pick up new species, and enable the regular review of weed control priorities.

5.3.1 Limitations of existing information

Neither of the two previous surveys (Wildlands 1998; Te Ngahere 2009) covered the entire area of Polhill Gully Reserve and George Denton Park (as outlined in Figure 1). The Wildland Consultants (1998) survey covered Polhill and Waimapihi Gullies only, an area of approximately 20 ha, while the Te Ngahere (2009) survey was limited to those parts of reserves deemed vulnerable (streams, edges, tracks, and disturbed sites, such as slips). Consequently, this means much of the area has not been previously surveyed, and that the full extent of infestation by some shade-tolerant weed species, such as tradescantia and Darwin's barberry, remains uncertain, while more recent infestations by other species may have escaped notice altogether. It is therefore a high priority to undertake a comprehensive weed survey of the entire reserve, to inform decisions on weed management and ultimately protect the health of the forest habitats. This could be prioritised by habitat type, as outlined in Table 1.

Table 2: Weeds present in Polhill Gully Reserve and George Denton Park listed in order of control priority.

Scientific Name	Common Name	Risk Class	Weed Management Recommendations	GW RPMS[1]	WCC PMS[2]	Distribution Changes From 1998 to 2008[3]	% Change From 1998 to 2008[3]	Habitat Score[4]	⇨ Decreasing Order of Priority ⇨					Notes
									Rewarewa Forest	Mahoe Forest	Riparian	Ridge Lines	Garden waste dump Sites	
Clematis vitalba	old man's beard	1	On-going control, following infestation priorities.	Site-led	Suppression	Not previously recorded.		M		✓	✓			PMS short term goal: prevent flowering and seed set of all plants on WCC, covenant, or buffer zone properties.
Passiflora tripartita var. *mollissima*	banana passionfruit	1	Survey former sites (Wildland Consultants, 1998) to ensure species is no longer present. If found, eradicate.	Site-ld	Suppression	Not recorded in 2008.		M		✓	✓	✓	✓	PMS short term goal: prevent flowering and seed set of all plants on WCC, covenant, or buffer zone properties.
Senecio glastifolius	purple ragwort	2	Control to eradicate.	KNE	KNE	Not previously recorded.		M				✓	✓	
Selaginella kraussiana	creeping clubmoss, selaginella	2	Control to eradicate.	KNE	KNE	Not previously recorded.		M			✓			
Lonicera japonica	Japanese honeysuckle	2	Control to eradicate.	KNE	KNE	Increase in coverage.	97.8%	M		✓				
Actinidia deliciosa	kiwifruit	2	Control to eradicate.			Not previously recorded		L					✓	
Prunus campanulata	Taiwan cherry	2	Control to eradicate.			Not previously recorded.		L					✓	Fruit spread by birds, so poses risk to Karori Sanctuary. Eradicate while population is still small.
Senicio mikanioides	German ivy	2	Survey former sites (Wildland Consultants, 1998) to ensure species is no longer present. If found, eradicate.	KNE	KNE	Not recorded in 2008.		M		✓ (*)	✓ (*)		✓ (*)	
Vinca major	periwinkle	2	Survey former sites (Wildland Consultants, 1998) to ensure species is no longer present. If found, eradicate.	KNE	KNE	Not recorded in 2008.		M					✓ (*)	
Acer pseudoplatanus	sycamore	2	Survey former sites (Wildland Consultants, 1998) to ensure species is no longer present. If found, eradicate.	KNE	KNE	Not recorded in 2008.		M			✓ (*)			
Tradescantia fluminensis	tradescantia	3	Control to minimise increases in coverage following infestation priorities. Long term aim to eradicate.	KNE	KNE	Decrease in coverage.	-64%	H	✓	✓	✓	✓	✓	Including areas of controlled weeds.
Hedera helix subsp. *helix*	ivy	3	Control to minimise increases in coverage following infestation priorities. Long term aim to eradicate.			Not recorded in 2008. Observed in 2010.		M		✓	✓		✓	
Berberis darwinii	Darwin's barberry	3	Additional survey to accurately access coverage. Control following infestation priorities to minimise increase in coverage.	KNE	KNE	Decrease in coverage.	-99.3%	M		✓		✓		

Scientific Name	Common Name	Risk Class	Weed Management Recommendations	GW RPMS[1]	WCC PMS[2]	Distribution Changes From 1998 to 2008[3]	% Change From 1998 to 2008[3]	Habitat Score[4]	⇨ Decreasing Order of Priority ⇨					Notes
									Rewarewa Forest	Mahoe Forest	Riparian	Ridge Lines	Garden waste dump Sites	
Rubus sp. (*R. fruticosus* agg.)	blackberry	4	Control to minimise increases in coverage.	Site-led	KNE			M			✓	✓	✓	
Allium triquetrum	wild onion	5	Control to minimise increases in coverage.	KNE	KNE	Not previously recorded.		M			✓	✓	✓	
Crocosmia x crocosmiiflora	montbretia	5	Control to minimise increases in coverage.		KNE	Not previously recorded.		M			✓		✓	
Agapanthus praecox	agapanthus	5	Control to minimise increases in coverage.			Not previously recorded.		M		✓				
Populus alba	white poplar	5	Control to minimise increases in coverage.			Not previously recorded.		M			✓	✓		
Paraserianthes lophantha	brush wattle	5	Control not recommended at present. Monitor to assess distribution changes. Reassess priority at a later date if required.	KNE	KNE	Not recorded in 2008. Observed in 2010.		M		✓				Scattered distribution.
Pinus radiata	radiata pine	5	Control not recommended at present. Monitor to assess distribution changes. Reassess priority at a later date if required.	KNE	KNE	Decrease in coverage.	-97.7%	M		✓				
Chamaecytisus palmensis	tree lucerne	5	Control not recommended at present. Monitor to assess distribution changes. Reassess priority at a later date if required.			Not previously recorded.		M			✓			
Acacia longifolia	Sydney golden wattle	5	Control not recommended at present. Monitor to assess distribution changes. Reassess priority at a later date if required.			Not previously recorded.		M				✓		
Laurus nobilis	bay tree, sweet bay	5	Survey former sites (Wildland Consultants, 1998) to ensure species is no longer present.			Not recorded in 2008.		M		✓ (*)				
Cytisus scoparius	broom	6	Not recommended for control. Monitor to prevent spread, assess if hindering indigenous succession.	KNE	KNE	Not recorded in 2008. Observed in 2010		M				✓		
Ulex europaeus	gorse	6	Not recommended for control except for PMS boundary requirements.	Site-led	Suppression	Not recorded in 2008. Observed in 2010		M				✓		PMS short term goal: meet RPMS requirements for boundary control.
Cupressus macrocarpa	macrocarpa	6	Not recommended for control.			Not previously recorded.		M		✓				Control in primary forest remnants first.

1 Greater Wellington (2009). Indicates level of control outlined in the Regional Pest Management Strategy (RPMS). Site-led and KNE (Key Native Ecosystem)-species are widespread pests that have spread rapidly over long distances and the adverse effects of these species is considered to be severe, but total control or containment is not achievable. The focus is for control of pest species by the land-owner of these sites, and KNE sites may receive funding to support such pest control. Containment species are those species that have established in the Greater Wellington area, but have not yet achieved maximum distribution, and may be able to be prevented from infesting additional sites.

2 Wellington City Council (2004). Indicates levels of control outlined in the Pest Management Strategy (PMS).

3 Data taken from Te Ngahere (2009), where available.

4 Habitat score based on distribution of pest plant within habitats shown in Figure 1. H-High, Rewarewa forest (Park 1999 primary forest remnant). M-Medium includes Mahoe forest, Riparian habitats, Ridgelines. L-Low includes Garden waste dump sites.

* Distribution from maps in Wildland Consultants (1998).

Accurate distribution information, such as shape files, was not provided in the Te Ngahere (2009) survey. Additional survey effort may be required, prior to undertaking control of pest plants in Classes One to Three, to accurately assess the distribution and types of weed infestation.

5.3.2 Garden waste dump sites

Garden waste dump sites are an ongoing source of weed invasion. It is important to know where these sites are and to monitor them, in order to minimise the threat they pose to the reserve. Three garden waste dump sites were identified during the site visit (Figure 1), but there are likely to be more along the reserve boundary. A further survey is required to assess the location and extent of garden waste dump sites, and to record weedy species in these areas.

The boundary between the reserve and urban areas should be walked to accurately locate, map, and assess all sites. The sites then need to be prioritised in terms of risk class, weediness, accessibility for control, and potential for enhancement through community restoration programmes. To reduce the risk of additional garden waste dump sites becoming established, an advocacy programme should be undertaken with residents adjacent to the reserve boundary.

5.3.3 Native 'weeds'

Several indigenous species that have their natural range only in the northern part of the North Island are currently naturalised in the Wellington region, and may be regarded as weeds in the Wellington forest environment. The most common of these species include pohutukawa (*Metrosideros excelsa*), karo (*Pittosporum crassifolium*), and karaka (*Corynocarpus laevigatus*). All three species have frequently been utilized for amenity planting around the city, as well as being common in gardens. However, no mature specimens of these species have been observed within the indigenous vegetation of the reserve. It is recommended that any seedlings be controlled to prevent intrusion into the forest habitat.

5.3.4 MTB trails

Many weedy species reproduce vegetatively and are able to establish new infestations following dispersal of leaf or stem fragments (e.g. tradescantia). Mountain-bikes are particularly suitable vectors for this form of dispersal, as vegetative fragments may be inadvertently carried in tyres, chains, and frames. MTB trails should be regularly surveyed for new infestations, and responsible riding practises (e.g. keep to trails, clean mud and vegetation off bikes between visits) should continue to be promoted in the mountain-biking community.

5.4 Weed management summary

5.4.1 Weed control priorities

Table 2 provides a list of species known to be present in Polhill Gully Reserve and George Denton Park. Species in Risk Classes One to Three should be controlled or

eradicated as soon as possible. Information in Table 2 should be reviewed and updated every three years.

5.4.2 Weed control guidelines

- Keep high value sites weed free;
- Reduce spread of satellite infestations;
- Start control on edge of infestation and work towards core;
- Start control on edge of park and work towards centre;
- Control upstream riparian infestations first and work downstream;
- Control prior to seed set and avoid spreading propagules;
- Minimise extent of area cleared, if possible;
- Undertake restoration planting as soon as possible after weed control.

5.4.3 Weed survey requirements

Weed survey requirements are outlined below, in priority order:

- Survey the reserve for Risk Class One weeds (old mans beard and banana passionfruit) to ensure control/eradication from the site;
- Survey priority habitats (primary forest remnants) for shade-tolerant weed species. Update control priorities, if required;
- Survey reserve boundaries for garden waste dump sites. Update control priorities, if required;
- Survey for widespread shade-tolerant species (Darwin's barberry, tradescantia, and ivy), to accurately determine the extent and locations of infestations. Update control priorities if required;
- Survey MTB trails for pest plant infestations. Update control priorities if required;
- Survey for indigenous weedy species, to accurately determine the extent and locations of any potential infestations. Update control priorities if required;
- Undertake annual monitoring, to assess the success of the ongoing weed control programme. Record the changes in weed distribution and potentially reprioritise species and/or sites for control;
- Initiate comprehensive five-yearly weed surveys, to ensure that any future infestations are identified at an early stage of establishment.

As part of any weed survey it is important that accurate written information is kept on files, using a consistent recording system, and that records are kept up-to-date.

6. RESTORATION PLANTING

There are three reasons for undertaking restoration planting in Polhill Gully Reserve and George Denton Park: firstly, to fill gaps in the indigenous vegetation cover, thereby reducing the opportunities for weeds to establish; secondly, to enhance species diversity through the re-establishment of 'missing species' in the reserve; and thirdly, to improve the foraging habitat available within the reserve for the use of rare bird populations in the adjoining Karori Wildlife Sanctuary. These restoration planting opportunities are discussed below, along with factors that influence their success (or failure).

6.1 Restoration planting to fill gaps in indigenous vegetation cover

Currently several areas within Polhill Gully Reserve and George Denton Park would benefit from restoration planting to fill gaps in the indigenous vegetation cover, thereby reducing potential for weed establishment. Canopy gaps can be caused by weed control, track construction, or by natural processes such as tree fall. Additionally, garden waste dump sites may require restoration planting, once advocacy has been undertaken. The various management requirements are discussed below.

6.1.1 Areas where weed control or construction has been undertaken

These are the highest priority sites for restoration planting, as previous weed control can reduce or remove the canopy, which makes these sites vulnerable to re-invasion by a fresh cohort of adventive species (Plate 5). Earthworks for track construction have a similar effect, with the added factor of disturbing the soil and releasing buried weed seeds. Weed control in these areas needs to be well-managed and sites should be replanted as soon as possible after successful weed removal, to reduce opportunities for new pest plants to become established. Approaches to restoration planting in these areas are outlined below:

- Minimise the time a site is bare. Aim for weed control followed by revegetation within 3-6 months, i.e. undertake weed control over summer which is then followed by planting in May;
- Establish canopy cover as quickly as possible;
    - Select fast growing species, such as toetoe (*Cortaderia fulvida*), cabbage tree (*Cordyline australis*), karamu (*Coprosma robusta),* and manuka (*Leptospermum scoparium*). A wider range of species can be planted once a good cover is established.
    - High density planting of at least one plant per 1 m^2 in terrestrial situations, and one per 0.75 m^2 in wetland situations.
- Root trainers require less disturbance of soil to plant so are useful on unstable or steep sites;

- Geotextile material could be used on steep, erosion prone sites, to prevent weed establishment. This should be assessed by a Geotechnical Engineer.

6.1.2 Restoration of garden waste dump sites

These sites differ from interior sites in that weeds are already well-established, and a greater variety of exotic species will dominate the seed-bank. Weed monitoring and control will need to be ongoing, as there is potential for many of these species to be shade tolerant, and persist underneath the canopy. Otherwise, restoration should proceed as for interior sites.

6.2 Restoration planting for enhancement of species diversity

Many of Wellington City's forest remnants lack some of the species which are considered to be indicators of primary forest (as described by Park, 1999). The 19 such indicator species in Wellington (Table 3) are referred to here as 'missing species'. Fifteen of these species were not recorded during the site survey and another, rewarewa, was present only in low numbers.

Podocarp tree species (e.g. rimu (*Dacrydium cupressinum*), matai, miro (*Prumnopitys ferruginea*), kahikatea, and totara (*Podocarpus totara*)) are frequently missing from Wellington forest remnants. If these species are to be restored, the most suitable strategy would entail large-scale targeted plantings of seedlings, as the natural seed bank is likely to be impoverished. However it would is recommended that city-wide guidelines are established for podocarp planting, including where best to source plant propagules, whether species are shade-tolerant or not, and whether species prefer dry ridges or wetter valleys. The guidelines could be developed from the successes and failures of previous podocarp planting efforts. The guidelines should also consider the requirement to maintain view-shafts of the surrounding landscape and other such District Plan requirements.

Some of the other 'missing species' could be planted in small numbers, to enhance the species diversity within the reserve. Many of these species can be hard to establish, are generally slower growing, and often prefer sheltered sites beneath a canopy, rather than establishing in the open. Species preferences should be matched to site conditions, and it would be useful to record planting locations, for future monitoring.

Table 3: Species indicators of primary forest remnants in Wellington (missing species), their abundance, and potential for supplementary planting in Polhill Gully Reserve and George Denton Park.

Scientific Name	Common Name	Abundance in Polhill Gully Reserve and George Denton Park	Potential for Supplementary Planting
Dacrycarpus dacrydioides	Kahikatea	Not recorded.	Podocarp enhancement planting.
Dacrydium cupressinum	Rimu	Not recorded.	Podocarp enhancement planting.
Prumnopitys taxifolia	Matai	Not recorded.	Podocarp enhancement planting.
Podocarpus totara var. totara	Totara	Not recorded.	Podocarp enhancement planting.
Prumnopitys	Miro	Not recorded.	Podocarp enhancement planting.

Scientific Name	Common Name	Abundance in Polhill Gully Reserve and George Denton Park	Potential for Supplementary Planting
ferruginea			
Alectryon excelsus var. *excelsus*	Titoki	**Recorded** with young plants present.	Not required if natural recruitment continues.
Beilschmiedia tawa	Tawa	**Recorded** with young plants present.	Not required if natural recruitment continues.
Dysoxylum spectabile	Kohekohe	**Recorded** with young plants present.	Not required if natural recruitment continues.
Elaeocarpus dentatus	Hinau	Not recorded.	Enhancement planting in selected sites.
Knightia excelsa	Rewarewa	**Recorded**.	Enhancement planting in selected sites.
Laurelia novae-zelandiae	Pukatea	Not recorded.	Enhancement planting in selected sites.
Metrosideros robusta	Northern rata	Not recorded.	Limited potential. Will establish on the ground but prefers perched sites. Perhaps suitable for slip faces.
Nestegis lanceolata	White maire	Not recorded.	Enhancement planting in selected sites.
Pennantia corymbosa	Kaikomako	Not recorded	Enhancement planting in selected sites.
Streblus banksii	Turepo	Not recorded.	Regionally endangered species (Sawyer 2004). Enhancement planting in selected sites.
Syzygium maire	Maire tawake, swamp maire.	Not recorded.	Enhancement planting in selected sites.
Weinmannia racemosa	Kamahi	Not recorded.	Enhancement planting in selected sites.
**Olearia paniculata*	Akiraho	Not recorded.	Enhancement planting in selected sites.
**Sophora microphylla* or *S. chathamica*	Kowhai	Not recorded.	Enhancement planting in selected sites.

* Indicator of the survival of a primary forest element in southern coastal sites, but could still be planted in Polhill Gully Reserve and George Denton Park.

6.3 Restoration planting to improve foraging habitat for birdlife

With the Karori Wildlife Sanctuary immediately adjacent, the reserve is often utilized as foraging habitat by indigenous birds. Many of the plant species listed in Table 3, along with a variety of other species common in the Wellington region, are valuable food sources for native birds, providing a range of nutritional values (Table 4).

Indigenous fruit bearing understorey species, such as coprosmas, can often be quickly established and provide good sugar-laden fruit for birds. Northern rata (*Metrosideros robusta*), along with other rata species and nikau, may be difficult to establish, but planted in the right location could provide a valuable contribution to year round food and nutrient availability. Species such as pohuehue and karaeo (supplejack) already occur within the reserve and should be maintained where this is appropriate.

Table 4: Potential foraging enhancement species, and their nutritional values.

Scientific Name	Common Name	Sugars	Lipids	Nectar	Nitrogen	Calcium
Podocarps	rimu, totara, miro, matai, kahikatea	✓	✓			
Beilschmiedia tawa	tawa		✓			
Alyctron excelsus	titoki	✓				
Dysoxylum spectabile	kohekohe		✓			
Sophora microphylla	kowhai			✓	✓	
Phormium tenax	harakeke			✓		
Aristotelia serrata	makomako	✓		✓		
Pseudopanax arboreus	whauwhaupaku	✓		✓		
Macropiper excelsa	kawakawa		✓			
Cordyline australis	ti kouka	✓				
Coprosma spp.	coprosma	✓				
Metrosideros spp.	rata			✓		
Rhopalostylis sapida	nikau		✓			✓
Meuhlenbeckia spp.	pohuehue				✓	
Ripogonum scandens	karaeo		✓			✓

6.4 Restoration planting summary

Priorities for restoration planting are provided in the list below:

- Planting in riparian areas following weed control.
- Planting for enhanced species diversity, to re-introduce some of the 'missing species'.
- Planting for improved foraging habitat for native avifauna.
- Frequent monitoring of restoration planting sites to manage the areas for greater success. Ensure that accurate records are kept, including planting locations, species used, measures of success, and causes of failure.

7. ADDITIONAL MANAGEMENT REQUIREMENTS

A number of management requirements are beyond the scope of these advisory notes, and are mentioned below as options to further improve the ecological potential of the reserve. An additional report could be commissioned to explore these requirements.

7.1 Pest animal control

- Prior to and following restoration planting;
- To maintain or enhance health of indigenous vegetation;

- To lower densities of pest animals and reduce impacts on bird, lizard and invertebrate species;

Should pest animal control be reduced or stopped at some point in the future then the likely consequences will be a progressive reduction in the health and productivity of indigenous plant and animal species.

7.2 Improvement of stream health

- Assess ecological values of Waimapihi (Aro) Stream and how these could be improved, including undertaking fish and other aquatic species surveys;
- Limit input of sewage contaminants into the stream;
- Ensure good sediment capture systems are employed for storm water;
- Address fish passage issues associated with in-stream structures;
- Advocate for stringent erosion and sediment control measures from any developments that drain into Waimapihi (Aro) Stream.

7.3 Advocacy

- Initiate advocacy with adjacent landowners to reduce dumping of garden waste;
- Encourage the activities of community groups looking after the reserve;
- Continue advocacy with MTB organisations to promote responsible mountain-biking practices;
- If possible, formalise legal protection of adjacent indigenous vegetation, to maintain the surrounding vegetation buffer;
- Develop and disseminate information on Polhill Gully Reserve and George Denton Park to promote interest in the wider Wellington community;
- Encourage interest groups, such as the Wellington Botanical Society, to provide additional ecological information by undertaking a comprehensive field visit.

8. WORK PROGRAMME AND SCHEDULE

The weed management and restoration planting required for Polhill Gully Reserve and George Denton Park is a multi-year undertaking. A work programme and schedule has been provided in Table 5 to assist with planning. The six main tasks - weed control, weed survey, restoration planting, animal pest control, stream enhancement and advocacy - have all been outlined above.

