Harbourview-Orangihina Park Community Restoration Plan

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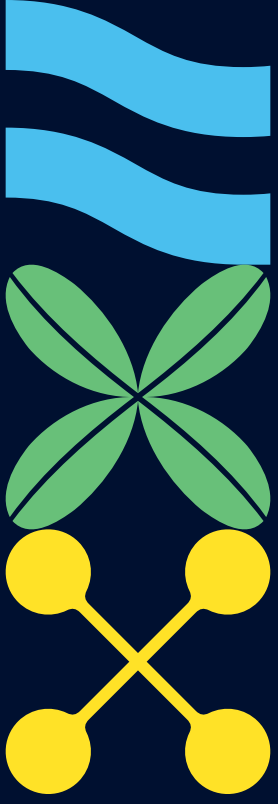
AUCKLAND COUNCIL



The author and Auckland Council staff would like to thank Henderson-Massey Local Board for funding the development of this restoration plan. A big thanks also to the numerous groups and individuals (there are too many of you to mention!) who have contributed to the development of this report. Your patience, generosity, and incredible commitment to Harbourview-Orangihina Park are greatly appreciated.

Henderson-Massey Local Board
Auckland Council

Preface

This restoration plan for Harbourview-Orangihina Park aligns with, and is guided by, the Harbourview-Orangihina Park Master Plan that was adopted in 2019. It seeks to provide a detailed restoration plan for the park that incorporates community and iwi values and perspectives, and can be easily adopted by community groups and iwi to encourage engagement and collaboration.

Harbourview-Orangihina Park encompasses 85 hectares of pastoral and intertidal coastal land located on the eastern fringe of Te Atatū Peninsula adjacent to the Waitematā Harbour near the Whau River mouth. It retains a wilderness feel, in contrast to adjacent residential areas. It is home to outstanding geological formations, rare and endangered fauna – particularly wetland birds and shorebirds – as well as freshwater and saline wetlands. This report summaries these values as well as the environmental threats, such as introduced species, urban catchment influences on water quality, and sea level rise.

As a community restoration plan, its central tenet is that engagement and involvement of people is key to the park's restoration. This includes restoration of cultural connections or indeed reconnection of people to the environment they live in through involvement in restoring the mauri of the park. Principles taken from te ao Māori of kaitaikitanga, maanakitanga and mātaurangi Māori (loosely be translated as guardianship, hospitality and Māori knowledge) can guide its implementation. These are inclusive comments that do not exclude any groups or individuals from contributing to the park's restoration.

There is a huge opportunity to take a whole-system (ki uta ki tai – mountains to the sea) approach to the park's restoration, as the catchments are small and contained within the community of Te Atatū Peninsula. The consistent feedback from community stakeholders and Auckland Council staff was that to fully embrace this this opportunity it would be necessary to have a dedicated person as a coordinator to assist in implementing this plan, and this is included in the recommendations.

The report is guide rather than a rule book, with priorities to be decided by those undertaking the work, as resources allow. It is hoped that the plan will be a living document that will be updated as the project continues. There is still much to learn, and many opportunities for further research and shared discoveries at Harbourview-Orangihina Park.

Contents

1. Plan scope and development

Auckland Council engaged Thomas Consultants Ltd to develop this ecological restoration plan for the Harbourview-Orangihina Park that incorporates mana whenua and community perspectives and values, and maximises opportunities for community involvement and leadership in its implementation. This plan aligns with and is guided by, the Harbourview-Orangihina Park Master Plan adopted in 2019. It has been developed following a workshop, walkover and various meetings and discussion with mana whenua representatives, community stakeholders and council staff from various departments. It is a resource to coordinate work led from within the community in partnership with mana whenua, council and key stakeholders.

2. Harbourview-Orangihina Park: an introduction

Harbourview-Orangihina Park is an 85-hectare, approximately 2km long area of coastal Council reserve land located on the eastern fringes of Te Atatū Peninsula, in the Henderson-Massey Local Board area (see overview map, Figure 1, next page).

The park is well used for walking, riding, bird watching, picnicking, running and dog walking. Te Atatū pony club leases land at the southern end of the park. Despite this use, the park retains a wilderness feel, in contrast to adjacent residential areas. The park overlooks the Waitematā Harbour, and the views across the harbour are valued.

As described in the master plan, the park is a “dynamic and sensitive coastal landscape, and a place of significant ecological, archaeological, cultural heritage and recreational value. The park is home to outstanding geological formations, rare and endangered fauna, and its coastal salt marsh environment is of regional importance”.

The topography of the park comprises two terraces – the upper terrace and the lower terrace – separated by a slope. For the purposes of this restoration plan, the park has been broken northern, central, and southern sections. See Harbourview-Orangihina Park Overview Plan on following page.

Harbourview-Orangihina Park Community Restoration Plan

3. Site history

Harbourview-Orangihina Park is a human landscape; its history of occupation and use explains the vegetation patterns and species that are found there today. The site is particularly significant for Te Kawerau a Maki and Ngāti Whātua Ōrākei. Orangihina means 'place of Rangihina' – an ancestress of both the Te Kawerau a Maki and Ngāti Whātua people and the wife of the great warrior Te Au O Te Whenua.

There are several identified archaeological sites on the park, both Māori and early European settler. Te Atatū is well located on the Whau River portage – the historic pathway between the Waitematā and Manukau harbours. Māori occupied the area both permanently and seasonally, with settlement focused on fishing and gathering natural resources.

European colonisation of the area started in the 1880s and led to the site being cleared for horticulture and agriculture (see photo 1). Presumably this was when the network for drains (many still visible today) was constructed on the lower terrace. In the 1890s, the industrial Auckland Brick and Tile Company occupied the southern end of the park and its bricks were transported to the Auckland market by scow (a type of flat-bottomed barge). Bricks can still be seen on the shoreline here. Photo 1 (next page) is of the site in 1909. Other significant heritage features of the park on the upper terrace include the 19th century brick villa and World War II anti-aircraft gun emplacements.

Photo 1: Photographer unknown. Te Atatū, looking due south towards Pollen Island and Rosebank Peninsula, 1909. Pauling Collection. Auckland Libraries Heritage Images.

Until the 1950s, Te Atatū was largely rural. The construction of the north-western motorway spurred its development as a largely residential area. Many Māori moved from their wā kāinga (tribal communities)

as part of the urban Māori migration from other rohe and were prominent in the establishment of the modern Te Atatū Peninsula township. The long-planned Te Atatū Marae is part of maintaining Māori culture and connections.

At what is now Harbourview Reserve (the northern end of Harbourview-Orangihina Park, the Harbour Board acquired land in the 1950s to construct a port. The port however, was never built, although the former beach at the end of Harbourview Road was 'reclaimed' and now provides the car parking area at the end of Harbour View Road. The land then remained predominantly in pasture until the late 1990s, with much of it leased to Te Atatū pony club which has had a presence here since 1972. Leisureland Fun Park (later Footrot Flats Fun Park) also operated in the area between what is now Huntaway Lane and the shoreline for a period during the 1980s and early 1990s (Uniservices 1995, Bioreseaches 1996).

In 1989, the land was transferred to Waitākere City Council. In the late 1990s, Waitākere City developed 41.5 hectares of the northern upper terrace as housing, setting aside the slope and lower terrace as reserve land. This was to collect and treat stormwater runoff from the new housing development, and two large stormwater ponds were built on the lower terrace. To service the residential development, a new sewer line was also built through the park in 2001, linking to the existing pumping station. Around this time, path construction and planting was undertaken along this northern end of the park. Planting was based on common revegetation species, with a high proportion of kānuka (LA4, 1996).

Waitākere City Council planned to develop the upper terrace to the south of the current housing. These plans became increasingly unpopular and led to calls for the remainder of the area to be set aside as a 'people's park'. In 2003, Waitākere City heeded these calls, setting the remainder of the area as open space and implementing a special $9 per household rate levy to fund the development of the park. Around this time, a further 2.5-hectare area was also formally identified as the location for an urban marae.

Further park development occurred in the early 2000s. In 2003, a new entrance to the park was created from Gloria Ave, as well as a car park and pathway from here heading south towards the power pylon. The Te Atatū pony club lease area was reduced to exclude the remainder of the lower terrace and key watercourses, which were then planted. Much of the remainder of the slope, excluding identified archaeological sites, was planted. The lower terrace at the southern end has not been planted and is now predominantly covered in rank grass and gorse that has regenerated since it was last grazed in the early 2000s.

In 2005, High Court proceedings were filed on behalf of former owners of this land, who wanted the council to return land which had been taken by the Harbour Board. The appeal was ultimately unsuccessful, but it was not resolved until 2016 and led to a 'pause' in any major investment by the council in the park. In contrast, during this time there has been increased interest from the local community and by conservation groups in the area and its ecology (see section 7 for additional details). A master plan, adopted 2019, highlighted the significance of the ecology of the site as well as the desire of mana whenua and community to participate in its restoration.

4. Master Plan 2019

The Harbourview-Orangihina Park Master Plan is the guiding document for the wider park development. It sets out:

- the historical, cultural, environmental and recreational values of the park
- the consultation process to create the master plan
- key design principles to guide development of the park

- a spatial plan showing how the park can be improved over time.

The key direction from the Master Plan relevant to community involvement in wider restoration of the park is to:

- Work with mana whenua (Te mahi tahi me ngā mana whenua) in the Master Plan's implementation, which by extension, includes this plan.
- Recognise the whakapapa of Orangihina: Celebrate Māori names, use plants that whakapapa to the site (i.e. ecosourced from Tāmaki Ecological District).
- Recognise tohu (signs and indicators in the wider landscape): Acknowledge site and landmarks significant to mana whenua significant, including the significance of the kuaka (godwit), the connection to the Whau River portage and to connection to the Te Whau pathway as well as the story of Rangihina after whom the park is named.
- Protect taiao (the natural environment): Protect and enhance all significant habitats and native ecosystems. Consider the effects of climate change and in particular rising sea levels' impact to the whenua. Provide protected areas for bird nesting and roosting.
- Provide opportunities to connect with nature, te ao Māori and Māori mātauranga relating to the natural values and area in association with mana whenua. Increase public understanding of the site's unique ecosystems, flora and fauna.
- Protect, maintain or enhance mauri tu (environmental health). Progressively remove and/or control plant and animal pests. Clean up and remediate the site where required.
- Protect the panoramic views across the Waitematā Harbour to Auckland city and Rangitoto Island
- Preserve the open, pastoral qualities of the park.

5. Physical features

5.1. Landform[1]

Te Atatū Peninsula sits between the drowned river valleys of the Henderson and Whau Creeks on the southern shoreline of the Waitematā Harbour and is approximately 4km long and 2km wide. The underlying rocks of Te Atatū Peninsula are layered sandstones and mudstones formed under an ancient ocean about 20 million years ago (Waitematā Formation). Overlaying this is mostly alluvium – a mix of boulders, pebbles, sand, silt and organic debris deposited by ancient rivers and streams.

The park itself is 2km long and located on the eastern side of Te Atatū Peninsula. The topography comprises two terraces, the upper terrace and the lower terrace, separated by a fore slope or scarp (referred to in this report as 'slope'). These terraces formed during the Pleistocene geological period. Harbourview-Orangihina Park is recognised as containing one of the last remaining undeveloped Pleistocene terrace surfaces around the Waitematā Harbour. Further information on these features are as follows.

Upper terrace: The upper Pleistocene terrace comprises the upper portion of the park (e.g. the pony club paddocks) as well as most of the peninsula and lies between approximately 15-22m above sea level. There is little remaining natural vegetation on the upper terrace.

Slope: Between the upper and lower terrace is a slope (also known as a fore slope or scarp). This is the former seacliff that formed 3000-4000 years ago when sea levels were about three metres higher than present levels. Most of this slope has been planted.

Lower terrace: The lower Pleistocene terrace formed as sea levels receded, leaving an area of old mudflat above the new sea level. This ground lies around 1.5m to 4m above sea level and slopes gently down to the Waitematā Harbour. This former mudflat area is now comprised of salt marsh, freshwater wetland, and previous pasture areas regenerating in weeds such as gorse and blackberry.

[1] This description is summarised from Bioresearches 1996.

Photo 2: An aerial view of the southern end of the park (looking west) showing the gorse covered lower terrace, planted slope, and pony club paddocks.

At the northern and southern ends of the park a small 'cliff' about 1m high has formed at the edge of the terrace. Given the soft soils, this edge is erosion prone (although Bioresearches identified there may have been periods of deposition as well as erosion in historic times). In the central portion of the park there is an extensive area of salt marsh transitioning into manawa (mangroves). Just outside the park is an extensive intertidal zone that spreads eastward towards the Whau Channel and the deeper water of the Waitematā Harbour. This area contains manawa (mangroves), shell banks and sandy mud flats.

The soils of the park are described as silty loams and clays, variable, but generally of moderate to low fertility. Peat is present in places but does not form the soil. The soils in the southern portion of the park are generally less fertile.

5.2. Hydrology

The water that feeds the parks wetlands and streams – either as groundwater seepage or as overland flow – comes from the parks wider catchment (or watershed). The catchment is predominantly the residential housing areas to the east of the park bounded by Te Atatū Road and Harbour View Road. Rain falling on these areas flows to the park through stormwater pipes or seeps through as groundwater. The hydrological features of the park include streams, drains, freshwater wetland, saline wetland, and stormwater ponds. These are shown on the relevant zone plans and are described further below.

Streams: Small gullies along the northern and central part of the park support small coastal streams. In the northern zone, when these reach the lower terrace, they help to feed the broad swampy zones. The two streams in the centre of the reserve have been deepened and straightened on the lower terrace and resemble drains. Note that the information contained in Auckland Council geomaps 'overland flow path' layer does not reflect the actual location of watercourses on site.

Photo 3: The northern-most stream (flows from the Riverstone Terrace Pond) is at the base of the gully underneath this bridge.

Photo 4: The lower reach of a stream in the central zone at high tide, with purua and Carex divisa growing either side.

Freshwater wetlands: The northern portion of the reserve contains the greatest extent of freshwater wetland, although there is a ridge of higher ground in the middle of the terrace. These wetlands are freshwater swamp, being fed by streams as well as groundwater with fluctuating water levels.

Water levels in the central portion of the reserve are in general currently too low to support indigenous freshwater wetland, apart from patches near the transition to the salt marsh. That said, this area can be wet in winter.

The southern portion of the reserve is drier than the north – there are no streams feeding the area, and the catchment area for groundwater is small as this is where the peninsula is at its narrowest. Although mostly dryland, it is a mosaic with small patches of wetland plants such as rautahi (*Carex geminata*), kukuraho (*Bolboschoenus fluviatus*) and twig rush (*Macherina* species). Being groundwater fed, these wetlands are fens.

Saline wetland: The park is on the edge of the harbour and contains extensive areas of salt marsh grading into manawa (mangrove).

Drains: There is a network of drains on the lower terrace that dates to when the area was farmed. They are obvious features on the 1940 aerial photography. These drains have not been maintained for many years and many no longer appear to be functioning. At the northern end of the park, some of the drains were already blocked in the early 1990s and raupō was growing (see Mitchell 1993). At the southern end of the park, although the drains are visible on aerial photography, in the areas where gorse first started growing in these former paddocks on site, these drains are not obvious and no longer appear to be lowering water levels. The drains are most obvious in the central section of the lower terrace, where they have remained open.

Stormwater ponds: There are four stormwater ponds in the park, and another on the other side of Te Atatū Road which feeds into the park. These were created in the 1990s during the residential development of the upper terrace. The ponds are:

- Danica Esplanade Pond (see Photo 5)
- Longbush Road Pond
- Riverstone Terrace Pond
- Amenity Pond (near Harbour View Road car park)
- Te Atatū Road Pond (outside the pond, but feeds into a stream).

Further details about the park's hydrology is contained in the accompanying Wetland Feasibility Report (Thomas Consultants Ltd, 2020).

Photo 5: An aerial view of Danica Esplanade Pond, showing the scattered slope planting (between the path and the road) and extensive areas of salt marsh to the east (right of photo). Photo supplied by Auckland Council (2018).

