Boffa Miskell

# 23TGreen Island Landfill

## Draft Vegetation Restoration Management Plan Framework

Prepared for Dunedin City Council

30 September 2023

# Document Quality Assurance

| | | |
|---|---|---|
| **Bibliographic reference for citation:**<br>Boffa Miskell Limited 2023. *Green Island Landfill: Draft Vegetation Restoration Management Plan Framework*. Report prepared by Boffa Miskell Limited for Dunedin City Council. | | |
| Prepared by: | Maurice Dale<br>Senior Principal / Planner<br>Boffa Miskell Limited | |
| Reviewed by: | Rachael Eaton<br>Senior Principal \| Urban Designer<br>Boffa Miskell Limited | |
| Status: DRAFT | Revision / version: [A] | Issue date: 30 September 2023 |



Template revision: 20180621 0000

File ref: DRAFT_Vegetation_Restoration_Management_Plan_Framework_20230921.docx

# CONTENTS



# Appendices



# Figures

# Tables

# 1.0 Introduction

This Draft Vegetation Restoration Management Plan framework (**VRMP**) has been prepared to support the ongoing operation, closure, and aftercare of the Green Island Landfill (**GIL**). The VRMP is a requirement of draft condition 41 of the land resource consent to discharge waste and leachate to land.

Extensive screening vegetation exists around the perimeter of the landfill site largely comprised of mature exotic tree species. This vegetation is of a height and density which reduces views into the operational areas of the site and mitigates the landscape, visual, and natural character effects of the landfill. Once the landfill is capped and grassed post-closure, the vegetation will continue to assist with ensuring the landfill landform into the surrounding landscape, and assist mitigate visual effects of existing and proposed future waste minimisation and transfer facilities.

The Ecological Impact Assessment (**EcIA**) prepared for the operation and closure of the landfill did not identify the need for any ecological mitigation, offset or compensation measures to be implemented. The cultural aspirations of Te Rūnanga o Ōtākou expressed through engagement and the Cultural Impact Assessment for the operation and closure of the landfill, include the restoration of the ecological values of the Kaikārae Estuary, provision of habitat for taoka species and rebalancing of mauri.

The VRMP sets out the proposed actions to manage the health and long-term replacement of the existing screening vegetation on the site, and provision of riparian planting, with the objective of ensuring the landfill and waste minimisation and transfer facilities continue to be integrated into the surrounding landscape, any adverse visual effects are minimised, and enhancement of ecological and cultural values.

This Draft VRMP provides a framework for a comprehensive plan that will be prepared in consultation with Te Rūnanga o Ōtākou within 1 year of the granting of replacement of resource consents for the operation, closure, and aftercare of the Green Island Landfill. As a framework, it sets out the intended structure and indicative content, that will be further developed in the comprehensive final plan.

For the purposes of this Draft VRMP, all indicative content is shown in [red text].

# 2.0 Background

### 2.1.1 Site Location and Context

The location of GIL is shown in **Figure 1**. The GIL site is located approximately 8.8km by road from central Dunedin in the suburb of Green Island. The site comprises a total area of 75.6164

hectares, being the total area of the landholding owned by DCC and designated in the Proposed Second-Generation Dunedin City District Plan (**2GP**).

*Figure 1 – Green Island Landfill Site*


GIL is located adjacent to the Kaikārae Stream which flows into the Kaikārae Estuary to the west of GIL. The GIL has been primarily constructed on the upper parts of the Kaikārae Estuary. The current landfill footprint within which filling has occurred extends up to a maximum height of 25m above mean sea level (**amsl**). Land surrounding the landfill footprint, including the western perimeter access road between the landfill and Kaikārae Stream is low lying, being between 1.5 – 2.0m amsl. Immediately to the south and east of the landfill, the land rises gently to a series of low hills.

The Clariton Ave residential area comprises the closest residential properties to the GIL site, being approximately 200m southeast of the existing waste diversion and transfer facilities, and 120m east of the current landfill footprint.[1] Other residential properties are located to the southeast at Elwyn Crescent, and to the north and west within Sunnyvale and Fairfield. Those residential properties are located at greater distances and separated from the landfill site by a combination of the State Highway 1 corridor, the Kaikārae Stream and Estuary, and rural and open space land.