Priority habitat and vegetation areas for each task have been identified. Tasks have been ranked by urgency: that is, the ecological consequences of not doing the task. The size of the task has been estimated as follows: **small** is less than 40 person hours, **medium** is between one week and one month of person hours, and **large** comprises more than one month of work for one person. The schedule indicates the time (in years from now) within which a task should be initiated. Ongoing tasks are also shown.

Table 5: Work programme for Polhill Gully Reserve and George Denton Park.

Task	Activity	Priority Sites[1]	Urgency[2]	Task Size[3]	Schedule[4]	Ongoing[5]	Report Section
Weed control	Control and follow-up control of Class One and Two weeds species.	Control prioritised by habitat type (Table 1).	High	Large	1	Yes	5.2
	Control and follow-up control of Class Three weeds.	Control prioritised by habitat type (Table 1).	High	Large	1-2	Yes	5.2
	As control of Class One to Three weeds is achieved, reprioritise weeds in Classes Four to Six.	Control prioritised by habitat type (Table 1).	High	Large	2-5	Yes	5.2
	Minimise access to garden waste dump sites, if feasible.	Boundary.	Medium	Medium	1-2	Yes	5..3.1
Weed survey	Establish a document bank, to provide a repository for all written information associated with management actions within the reserve.	All.	High	Small	1	Yes	5.3
	Survey for Class One weeds: old man's beard, banana passionfruit, and any new species.	All.	High	Small	1	Yes	5.4.2
	Survey primary forest remnants (Park 1999), for shade-tolerant weeds.	Primary forest remnants (Park 1999).	High	Small	1-2	Yes	5.4.2
	Survey boundary for garden waste dump sites.	Boundary.	High	Medium	1	Yes	5.3.1 5.4.2
	Survey to determine extent of established weeds such as tradescantia, ivy, and Darwin's barberry.	All.	High	Medium	1-2	Yes	5.3.1 5.4.2
	Assess weed distribution changes and reprioritise species to be controlled, as appropriate.	All.	High	Medium	1-2	Yes	5.3 5.4.2
	Repeat five year weed survey.	All.	High	Medium	5	Yes	5.3
Restoration planting	Site preparation.	Replanting sites.	High	Small	1	Yes	
	Planting.	Replanting sites.	High	Small	1	Yes	
	Monitor plantings sites.	Replanting sites.	High	Small	1	Yes	
	Maintain plantings.	Replanting sites.	High	Large	1	Yes	
	Infill planting.	Replanting sites.	High	Small	1	Yes	
	Establish a document bank, or written information associated with all management within the reserve.	All.	High	Small	1	Yes	
	Establish restoration area(s) at garden waste dump sites.	Boundary.	Medium	Medium	1-2	Yes	5.3.1 6.1
	Small scale enhancement of species diversity.	Riparian. If approved, primary forest remnants (Park 1999).	Low	Small	5-10		6.2

Task	Activity	Priority Sites[1]	Urgency[2]	Task Size[3]	Schedule[4]	Ongoing[5]	Report Section
	Small scale planting of podocarps.	Riparian. If approved, primary forest remnants (Park 1999).	Low	Small	5-10		6.2
Animal pest control	Control priority KNE pests.	All.	High	Medium	1	Yes	7.1
	Monitor for and control pests that will damage restoration planting.	Riparian.	High	Medium	1	Yes	6.1.2
Stream enhancement	Liaise with Capacity Infrastructure Services about sewer and water infrastructure and restoration effort.	Riparian.	High	Small	1	Yes	7.2
	Ecological assessment.	Riparian.	Medium	Small	1		7.2
	Enhance and/or establish fish passage.	Riparian.	Low	Medium	2-5		7.2
	Assess potential to mitigate erosion from storm water outlets. Implement mitigation strategies.	Riparian.	Low	Large	5-10		7.2
Advocacy	Contact neighbouring property owners about the importance of buffering indigenous vegetation cover.	Boundary.	Medium	Large		Yes	7.3
	Contact neighbouring property owners about garden waste dumping.	Boundary.	Medium	Large	1-2	Yes	7.3
	Obtain additional ecological information: encourage Wellington Botanical Society to undertake a fieldtrip.	All.	Low	Small	1-2		7.3
	Publicise and promote Polhill Gully Reserve and George Denton Park in the Wellington community.		Low	Medium	1-2		

1: Priority sites: Whether this task should occur in all or only part of the reserve area, and if part then which part.
2: Urgency: Relates to the ecological consequences of not doing the task. A task with High urgency has greater ecological implications if not undertaken than a Low urgency task.
3: Task size: Small is less than 40 person hours; Medium is one week to one month of person hours; and Large is more than one month of work for one person.
4: Schedule: Indicates the ideal time (in years from now) within which a task should be initiated.
5: Ongoing: Illustrates whether a task is likely to be repeated or needs to be carried on for a longer period then the 10 years considered here.

9. CONCLUSIONS

Polhill Gully Reserve and George Denton Park is an important asset in Wellington City. Although historic clearance and grazing has greatly reduced biodiversity in the reserve, it remains an ecologically interesting area that contains remnant primary forest and forms a vegetation corridor linking Karori Sanctuary with southern parts of the Town Belt. Its proximity to the sanctuary adds further value by providing indigenous foraging habitat for rare and re-established bird species.

There are several weed management issues within the reserve area, which, require ongoing management. Individual tasks have been described are prioritised to manage and control the impacts of ecologically significant weed species, and maintain and improve the reserve's overall ecological condition. Several small areas require restoration planting, to prevent weed establishment, enhance biodiversity, and enhance bird foraging habitat. These should be monitored frequently to ensure successful implementation. Additional ecological enhancements can be achieved by improving stream health, maintaining or increasing pest animal control, undertaking advocacy, and supporting a community care group for the reserve and adjacent land.

ACKNOWLEDGMENTS

We would like to thank Myfanwy Emeny from the Wellington City Council for initiating this project. We would also like to thank Myfanwy Emeny and Justin McCarthy, from WCC, for providing data, discussion, and advice and peer review of the data and report.

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PLANT SPECIES RECORDED IN POLHILL GULLY RESERVE AND GEORGE DENTON PARK

Key

1. Indigenous species recorded by Mitcalfe & Horne (1993), Park (1999), and during the site visit, 28 July 2010.
2. Exotic species recorded by Wildland Consultants (1998), Te Ngahere (2009), and during the site visit, 28 July 2010.
3. Not recorded in 2008, and no longer thought to be present.

(P) Some specimens planted for amenity or restoration purposes.

INDIGENOUS SPECIES[1]

Monocot. trees and shrubs

Cordyline australis (P)	ti kouka, cabbage tree

Dicot. trees and shrubs

Alectryon excelsus subsp. excelsus	titoki
Aristotelia serrata	makomako, wineberry
Beilschmiedia tawa	tawa
Brachyglottis repanda	rangiora
Coprosma grandifolia	kanono
Coprosma robusta	karamu
Coprosma repens (P)	taupata
Coprosma propinqua var. *propinqua*	mingimingi
Coprosma rhamnoides	
Dysoxylum spectabile	kohekohe
Geniostoma ligustrifolium var. *ligustrifolium*	hangehange
Hebe stricta (P)	koromiko
Hedycarya arborea	pigeonwood
Hoheria sextylosa	houhere, lacebark
Knightia excelsa	rewarewa
Leptospermum scoparium agg.	manuka
Macropiper excelsum subsp. *excelsum*	kawakawa
Melicytus ramiflorus subsp. *ramiflorus*	mahoe
Metrosideros excelsa (P)	pohutukawa
Myoporum laetum (P)	ngaio
Myrsine australis	mapou
Olearia paniculata	akiraho
Pittosporum eugenioides (P)	tarata
Pittosporum tenuifolium	kohuhu
Pseudopanax arboreus var. *arboreus*	whauwhaupaku, five finger
Pseudopanax crassifolius	horoeka, lancewood

Schefflera digitata	pate
Solanum laciniatum	poroporo
Urtica ferox	ongaonga, tree nettle

Monocot. lianes

Freycinetia banksii	kiekie
Ripogonum scandens	kareao, supplejack

Dicot. lianes

Metrosideros diffusa	rata
Metrosideros perforata	rata
Muehlenbeckia australis	puka
Parsonsia heterophylla	akakaikiore
Rubus cissoides agg.	tataramoa, bush lawyer

Ferns

Adiantum cunninghamii	huruhuru tapairu, maidenhair fern
Asplenium bulbiferum	mouku, hen and chicken fern
Asplenium flaccidum	makawe
Asplenium flabellifolium	necklace fern
Asplenium oblongifolium	huruhuruwhenua
Blechnum chambersii	rereti
Blechnum filiforme	panako
Blechnum fluviatile	kiwikiwi
Blechnum novae-zelandiae	kiokio
Ctenopteris heterophylla	
Cyathea medullaris	mamaku
Histiopteris incisa	matata, water fern
Hymenophyllum multifidum	mauku, filmy fern
Hymenophyllum sanguinolentum	piripiri, filmy fern
Lastreopsis glabella	smooth shield fern
Microsorum pustulatum	kowaowao, hounds tongue fern
Microsorum scandens	mokimoki
Pallaea rotundifolia	tarawera, button fern
Pneumatopteris pennigera	pakau
Polystichum neozelandicum subsp. *neozelandicum*	pikopiko, shield fern
Pteris tremula	turawera, shaking brake
Pyrrosia eleagnifolia	leather-leaf fern

Grasses

Cortaderia fulvida	toetoe
Microlaena polynoda	
Microleana stipoides	patiti, meadow rice grass
Poa cita	silver tussock

Sedges

Carex flagellifera	manaia
Carex secta	purei

Rushes

Juncus pallidus	wi

Dicotyledonous herbs

Aciphylla squarrosa	karamea, Spaniard
Euchiton audax	

Remaining Monocotyledonous plants

Dianella nigra	turutu
Phormium tenax (P)	harakeke, flax

NATURALISED AND EXOTIC TREE SPECIES[2]

Gymnosperms

Cupressus macrocarpa	macrocarpa
Pinus radiata	radiata pine

Dicot. trees and shrubs

Acacia longifolia	Sydney golden wattle
Acer pseudoplatanus[3]	sycamore maple
Berberis darwinii	Darwin's barberry
Cytisus scoparius	broom
Chamaecytisus palmensis	tree lucerne
Laurus nobilis[3]	sweet bay
Paraserianthes lophantha	brush wattle
Populus alba	white poplar
Prunus campanulata	Taiwan cherry
Ulex europaeus	gorse
	inkweed

Dicot. lianes

Actinidia deliciosa	kiwifruit
Clematis vitalba	old man's beard
Hedera helix subsp. *helix*	ivy
Lonicera japonica	Japanese honeysuckle
Passiflora tripartita var. *mollissima*[3]	banana passionfruit
Rubus fruticosus agg.	blackberry

Lycopods and psilopsids

Selaginella kraussiana	creeping clubmoss selaginella

Monocot. herbs

Agapanthus praecox	agapanthus
Crocosmia ×crocosmiiflora	montbretia
Tradescantia fluminensis	tradescantia

Composite herbs

Erigeron karvinskianus	Mexican daisy
Senecio glastifolius	purple ragwort
Senecio mikanoides[3]	German ivy

Dicot. herbs (other than composites)

Vinca major[3]	periwinkle

SITE PHOTOGRAPHS

Plate 1: Mahoe forest, with exotic scrub in the foreground.

Plate 2: Interior of mahoe forest, showing the open understorey.

Plate 3: Exotic conifer treeland.

Plate 4: Mixed broadleaf-exotic scrub.

Plate 5: Weeds invading a recent canopy gap.

Plate 6: Slip colonised by exotic scrub.

WEED CONTROL AND RESTORATION PLANTING IN WRIGHT HILL RESERVE WELLINGTON CITY

OCTOBER 2010

Contract Report No. 2447c

Prepared for:

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CONTENTS

APPENDICES

PROJECT TEAM

7(2)(a) Site visit, report preparation.
7(2)(a) - Report review.
7(2)(a) - Report review.

Reviewed and approved for release by:

7(2)(a)

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Director/Principal Ecologist
Wildland Consultants Ltd

1. INTRODUCTION

Wellington City Council (WCC) requires advice on the management of the Wright Hill Reserve (including Burrows Avenue Reserve), in the form of advisory notes. The 101 ha reserve covers the summit and northern and south-western slopes of Wright Hill, in Karori, Wellington. The summit is also the site of the historic Wright Hill Fortress. The reserve is contiguous with the Karori Sanctuary, and is part of "one of the largest expanses of indigenous vegetation in the Outer Green Belt and a major ecological hub for this part of the city" (WCC 2003). It is also recognised as a Key Native Ecosystem by the Greater Wellington Regional Council (GW) Pest Management Strategy (GW 2009).

Wright Hill Reserve is particularly popular with mountain-bikers, with two designated (and several unofficial) MTB tracks forming an extension of the track network of the nearby Makara Peak mountain-bike park. The Wright Hill Fortress is in the ongoing process of restoration, with the Wright Hill Fortress Restoration Society co-ordinating restoration efforts and holding regular open days for the public. Open areas associated with the fortress are popular picnic spots, and have been the focus of vegetation restoration efforts by community groups in the past.

The site was inspected on 26 July 2010. This report outlines the ecological values of the Wright Hill Reserve, and provides an outline of requirements for weed management and restoration planting. Details of all management requirements have been provided, along with a work programme and schedule.

2. ECOLOGICAL VALUES AND MANAGEMENT ISSUES

In order to set priorities for restoration efforts across all Wellington City Council Reserves, it is important to understand the ecological processes and values within the areas of interest. This section outlines the values of the Wright Hill Reserve and describes the habitats and vegetation types.

Wright Hill Reserve comprises 34.41 ha of mahoe (*Melicytus ramiflorus* subsp. *ramiflorus*)-dominated indigenous forest, along with remnants of primary kamahi (*Weinmannia racemosa*)-tawa (*Beilschmiedia tawa*)–kohekohe (*Dysoxylum spectabile*) forest. The more exposed parts of the reserve comprise mahoe-gorse (*Ulex europaeus*)-Darwin's barberry (*Berberis darwinii*) scrub. An area of kamahi-miro (*Prumnopitys ferruginea*)-tawa forest (regionally rare in Wellington) is located in the gullies on the northern slopes. The reserve provides indigenous vegetation cover for a tributary of the Karori Stream (NIWA 2007).

The reserve has ecological values that are important at regional and district levels. Wildland Consultants (2009) undertook an analysis of the ecological significance of the primary forest remnants in Wright Hill Reserve, which ranked fifth equal (Primary Forest Remnant 0306.14 of Park (1999); assessed as Site 141 (12.58 ha) in Wildland Consultants (2009)) and sixth equal (Primary Forest Remnant 0306.13 of Park (1999); assessed as Site 140 (32.49 ha) in Wildland Consultants (2009)) for ecological importance in this study. The reasons for this site ranking are listed below, in order from national, to district level:

- Contains 'At Risk' land environments;[1]
- Greater Wellington Key Native Ecosystem;
- Contains significant primary forest remnants (Park 1999);
- Surrounded and buffered by indigenous vegetation;
- Riparian vegetation primarily consists of indigenous species;
- The area contains and protects a stream[2].

The reserve is also contiguous with the Karori Wildlife Sanctuary, buffering it and forming part of an extended foraging habitat for its high conservation value bird species.

The main management issues for Wright Hill Reserve are similar to those of other forest remnants in Wellington City and include pest animals, existing and potential pest plants, stream water quality, and development pressure on adjoining land. While the reserve has adequate legal protection, the indigenous vegetation on some adjacent properties is not legally protected. This adjoining vegetation provides an important buffering function to the reserve, and the overall health of the reserve could be detrimentally affected if this buffering vegetation was to be removed. These advisory notes deal with these issues which are important for the long-term ecological health of the reserve.

3. VEGETATION AND HABITATS

3.1 Overview

Three main habitat types have been identified: forest, riparian, and exposed sites. Within these habitats, nine vegetation types are described, based on vegetation structure and composition, underlying landforms, and weed management issues (Wildland Consultants 1998). Habitats and vegetation types are mapped in Figure 1, with descriptions of all types provided below. A species list is provided in Appendix 1.

3.2 Forest habitats

Kamahi-Tawa-Kohekohe Forest (Park 1999 Primary Forest Remnant) (29.95 ha)

This area of forest is dominated in the canopy by kamahi, tawa, and kohekohe, up to *c*.8 m tall (Plate 1). Other canopy species include mahoe, mapou (*Myrsine australis*), and mamaku (*Cyathea medullaris*). Hinau (*Elaeocarpus dentatus*), rimu (*Dacrydium cuppressinum*), northern rata (*Metrosideros robusta*), and totara (*Podocarpus totara*) are occasional emergents. In the understory, pukatea (*Laurelia novae-zelandiae*), kaikamako (*Pennantia corymbosa*), and puka (*Griselinea littoralis*) are common. Lianes include supplejack (kareao, *Ripogonum scandens*), pohuehue (*Muehlenbeckia australis*), white rata (*Metrosideros diffusa*), akakaikiore (*Parsonsia heterophylla*),

[1] At Risk land environments are considered a national priority for protection (Ministry for the Environment 2007a, 2007b).

[2] Streams are listed as one of Wellington's threatened ecosystems (Wellington City Council 2007).

and kiekie (*Freycinetia banksii*). These areas were identified by Park (1999) as having 'marker' tree species (refer to Table 3 below) that are assumed to be representative of the formerly widespread indigenous forest tracts of Wellington City.

Kamahi-Miro-Tawa Forest (Park 1999 Primary Forest Remnant) (12.11 ha)

Primary forest with a canopy dominated by kamahi, miro, and tawa. Pokaka (*Elaeocarpus hookerianus*), putaputaweta (marbleleaf, *Carpodetus serratus*), porokaiwhiri (pigeonwood, *Hedycarya arborea*), toru (*Toronia toru*), and houhere (lacebark, *Hoheria sexstylosa*) are also present. Hinau and northern rata are occasional emergents. Kohuhu (*Pittosporum tenuifolium*), hupiro (stinkwood, *Coprosma foetidissima*), and thin-leaved coprosma (*C. areolata*) are present in the understory.

Mahoe Forest (34.41 ha)

Regenerating mahoe-dominated forest to *c*.6 m tall, with a range of other common species in the canopy, such as mapou, kohekohe, porokaiwhiri, tarata (lemonwood, *Pittosporum eugenioides*), and whauwhaupaku (fivefinger, *Pseudopanax arboreus*) (Plate 2). Other species present include ngaio (*Myoporum laetum*), manuka (*Leptospermum scoparium*), kanuka (*Kunzea ericoides*), kanono (*Coprosma grandifolia*), rangiora (*Brachyglottis repanda*), and karamu (*Coprosma robusta*). Pohuehue and bush lawyer (*Rubus cissoides*) are present as lianes. Gorse and Darwin's barberry are scattered throughout.

3.3 Exposed habitats

Mixed Broadleaved-Gorse Scrub (12.04 ha)

The upper slopes of Wright Hill are exposed and have a more recent history of disturbance, such as fire and vegetation clearance, than do the lower slopes. Indigenous vegetation is consequently in a less advanced state of re-establishment, and exotic species have greater representation.

(a) On the midslopes, canopy height ranges from 2-4 m and consists of whauwhaupaku, mapou, hangehange, rewarewa, hinau, and ponga (*Cyathea dealbata*), amongst others. Gorse, Darwin's barberry, and broom (*Cytisus scoparius*) are scattered beneath the canopy.

(b) Higher up the slopes, gorse and Darwin's barberry are co-dominant with broadleaved indigenous species, the most abundant of which are by mahoe, rangiora, and kanono (Plate 3). Wilding pines (*Pinus* sp.) are occasionally emergent. Rarahu (bracken, *Pteridium esculentum*) and hupiro are also common.

Exotic Conifer Treeland (1.36 ha)

Mature exotic conifers (mainly radiata pine (*Pinus radiata*) and lodgepole pine (*P. contorta*), but also macrocarpa (*Cupressus macrocarpa*), line the ridges. Mixed broadleaved-gorse scrub forms the understory.

Exotic Scrub (9.69 ha)

The uppermost slopes of Wright Hill are dominated by swathes of mixed gorse-broom-Darwin's barberry scrub (Plate 4), particularly around the vicinity of the historic fortress.

Parkland (1.55 ha)

Several cleared areas around the fortress are maintained as mown exotic grassland for historic and access reasons. The cleared area around the site of the No. 1 gun-pit has been planted with native shrubs and flaxes along its margins.

Garden Waste Dump Sites (0.02 ha)

There is one known garden waste dump site (Figure 1), but it is possible that there are more sites around the edge of the reserve. The known dump site has undergone a degree of rehabilitation in the past. Key weed species include buffalo grass (*Stenotaphrum secundatum*) and black nightshade (*Solanum nigrum*). Poroporo (*Solanum laciniatum*) a native species often regarded as weedy, is also present here. Other weed species may establish as a result of garden waste dumping.

4. OVERVIEW OF MANAGEMENT REQUIREMENTS

These advisory notes deal with the management of pest plants, which are considered to be the most significant threat to the reserve, and restoration planting. The weed management section below summarises and prioritises requirements for weed surveys and control operations. Restoration planting is required in small parts of the reserve, mainly to prevent the further establishment of invasive weeds. Animal pest control is managed largely by GW as part of their city-wide programme. Effective pest control is crucial to the success of indigenous revegetation efforts. Details of management requirements are presented in Section 8 and are summarised in Table 5.

5. WEED MANAGEMENT

Pest plants pose significant short- and long-term threats to the ecological values of Wright Hill Reserve and weed management is therefore a priority. This section outlines known information regarding weed species within the reserve, and then prioritises requirements for further weed surveys and control operations. The weed control already undertaken by WCC has reduced the distribution of some species and contained the spread of others, but further control work is required.