6. Ecological features and ecosystem types

6.1. Context and significance

Harbourview-Orangihina Park is located in the Tāmaki Ecological District. Tāmaki Ecological District encompasses the most urbanised areas of the Auckland Region between the Manukau and Waitematā Harbours and is one of the most modified ecological districts in New Zealand. Indigenous vegetation only occurs across 6.9% of the Tāmaki Ecological District and as such any remaining natural areas are vitally important[2].

The large area of salt marsh on the coastal edge of the lower terrace is the most significant ecological feature of the park. Together with Pollen and Traherne Islands within the Motu Manawa Marine Reserve to the south, it forms part of a network of estuarine ecosystems that includes high-tidal sandflats, manawa (mangroves), shell banks, and intact salt marsh communities such as sea rush and glasswort.

The Harbourview-Orangihina Park salt marsh grades into freshwater wetland or terrestrial habitat. Such ecotones, as they are known, are valuable but now uncommon as a result of the reclamation of coastal areas for agriculture and development.

The freshwater wetlands, such as the raupō swamp at the northern end of the park, are critically depleted nationally and regionally (that is, they now cover less than 10% of their original extent). Wetlands support more bird life than the equivalent area of forest, and a number of threatened wetland birds are found on the reserve including mātātā (fern bird) and pūweto (spotless crake).

The park's terrestrial vegetation is more modified but is of critical importance as a buffer to these freshwater and estuarine areas and has potential to be a viable ecological corridor. Threatened and 'at risk' wildlife species (see section 6.4) are found throughout the park, and are not confined to areas of indigenous vegetation, for example, shorebirds roost and nest on the upper terrace within the pony club lease area.

Overall, the Harbourview-Orangihina Park is of at least regional ecological significance. Its significance is recognised by its identification as a Significant Ecological Area, a Biodiversity Focus Area, and Northwest Wildlink Biodiversity Hub. These are discussed further in the remainder of this section.

6.1.1. Significant Ecological Area

All of the lower terrace and slope, as well as some of the existing streamside planting, is identified as a Significant Ecological Area (SEA) in the Auckland Unitary Plan (operative in part). The adjacent coastal area is identified as a marine Significant Ecological Area.

6.1.2. Biodiversity Focus Area

The Auckland Council Indigenous Biodiversity Strategy (2012) has two primary objectives, namely to:

[2] Auckland Protection Strategy, accessed at: https://www.doc.govt.nz/Documents/getting-involved/landowners/nature-heritage-fund/nhf-akld-protection-strat.pdf

- conserve the greatest number and most diverse range of Auckland's indigenous ecosystems and sequences, and
- achieve long-term recovery of the greatest number of threatened species whose range includes the Auckland region.

Identifying and managing Biodiversity Focus Areas (BFAs) is the key method Auckland Council is employing to achieve the above objectives. BFAs are the minimum set of sites that, if looked after, will ensure viability of the full range of indigenous ecosystems and species in the region. BFAs on council land are intended to be the sites where the council proactively manages biodiversity.

The coastal area of freshwater wetland and saline wetlands of Harbourview-Orangihina Park has been identified as forming part of the Motu Manawa / Pollen Island BFA which includes saline areas around the mouth of Whau River and the Motu Manawa / Pollen Island, and Traherne Island (Te Kou). This BFA area is shown in Figure 2. The BFA area could be extended as a wetland/terrestrial BFA to include core mātātā (fernbird) habitat on the lower terrace.

Figure 2: The BFA area shown in green. Image taken from Auckland Council's conservation website (Tiaki Tāmaki Makaurau) accessed 8 September 2020.

6.2. North-West Wildlink and Te Whau Pathway

Native wildlife needs safe and linked habitat to survive and move from place to place across the landscape. The vision of the North-West Wildlink is to have a green corridor that links habitats and communities from the Waitākere Ranges in the west to the Hauraki Gulf islands in the east. The Te Atatū Peninsula

biodiversity hub is centred on the 'Wildlink Wonder' of Harbourview-Orangihina Park and surrounding coastal habitats (Boffa Miskell 2017). This highlights that restoring the park will have wider benefit for biodiversity in the region, particularly for birds. Together with Pollen and Traherne islands within the Motu Manawa Marine Reserve to the south, it forms an expansive and important network of estuarine ecosystems.

The Whau River is also a hotspot, with the margins of the Whau River proposed to be restored in association with the development of the Te Whau Pathway – a 12km shared path along the western edge of the Whau River, from Te Atatū to Green Bay. The Te Whau Pathway is a collaboration between Auckland Council, the Whau and Henderson-Massey local boards, Auckland Transport, Te Kawerau a Maki, Ngāti Whātua Ōrākei and the Whau Coastal Walkway Environmental Trust. In July 2020, the government announced it was one of the funded 'shovel ready' projects.

6.3. Vegetation and ecosystem types

Harbourview-Orangihina Park is a diverse mosaic of terrestrial, freshwater and salt marsh vegetation and habitats with much of it planted, often by volunteers. The vegetation of the north, central and south areas is described below. The ecosystem types follow Auckland Council's publication *Indigenous terrestrial and wetland ecosystems of Auckland*. This publication and further information about ecosystems can be can be found on the website Tiaki Tāmaki Makaurau (Conservation Auckland)[3]. A species list is included in Wildlands 2012.

A map of the current ecosystems is included in Appendix D.

6.3.1. North

The northern area described in this section is from the Danica Esplanade Pond north. Much of the slope and upper stream margins here has been planted although only sparsely with the result being vegetation is patchy and generally does not contain any future canopy species or the full complement of understorey species. As such there are still additional opportunities for community planting here. There is a larger planted area north of the brick villa that relates to an identified archaeological site.

Kānuka is the key species that was used in the original planting and are now about 5m tall with some of these trees recently cut down, presumably to improve views from adjacent properties. More recent slope plantings are dominated by whaririki (coastal flax). Planted areas have been mapped as *PL.1 Native restoration planting* (if less than 20 years old) or PL1.2 if older. Planting in the 2020 planting season has provided a much needed buffer to some of this original planting. There is also an area of cypress trees on the edge of the slope (on the downhill side of the path), which is mapped as *EF.2 Exotic forest* with <50% native understorey. The original ecosystem type for this slope is *WF4 Coastal broadleaf forest.*

The lower terrace contains three stormwater ponds (mapped as *OW, Open Water*). The fringes of the largest of these – Danica Esplanade Pond and Longbush Road Pond – have been planted with emergent wetland plants, including kuta (*Eleocharis sphacelata)* and jointed twig rush (*Macherina teretifolia*). The Danica Esplanade pond also has a major infestation of the aquatic weed *Egeria*.

The lower terrace contains the largest and most intact (albeit with a high portion of non-native plants) areas of natural freshwater wetland on the park with the core area dominated by raupō

[3] See www.tiakitamakimakaurau.nz/discover-tamaki-makaurau/what-is-an-ecosystem

and pampas grass *(WL19 Raupō reedland).* The northern and eastern edge of this ecosystem grade into *WL10 Oioi restiad rushland/reedland.* This is a diverse wetland type and areas of jointed twig rush *(Machaerina articulata)* are mapped as part of *WL10 Oioi restiad rushland/reedland* as well as the kukuraho (*Bolboschoenus fluviatilis)* areas and grass dominated area at the northern end of the park and the oioi dominated area on the immediate coastal edge. This area contains areas invasive wetland grasses, such as mercer grass and saltwater paspalum. From the Longbush Pond south there are areas of a *PLW.1 Planted wetland* (less than 10 years old) and *PLW.2 Planted wetland* (more than 10 years old) which is a semi-wetland area of scattered tī kōuka (cabbage tree), harakeke and mānuka with rank grass, blackberry and Japanese honeysuckle. The original ecosystem in these planted areas is believed to be *WF8 Kahikatea, pukatea forest*[4].

Within this area is an apparent dune ridge running parallel to the shore line. This area has sandy soils and has been planted with kānuka and other revegetation species. The original ecosystem type is likely to have been *WF5: Tōtara, kānuka, broadleaved forest.* WF5 is a critically endangered ecosystem type, with few examples in the region.

Extensive areas of salt marsh (*SA1.3 Searush and oioi*) also occur in this northern zone, dominated by wīwī (sea rush) and oioi. Manawa (*SA1.2 Mangrove*) have penetrated this area, their seeds travelling up the historic drains. This pattern can be seen on aerial photographs.

Small areas of shell bank along the northern foreshore support knobby clubrush and needle grass. *SA1.5 Shell-barrier Beaches (Chenier Plains)*.

Photo 6 is an overview photo of this zone looking north.

Photo 6: The northern zone, showing the criss-cross pattern of the location of historic drains. Photo supplied by Auckland Council (2017).

[4] See *Native to the West* (2nd edition, 2005) available at http://www.lucas-associates.co.nz/assets/Guidelines/Native-To-The-West.pdf

6.3.2. Central

The central area is the area south of the residential houses where the park widens to include the upper terrace. This upper terrace was likely *WF7: Puriri Forest,* a previously abundant ecosystem type in Auckland, that is thought to be the original ecosystem type for most of the peninsula[5] (upper terrace). This upper terrace is now predominately mown grass, apart from the stream margins that have been densely planted with species such as harakeke, tī kōuka, mānuka, rautahi (*Carex geminanta*) (*PL.1, Native restoration planting*). The Matariki planting in 2019[6] added width to this streamside planting, with a more diverse range of coastal trees and shrubs, as well as adding a separate circular rongoā (traditional Māori medicine) garden.

The lower terrace here is generally dominated by rank grass species such as kikuyu (*Cenchrus clandestinus*) and tall fescue (*Lolium arundinaceum subsp. arundinaceum*), with environmental weeds such as gorse, blackberry, and Japanese honeysuckle (mapped as either *EG. Exotic Grassland* or *ES Exotic scrub*). Adjacent to the salt marsh, the invasive *Carex divisa* forms large areas of monoculture (*EW Exotic wetland*). A large 2018 Sustainable Coastlines planting is found on this lower terrace[5].

Extensive areas of salt marsh (*SA1.3 Searush and oioi)* also occur in this central region, with patches of *SA1.4 Saline Herbfield* namely ureure (glasswort, *Sarcocornia quinqueflora*), mākoako (sea primrose, *Samolus repens*), remuremu (*Selliera radicans*) and bachelors buttons (*Cotula coronopifolia*). Shrubs, commonly makaka (*Plagianthus divaricatus/*salt marsh ribbonwood) and, less commonly, coastal tree daisy (*Olearia solandri)* are scattered on the edge of the salt marsh. Manawa (mangroves) have penetrated this area, with seeds travelling along the historic drains.

Photo 7: A 2017 drone photo of the central and southern zones, looking south, (photo supplied by Auckland Council).

[5] As per the ecosystem mapping available through Auckland Council GEOMaps

[6] This area is not visible on the current aerial, so has not been included in the mapping in Appendix D.

6.3.3. South

The upper terrace is in mown lawn and pony club paddocks. Specimen pōhutukawa trees fringe the path. There is also a pā harakeke here. A pā harakeke is an area where varieties of harakeke (swamp flax), selected for their good muka (fibre) or raranga (weaving) qualities are grown.

Bioresearchers (1996), noted the soils are less fertile at this end of the park, and this reflected in the current ecosystems and former ecosystems. The lower terrace is thought to have originally been *WL12: Mānuka fen.* This ecosystem is a mosaic of wetland and non-wetland areas with low fertility than wetland areas further north being predominately groundwater feed. The small patches of twig rush (*Macherina tenax*) are a clue to this original ecosystem. There are also small areas of kukuraho (*Bolboschoenus fluviatilis*). Gorse does particularly well due to its ability to fix nitrogen and thereby grow in nutrient-poor soils. This lower slope is predominately in gorse and rank pasture (see Photo 8), and has been mapped as either *EG. Exotic Grassland* or *ES Exotic scrub*. There are no native seedlings coming up under the gorse, presumably because of its young age Japanese honeysuckle is increasingly common here.

The original ecosystem type for the southern slope is thought to have been *WF11 Kauri, podocarp, broadleaved forest,* a widespread diverse forest with kauri interspersed, common on lower fertility soils. Part of this has been planted mostly in kānuka, with a strip of tī kōuka, (*Cordyline austalis* – cabbage tree) and harakeke (swamp flax) on the base of the slope. The southernmost slopes were not planted as they are archaeological sites. These areas are dominated by exotic trees including black wattle (*Acacia mearnsii*) and gum (*Eucalyptus*). Under this canopy natural regeneration is starting, including canopy species such as totara but overall the understorey remains fairly open. There is a big patch of the invasive giant reed (*Arundo donax*) right on the park boundary.

Photo 8: Looking south at high tide over the rank grass of the lower terrace towards the planted slope and black wattle and eucalyptus at the southern end of the park.

6.3.4. Outside the coastal boundary

There are extensive areas of manawa (mangrove) outside of the reserve boundary. Within this area is a significant shell bank (Photo 9), (*SA1.5 Shell-barrier Beaches (Chenier Plains*) that is fringed with ureure (glasswort), mākoako (sea primrose) and remuremu, and contains needle grass (*Austrostipa stipoides*) and wīwī/knobby clubrush (*Ficinia nodosa*). Non-native plants here include buck's horn plantain (*Plantago coronopus*) and orache (*Atriplex prostrata*). Pampas grass is a threat to this area. This area is administered by the Department of Conservation and is a naturally uncommon ecosystem type[7].

Photo 9: Looking south over the shell bank outside of the reserve (2018). Photo from iNaturalist and used with permission.

6.3.5. Vegetation of conservation significance

Bioresearches (1996) identified a number of locally rare or threatened plants that are thought to have occurred naturally on the site in the past. These include *Ranunculus urvilleanus* (one found in 1996) *Thyridia repens (formerly Mimulus repens), Oxybasis ambigua (*formerly *Chenopodium glaucum),* sand buttercup *Ranunculus acaulis, Myriophyllum triphyllum* (a freshwater macrophyte)*, Hydrocotyle novae-zeelandia,* waoriki *Ranunculus amphitrichus* and tarawera *(Epilobium pallidiflorum)*. These are all small herbs. *Ranunculus acaulis* still persists on the lower terrace (Dion Pou *pers comm*), otherwise none of these plants have been found on the site in recent years, but should populations be found they should be protected.

Coastal tree daisy (*Olearia solandri)* is not threatened but appears to have become less common in the reserve over time. Taupata (*Coprosma repens*) was recorded as being commonly associated with shell banks by Kingett Mitchell 2002 but has not been found recently. Both species are of local conservation significance and taupata is of significance to mana whenua.

[7] See reference contained in https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/coastal/

6.4. Animals

Birds (shorebirds, wetland and terrestrial), fish, reptiles and invertebrates are all found in the reserve. This section concentrates on species of conservation significance/taonga species, rather than a census of all species. Appendix A includes a list of all threatened and 'at risk' animal species known from the park and adjacent coastal habitats. Other species continue to be found in the park.

6.4.1. Birds

The diversity of vegetation types and habitats within the park supports a wide range of bird species, both native and exotic. The most commonly seen birds when walking in the park are pukeko, spur wing plovers, matuku moana, (white faced heron), welcome swallow and kahu (swamp harrier) circling overhead. Other native birds such as kōtare (kingfisher), tūī, pīwakawaka (fantail) and riroriro are present but not currently in large numbers.

This section does not cover all the species found but concentrates on the species of most conservation value. The park supports no less than 18 'Threatened' or 'At Risk' species. The most threatened is the matuku (Australasian bittern), whose presence in the park was confirmed in 2018[8] although it might be only an occasional visitor. Its threat status of 'Nationally Critical' is the last threat category before extinct. The next step down is 'Nationally Vulnerable' and includes the tūturiwhatu (banded dotterel) and ngutuparore (wrybill) which are also present in the reserve.