### 2.1.2 Green Island Landfill Operation and Closure

GIL is the city's current landfill for the disposal of municipal solid waste and hazardous waste. The site also contains other waste diversion and transfer facilities for the drop off and consolidation of general waste, reusable and recyclable material, greenwaste, and household hazardous substances.

[1] The current active landfill area is located at greater distances from Clariton Ave.

Waste disposal first occurred at GIL in 1954 and the site has been used for waste disposal since that time. The pre-existing landform for the GIL was a tidal estuary. Landfilling commenced at the south-eastern corner of the site and has progressed west over time. In the mid 1990's a soil bund was constructed that encircles the landfill on the eastern, northern, and western sides adjacent to the Kaikārae Stream and Estuary. All waste placement since this time has been within the bund, which buttresses the waste and provides a physical and hydraulic barrier from the adjacent Kaikārae Stream and Estuary.

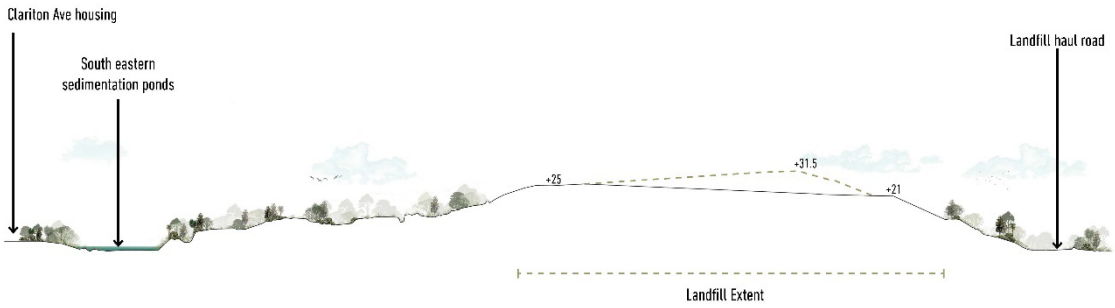
Improvements to the environmental management of site were made in the mid-1990's, including construction of a perimeter leachate interception trench, stormwater sediment ponds (the *eastern* and *western sedimentation ponds*), and works associated with the conveyance of stormwater into these ponds. At the same time diversion of a number of small channels occurred resulting in the construction of new wetlands (the *south eastern constructed wetlands*) and their connection via a culvert to another new wetland (the *eastern constructed wetland*) located in a remnant branch of the original channel adjacent to the Brighton Road access to the site.

Based on current waste disposal projections, the landfill is expected to reach full capacity in approximately April 2027. DCC has been planning for this eventuality, and as part of the Waste Future's Programme has confirmed the need to replace the landfill at GIL with a new landfill located at Smooth Hill in southwest Dunedin. It is unlikely that Smooth Hill will be ready to accept waste until 2027 at the earliest.

In the interim, DCC intends to continue to dispose of waste at GIL to meet the city's waste disposal needs. This involves increasing the height of the landfill to the west reaching a maximum height of 31.5m amsl while remaining within the current landfill footprint as shown in **Figure 2.** The shape of the final surface has been designed to ensure it remains below the viewing plane of residential properties at Clariton Ave towards Pukemakamaka/Saddle Hill and is sympathetic to the surrounding predominately rural landscape.

The increased height will provide an available landfill void of 670,000m$^3$ for the disposal of waste until sometime between December 2029 and March 2031 depending on actual waste disposal rates, after which the landfill will close. Waste diversion and transfer facilities are intended to continue operating at the site following the closure of the landfill, which will be redeveloped as part of a new Resource Recovery Park Precinct (**RRPP**).

*Figure 2 – Cross Section of Proposed Final Landfill Surface*



# 3.0 Purpose and Structure of the Plan

### 3.1.1 Purpose

The purpose of the VRMP set out in draft condition 41 of the land resource consent to discharge waste and leachate to land is to:

> *manage the health and long-term replacement of the existing screening vegetation on the site, and provision of riparian planting, with the objective of ensuring the landfill and waste minimisation and transfer facilities continue to be integrated into the surrounding landscape, any adverse visual effects are minimised, and enhancement of ecological and cultural values.*

The plan is required to be developed in consultation with Te Rūnanga o Ōtākou. The VRMP is required as a minimum to include:

- *A survey of the health of the existing trees.*
- *Routine monitoring and maintenance of the existing trees to promote their health and long-term stability.*
- *Long-term post closure actions for the replacement of the existing trees, incorporating eco-sourced native species to enhance natural character, landscape, and amenity values, and their ongoing maintenance.*
- *Riparian planting and pest management to support restoration of the ecological values of the Kaikārae Estuary, provision of habitat for taoka species and rebalancing of mauri.*
- *A detailed programme of works, including timeframes for implementation.*
- *Key responsibilities of onsite personnel.*
- *A review process that includes Te Rūnanga o Ōtākou and Otago Regional Council.*

### 3.1.2 Structure

This VRMP is structured as follows:

- **Section 4** – summarises the existing landscape, ecological, and cultural values of the landfill site and its immediate context, which inform the management actions within the plan.
- **Section 5** – sets out the vegetation management and restoration objectives for the site.
- **Section 6** – describes the health of the existing perimeter screening vegetation, and actions for routine monitoring and maintenance of that vegetation to promote its health and long-term stability.
- **Section 7** – describes long-term post closure actions for the replacement of the existing screening vegetation, riparian planting, and plant and animal pest management.
- **Section 8** – sets out a detailed implementation plan, including a programme of works, timeframes, and responsibilities.

- **Section 9** – describes monitoring and plan review processes.

# 4.0 Existing Landscape, Ecological, and Cultural Values

[The content in this section is based on that included within the AEE for the operation, closure, and aftercare of the landfill. It will be updated as part of the preparation of the final plan].

## 4.1 Landscape and Natural Character

### 4.1.1 Landscape Values and Visibility

The GIL site comprises a working landfill within the low-lying part of a wider basin-like landscape. The area surrounding the landfill has a settled, suburban, rural, and coastal character. The suburbs of Green Island, Abbottsford and Fairfield surround the site to the northwest, north and east and comprise a combination of residential, commercial, and industrial development as well as recreational open space. To the south, the landscape has a varied character but is predominantly rural, characterised by open space, stands of large trees, shelterbelts, narrow, gravel roads and farm buildings. There are also larger lot residential properties and the denser, small coastal settlement of Waldronville.

The site and surrounding area are not identified in the 2GP as being in the coastal environment or part of any Outstanding Natural Feature or Landscape (**ONF/ONL**), or a Significant Natural Landscape (**SNL**) highly valued for their contribution to the amenity values or the quality of the environment. The cone of Pukemakamaka/Saddle Hill 3.5km to the west of the site is identified as an ONF, and its upper slopes identified as an SNL in the 2GP. Abbotts Creek, Kaikārae Stream, and the Kaikārae Estuary are considered other key landscape features nearby. All these landscapes are recognised as holding important values including to Te Rūnanga o Ōtākou.

The site is visually well contained from close views, largely screened by the perimeter bunds, and established trees. The hilly character of the surrounding landscape means visibility is obscured by intervening landform from some locations, but elevated views are available from others. Abbotts Creek and Kaikārae Estuary, the motorway and the GIWTTP provide some spatial separation between the site and residential neighbours to the south, west and north. Key viewing audiences include residential and light industrial properties to the east, Island Park Golf Club, and large lot residential properties to the southwest, land recently rezoned General Residential to the southeast, and residential suburbs and recreation spaces on elevated terraces to the west through to the northeast.

### 4.1.2 Natural Character

The Coastal Environment of Otago Natural Character and Outstanding Natural Features and Landscapes Assessment 2015 rated the natural character of the Kaikārae Estuary as being Medium – Low and recognised "w*hile providing important habitat for wildlife this unit has been significantly modified by human habitation and lacks perceptual naturalness of wild and scenic value."* [2]

The site was once part of the intertidal saltmarsh area of the Kaikārae Estuary but has been progressively drained, filled, and capped since being occupied by the current landfill. The estuary is long, narrow, and shallow, and its margins modified by roads, causeways, drainage channels and buildings as well as reclamation. Vegetation patterns in and around the estuary are extensively modified. Much of the former indigenous vegetation has been replaced by weedy exotic species.