5.1 Weeds present in Wright Hill Reserve

Most weeds are located along the stream bank, in areas with less indigenous canopy cover, and around the outer edges of the reserve. Fifteen environmental pest plant species were identified and each species has been assigned to one of six risk classes

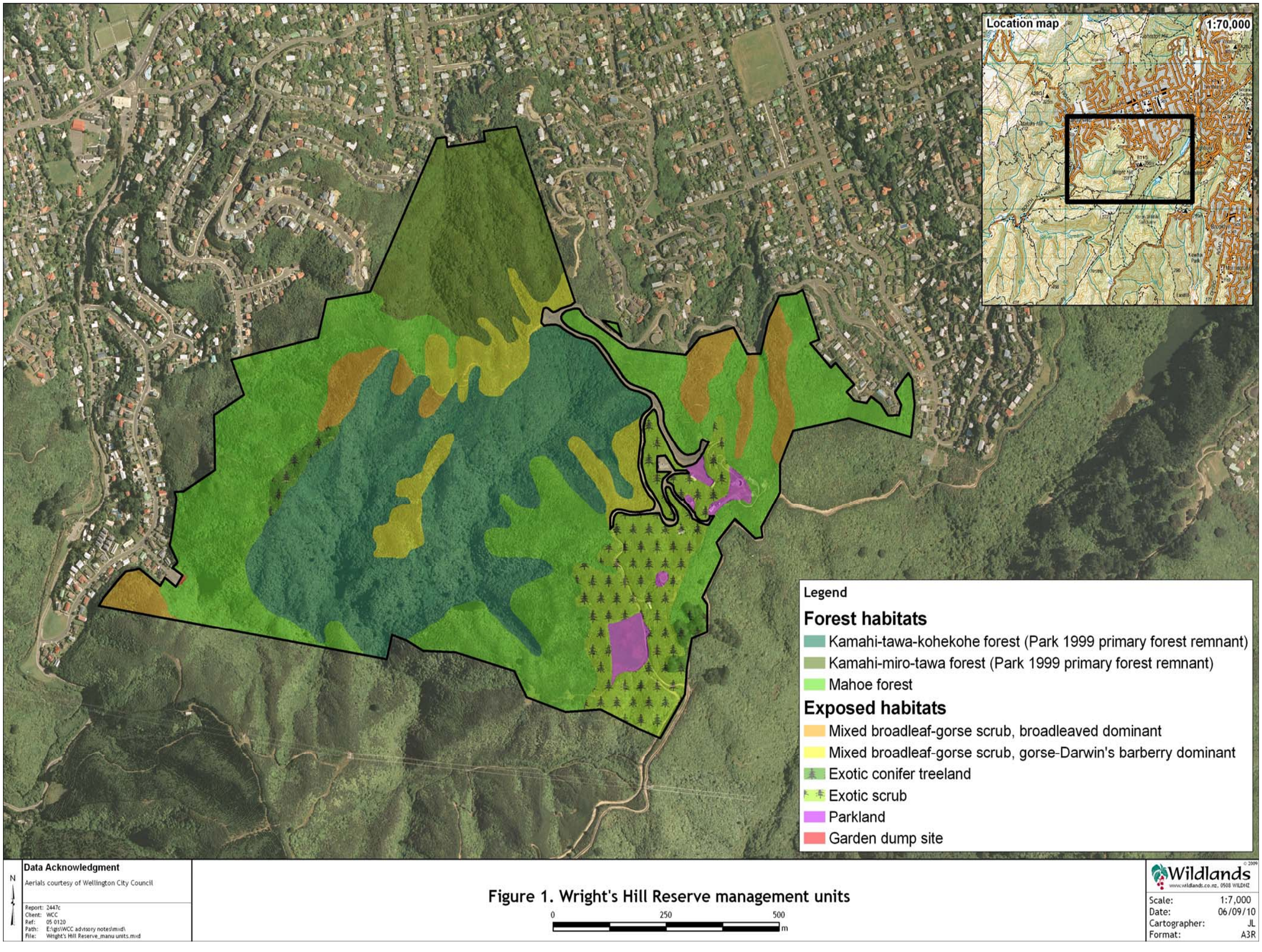

Figure 1. Wright's Hill Reserve management units

(refer to Table 2) based on an assessment of the degree of threat to the ecological values of the reserve, the vulnerability of the vegetation and habitats, and the size of the infestations. As no published information regarding weed species distributions in Wright Hill Reserve could be found, all recommendations are based on observations made during the site visit.

5.2 Weed control priorities

This section briefly describes the rationale for assigning weed species to particular risk classes, using six categories.

1. Class One

   Class One species are Suppression pests identified in the Wellington City Council Pest Management Strategy (WCC 2004). Although none were noted during the visit, additional surveys should be undertaken to determine whether any such species occur in the reserve; if found, they should be eradicated.

2. Class Two

   All Class Two species should be controlled, preferably to eradication. These species are present in low numbers or are restricted to smaller infestations. Control should be instigated before these species spread and this control should be prioritised by habitat type (Table 1). Although only one species of this class was observed, a more thorough survey of the reserve may locate others.

3. Class Three

   Class Three species threaten the ecological integrity of the study area and the long-term viability of the ecologically valuable vegetation. Infestations of these species are generally sizeable and would require substantial effort to control, and should, therefore, be prioritised by infestation type.

4. Class Four

   These are environmental pest plant species that are present in moderate to large infestations, but pose a lesser threat to ecological processes or values in the reserve. These should be controlled as resources allow, or if they begin to threaten the indigenous vegetation of the reserve.

   Balm of Gilead (*Cedronella canariensis*) (Plate 5) appears to be particularly pervasive in moist and shady habitats throughout Wellington City. This species requires careful monitoring, and it is recommended that its pest plant status in the city should be re-evaluated.

5. Class Five

   These are small infestations of pest plants which do not threaten ecological processes, and control is not advocated at present.

6. Class Six

Species listed under Class Six are not recommended for control, because they either pose little threat to ecological values, or seem unlikely to spread significantly. Gorse will need to be controlled to fulfil RPMS requirements; although it poses little ecological threat.

Control efforts should concentrate on Class One to Class Three environmental pest plants. However, other control priorities may also be important. For instance, a small area of a newly-arrived weed is a high priority to prevent it from becoming established, and because the cost of eradication in the early stages is much cheaper then when a species is more established and widespread. In addition, site-led priorities such as the value of habitats present are also important considerations (Table 1). Table 2 prioritises weed infestations by species risk class, species (within risk classes), and habitat type (using the priorities in Table 1).

Table 1: Priorities for weed control by habitat type, Wright Hill Reserve, Wellington City.

	Highest Priority	**Medium Priority**	**Lowest Priority**
Habitat type	High value, least disturbed	Medium value, moderately disturbed	Low value, highly disturbed
Example	Pre-1840 forest, Park 1999 primary forest remnants.	Mahoe forest, Riparian, Ridgelines.	Garden dumping sites.

It should be noted that budget limitations, the size the infestations and range of species involved, will likely mean that weed control will need to be managed over a multi-year work programme.

5.3 Weed survey priorities

Weed surveys are vital to determine which weed species are present, and what their distributions are. They are required to help the prioritisation of species and sites, for monitoring the success of weed control operations, and to ascertain if new species and infestations have become established. There appears to have been no formal comprehensive weed survey completed for Wright Hill Reserve in recent years. Ongoing, preferably annual (or maximum of five yearly intervals) weed surveys are required to assess the success of weed control operations, pick up new species, and enable the regular review of weed control priorities.

5.3.1 Limitations of existing information

All specific weed information contained in this report is the result of limited observations made during a site visit over a single day. Other information may exist elsewhere in piecemeal form, or as institutional knowledge. It is unlikely that all current threats have been identified and species distributions within the reserve are estimates only. Therefore, it is a high priority to undertake a comprehensive weed survey in the reserve, in order to more accurately identify and assess pest plant threats.

Table 2: Weed species present in Wright Hill Reserve listed in order of control priority.

Scientific Name	Common Name	Risk Class	Weed Management Recommendations	GW RPMS[1]	WCC PMS[2]	Habitat Score[3]	⇨ Decreasing Order of Priority ⇨					Notes
							Primary Forest Remnant	Mahoe Forest	Riparian	Ridge Lines	Garden Dumping Sites	
Erica lusitanica	Spanish heath	2	Control to eradicate	KNE	KNE	M				✓		
Tradescantia fluminensis	Tradescantia	3	Control to minimise increases in coverage following infestation priorities. Survey high value habitats for this shade tolerant species. Long term aim to eradicate.	KNE	KNE	H	✓	✓	✓	✓		
Berberis darwinii	Darwin's barberry	3	Survey to accurately access coverage. Survey high value habitats for this shade tolerant species. Control to minimise increase in coverage.	KNE	KNE	H	✓	✓		✓		
Rubus sp. (*R. fruticosus* agg.)	Blackberry	4	Control to minimise increases in coverage.	Site-led	KNE	M			✓	✓	✓	
Cedronella caneriensis	Balm of Gilead	4	Control to minimise increases in coverage. Monitor distribution changes and reassess priority at a later date if required.			M						Recommend re-evaluation of pest status in Wellington City.
Solanum chenopodioides	Velvety nightshade	4	Control to minimise increases in coverage.			M						
Paraserianthes lophantha	Brush wattle	5	Control not recommended at present. Monitor to assess distribution changes. Reassess priority at a later date if required.	KNE	KNE	M		✓				
Crocosmia x crocosmiiflora	Montbretia	5	Control to minimise increases in coverage.			M						
Solanum nigrum	Black nightshade	5	Control to minimise increases in coverage.			M		✓	✓		✓	
Foeniculum vulgare	Fennel	5	Control to minimise increases in coverage.			L					✓	
Pinus radiata	Radiata pine	5	Control not recommended at present. Monitor to assess distribution changes. Reassess priority at a later date if required.			M		✓		✓		
Pinus contorta	Lodgepole pine	5	Control not recommended at present. Monitor to assess distribution changes. Reassess priority at a later date if required.			M		✓		✓		
Cytisus scoparius	Broom	6	Not recommended for control. Monitor to prevent spread, assess if hindering indigenous succession.	KNE	KNE	M				✓		
Ulex europaeus	Gorse	6	Not recommended for control except for PMS boundary requirements.	Site-led	Suppression	M				✓		PMS short term goal: meet RPMS requirements for boundary control.
Cupressus macrocarpa	Macrocarpa	6	Not recommended for control.			H	✓	✓				

1 Greater Wellington (2009). Indicates level of control outlined in the Regional Pest Management Strategy (RPMS). Site-led and KNE (Key Native Ecosystem)-species are widespread pests that can, and have, spread rapidly over long distances and adverse impacts of species is considered to be severe, but total control or containment is not achievable. The focus is for control of pest species by the land-owner of these sites, and KNE sites may receive funding to support such pest control. Containment species are those species that have established in the Greater Wellington area, but have not yet achieved maximum distribution, and may be able to be prevented from infesting additional sites.

2 Wellington City Council (2004). Indicates levels of control outline in Pest Management Strategy (PMS).

3 Habitat score based on distribution of pest plant within habitats shown in Figure 1. H-High includes Park 1999 primary forest remnants. M-Medium includes Mahoe forest, Riparian habitats, Ridgelines. L-Low includes Garden dumping sites.

5.3.2 Garden waste dump sites

Garden waste dump sites are an ongoing source of weed invasion. It is important to know where these sites are and to monitor them, in order to minimise the threat they pose to the reserve. One known garden dumping site was identified during the site visit (Figure 1), but there are likely to be more along the reserve boundary. A further survey is required to assess the location and extent of garden dumping sites, and to record weedy species in these areas.

The boundary between the reserve and urban areas should be walked to accurately locate, map, and assess all sites. The sites would then need to be prioritised in terms of risk class, weediness, accessibility for control, and potential for enhancement through community restoration programmes. To reduce the risk of additional garden waste dump sites becoming established, an advocacy programme should be undertaken with residents adjacent to the reserve.

5.3.3 Native 'weeds'

Several indigenous species that have their natural range only in the northern part of the North Island are currently naturalised in the Wellington region, and may be regarded as weeds in the Wellington forest environment. In Wright Hill Reserve, these include karo (*Pittosporum crassifolium*), karaka (*Corynocarpus laevigatus*), and pohutukawa (*Metrosideros excelsa*). Mature specimens of these species are not recommended for control, for practical, financial, and cultural reasons. However, the distribution of these species in the reserve should be surveyed and new weed recruitment controlled to minimise further intrusion.

5.3.4 MTB trails

Many weedy species reproduce vegetatively and are able to establish new infestations following dispersal of leaf or stem fragments (e.g. tradescantia) (Plate 6). Mountain-bikes are particularly suitable vectors for this form of dispersal, as vegetative fragments may be inadvertently carried in tyres, chains, and frames. MTB trails should be regularly surveyed for signs of pest plant infestation, and responsible riding practises should continue to be promoted in the mountain-biking community.

5.4 Weed management summary

5.4.1 Weed control priorities

Table 2 provides a list of species known to be present in the Wright Hill Reserve. Species in risk classes One to Three should be controlled or eradicated as soon as possible. Information in Table 2 should be reviewed and updated every three years.

5.4.2 Weed control guidelines

- Keep high value sites weed free;
- Reduce spread of satellite infestations;

- Start control on edge of infestation and work towards core;
- Start control on edge of park and work towards centre;
- Control upstream riparian infestations first and work downstream;
- Control prior to seed set and avoid spreading propagules;
- Minimise extent of area cleared, if possible;
- Undertake restoration planting as soon as possible after weed control.

5.4.3 Weed survey requirements

Weed survey requirements are outlined below, in priority order:

- Survey the reserve for Risk Class One weeds that have been found in similar habitats elsewhere in Wellington (e.g. cathedral bells (*Cobaea scandens*), kahili ginger (*Hedychium gardnerianum*), and climbing asparagus (*Asparagus scandens*). Update control priorities if required;
- Survey priority habitats, such as primary forest remnants (Park 1999), for shade-tolerant weed species. Update control priorities, if required;
- Survey the reserve boundaries for garden waste dump sites. Update control priorities, if required;
- Survey the Darwin's barberry population, particularly within the indigenous vegetation, to accurately determine the extent and locations of infestation. Update control priorities if required;
- Survey MTB trails for pest plant infestations. Update control priorities if required;
- Survey the remainder of the reserve for other pest plant threats. Update control priorities if required;
- Undertake annual monitoring, to assess the success of the ongoing weed control programme. Record the changes in weed distribution and potentially reprioritise species and/or sites for control;
- Initiate comprehensive five-yearly weed surveys, to ensure that any future infestations are identified at an early stage of establishment.

As part of any weed survey it is important that accurate written information is kept on file, using a consistent recording system, and that records are kept up-to-date.

6. RESTORATION PLANTING

There are three reasons for undertaking restoration planting in Wright Hill Reserve: firstly, to fill gaps in the indigenous vegetation cover, thereby reducing the opportunities for weeds to establish; secondly, to enhance species diversity through the re-establishment of 'missing species' in the reserve; and thirdly, to improve the foraging habitat available within the reserve for the use of rare bird populations in the adjoining Karori Wildlife Sanctuary. These restoration planting opportunities are discussed below, along with factors that influence their success (or failure).

6.1 Restoration planting to fill gaps in indigenous vegetation cover

Currently several areas within Wright Hill Reserve would benefit from restoration planting to fill gaps in the indigenous vegetation cover, thereby reducing potential for weed establishment. Canopy gaps can be caused by weed control, track construction, or by natural processes such as tree fall. Additionally, garden waste dump sites may require restoration planting, once advocacy has been undertaken. The various management requirements are discussed below.

6.1.1 Areas where weed control has been undertaken

These are the highest priority sites for restoration planting, as previous weed control has reduced or removed the canopy, which makes these sites vulnerable to re-invasion by a fresh cohort of adventive species. Additionally, there are steep riparian sites, which, due to erosion, do not currently have significant indigenous vegetation cover. All of these sites may benefit from restoration planting to reduce opportunities for pest plant establishment. Approaches to restoration planting in these areas are outlined below:

- Minimise the time a site is bare. Aim for weed control followed by revegetation within 3-6 months, i.e. undertake weed control over summer which is then followed by planting in May;
- Establish canopy cover as quickly as possible;
    - Select fast growing species, such as toetoe (*Cortaderia fulvida*), cabbage tree (*Cordyline australis*), karamu (*Coprosma robusta),* and manuka (*Leptospermum scoparium*). A wider range of species can be planted once a good cover is established.
    - High density planting of at least one plant per 1 m^2 in terrestrial situations, and one per 0.75 m^2 in wetland situations.
- Root trainers require less disturbance of soil to plant so are useful on unstable or steep sites;
- Geotextile material could be used on steep, erosion prone sites, to prevent weed establishment. This should be assessed by a Geotechnical Engineer.

6.1.2 Restoration of garden waste dump sites

These sites differ from interior sites in that weeds are already well-established, and a greater variety of exotic species will dominate the seed-bank. Weed monitoring and control will need to be ongoing, as there is potential for many of these species to be shade tolerant, and persist underneath the canopy. Otherwise, restoration should proceed as for interior sites.

6.2 Restoration planting for enhancement of species diversity

Many of Wellington City's forest remnants lack some of the species which are considered to be indicators of primary forest (as described by Park 1999). The 19 such indicator species in Wellington (Table 3) are referred to here as 'missing species'. Seven of these species were not recorded during the site survey and a further eight species were only present in low numbers (Table 3).

Podocarp tree species (e.g. rimu (*Dacrydium cupressinum*), matai, miro (*Prumnopitys ferruginea*), kahikatea, and totara (*Podocarpus totara*)) are frequently missing from Wellington forest remnants. If these species are to be restored, the most suitable strategy would entail large-scale targeted plantings of seedlings, as the natural seed bank is likely to be impoverished. However it would is recommended that city-wide guidelines are established for podocarp planting, including where best to source plant propagules, whether species are shade-tolerant or not, and whether species prefer dry ridges or wetter valleys. The guidelines could be developed from the successes and failures of previous podocarp planting efforts. The guidelines should also consider the requirement to maintain view-shafts of the surrounding landscape and other such District Plan requirements.

Some of the other 'missing species' could be planted in small numbers, to enhance the species diversity within the reserve. Many of these species can be hard to establish, are generally slower growing, and often prefer sheltered sites beneath a canopy, rather than establishing in the open. Species preferences should be matched to site conditions, and it would be useful to record planting locations, for future monitoring.

Table 3: Species indicators of primary forest remnants in Wellington (missing species), their abundance, and potential for supplementary planting in Wright Hill Reserve.

Scientific Name	Common Name	Presence in Wright Hill Reserve	Potential for Supplementary Planting
Dacrycarpus dacrydioides	Kahikatea	Not recorded.	Podocarp enhancement planting.
Dacrydium cupressinum	Rimu	**Recorded**.	Podocarp enhancement planting.
Prumnopitys taxifolia	Matai	Not recorded.	Podocarp enhancement planting.
Podocarpus totara var. totara	Totara	**Recorded**	Podocarp enhancement planting.
Prumnopitys ferruginea	Miro	**Recorded**	Podocarp enhancement planting.
Alectryon excelsus var. *excelsus*	Titoki	**Recorded** with young plants present.	Not required if natural recruitment continues.
Beilschmiedia tawa	Tawa	**Recorded**.	Enhancement planting in selected sites.
Dysoxylum spectabile	Kohekohe	**Recorded** with young	Not required if natural recruitment

Scientific Name	Common Name	Presence in Wright Hill Reserve	Potential for Supplementary Planting
		plants present.	continues, but this requires control of browsing pests.
Elaeocarpus dentatus	Hinau	**Recorded** with young plants present.	Enhancement planting in selected sites.
Knightia excelsa	Rewarewa	**Recorded**.	Enhancement planting in selected sites.
Laurelia novae-zelandiae	Pukatea	**Recorded.**	Enhancement planting in selected sites.
Metrosideros robusta	Northern rata	**Recorded.**	Limited potential, will establish on the ground but prefers perched sites. Perhaps suitable for slip faces.
Nestegis lanceolata	White maire	Not recorded.	Enhancement planting in selected sites.
Pennantia corymbosa	Kaikomako	**Recorded.**	Enhancement planting in selected sites.
Streblus banksii	Turepo	Not recorded.	Regionally endangered species (Sawyer 2004). Enhancement planting in selected sites.
Syzygium maire	Maire tawake, swamp maire	Not recorded.	Plant in riparian areas after indigenous cover has been established.
Weinmannia racemosa	Kamahi	**Recorded** with young plants present.	Enhancement planting in selected sites.
**Olearia paniculata*	Akiraho	Not recorded.	Enhancement planting in selected sites.
**Sophora microphylla* or *S. chathamica*	Kowhai	Not recorded.	Enhancement planting in selected sites.

* Indicator of the survival of a primary forest element in southern coastal sites, but could still be planted in Wright Hill Reserve.

6.3 Restoration planting to improve foraging habitat for birdlife

With the Karori Wildlife Sanctuary immediately adjacent, Wright Hill Reserve is often utilized by birds as foraging habitat. Many of the plant species listed in Table 3, along with a variety of other species common in the Wellington region, are valuable food sources for native bird species, providing a range of nutritional values (Table 4).

Indigenous fruit bearing understorey species, such as coprosmas, can often be quickly established and provide good sugar-laden fruit for birds. Northern rata, along with other rata species and nikau, may be difficult to establish, but planted in the right location could provide a valuable contribution to year round food and nutrient availability. Species such as pohuehue and karaeo (supplejack) already occur within the reserve and should be maintained where this is appropriate.

Table 4: Potential foraging enhancement species, and their nutritional values.