Wetland birds

The lower terrace with its freshwater wetlands and estuarine wetlands supports wetland birds of conservation significance. These birds are rarely seen, as they are well-camouflaged and generally remain under the cover of wetland vegetation. The important wetland birds in Harbourview-Orangihina are:

- Mātātā/North Island fernbird
- Moho-pererū (banded rail)
- Pūweto (spotless crake)
- Matuku (Australasian bittern)

The discovery of mātātā in the 1990s helped to highlight the importance of protecting the area. These small territorial birds are found on the landward edge of the salt marsh, particularly where a mixture of lower growing rushes (e.g. oioi) and shrubs such as mākaka (salt marsh ribbonwood) create the 'two tiered' vegetation that mātātā favour. A survey in 2016[9] indicated that about 10 birds are present, but that banding of birds would be required to confirm numbers.

Moho-pererū (banded rail) looks similar to the more well-known weka, but not as large. They are found in the manawa (mangrove) and salt marsh vegetation, and in the well covered drains/streams in the central portion of the lower terrace[10] (i.e. out from the car park adjacent to Gloria Ave). Their footprints are seen more than the birds themselves.

The secretive and small – half the size of a blackbird – pūweto (spotless crake) were found in the park by Birds NZ in 2018. Pūweto is a wetland specialist that prefers wetlands dominated by dense emergent vegetation, particularly raupō where they feed on seeds, fruit and leaves of aquatic

[8] The matuku was captured on a camera trap in 2018. See https://www.stuff.co.nz/auckland/106271383/rare-and-secretive-bird-spotted-posing-as-a-log-in-suburban-te-atat-auckland.

[9] Painting, J (2016) Harbourview Reserve Matata/Fernbird (Bowdleria punctata spp. Vealeae) Survey 2016. Unpublished report.

[10] Painting, J (2016)

plants, and a wide variety of invertebrates. They may forage on open mud near dense vegetation but are quick to retreat when disturbed.[11]

Matuku (Australasian bittern) travel long distances and often rely on a network of wetlands[12]. The matuku spotted at Harbourview-Orangihina Park in 2018[13] could presumably travel between here and Te Henga Wetland or the Kaipara Peninsula. The Department of Conservation considers matuku a potential indicator of wetland health because they are dependent on the presence of high quality and ecologically diverse habitats and rich food supplies.

Shorebirds

The shorebird habitats include intertidal flats, shell banks and the pony club paddocks.

The extensive intertidal flats are important feeding grounds for a wide variety of shorebird species. During low tide they spread over the exposed intertidal mud and sand flats feeding on shellfish, crabs and worms. Chief amongst these wading birds is the kuaka (bar-tailed godwits). Flocks of these birds (up to 3000[14]) start to arrive from their northern hemisphere breeding grounds in Siberia and Alaska in September and depart from March, although non-breeding birds will remain in New Zealand. The birds take advantage of the three-hour time difference between the Manukau and Waitematā harbours to spend more time feeding. The kuaka are a taonga species, thought to have alerted Polynesians to the presence of Aotearoa.

Several of the wading birds are domestic rather than international travellers, breeding in the South Island. Tōrea (the South Island pied oystercatchers) and ngutu parore (wrybill) arrive in the area from mid to late December. Some non-breeding birds do overwinter here.

Other notable shorebirds that feed and roost on the intertidal flats are kōtuku ngutupapa (royal spoonbills), matuku moana, (white faced heron), tōrea pango (variable oystercatchers) and poaka (pied stilts). It is a wintering site for tarāpunga (red-billed gull), with up to 500 birds now regularly seen on the mudflats beside the manawa (mangroves).

During high tide shorebirds gather in roosts waiting for the tide to recede. Te Atatū pony club's paddocks are one such roost site, particularly for the larger 'spring[15]' tides. The birds coexist well with the horses, and the open grassy paddocks provide a reasonably safe roosting and foraging area because the birds can see predators easily. Birds such as tōrea also use the pony club paddocks when the ground is wet and soft, and soil invertebrate food is more readily available[16] and up to 600 have been found at times on the pony club grounds[17].

Tūturiwhatu (dotterel) nest in a small scrape on the ground, and nest on the pony club paddocks.

[11] Fitzgerald, N. 2013 [updated 2017]. Spotless crake. *In* Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz

[12] Williams, E. 2013 [updated 2018]. Australasian bittern. In Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz

[13] Observed in camera trap. See Youtube video at https://www.youtube.com/watch?v=JI297ejeHzs

[14] Maximum numbers based on counts by Birds NZ

[15] Spring tides are not connected to the season of spring. Spring tides result in high waters that are higher than average and low waters that are lower than average. The largest spring tides are commonly called king tides.

[16] Bioresearches (2010) Assessment of Avian Ecological Effects, Waterview Connection

[17] Birds NZ – based on maximum count.

6.4.2. Fish

The native fish that have been found in Harbourview-Orangihina Park are listed in Table 1 below. Pest fish are discussed in section 6.2. There is also an unconfirmed sighting of tītarakura (giant bully) from the park[18].

Table 1: Native fish found at Harbourview-Orangihina Park

Common Name(s)	Scientific Name
Inanga/white bait	*Galaxias maculatus*
Toitoi/common bully	*Gobiomorphus cotidianus*
Tuna/short finned eel	*Anguilla australis*
Banded kōkopu[19]	*Galaxias fasciatus*
Pōrohe/common smelt	*Retropinna australis*

Fish have been found in the two streams on the central lower terrace (i.e. out from the main car park accessed from the Gloria Ave roundabout) and below the Riverstone Stormwater Pond[20]. Tuna (short finned eel) have also been found here.

Unfortunately, the native fish population appears to be under stress. In 2017 adult inanga were found to have whitespot, fatal fungal disease brought on by stress and poor environmental conditions[21]. The summer of 2019/2020 was also particularly dry, and this may have further stressed fish populations.

6.4.3. Lizards

Native lizards (e.g. skinks and geckos) appear to be only at low densities in the park. A comprehensive search for lizards employing over 200 Artificial Cover Objects (ACOs) and extensive manual searching found only 5 copper skinks[22]. The invasive plague skink is unfortunately common at the reserve.

No tree dwelling geckos have been found at the reserve.

6.4.4. Invertebrates

Invertebrates are animals without a backbone, such as insects, spiders and slugs. Terrestrial and wetland invertebrates at the reserve have not been surveyed, however, wetland areas in particular usually support large numbers of invertebrates that provide food for the fish and birds there[23]. This includes many species of pēpepe (insects) – such as flax loopers and cabbage tree

[18] C.Bindon pers comm.

[19] Video of kōkopu on lower terrace from 2018: https://www.youtube.com/watch?v=sLNoy0z_05g

[20] Recorded on iNaturalist

[21] Henderson Massey Local Board Inanga Spawning Project (2017 – 2018). Unpublished report by Belinda Studholme (Community Waitākere) and Sophie Tweddle (Whitebait Connection). 6 adult and juvenile inanga caught and 3 toitoi were found).

[22] Bioresearches (2012) *Causeway Alliance, Harborview Reserve Reptile Survey.* Unpublished report. Some copper skinks impacted by the SH16 upgrade were relocated to the reserve.

[23] Peter Johnson, 'Wetlands - Wetland wildlife', Te Ara - the Encyclopedia of New Zealand, http://www.TeAra.govt.nz/en/wetlands/page-5 (accessed 10 September 2020)

moths. Pōhuehue (*Muelenbeckia complexa*) which grows on the edge of the salt marsh is the favourite food of copper butterflies.

The manawa (mangrove), mud flats, salt marsh and tidal reaches of the small stream and drain areas provide habitat for a range of estuarine fauna such as karehu (mud snails) and mud crabs. Edible shellfish such as cockles, pipi and whelks provide food for birds and fish on the sand flat area.

Damselfly, dragonfly, shrimp, water flea, midge, and rounded snail have all been found in the streams in the reserve.

7. Threats

7.1. Environmental weeds and pathogens

7.1.1. Environmental weeds

Perhaps the most pressing environmental issue for the reserve is the environmental weeds (plant pests) that have greatly increased in the reserve since 2002[24]. Excluding areas of wīwī (sea rush), oioi and manawa (mangrove), weeds are now common throughout the park. A good account of the environmental weeds – including weed density maps – is presented in Wildlands (2012) although all weeds have increased in the eight years since this was written[25].

Environmental weeds are non-native plants that by their aggressive growth compete with native plants for light, nutrients, and space. They can quickly take over an area forming a monoculture (single species). Weeds like pampas, gorse and wattle are more flammable than native species increasing the risk of wildfires. Not all non-native plants are invasive, and the same species can be invasive in one circumstance and not another. For example, gorse which can sometimes be used as a nurse crop.

The environmental weeds having the most detrimental impact on the reserve currently are the aggressive climber Japanese honeysuckle which now covers large areas of the reserve and can grow in wetland and non-wetland areas, and pampas grass which is spreading everywhere except under existing canopies (it does not tolerate shade). Agricultural weeds such as gorse and blackberry are taking over large areas of former paddock especially in the central and southern zone. Grey willow is just starting to spread in the raupō wetland and could potentially (along with pampas) come to dominate this area.

There are three current council contracts which include some element of weed control, but despite this most of the park receives no environmental weed control. These are:

- the Full Facilities Contract to cover the path edges
- the Ecological Restoration Contract, under which the Biodiversity Focus Area (see Figure 2) is a ‘general’ site – meaning a small suite of weeds is targeted once per year
- a Plant Maintenance Contract to maintain areas of community restoration planting.

[24] Kingett Mitchell (2002) noted substantial weed control had occurred since the 1996 Bioresearches report and many species were no longer present. Extensive weed spread appears to have occurred since this date. For example, in 2002 Japanese honeysuckle was only in small localised patches. It now dominates large areas of the reserve.

[25] The environmental weeds not listed in the species list in this report are: *Carex divisa* (listed in the report but not the appendix), *Lagunaria patersonia* (Norfolk Island hibiscus) and *Egeria densa*

7.1.2. Pathogens

Plant pathogens are an emerging threat. There are currently two of concern in the Auckland area: myrtle rust and kauri dieback.

Myrtle rust (*Austropuccinia psidii*) has been present in New Zealand since 2017. It affects the Myrtaceae family which includes mānuka, kānuka and pōhutukawa. It has been found in gardens in Te Atatū South[26], close to the park.

Kauri dieback is a soil borne disease that poses a serious threat to the survival of kauri in New Zealand. It is spread through movement of infected soil and water. As there is currently no cure for kauri dieback, phytosanitary procedures are crucial to reduce the spread of the disease. There are no kauri on site or in the vicinity and as such following strict kauri dieback hygiene protocols is not necessary. It is however good practice to ensure boots, machinery and tools used on site are clean to reduce the risk of introducing the seed of weeds.

7.2. Pest animals

New Zealand's native flora and fauna are particularly vulnerable to introduced pests, particularly mammals introduced by settlers in the late 1800s.

The known or suspected pest animals are listed in the table below. Not all of these species have established control methods.

[26] 'research grade' observations on iNaturalist

Table 1: Pest species at Harbourview-Orangihina Park

Pest type	Pest	Characteristics and impacts
Terrestrial mammal	Rodents	Rats and mice are common in many environments. They are able to breed rapidly when the conditions are right and are significant predators of native birds (particularly chicks and eggs), lizards and invertebrates. They also eat the seeds of native plants, interrupting the natural succession of native species.
	Possums	Possums can have a devastating impact on native bush areas and their fauna. They are known to impact established plant populations by disrupting flowering, fruiting, seed dispersal and germination.Possums also predate native wildlife and compete for food and other resources. They appear to be at low numbers in the reserve.
	Mustelids	Mustelids include ferrets, stoats and weasels. They are common predators in many different ecosystems in New Zealand, including bush, wetlands and farmland. Their native prey consists of many bird species, bird eggs, lizards and invertebrates. Mustelids are able to breed rapidly when there is lots of food available and they are good swimmers so can access areas other predators can't. Mustelids are very hard to trap, only one stoat has been caught to date.
	Cats	All cats (domestic and feral) are significant predators on native birds, insects, lizards, and fish. Feral cats are secretive, so can often be present but not detected.
	Rabbits	Rabbits browse native seedlings, especially new plantings.
Freshwater	Fish	The Danica stormwater pond contains large orange fish (likely to be either goldfish, koi carp or ornamental carp). Pest fish can stir up sediment making the water murky and eat native wetland plants.
	Gambusia	Gambusia are a small fish that makes up for its small size by being extremely aggressive, attacking larger native fish. They are extremely tolerant of water with low oxygen and are common in the stormwater ponds.
	Red eared slider	Not confirmed in the reserve, but these turtles are emerging pest species, and suspected to be present in the reserve[27].
Reptile	Plague skink	Plague skinks can reach high population densities in a relatively short time. It is thought that they compete with our native skinks for food and habitat.
Invertebrate	Wasps	Introduced wasps[28] have no natural predators in New Zealand. Paper wasps can reach high densities in wetland areas (where they find ample invertebrates to prey on), but do not pose the same threat to human health as German and common wasps. All these wasps compete to some degree with birds and other insects for the same food sources (many of which native animals depend on). Mild winters and warm springs favour increased wasp densities.

7.3. Catchment modification and water quality issues

Urban development changes a catchment's hydrology. This happens due to impervious surfaces such as roofs, driveways, roads, car parks and paved areas. Instead of soaking into the ground and replenishing groundwater, rainfall (stormwater) rushes across these impervious surfaces and through a stormwater drain. Development in Harbourview-Orangihina Park's catchment is likely to have led to reduced summer inflows to the area (due to less groundwater recharge) and increased 'flash' (short duration) flood flows. The water entering the park will also contain a variety of contaminants (such as petrochemicals and heavy

[27] Chris Bindon, Auckland Council, *per comm*

[28] New Zealand has thousands of species of wasp but most of them are tiny native species that cannot sting

metals such as zinc and copper) at a wide range of concentrations, collected as the rainwater runs over impervious surfaces[29] .

When the housing was built along the eastern side of Te Atatū Peninsula in the 1990s, next to what is now Harbourview-Orangihina Park, stormwater ponds were built to capture and treat the water before it reached the harbour. Unfortunately, ponds can develop their own water quality problems (see Photo 10 and Photo 11). The ideal pond has clear, cool water, low nutrient levels and lots of wetland plants. However, over time the gradual build-up of nutrients and organic matter washed into the pond can lead to too much growth of algae or aquatic weeds. When these die and rot, it kills animal life by depriving it of oxygen. This process is called eutrophication. Eutrophic ponds have cloudy and dark coloured water with low oxygen levels, thick stagnant sediments and lots of algae. Pest fish can exacerbate the problem by stirring up bottom sediments and eating the wetland plants that are needed to improve water quality.

There is no up to date information on the water quality of streams in the park, although the disease found in the inanga in 2017 (see section 5.3.2) suggests water quality is a concern.

The quality of the sediment and coastal water quality outside the park's boundary is also influenced by the quality of the water coming from the Whau River and wider Whau catchment. The continued expansion of manawa (mangroves) in this area indicates that there are sediment inputs into the harbour from this river.

Photo 10: The amenity pond showing the poor water quality, March 2020.

Photo 11: The Danica Esplanade Pond was full of the aquatic weed Egeria before this was mechanically removed in March 2020.

[29] See summary and references contained in "Storey R, Brierley G, Clapcott J, Collier K, Kilroy C, Franklin P, Moorhouse C and Wells R (2013). Ecological responses to urban stormwater hydrology. Prepared by National Institute of Water and Atmospheric Research for Auckland Council. Auckland Council technical report, TR2013/033" available at www.knowledgeauckland.org.nz

7.4. Disturbance: people and their dogs

This section discusses the impact of human disturbance – generally caused when people walk or ride off track – rather than natural disturbance events.

- Dogs are commonly walked in the reserve, mostly on tracks with about half on-leash as required by the bylaws[30]. It is when dog owners allow their dogs to roam on the lower terrace (including next to the track), in the salt marsh and on the foreshore, and mudflats and sandflats, that dogs come into conflict with sensitive wildlife. For example, Kuaka (bar-tailed godwits) arrive in New Zealand hungry after their non-stop flight from their breeding grounds and need to feed quickly to gain strength. Any reduction in foraging time – for example, being chased by dogs[31] – can contribute to inadequate weight gain and insufficient strength for the return flight to Alaska/Siberia.
- Ground-nesting birds such tūturiwhatu (both northern NZ dotterel and banded dotterel) will leave their nest if they feel threatened, leaving chicks and eggs more vulnerable to cold and predation. Matuku (Australasian bittern) are thought to be especially sensitive to being disturbed and can take flight or 'flush' for fear of predation when people or dogs get too close. Shorebirds need secure and undisturbed high tide roosts, or the roosts will be abandoned[32].
- Wetland birds, such as mātātā (North Island fernbird and moho-pererū (banded rail) can be found close to the main track and near the northern stormwater pond, and can be disturbed by wandering dogs or even killed.[33]

Even without dogs, when people walk or ride off-track they can damage these areas – both salt marsh and salt meadow vegetation is particularly vulnerable to damage by trampling. Informal tracks are common in the reserve.