## 4.2 Ecological Values

### 4.2.1 Terrestrial Vegetation and Habitats for Fauna

The existing working landfill extent is highly modified and does not support ecologically important indigenous vegetation or habitats for indigenous fauna (except for black-backed gulls and red-billed gulls). Where vegetation occurs on recently worked areas of the landfill, it comprises exotic grassland and weedy exotic herbs and shrubs (e.g., gorse, scotch broom).

Immediately surrounding the landfill footprint to the southeast, areas of indigenous vegetation (e.g., toetoe, pūrei, kōhūhū, and other readily growing indigenous species) have been planted on previously filled and capped areas of the landfill. These planted areas, along with the shelterbelts planted around the landfill site and rank exotic grass and gorse scrub, provide habitat for native and exotic bird species and may also provide poor-quality habitat for indigenous lizards.

The areas of planted indigenous vegetation encompasses common readily growing species which are 'not threatened', are not representative of intact forest types in the Ecological District, are small, and have limited species diversity and habitat patten.

### 4.2.2 Avifauna

Thirty-two species use or may potentially use, the GIL site and immediate surrounds. Fourteen of these species were recorded during surveys conducted at GIL and the Kaikārae Estuary. Of the 32 species:

- Three are classified as nationally Threatened (black-fronted tern, Otago shag and Caspian tern);

[2] Coastal Environment of Otago Natural Character and Outstanding Natural Features and Landscapes Assessment, Dunedin City Section Report, 2015, Mike Moore et al.

- Twelve as At Risk (white-fronted tern, black-billed gull, New Zealand pied oystercatcher, red-billed gull, New Zealand pipit, eastern bar-tailed godwit, banded dotterel, little shag, variable oystercatcher, pied shag, black shag, and royal spoonbill); and
- Seventeen as Not Threatened.

All three Threatened species and the majority of the 12 At-Risk species listed, do not use the GIL site itself, but instead use Kaikārae Estuary, primarily as part of their foraging habitat network in the wider area. The estuary hosts large numbers of birds and is an important feeding and breeding ground for a wide range of coastal, oceanic and wetland bird species, including gulls, terns, swans, ducks, shags, stilts, and oystercatchers.

Excluding the Kaikārae Estuary, At-Risk species recorded at the site itself and surrounds include New Zealand pipit (grassland / shrub areas), royal spoonbill (ponds), shags (waterways) and red-billed gulls (roosting on infrastructure).

The most abundant species recorded on the GIL site are southern backed gulls (SSGB) (Not Threatened), followed by red billed gulls, and starlings, for which the landfill provides a food source.

### 4.2.3 Aquatic Habitats and Fauna

The margins of the Kaikārae Stream and Estuary bordering the site to the north and west are identified as a Regionally Significant Wetland in the Regional Plan: Water[3] (known as the Kaikārae Lagoon Swamp), and an Area of Significant Biodiversity Value in the 2GP. They include areas of natural wetlands for the purposes of the NES-FW and comprise areas of significant indigenous vegetation and significant habitats of indigenous fauna for the purposes of s6(c) of the RMA.

The indigenous vegetation present in the Kaikārae Stream and Estuary comprises largely saltmarsh ribbonwood, pūrei and oioi rush, with much of the former indigenous vegetation having been replaced by weedy exotic species, particularly cocksfoot, gorse and crack willow. Freshwater-influenced swamp areas border the brackish mudflats in some places.

Historic fish records (1989) from Kaikārae Stream indicate the presence of īnanga and longfin eel (both At Risk - Declining species), black flounder, common bully, and redfin bully (Not Threatened species). More recent records (2007) indicate upland bully and shortfin eel (both Not Threatened). Kēkēwai / freshwater crayfish (At Risk – Declining), and kanakana / lamprey (Threatened - Nationally Vulnerable). Information about fish communities in the Kaikārae Estuary is limited, however the main species present are common bully, estuarine triplefin, smelt, flounder, eels, whitebait (possibly īnanga) and trout.

Fish surveys undertaken 100m upstream and downstream of the landfill surface water monitoring sites GI1, GI2, and GI3 resulted in a total of six species of fish being caught with all three sites comprising similar species, including black flounder, common bully, inanga, longfin eel, shortfin eels, and upland bully. The black flounder was recorded at GI3 only and upland bully were recorded at the hard-bottomed GI1 site only. No eels were caught at the GI2 site. The most

[3] https://www.orc.govt.nz/managing-our-environment/water/wetlands-and-estuaries/dunedin-district/Kaikārae-lagoon-swamp.

abundant species caught were common bully at all sites and the size range of this species was similar between sites. No kōura or kākahi were observed at any sites.