Scientific Name	Common Name	Sugars	Lipids	Nectar	Nitrogen	Calcium
Podocarps	rimu, totara, miro, matai, kahikatea	✓	✓			
Beilschmiedia tawa	tawa		✓			
Alyctron excelsus	titoki	✓				
Dysoxylum spectabile	kohekohe		✓			
Sophora microphylla	kowhai			✓	✓	

Scientific Name	Common Name	Sugars	Lipids	Nectar	Nitrogen	Calcium
Phormium tenax	harakeke			✓		
Aristotelia serrata	makomako	✓		✓		
Pseudopanax arboreus	whauwhaupaku	✓		✓		
Macropiper excelsa	kawakawa		✓			
Cordyline australis	ti kouka	✓				
Coprosma spp.	coprosma	✓				
Metrosideros spp.	rata			✓		
Rhopalostylis sapida	nikau		✓			✓
Meuhlenbeckia spp.	pohuehue				✓	
Ripogonum scandens	karaeo		✓			✓

6.4 Restoration planting summary

Priorities for restoration planting are provided in the list below:

- Planting in riparian areas where weed control has been undertaken (Figure 1);
- Frequent monitoring of restoration planting sites to manage the areas for greater success. Ensure that accurate records are kept, including planting locations, species used, measures of success, and causes of failure;
- Planting for enhanced species diversity, to re-introduce some of the 'missing species';
- Planting for improved foraging habitat for native avifauna.

7. ADDITIONAL MANAGEMENT REQUIREMENTS

A number of management requirements are beyond the scope of these advisory notes, and are mentioned below as options to further improve the ecological potential of the reserve. An additional report could be commissioned to explore these requirements.

7.1 Pest animal control

- Prior to and following restoration planting;
- To maintain or enhance health of indigenous vegetation;
- To lower pest animal densities and reduce impacts on bird, lizard and invertebrate species;
- To support the conservation efforts in Karori Sanctuary.

Should pest animal control be reduced or stopped at some point in the future, then the likely consequences will be a progressive reduction in the health and productivity of indigenous plant and animal species.

7.2 Improvement of stream health

- Assess ecological values of streams within the reserve and how these could be improved, including undertaking fish and other aquatic species surveys;
- Limit input of contaminants into the stream;
- Ensure good sediment capture systems are employed for storm water.

7.3 Advocacy

- Initiate advocacy with adjacent landowners to reduce dumping of garden waste;
- Maintain advocacy with MTB organisations to promote responsible mountain-biking;
- Encourage the establishment of a community care group to look after the reserve, possibly in partnership with the Wright Hill Fortress Restoration Society;
- If possible, formalise legal protection of adjacent indigenous vegetation, to maintain the surrounding vegetation buffer;
- Develop and disseminate information on Wright Hill Reserve to promote interest in the wider Wellington community;
- Encourage interest groups, such as the Wellington Botanical Society, to provide additional ecological information by undertaking a field visit.

7.4 Legal protection

- Review the legal status of the reserve in the District Plan. Wright Hill Reserve is not currently listed as a WCC Conservation Site despite containing significant areas of primary indigenous forest habitat.

8. WORK PROGRAMME AND SCHEDULE

The weed management and restoration planting required for Wright Hill Reserve is a multi-year undertaking. A work programme and schedule has been provided in Table 5 to assist with planning. The six main tasks - weed control, weed survey, restoration planting, pest animal control, stream enhancement, and advocacy - have all been outlined above.

Priority habitat and vegetation areas for each task have been identified. Tasks have been ranked by urgency; that is the ecological consequences of not doing the task. The size of the task has been estimated as follows: **small** is less than 40 person hours, **medium** is between one week and one month of person hours, and **large** comprises more than one month of work for one person. The schedule indicates the time (in years from now) within which a task should be initiated. Ongoing tasks are also shown.

Table 5: Work programme for Wright Hill Reserve.

Task	Activity	Priority Sites[1]	Urgency[2]	Task Size[3]	Schedule[4]	Ongoing[5]	Report Section
Weed control	Control and follow-up control of Class One and Two weeds species.	Control prioritised by habitat type (Table 1).	High	?	1	Yes	5.2
	Control and follow-up control of Class Three weeds.	Control prioritised by habitat type (Table 1).	High	?	1-2	Yes	5.2
	As control of Class One to Three weeds is achieved, reprioritise weeds in Classes Four to Six.	Control prioritised by habitat type (Table 1).	High	Large	2-5	Yes	5.2
	Monitor control outcomes to ensure that goals are achieved. Minimise access to garden waste dump sites, if feasible.	Control prioritised by habitat type (Table 1). Boundary.	High Medium	Small Medium	1 1-2	Yes Yes	5.2 5.3.1
Weed survey	Establish a document bank, to provide a repository for all written information associated with management actions within the reserve.	All.	High	Small	1	Yes	5.3
	Survey for Class One weeds.	All.	High	Small	1	Yes	5.4.2
	Survey primary forest remnants (Park 1999) for shade-tolerant weeds.	Primary forest remnants (Park 1999).	High	Medium	1-2	Yes	5.4.2
	Survey boundary for garden dumping sites.	Boundary.	High	Medium	1	Yes	5.3.1 5.4.2
	Survey to determine extent of endemic weeds such as Darwin's barberry.	All.	High	Medium	1-2	Yes	5.3.1 5.4.2
	Assess weed distribution changes and reprioritise species to be controlled, as appropriate.	All.	High	Medium	1-2	Yes	5.3 5.4.2
	Repeat five year weed survey.	All.	High	Medium	5	Yes	5.3
Restoration planting	Site preparation.	Replanting sites.	High	Small	1	Yes	6.1.1
	Planting.	Replanting sites.	High	Small	1	Yes	
	Monitor plantings sites.	Replanting sites.	High	Small	1	Yes	
	Maintain plantings.	Replanting sites.	High	Large	1	Yes	
	Infill planting.	Replanting sites.	High	Small	1	Yes	
	Establish a document bank, or written information associated with all management within the reserve.	All	High	Small	1	Yes	
	Establish restoration area(s) at garden dumping sites.	Boundary.	Medium	Medium	1-2	Yes	5.3.1 6.1

Task	Activity	Priority Sites[1]	Urgency[2]	Task Size[3]	Schedule[4]	Ongoing[5]	Report Section
	Small scale enhancement of species diversity.	Riparian. If approved, primary forest remnants (Park 1999).	Low	Small	5-10		6.2
	Small scale planting of podocarps.	Riparian. If approved, primary forest remnants (Park 1999).	Low	Small	5-10		6.2
	Planting additional food species[6]	Under indigenous canopy and at replanting sites as appropriate.	Low	Medium	5-10		6.3
Animal pest control	Control priority KNE pests.	All.	High	Medium	1	Yes	7.1
	Monitor for and control pests that will damage restoration planting.	All.	High	Medium	1	Yes	6.1.2
Stream enhancement	Liaise with Capacity about sewer and water infrastructure and restoration effort.	Riparian.	High	Small	1	Yes	7.2
	Ecological assessment.	Riparian.	Medium	Small	1		7.2
	Enhance fish passage.	Riparian.	Low	Medium	2-5		7.2
	Assess potential to mitigate erosion from storm water outlets.	Riparian.	Low	Large	5-10		7.2
	Mitigate erosion from storm water outlets.	Riparian.	Low	Large	5-10		7.2
Advocacy	Contact neighbouring property owners about the importance of buffering indigenous vegetation cover.	Boundary.	Medium	Large		Yes	7.3
	Contact neighbouring property owners about garden waste dumping.	Boundary.	Medium	Large	1-2	Yes	7.3
	Obtain additional ecological information: encourage Wellington Botanical Society to undertake a fieldtrip.	All.	Low	Small	1-2		7.3
	Publicise and promote Wright Hill Reserve in the Wellington community.		Low	Medium	1-2	Yes	7.3

1: Priority sites: Whether this task should occur in all or only part of the reserve, and if part then which part.
2: Urgency: Relates to the ecological consequences of not doing the task. A task with High urgency has greater ecological implications if not undertaken than a Low urgency task.
3: Task size: Small is less than 40 person hours; Medium is one week to one month of person hours; and Large is more than one month of work for one person. '?' indicates that the task size is currently uncertain.
4: Schedule: Indicates the ideal time (in years from now) within which a task should be initiated.
5: Ongoing: Illustrates whether a task is likely to be repeated or needs to be carried on for a longer period then the 10 years considered here.
6: Planting additional food species is only warranted if pest animal control is effective. Otherwise rare and threatened birds may be encouraged to forage in an area where they are at risk from predation.

9. CONCLUSIONS

Wright Hill Reserve is an important asset within the Parks and Gardens of Wellington City, and an important historical site. It is an ecologically significant reserve that contains remnants of primary forest. A recent survey (Wildland Consultants 2009) ranked this site sixth equal in terms of relative ecological importance within Wellington City.

There are several weed management issues within the reserve which require ongoing management. Individual tasks have been described and prioritised to manage and control the impacts of ecologically significant weed species, and maintain and improve the reserve's overall ecological condition. Several small areas require restoration planting, to prevent weed establishment, enhance biodiversity, and enhance bird foraging habitat, and these should be monitored frequently to ensure successful implementation. Additional ecological enhancements can be achieved by improving stream health, maintaining or increasing pest animal control, undertaking advocacy, and encouraging the establishment of a community care group for the reserve and adjacent land.

ACKNOWLEDGMENTS

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PLANT SPECIES RECORDED IN WRIGHT HILL RESERVE

Key

1. Indigenous species recorded by Parks (1999) and during the 2010 field survey.
2. Partial list of exotic species from the 2010 field survey.

INDIGENOUS SPECIES[1]

Gymnosperm trees and shrubs

Dacrydium cuppressinum	rimu
Podocarpus totara	totara
Prumnopitys ferruginea	miro

Monocot. trees and shrubs

Cordyline australis	ti kouka, cabbage tree

Dicot. trees and shrubs

Alectryon excelsus subsp. excelsus	titoki
Aristotelia serrata	makomako, wineberry
Beilschmiedia tawa	tawa
Brachyglottis repanda	rangiora
Carpodetus serratus	putaputaweta
Coprosma areolata	
Coprosma foetidissima	hupiro
Coprosma grandifolia	kanono
Coprosma lucida	shining karamu
Coprosma robusta	karamu
Coprosma rotundifolia	
Coprosma propinqua var. *propinqua*	mingimingi
Coriaria arborea var. *arborea*	tutu
Corynocarpus laevigatus	karaka
Dysoxylum spectabile	kohekohe
Elaeocarpus dentatus	hinau
Elaeocarpus hookerianus	pokaka
Fuchsia excorticata	kotukutuku
Geniostoma ligustrifolium var. *ligustrifolium*	hangehange
Griselinia lucida	puka
Hebe parviflora	koromiko taranga
Hebe stricta var. *stricta*	koromiko
Hedycarya arborea	pigeonwood
Hoheria populnea	hourere, lacebark
Knightia excelsa	rewarewa

Kunzea ericoides	kanuka
Laurelia novae-zelandiae	pukatea
Leptospermum scoparium agg.	manuka
Macropiper excelsum subsp. *excelsum*	kawakawa
Melicope ternata	wharangi
Melicytus ramiflorus subsp. *ramiflorus*	mahoe
Metrosideros excelsa	pohutukawa
Metrosideros robusta	northern rata
Myoporum laetum	ngaio
Myrsine australis	mapou
Olearia paniculata	akiraho
Olearia rani var. *colorata*	heketara
Ozothamnus leptophyllus	tauhinu
Pennantia corymbosa	kaikomako
Pittosporum crassifolium	karo
Pittosporum eugenioides	tarata
Pittosporum tenuifolium	kohuhu
Pseudopanax arboreus var. *arboreus*	whauwhaupaku, five finger
Pseudopanax crassifolius	horoeka, lancewood
Schefflera digitata	pate
Solanum laciniatum	poroporo
Urtica ferox	ongaonga
Urtica incisa	ongaonga, tree nettle

Monocot. lianes

Freycinetia banksii	kiekie
Ripogonum scandens	kareao, supplejack

Dicot. lianes

Metrosideros diffusa	rata
Metrosideros fulgens	rata
Metrosideros perforata	aka, white rata
Muehlenbeckia australis	puka
Muehlenbeckia complexa	pohuehue
Parsonsia capsularis	akakiore
Parsonsia heterophylla	akakaikiore
Rubus cissoides agg.	tataramoa, bush lawyer

Dicot herbs

Acaena novae-zelandiae	piripiri

Ferns

Arthropteris tenella	
Asplenium bulbiferum	mouku, hen and chicken fern
Asplenium colensoi	
Asplenium flabellifolium	necklace fern

Asplenium flaccidum	makawe
Asplenium hookerianum	patako-paraharaha
Asplenium oblongifolium	huruhuruwhenua
Blechnum chambersii	rereti
Blechnum discolor	petipeti, crown fern
Blechnum filiforme	panako
Blechnum fluviatile	kiwikiwi
Blechnum minus	swamp kiokio
Blechnum novae-zelandiae	kiokio
Cyathea dealbata	ponga, silver fern
Cyathea medullaris	mamaku
Histiopteris incise	matata, water fern
Hymenophyllum demissum	irirangi, filmy fern
Hymenophyllum flexuosum	mauku, filmy fern
Leptopteris hymenophyloides	heruheru
Microsorum pustulatum	kowaowao, hounds tongue fern
Microsorum scandens	mokimoki
Paesia scaberula	matata
Pneumatopteris pennigera	pakau
Polystichum neozelandicum subsp. *neozelandicum*	pikopiko, shield fern
Polystichum vestitum	puniu, prickly shield fern
Pteridium esculentum	rarahu, bracken
Pyrrosia eleagnifolia	leather-leaf fern

Grasses

Cortaderia fulvida	toetoe

Sedges

Carex geminata agg.	rautahi
Carex virgata	purei
Cyperus ustulatus	toetoe, upokotangata

Rushes

Juncus pallidus	wi

Monocot. herbs (other than grasses, sedges, and rushes)

Collospermum hastatum	kahakaha
Dianella nigra	turutu
Phormium cookianum	wharariki, mountain flax
Phormium tenax	harakeke, flax

NATURALISED AND EXOTIC SPECIES[2]

Gymnosperms

Cupressus macrocarpa	macrocarpa
Pinus contorta	lodgepole pine
Pinus radiata	radiata pine

Dicot. trees and shrubs

Berberis darwinii	Darwin's barberry
Cedronella caneriensis	balm of Gilead
Cytisus scoparius	broom
Erica lusitanica	Spanish heath
Foeniculum vulgare	fennel
Paraserianthes lophantha	brush wattle
Solanum chenopodioides	velvety nightshade
Solanum nigrum	black nightshade
Ulex europaeus	gorse

Dicot. lianes

Rubus sp. (*R. fruticosus* agg.)	blackberry

Grasses

Holcus lanatus	Yorkshire fog

Monocot. herbs (other than grasses)

Tradescantia fluminensis	tradescantia
Crocosmia ×crocosmiiflora	montbretia

APPENDIX 2

SITE PHOTOGRAPHS

Plate 1: Pest animal trapline, tawa-kohekohe forest (Park 1999 primary forest remnant).

Plate 2: Interior of mahoe forest.

Plate 3: Mixed broadleaf-exotic scrub.

Plate 4: Exotic scrub.

Plate 5: Balm of Gilead (*Cedronella canariensis*).

Plate 6: Riparian tradescantia infestation alongside a mountain-bike track.

Wellington City Council

SNA Botanical Ground-truthing of the Wellington South Coast 2021/22

Te Kopahou Visitor Centre to Sinclair Head

Surveyed by 7(2)(a) – RESTORE

Aciphylla squarrosa var. *squarrosa*. Photo 7(2)(a)

Scope

Wellington City Council (WCC) contracted 7(2)(a) RESTORE to improve the accuracy and capture of ecological values within the Wellington's South Coast - Te Kopahou SNA to support better management of these sites by WCC officers. In particular to ground truth SNAs and produce a more detailed inventory of the significant ecological values, identified within the larger sites.

Methodology

The general approach for surveying the area was to start at Sinclair Head at the Western most extent of the site and work back toward the car park area on the eastern boundary of the site. A transect of sorts was travelled along recording all species of interest seen as well as recording locations of interest using a GPS unit. The 'transect' is not completely linear as the substrate, vegetation and terrain depicted dictated where could be surveyed safely and thoroughly. For example, large swathes of gorse were not investigated due inaccessibility.

The SNA was visited 18 times during this survey from July 2021 to February 2022. Due to weather and time constraints, a mixture access points and timings was used to complete the survey.

Species were reported according to their Regional Threat Classification (Crisp, 2020), or National Threat Classification (de Lange *et. al.*, 2018).

Specific Site Descriptions (Zones)

The SNA was split into various zones based on their geomorphology as illustrated in Map 1. Further details of each zone are highlighted in the following sections. Each species list was recorded as per zone and can be seen in the accompanying spreadsheet 'Te Kopahou South Coast Survey Species Data'.

Map 1. The SNA zones surveyed during this project.

CLIFF
This only includes the area directly west of the Te Kopahou carpark as it is relatively unique in its steepness and location. This is a very small zone which did not take much evaluation.

COAST
This includes habitat at the base of the slopes which may been dune, unworked scree, and beach. A couple of seeps are also present. Scree fans were also included in the 'coast' zones due to the general gradual slope and composition of substrate being weathered greywacke.

STONE STACKS
Any rock stacks seaside of the access road, including any sea surrounded rocks as long as vegetation is present and able to be identified.

QUARRY
This encompasses the area formally used as a quarry. This area is artificially modified to include steeper than usual bedrock faces, as well as flat(ish) platforms. This type of habitat is unique in the survey area.

RIPARIAN
These sites are the area directly near and affected by a stream. The likelihood of substrate which may be affected either positively or negatively by constant water supply. Areas like this can also have a higher humidity than sites nearby which may allow species to thrive that would not otherwise.

CATCHMENTS
Two catchments (Raurekau Falls and Taumata Patiti Pa) were added to the survey after initial feedback was given. Both areas have riparian zones at their floors which lead to the sea on the South Coast. Each catchment is quite unique as their output is very seasonal and remarkably contained compared to the greater area.

SLOPES
The majority of the site is regarded as slope, yet some differentiation can be made. The slopes have been divided into three types dependant on orientation; South-West, South, and South-East. The slopes are steep and are generally composed of rocky outcrops surrounded by either stable or unstable scree.

Pest Animal Sign

14/7/21 – During survey of Sinclair Head a lot of pig routing and scat was noted. Saw a live possum in SWS1 toward the top edge intersection which ran as soon as it saw me. Some of the lower slope *Aciphylla squarrosa ssp. squarrosa* showed signs of being nibbled by deer/hare/rabbit.

Most of the *Pimelea* sp. appeared to be targeted by rabbit/Hare, leaving a small remnant of the plant alive but in poor health.

23/7/21 - Possum seen on true left of lower section (R4) bank of Raurekau Catchment.

11/8/21 – Live possum seen on Eastern edge of Raurekau Falls Catchment, at top of lower branch to tributary R2. Two rats ran across my note board as I pushed through some vegetation at the bottom of the true left tributary of Raurekau Falls catchment.

24/9/21 – Live possum seen sleeping in the rotting remnant of a *Phormium* sp.

29/9/21 – Live possum ambled off in front of me at top of eastern edge of SES3.

15/10/21 – Live Hare seen in terraced area above Red Rocks (SWS2). Live possum seen living/sleeping under *Coprosma propinqua* in Northern section of the Taumata Patiti Pa catchment

9/2/22 – SES1/SWS3/SFS - Three live possums seen during this day's survey. All seemed pretty relaxed with my presence to the point I managed to take photos. There was lots of rabbit scat present in the SES1 area.

In the zone SWS3 in the upper reaches particularly there was a lot of pig scat, so much so it felt as if the area was where they might reside. There were a couple of flattened out areas of vegetation.

Native Species of Interest

Table 1. shows how many data points of the species were collected throughout the entire site. Further details per zone are included later in the report including a zone-specific threat rating compared to a general rating shown in Table 2. Some of the species featured below are not locally or nationally threatened, but may be of interest to WCC for seed sources etc. Some of the species featured in the accompanying document 'WCC South Coast SNA Survey 2021/22' may not have been recorded on GPS and are therefore not in Table 1.

Table 1. Targeted native species of interest.

Species	Threat Classification	GPS Points	# Of specimens	# Of zones represented	Threats
Aciphylla squarrosa var. squarrosa	Vulnerable	137	516	9	Medium – Predation (Pigs depending on locale)
Anthosachne solandri	Endangered	14	38	3	Low – Erosion/ browsing
Brachyglottis lagopus	Naturally Uncommon	24	585	7	None
Caladenia variegata	Naturally Uncommon	1	4	1	Medium – Plant collectors
Carex cyanea	At Risk - Declining	22	52	5	None
Clematis afoliata	Regionally Naturally Uncommon	1	1	1	Medium – Isolation from other specimens
Corybas macranthus	Not Threatened	1	30	3	Low – Plant collectors
Craspedia uniflora var. maritima	Endangered	74	2532	8	None
Crassula mataikona	Naturally Uncommon	5	10	10	None
Freycinetia banksii	Not Threatened	1	1	1	Low – Browsing (Goat)
Fuchsia colensoi (F. excorticata X F. perscandens)	Unusual Hybrid	2	3	1	Medium - Erosion
Fuchsia perscandens	Locally Uncommon	18	51	3	None, possibly regional stronghold
Leptospermum scoparium var. scoparium	Nationally Vulnerable	60	765	6	Low – Myrtle Rust
Linum monogynum var. monogynum	At Risk - Declining	26	265	9	None
Melicytus crassifolius	Regionally Declining	10	22	6	Low – Browsing (Rabbit, Hare)
Melicytus orarius	Regionally Critical	2	2	1	Low – Track-side maintenance
Metrosideros fulgens	Nationally Vulnerable	1	2	1	Low – Myrtle Rust
Metrosideros perforata	Nationally Vulnerable	9	42	4	Low – Myrtle Rust
Pimelea prostrata ssp. seismica	Data Deficient	33	189	7	Low – Erosion (Not Immediate)
Poa billiardierei	Declining	1	40	1	Low - Browsing
Pterostylis foliata	Naturally Uncommon	1	55	3	Medium – Plant collectors
Raoulia hookeri ssp. hookeri	Declining	42	2277	6	Low - Erosion
Rubus squarrosus	Not Threatened	2	2	3	None
Scandia geniculata	Naturally Uncommon	87	295	5	None
Senecio aff. rufiglandulosus	Data Deficient	3	7	2	None
Sophora molloyi	Regionally Critical	24	64	5	Low - Erosion
Trisetum antarcticum	Declining	4	14	2	None
Vittadina australis	Endangered	15	92	4	Low – Adventive Overgrown

Native Species – General split of species

Table 2. General split of native species present in the zones defined in Map 1.

ZONE	Cliff		Riparian		Quarry		Coast		South East Facing Slope		Raurekau Falls Catchment		Taumata Patiti Pa Catchment		South Facing Slopes		South West Facing Slopes		Stone Stacks		Tops	
Number of Species recorded	20		155		93		77		119		146		91		49		96		34		38	
Structural Class	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
MONOCOT TREES & SHRUBS			**1**	0.6							**1**	0.7										
DICOT TREES & SHRUBS	**7**	35.0	**37**	23.9	**21**	23.0	**21**	27.3	**25**	21.0	**33**	22.8	**19**	20.9	**12**	24.5	**23**	24.0	**6**	17.6	**11**	29.0
MONOCOT LIANES			**1**	0.6							**1**	0.7										
DICOT LIANES & TRAILING PLANTS	**2**	10.0	**8**	5.2	**6**	6.2	**8**	10.4	**9**	7.6	**14**	7.9	**8**	8.7	**2**	4.1	**6**	6.2	**3**	8.8	**3**	7.9
CLUBMOSSES & QUILLWORTS											**1**	0.7										
FERNS & FORK FERNS	**1**	5.0	**34**	21.9	**21**	23.1	**9**	11.6	**15**	12.6	**30**	20.7	**22**	24.3	**10**	20.4	**14**	14.6	**2**	5.8	**12**	31.6
ORCHIDS	**2**	10.0	**5**	3.2	**2**	2.2	**2**	2.6	**6**	5.0	**8**	5.7	**5**	5.4	**4**	8.2	**4**	4.2	**1**	3.0		
GRASSES	**1**	5.0	**8**	5.2	**6**	6.2	**5**	6.5	**9**	7.6	**4**	2.9	**4**	4.3	**4**	8.2	**8**	8.4	**3**	8.8	**1**	2.6
SEDGES			**12**	7.7	**3**	3.1	**5**	6.5	**5**	4.2	**8**	5.7	**3**	3.3	**1**	2.0	**5**	5.2	**1**	3.0	**1**	2.6
RUSHES & ALLIED PLANTS	**1**	5.0	**4**	2.6	**3**	3.1	**4**	5.2	**2**	1.7	**4**	2.9	**3**	3.3	**2**	4.1	**2**	2.1	**1**	3.0	**1**	2.6
HERBS - MONOCOT, OTHER THAN ORCHIDS, GRASSES etc.	**1**	5.0	**4**	2.6	**2**	2.1	**2**	2.6	**4**	3.4	**4**	2.9	**3**	3.3	**1**	2.0	**2**	2.1	**1**	3.0	**2**	5.2
HERBS - DICOT COMPOSITES			**8**	5.2	**9**	9.6	**4**	5.2	**13**	10.9	**12**	8.4	**7**	7.7	**7**	14.3	**11**	11.4	**3**	8.8	**1**	2.6
HERBS - DICOT OTHER THAN COMPOSITES	**5**	25.0	**33**	21.3	**20**	21.4	**17**	22.1	**31**	26.0	**26**	18.0	**17**	18.8	**6**	12.2	**21**	21.8	**13**	38.2	**6**	15.9

Key. # = number of species in that group; % = Percentage of total species recorded in that zone

Cliff Zone– 1 Area

Surveyed - 12/7/21

Figure 1 shows this area is unique as it faces North-west (See Map 1.), it is also very close to the Te Kopahou Visitor Centre carpark and therefore easily accessible by humans and their animals. The slope is particularly steep and generally solid rock.

Figure 1. The Cliff Zone, the area next to the Te Kopahou Visitor Centre Carpark. 7(2)(a)

Threats

- Human and animal traffic
- Plant collection
- North-westerly wind/rain/storms
- Potential slippage
- Erosion by Hape Stream

Species

Exact locations of the species in the following tables can be found in the accompanying document 'WCC South Coast SNA Survey 2021/22 - GPS Locations of Species of interest'.

NATIVE

A total of 20 native plant species are present in the areas within this zone description. One of these was unfortunately a pest plant *Pittosporum crassifolium*. Location of all species present in each of the areas of each zone can be seen in the accompanying spreadsheet document entire survey species list 'WCC South Coast SNA Survey 2021/22'. Table 3 shows the recorded GPS points for native species of interest.

Table 3. Targeted Native Species of Interest in the Cliff Zone.

Species	GPS Points	Number of specimens	Threats
Crassula mataikona	0	Several	None
Pimelea prostrata ssp. seismica	1	2	Erosion – Not Immediate

NON-NATIVE PEST PLANTS

Table 4 shows the GPS points of the pest plant species of interest.

Table 4. Targeted Non-native Species of Interest in the Cliff Zone.

Species	GPS Points	Number of specimens	Threat Level
Chrysanthemoides monilifera subsp. monilifera		Several	Medium – Good idea to control

- Boneseed was present in the area but only as a couple of specimens

Riparian Zone – 3 Areas

Surveyed - 12/7/21, 20/7/21, 23/7/21, 15/9/21, 11/12/21.

These three areas all had running water at the time of survey and were delineated from surrounds by the eroded environment either side of the flowing water.

R1 - Hape Stream - This stream is encountered as soon as you travel into the Te Kopahou Reserve and was not specified as an area needing survey as it has been thoroughly surveyed in the past. The lower section was surveyed to gather a species list which could be compared to those from the other two streams surveyed.

R2, R3, R4 - Un-named Stream to Whare-Raurekau (Figure 2.) - Running North to South, a steep un-named waterway utilised by the baches on the old site of Whare-Raurekau (Adkins, 1959) nearby as a water supply. The area has steep cliff-like sides and a series of waterfalls, which at time of first visit had a reasonable amount of continuous flow. Several steps of smaller grade rock material flatten the span between each side of the waterway. Directly below the waterfall larger grade rock material is evident and potentially relatively newly placed.

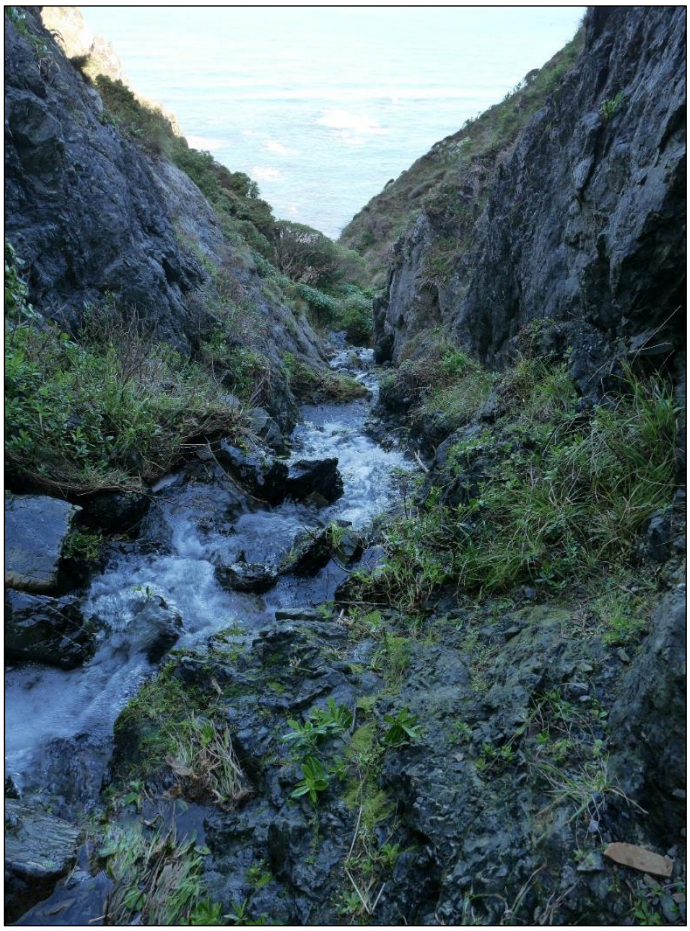

Figure 2. The un-named stream “Raurekau Falls” above the first area of batches. 7(2)(a)

R5 - Un-named Stream in Taumata Pa Catchment - A stream of lower energy and flow than the other two surveyed therefore showing lower range of species and area surveyed. A track has been formed beside this stream which makes access to the greater Pa catchment relatively straightforward.

Threats

- Animal incursions
- Plant collection
- Erosion - potential slippage
- Human activity – water supply to the baches

Species

Exact locations of the species in the following tables can be found in the accompanying document ‘WCC South Coast SNA Survey 2021/22 - GPS Locations of Species of interest’. **NATIVE**

A total of species of 155 native plants are present in the areas within this zone description. Location of all species present in each of the areas of each zone can be seen in the accompanying spreadsheet document entire survey species list ‘WCC South Coast SNA Survey 2021/22’. Table 5 shows the recorded GPS points for native species of interest.

Table 5. Targeted Species of Interest in the Riparian Zone.

Species	GPS Points	Number of specimens	Threats
Aciphylla squarrosa var. squarrosa	21	95	High - Pig predation
Anthosachne solandri	1	2	Low – Browsing (Rabbit, Hare)
Brachyglottis lagopus	3	24	None
Corybas macranthus	1	30	Low – Plant collection
Craspedia uniflora var. maritima	7	150	None
Crassula mataikona	2	5	None
Freycinetia banksii	1	1	Medium – Browsing (goat)
Fuchsia perscandens X F. excorticata	1	1	Medium - Erosion
Fuchsia perscandens	2	3	None
Leptospermum scoparium	10	40	Low – Myrtle Rust
Linum monogynum var. monogynum	3	43	None
Melicytus crassifolius	5	7	None
Metrosideros fulgens	1	2	Low- Erosion
Metrosideros perforata	4	19	Low - Erosion
Scandia geniculata	16	45	None
Senecio aff. rufiglandulosus	2	4	None
Sophora molloyi	4	5	None

- *Linum monogynum var. monogynum* - more common than recorded, too many to record accurately.
- *Freycinetia banksii* - only found in the RFC riparian areas.
- *Fuchsia perscandens X F. excorticata* - only one specimen seen in the Hape Stream area and in jeopardy of falling into the stream.
- *Senecio aff. rufiglandulosus* - this is a species needing further study as it has unusual features that do not entirely fit with the species it resembles.

NON-NATIVE PEST PLANTS

Table 6 shows the GPS points of the pest plant species of interest.

Table 6. Targeted Non-native Species of Interest in the Riparian Zone.

Species	GPS Points	Number of specimens	Threat Level
Berberis darwinii	1	1	Medium – Control while only a few
Buddleja davidii	2	8	Medium – Control while only a few
Chrysanthemoides monilifera subsp. monilifera	14	228	Medium – Good idea to control
Polypodium vulgare	1	1	High – Remove immediately

- *Chrysanthemoides monilifera subsp. monilifera* was quite commonly seen sporadically over much of this site. The specimens noted were generally only in bunches of a few plants except in a couple of locations.
- *Polypodium vulgare* was not seen in this area prior to survey and should be dealt with as soon as possible (Raurekau Falls Catchment).
- *Berberis darwinii* is only in small numbers and could successfully be manually controlled.
- The area R2 when surveyed had numerous weedy plant species including *Rubus fruticosus, Rubus lacinatus* and English Ivy above.

Quarry Zone – 1 Area

Surveyed - 12/7/21, 20/7/21, 29/7/21.

This area was previously a quarry. Figure 3 shows the contours of the cliff face as it remains, exposed rock faces and drainage ruts provide a suitable environment for several of the hardier South Coast flora species.

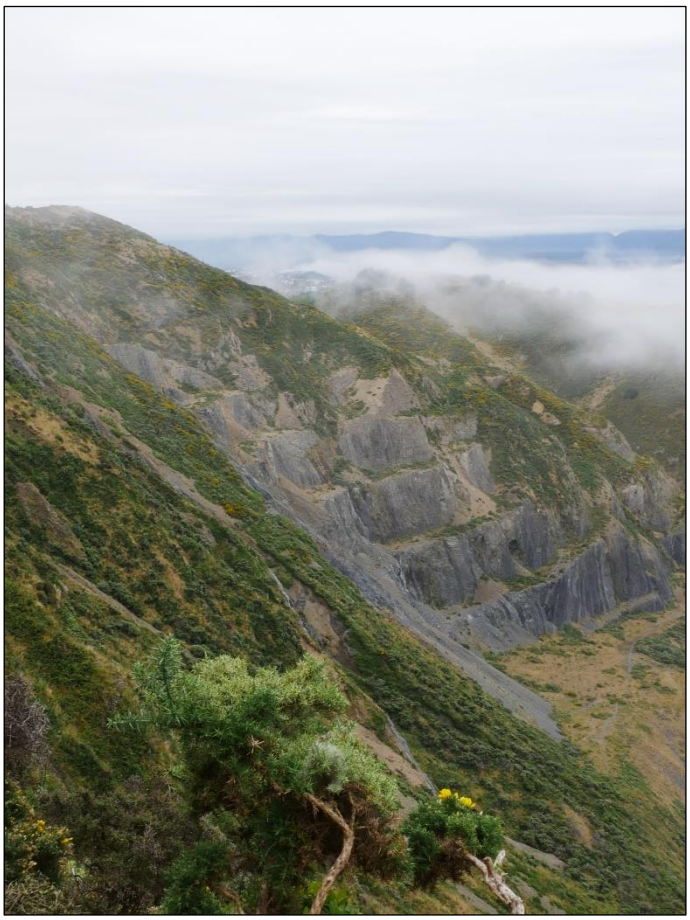

Figure 3. The Quarry Zone – Steep faces are a feature of this environment. 7(2)(a)

Threats

- Plant collection
- Potential slippage

Species

Exact locations of the species in the following tables can be found in the accompanying document 'WCC South Coast SNA Survey 2021/22 - GPS Locations of Species of interest'.

NATIVE

A total of 93 native plant species are present in the areas within this zone description. Location of all species present in each of the areas of each zone can be seen in the accompanying spreadsheet document entire survey species list 'WCC South Coast SNA Survey 2021/22'. Table 7 shows the recorded GPS points for native species of interest.

Table 7. Targeted Species of Interest in the Quarry Zone

Species	GPS Points	Number of specimens	Threats
Aciphylla squarrosa var. squarrosa	10	26	Low - Pig predation
Anthosachne solandri	1	3	Low – Browsing (Rabbit, Hare)
Brachyglottis lagopus	1	20	None
Carmichaelia australis	1	4	None
Craspedia uniflora var. maritima	7	400+	None
Lagenophora pumila	1	5	None
Leptospermum scoparium	5	15	Low – Myrtle Rust
Libertia ixioides	2	35	None
Linum monogynum var. monogynum	2	2	None
Melicytus crassifolius	1	1	None
Melicytus orarius	1	1	Low – Track-side maintenance
Raoulia hookeri var. hookeri	5	800+	Low - Erosion
Scandia geniculata	1	3	None

- *Craspedia uniflora var. maritima* – the population found on the faces at the Western end are the largest in the reserve seen during the survey.
- *Linum monogynum var. monogynum* - more common than recorded, too many to record accurately.
- *Raoulia hookeri var. hookeri* - the population found on the faces at the Western end are the largest in the reserve seen during the survey.

NON-NATIVE PEST PLANTS

Table 8 shows the GPS points of the pest plant species of interest.

Table 8. Targeted Non-native Species of Interest in the Quarry Zone.

Species	GPS Points	Number of specimens	Threat Level
Buddleja davidii	2	8	Medium – Control while only a few
Chrysanthemoides monilifera subsp. monilifera	14	228	Medium – Good idea to control
Cortaderia selloana	1	1	High – Remove immediately
Polypodium vulgare	2	11	High – Remove immediately

- *Chrysanthemoides monilifera subsp. monilifera* was present in the area but only as a couple of specimens.
- *Polypodium vulgare* was not seen in this area prior to survey and should be dealt with as soon as possible.
- *Cortaderia selloana* would be best to be removed before it becomes prolific.

Coast Zone – 3 Areas

Surveyed - 20/7/21, 4/8/21, 15/9/21, 18/11/21.

This area has been divided into three sites in the survey area, (Map 1).

Co1 - Encompasses the area from the carpark to just beyond the first baches. This area includes some restoration plantings which make it somewhat different from Co2 & Co3.

Co2 - Is the zone from just past the first batches to Pariwhero – Red Rocks and is South-East facing. It also includes the lower section of a stable scree fan

Co3 - Includes the zone from Pariwhero – Red Rocks to the end of the survey site at Sinclair Head, including the Seal haul out area.

This zone is the most accessible and dynamic. Tides and human interaction continually shape and reshape this zone.

- During the visit on 18/11/21 numerous lizards (skinks) were seen darting away as I recorded the plants.
- When recording Co3 the planted areas near the batches were ignored, lots of Pohutukawa present in this area.

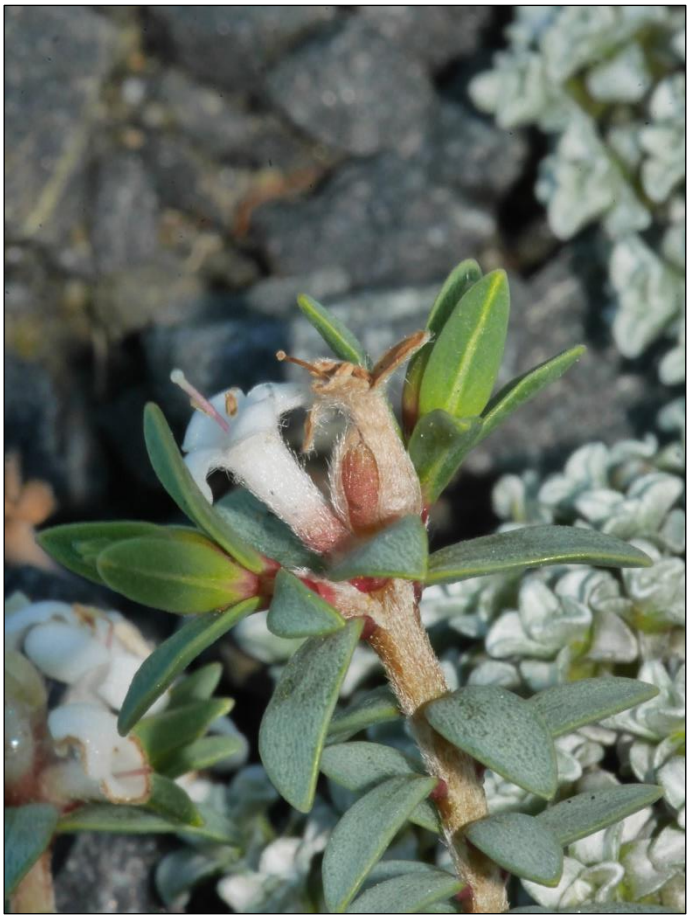

Figure 4. Coastal dwellers - *Pimelea prostrata subsp. seismica* in flower, with *Raoulia hookeri var. hookeri* in the background. 7(2)(a)

Threats

- Animal incursions
- Plant collection
- Erosion - potential slippage
- Storm surges
- Human activity – walkers, explorers, and vehicles

Species

Exact locations of the species in the following tables can be found in the accompanying document 'WCC South Coast SNA Survey 2021/22 - GPS Locations of Species of interest'.

NATIVE

A total of 77 native plant species are present in the areas within this zone description. Location of all species present in each of the areas of each zone can be seen in the accompanying spreadsheet document entire survey species list 'WCC South Coast SNA Survey 2021/22'. Table 9 shows the recorded GPS points for native species of interest.

Table 9. Targeted Species of Interest in the Coast Zone.

Species	GPS Points	Number of specimens	Threats
Aciphylla squarrosa var. squarrosa	3	18	Medium – Tidal/human activity
Leptospermum scoparium	1	1	Low – Myrtle Rust
Linum monogynum var. monogynum	1	20	None
Melicytus crassifolius	1	1	Medium – Tidal/human activity
Pimelea prostrata subsp. seismica	10	62	Medium – Tidal/human activity
Plagianthus divaricatus	1	5	Medium – Tidal/human activity
Raoulia hookeri var. hookeri	4	585	Low - Erosion
Sophora molloyi	1	3	Low - Erosion

- *Linum monogynum var. monogynum* - more common than recorded, too many to record accurately.
- *Plagianthus divaricatus* - this species only noted once on the whole survey, near the Seal haul out area.
- *Pimelea prostrata subsp. seismica* (Figure 4.) – the largest population with the healthiest plants seen in this zone.

NON-NATIVE PEST PLANTS

Table 10 shows the GPS points of the pest plant species of interest.

Table 10. Targeted Non-native Species of Interest in the Riparian Zone.