7.5. Climate change, especially sea level rise and coastal erosion

The climate is changing and these changes will have far-reaching consequences for people and the environment. The future impacts in the longer term will be influenced by the speed at which the world – including New Zealand – reduces greenhouse gas emissions[34]. The key impacts at Harbourview-Orangihina are likely to be:

- sea level rise – both increasing the area of salt marsh and contributing to coastal erosion
- an increase in extreme weather events, including droughts and storms
- the additional spread, survival and establishment of invasive species. For example, mild winters lead to increased rat numbers.

Sea level around Auckland is rising. So far, the average sea level has risen by about 20 cm in the past century. A rise of a further 25-35 cm by 2050 is now inevitable[35]. King tides, storm surges and waves now reach higher up the reserve than they used to, and we are likely to see salt marsh extend further inland.

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[30] Lukies, K, Cowie, S. and Taylor, A. (undated) Can community-based social marketing techniques encourage compliance with dog leash bylaws near urban marine reserves in Auckland? Unpublished report by the School of Psychology, University of Auckland, Auckland, New Zealand. This report has a good summary of the impacts of off-leash dogs on wildlife.

[31] Dogs chasing waders was observed at the site walkover, 9 March 2020

[32] See page 30 for references contained within

[33] O'Donnell, C.F.J.; Clapperton, B.K.; Monks, J.M. 2015. Impacts of introduced mammalian predators on indigenous birds of freshwater wetlands in New Zealand. New Zealand Journal of Ecology 39: 19-33

[34] See Ministry for the Environment's 2020 National Climate Change Risk Assessment (NCCRA)

[35] See "Little bit of sea-level rise = lots more coastal flooding" at https://www.rnz.co.nz/national/programmes/ourchangingworld

The eastern shoreline of the Te Atatū Peninsula is relatively protected by its inner harbour location but is susceptible to wind generated waves during storm events when the wind blows from the north-east. The soils of the lower terrace are young, loosely bound and highly erodible (see Photo 12 and Photo 13). Where these are not protected by salt marsh they are actively eroding. Since 1959 it is estimated that erosion along parts of Harbourview-Orangihina Reserve has been in the order of 1m per year[36]. Existing shell banks could be lost to sea level rise and erosion.

Photo 12: Active erosion in the southern zone.

Photo 13: Erosion at the brickworks site. Planting is unlikely to slow erosion as wind-driven waves can undermine the root plate.

[36] 4Sight Consulting (2018). *Memorandum. Te Atau Peninsula Seawall Maintenance - Coastal Processes and Impact Assessment.* Report prepared to accompany consent application to repair sea walls including the car park at Harbour View Reserve.

8. Current management, community and agency involvement

Harbourview-Orangihina Park is an Auckland Council reserve managed by the council's Community Facilities team on behalf of the Henderson-Massey Community Board. As a large and important reserve, a number of other departments are also involved. Much of the day-to-day management is delivered by council contractors. A list of council departments as well as other government agencies of relevance are listed in Appendix B.

Mana whenua are council's recognised partner with rangatiratanga (authority) in this area. They provided guidance into the development of the Master Plan. Te Aranga Design Principles are woven into the Master Plan, and these principles are reflected in this plan also. Mana whenua with an interest in this area are Te Kawerau ā Maki and Ngāti Whātua Ōrākei.

An urban, or Mataawaka Marae has been planned for decades with two and a half hectares of the park on the upper terrace set aside on the park for this purpose since 2002. The marae will have the blessing of mana whenua but will be built and administered by the Māori whānau of Te Atatū, many of whom arrived as part of the urban Māori migration from other rohe. The marae will be open to all and have a kaitiaki role in educating visitors on the cultural, heritage, and environmental values of the park. Members of the Marae Committee and Trust were represented on the Community Reference Group providing significant input during the drafting of the Master Plan and into this community restoration plan. Members of the Marae Whānau have practical connections to the park; they have created Pā Harakeke to utilise the reserve for rongoā and to propagate and supply native plants, and have undertaken restoration plantings.

The Marae Whānau invited the environmental groups of the area to attend the annual Matariki event. Matariki is the beginning of the Māori new year, and one of the most significant events of the Maramataka (traditional Māori calendar). At Matariki the Marae Whānau proposed the idea that the groups come together under a single environmental kaupapa, now known as the Te Taiao Network.

The Te Taiao Network is an umbrella group of community and conservation groups working in and around Te Atatū Peninsula (not just those working at Harbourview-Orangihina Park). Their vision is that mauri/life vitality of Te Taiao of Te Atatū Peninsula is restored and flourishing. The group is jointly coordinated by Sustainable Coastlines and Community Waitākere. The groups brought together under the Te Taiao Network include groups that have been involved in the park for many years and have generously given their time and expertise towards the development of this restoration plan. They are listed in Table 1, as well as groups not affiliated with Te Taiao Network.

The local community was key in advocating for the creation of the park and many community volunteers were involved in the development of the Master Plan process, as well as generously giving their time and expertise towards the development of this restoration plan. Community groups undertake revegetation, pest control, monitoring, clean ups and environmental education programmes within the park.

Table 1: Stocktake of community groups currently involved in Harbourview-Orangihina Park

Group	Main activities
Birds New Zealand	Birds New Zealand (a.k.a. the Ornithological Society of NZ) is committed to the study of birds and their habitat use within New Zealand. The Auckland branch of Birds New Zealand has been counting shorebirds on the site with three observation sites at Harbourview-Orangihina twice per year (June and

Group	Main activities
	November) since 1997. They also count bird numbers on the Ppny club paddocks during spring tides by walking around the edge. More recently they have also been involved in wetland bird monitoring using playback calls.
Community Waitākere	Community Waitākere is a community development organisation committed to achieving our vision of connected, thriving and sustainable West Auckland communities. They provide neighbourhood and environment-based community programmes, training, information and connection to the community sector. Under the banner of 'Wild about Te Atatū' Community Waitākere has: ● coordinated citizen science monitoring such camera traps, pest monitoring, five-minute bird counts, and wetland bird monitoring using playback calls ● support the pest control undertaken by Harbourview-Orangihina Park Predator Control 2050 ● run an Environmental Education programme for local schools and preschools, in conjunction with Auckland Zoo ● distributed rat trap boxes and 'rat motels' for backyard trapping ● coordinated planting days.
Friends of Harbourview	Friends of Harbourview is an advocacy and volunteering group. Under the guise of the then Forest & Bird Motu-Manawa Restoration Group they initiated community-based pest trapping in 2011, followed by the first native plant restoration programme in 2012. They organise native plantings (generally small islands of 'fernbird friendly' planting), weeding bees, educational walks and annual beach clean-up activities. Previously they were involved in pest control. They are closely aligned with the Motu Manawa – Pollen Island Restoration Group that advocates for the marine reserve. The group is not affiliated with Te Taiao Conservation Network.
Harbourview Orangihina Park Predator Control 2050	Harbourview-Orangihina Park Predator Control 2050 are volunteers who want to share, participate, volunteer, educate and inspire others to protect Harbourview-Orangihina. They currently look after three rat trapping lines (over 100 traps) in 'rat hotels'.
Sustainable Coastlines	Sustainable Coastlines is a registered New Zealand charity that delivers coastal clean-up events, educational programmes, public awareness campaigns, and riparian planting projects. They have been involved in recent planting at the reserve and helped set up Te Atatū Peninsula Te Taiao Conservation Network.
Recovery First programme	The Recovery First programme runs a local nursery that has supplied plants for community planting days.
Te Atatū Marae Coalition Trust Board and Te Atatū Marae Committee	The marae coalition trust board are working towards a marae development in this space. The marae will be open to all and aspires to a kaitiaki role over the area, including space for visitor education on te ao Māori and park environmental and heritage values. The Te Atatū Marae Committee have coordinated matariki events including the 2019 planting. They champion of the marae taking a kaitiaki role in this space and initiators of the Taiao Conservation Network.
Te Atatū Peninsula Te Taiao Conservation Network	Formed in 2020, this umbrella group of community and conservation groups work in and around Te Atatū Peninsula (not just those working at Harbourview-Orangihina). Their vision is for the groups involved to work collaboratively so that the mauri/life-force of the te taiao of Te Atatū Peninsula is restored and flourishing. The network was formed around the opportunity for the groups in the network to work more closely with the aim to increase their impact and avoid duplicating efforts. The group is jointly coordinated by Sustainable Coastlines and Community Waitākere.
Te Atatū pony club	The pony club has had a presence since 1972. The Master Plan clarified that they will continue to have a long-term presence in the park.
Other groups and individuals	Forest & Bird Waitākere Branch Pristine Waterways Te Wai o Pareira (Rivercare Group) DTEK (Down to Earth Kiwis) – undertakes regular rubbish removal from the reserve

Group	Main activities
	Research institutes (Unitech, Massey University, University of Auckland) Local schools (3 primary, one intermediate and one secondary school) and preschools (many have been involved in Wild about Te Atatū) The wider community of visitors to the park Residential neighbours

9. Guiding principles

The following are guiding principles for implementing this community restoration plan.

Kaitaikitanga: Kaitiakitanga is translated as guardianship and protection. It is a way of managing the environment, based on the Māori world view. A kaitiaki is a guardian, and can be a person or group that cares for an area, given the role by mana whenua. Kaitiakitanga recognises that people are part of the environment – not superior to it, and the condition or health of the people and the environment are intricately related.

Manaakitanga: Manaakitanga loosely translates to 'hospitality' and incorporates concepts such as showing kindness, generosity, support for others, and respecting and honouring the mana of people. It increases the mauri (life-force) of a community.

Mātauranga Māori: The term mātauranga Māori refers to Māori knowledge, wisdom, understanding and skill. Mātauranga Māori refers to the body of knowledge originating from Māori ancestors, including the Māori world view and perspectives, Māori cultural practices and innovations. In the context of this restoration plan, it represents the possibility to bring traditional ecological knowledge such as the tohu (indicators) and the maramataka (lunar calendar) alongside local ecological knowledge and western science.

Te Atatū Peninsula is multicultural suburb of about 14,000 people that is experiencing rapid population growth. Adopting guiding principles from te o Māori does not exclude non-Māori. Research shows that including values and practices pertaining to an indigenous worldview, such as mātauranga Māori, can encourage meaningful community engagement and build a strong connection between Māori and non-Māori alike and the environment they live in[37].

10. Community monitoring and education

Monitoring helps determine if a programme is on track and when changes may be needed and is the basis for taking an adaptive management or 'learning by doing' approach to ecological restoration.

Community-based monitoring has the added advantage of increasing community learning and cohesiveness. Where possible, monitoring methods should be easy-to-use and able to be implemented by the community and volunteers, including schools and even pre-schools.

[37] See New Zealand Journal of Ecology (2019) 43(3): 3379. Ka mua, ka muri: the inclusion of mātauranga Māori in New Zealand ecology. Special issue: accessed at: https://newzealandecology.org/nzje/3379

Specific mātauranga Māori indicators can be used here in conjunction with western science-based indications. An example is tohu. Tohu are signs that show whether things are getting better or worse. Developing these would assist the marae in their kaitiaki role for the reserve[38].

10.1. Current monitoring

There is already extensive community monitoring underway in the reserve as detailed in Table 2 below.

Table 2: Current community monitoring at Harbourview-Orangihina Park

Monitoring	How	Started	Data stored	Who
Pest monitoring	Tracking tunnels on nine pest monitoring lines	2018	TrapNZ	Currently led by Community Waitākere with assistance from Forest & Bird and local volunteers
Five-minute bird counts	Methodology: as per DOC guidelines. Sixteen sites, bird counts undertaken in summer (January) and winter (July)	2019	TrapNZ	Currently led by Community Waitākere with assistance with Forest & Bird and local volunteers
Wetland bird monitoring	Undertaken at 21 sites, twice a year (March and September). Target species are Mātātā (North Island fernbird), moho-pererū (banded rail) and pūweto (spotless crake)	2019	Community Waitākere with Birds NZ (with plans to add results to TrapNZ)	Community Waitākere, and Birds NZ (Auckland Branch)
Shorebird monitoring	Surveys of shorebirds from three locations (plus one outside the reserve at Spinnaker Strand)	1997	Birds NZ Auckland database	Birds NZ (Auckland Branch)

10.2. Developing mātauranga Māori indicators

The marae plans to incorporate living classrooms to enable the nurturing of mātauranga Māori, te ao Māori restoration practices and the growth of kaitiaki. A specific inventory of cultural materials and taonga species at the reserve would assist with this, as well as the development of a maramataka – a traditional seasonal (lunar) calendar for the site, that could be developed by kaitiaki.

10.3. Options for further monitoring and research

Taonga species

[38] One option could be to incorporate Tohu into a wider 'recovery wheel' (developed by the Society of Ecological Restoration) to assess the recovery in the reserve.

The wetland bird monitoring could also be expanded to determine frequency of use by matuku (Australasian bittern) using audio recorders. Invertebrate monitoring is another option to consider, and initial discussions have been held with Auckland University.

One project that would increase the understanding of the mātātā[39] (fernbird) would be a banding project. The results of this and any research should be shared as widely as possible.

Vegetation monitoring

Plants are not currently monitored. Simple audits should be undertaken to review the success of plantings. When this report was written it was not possible to establish why some plantings had failed. Failure is expected, and can be overcome, if it is possible to work out why it has occurred. A series of permanent vegetation plots could also be used in the reserve to monitor change over time, however, the installation and monitoring of these would likely require specialist input. There is one permanent wetland monitoring plot in the reserve.

Photopoints are also a good, simple monitoring tool, however, ground-based photopoints can become redundant when vegetation becomes too dense. Drones are increasingly useful in this respect. Drones that are able to take high resolution images have become more affordable. These can be used for photo-points that can show the success (or otherwise) of weed eradication, restoration planting and wetland creation. Drones can be repositioned at the same point in the air to take oblique images, building a visual narrative of environmental change over time. NB: the use of drones at this location requires additional permissions as the park is in the flight path for the Whenuapai Airbase, and they should not be overused as they could disturb shorebirds and wetland birds.

Water quality monitoring

There is no up to date information on the water quality in the park, and offers an opportunity for school, or other interested groups or individuals to get involved in water quality monitoring. One option is to join the Wai Care programme. Wai Care is a water quality monitoring, education and action programme for community groups, individuals, businesses and schools across the Auckland region, supported by Auckland Council.

Wai Cares the SHMAK[40] kit that has been developed by NIWA for stream health monitoring and assessment. The enables non-scientists to collect consistent, scientifically valid information from small streams. Data can be stored on the NZ Water Citizens website[41]. Mātauranga Māori indicators for the streams are ways to understand whether they are safe to enter and potentially harvest from.

Monitoring sea level rise and climate change

A first step in enabling an effective response to sea level rise and coastal erosion is to gain an understanding of the current and likely future impacts. This is another area where a community-based citizen science approach could be taken. For example, one or more CoastSnap[42] stations to monitor coastal erosion could be installed. These are a cradle that people can put their smartphone in to take a photo. The first Auckland example has been installed recently at Muriwai by the Auckland King Tide programme.

A response could be to encourage manawa (mangrove) to grow as a buffer for erosion-prone areas. This needs to be balanced against the loss of feed and roost areas for shorebirds.

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[39] Painting, J (2016) Harbourview Reserve Matata/Fernbird (Bowdleria punctata spp. Vealeae) Survey 2016. Unpublished report

[40] See https://niwa.co.nz/freshwater/management-tools/water-quality-tools/stream-health-monitoring-and-assessment-kit

[41] https://www.nzwatercitizens.co.nz/

[42] For more information see https://www.environment.nsw.gov.au/research-and-publications/your-research/citizen-science/get-involved/coastsnap

To protect the shoreline here with some form of sea wall would be expensive. For example, the budget for the recent repair of existing seawalls/defences, many of which were only built in the 1990s, from the Harbour View car park and along the coast from here to Kelvin Strang was almost $900,000[43].

Sharing information, contacts and records

There is lots of information available about the park and its values that would be useful to have a collated all in one place. One option suggested for this was a mobile app or a website. However, instead of creating a separate platform, it is recommended that this information is held on 'Tiaki Taiao Conservation Auckland' a new website built to provide a regional interface between Aucklanders and conservation partners such as Auckland Council, the Department of Conservation, Forest & Bird, Manaaki Whenua (Landcare Research) and others. This new online tool will "enable better promotion and effectively grow best practice conservation activity across the region, encouraging Aucklanders to get involved while also building capability into those organisations and individuals already involved in conservation"[44]. The site will eventually integrate with existing digital tools such as TrapNZ and iNaturalist. There is already a dedicated page for the Pollen Island Biodiversity Focus Area, and this could be complemented by a Harbourview-Orangihina Park page.

Records of all project data, including documents related to planning, implementation, monitoring, and reporting need to be maintained, and held in one accessible place, perhaps by a restoration coordinator or community park ranger. This includes recording all details of restoration activities, number of work sessions and monitoring records. Nurseries should keep records of ecosourcing. This assists any future reviews or refining of practices. Smartphone apps, such as TrapNZ, can be used for record keeping where they are available.

Finally, there are so many different people and groups that are involved one way or another in Harbourview-Orangihina Park that a simple shared contacts database[45] may be of use.

11. Recommendations

Appendix D and Appendix E show the current and the target ecosystem for each area. The ecosystem types follow Auckland Council's publication *Indigenous terrestrial and wetland ecosystems of Auckland*. This publication and further information about ecosystems can be found on the website Tiaki Tāmaki Makaurau (Conservation Auckland)[46].

For each target ecosystem, and accompanying table in Appendix F describes:

- the constraints and considerations for restoring these area (e.g. the requirement for views),
- recommended tasks
- recommending sequencing, and
- specific skills required.

The remainder of this section includes wider park-wide recommendations, some are not strictly recommendations for the community, but are for council to consider.

[43] Item 23 attached to Henderson Massey Board meeting minutes, 3/12/2020

[44] From internal Council memo supplied

[45] With permission, this could be put together using the people who have contributed to this report

[46] See www.tiakitamakimakaurau.nz/discover-tamaki-makaurau/what-is-an-ecosystem

11.1. Maximise opportunities to connect people with te taiao (the natural world)

Restoration of the park provides opportunities for people to increase their understanding of the site's unique ecosystems, flora and fauna, and to practically connect with nature, te ao Māori and Māori mātauranga relating to the natural values and area in association with mana whenua. The monitoring described in section 9 are a key method to connect people with the park. Additional methods are described in this section.

Improving access is one way to foster connections with nature, which is clearly signalled in the Master Plan. There is a clear desire for additional walking paths, particularly to access the foreshore – if additional tracks are not provided there is a risk that people will make their own pathways which can be more damaging. The Master Plan proposes track upgrades and additional tracks, providing protective facilities such as boardwalks, barriers and bird hides.

Any new facilities also need to route people away from sensitive sites. One departure from the Master Plan is recommend here, and that is not to construct the wetland boardwalk as shown in the Master Plan[47] as this goes through the core of the wetland bird habitat.

The Master Plan already incorporates bird hides. In addition to this, and instead of the wetland boardwalk, it is recommended that a viewing tower and a viewing platform is created at the locations shown on the zone plans (Appendix F). These would have the additional advantage of being able to be used as part of regular shorebird monitoring. A costing for this is included in Appendix G.

Other methods of increasing opportunity include:

- Education to be included across all activities, including and community planting days.
- Living classrooms to enable the nurturing of mātauranga Māori
- Annual get-togethers of all those involved in the care of the park, and guided walks.

[47] Last page: See 'Secondary paths (gravel/grass/boardwalk)' on 'people' figure. Structures such as boardwalks are unlikely to be granted resource consent due to prevalence of site use by threatened birds.

Photo 16: An example of a viewing tower from Sydney (photo supplied by Trina Smith).

Photo 17: An example bird hide from Ambury Park.

11.2. Mauri Tu: Progressively eradicate or reduce the impact of animal and plant pests

11.2.1. Strategically reduce environmental weeds across the entire site

Environmental weeds have spread extensively over the last decade or so, and tackling weeds is going to require a dedicated and coordinated programme of a similar timeframe (as well as ongoing level of maintenance to keep weed levels low). It is important that the approach to weed control is strategic. A strategic weed control programme is:

- Prioritised: start with weeds that are currently restricted to a few isolated individuals that have the potential to spread – e.g. grey willow, Norfolk Island hibiscus and Elaeagnus
- Staged: weed control needs to be staged over approximately 10 years. The disruption and disturbance of tackling all the weeds at once is likely to have unintended consequences and promote the regeneration of light-demanding weeds. Most weeds thrive in high light.
- Coordinated: weed control needs to be coordinated with planting because for many weeds the only way to eradicate (or suppress) them is with shade. Some weeds, e.g. watsonia, should not be controlled unless the area is in the process of being prepared for planting.
- Sensitive to wildlife: weed control needs to recognise that environmental weeds can provide wildlife habitat (this is another reason to stage weed control).

- Sensitive to heritage: in archaeological sites only methods that do not disturb the soil can be used, i.e. the careful cut and paste of shrub/tree weeds and hand spraying. No hand pulling or grubbing of weeds can occur in these areas.
- Low toxicity: the least toxic method of weed control that is effective should be used. 'Cut and paste' or 'drill and inject' methods should be used where possible as these minimise herbicide use. Consideration should be given to manual methods where these are effective and there is capacity. If areas dominated by gorse are proposed to be planted, these could be mechanically mulched as an alternative to spraying (some follow-up spraying may still be required).
- Adaptable: the success of weed control should be monitored and changes made where required. Within wetland areas, it is often not possible (nor desirable) to eradicate all non-native species.

For most species, extensive information on best-practice weed control is available on Auckland Council's website and is not repeated here. For some species, such as salt marsh paspalum and mercer grass, some trial and error may be required to get the best approach. It is important that weed control is undertaken by trained and skilled restoration specialists, with experience working around streams and in wetlands. Serious consideration should be given to using drones to spray inaccessible weeds (for example, pampas where it grows in the wetland).

Under supervision, volunteers could undertake weed control in selected locations using special 'weed bags'[48] to compost the weeds – perhaps as a way of maintaining weeds after the bulk of them have been controlled by specialists. Volunteers can also help with weed surveillance, for example by uploading observations of weed species to iNaturalist. Those undertaking pest control or pest monitoring will often be the first to notice changes in the park.

Finally, if supported by mana whenua, biocontrol agents are an option to control some widespread species (e.g. the Honshu butterfly for controlling Japanese honeysuckle) at the park.

The priority categories for weeds are listed in the table on the following page.

[48] Available at EcoMatters: https://www.ecomatters.org.nz/wp-content/uploads/2020/05/EcoMatters_Weedbags-A5-flyer.pdf

Table 3: Environmental Weeds – priorities (A full table of weeds/priorities is included in Appendix C

Priority	Description
1	These plants pose a significant threat to the site's ecology andtheir current populations are small. Control of these species should occur as quickly as possible whilst populations remain small. Where found, the location of these plants should be recorded on iNaturalist. Examples: Grey willow, Norfolk Island hibiscus and Elaeagnus.
2	Serious ecological plant pests that are widely established, or plant pests in smaller localised populations that are less of a threat (e.g. elephant's ear). In general control should start with the 'outliers' before tackling the 'core' of the infestation. For example, that would mean controlling pampas grass along the pathway before slowly rolling back to the core infestation in the wetland. Examples: pampas grass and Japanese honeysuckle.
3	Widespread plant pests that have existing value as shelter and fauna. Control needs to be staged, rather than undertaken all at once in order to: • avoid opening up large areas that become havens for new environmental weeds • facilitate natural regeneration, and • be coordinated with planting. Examples: gorse and *Carex divisa.*
4	Wetland weeds for which some trial and error is needed to achieve control. Planting may be needed to achieve control. Examples: Mercer grass and salt-water paspalum.
5	Weeds that will generally not be targeted for control. Examples: existing eucalyptus and black wattle canopy (although seedlings should be targeted).

The recommended work programme is:

1. Start with Priority 1 weeds across all zones.
2. Tackle weeds on slopes and path edges (North, Central, South) – these are the 'outlier' weeds. Fill in any gaps with planting and increase buffer planting where required (see also section 10.6 for a recommended approach to planting).
3. Weed control on the lower terrace for any areas proposed for planting the following season.
4. Stage weed control in areas not proposed to be planted – start at the northern end of the park and undertake a 'rolling front' of weed control (of priority weeds).

11.2.2. Continue and expand pest animal control

In cooperation with Auckland Council, the then Forest & Bird Motu-Manawa Restoration Group initiated a volunteer pest animal trapping programme for Harbourview-Orangihina Park in 2011. The programme was restarted after a brief pause by June 2019 with support from Community Waitākere and Forest & Bird Waitākere branch with a view to grow community involvement.

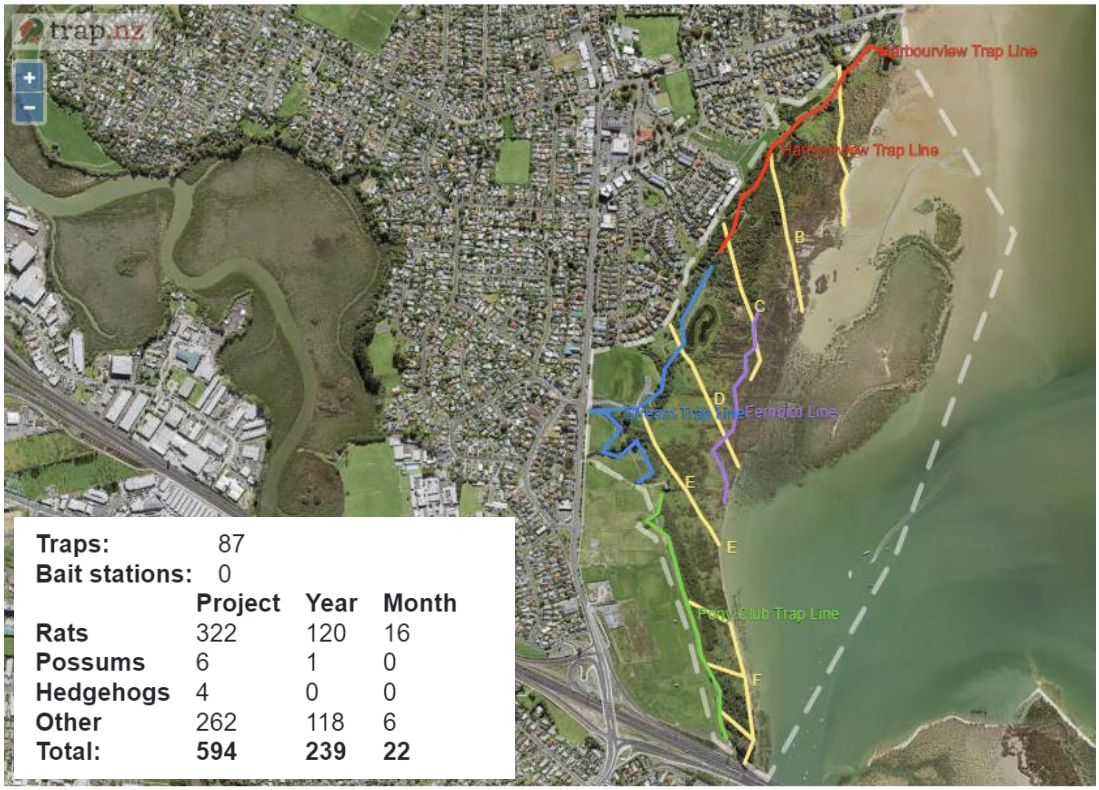
The current programme targets rats (both ship and Norway rats), possums and hedgehogs. Although not specifically targeted, a significant number of mice have also been caught. There are 66 traps, consisting of four lines of victor rat traps (Harbourview, streams and pony club and a newly installed 'fernbird line') as well as possum traps placed in locations identified through monitoring that show increased levels of possum activity. Traps are generally checked and re-

baited monthly. As at October 2021, 322 rats, 262 mice, four hedgehogs and six possums have been caught (see Figure 3). The pony club also undertakes its own control of rats and rabbits.

Alongside trapping, rat numbers are monitored using tracking tunnels and birds (which should increase in response to pest control) using five-minute bird counts as well as additional wetland cryptic bird monitoring. These results, along with the trapping records, are recorded in TrapNZ, a free online portal for recording trap, bait, monitoring and biodiversity outcome data (see Figure 3). There is strong community interest in maintaining and expanding the current programme, as capacity allows, rather than having the work done by contractors.

Figure 3: Screenshot from TrapNZ showing the three rat lines and the yellow tracking tunnel monitoring lines. Taken 21 October 2020.

It is worth expanding the programme to targeting mustelids (ferrets, stoats, and weasels), as these



are key predators of wetland birds. They also eat rats and mice, and if these are less available because of control, then the mustelids will target birds. Volunteer-led stoat control was undertaken from 2012 on a trial basis with six stoat traps supplied by Auckland Council and set on the lower terrace, close to the salt marsh in order to protect the mātātā (fernbird).

Unfortunately, mustelids are notoriously difficult to catch. For example, the advice is to not move traps unless they have failed to catch anything in two years. The currently used mustelids traps (e.g. DoC 2000s) are also hard to set, and any volunteers re-baiting these would need to receive specific training[49]. Mustelid trapping is set to become easier and more effective with new lures (e.g. a stoat 'super lure' by Manaaki Whenua) and new traps for mustelids (e.g. the AT200 for rats,

[49] Advice contained in Auckland Council (2020) "Pest animal control guidelines for the Auckland region Best practice techniques to ensure success".

stoats and ferrets) in development, with apparently promising results. It is recommended that these new methods of stoat control should be adopted when they are available.

At this stage the focus is on trapping to determine if this alone can significantly reduce rat and possum populations. Monitoring results over time will begin to show if other approaches are needed, including potentially the targeted use of safe and appropriate baits (if approval is granted by Auckland Council).

A suggestion to extend the current work is to include setting a target for rat levels, using the rat tracking tunnel index (TTI). This is calculated as the average number of tunnels detecting rats per line and presented as a percentage. It provides a coarse index of rat relative abundance and can be used to show gross changes in relative abundance over time. Whilst there is some variability in rat numbers, meaning it may not always be possible to achieve the targets, a target of no more than 10% is recommended. A monitoring line could also be run on the pony club land.

An option to consider it the newer automatic traps such as the AT220 made by NZ Autotraps (see Photo 15) could be used with careful 'pulse' baiting – only used if monitoring results show that trapping alone is not sufficient to suppress pest numbers. Automatic traps could be deployed in less accessible areas to the north of the park close to the salt marsh or shell banks – areas where it is prudent to reduce access to avoid disturbing wildlife and trampling salt marsh.

Rabbit control may also be required, particularly if they are the cause of damage to new plantings. Rabbit control, however, is best undertaken by a professional pest control contractor, not by community groups as rabbit control is achieved by either shooting or the use of toxins.

It is likely that cats – including domestic – will be having an impact on native wildlife in the reserve. Auckland Council's biosecurity staff[50] are currently working on region-wide evidence-based approach to cat management and the best approach to working with cat owners. It is recommended that the community and local board waits until this guidance is available before looking to address this issue. Recommendations around monitoring and reporting are included in section 9. These include setting a specific target for pest control, to assist in refining and improving the current programme.

[50] Dr Imogen Basset, Auckland Council pers comm

Photo 14: Harbourview-Orangihina Park Predator Control 2050 members carefully re-bait a Victor Professional rat trap with peanut butter.

Photo 15: The AT220 only requires checking every six months and could be deployed near the salt marsh interface. Photo supplied by NZ Auto Traps.

11.2.3. Connect to wider community pest and weed control efforts – establish a 'halo'

An 'ecological halo' is a buffer of kaitiaki (guardian) households around valuable ecological areas. It recognises that pest control and weed control is most effective on a large scale. There is already an existing programme, under the umbrella of Wild About Te Atatū, that encourages Te Atatū residents to participate in pest control by supplying low-cost rat traps and advice. It is recommended that this is continued. Such programmes can take many years to gain traction, but an example of what can be achieved when pest control is embraced by the wider community is provided by the Predator Free Miramar Peninsula programme in Wellington[51]. Pest control on the peninsula all contributes to wider pest control contributes to wider goals of Pest Free Waitākere and Predator Free 2050.

The programme could also be expanded to include environmental weed advocacy (the first species would be moth plant and Chinese privet, both becoming more common in adjacent gardens), as well as encouraging protection of larger trees and planting of native and other useful habitat providers in private property across the peninsula.

Native amenity gardens around the Te Atatū Motorway Interchange is maintained by either Auckland Council's Community Facilities team on behalf of Auckland Transport, or by the Auckland Systems Management Alliance on behalf of Waka Kotahi (on the 'motorway side of the fence'). Weeds – such as pampas grass – are relatively common in these gardens and are a potential weed source for the park. A higher standard of environmental weed control would be beneficial.

The Department of Conservation also manages the shell bank just outside the park's boundary as well as the nearby Motu Manawa (Pollen Island) Marine Reserve, and it would be worthwhile coordinating on weed surveillance and pampas control.

[51] See: https://www.stuff.co.nz/environment/114070575/miramar-predator-wipe-out-nzs-biggest-and-most-complex-urban-eradication and https://www.pfw.org.nz/miramar-2019/

11.3. Protect and enhance habitat for wetland and taonga shore birds

11.3.1. Protect existing shorebird roosting sites

The remaining spring tide roosting sites for shorebirds at Harbourview-Orangihina could be lost to disturbance or sea-level rise. Birds need such areas to rest (roost) until the outgoing tide uncovers the sand and mudflats and birds are able to resume feeding. The main existing roost sites are shell banks and the pony club paddocks. The armoured groyne structures at the northern end are also used, particularly by tōrea (South Island pied oystercatcher).

For existing shell banks, including the shell bank outside the park boundary, protecting these is likely to involve:

- Establishing permanent photopoints as part of monitoring.
- Controlling all non-native species (e.g. wild carrot) growing on the shell bank (timed for winter and low tide to avoid conflict with migratory birds or nesting).
- Potentially supplementing these with additional shell material (see next section also).
- Providing extra pest control close to these locations (as described in section 10.2.2).

Suggestions for the pony club paddocks:

- Aim to graze the paddocks so that the grass is less than 100mm high, and preferably less than 60mm – shorebirds do not like the grass to be above their heads. Cattle could also graze at this location.
- Check for nesting tūturiwhatu (northern New Zealand dotterel) before paddocks prior to any mowing between July and December. A simple walkover before mowing is sufficient to identify if there are any nests or chicks present as parent birds will nosily undertake 'distraction displays' to lead any intruders away from their young.
- Consult a shorebird expert prior to any development, such as an equestrian arena with an all-weather surface, regarding the location and timing.
- The screen planting at the former motorway construction site should be cut down, and any existing specimen trees (there are some near the club house) should have their lower branches removed to keep the open nature of the paddocks. Any new shade trees should be of varieties that can be pruned to keep views for shorebirds (e.g. pōhutukawa and pūriri).
- Extend rat monitoring to include the pony club, if possible.
- Continue rat and rabbit control. Effective rat control may require considering how to reduce the supply of food for rats (this may mean for example, raising hay off the ground).

It is recommended that advice be sought from an expert on shorebirds to input into the design, construction and operation of the marae.

11.3.2. Consider creating an artificial shorebird roost site

Spring tide roosting areas are limited around the Waitematā Harbour. The first priority is to protect the existing spring tide roost sites – the shell banks (especially the offshore shell bank) and the pony club paddocks – however these could be supplemented by an artificial roost as described in the Master Plan.

There is an artificial roost site that could be used as a model for what could be built here – that is the larger of the artificial roosts sites that have been constructed at Ambury Park[52] (the 'long island'). This roost was built in 2003 when the sewerage ponds were decommissioned. This is a large (about 250m-long and 30m-wide) boulder, concrete and crushed shell structure built to withstand king tides and wave action and minimise the need for maintenance. It is located on the mudflats about 20-30m offshore with the coastal pathway and hide allowing people to observe the birds from one end. It attracts a wide range of birds, including kuaka (bar-tailed godwits) and tūturiwhatu (NZ dotterels) that nest here.

Another approach was taken in Shoal Bay, where the construction of alternative nesting sites was required as mitigation for the loss of nesting sites for tūturiwhatu (NZ dotterel), tōrea pango (variable oystercatcher) when the Northern Busway was constructed[53]. Here shell was used to construct new shell banks. Such structures are not likely to withstand erosion at Harbourview-Orangihina. At Shoal Bay an existing shell bank was supplemented with additional shell material, and this is something that could be explored at Harbourview-Orangihina Park.

There are risks with creating a bird roost. There is no guarantee that an artificial shorebird roost site at this location would attract the full suite of shorebirds present in Harbourview-Orangihina[54]. It would also be expensive to consent, construct and maintain. At this stage there does not appear to be strong community support for a creating an artificial roost site[55], perhaps because the issue of lack of local roosting space for wading birds and the risks to the existing roosts on the upper terraces is not widely known in the community – it is however an option for the future. A potential site for such a roost is included on the central zone plan (Appendix F). It is further north than shown in the Master Plan as the proposed location has easier site access for machinery, which would be needed to access, construct and maintain such a structure.

11.3.3. Investigate reintroductions

The first priority is to protect and expand existing populations of taonga / threatened species in the reserve. This includes encouraging species that have been occasional visitors such as the matuku (Australasian bittern) and weweia[56] (dabchick) to spend more time there.

Should a high standard of pest control be achieved as well as evidence that dog owners are complying with the dog bylaws, reintroductions could be considered. For example, pāteke (*Anas chlorotis*) or brown teal, is a small dabbling duck species endemic to New Zealand that was previously common in freshwater wetlands. It is an 'At Risk: Recovering' species with a number of recent wild reintroductions including at Te Henga wetland. Approval of any introductions would require mana whenua support and DoC approval.

Native lizards have been reintroduced into the park by NZTA, and this could also continue[57].

[52] See Garton, C. Lawrie, D. Turner, B and Templeton, L (2018) *60 Years of Migratory Bird Management on the Manukau*. Accessed at https://www.waternz.org.nz/Article?Action=View&Article_id=1558

[53] See Waka Kotahi biodiversity case studies, accessed at https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/biodiversity/biodiversity-case-studies-and-research/

[54] There is, however, reasonable confidence that Tūturiwhatu (NZ dotterel) would use the shell bank (Chris Bindon *pers comm*)

[55] Based on discussions during the development of this plan

[56] Last seen using the ponds in 2016

[57] Bioresearches (2012) Causeway Alliance, Harborview Reserve Reptile Survey. Unpublished report. Some copper skinks impacted by the SH16 upgrade were relocated to the reserve.

11.3.4. Wetland creation

The Master Plan identified an area on the lower terrace as a potential wetland creation area. A separate report has been prepared on the feasibility of wetland creation here and concludes that wetland creation is feasible at this location[58].

A well designed and built wetland at this location has the potential to be attractive to a very wide range of birds such as herons, crakes, rails, and waterfowl, (e.g. pāteke, kuruwhengi, tētē, pūtangitangi, pārera etc) as well as shorebirds including tūturiwhatu (NZ dotterel), tōrea pango (variable oystercatcher) and poaka (pied stilt). It could also be attractive to other species that are absent altogether (pāteke) or occasional visitors (such as currently just-visiting species (matuku / Australasian bittern and weweia / dabchick). The streams and drains provide some limited habitat for native fish, with a wetland potentially providing more habitat for inanga and tuna (long finned eel) than the very limited ability that the streams/drains provide currently. Wetland creation also has the potential to incorporate harvest species, such as kuta.

To achieve this requires a wetland with gently sloping and irregular edges, areas of deeper areas of water (up to 3m), areas of shallow water, occasionally flooded areas, and damp (ephemeral) margins. Further habitat features such as islands, and logs for perching and resting sites can be incorporated in the final design.

To ensure the wetland improves water quality it is important that the wetland incorporates large areas of emergent wetland plants (as this is where water quality improvements processes such as dentification, occur), areas of deeper and cooler water, and good circulation of water. The wetland feasibility report considered blocking the existing drains, and found that the impact of this would only create areas of shallow, stagnant, warm water prone to low oxygen levels and drying up. Two of the watercourses, although having the appearance of drains, are modified coastal streams that provide habitat for native fish such as inanga, so any modifications would need to allow continued fish passage. Some earthworks, down to the level of the groundwater, are therefore required to create deep, stable wetlands. This could be combined with the careful partial damming of streams to raise groundwater levels to reduce the volume of earthworks required and therefore construction costs.

Incorporating large areas of emergent wetland plants – such as raupō – in any final wetland design would help maintain and improve water quality. Habitat features such as gently sloping and irregular edges, areas of shallow as well as deeper areas of water (up to 3m), islands, and logs for perching and resting sites should be included in the final design. The wetland can also be built in three stages which would allow for observation, checking of design assumptions and allowing changes to be made to the design before constructing the next stage.

The feasibility report is just the first step in wetland creation. A minimum of a further 12 months of groundwater measurements is recommended to confirm groundwater levels before any wetland is designed. Wetland creation requires consent and a consent application would need to be accompanied by a series of detailed plans (e.g. landscape, ecology, engineering).

The location for the wetland – as recommended by the accompanying feasibility report – is an area of about 1.5 hectares shown on the central zone plan. If the wetland is created, there is the opportunity to build a bird hide in the north-western corner. Extensive planting around the drier margins would also be required to limit access to this one point, to reduce disturbance to birds.

[58] Thomas Consultants (2020). Harbourview-Orangihina Park – Wetland Feaibility Report.

11.4. Reduce the conflict between dogs and wildlife

The existing dog bylaws[59] prohibit dogs from the foreshore areas (including mud and sandflats) and require that dogs be kept on-leash elsewhere on the reserve in order to protect sensitive wildlife. There are two off leash dog areas on the upper terrace. One is between the carpark and Te Atatū Road, the other is the Danica Esplanade, an area of mown grass and gardens on the upper terrace that is contiguous with Harbourview-Orangihina Park. One study found about half of the dog walkers complied with these bylaws[60] and dog footprints are commonly seen on foreshore areas.

Animal Welfare Officers monitor and enforce these bylaws and can issue fines of up to $300 for breaches, but the frequency of their visits is largely dependent on reporting by the public so Animal Welfare knows which areas to target. Any details of specific repeat offenders, such as vehicle registration numbers or dog names help Animal Welfare take enforcement action against specific people – otherwise they are only able to take enforcement against those who are there when undertaking patrols, which does not always catch the repeat offenders. Animal Welfare does undertake proactive patrols and should be encouraged to do so at this location given its wildlife values. One option would be to time these 2-3 hours after high tide between September and March when the kuaka (godwits) are feeding on the nearby mudflats.

New signs installed by council prohibit dogs from all of the lower terrace, although perhaps do not make it clear that dogs are prohibited from the foreshore, which is under the Department of Conservation's jurisdiction. Alternative options for signage including drawing people's attention to the reason it is so important to keep dogs on lead and outside of certain areas (see Photo 19 for an example). It might also be worth considering adding a large fenced dog exercise area between the two streams on the upper terrace (currently an on-leash area), an area with no biodiversity value. Such facilities at Meola Reef and Henderson Valley Road are popular with dogs and their owners.

Improving enforcement and signage are likely to be necessary to improve compliance with bylaws, but it may not in itself be sufficient – advice from experts on behaviour-change programmes might be useful here. In addition, the final design of any paths and boardwalks need to consider how to make it less likely that dogs and their owners venture into sensitive areas. In some cases, fences hidden by vegetation may be useful.

[59] Dogs are controlled Dog Control Act 1996 and council bylaws under this Act. There are penalties for owners whose dogs attack people, stock, or protected animals. The latest Auckland Council Dog Bylaws were adopted in 2019.

[60] Lukies, K, Cowie S, and Taylor, A. *Can community-based social marketing techniques encourage compliance with dog leash bylaws near urban marine reserves in Auckland?* Unpublished report prepared by School of Psychology, University of Auckland, on behalf of Auckland Council. This report also has a useful summary of the literature regarding the impact of dogs on wildlife.

Photo 18: New dog signs on park.

Photo 19: An alternative example of signage that from the Waitākere Ranges that focuses on the species to be protected. E.g. Moho-pererū (banded rail) could be the featured species for Harbourview-Orangihina Park.

11.5. Ki uta ki tai: take a catchment-based approach to restore water quality, watercourses (streams and drains), ponds and wetlands

Water quality improvements require a whole-of-catchment approach in line with the concept of 'ki uta ki tai' (mountains to the sea). Restoring the mauri of the waterways would result in water that could be safely entered into and harvested from.

Areas outside of the park influence the water quality in the park, and in turn the water quality in the park influences the quality of the water in the Waitematā Harbour (along with wider Whau Catchment). The small stream that starts on the park near the corner of Landmark Drive and Danica Esplanade bypasses the stormwater pond and flows directly to the lower terrace. Its catchment is centred around Hunterway Lane and Cellarmans Street. Treatment devices such as EnviroPods™ or similar could be placed in the road catchpits in this location to remove sediment, trash, debris and other pollutants from before they reach the stream. This option could be explored by Auckland Council's Healthy Waters department.

The quality of the coastal sand and mudflats is influenced by a larger catchment – that of the whole Whau River catchment.

11.5.1. Council to consider a review stormwater pond management

The ideal pond has clear, cool water, low nutrient levels and lots of wetland plants. Over the summer of 2019/2020 conditions in the stormwater ponds were far from ideal. It is possible that pest fish (see section 6.2) could be exacerbating problems by stirring up bottom sediments and eating the wetland plants that are needed to improve water quality.

Although designed for stormwater management, ponds can have biodiversity values, including supporting wildlife such as mallard, welcome swallow, pukeko and matuku moana (white-faced heron). A single weweia (dabchick) was noted in the Danica Pond through mid-2020 and was in residence for at least one week[61]. Cool, clear water would also benefit dabchick.

[61] First observed by C.Burton. Also in 2016 a weweia (dabchick) took up residence in one of the ponds for a time.

The ponds are maintained by Auckland Council's Healthy Water's department. Current management includes mechanical removal of sediment and aquatic weed from Danica Pond[62]. Barley straw can be placed in netting bags that can be tethered to the side of a pond, which is a common (though not always successful) management technique to reduce algae and avian botulism.[63]

The following recommendations are provided for management of the stormwater ponds for Auckland Council's Healthy Waters department:

- Monitor water quality in the ponds, and set a target 'trophic index'.
- Survey the ponds to confirm exactly what species of fish are found in them, and provide recommendations around the management and possible eradication, if desirable. This could potentially be achieved by emptying the ponds in summer (a dry summer would be ideal) and removing pest species before allowing the area to refill.
- Investigate whether the aquatic weed (Egeria) in Danica Esplanade Pond could be eradicated rather than occasionally removed. Eradication is most likely to be feasible if the ponds are emptied to remove pest fish.
- Review management – including frequency of maintenance – whether any additional changes are required to the ponds in order to 'naturalise' them and increase their effectiveness at removing contaminants.
- Provide additional planting on the northern side of the pond to increase shading and reduce water temperatures.

11.5.2. Streamside planting

Much streamside planting has already been completed at the park. Streamside planting assists with improving water quality and freshwater habitat. There are some areas of stream on the upper terrace that have not been planted. Note that the Master Plan shows this planting is low to medium stature planting.

11.6. Innovative and sensitive management of archaeological sites

The archaeological sites found at Harbourview-Orangihina Park are a constraint on planting and other development in the park. It is an offence to modify these areas with ground disturbance – including planting – under the Heritage New Zealand Pouhere Taonga Act 2014 without written authority of Heritage New Zealand. Under the Resource Management Act Historic Heritage is a matter of national significance and the council is obligated to manage effects on historic heritage to best-practice standards within council-owned land. These sites represent both prehistoric and historic settlement period occupation of the peninsula, and their locations must be avoided. The extent of the known archaeological sites is shown on page 24 of the Master Plan.

The constraint on planting means these areas have generally been left to become weed seed sources. An innovative approach to their management recommended by Ngāti Whātua's representative is to plant the following plants with 'light' root systems next to midden sites, as they will not damage them as they

[62] The frequency of this is unknown – but Danica Pond and Longbush Pond were dredged in 2020.

[63] See references contained in de Winton M (2013) et al. Review of best management practices for aquatic vegetation control in stormwater ponds, wetlands, and lakes. Prepared by NIWA and the University of Waikato for Auckland Council. Auckland Council technical report, TR2013/026

spread: kūmarahou, aruhe (bracken), pohuehue, waekura (umbrella fern) and mingimingi. It may be possible to direct seed pohuehue in these areas. In order to provide extra protection to archaeological sites, these can be carefully mulched under the direction of Auckland Council's archaeologist.

The extent of all recorded archaeological sites will be determined by the Auckland Council Heritage Unit prior to planting and all areas to be avoided will be clearly marked out by the council archaeologist and Parks staff prior to planting. This is best done after weed control has been completed in the area, generally early Autumn. As noted in section 10.2.1, weed control can occur in archaeological sites provided it is limited to methods that do not disturb the soil, such as hand spraying and careful 'cut and pasting'.

It is possible that there are archaeological sites – both Māori and European – that are yet to be discovered. In these areas 'accidental discovery protocols' apply. In order to ensure compliance with these protocols all participants at planting days must be briefed that if they discover any archaeological material – including shells which may indicate a midden site – they must stop planting and let the planting supervisor know. For planting near archaeological sites this pre-planting briefing should be from a council officer.

Should any archaeological material be discovered, the person in charge of the planting shall:

1. ensure that planting stops immediately; and
2. tape off an area within 10m of the discovery; and
3. notify council's Heritage Team at the earliest opportunity.

In the unlikely event that any skeletal remains are uncovered, the police must be contacted in the first instance, as well as council's heritage team and Heritage New Zealand.

11.7. Ngahere-Rākau Whenua: restoration planting

Natural regeneration is occurring in the reserve – albeit slowly and only where there is an existing canopy (either native or exotic). To achieve a native-dominated system requires extensive planting (about 15 hectares). First a word of caution on planting in the lower terrace – substantial planting has occurred here in the north and central zone, much of it unsuccessful[64]. The lower terrace is not an easy place to establish plants. For example, it can be wet in winter and then dry in summer, and there are areas where the soil has been disturbed by old farm tracks and other activities. Aggressive grasses (such as kikuyu grass or tall fescue) or weeds (such as bindweed) can smother and kill young plants. It appears that plants have been lost at times both to insufficient maintenance and 'overspray' during maintenance. Whilst it has not been raised to date by anyone involved in the plantings, it is possible that past (or future) plantings could be lost to either rabbit browse or by being pulled out by pukeko[65].

Authentic ngahere-rākau whenua (restoration) is the practice of acknowledging the whakapapa of plants and the use of eco-sourced plants from suitable ecosystems. Appendix E shows the target ecosystem types, which can be used as a guide for the type of plants to be selected. Plants then should be 'eco-sited' i.e. placed in locations they would naturally occur.

It is also critical that the size of plantings does not exceed the capacity and resources to look after the planting for the first few years. Plant maintenance needs to continue for 3-5 years until 'canopy closure is achieved'. Given the difficult site conditions especially on the lower terrace, planting may benefit from the greater use of mulch. In areas that are not mulched, the recommended method for maintaining plantings is 'hand releasing'. Hand releasing can be done by community groups and volunteers although it generally is not as popular as planting and should not be relied upon as the only component of a

[64] First commented on by Kingett Mitchell 2002.

[65] Cardboard or other biodegradable plant protectors can be used for plants if rabbits or pukeko are causing damage to plantings on the lower terrace.

maintenance programme. A kaitiaki delivery team could be the best option to deliver manual methods, as it is not commonly practiced by standard council contractors.

Several small planting areas are more difficult to maintain. Therefore, it is recommended that any community planting should be either:

- large and of compact shape (over 500m^2); or
- linked to existing planting/naturally established vegetation; or
- the community group can commit to undertaking plant maintenance (e.g. Friends of Harbourview wish to continue small-scale plantings).

Planting can incorporate plants for cultural provision, such as rongoā (medicine and healing), raranga (weaving materials), mahi toi (art), mara kai (food garden). Such plants include kawakawa, karaka, harakeke, koromiko and mānuka. Planting generously (i.e. not spacing plants too far apart), and planting alongside pathways required for maintenance culture, provision can be incorporated into the wider restoration planting. Planting can also work in with the proposed play-along-the-way nature trail (see Master Plan) which is proposed to use all-natural materials.

Avoid bare ground as it is a magnet for weeds. If there is any bare ground following planting this should be seeded with a dwarf rye and clover mix to protect the soil and keep weeds out whilst the plants establish. Alongside planting techniques such as direct seeding of species such as pohuehue and translocations (within the park) should be trailed.

Plants need to be sourced from a well-run nursery (or nurseries) to ensure quality planting stock and with good hygiene practices, to avoid introducing, say, Argentine ants to the area in potting mixes. A sustainable approach would be to source these plants from local and regional nurseries (rather than from outside the region). For some of the target ecosystems, plants are not typically grown, and may need to be specially grown for this project. A collaboration between iwi and community nurseries may be the best approach to providing a sustainable source of plants for such a large project.

12. Draft costings, governance and plan review

To give a guide as to potential cost of implementing this plan, draft costings and timeline are included in Appendix G. Note that costings are necessarily approximate, and no attempt has been made to cost all of the items in the Master Plan shown on the zone plans (such as 'play-on-the-way stations'). It shows a potential cost of $5 million over a 10-year period.

A full discussion of governance is beyond the scope of this report However, because this is a restoration plan for the community, it is recommended that a governance group including representation from groups involved in development of this report is set up to implement the plan.

As a minimum, regular (perhaps quarterly) meetings between mana whenua, community and representatives from Auckland Council (including representatives from Healthy Waters, Community Ranger and Natural Environment Design/Natural Environment Delivery) would help foster collaboration and cooperation (mahi tahi) in implementing this plan.

Consistent feedback from council and community stakeholders was that it would be beneficial to have a dedicated coordinator to assist in implementing this plan.

To keep this a 'living document' it is recommended that it is reviewed and updated as required, no less than every five years.

13. Selected references, background reports and further reading

Many reports and plans have been written about Harbourview-Orangihina Park. The key references consulted during the development of this community restoration plan are:

Auckland Council (2019) *Harbourview-Orangihina Park Te Mahere Matua O Te Papa Rehia O Harbourview-Orangihina.* Adopted Masterplan, Henderson Massey Local Board, Auckland Council, February 2019.

Bioresearches (1996) Waitākere *City, Lowland Area and Escarpment, Harbour View, Ecological and Archaeological Characteristics.*

Boffa Miskell Limited (2017) *North West Wildlink: Prioritisation Report*. Report prepared by Boffa Miskell Limited for Auckland Council.

Singers, N.; Osborne, B.; Lovegrove, T.; Jamieson, A.; Boow, J.; Sawyer, J.; Hill, K.; Andrews, J.; Hill, S.; Webb, C (2017) *Indigenous terrestrial and wetland ecosystems of Auckland.*

Kingett Mitchell Ltd (2002) *Ecological Assessment of Harbour View Reserve.* Report prepared for Waitākere City Council.

LA4 Landscape Architects (1996) *Landscape Development proposals for the Harbour View lowland Reserve Te Atatu*.

Manaaki Whenua (2017*) Te reo o te repo = The voice of the wetland: connections, understandings and learnings for the restoration of our wetlands*. Edited by Yvonne Taura, Cheri van Schravendijk-Goodman and Beverley Clarkson.

Uniservices (1995) *A Preliminary Ecological Survey of Land at Te Atatu North, Auckland*, Uniservices Limited, a wholly owned company of The University of Auckland.

Thomas Consultants (2020) *Harbourview-Orangihina Park – Wetland Feasibility Report* prepared 14 September 2020, for Auckland Council.

Waitākere City Council (2003) *Harbourview-Orangihina, Open Space Management Plan*, City Development Committee, Prepared by Waitākere City Council Parks Planning Section, February 2003.

Wildlands (2012) *Ecological Restoration Plan for Harbourview-Orangihina Reserve,* Te Atatu Peninsula.

Appendix A: Threatened and at-risk species

Common Name(s)	Scientific Name	Threat status[66]
Fork-tailed swift[67]	*Apus pacificus*	Vagrant
Inanga / white bait	*Galaxias maculatus*	At Risk. Declining
Huahou / lesser knots	*Calidris canutus rogersi*	Threatened. Nationally Vulnerable
Kākāriki / red-crowned parakeet	*Cyanoramphus novaezelandiae*	Relict
Kawau / pied shag	*Phalacrocorax varius varius*	At Risk. Recovering
Kōtuku ngutupapa / royal spoonbill	*Platalea regia*	At Risk: Naturally Uncommon
Kuaka / eastern bar tailed godwit	*Limosa lapponica baueri*	At Risk. Declining
Mātātā / North Island fernbird	*Bowdleria punctata vealeae*	At Risk. Declining
Matuku / Australasian bittern	*Botaurus poiciloptilus*	Threatened. Nationally Critical
Moho-pererū / banded rail	*Gallirallus philippensis assimilis*	At Risk. Declining
Ngutuparore / wrybill	*Anarhynchus frontalis*	Threatened: Nationally Vulnerable
Pihoihoi / pipit	*Anthus novaeseelandiae novaeseelandiae*	At Risk. Declining
Pūweto / spotless crake	*Porzana tabuensis tabuensis*	At Risk. Declining
Taranui / Caspian tern	*Sterna caspia*	Threatened. Nationally Vulnerable
Tarāpunga / red billed gull	*Larus novaehollandiae*	At Risk. Declining
Tōrea pango / variable oystercatcher	*Haematopus unicolor*	At Risk. Recovering
Tōrea / South Island pied oystercatcher	*Haematopus ostralegus*	At Risk. Declining
Tūturiwhatu / banded dotterel	*Charadrius bicinctus*	Threatened. Nationally Vulnerable
Tūturiwhatu / northern New Zealand dotterel	*Charadrius obscurus aquilonius*	At Risk. Recovering
Weweia / New Zealand dabchick	*Poliocephalus rufopectus*	At Risk. Recovering

[66] Threat status according latest guidelines on Department of Conservation website.

[67] 21 March 2020, accepted by OSNZ Rare Birds Committee 2020

Appendix B: Local and central government stocktake

This table is a brief summary of council departments currently involved in the management or planning for Harbourview-Orangihina Park.

What happens outside of the park also has an influence on the park. The key government agencies here are:

- The Department of Conservation who manage the shell bank area off Harbourview-Orangihina Park and Motu Manawa-Pollen Island and associated Marine Reserve.
- Vegetation associated with the motorway corridor and Te Atatū interchange is managed by either the Auckland Systems Management Alliance (on behalf of Waka Kotahi) or by Community Facilities on behalf of Auckland Transport.

Table 4: Summary of council departments involved in management or planning for Harbourview-Orangihina Park.

Department	Current involvement
Community Facilities	• Master Plan development – undertaken by Service Asset Planning Specialists within the Service and Asset Planning team of Service Strategy and Integration. • Overall implementation of the Master Plan. Parks and Places Specialists within Parks Sport and Recreation provide strategic direction on the park in general and the development within the Master Plan. • Community Rangers work with community groups on plantings. They also organise contractors to maintain some of the plantings. (Community Park Rangers sit within Community Parks, in Parks, Sport and Recreation, Customer and Community Services). • Contract coordinators oversee and organise the Full Facilities Contract which covers (amongst other things) mowing and maintaining path edges. • Community Lease Specialist is responsible for the lease.
Natural Environment Design / Natural Environment Delivery	• The Ecological Restoration Contract, and management of the Biodiversity Focus Area (current area shown in Figure 2), in conjunction with Community Facilities. • Advice for communities regarding biodiversity management
Healthy Waters	• Maintain the 5 stormwater ponds. • Manage stormwater infrastructure in the catchment (e.g. stormwater pipes leading to the reserve) .
Animal welfare	• Enforce dog bylaws. • Update bylaws .
Environmental Monitoring, Research and Evaluation Unit	• State of the Environment monitoring (there is one State of the Environment wetland monitoring plot on the northern area and one estuarine plot on the adjacent mudflats).

Appendix C: Site-wide weed lists and priorities

Priority	Description
1	These plants pose a significant threat to the site's ecology AND their current populations are small. Control of these species should occur as quickly as possible whilst populations remain small. Where found, the location of these plants should be recorded on iNaturalist.
2	Serious ecological plant pests that are widely established OR plant pests in smaller localised populations that are less of a threat (e.g. elephant's ear). In general, for widespread weeds, control should start with the 'outliers' before tackling the 'core' of the infestation. For example, that would mean controlling pampas grass along pathways, before slowly rolling back to the core infestation in the wetland.
3	Widespread plant pests that have existing value as shelter and fauna. Control needs to be staged, rather than undertaken all at once in order to: • avoid opening up large areas that become havens for new environmental weeds • facilitate natural regeneration, and • be coordinated with planting.
4	Wetland weed for which some trial and error is needed to achieve control. Planting may be needed to achieve control. Examples: Mercer grass and salt-water paspalum.
5	Weeds that will generally not be targeted for control.

Weed	Priority	Notes
Agapanthus	2	Any species found on shell banks should be considered 'priority 1' species. Otherwise treat as priority 2 weed.
Arum lily	2	Found on lower terrace. Relatively slow spreading.
Bindweed	4	Native bindweeds are a natural component of coastal and wetland areas and trying to eradicate bindweed will cause lots of damage. However, bindweed control is needed in areas of restoration planting. Most bindweed growing in the reserve is a hybrid between the native pink bindweed *Calystegia sepium* and the exotic white bindweed *C.sylvatica*.
Blackberry	3	Only control in areas proposed for planting within the weed control season prior to planting.
Black wattle	3	All seedings and saplings of exotic trees should be hand-pulled. Large trees should generally be left.
Brush wattle	3	All seedings and saplings of exotic trees should be hand-pulled. Large trees should generally be left.
Cape gooseberry	3	Prioritise the control of small and new infestations, unless planting.
Carex divisa	3	Only control if planting. Key replacement species is likely oioi.
Chinese privet	2	Start with 'outliers' along the slope (all zones) before tackling major infestation in the northern slope, followed by the large infestation on the lower terrace (north).

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Weed	Priority	Notes
Climbing asparagus	1	Currently only in small, scattered patches.
Elaeagnus	1	Target all known infestations. Slow growing, but capable of crushing established trees and forming huge monocultures. See Wildlands 2012 for locations.
Elephant's ear	2	Found on lower terrace. Relatively slow spreading.
Eucalyptus	3	Leave existing trees, but hand-pull any seedlings found.
Garden nasturtium	3	Generally only control where planting.
Giant reed	n/a	Cannot currently be controlled as growing in an archaeological site. Requires 'bespoke' control plan to be developed that is sensitive to archaeological values.
Gladiolus	5	Control if planting.
Gorse	2, 3, 5	Priority 2: Control along all paths. If possible, cut and paint and remove plant from path edge to reduce fire risk. Priority 3: Most other areas, only control when areas are going to be planted. Priority 5: In some inaccessible locations where it is surrounded by other vegetation gorse should be left to be shaded out.
Grey willow	1	Cut and paste stump. Removal all dead wood from site. Currently present at three locations (see iNaturalist).
Inkweed	5	Control if planting.
Japanese honeysuckle	2	Widespread in all zones. Remove outliers and progressively remove.
Macrocarpa	2	All zones. All seedings and saplings of exotic trees should be hand-pulled or cut down.
Maritime pine	2	All zones. All seedings and saplings of exotic trees should be hand-pulled or cut down.
Mercer grass	5	Consider not planting and monitoring to see if natural salt turf species re-establish.
Moth plant	2	Present in all zones.
Norfolk Island hibiscus	1	Currently one tree on shell bank. Location noted on iNaturalist. The potential impact of this species is unknown, but it is easier to remove one tree now, than find out it is the next serious coastal weed.
Orache	4	Consider spraying on shell banks. Monitor success.
Pampas grass	2	Start with 'outliers' along path edge, then slope. Achieve success here before tackling large infestation in the wetland. Consider controlling on adjacent shell bank (outside of the reserve). Make sure that weeders can distinguish from the native toetoe, which has been used in plantings.
Periwinkle	2	Prioritise control of small and new infestations, unless planting.
Salt water paspalum	4 / 5	Consider monitoring to see if natural salt turf species re-establish, before planting.
Smilax	2	Spread partially limited by rust fungus.
Tradescantia	2	Prioritise the control of small and new infestations, unless planting.

Weed	Priority	Notes
Tree privet	2	Consider ‘drill and inject’ methods for larger trees.
Watsonia	5	Control if planting.

Appendix D: Maps of existing ecosystem type

Harbourview-Orangihina
Current Ecosystems: Central

WL10
SA1.4
SA1.2
SA1.3
PL.1
PL.2
SA1.4
ES
PLW.2
WL10
SA1.2
SA1.4
SA1.2
PL.2
EW
PL.2
SA1.4
PL.2
OW
ES
SA1.4
PL.2
PL.2
SA1.3
ES
PL.2
PL.2
EW
ES
PL.2
PL1.2
OW
ES
EW
SA1.2
SA1.5
PL.2
ES
PL.2
PL.2
SA1.2
EG
ES
PL.1
ES
EG
EG
ES
SA1.2
EG
0
50
100
150 m

Harbourview-Orangihina Current Ecosystems: East

Harbourview-Orangihina Current Ecosystems: North

Harbourview-Orangihina Current Ecosystems: South

Appendix E: Maps of target ecosystem type

Harbourview-Orangihina
Target Ecosystems: Central

WL10
SA1.4
SA1.3
SA1.2
SA1.3
WF4
WF5
SA1.4
WF8
WL10
WF4
SA1.4
SA1.2
SA1.2
WF4
SA1.6
WL10
SA1.4
WF4
OW
SA1.6
SA1.4
WF4
WF4
WF4
SA1.3
WF4
EG
WF4
WF7
WF4
WETLAND
WL10
WL10
SA1.2
SA1.5
WF7
VS3
WL10
EG
WF7
WF4
WF7
WF7
SA1.2
SHELLBANK
WF11
WL12
WF11
WF11
0 50 100 150 m
SA1.2

Harbourview-Orangihina Target Ecosystems: East

Harbourview-Orangihina Target Ecosystems: South

Appendix F: Target ecosystems, constraints, sequencing and skills

WF4

Target	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
WF4 Coastal broadleaf forest	This is the target ecosystem for the slope at the northern end of the park. It occurs above and below the existing path. Area has extensive restoration planting dating from the late 1990s/early 2000s.	• Existing tracks • Identified archaeological areas • Views from park (especially view from gun emplacements which is identified in the Unitary Plan historic overlay) • "play along the way" activity stations and improved path connections as shown in Master Plan • Possible viewing structures • Wastewater line (follows path)	• Identify and prioritise new supplementary planting areas • Consider whether to work with exotic canopy trees as shelter or to remove • Develop plant schedules • Source plants • Eradicate environmental weeds • Prepare planting areas • Planting (including mulching, if preferred) • Plant establishment • Monitoring	• Community and neighbour engagement • Restoration ecology (for developing plant lists) • Specialist weed control • Organising and running community planting days and plant set out skills • Community 'hand releasing'[1] of planting or specialist contractors • Project management • Auditing and ecological monitoring

[1] 'Releasing' means removing any unwanted grass or other plants from around new plants. 'Hand releasing' is to do this without any tools or herbicide.

Harbourview-Orangihina Park Community Restoration Plan

WF8

Targets	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
WF8 Kahikatea, pukatea Forest	Much of the lower terrace at the northern end was thought to have been swamp forest with seasonally high water tables (similar to what is on the Omaha Peninsula). Areas have been planted with (predominately) tī kōuka and harakeke.	• Modified soils from earthworks for stormwater ponds • Modified soils associated with the past uses of the site (prior earthworks including tracks) • Modified drainage i.e., farm drains (only some of which still appear partially functional) • Limited (potentially none?) seed sources for forest type locally	• Prioritise areas for supplementary planting • Investigate soils consider ripping or other techniques for old tracks etc • Review drainage – consider using low-tech and reversible methods to raise water levels • Control wetland weeds before raising water levels • Eradicate environmental weeds • Prepare planting areas • Planting • Plant establishment • Monitoring	• Community engagement • Wetland ecology – plant ID, selecting planting lists etc • Wetland hydrology – to consider impact on water levels • Specialist weed control • Organising and running community planting days and plant set out skills • Community hand releasing of planting OR specialist contractors • Project management • Auditing and ecological monitoring

WF5

Targets	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
WF5: Tōtara, kānuka, broadleaved forest	Apparent dune ridge running parallel to the shore line. WF5 is a critically endangered ecosystem type, with few examples in the region. Area has been planted with kānuka and other revegetation species.	• Drains have been cut through this area (presumably to drain areas further inland)	• Prioritise areas for enhancement planting • Eradicate environmental weeds • Monitoring	• Community engagement • Restoration ecology – plant ID, selecting planting lists etc • Specialist weed control • Project management • Auditing and ecological monitoring

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WF7

Target	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
WF7: Puriri Forest	Originally an abundant ecosystem type in Auckland. Believed to be the original ecosystem type for most of the Peninsula (upper terrace).	• Protection of streams • Views from park	• Identify supplementary planting areas • Environmental weed control • Site preparation • Planting • Plant establishment • Monitoring	• Community engagement • Project management • Plant identification • Specialist weed management

WL19: wetland creation

Target	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
Wetland creation: WL19 Raupō reedland (including open water as habitat).	Wetland creation: **WL19 Raupō reedland** (including open water as habitat) **VS3 mānuka, kānuka scrub** as buffer for wetland.	• Existing watercourses are straightened and deepened streams – not drains • Consenting: Hydrological modifications requires resource consent • Coastal erosion and sea level rise	• Complete hydrological investigations (12 months of data recommended) • Develop plans for resource consent application • Physical works to create wetland area(s) • Planting • Plant establishment • Monitoring	• Community liaison • Project management, planning and budgeting • Resource management (planning, consenting, hydrology, wetland ecology) • Specialist weed management •

SA1.5 Shellbank creation

Target	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
Shell bank creation	Shell bank creation: **SA1.5 Shell-barrier Beaches** (Chenier Plains)	• Potential site for creation of an artificial "shell" bank roost identified (existing informal track to become access route for construction and maintenance) • Consenting • Coastal erosion and sea level rise • Requirements for ongoing maintenance • Hides to watch birds from a safe distances • Dog access	• Formal feasibility assessment to establish next steps	• Community liaison • Project management, planning and budgeting • Resource management (planning, consenting, coastal process specialist, shorebird ecology)

WF11

Target	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
WF11 Kauri, podocarp, broadleaved forest	Widespread diverse forest with kauri interspersed, common on lower fertility soils, like those present along the slope on the southern portion of the park	• Identified archaeological sites • Views from park	• Identify and prioritise supplementary and mass planting areas • Environmental weed control • Site preparation • Planting • Plant establishment • Monitoring	• Community liaison • Project management • Plant identification • Specialist weed management

Harbourview-Orangihina Park Community Restoration Plan

WL12

Target ecosystems	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
WL12: Manuka fen	Wetland mosaic (i.e. wetland and non-wetland areas). Low fertility and predominately groundwater feed Existing gorse (ES) and pasture grasses (EG) are a matrix with wetland areas with purua grass and twig rush (*Macherina teretilfolia*)	• Identified archaeological sites • Coastal erosios • Extensive established gorse • Master Plan: - Proposed boardwalk potentially in conjunction with restoration of the brickworks site - "Play along the way" activity stations and improved path connections	• Environmental Weed control • Site preparation • Planting • Plant establishment • Monitoring	• Community liaison • Project management • Wetland ecology – especially to identify and protect remnant wetland vegetation • Plant identification • Specialist weed management. • Ecological monitoring

SA1.6

Target ecosystem	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
SA1.6 Coastal scrub (drier areas close to saline influence)	Coastal scrub is the identified target ecosystem for drier areas close to saline influence. Has been planted with mānuka dominated mix.	• This area is very modified (soils are not original)	• Prioritise areas for enhancement planting • Eradicate environmental weeds • Prepare planting areas • Planting • Plant establishment • Monitoring	• Community engagement • Wetland ecology – plant ID, selecting planting lists etc • Wetland hydrology – to consider impact on water levels • Specialist weed control • Organising and running community planting days and plant set out skills • Community hand releasing of planting OR specialist contractors • Project management • Auditing and ecological monitoring

Harbourview-Orangihina Park Community Restoration Plan

Saline ecosystems

Existing ecosystems	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
Saline ecosystems. SA1.2 Manawa (Mangrove) SA1.3 Searush and oioi (salt marsh) SA1.4 Saline Herbfield SA1.5 Shell-barrier Beaches (Chenier Plains)	Saline ecosystems generally intact and ecologically significant. SA1.1: Sea grass was probably also previously present on low-lying sandy silt flats (ecosystem is vulnerable to being lost through sedimentation). SA1.5 Shell-barrier Beaches (Chenier Plains) is a threatened ecosystem.	• Catchment management and sediment supply play an important role in the dynamics of this ecosystem type (including inputs from the Whau River) – increased sediment favours manawa spread at the expense of other ecosystems and sandflats • Sea level rise likely to increase extent of saline wetlands • Manawa (mangrove) potentially has a role in shore line protection from erosion	• Monitoring • SA1.5 Shell-barrier Beaches (Chenier Plains) may require targeting weed control	• Community engagement • Wetland ecology – plant ID, selecting planting lists etc • Wetland hydrology – to consider impact on water levels • Specialist weed control • Organising and running community planting days and plant set out skills • Community hand releasing of planting or specialist contractors • Project management • Auditing and ecological monitoring

EG

Existing ecosystems	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
Shorebird habitat (**EG**)	Exotic grass – Upper Terrace (**not mapped**). This is important shorebird habitat.	• Te Atatū Marae development • Te Atatu Pony Club lease • Additional pedestrian links shown in the Master Plan • Possible link to Te Whau Pathway • Views from park – for people and for shorebirds • Need to keep areas as open as possible for shorebirds	• Monitoring of shorebirds	• Community liaison • Shorebird expertise and advice for leasee and marae

Harbourview-Orangihina Park Community Restoration Plan

WL19

Existing Ecosystems	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
WL19 Raupō reedland	Located on northern lower terrace. Wetland feed by both groundwater water and surface water. Water levels will naturally fluctuate. This ecosystem was almost completely destroyed by farming and has recovered and expanded over time.	• Historic drains in this area do not appear to be functional • Ecosystem vulnerable to weed invasion	• Weed control • Monitoring extent and health	• Specialist weed control

WL10

Existing Ecosystems	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
WL10 Oioi restiad rushland/reedland • Purua grass • Jointed twig rush	Main freshwater wetland type that is sometimes brackish (e.g. grades into salt marsh). Water fertility and water levels fluctuations less than WL19 Raupō reedland.	• Modified soils associated with the past uses of the site (prior earthworks including tracks) • Modified drainage i.e., farm drains (only some of which still appear partially functional)	• Prioritise areas for supplementary or mass planting • Investigate soils - consider ripping or other techniques for old tracks etc • Review drainage – consider using low-tech and reversible methods to raise water levels • Control wetland weeds before raising water levels • Eradicate environmental weeds. • Trials may be needed for areas of *Carex divisisa* or *Paspulum*. • Prepare planting areas • Planting • Plant establishment • Monitoring	• Community engagement • Wetland ecology – plant ID, selecting planting lists etc • Wetland hydrology – to consider impact on water levels • Specialist weed control • Organising and running community planting days and plant set out skills • Community 'hand releasing'[2] of planting or specialist contractors • Project management • Auditing and ecological monitoring

[2] 'Releasing' means removing any unwanted grass or other plants from around new plants. 'Hand releasing' is to do this without any tools or herbicide.

EG (meadow)

Existing ecosystems	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
Meadow (**EG**)	Exotic grass – lower terrace – can be managed to increase diversity of bird life	• Main sewer line runs through this area	• Weed control and/or occasional mowing to maintain area as grass	• Community liaison • Project management • Plant identification • Specialist weed management - at least until serious environmental weeds are eradicated

OW Open Water (Ponds)

Existing ecosystems	Notes	Constraints and considerations	Recommending tasks and sequencing	Skills
Open Water (OW)	Four constructed stormwater ponds in the park, plus occasional areas of natural open water.	• Pond managed by AC Healthy Waters department • Ponds were installed to improve water quality from residential areas, but now have own water quality and invasive species (plant and animal) • Ponds do have some habitat value for native waterfowl (e.g. weweia/dabchick)	• Monitor (including water quality and habitat use) • Consider naturalising ponds	• Specialist stormwater engineers required for any naturalising plans for ponds

Appendix G: Draft Costings and Timeline

	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	29/30	30/31
1. Wetland creation										
1.2 Ground water monitoring	$ 5,500									
1.3 Design and consent		$ 50,000								
1.4 Physical works Y1			$ 400,000							
1.5 Physical works Y2				$ 300,000						
1.6 Physical works Y3					$ 300,000					
1.7 Maintenance						$ 12,000				$ 12,000
2. Bird hides and monitoring towers										
2.1 Design and consent		$ 50,000								
2.2 Physical works			$ 200,000							
3. Weed control										
3.1 Priority weed control	$ 20,000	$ 10,000								
3.2 Ongoing weed control (incl. path edges)		$ 97,200	$ 81,000	$ 64,800	$ 48,600	$ 32,400	$ 32,400	$ 32,400	$ 32,400	$ 32,400
3.3 Support, auditing and monitoring		$ 5,360	$ 4,050	$ 3,240	$ 2,430	$ 1,620	$ 1,620	$ 1,620	$ 1,620	$ 1,620
4. Community animal pest control										
4.1 Materials, e.g. additional automatic traps	$ 3,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
4.2 Support, auditing, monitoring & reporting		$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
5. Community planting										
5.1 Site prep	$ 15,000	$ 1,500	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000
5.2 Planting (supply, delivery, and planting events)	$ 41,250	$ 82,500	$ 82,500	$ 82,500	$ 82,500	$ 82,500	$ 82,500	$ 82,500	$ 82,500	$ 82,500
5.3 Maintaining planting (hand releasing)	$ -	$ 11,250	$ 33,750	$ 56,250	$ 67,500	$ 67,500	$ 67,500	$ 67,500	$ 67,500	$ 67,500
5.4 Support, auditing and monitoring	$ 2,000	$ 4,763	$ 7,313	$ 8,438	$ 9,000	$ 9,000	$ 9,000	$ 9,000	$ 9,000	$ 9,000
6. Community monitoring/citizen science										
6.1 Support		$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000
6.2 Bioblitz (optional)		$ 30,000								
7 Miscellaneous										
7.1 Temporary signage dog bylaws	$ 2,000									
7.2 Erosion monitoring - set up		$ 2,500	$ 2,500							
7.3 Drone aerials		$ 8,000								
8 Coordination and project management										
8.1 Coordinator time		$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000
TOTAL ($5,631,293)	$ 88,750	$ 589,073	$ 1,077,113	$ 781,228	$ 776,030	$ 471,020	$ 459,020	$ 459,020	$ 459,020	$ 471,020

22-PRO-1030

Henderson-Massey Local Board
Auckland Council