Long term monitoring of by the ORC in the Kaikārae Stream just upstream of site GI1, and within the estuary indicates macroinvertebrate health is fair to poor reflective of the degraded water quality in the wider catchment. Macroinvertebrate surveys identified the most abundant taxa groups comprised mostly tolerant taxa. No kākahi (freshwater mussels) or kēkēwai (freshwater crayfish) were found. The macroinvertebrate community index (MCI) scores indicate that all sites have probable mild-severe enrichment, having "fair" or "poor" water quality, while the qualitative variant (QMCI) scores showed GI3 and GI5 as having "good" water quality.

## 4.3 Cultural Values

Te Rūnanga o Ōtākou have mana over the GIL site and surrounding area. The Kaikārae Estuary is part of an integrated cultural landscape (wāhi tupuna) for mana whenua. Te Rūnanga o Ōtākou's associations with the area are summarised in **Table 1** below:

*Table 1 - Mana Whenua Associations with the Kaikārae Estuary*

| **Ikoa Māori** | **Location/Ikoa Pākehā** | **Description** |
|---|---|---|
| Pakaru | Kaikārae Lagoon | Pakaru is the traditional Māori name for the Kaikārae Lagoon, near the mouth of Kaikārae (the Kaikārae Stream). Along with Kaikārae, Pakaru was an important kāinga mahinga kai (food-gathering place) for local Kāi Tahu. |
| Kaikārae | Kaikārae Lagoon and Stream | Kaikārae is associated with the Waitaha explorer Rākaihautū. Upon arriving at Whakatū (Nelson) in the Uruao waka, Rākaihautū divided his people into two groups. His son, Rakihouia, took one party to explore the coastline, and Rākaihautū led the other party through the interior of Te Waipounamu and down to Murihiku (Southland). While travelling back up the island, Rākaihautū and his party stopped at the mouth of a stream to eat, and their food was a seabird known as karae. This particular location and stream was named Kaikārae. |
| Pukemakamaka | Saddle Hill | Matamata was the kaitiaki (guardian) of Kāti Māmoe chief Te Rakitauneke and is attributed to carving out the Ōtākou harbour and the Taiari river in search of his lost master when they became separated. The taniwha finally resting where Saddle Hill is now, becoming the peaks Turi Makamaka (Jaffray Hill) and Puke Makamaka (Saddle Hill). |

Traditional travel routes through the interior and along the coast connected Kāi Tahu to places of importance for gathering and harvesting mahika kai and connected sites of permanent and seasonal occupation. Old tracks followed "along the western hill-tops, the line of Kaikārae Valley, and the seacoast". Other Kāi Tahu trails proceeded from Kaikārae over Whakaari or Whānau-paki (Flagstaff), to Waikōuaiti.

Mahika kai practices underpin the Kāi Tahu relationship with Otago's rivers, lakes, wetlands, and estuaries. The coastal estuaries, lakes and wetlands of the Otago region once supported rich and healthy mahika kai resources, including a range of shellfish, sea fishing, eeling and harvest of other freshwater fish in lagoons, wetlands and rivers, waterfowl, sea bird egg gathering, forest birds, and a variety of plant resources including harakeke, fern and tī kōuka root.

For mahika kai to be sustained, populations of species must be present across all life stages and must be plentiful enough for long term sustainable harvest. Safe access to mahika kai sites must be available, kai must be safe to gather, safe to harvest and safe to eat and management and harvesting practices must be able to be carried out in accordance with tikaka.

The transmission of mātauraka necessitates whānau being able to access healthy mahika kai to carry out customary practices. The restoration of the mauri of Kaikārae estuary to provide healthy habitat for mahika kai and taoka species is a long-term vision for Ōtākou whānau.

# 5.0 Management and Restoration Objectives

The primary objective of the management of the health and long-term replacement of the existing screening vegetation on the site, and provision of riparian planting, are to ensure the landfill and waste minimisation and transfer facilities continue to be integrated into the surrounding landscape, any adverse visual effects are minimised, and the enhancement of ecological and cultural values.