Species	GPS Points	Number of specimens	Threat Level
Chrysanthemoides monilifera subsp. monilifera	1	8	Medium – Good idea to control
Clematis vitalba	1	5	High – Remove immediately
Glaucium flavum	2	6	Medium – Remove while only a few

- *Chrysanthemoides monilifera subsp. monilifera* not seen in volumes, quite achievable to control.
- *Clematis vitalba* – ideally remove before it spreads.

South-East Slope Zone – 4 Areas

Surveyed - 29/7/21, 4/8/21, 11/8/21, 15/9/21, 29/9/21, 29/10/21, 10/11/21, 18/11/21, 24/11/21, 9/2/22.

In total these 4 areas make up the largest part of the survey (Map 1).

SES1 – This area is from the Quarry to east of the first baches below Raurekau Falls.

SES2 – This is the smallest of the 4 areas and was particularly difficult to survey. It is the slope above the R4 section of the lower part of the Raurekau Falls.

SES3 (Figure 5.) – This is the largest single section of the survey. The area starts at the western edge of the Raurekau Falls Catchment and extends to the point formed by Red Rocks.

SES4 – This area is on the eastern slope of Sinclair head and is bordered by the Taumata Patiti Pa Catchment.

- A native NZ Falcon was seen speeding past early in the day of 9/2/22.
- The area above and South of the Raurekau Falls Catchment at the extreme West of SES1 was mostly Gorse and unable to be surveyed.

Figure 5. SES3 – The largest area of any Zone in the survey. 7(2)(a)

Threats

- Animal incursions
- Plant collection
- Erosion - Potential slippage

Species

Exact locations of the species in the following tables can be found in the accompanying document ‘WCC South Coast SNA Survey 2021/22 - GPS Locations of Species of interest’.

NATIVE

A total of 119 native plant species are present in the areas within this zone description. Location of all species present in each of the areas of each zone can be seen in the accompanying spreadsheet document entire survey species list ‘WCC South Coast SNA Survey 2021/22’. Table 11 shows the recorded GPS points for native species of interest.

Table 11. Targeted Species of Interest in the South-East Slope Zone.

Species	GPS Points	Number of specimens	Threats
Aciphylla squarrosa var. squarrosa	56	199	Low – Browsing by rabbit/hare
Anthosachne solandri	10	20	None
Brachyglottis lagopus	4	250	None
Carex breviculmis	1	1	None
Carex cyanea	3	5	None
Clematis afoliata	1	1	None
Craspedia uniflora var. maritima	29	792	None
Crassula mataikona	1	1	None
Leptospermum scoparium	25	445	Low – Myrtle Rust
Linum monogynum var. monogynum	8	127	None
Melicytus crassifolius	1	1	Low - Slips
Metrosideros perforata	1	10	Low – Myrtle Rust
Pimelea prostrata subsp. seismica	13	94	Medium – Browsing by rabbit/hare
Pterostylis foliata	2	22	None
Raoulia hookeri var. hookeri	16	184	Low - Erosion
Scandia geniculata	10	26	None
Sophora molloyi	7	7	Low - Erosion
Trisetum antarcticum	1	4	None
Vittadina australis	9	71	Low - Overgrown

- *Aciphylla squarrosa var. squarrosa* – Good amount in this zone, potentially as refugia due to inaccessibility of sites.
- *Brachyglottis lagopus & Craspedia uniflora var. maritima* – commonly seen in good numbers in areas of outcrop which also have slight seeps.
- *Linum monogynum var. monogynum* - more common than recorded, too many to record accurately.
- *Pimelea prostrata subsp. seismica* – overall a good amount found, but many were small plants which had been trimmed by browsing.
- *Pterostylis foliata* – Not seen in this area prior to survey, due to accessibility.

NON-NATIVE PEST PLANTS

Table 12 shows the GPS points of the pest plant species of interest.

Table 12. Targeted Non-native Species of Interest in the South-East Slope Zone.

Species	GPS Points	Number of specimens	Threat Level
Agapanthus praecox subsp. orientalis	1	2	Medium – Spreads - controllable while in small numbers
Berberis darwinii	2	1	Medium – Spreads - controllable while in small numbers
Chrysanthemoides monilifera subsp. monilifera	71	423	Medium – Good idea to control
Lupinus arboreus	3	12	Medium – Spreads - controllable while in small numbers
Pittosporum crassifolium	1	1	Medium – Spreads - controllable while in small numbers
Senecio angulatus	1	40	Medium – Spreads - controllable while in small numbers
Ulex europaeus	8	62	Low – Potentially controllable

- *Chrysanthemoides monilifera subsp. monilifera* seen in volumes, difficult to control without much expense.
- *Lupinus arboreus* is only in small numbers and could successfully be manually controlled.
- *Senecio angulatus* is only in small numbers and could successfully be manually controlled.
- *Pittosporum crassifolium* is single specimen which could successfully be manually controlled.
- *Ulex europaeus* patches away from large swathes could successfully be manually controlled.

Raurekau Falls Catchment

Surveyed - 23/7/21, 31/7/21, 11/8/21, 24/9/21, 29/9/21, 24/11/21, 9/2/22.

This area was a late addition to the survey area due to its uniqueness in being a small catchment feeding the Raurekau Falls. This water is the supply used by the first group of baches encountered on the coastal trail. Figure 6 (next page) shows the area contains two tributaries detailed on Map 1, as R2 and R3.

Figure 5. The Raurekau Falls Catchment - Looking north up towards the steep terrain and catchment area. 7(2)(a)

The eastern west-facing slope has dense vegetation of mahoe, gorse, and *Coprosma propinqua*, and is quite slow to manoeuvre through. The southern section of the western side of the catchment has a large area of impenetrable gorse which needed to be detoured below then back up to survey the vegetation on the other side of it.

The tributaries are well vegetated towards their upper reaches, the lower section is sparsely vegetated before dropping off into the fall's valley.

- Numerous skinks were seen on the upper exposed stony slopes of the East-facing Western section (24/11/21).

Threats

- Pig-sign is relatively common in parts of this catchment, either below the canopy on the east, or in the open areas of lower section towards the Falls. In the east the understory was lacking due mainly to the consistent routing. The west section also has large swathes of excavated substrate below the shrubbery.
- Possums (live) were seen several times during this survey.
- Rats were encountered on one occasion possibly suggesting high numbers.

Species

Exact locations of the species in the following tables can be found in the accompanying document 'WCC South Coast SNA Survey 2021/22 - GPS Locations of Species of interest'.

NATIVE

A total of 146 native plant species are present in the catchment areas within this zone description, this does not include the riparian zone (which are featured in the Riparian Zone of this report). When the 3 riparian areas within this zone are included a further 31 species can be considered, . Location of all species present in each of the areas of each zone can be seen in the accompanying spreadsheet document entire survey species list 'WCC South Coast SNA Survey 2021/22'. Table 13 shows the recorded GPS points for native species of interest.

Table 13. Targeted Species of Interest in the Raurekau Falls Catchment Zone.

Species	GPS Points	Number of specimens	Threats
Aciphylla squarrosa var. squarrosa	2	5	High – Pig predation
Astelia fragrans	1	1	None
Brachyglottis lagopus	7	126	None
Caladenia variegata	1	4	None
Carex cyanea	18	38	None
Carmichaelia australis	1	25	None
Corybas macranthus, Pterostylis graminea, P. banksii	1	100+	None
Craspedia uniflora var. maritima	6	170+	None
Fuchsia perscandens	18	51	None
Geranium microphyllum aff.	1	2	None
Leptospermum scoparium	4	7	Low – Myrtle Rust
Libertia ixioides	1	1	None
Linum monogynum var. monogynum	5	24	None
Melicytus orarius	1	1	None
Pimelea prostrata subsp. seismica	1	1	Medium – Browsing by rabbit/hare
Pterostylis foliata	1	15	None
Raoulia hookeri var. hookeri	1	2	None
Rubus cissoides	1	1	None
Rubus squarrosus X R. cissoides	1	1	None
Rubus squarrosus	2	2	None
Scandia geniculata	59	220	None
Senecio rufiglandulosus aff.	1	3	None
Sophora molloyi	9	28	Low - Erosion
Trisetum antarcticum	1	4	None
Vittadina australis	1	4	Low - Overgrown

- This catchment is an area with highly concentrated populations of *Fuchsia perscandens* and *Scandia geniculata.*

NON-NATIVE PEST PLANTS

Table 14 shows the GPS points of the pest plant species of interest.

Table 14. Targeted Non-native Species of Interest in the Raurekau Falls Catchment Zone.

Species	GPS Points	Number of specimens	Threat Level
Berberis darwinii	26	56	Medium – Spreads - controllable while in relatively small numbers
Chrysanthemoides monilifera subsp. monilifera	12	89	Medium – Good idea to control
Ilex aquifolium	1	1	Medium – Spreads via fruit
Lonicera japonica	1	3	High – Good to remove
Lupinus arboreus	1	6	Medium – Spreads

- *Polypodium vulgare* was in this catchment (see Riparian Zone of this report).
- Several *Berberis darwinii* specimens were noted and recorded in the area which due to the small number would be quite possibly controllable with not too much effort.
- *Chrysanthemoides monilifera subsp. monilifera* seen in volumes, difficult to control without much expense.
- *Ilex aquifolium* – ideally remove before it spreads.
- *Lupinus arboreus* is only in small numbers and could successfully be manually controlled.
- *Lonicera japonica* would be ideal to remove, but these specimens are well established in relatively mature native vegetation.
- Gorse patches too big to mention or try and control.

Taumata Patiti Pa Catchment

Surveyed – 15/10/21, 21/10/21

This area was a late addition to the survey area due to its uniqueness in being a small catchment feeding the historic Taumata Patiti Pa site west of Waipapa Stream. This water is the supply used by the last bach encountered on the coastal trail. The area contains two tributaries detailed on the map as R5.

A rudimentary track has been formed which is why I was asked to survey this area as it provides an entrance point for human introduced weed species. The eastern west-facing slope has dense vegetation of gorse and *Coprosma propinqua* and is quite slow to manoeuvre through unless a clear path is chosen. The tributaries are mostly dry until towards the steeper walled valley begins below their confluence.

Figure 6. Residents of the Taumata Patiti Pa Catchment – Clockwise *Fuchsia perscandens, Geranium aff. microphyllum, Corybas macranthus, Crassula sieberiana.* 7(2)(a)

Threats

- The area appears to have very few *Berberis darwinii*, which could be successfully controlled.
- Gorse in present but mostly in patches which may be a consideration for control.
- A single patch of *Polypodium vulgare* was found in the catchment.
- Evidence of Pigs using the area was seen.

Species

Exact locations of the species in the following tables can be found in the accompanying document ‘WCC South Coast SNA Survey 2021/22 - GPS Locations of Species of interest’.

NATIVE

A total of 99 native plant species are present in the catchment areas within this zone description, this does not include the riparian zone (which are included in the Riparian Zone section). When the riparian area within this zone is included a further 9 species can be considered. Table 15 shows the recorded GPS points for native species of interest.

All species present in the area of this zone can be seen in the accompanying spreadsheet document entire survey species list ‘WCC South Coast SNA Survey 2021/22’.

Table 15. Targeted Species of Interest in the Taumata Patiti Pa Catchment Zone.

Species	GPS Points	Number of specimens	Threats
Brachyglottis lagopus	1	2	None
Craspedia uniflora var. maritima	2	23	None
Fuchsia perscandens	14	56	None
Geranium aff. microphyllum.	1	1	None
Libertia ixioides	1	3	None
Linum monogynum var. monogynum	5	24	None
Melicytus crassifolius	3	3	Medium – Browsing by rabbit/hare
Pimelea prostrata subsp. seismica	1	1	Medium – Browsing by rabbit/hare
Pterostylis foliata	1	1	None
Rubus squarrosus	2	6	None
Scandia geniculata	23	98	None
Vittadina australis	3	18	Low - Overgrown

- This catchment is also another area with concentrated populations of *Fuchsia perscandens* and *Scandia geniculata.*

NON-NATIVE PEST PLANTS

Table 16 shows the number of GPS points of the pest plant species of interest.

Table 16. Targeted Non-native Species of Interest in the Taumata Patiti Pa Catchment Zone.

Species	GPS Points	Number of specimens	Threat Level
Berberis darwinii	1	1	Medium – Spreads - controllable while in small numbers
Chrysanthemoides monilifera subsp. monilifera	17	40	Medium – Good idea to control
Pittosporum crassifolium	2	2	Medium – Spreads - controllable while in small numbers
Polypodium vulgare	1	5	High – Remove immediately
Rosa rubiginosa	1	1	Medium – Spreads - controllable while in small numbers
Ulex europaeus	4	28	Low – Patches could be controlled

- *Berberis darwinii* is only in small numbers and could successfully be manually controlled.
- *Chrysanthemoides monilifera subsp. monilifera* seen in low volumes compared to other areas, may be worth controlling in this Zone.
- *Pittosporum crassifolium* – ideally remove before it spreads.
- *Polypodium vulgare* was not seen in this area prior to survey and should be dealt with as soon as possible.
- *Ulex europaeus* patches not too big to possibly eradicate from the area.

South Facing Slopes Zone – 2 Areas

Surveyed – 15/9/21, 24/11/21, 9/2/22.

This zone comprises of two faces either side of the Raurekau Falls riparian intersection with the coastline. Both slopes are particularly steep as can be seen in Figure 7.

Both areas were surveyed mostly from below or above as the slope terrain was not safe to traverse.

Figure 7. Looking across SFS2 from the south side (top of SWS3). 7(2)(a)

Threats

- Coastal erosion is the only likely issue for these 2 areas, yet both areas are some height above the high tide mark for now.
- Human interaction may prove a problem in time as they are above baches.
- Gorse is present in large volumes and not safely controllable.
- A live possum was recorded at the top of SFS1 in the area transitioning into a more gradual slope.

Species

Exact locations of the species in the following tables can be found in the accompanying document 'WCC South Coast SNA Survey 2021 - GPS Locations of Species of interest'.

NATIVE

A total of 49 native plant species are present within this zone description. Table 17 shows the recorded GPS points for native species of interest.

All species present in the areas of this zone can be seen in the accompanying spreadsheet document entire survey species list 'WCC South Coast SNA Survey 2021/22'.

Table 17. Targeted Species of Interest in the South Facing Slope Zone.

Species	GPS Points	Number of specimens	Threats
Aciphylla squarrosa var. squarrosa	4	5	None
Brachyglottis lagopus	5	165	None
Craspedia uniflora var. maritima	5	190	None
Leptospermum scoparium	8	58	None
Libertia ixioides	1	1	None
Linum monogynum var. monogynum	5	24	None
Pterostylis foliata	1	18	None
Raoulia hookeri var. hookeri	6	84	None
Scandia geniculata	1	1	None

NON-NATIVE PEST PLANTS

Table 18 shows the GPS points of the pest plant species of interest.

Table 18. Targeted Non-native Species of Interest in the South Facing Slope Zone.

Species	GPS Points	Number of specimens	Threat Level
Chrysanthemoides monilifera subsp. monilifera	3	14	Medium – Good idea to control
Lupinus arboreus	1	165	Medium – Spreads

- *Chrysanthemoides monilifera subsp. monilifera* seen in low volumes compared to other areas, may be worth controlling in this Zone.
- *Lupinus arboreus* would be difficult to remove/control easily without some sort of aerial application.

South-West Slope Zone – 3 Areas

Surveyed - 14/7/21, 15/10/21, 18/11/21, 9/2/22.

Differentiated from the majority of the slope habitat by the fact these slopes face south-west which ensures they receive more sunshine hours than others, especially whilst the sun curvature is lower during the winter months. (may be interesting to see what differences there are with species composition).

SWS1 – This area is represented by the western most extent of the SNA survey, this is the sunny side of Sinclair Head (Figure 8.).

SWS2 – The sunny slope above Red Rocks from the ridgeline to Waipapa Stream's eroded east-side.

SWS3 – The small sunny patch above the Raurekau Falls Riparian area R4.

Figure 8. Sun hitting the slope SWS1 of Sinclair head in July. Photo 7(2)(a)

Threats

- Erosion, fresh tongues of slippage evident in places, particularly SWS1.
- Massive amounts of *Centranthus ruber* – Red Valerian particularly in SWS2.
- Southern section of SWS1 has had a lot of pig routing of the *Aciphylla squarossa var. squarossa,* almost down to sea level.
- SWS3 had a lot of boneseed and gorse present directly above the batches on the southern extent of area.

Species

Exact locations of the species in the following tables can be found in the accompanying document 'WCC South Coast SNA Survey 2021/22 - GPS Locations of Species of interest'.

NATIVE

A total of 96 native plant species are present in the areas within this zone description. Location of all species present in each of the areas of each zone can be seen in the accompanying spreadsheet document entire survey species list 'WCC South Coast SNA Survey 2021'. Table 19 shows the recorded GPS points for native species of interest.

Table 19. Targeted Species of Interest in the South West Slope Zone.

Species	GPS Points	Number of specimens	Threats
Aciphylla squarrosa var. squarrosa	38	161	High – Predation by Pig
Anthosachne solandri	2	13	None
Brachyglottis lagopus	4	10	None
Craspedia uniflora var. maritima	19	820	None
Crassula mataikona	2	4	None
Leptospermum scoparium	7	200	Low – Myrtle Rust
Linum monogynum var. monogynum	1	15	None
Melicytus crassifolius	2	12	Low - Slips
Metrosideros perforata	4	13	Low – Myrtle Rust
Pimelea prostrata subsp. seismica	9	32	Medium – Browsing by rabbit/hare
Poa billiardierei	1	40	None
Raoulia hookeri var. hookeri	10	620	Low - Erosion
Sophora molloyi	3	21	Low - Erosion
Trisetum antarcticum	2	6	None
Vittadina australis	5	17	Low - Overgrown

- *Aciphylla squarrosa var. squarrosa* – Good amount in this zone, potentially as refugia due to inaccessibility of sites.
- *Craspedia uniflora var. maritima* – commonly seen in good numbers in areas of outcrop which also have slight seeps.
- *Linum monogynum var. monogynum* - more common than recorded, too many to record accurately.
- *Poa billiardierei* – only location during survey this species was noted (SWS1).
- *Pterostylis foliata* – Not seen in this area prior to survey, due to accessibility.

NON-NATIVE PEST PLANTS

Table 20 shows the GPS points of the pest plant species of interest.

Table 20. Targeted Non-native Species of Interest in the South West Slope Zone.

Species	GPS Points	Number of specimens	Threat Level
Berberis darwinii	1	1	Medium – Spreads - controllable while in small numbers
Chrysanthemoides monilifera subsp. monilifera	26	112	Medium – Good idea to control
Hedera helix	1	10	Medium - Good idea to control
Lupinus arboreus	1	3	Medium – Spreads - controllable while in small numbers
Ulex europaeus	2	80	Low – Potentially controllable

- *Berberis darwinii* is only a small number and could be successfully manually controlled.
- *Chrysanthemoides monilifera subsp. monilifera* seen in volumes, difficult to control without an expensive campaign.
- *Lupinus arboreus* is only in small numbers and could successfully be manually controlled.
- *Hedera helix* is only in small numbers and could successfully be manually controlled.
- *Ulex europaeus* patches away from large swathes could successfully be manually controlled.

Stone Stacks Zone – 6 Areas

Surveyed - 4/8/21

Only rocky outcrops coastward of the coastal access road were considered for this zone of the survey, all species found in this zone are particularly salt tolerant (see Figure 8.). This zone represents the most volatile as some sites are temporary due to coastal process interactions. There are several rocky outcrops along the coast with the largest and most diverse being that beyond Red Rocks which is referred to Devil's Gate.

Figure 8. *Polystichum oculatum*, residing on Devil's Gate, and looking more robust, and greener than the usual blue-green this species is renowned for. 7(2)(a)

Threats

- Human interaction
- Storms
- Tidal erosion

Species

Exact locations of the species in the following tables can be found in the accompanying document 'WCC South Coast SNA Survey 2021 - GPS Locations of Species of interest'.

NATIVE

A total of 37 native plant species are present in this zone description. Location of all species present in each of the areas of each zone can be seen in the accompanying spreadsheet document entire survey species list 'WCC South Coast SNA Survey 2021/22'. Table 21 shows the recorded GPS points for native species of interest.

Table 20. Targeted Species of Interest in the Stone Stacks Zone.

Species	GPS Points	Number of specimens	Threats
Aciphylla squarrosa var. squarrosa	3	7	Low – Plant collection
Craspedia uniflora var. maritima	1	2	None
Linum monogynum var. monogynum	1	10	None

- *Aciphylla squarrosa var. squarrosa* – Only seen at Devil's Gate.

NON-NATIVE PEST PLANTS

There were no GPS points recorded for pest plant species of interest in this zone.

Tops Zone – 1 Area

Surveyed - 14/7/21

An unusual area being somewhat unique to the survey, due to its isolation. The Tops Zone is one area Located on the border of the SNA and private land and is high above Sinclair Head as shown in Figure 9. The area was particularly wet during the survey suggesting a seep was likely.

Figure 9. Top of the Tops Zone looking down on Sinclair Head. 7(2)(a)

Threats

- Pigs
- Storms

Species

Exact locations of the species in the following tables can be found in the accompanying document 'WCC South Coast SNA Survey 2021/22 - GPS Locations of Species of interest'.

NATIVE

A total of 41 native plant species are present in this zone description. Location of all species present in each of the areas of each zone can be seen in the accompanying spreadsheet document entire survey species list 'WCC South Coast SNA Survey 2021/22'. Table 21 shows the recorded GPS points for native species of interest.

Table 21. Targeted Species of Interest in the Tops Zone.

Species	GPS Points	Number of specimens	Threats
Carex cyanea	1	9	None

- *Carex cyanea* – Locally common below the scrub.

NON-NATIVE PEST PLANTS

There were no GPS points recorded for pest plant species of interest in this zone.

References

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de Lange, P.J.; Rolfe, J.R.; Barkla, J.W.; Courtney, S.P.; Champion, P.D.; Perrie, L.R.; Beadel, S.M.; Ford, K.A.; Breitwieser, I.; Schonberger, I.; Hindmarsh-Walls, R.; Heenan, P.B.; Ladley, K. (2018) *Conservation status of New Zealand indigenous vascular plants, 2017.* New Zealand Threat Classification Series 22. Department of Conservation, Wellington. 82 p.

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Logan, R., Lee, D., Wassilieff, M. (1998) *List of Indigenous Vascular Plant Species and Preliminary List of Animal Species identified in the Valleys located above the high waterfall on the Stream leading to Whare-Raurekau* on Wellington South Coast (Map Grid Reference @ R27, R28 & Pt. Q27 554833).* SOUTHERN ENVIRONMENTAL ASSOCIATION (WELLINGTON) INCORPORATED, C/-15 High Street, Island Bay, Wellington.

Ward, M.D. (2022) *Wellington City Council South Coast SNA Survey 2021.* (based on observations from 2021-2022), 8 pages, RESTORE 2022.

Ward, M.D. (2022) *WCC South Coast SNA Survey 2021 - GPS Locations of Species of interest.* Excel spreadsheet. RESTORE 2022.

NZBSL monthly audit | Date audit done: 20/08/19 | Start and finish time of audit 1:30-3:30

General audit information	
Site name	Te Kopahau
Op area number and name Target species	DB_1, DB_1a - Darwin's Barberry, spanish heath, holly SH_1 - Spanish Heath
GPS track log of audit	https://drive.google.com/open?id=1mYBxDn8QM6hZIozMT2SGTRzvULzG1eD5 https://drive.google.com/open?id=1ryeYfKiFKvglV15c0OZwulXkFSFIyBUv
Phase	DB_1, DB_1a: Phase 1 SH_1: Phase 1
Tier/Target spp	DB_1, DB_1a - Darwin's Barberry, spanish heath, holly SH_1 - Spanish Heath
Date(s) work undertaken	Darwin's Barberry site: 04/07/19, 11/07/19, 29/07/19 Spanish Heath site: 17/07/19
Specific audit information	
info on why picked	Darwin's Barberry site: To check over recent work done in the sites and to see the progress from previous years controlled. Mentioned by Nick to IK that DB_1 site is looking really good now due to continuous control over the years, noted new spots of Dracophillia coming through.

	Spanish Heath site: IK wanted to check over the site to see how well the spanish heath was controlled
what was seen	Darwin's Barberry site: Good effective control on Darwin's Barberry, no large individuals found. Site is now in seed bank which IK is happy to see. Note that there were seedlings & juveniles missed underneath large controlled Darwins. Also on the northern side over the ridge, some spanish heath seedlings were found that need to be controlled in the next phase. Spanish Heath site: A patch of Spanish heath seedlings outside of the area is controlled. IK to extend the shapefile out to include this area. NZBSL to make an effective control plan, ie. knapsack spray, being aware that there are some native seedlings right up next to the spanish heath (can be seen in the photos below).
Reached standard (Y/N)	Y
what regrowth is being seen	Minimal regrowth found, mostly seedlings/small darwin's barberry and some spanish heath missed at DB_1/1a Found some DB cut to base and others not, need to make sure quality is transparent across the team. Also need to make sure everyone is cutting them flat to prevent chemical dripping into the soil. Need to be mindful of waypointing areas in the dracophyllum where there are large amounts of seedlings coming back so that they can be easily found in future years. SH_1: missed spanish heath seedlings that are outside the shapefile, IK to extend shapefile, see comment above NZBSL to confirm location please
non target damage	N/A, although given the harsh environment if is still obvious the damage from previous gun and hose work.
other potential future issues	Darwin's Barberry site: Waypoint "hotspots" where high light environment, and grass (not heaps of dracophyllum cover) to spray seedling DB Waypoint requirements: created waypoints and return in the following season. Waypoint all

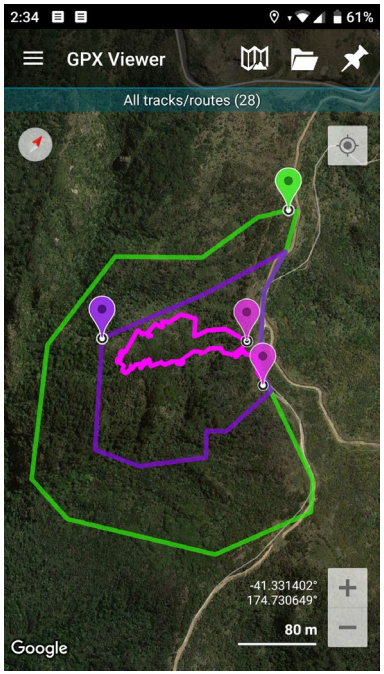
	‘adults’. Note: We are already planning to return to do control the seedling DB. Grid search seedbank & missed plants. ~Pine tree was found by IK, mentioned by Nick Spanish heath site (SH_1) to have the shapefile extended to include spanish heath seedlings found during site audit. Waypoint all spanish heath that are ‘rare’ Old SH site, S carpet bomb and mature flowering, better control in spring. IK to make shapefile of previous tracks going slightly outside the area to see if any others are around. (1/2 day) - waypointed. sweep and wider area, likes newly distributed soil, wind dispersed seedlings. KS or spray bottles? carpet bomb seedlings with no bikill

Other information discussed:
Action Points

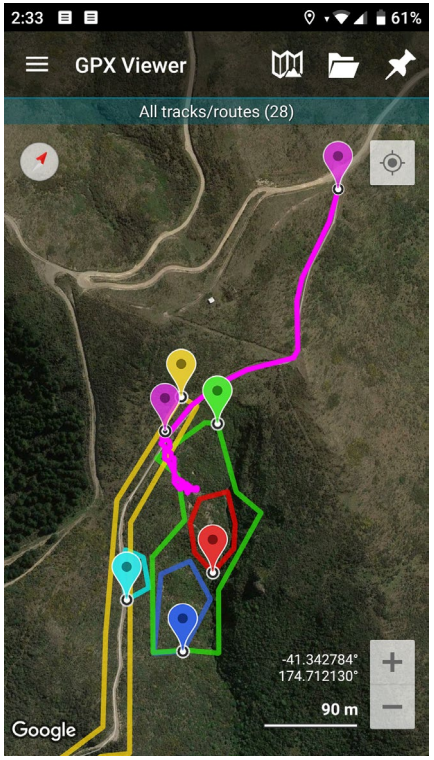
Responsible person	**Issue**	**Due Dates**	**Completed**	**comments**
IK	To make shapefile for spanish heath from October annotated map			
~~IK~~ NZBSL	Add Spanish heath to DB_1 specs, control holly found by track			NZBSL can add these species - my approval was given at the audit.
NZBSL	Question: What time of year to spray seedbank (DB_1/1a)			IK would recommend November
NZBSL	Need to mention to the team in a toolbox that in DB_1/1a some DB cut to base and others not, need to make sure quality is transparent across the team. Also need to make sure			

	everyone is cutting them flat to prevent chemical dripping into the soil			
NZBSL	Sort out why the Leanne's points didn't save. Was it because no reception. If so you need a business procedure of how to manage data when there isn't reception.			IK will discuss this at the GIS meeting.

Map of track where audit was done – screen dump of tracks/relevant photos taken during audit

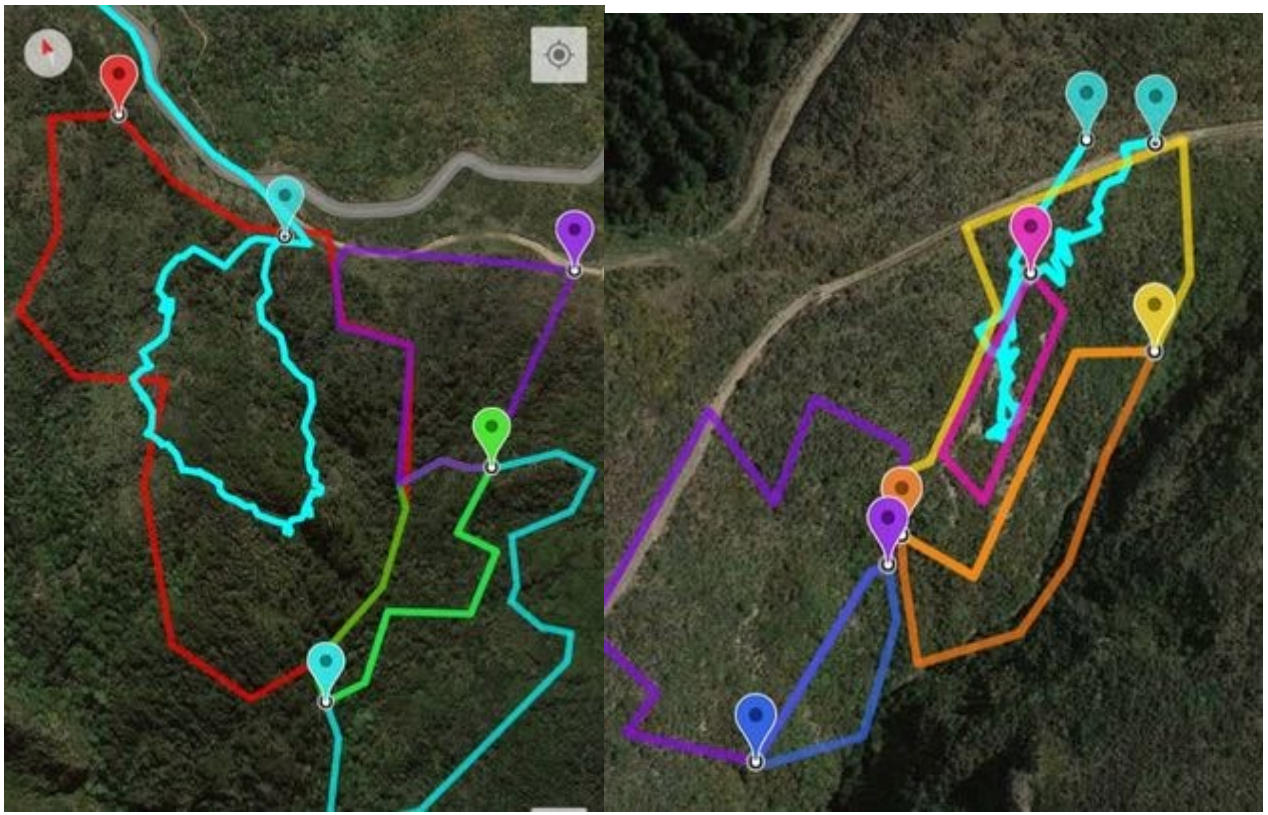
Photo	comment
	DB_1/1a gps tracks from site audit (waypoints made during site audit, unfortunately these didn't save? Will try find on ArcGIS)

	DB_1/1a - photo taken where large DB controlled but seedings around/underneath missed
	Photo of IK hand weeding some DB/SH in DB_1/1a

	SH_1 gps tracks from site audit

	Comparison of what to look out for.

NZBSL monthly audit | Date audit done:27/06/2022 | Start and finish time of audit: 1:00pm-3:00pm

General audit information	June Audit report
Site name	Te Kopahou - Darwin's Barberry, Spanish Heath.
Op area number and name Target species	DB_1, DB_2 SH_3, SH_3a
GPS track log of audit	
Phase	Spanish heath - Seedbank Darwin's Barberry - DB_1 - Seedbank - DB_2 - Initial control

Tier/Target spp	All sites; Darwin’s Barberry 1, Spanish Heath 1, Old Man's Beard 1
Date(s) work undertaken	May, June
Specific audit information	
Info on why picked	Worked area recently.
what was seen	Seedlings around the base of natives. (these were left only focusing on juveniles and matures)
Reached standard (Y/N)	Spanish Heath - Yes Darwin's Barberry - Yes
what regrowth is being seen	Seedlings at all site’s.
non target damage	*Nil*

other potential future issues/Work	• Spanish heath - extending the op areas to see if there is outliers • Darwin's Barberry - following up op area DB_1 every 2 years and extending the area to DB_2 to get rid of darwin's seeding into site and creating room for the draconfilien to spread.

Other information discussed:
Action Points

Responsible person	**Issue**	**Due Dates**	**Completed**	**comments**
CI	Take 2L-5L knapsack to spray blanket seedling's	31/10/2022		
IK	Extended SH shapefiles for a next financial year to search areas outside of OP areas.	31/10/2022		
CI	Grab coupon parking WCC	31/10/2022		
IK	Change DB_1 to follow up 2yearly	31/10/2022	To do.	.

CI & IK	Illona to add to spec's - Drill and Fill Pine tree next to SH_1	31/10/2022	Yep winter	

Research Permit Application Form

Absolutely Positively Wellington City Council
Me Heke Ki Pōneke

A permit to conduct research in Wellington City Council land.
Send your completed applications to:urbanecology@wcc.govt.nz
For more information, phone 04 499 4444

When you submit your application, we request that you rename the file using a date-name-location-permit format.
Eg. 20190105-JohnDoe-Makara-permit.pdf

Application Information	
Applicant Name:	7(2)(a)
Purpose of Research:	To observe the biodiversity condition in Te Kopahou Reserve

After finishing your application, please return to this page to ensure your application is complete.

Applicant Checklist	
Applicant Information	
Personal Details	■
Organisation Details	■
Details of Proposed Activity	
Have you outlined the proposed activity and/or attached your research proposal?	■
Have you outlined the proposed location and attached maps?	☐
Effects and Mitigation	
Have you identified all actual and potential effects?	■
Have you identified ways to mitigate these effects?	■
Health and Safety	
Have you outlined your Health and Safety Plan and attached your plan (if you have one)?	■
Have you identified the hazards and methods to mitigate them?	■
Consultation	
Have you consulted with relevant stakeholders?	■
Have you attached copies of the consultations (if applicable)?	☐
Declaration	
Have you signed the declaration?	■

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Eg. 20190105-JohnDoe-Makara-permit.pdf

Important:

Kia Ora, thank you for your interest in conducting research in Wellington City's open spaces, coast, gardens, parks and reserves.

Fill in this form if you intend to conduct a research project and/or other research activities. If you are collecting materials for non-research purposes, you should fill in the collection form instead.

To expedite the process, please ensure that you have filled in all relevant sections, provided adequate information and attached all relevant documents.

If all required information and documentation is provided, we aim to process applications within a fortnight (2 weeks). If we require further information or there is additional complexity to the project, such as new sites needing to be identified, a longer timeframe may be required. To avoid any delays to your project we encourage you to apply as early as possible.

Please note: if the information provided is insufficient, we may request further information, and this may result in delays.

Be aware that additional permits may be required for the proposed activity that the responsibility for procuring these permits lies with the applicant.

1. Applicant Details

Full name	7(2)(a)		
Address:	7(2)(a)		
Phone:	7(2)(a)	Email:	7(2)(a)
If you are affiliated with an organisation (school, cultural group, private company, etc.), please fill in the following section			
Organisation:	Forest & Bird, Wellington Branch		
Type of Organisation:	NGO		
Organisation address:	Forest & Bird National Office Ground floor, 205 Victoria Street, Te Aro, Wellington PO Box 631 Wellington, 6011		
Contact Person:	7(2)(a)		
Phone:	7(2)(a)	Email:	7(2)(a)

2. Research Details

a) Purpose of the research activity: *(tick all that apply)*

☐ Educational ☐ Commercial ☐ Cultural ■ Conservation ☐ Other: _____

b) Briefly describe the proposed activity. **If you have one, please <u>attach your research proposal</u>**

Forest & Bird has a mission to improve the biodiversity of nature in New Zealand. The activity being undertaken in Te Kopahou is part of a broader commitment that the Wellington Branch has to restore biodiversity in the Outer Green Belt.

This is not a scientific exercise and there will be no samples or any other interference with the flora or fauna in Te Kopahou. The purpose of visiting the Te Kopahou reserve is to get a better understanding of the overall condition of the site and provide us with data that we can use to form an opinion on how the biodiversity might improve over the long term and the possibilities for that improvement.

c) Preferred Dates: *(dd/mm/yyyy) to (dd/mm/yyyy)*

From: 09/03/2023 To: 30/06/2023

d) Alternative Dates: *(dd/mm/yyyy) to (dd/mm/yyyy)*

From: To:

e) Frequency of the activity: infrequent, maybe once or twice a month

a) Have you received a Wellington City Council permit for this activity in the past? ☐ YES ■ NO

b) If YES, when did you receive that permit?

f) Names and qualifications of the people involved in the proposed activity: *(e.g. Walt Moody, PhD Ecology; 2 volunteers with 5 years of mist netting experience).*

7(2)(a) 7(2)(a)

7(2)(a)

g) List any additional permits you require and whether they have already been acquired: *(e.g. DoC endangered species permit, submitted and awaiting outcome)*

h) What iwi consultation or engagement have you undertaken?

Some informal discussion with members of iwi at Zealandia but no formal iwi engagement has been undertaken. Our investigation is preparatory and anticipates a more formal and structured engagement at some point with iwi, hopefully in the near future with Council.

i) Do you require council support or special access? *(e.g. off-road vehicle access)*

7(2)(a)

7(2)(a)

j) Will you be adding any new structures, fittings, markings or other permanent or semi-permanent features? *(e.g. transect tapes, tree markings, etc.)* Please include their distinct features *(e.g. purple and yellow transect markings, X branded camera traps)*

There will be no structures or markings, our visits will be purely observation and photographs

3. Location Details

c) Do you have a specific location required for your activity? ■ YES ☐ NO

If NO, consider emailing us at urbanecology@wcc.govt.nz to discuss possible locations.

a) Which sector(s) will the activity be located? *(Refer to attached map for details)*

☐ Northern Sector ☐ Western Sector ☐ Central/Town Belt ☐ Coastal 1 (*Evan's Bay-Miramar-Lyall Bay*)

■ Coastal 2 (*Te Reikaihau Point to Sinclair Head*) ☐ Botanic Gardens ☐ Otari-Wilton's Bush

d) Describe the preferred location of proposed activity: *(please attach a map)*

Te Kopahou reserve

e) Describe an alternative location where the activity could be undertaken: *(please attach a map)*

N/A

4. Collection Details

If you intend to collect any specimens or materials fill this section, if no collection is involved in your activity then skip to section 5

Please note: Samples must not be taken from biologically sensitive areas or in quantities that would unduly deplete the population or damage any other ecological associations. At all times, the amount of material to be collected must be kept to a minimum, less than 10% of any fruit, seeds, leaves or other material from any individual plant.

For some species, further restrictions may apply

a) Material to be collected: *(tick all applicable)*

☐ Native Plants ☐ Exotic Plants ☐ Invertebrates ☐ Exotic Wildlife ☐ DNA samples ☐ Rocks ☐ Soil

■ Other(s) : no material of any sort is to be collected

b) Specifics of the material to be collected: *(attach a separate sheet if necessary)*

Name of Material	Type of Material	Quantity	Collection site
e.g. Harakeke (Flax)	*Leaves*	*10*	*Otari-Wilton's Bush*

5. Effects and mitigation

All activities have effects. In the following section, please describe the actual and potential effects of your proposed activity on our shared environment.

Where you identify any actual or possible adverse effects, outline strategies you propose to avoid, remedy or mitigate those effects. (E.g. Weeds may be introduced into the area via sampling equipment. Proposed mitigation: Washing all sampling equipment before arriving at sampling area.) If you require more space, please attach a separate sheet of paper.

a) Effects on the subject(s) of your research.

There are no effects that we can envisage as we are using existing tracks and making observations from these tracks. There may be occasions for us to walk off track a few metres to observe/investigate a location.

Mitigation or avoidance:

We will check and clean our clothing, footwear and equipment to avoid introducing undesirable seed and any other organic material before each visit. If we move off formed tracks we will take care to avoid walking on or damaging plants. We won't walk anywhere where there is a chance of disturbing loose material.

b) Effects on waterways, including streams, lakes, or coastal waters.

None,

Mitigation or avoidance:

We will stay out of waterways, walking boots and clothing will be cleaned before each trip .

c) Effects on native vegetation, and/or amenity planting.

None

Mitigation or avoidance:

We will avoid interfering with vegetation

d) Effects on soils, rocks or other abiotic features.

None that we can envisage

Mitigation or avoidance:

We will keep to formed tracks for the majority of our visits and any off-track digression will be minimal and close to the track. We will not knowingly walk on ground cover plants and will avoid walking on loose unstable ground

e) Effects on wildlife, habitats or other biotic features.

None that we can envisage

Mitigation or avoidance:

Be alert to the presence of wildlife (particularly lizards) and avoid disturbing it by keeping to tracks and remaining at a distance

f) Effects on fencing, tracks or any other public assets:

None

Mitigation or avoidance:

g) Effects on other users of the site, including visitors, staff, etc.

None

Mitigation or avoidance:

We are essentially visitors ourselves and acknowledge other people we might meet. We can wear a F&B hi-vis vest if WCC think it appropriate.

h) Effects on historical, archaeological or cultural sites.

None

Mitigation or avoidance:

These will be avoided and not disturbed

i) What activities will be visible nearby locations, including from trails or private residences? *(e.g. Flag markings visible from the trail, researchers visible from local houses)*

We won't look any different to any other visitor unless we wear a F&B hi vis vest in which case it would draw attention to ourselves.

Mitigation or avoidance:

j) What sort of noise will this activity generate? Please explain.

Normal conversation

Mitigation or avoidance:

k) What is the fire risk of this activity? Please explain.

None

Mitigation or avoidance:

We do not smoke and will not carry inflammable substance or equipment

l) Could the proposed activity introduce weeds or other invasive species? Please explain.

It would be possible

Mitigation or avoidance:

Clean our gear and clothing including boots as if going to an offshore island

m) Does the proposed activity have any positive effects on park values (natural and/or historic)? Please explain.

We hope that the observations and data that we collect will be of value to F&B and Council and contribute to the protection and enhanced biodiversity of Te Kopahou

6. Health and Safety

a) Hazard Management

As a research permit holder, you shall take all reasonable and practicable steps to prevent injury to yourself and others.

We encourage you to contact your local ranger(s) on 04 499 44444. They will inform you of any site dangers of which you must be aware as well as suggest ways to control the hazards. We also advise you to contact them 24 hours before the start of your activity, so that they may advise you of any new hazards that have arisen.

In the event of an emergency, contact emergency services by dialling 111. All incidents must be reported to the Wellington City Council on 04 499 4444.

b) Have you already engaged with relevant WCC staff about any hazards, dangers and procedures at the proposed location(s)? ☐ YES ■ NO

c) Does your organisation have a Health and Safety Policy that you will be operating under? ■ YES ☐ NO

d) Do you or your organisation have a Health and Safety Plan for your proposed activity?
if so, please attach it to this application (if you attach a plan, you may skip section 6.e) ■ YES ☐ NO

Note: WCC reserves the right to request further health and safety planning and information if the controls or information are deemed insufficient to complete the permit process.

e) Health and Safety Plan

- Divide each job into its main tasks/steps *e.g. site set up, traffic management, aerial work, ground work, pack up, driving to new site etc.*
- Examine the task/step to identify any possible hazards:
  - associated with carrying out each step
  - created if the task steps are incorrect or not completed
- Record all hazards you identify
- Suggest ways to control the hazard.
- Risk score: Once controls are in place, what is the current risk – based on the combined score from the consequence + likelihood from the risk matrix?

Hazard: *(What is the danger?)*	**Description:** *(How can it harm?)*	**Control:** *(How do we make it a safe work practice?)*	**Risk Score:** *(Refer to risk matrix below)*
e.g. Weather – Hot Days	e.g. Sunburn, Sunstroke, Dehydration	e.g. Working in the shade, wearing a hat, bringing adequate water	*e.g. Low*

Risk Matrix

Likelihood *(How Often)*	**Consequences** *(What could be the harm or damage)*			
	Minor (First aid/ debrief)	**Moderate** (Medical treatment)	**Major** (Notifiable event / lost time injury)	**Severe** (Fatality or permanent impairment)
Almost certain *(within a week)*	**Medium**	**High**	**Extreme**	**Extreme**
Likely *(next 1-12 months)*	**Low**	**Medium**	**High**	**Extreme**
Unlikely *(next 1-5 years)*	**Low**	**Medium**	**High**	**Extreme**
Rare *(5 years +)*	**Low**	**Low**	**Medium**	**High**

Health and Safety Obligations

I will comply with all reasonable directions of Wellington City Council relating to health and safety ■

I understand my obligations to myself, any subcontractors and employees under the Health and Safety at Work Act 2015, and confirm my intention to comply at all times while conducting the activities under this permit on public land. ■

I understand my obligation to report all health and safety incidents including accidents and near misses to Wellington City Council ■

I will inform the council about the outcomes of my research/material collection ■

7. Consultation

Neighbours, other park users, iwi and other interest groups may have a stake in your proposal. Ideally you should consult with them and discuss the positive and negative aspects and effects of your proposed activity. If you are unsure about groups that may need to be consulted, please contact the WCC staff member you have been corresponding with for more information.

If you have consulted with any relevant stakeholders, then please list down their names as well as outcomes of the consultation. List down their feedback, including and concerns and suggestions, as well as your response to that feedback.

Consultee	Organisation/Relationship	Feedback	Response
e.g. H. Tuwhare	*Neighbour*	*e.g. He raised concerns about our safety due to steep slopes.* *Suggested we move site 10m North.*	*e.g. Assessed site, and found concerns valid.* *Moved site 10 m North.*
Tom Mayo	Council Ranger	advised to speak to Henk Louw, Council Urban Ecology Manager	meeting organised and advised to apply for permit
7(2)(a)	Batch Owner	Supportive of F&B involvement in Te Kopahou	will provide 4WD support

8. Applicant Statement

I hereby certify that all the information contained in this application is, to the best of my knowledge, true and correct.

I have read and understand the above terms and conditions and am duly authorised to sign this agreement.

I agree to comply with the conditions and to take all necessary precautions while using Council Reserve, Park, Garden or Open Spaces.

I understand that my proposal may be subject to additional conditions, outlined in schedule 1.

Name 7(2)(a)	Date:
Signature: 7(2)(a)	

Wellington City (the Council) hereby grants the applicant a permit for the purposes outlined in the preceding application, with the sites, dates and conditions specified in schedule 1 of this permit.

Conditions:

1. The permit holder shall apply to the conditions of this permit at all times.
2. The permit holder agrees to pay a collection fee of $100 in advance of the collection activity. This fee is waived if the collection is conducted for non-commercial research, conservation, education or cultural purposes.
3. This permit does not confer on the permit-holder any interest in the site(s), nor does it remove any rights of the public to use and enjoy the whole or any part of the site(s).
4. The Council may terminate this permit by notice in writing to permit-holder if there are breaches to any of the terms of this permit or if the activity causes any unforeseen or unacceptable effects.
5. The permit-holder shall carry out the authorised activity in a safe and reliable way and comply with all statutes, bylaws and regulations affecting or relating to the land of the activity.
6. The permit holder acknowledges their safety is their responsibility and they may seek advice from the council in order to preserve their safety.
7. In the event of an accident or a near miss accident, the permit holder agrees to report it to the Wellington City Council as soon as practicable
8. Only people specifically named on this permit are authorised to carry out the activity – these rights are non-transferrable.
9. The permit holder shall not, unless authorised in writing by the Council, interfere with, remove, damage, or endanger the natural features, animals, plants or historic resources in any area administered by the Council, or bring any plants or animal(s) to the site(s), or deposit debris, rubbish, or other dangerous or unsightly matter, or contaminate any body of water.
10. While conducting this activity, the permit holder shall carry this permit with them at all times and must produce it on demand to Wellington City Council staff.
11. The permit-holder should explain to any interested members of the public who observe the activity, the nature of the permit-holder's work and that it is being undertaken with special approval.
12. The permit holder shall not restrict access to any road or track at any time without permission of the relevant site manager.
13. The activity is to be conducted in the manner directed by the Council away from tracks, picnic areas or areas of high public use and, as far as practicable, out of sight of the public.
14. Wherever practicable, access routes to the collection areas should avoid damage to natural features.
15. If collecting material from within the collection areas of a garden, a member of the staff may be required to be present.
16. The amount of material to be collected must be kept at a minimum at all times. For plant material this is generally restricted to <10% of available ripe fruit per individual plant, or for cutting material <10% of available suitable cutting material per individual plant.

17. Samples must not be collected from biologically sensitive areas, or in quantities that would unduly deplete the population or damage any other ecological associations.
18. The permit holder shall maintain and provide to the Council records of records of collection sites and materials collected, e.g. maps of the site(s) used and lists of materials taken from each.
19. If requested, the permit holder shall keep the Council and mana whenua informed of the progress of the activity.
20. After completing the activity, the permit holder shall forward a copy of any research findings, reports and publications to the Council office that issued this permit. Furthermore, they shall forward a copy of the species collected, the sites from which they were collected, any accident or near miss accident reports and any other relevant information.
21. The permit holder acknowledges that the Council may provide copies of research findings, accident reports, publications and any other relevant information to mana whenua or other individuals and/or organisations.
22. No material collected under this permit may be used for commercial purposes or patenting of plant varieties or registration of intellectual property rights on any derivatives without first getting approval from the Wellington City Council.

Schedule 1 **FOR OFFICE USE ONLY**	
a) Do you approve of the people involved in this project? *[per section 1]*	☐ **Yes**, as stated by applicant ☐ **Yes**, with conditions ☐ **No**
Conditions:	
b) Do you approve of the proposed sites? *[per section 3]*	☐ **Yes**, with preferred site(s) ☐ **Yes**, with alternative site(s) ☐ **Yes**, with sites listed below ☐ **No**
Conditions:	
c) Do you approve of the proposed dates? *[per section 1]*	☐ **Yes**, with preferred dates ☐ **Yes**, with alternative dates ☐ **Yes**, with entirely new dates ☐ **No**
Conditions:	
d) Do you have any other comments or conditions?	☐ **Yes** ☐ **No**
Comments:	

Approved by		Date:
Name:	Signature:	
Position:	Phone:	Email:
Does this permit require additional approval?	☐ YES ☐ NO	
Additional approval		Date:
Name:	Signature:	
Position:	Phone:	Email:


Northern
Western
Town Belt
Coastal 1
Coastal 2
Ranger Areas
0 1 2 4 6
Kilometers
scale 1:87,000
MAP PRODUCED BY:
Wellington City Council
101 Wakefield Street
WELLINGTON, NZ
ORIGINAL MAP SIZE: A4
AUTHOR: prestozj
DATE: 11/04/2019
Absolutely Positively
Wellington City Council

This guide is designed to assist applicants in developing a Health and Safety plan. It provides an overview of some common hazards encountered while working in reserves as well as procedures with which they may be addressed. *This is NOT a comprehensive list, and your activity will likely involve hazards not listed here.*

Potential hazard types

Asset failures
Being near, on or in water
Biological agents
Dust, asbestos and silica
Electrical appliances and internal outlets
Events in Council facilities or on Council-owned land
Excavations
Exposure to criminal activity (theft / vandalism)
Extreme natural events
Firearms
Fixed plant
Hazardous substances
Health and impairment
Helicopters, drones and other powered aerial equipment
Ignition sources
Manual handling
Noise
Other mobile equipment
Personal confrontation
Stacking, racking and material storage
Surface conditions
Tools and equipment
Traffic and pedestrian movement during work activities
Vehicles on/off roads (including bicycles)
Work at Height
Working alone / remote work
Work in confined spaces
Working outside
Work with or in the vicinity of services

TIPS

- Include site specific hazards eg access to site, weather, ground conditions, public, traffic, other contractors/PCBU's etc
- Look for opportunities to eliminate hazards/risks or unnecessary steps.
- Each hazard must be controlled by working through the hierarchy of control in order (below)
- Look for ways to improve other aspects, such as quality and productivity, as these things can often help justify costs of making improvements.

Risk Matrix

Likelihood *(How Often)*	**Consequences** *(What could be the harm or damage)*			
	Minor (First aid/ debrief)	**Moderate** (Medical treatment)	**Major** (Notifiable event / lost time injury)	**Severe** (Fatality or permanent impairment)
Almost certain *(within a week)*	Medium	High	Extreme	Extreme
Likely *(next 1-12 months)*	Low	Medium	High	Extreme
Unlikely *(next 1-5 years)*	Low	Medium	High	Extreme
Rare *(5 years +)*	Low	Low	Medium	High

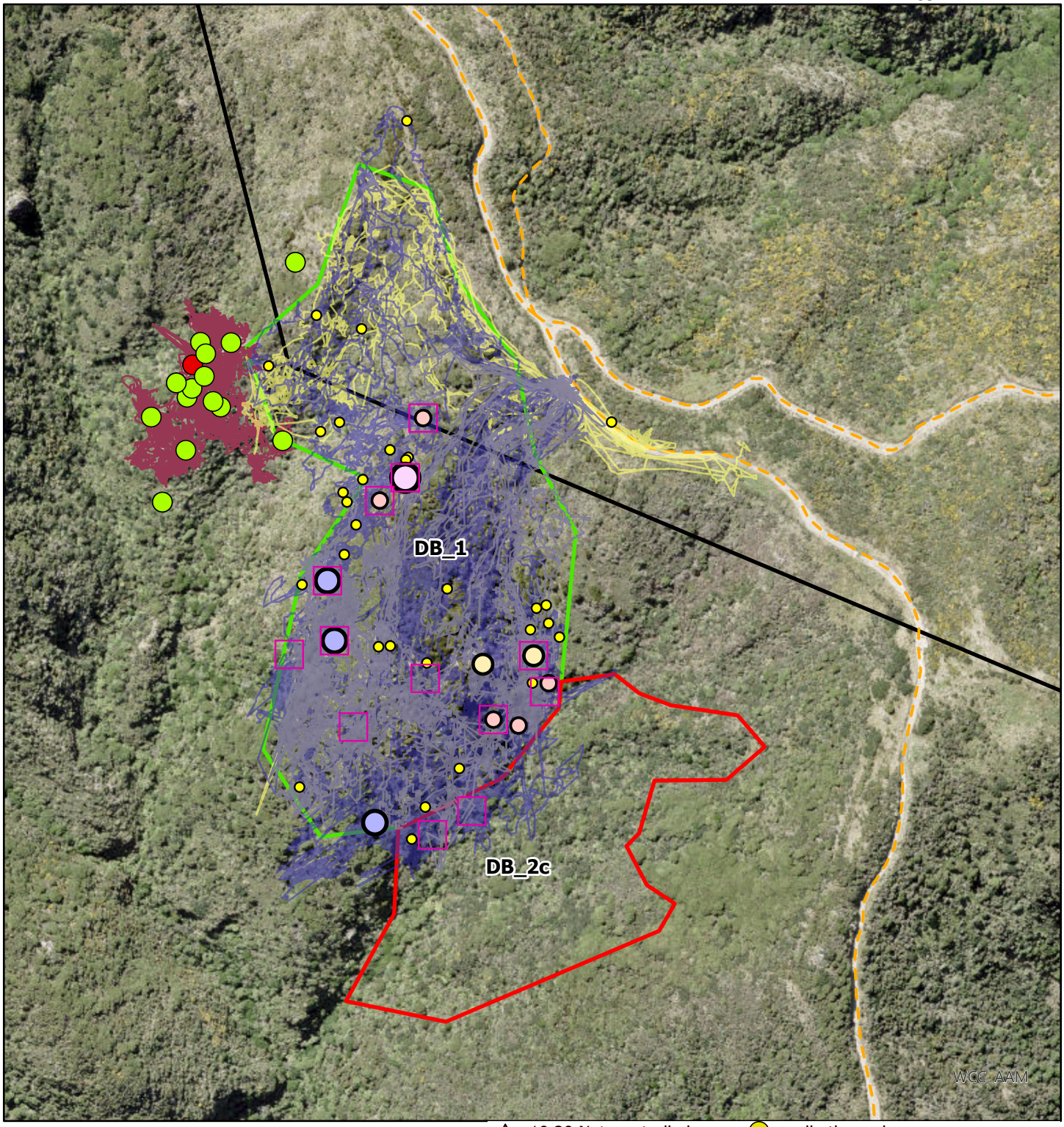
Examples of Common Hazards in the Field

- **Bad weather:** check the weather report for the day, wear suitable clothing and be prepared to postpone work if needed.
- **Sharp objects in rubbish:** take care when handling rubbish bags and containers.
- **Unsafe use of equipment:** ensure suitable training on the correct use of equipment. Keep clear of tools in use; ensure adequate space between tool users.
- **Uneven ground:** wear suitable footwear. Use caution when navigating terrain.
- **Falling rocks, slippery areas and steep banks:** avoid potential problem areas, choose routes carefully.
- **Poor lifting technique**: lift with your legs and ask for assistance if required – the safe limit will differ from person to person but no-one should be lifting anything heavy without assistance.
- **Water** – **cold, polluted water or rising streams**: avoid where possible and be prepared to postpone work if needed.
- **Dangerous vegetation – rotting branches, poisonous plants (e.g. nettle), etc.**: avoid where possible, report concerns to Wellington City Council. Check for loose branches above when working under trees. In high winds, avoid pine and bush areas. Do not climb trees without proper equipment, training and PPE
- **Fast moving tides:** if working on a beach, check the tidal reports for the day. Take care and postpone work if needed.
- **Roads**: If working near the road, wear high-visibility jackets. Take extreme care – if you need to work within two metres of the road, talk to a park ranger about road control options.
- **Heat**: seek shade, take adequate rest, food and drink, rotate and share the work load.
- **Fatigue:** Take breaks; ensure people aren't working for long periods of time. Look out for one another.
- **Beehive or wasp nests:** leave the area if a nest or hive is disturbed; report wasp nests to Wellington City Council.
- **Working alone:** inform other people about the specifics of your activity, including where you're going, what you intend to do there and when you plan to return. Have a working mobile phone or alternative communication device if off site.
- **Neighbours and other passers-by:** respect all neighbours and members of the public, if they become aggressive or complain about activities speak with them politely and direct them to contact WCC at 04 499 4444.
- **People:** Ensure anyone under the influence of drugs or alcohol does not participate. Anyone with allergies should notify the project leader and carry personal medication.

Accident procedures

- In the event of an accident you should have a suitable first aid kit and mobile phone on hand.
- If someone is injured:
    - stop work and provide emergency first aid and support.
    - call emergency services (111) if necessary.

Call the WCC call centre as soon as practical after the accident at (04) 499 4444 to report the incident.



Darwins Te Kopahou issued 24 Sept 2020

19 20 Not_controlled

NFU or hotspot

19 20 Controlled points

SIZE

- 11-20
- 21-50
- 50-100
- 100+
- Under 11m2

20_21 Points

- controlled
- not_controlled
- other
- partial_control

<all other values>

NZBSL_Tracks_18_19

NZBSL_tracks_19_20

August WCC all units tracks

WCC Tracks

Operation_area_20_21

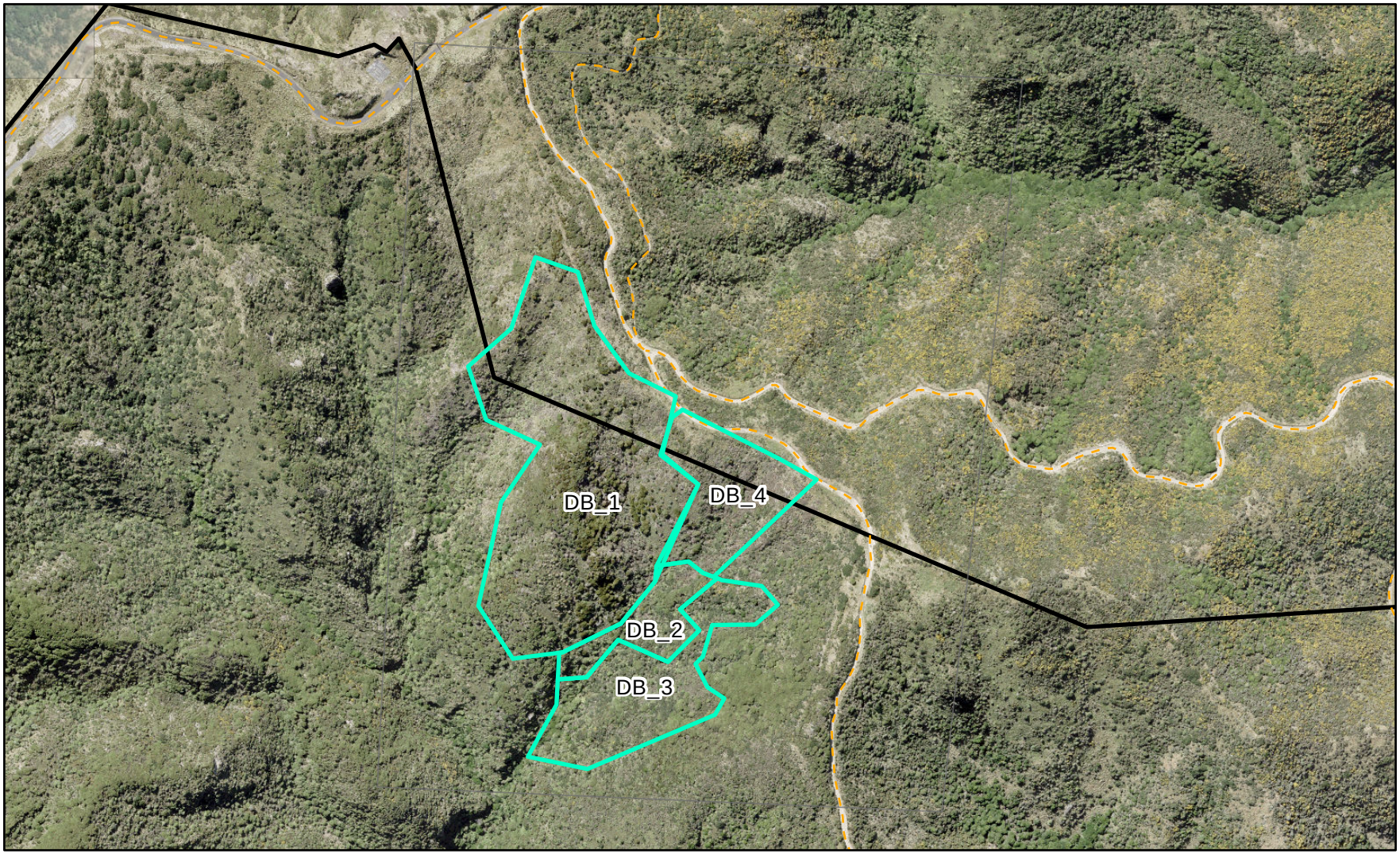
- Follow up
- Seedbank
- Initial control
- <all other values>

Weed_Points

Parks and Reserves

No Spray

wcc_dynamic.SDEADMIN.crs_parcel



NZBSL op maps issued 30 Sept 2021

Page Name: Te Kopahou Darwins 1 (Dracophyllum)