The following principles have been developed to achieve these objectives, and guide the development of specific vegetation maintenance and restoration actions in the remainder of this plan:

[The management and restoration principles are to be determined in consultation with Te Rūnanga o Ōtākou and will be included in the final plan. It is anticipated the principles will broadly include the following:

- Ensure the health and long-term stability of existing screening vegetation around the perimeter of the site through monitoring and maintenance.
- Ensure the replacement of the existing screening vegetation around the perimeter of the site by progressive underplanting with native tree species within the existing vegetation, and as they mature gradually felling and removing the existing exotic trees.
- Enhance riparian planting around the site margins with the Kaikārae Stream and Estuary.
- Ensure replacement screening vegetation planting as a minimum can provide at maturity the same level of screening as the existing vegetation.
- Ensure all new planting:
    - recognises opportunities to integrate with the existing landform, hydrological flow paths, natural waterbodies/wetlands, and indigenous flora and habitats.
    - avoids the need for major physical interventions (e.g. earthworks).

- does not compromise the ongoing operation of the waste diversion and transfer facilities on the site, the integrity of the final landfill cap, or ongoing operation and maintenance of post-closure landfill infrastructure.
- consists of eco-sourced low flammability species present in the area or Ecological District, including fast-growing species to provide ongoing screening, and lower native plantings in riparian margins of the site to further improve habitat and cultural values.
- recognises potential opportunities for post-closure use of the landfill site for recreation or other uses, including incorporating mana whenua values and pūrākau associated with the Kaikārae Estuary. (note confirmed plans for long-term use of the landfill site will be included in the Landfill Closure Management Plan).

- Ensure the control of pest plants and animals within the site to assist the establishment of replacement and riparian planting].

# 6.0 Maintenance Actions for Existing Perimeter Vegetation

[Content to be added into final plan following completion of an arboriculture assessment of the health of the existing perimeter screening vegetation, and consultation with Te Rūnanga o Ōtākou. It is anticipated this section will include:

- Description of the existing perimeter screening vegetation within the site, including locations (shown on a plan); and species, approximate height, health, stability, and potential life expectancy (set out in a schedule).
- Requirements for monitoring the health and stability of the screening vegetation within the site, including method/s, frequency, and record keeping.
- Requirements for vegetation maintenance within the site in response to monitoring, including:
  - pruning.
  - removal of vegetation that is dead or is a danger to human health and safety or property.
  - record keeping.

# 7.0 Vegetation Restoration Actions

[Content to be added into final plan, following consultation with Te Rūnanga o Ōtākou. It is anticipated this section will include:

- Proposed screening vegetation planting and riparian restoration zones within the site shown on a plan.
- Requirements for each planting and restoration zone including:
  - existing vegetation to be retained.
  - pest plants to be removed prior to planting.
  - site preparation.
  - target density of planting.
  - planting species mix, grade, and spacing.
  - planting method/s.
  - any fencing required.
  - maintenance requirements for planting, including additional planting to replace dead vegetation to achieve target densities.
  - and weeds to be retained or removed prior to planting, site preparation, planting species mix, grade, and spacing, staging and timing of planting, planting method/s, fencing, and maintenance requirements for each zone.
- Requirements for felling and removal of existing screening vegetation within the site as the replacement planting matures, including staging and removal method/s.
- Requirements for control of pest plants and animals (species to be listed) prior to planting in each zone, or affecting the establishment of planting, including control methods.

# 8.0 Implementation Plan

[Content to be added into final plan, following consultation with Te Rūnanga o Ōtākou. It is anticipated this section will include:

- Overall timing of works for each zone set out in a schedule, including planting, removal of existing vegetation, maintenance, and animal and plant pest control.
- Responsibilities for implementation of the plan, including key personnel.

# 9.0 Monitoring and Review

[Content to be added into final plan, following consultation with Te Rūnanga o Ōtākou. It is anticipated this section will include:

- Procedures for monitoring the success of planting, restoration, and pest control efforts in achieving the objectives and principles of the plan, including:
  - frequency
  - methods
  - record keeping
  - follow up actions if monitoring identifies objectives and principles of the plan are not being met.
- Timeframe and process for review of the plan.

# Appendix 1:

# Appendix 2: