Compliance Monitoring Certified

Auckland Council

Date: 15/11/2023
LUC60407134
Certifier: Ada Wang
Related conditions: 42
Revision: 2

Habitat Restoration Management Plan

Eastern Busway Alliance

Document Number: EB-PL-0-EV-000009

Rev: 2

Date: 17th October 2023

Eastern Busway

This page has intentionally been left blank

Document History and Status			
Rev	**Date**	**Responsible**	**Status/ History**
A	22 Aug 2023	Alex Bees	Draft for review Pending submission of Appendix B
1	28 Aug 2023	Alex Bees	Pending submission of Appendix B Note: Final Plan pending Mana Whenua input
2	17 Oct 2023	Alex Bees	Final

Document Approval		
Action	**Name**	**Position**
Responsible	Alex Bees	Environmental Lead
Reviewer	Conor Reid	Senior Ecologist - AECOM
Reviewer	Fiona Davies	Associate Director (Ecology) - AECOM
Reviewer	Mike Cassidy	SHEQS Manager
Approver	Matt Zame	Project Director

Contents

List of Tables

List of Figures

Acronyms

Table 1 Acronyms

Acronym	Term	Definition
AC	Auckland Council	
ALT	Alliance Leadership Team	The team that will perform the day-to-day operational leadership and management functions of the Alliance
APD	Project Director	The Alliance Project Director
AT	Auckland Transport	Auckland Transport
EB1	Eastern Busway Panmure to Pakuranga	
EB2	Eastern Busway Pakuranga Town Centre	
EB3C	Eastern Busway Pakuranga to Botany - Commercial	
EB3R	Eastern Busway Pakuranga to Botany - Residential	
EB4	Eastern Busway Botany Town Centre Station	
EBA	Eastern Busway Alliance	The alliance between the Alliance Participants formed for the delivery of Eastern Busway Stages 2, 3 and 4
KPI	Key Performance Indicator	The measurable value that demonstrates how effectively the Alliance is achieving key business objectives
KRA	Key Result Area	Performance targets against which the Alliance achievements are measured
PAA	Project Alliance Agreement	Formed between AT and the selected Participants for the purposes of detailed design, construction, commissioning, and defects correction of the Project
PAB	Project Alliance Board	
SLT	Senior Leadership Team	

For a full list of Eastern Busway acronyms please see document **EB-LS-0-PP-000001 Acronyms**

1 Introduction

1.1 Project Vision & Objectives

Transport choices to transform communities. The Eastern Busway is about creating more lifestyle and climate friendly travel options for the growing East Auckland community.

1.2 Project Scope

The Eastern Busway is a rapid transit busway project that will create faster, more reliable and connected transport options for communities in east and south Auckland. It is being delivered by Auckland Transport, a Controlled Organisation (CCO) of Auckland Council.

Auckland Transport (AT) has formed an Alliance Team, the Eastern Busway Alliance (EBA), comprised of the following Alliance Participants: AT, Fletcher Construction Infrastructure Ltd., ACCIONA Construction NZ Ltd., AECOM NZ Ltd., and Jacobs NZ Ltd. The scope and terms of EBA's services are defined in the Project Alliance Agreement (PAA).

1.3 Project Description

The Eastern Busway project is a multimodal transport upgrade project between Panmure and Botany (Figure 1) in east Auckland. The project consists of four sections and Panmure Station. Panmure station is complete; Section 1, Panmure to Pakuranga is also complete. Section 2, 3 Residential, 3 Commercial and 4i are in the delivery phase.

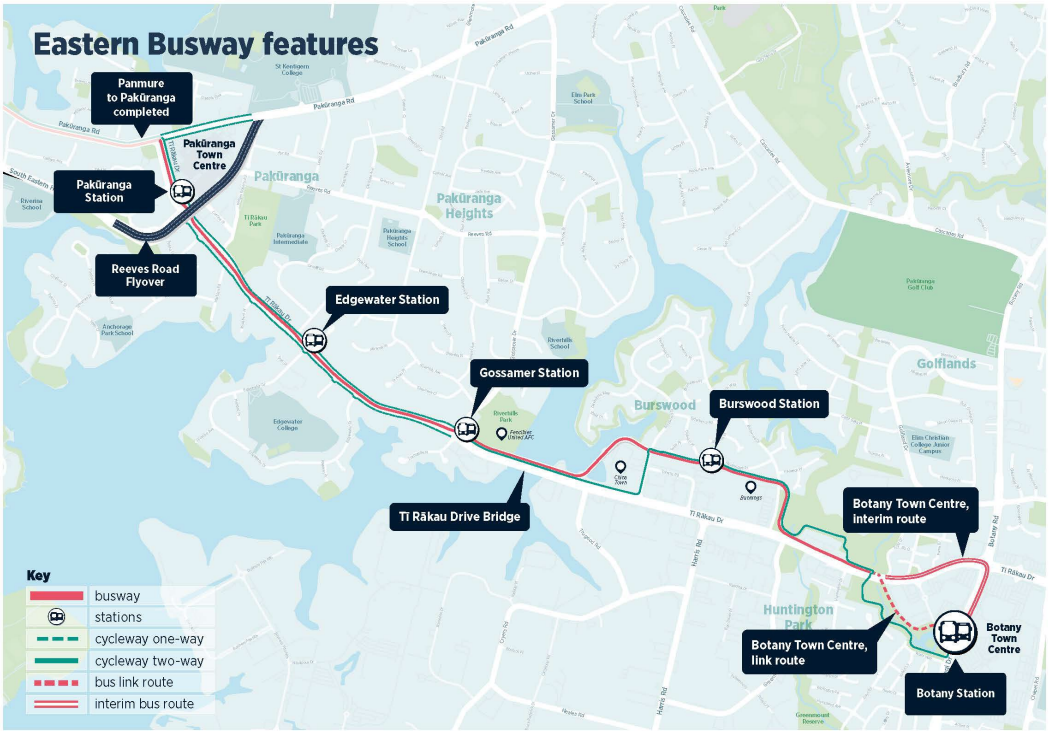

Figure 1 Eastern Busway alignment between Panmure and Botany town centres in east Auckland

1.4 Alliance Charter

As Alliance Participants we have been chosen to:

- Deliver a project that engages and delights our community
- Champion the values of:
  - **Kaitiakitanga** – thoughtful guardianship of the environment
  - **Manaakitanga** – respect, generosity and care for all people
  - **Tikanga -** doing the right thing in the right way
- Look beyond the busway to enable future growth, integration, and regeneration
- Be a beacon project and team, raising the capability of all participants
- Build best in class practices in safety, sustainability and project controls
  - Grow our people and empower them to develop and succeed

Figure 2 Alliance Key Result Areas (KRA)

Figure 3 Alliance Principles

Care | Honesty & Openness | Bold | Connect | Think Ahead | Enjoy the Journey

2 Management Plan Scope & Objectives

This Habitat Restoration Plan (HRP) has been prepared in accordance with Auckland Council's (AC) EB2/EB3R resource consent conditions (section 5) as well as Auckland Unitary Plan: Operational, Chapter M, Appendix 16 Guideline for native revegetation plantings.

This HRP details the restoration required to compensate for the loss of lizard habitat as a result of the Project. Locations for lizard habitat restoration have been identified and were selected based upon the proximity to the Project Area, future development effects and ability to enhance existing connections.

The Plan includes:

- Identification of 1.15 ha for EB2 and 0.30 ha for EB3R (combined 1.45ha) to be restored as lizard habitat.
- Detail the restoration required at each site to replace and enhance lizard habitat including the planting design (including vegetation to be retained), and supplementary refuges.
- Details of fencing to protect and demarcate plantings (where appropriate).
- A programme of establishment and post establishment protection and maintenance of plants (fertilising, weed removal/spraying, replacement of dead/poorly performing plants, watering to maintain soil moisture, maintenance programme). All plantings shall be maintained for a minimum of 10 years.
- Details of the proposed plant species, plant sourcing (locally eco-sourced native pioneer species that are adapted to the Auckland environment are preferred in the first instance), plant sizes at time of planting, plan of the planted area within the planting area required, density of planting, and timing of planting.

3 Stakeholder Engagement

Consultation with AC, DOC, and Mana Whenua has been undertaken in the development of the HRP, by way of various hui and email correspondence. Discussion and recommendations are summarised in the table below.

Table 2 Stakeholder engagement and hui record and details

Date of Hui	Stakeholder representative in attendance	Matters discussed	Response from Stakeholder
30 June 2022	Ngāi Tai ki Tāmaki Zaelene Maxwell-Butler Ngāti Tamaoho Lucie Rutherford Te Patukiriri Paulette Reidy Ngāti Tamaterā Eddie Ngāti Whanaunga Gavin Anderson Ngāti Maru Geoff Cook	Potential for lizards within footprint, habitat identified as potential for copper skink and ornate skink (At Risk – Declining). Suitable relocation and restoration sites within and adjacent to designation being identified SEART Mitigation/compensation to include restoration and enhancement planting.	Please see Appendix B: Uru Whakaaro Lizard Management Plans
12 April 2022	Auckland Council Parks team		Please see Appendix B: Uru Whakaaro Lizard Management Plans
6 July 2023	Alica Wong - Auckland Council Biodiversity Officer		Response TBC.
3rd October	Uru Whakaaro Ltd Natalie Couch	Habitat Restoration Plan and Planting Plan reviewed	Please see Appendix B: Uru Whakaaro Lizard Management Plans

4 Roles and responsibilities

The roles and responsibilities of staff and contractors responsible for implementation of the HRP is set out in the table below. Team members will have the appropriate experience, project involvement and responsibility to ensure that all relevant aspects of Eastern Busway are considered when making decisions on HRP implementation.

Table 3 Roles and responsibilities

Name	Role	Contact Details	Responsibility
Alex Bees	Environmental Lead	alex.bees@easternbusway.nz Ph: 027 264 2039	• Overall responsibility for SROP implementation including contractor monitoring/KPI compliance • Attendance at inspections (Section X) • Mana whenua liaison
Conor Reid	Senior Ecologist (AECOM)	conor.reid@aecom.com Ph: 027 777 4477	• Production of the HRP • Support on HRP implementation and inspections (as required)
TBC	Restoration/ maintenance Contractor	TBC	• Site preparation (Section X) and planting (Section X) • Attendance at inspections (Section X) • Implementing monitoring (Section X) and KPI confirmation (Section 9)

The listed activities must be carried out satisfactorily, to the standard determined by the Project Ecologist, to achieve effective Ecological Restoration.

4.1 Inspection requirements

Progress inspections will be undertaken by the client and/or their representatives at the stages of restoration delivery detailed in the table below. A checklist has been provided in Appendix A, to aid the Restoration Contractor(s) and the client to monitor progress.

Table 4 Progress inspections by client and/or the clients representative

Inspection	Attendees
On site start up meeting to ensure that all parties fully understand the works to be delivered	• Restoration Contractor(s) • Client • Project Manager • Client representatives (Project Ecologist and Project Landscape Architect)
Inspection of site post set up (prior to planting)	• Client and/or the client's representative
Inspection post planting	• Client and/or the client's representative
6 monthly inspection of maintenance in Year 1 post planting	• Client and/or the client's representative

Inspection	Attendees
Annual inspection of maintenance from Year 2 to Year 5 post planting	• Client and/or the client's representative
Final inspection at Year 10	• Client and/or the client's representative

On conclusion of each inspection the client's representative will produce a short report summarising progress and detailing any remedial action that is required. This does not replace the Restoration Contractor(s) monitoring responsibilities (Section 10). The report produced by the client's representative will be shared with the Restoration Contractor(s).

5 Consent Conditions

This HRP has been prepared in accordance with the AC resource consent conditions. This document is intended to provide a framework and information that will assist in the implementation of these requirements.

If there is a conflict between the HRP and the corresponding legislative requirements, including consent conditions, then the legislative requirements shall prevail.

Relevant conditions in the Regional Resource Consent Conditions regarding the habitat restoration plan for EB2 and EB3R.

Number (EB2/EB3R)	Condition	Management Plan Section Reference
42/88	The Consent Holder must submit a Habitat Restoration Plan (HRP) for certification in accordance with Condition 11/13.	This plan
43/89	The purpose of the HRP is to detail the site-specific lizard habitat restoration measures which addresses the impacts of the Eastern Busway Project (Package EB2 and EB3R) on lizard habitat as identified within the 'Eastern Busway: Ecological Impact Assessment report'.	This plan
43/89a.	The HRP must be developed in accordance with the conditions of the LMP (Conditions 40 to 41/84 to 85), in order to ensure the habitat(s) that lizards are relocated to will support viable native lizard populations for all species present pre-development.	This plan
43/87b.	The HRP must include: i. Identification of areas to be restored as lizard habitat to the quantum of 1.15ha (EB2) / 0.3ha (EB3R) as identified in 'Eastern Busway: Ecological Impact Assessment report';	6
	ii. Detail of the restoration required at each site to replace and enhance lizard habitat including the planting design (including vegetation to be retained), and supplementary refuges;	8.1 and 8.3
	iii. Demarcation and protection of all plantings by fencing (where appropriate);	9.7
	iv. A programme of establishment and post establishment protection and maintenance of plants (fertilising, weed removal/spraying, replacement of dead/poorly performing plants, watering to maintain soil moisture, maintenance programme). All plantings must be maintained for a minimum of the 3 (three) years; and	9.9 and 10
	v. Details of the proposed plant species, plant sourcing (locally Eco-Sourced native pioneer species that are adapted to the Auckland environment are preferred in the first instance), plant sizes at time of planting, plan of the planted area within the planting area required, density of planting, and timing of planting.	9
44/90	The HRP planting requirements must be implemented during the first planting season following the Eastern Busway Project (Package EB2 and EB3R) being operational. If the weather in that planting season is unsuitable for planting, as determined by the Council, the landscaping must instead be implemented at the first practicable opportunity thereafter. The next practicable opportunity must be agreed to by the Council.	11

6 Restoration Site Description

The location for lizard habitat restoration has been identified and was selected based upon the proximity to the Project Area, future development effects and ability to enhance existing connections for lizards. The area selected is located in between the southeastern highway (SEART) and the Tamaki River, contiguous to the Pandora Place Esplanade Reserve, and is henceforth referred to as “the Site”. It is currently managed grass adjacent to the highway and includes areas of coastal margins with exotic scrub and exotic-dominated treeland. Species composition is further detailed in Section 8.3. The Site will cover 1.45 ha of planting and is shown in Figure 2 below.

Figure 4 Restoration Site

7 Pre-planting site assessment

Plants are adapted to survive in specific areas. Not every plant will do well in the same environment. In order to ensure the survival of revegetation planting, it is important that the appropriate plants are selected for the Site. The following two aspects have been considered when selecting appropriate plants for the Site. They are:

- Sourcing from ecological district (refer Section 9.2)
- Appropriate plants for the locality of the planting – slope, soil characteristics, wind, aspect, degree of shading, distance from the coast, wetness of the site and frost zones (refer Section 7.1 - 7.5)

The following information is provided to ensure an appropriate pre-planting plant assessment to meet the above requirements.

7.1 Ecological District

The Site is situated in the Tāmaki Ecological District. The geology of the district is characterised by sandstone, siltstone, and minor limestone with basaltic scoria cones, tuff rings, lava flows, and areas of alluvium within stream corridors (McEwen 1987). The climate has characteristically warm, humid summers and mild wet winters. Rainfall is typically plentiful throughout the year.

The landscape is urban, with residential areas throughout and commercial activities within Pakuranga Town Centre. Vegetation within the wider Project Area is limited but includes planted and amenity areas associated with private property, maintained roadside berms and reserves. Prior to forest clearance and land modification, historical forest cover would have been representative of characteristic North Island lowland forest with the dominant historical terrestrial ecosystem types (Singers & Rogers, 2014) within the Project Area would have been 'kauri, podocarp, broadleaved, beech forest' (WF12). In the coastal context this habitat would have been dominated by podocarps, including tānekaha (*Phyllocladus trichomanoides*), rimu (*Dacrydium cupressinum*) and miro (*Prumnopitys ferruginea*). Broadleaf species would have included tawa (*Beilschmiedia tawa*), northern rātā (*Metrosideros robusta*), rewarewa (*Knightia excelsa*), and kohekohe (*Dysoxylum spectabile*) (Singers et al., 2017).

Historically, the area would have supported a diverse range of invertebrates, amphibians, reptiles, birds, and bats (Singers et al., 2017). However, the ecological district has been heavily modified, with the drainage of freshwater systems and clearance of terrestrial indigenous vegetation in support of urban development.

7.2 Soil characteristics and drainage

Soils in the district are mainly composed of volcanic ash soils and are generally silty, friable, and free draining (McEwen 1987). Soils within the SEART restoration area are largely reclaimed and therefore may be compacted and subject to water logging in winter and drought in summer. Existing soil is described as engineered fill, with a thin layer of 50 – 200 mm of existing topsoil (AECOM & BECA drillhole/borehole log DH10). Subsoil is variable, clay silt, gravel, and poorly graded angular basalt, described as wet near the surface and dry below, indicating compaction and lack of infiltration.

Due to variable soil conditions, decompaction and cultivation is recommended to promote vigorous root and plant establishment. This may include mechanical decompaction (outside root zones of any remaining trees), scarifying or ripping to 300 mm depth. Where topsoil has been removed or is absent/limited (<300 m), imported topsoil may be required.

7.3 Area topography

The Site is generally flat with a small steep slope along the coastal margin of the Tamaki River tributary.

7.4 Site exposure

Th Site is mainly mown grass and is likely to be exposed to strong sunlight due to lack of shade. Scattered stands of mature exotic trees planted vegetation and weed dominated scrub also occur along the coastal edge. The SEART site is generally sheltered and should not be exposed to strong winds or salt spray. However, the Site is adjacent to the Tamaki tributary, and low-lying areas are susceptible to coastal/river flood inundation.

7.5 Extent of existing native vegetation on site

There is recently planted (<20 years old) native vegetation (PL.1) to the west of the Site, including mānuka (*Leptospermum scoparium*), tī kōuka/cabbage tree (*Cordyline australis*), karamū (*Coprosma* spp.), karo (*Pittosporum crassifolium*), harakeke/flax (*Phormium tenax*), taupata (*Coprosma repens*) and pōhutukawa (*Metrosideros excelsa*). Species composition of vegetation within the Site is further detailed in Section 8.3.

8 Site preparation

Sections 8.1 to 8.5 detail the site preparation works to be undertaken at the Site prior to planting taking place.

8.1 Lizard refugia

Prior to site clearance, habitat items (untreated logs/boulders) found in situ and salvaged from felled trees will be manipulated into log piles under guidance from the Project Herpetologist. The timber will be stacked in two ways:

- Log pile design (Figure 3): straight cut logs minimum 60 cm wide (where practicable) and 0.5 - 1 m long stacked horizontally.
- Wooden disc stack design (Figure 4): felled logs between 60 cm wide (where practicable) cut into 10cm discs and stacked vertically. Gaps between discs should be <7mm apart.

When stacked and secured, the interstitial spaces between the timber will be small enough (<7mm) to prevent mice from accessing the refugia and predating on the lizards. Each log pile/disc stack will have a footprint of approximately 2 m^2 and will be stacked to approximately 0.5 m in height. The Project Ecologist will be present to guide the Restoration Contractors on the installation of these features.

Initially ten refugia (x5 log and x5 disc style) will be located and spaced between the proposed relocations sites (Pandora Esplanade Reserve (SEART), Edgewater Drive Esplanade Reserve and Fremantle Place Esplanade Reserve). These will be situated in existing habitat with structural diversity and ground cover.

Figure 5 Traditional log pile (refugia) design

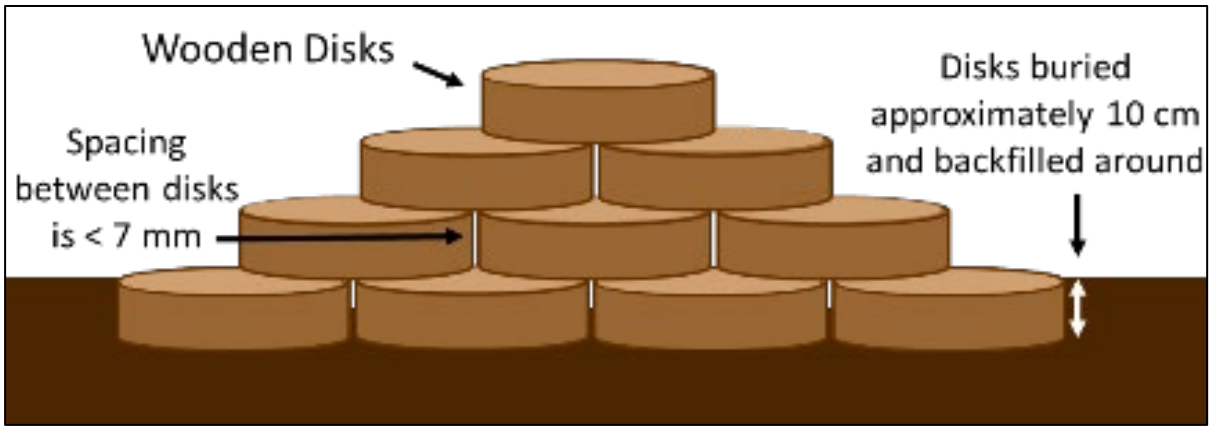

Figure 6 Wooden disc piles for lizards

8.2 Lizard salvage

All indigenous lizards are fully protected under the Wildlife Act 1953. Therefore, it is an offence to kill or injure indigenous lizards. There is the potential for copper skink to be present within the grassland and scrub in the Site. The EB2/EB3R Lizard Management Plan includes specific provisions for vegetation removal where there is the potential to harm lizards. The Restoration Contractor should take note of these provisions prior to vegetation removal and should consult the Project Ecologist if vegetation removal is going to occur.

8.3 Retention of existing vegetation

The main vegetation units include mixed native and exotic treeland, planted native vegetation, and exotic grass. All native vegetation should be retained, while exotic vegetation will be retained if it:

- Provides habitat structure and diversity (shade, groundcover, leaflitter and woody debris);
- Provides hydrological benefits to adjoining streams, such as bank stabilisation, instream shade and riparian buffer interception
- Does not negatively affect native fauna or flora.

Vegetation should be removed if it:

- Is a known pest species listed in the National Pest Plant Accord (NPPA) (Ministry of Primary Industries, 2020) or Auckland Regional Pest Management Plan (Auckland Council, 2020);
- Is a plant that is invasive and would adversely outcompete with proposed native planting.

8.3.1 Mixed exotic treeland (retained exotic canopy species)

Existing mature trees include native pohutukawa and non-invasive exotic species (e.g., *Casuarina sp*., *Eucalyptus sp.,* macrocarpa, and poplar). Mature trees provide leaflitter and woody debris suitable for native lizards. As these species are non-invasive and provide existing habitat within the restoration site they will be retained where possible. To encourage natural succession to a native dominated habitat long term, proposed planting will focus on infill and canopy gap planting within these areas.

8.3.2 Understorey and planted vegetation (retained regenerating natives)

Throughout the lizard relocation site and habitat restoration areas, there are sparse regenerating, bird dispersed, natives such as karo (*Pittosproum spp.*), karamū, māhoe (*Melicytus ramiflorus)*, cabbage tree/tī kōuka and red matipo (*Myrsine australis*), largely associated with exotic treeland understorey. There are also more extensive stands of native restoration plantings (PL.1) within the proposed restoration area. All existing native species should be retained and protected during the weed pest control stage of the project. Some individuals will be inconspicuous among weed dominated vegetation, it is the responsibility of contractors to identify and protect native trees and scrubs.

8.3.3 Ground cover (retained native/exotic ground cover)

Native groundcover species that occur sporadically include ferns such as rasp fern (*Doodia australis*) and giant umbrella sedge (*Cyperus ustulatus*). These should be retained and protected from disturbance. Some individuals will be inconspicuous among weed dominated vegetation and it is the responsibility of contractors to identify and protect native ground cover.

Most of the ground cover throughout the lizard translocation site and habitat restoration areas are exotic dominated grasses and herbaceous species. Excluding kikuyu grass (*Pennisetum clandestinum*) these can largely be retained. Once planted with native species the native canopy cover will largely shade out exotic groundcover.

Although identified as a pest plant, tradescantia (*Tradescantia fluminensis*) can provide important groundcover for native skink, where native cover is absent. Therefore, where it is not adversely affecting indigenous regeneration, in this context tradescantia will be retained. Similarly, kikuyu grass can provide suitable ground cover for native lizards. However, it forms dense mats, smothering native vegetation and suppressing seedling recruitment. Therefore, within planting areas this species will

likely need to be controlled to allow establishment of a native canopy. However, where this species is not inhibiting the growth of planted specimens it can be retained as important ground cover habitat.

The Site Landscape Plans (Appendix C) provide the locations of vegetation on the site to be retained. If the Restoration Contractor is unsure if any particular area of exotic vegetation should be retained, then the Project Ecologist should be engaged to clarify the matter.

Opportunity shall be provided to Mana Whenua to be present during pre-planting site preparation works.

8.4 Pre-planting weed management

8.4.1 Pest plant control

Pest plant species will be removed as part of the enhancement works associated with the stream. Pest plants are defined as those species requiring control or eradication by:

- The Biosecurity Act 1993 and subsequent amendments
- Auckland Regional Pest Management Plan 2020-2030 (Auckland Council, 2020)

It is the Restoration Contractor's responsibility to control all weeds within the Site. A list of pest plant species that may be encountered by the Restoration Contractor is presented in the table below.

Where any of these pest plant species are identified, then current best practice for their control is to be followed.

It is the Restoration Contractors responsibility to ensure that prior to starting any pest plant removal works within the Site that they have undertaken a detailed risk assessment and put in place appropriate protection measures for all members of staff.

Table 5 Pest plant species to be controlled

Common name	Scientific name
Black wattle	*Acacia mearnsii*
Madeira vine	*Anredera cordifolia*
Moth plant	*Araujia sericifera syn. Araujia hortorum*
Climbing asparagus	*Asparagus scandens*
Convolvulus/great bindweed	*Calystegia sylvatica*
Pampas grass	*Cortaderia jubata and C. selloana*
Hawthorn	*Crataegus monogyna*
Montbretia	*Crocosmia x crocosmiiflora*
Japanese spindle tree	*Euonymus japonicus*
Ivy	*Hedera helix*
Ginger	*Hedychium flavescens* and *H. gardnerianum*

Common name	Scientific name
Blue morning glory	*Ipomoea indica*
Tree privet	*Ligustrum lucidum*
Chinese privet	*Ligustrum sinense*
Japanese honeysuckle	*Lonicera japonica*
Tuber ladder fern	*Nephrolepis cordifolia*
Brush wattle	*Paraserianthes lophantha*
Phoenix palm	*Phoenix canariensis*
Bamboo species	*Phyllostachys* spp., *Pleioblastus* spp. *Pseudosasa* spp.
Blackberry (wild aggregates)	*Rubus fruticosus* agg.
Climbing dock	*Rumex sagittatus*
Palm grass	*Setaria palmifolia*
Woolly nightshade	*Solanum mauritianum*
Monkey apple	*Syzygium smithii syn. Acmena smithii*
Gorse	*Ulex europeaus*
Periwinkle	*Vinca major*
Arum lily	*Zantedeschia aethiopica*

8.4.2 Vegetation clearance

Grasses, annual weeds, and tradescantia will only be removed once restoration plants have stabilized and can support soil stability, unless it is within the vicinity of the planting hole. These plants are being retained to maintain topsoil, maintain slope stability and provide habitat (e.g., lizards) while native habitat is developing.

The table below lists the likely method of weed control, including herbicide and mechanical control. Herbicide application should be minimised where possible, particularly near waterbodies. It is the Restoration Contractor's responsibility to control all weeds within the Site.

The Restoration Contractor should take note of the following:

- Restoration Contractors will be suitably qualified and experienced for the method of delivery and type of chemical being used
- All herbicide application will be undertaken by a Registered Chemical Applicator or at a minimum by a Growsafe Approved Handler. This is particularly important for any herbicide application around or near waterways and within wetland areas
- Operators must apply industry best practice methods and be in alignment with the Management of Agrichemicals (NZS 8409:2004) guidelines. Records of herbicide application

must be kept, including what has been used, where, application rates and date of application

- Restoration Contractors will be suitably qualified and experienced for the method of delivery and type of chemical being used.
- All spray equipment is to be carefully calibrated to prevent over or under dosing.
- No herbicide containers, empty or full, are to be left unattended on Site at any time.
- Where herbicide with residual effects is applied, the Restoration Contractor shall ensure that no planting proceeds until the exclusion time frame specified by the manufacturer has passed (no planting is to occur within two weeks of the use of glyphosate).

Table 6 Methodology and timing of plant pest control and disposal

Species	Method of control	Timing	Disposal
Climbers and dense groundcover species e.g., blackberry, jasmine, blue morning glory, climbing asparagus, Japanese honeysuckle	Pest climber species should initially be controlled by spray. Two to three follow-up treatments with both spray and mechanical removal may be required prior to replanting. Mechanical removal should include cutting the stems at ground level and raking the plant material off the area to be planted. Then mechanically breaking down plant material to reduce the scale of this material. Spray new foliage when regrowth is approximately 800 to 1000 mm long.	Weed control work in this context is also site preparation for the subsequent stage or years planting, so there is an important relationship between resourcing and planning regular weed control sessions which in turn ensure future planting areas are well prepared in advance. The last treatments should be more than two weeks prior to planting to ensure there is no residue in the soil	Dead material can be retained onsite in small piles, where it does not pose a risk to further spread or does not obstruct future plantings. If offsite disposal is required due to the quantity of material, it is the Restoration Contractors responsibility to remove this material and dispose of it in a suitable refuse transfer facility.
Trees e.g., phoenix palm, alder, black wattle, tree privet, hawthorn, monkey apple	Pest tree species should be controlled using cut and paint treatment. Cut and paint stump of the tree close to the ground with a straight flat cut. The cut should be flat so ensure the herbicide can absorb into the cut surface. Paint the stump with glyphosate or approved chemical within 30 seconds of cutting to get uptake of the herbicide before the sap stops flowing. Use a squeeze bottle or paintbrush to just wet the surface, avoiding excess run-off of herbicide onto surrounding plants and soil. A chemical paste or gel formulation is ideal for this control method.		Depending on the species woody material can be retained on site where it does not pose a risk to further spread or obstruct future plantings. Care must be taken to try and minimise the spread of seed while handling. If offsite disposal is required due to the quantity of material, it is the Restoration Contractors responsible for the disposal of cleared

Species	Method of control	Timing	Disposal
			material offsite at a suitable refuse transfer facility.
Groundcover species e.g., kikuyu, montbretia, palm grass, periwinkle, tuber ladder fern	Pest groundcover species should initially be controlled by blanket/ mass spraying followed up with spot spraying as required. Two to three follow-up treatments may be required prior to replanting.		N/A

8.4.3 Timing of pest plant management

The Restoration Contractor should allow sufficient time for pest plant management to ensure the future planting areas are well prepared in advance. Sufficient control of some pest species may take several herbicide applications before planting with native species is feasible.

Other practical matters that may influence the timing of pest plant management include:

- Herbicide treatment should be applied during the growing season (ideally spring/summer);
- The last herbicide treatments should be more than two weeks prior to planting to ensure there is no residue that could affect new planting.

8.5 Domestic waste

Any waste material identified on site e.g., illegally dumped inorganic domestic waste is to be removed by the Restoration Contractor and correctly disposed of offsite.

9 Planting

A Site Landscape Plan has been prepared in collaboration with EBA Landscape team, refer to Eastern Busway Urban Design and Landscape Specification EB-0-D-0-UD-RP-100001 and proposed plans in (Appendix C) and must be complied with when undertaking planting on the Site.

The Restoration Contractor will need to provide offsite safe storage for plants and other equipment as there will be no facilities on site.

The Restoration Contractor will need to undertake a quality control assessment of the plant stock and the planting. Things that should be taken into consideration include:

- Plants are healthy and vigorous
- Correct species received on site
- The Restoration Contractor has confirmed with the nursery that plants have been hardened off
- Plants are not root bound
- Plants are all vertical when planted
- Fertiliser tab inserted with plant into ground if necessary (refer Section 9.5);
- Soil firmed but not overly compacted around each plant; and
- Planted at the correct depth (refer Section 9.4).

The Restoration Contractor will set out the plants specified in the Site Landscape Plan (Appendix D) prior to planting. Care needs to be taken to ensure that plants do not dry out while waiting to be planted.

9.1 Timing

Planting will be completed during winter (April to August) so that plants are well established prior to summer. A planting schedule is provided in Section 13. The period coincides with wet ground conditions which gives plants time to establish without requiring regular water. Avoid planting on hot, sunny, or windy days as these conditions can quickly dry out small plants. As the Site is coastal, frosts are unlikely and therefore frost tender species can be planted with low risk of failure.

Planting areas will likely be staged, this may include early planting areas that avoid proposed works and later planting where there may be short term conflict with temporary construction areas.

9.2 Eco-sourcing

Eco-sourcing refers to the New Zealand ecological districts, which are based on the underlying geology, landforms, and soils which affect the plant species found within an area. As the project site sits entirely within the Tamaki district all proposed planting will be sourced from this district or directly adjacent Hunua/Manukau districts. This will ensure all specimens are adapted to the specific conditions of the area and ensure appropriate genetic diversity. Additionally, plants will be selected to be most appropriate for the specific conditions (slope/geology/exposure/degree of shading/coastal) within the habitat restoration area. The following key parameters reflect specific conditions appropriate to the habitat restoration site, detailed in Section 7:

- Ecological district – Tamaki
- Soil Characteristics – alluvial and fill (reclaimed land)
- Soil drainage – poorly drained (compacted fill)
- Topography and aspect – flat/gently sloping to the southwest, with a steeper coastal edge
- Exposure – sheltered coastal upper estuary. Frost free and partially susceptible to coastal/ river flood inundation
- Existing vegetation - is largely exotic grass and treeland (*Casuarina sp*., *Eucalyptus sp*., , macrocarpa and poplar), with areas of planted natives (planted regenerating and scattered pohutukawa). There are several sparse regenerating bird dispersed natives (karo, karamū, cabbage tree/tī kōuka and red matipo) throughout.

9.3 Size and density

As the primary purpose of planting will be to create habitat suitable for native terrestrial lizards, the planting mix has been adapted to include ground cover and low growing shrubs. This is designed to create a relatively open canopy to allow basking behaviour. However, the areas selected for replanting is currently dominated by competitive weeds such as kikuyu grass and pampas. Despite proposed control, these species will likely reinvade the Site and will likely pose a long-term risk to the establishment of native species in this locality. As such planting size and density will be an important parameter to improve likely success of the restoration area. Planting larger size plants is recommended (grade ≥2.0 L) and high density ≤1 m spacing (10,000 stems per hectare) is recommended to encourage competitive growth from the native species and to reduce the amount of weed control required. Smaller shrubs, grasses and ferns can be smaller size but will need to be spaced closer (0.6 m) and larger specimen trees (≥5.0 L) can be spaced more widely at 5 m apart (Auckland Council, n.d.).

9.4 Planting depth

Plants shall be planted in hand dug holes ensuring that the hole is dug to at least twice the size of the respective plant container. The base of the planting hole is to be broken up/roughened with a double spade cut to shatter soil structure to allow rapid root formation and nutrient uptake.

9.5 Fertiliser

Fertiliser application should be avoided due to proximity to waterbodies and the relatively low nutrient requirement for native revegetation. Where appropriate, compost application within each planting hole is preferred to establish improved growing conditions. If application of fertilizer is deemed necessary outside of riparian margins, this should only include native species fertilizer/slow-release tablet applied into the base of the planting hole. Mulch (bark and woodchip) within waterlogged soils can strip nitrogen as it decomposes, which in turn can result in poor growth without fertiliser application.

9.6 Mulching

Mulching is an important tool for establishing new planting, by retaining soil moisture and supressing weed growth. Standard revegetation planting will often specify blanket application of 100 mm of bark/woodchip mulch to provide maximum weed suppression. However blanket application of mulch will supress ground cover habitat (including exotic grass species), which provides temporary habitat for lizards until the plantings have established. Additionally, banket application of mulch will homogenise the ground conditions within the restoration area, reducing habitat complexity for native lizards.

Therefore, the entire planted area within the restoration site must not be blanket mulched. As small stacher / slow growing species are more vulnerable to weed invasion (i.e. Transpower Restriction Zone Mix and Edging Mix), blanket mulch (100mm) will be required in this area, due to long term risk from kikuyu grass and pampas competition. Outside the Transpower Restriction Zone and Edging Mix areas, existing canopy (from existing trees) and proposed robust canopy forming (Infill/understorey mix, Coastal Edge Mix and Revegetation Mix) will rapidly surpass weed growth, with appropriate releasing as required. Alternatives to bark chip mulch (and spraying), include individual mini-mulch mats (cardboard, wool, or coir), straw mulch and/or plant guards to aid establishment and prevent smothering. Mulch mats may also provide additional refuges for lizards.

Bark/woodchip mulch should also be avoided in riparian areas or around steep terrain where water inundation may disperse bark chip. If mulching is required in these areas wool or coir matting can be pegged into place.

9.7 Fencing and staking

Fencing restoration areas, can be useful to prevent access to exotic browsing animals (wild/livestock) or where disturbance from public assess and or domestic dogs are likely to disturb sensitive habitat.

There is currently no existing fencing in place within the proposed relocation site/restoration area. As the Site is urban/reserve there is no risk from grazing/browsing livestock, and the only likely grazing/browsing pest species are rabbits and possums. As standard fencing will not deter these species, fencing is not proposed. Plants should be protected from interference (e.g., from pūkeko vandalism/theft) by staking with a 9” steel ground staple set at 45° or bamboo stakes (Auckland Council, 2021).

Additionally, the esplanade reserve on the north side of the creek has no formal public access and therefore disturbance from human activity or domestic dogs will be unlikely. However, if more formal access is proposed in the future, fencing should be reassessed if necessary.

9.8 Planting areas

The plant species lists, and planting area are presented in Appendix C Eastern Busway Urban Design and Landscape Specification EB-0-D-0-UD-RP-100001.

The following areas are to be planted:

- **Canopy Gap Mix** – Where no existing vegetation occurs (except grass), species suitable for primary planting in open areas. These species include a diverse mix of hardy ground cover, scrub and canopy forming species which will provides successional habitat, between other

planting areas. The diverse habitat structure will provide habitat for native lizards. These plants shall be kept free from competitive weeds using individual mini-mulch mats and or hand releasing / spot spraying.

- **Coastal Edge Mix** - Restoration of the coastal margin, will include appropriate coastal wetland and coastal margin species. This will include a diverse mix of salt tolerant ground cover and coastal edge species and coastal broadleaf trees outside the inundation zone. The diverse habitat structure will provide habitat for native lizards. These plants shall be kept free from competitive weeds using individual mini-mulch mats and or hand releasing / spot spraying.
- **Infill Mix** - Where existing vegetation will be retained (largely exotic treeland), species suitable for underplanting between existing vegetation will be planted. These species include a diverse mix of shade tolerant ground cover and canopy forming species. This will provide a shady habitat corridor suitable for native lizards. These plants shall be kept free from competitive weeds using individual mini-mulch mats and or hand releasing / spot spraying.
- Edging Mix – The edge mix will form a buffer between the planting area and the proposed stormwater swales and road construction. The edge planting mix includes low, dense ground cover planting, which will provide groundcover and open basking opportunities for native lizards. As the low planting will be vulnerable to ongoing competitive weed invasion (due to low stature planting), typical blanket mulching or matting will be required to suppress weeds.
- Transpower Restriction Zone Mix - Due to overhead powerlines, the Transpower restriction area has a vegetation height restriction of 2m. As such the planting mixed has been designed to include low stature groundcover, shrubs and scrub habitat. The diverse habitat structure will provide groundcover and basking opportunities for native lizards. As the low planting will be vulnerable to ongoing competitive weed invasion (due to low stature planting), typical blanket mulching or matting will be required to suppress weeds.

9.9 Post-planting maintenance

The purpose of maintenance is to achieve native plant establishment and canopy closure of the ground of >80% within 5 years, with a final 10-year check. The consent condition specifies 3 years maintenance; however, this has been extended to 5 years with a final 10 year check to account for assumptions made as part of offset/compensation Biodiversity Compensation Model (BCM), detailed in Eastern Busway EB2 and EB3 Residential Terrestrial and Freshwater Ecological Effects Assessment Document Number: EB234-1-PL-RP-Z2-000031, Appendix 4. The focus will therefore be on 'release weeding' of planted areas and the removal of pest / competitive weeds.

In the first year a minimum of 12 maintenance visits will be required. The Restoration Contractor needs to consider when key growing periods are and increase the intensity of monitoring and maintenance during those periods (e.g., spring). The Restoration Contractor at the start of the maintenance period will indicate to the Project Manager and the Project Ecologist their proposed schedule of maintenance prior to commencing. After the first year it may be appropriate for the number of maintenance visits to decrease. However, this would need prior approval from the Project Ecologist or Landscape Architect. Additional pest plant control may be required in spring when the ground warms and seeds in the soil germinate.

Opportunity shall be provided to Mana Whenua to be present for post-planting maintenance to exercise kaitiakitanga by assisting in the protection and monitoring of established planting.

9.9.1 Herbicide use

The Restoration Contractor should ensure the application of herbicides is consistent with the purpose of this Plan, which is to provide habitat for native wildlife. As herbicide use has the potential to impact non-target plants and invertebrates/microorganisms their application should be minimised where possible. General recommendations:

- Manual release /weed control should be prioritised where possible.
- Avoid herbicide use near streams or stormwater outlets, unless approved by Auckland Council.
- Choose herbicides with maximum selectivity for the target species.
- If spraying is approved, spray band widths must be no more than 200 mm in area (using a protective spray nozzle or cone).
- Grazon is to be used instead of other herbicides around newly planted areas including *Carex* sp. cabbage trees and flax (monocots).
- Glyphosate or a similar approved chemical will be used around shrub and tree species.
- The Restoration Contractor shall control all weeds and vegetation within 250 mm of plant stem or drip line as stated below
- Vegetation (weeds, grasses etc) does not exceed 50 mm prior to the initiation of weed control operation.
- Woody weeds (e.g. gorse, etc.) do not exceed 150 mm prior to the initiation of chemical control. During ongoing maintenance woody weeds will be cut and immediately treated with an appropriate herbicide.

The Restoration Contractors staff undertaking weed and pest control will be expected to demonstrate identification skills necessary to ensure natural regeneration is not jeopardised by incorrect plant identification during weed work. Natural regeneration occurs in different forms i.e., grass seedlings, broadleaf and conifer seedlings, therefore, the Restoration Contractors staff must be familiar with what is trying to be achieved.

9.9.2 Plant replacement

Plants will be monitored by the Restoration Contractor and verified by the Project Ecologist/Landscape Architect during the first five years following planting to identify and replace any plant losses. If possible, the cause of the losses should be recorded and remedied as required. For example, if rabbit herbivory is the cause for numerous losses, pest control strategies should be implemented to manage the problem. If losses do occur, like-for-like species replacement of failed specimens will be required (refer to Section 11 for trigger levels). Where the local conditions (e.g. soil moisture / canopy cover) has impacted species loss, replacement planting should include more appropriate species to suit the conditions.

9.9.3 Watering

If autumn or winter has been dry, it is important to ensure that plants are well watered in after planting. If water is required by the Restoration Contractor, its sourcing is the Restoration Contractor's responsibility.

10 Annual monitoring programme

The table below details the monitoring that will be undertaken by the Restoration Contractor/ and the frequency of that monitoring. An annual monitoring report shall be provided to the client and will also include KPI compliance discussed in Section 11.

Table 7 Long-term monitoring

Effect being monitored	Monitoring	Description
Success of habitat creation	Monitor plant losses in accordance with trigger levels (minimum of first five years) detailed in Section 11.	Annually, for the first five years post planting the Restoration Contractor will check for plant losses. The Restoration Contractor will replace the losses in the following planting season (taking into consideration the Key Performance Indicators in Section 11).
Pest plants	Maintenance of plantings (weed control) (minimum of first five years).	The Restoration Contractor is responsible for the delivery of a minimum of 12 maintenance visits each year (unless it is agreed that the number of visits can be reduced in Years 2 to 5 post planting). The spacing of the maintenance visit will vary through the year. More will be required during the plant growing period e.g., spring.
Sufficient watering	Monitor rainfall (i.e., drought) in first year of planting.	Monitor during the first summer period (October – April). If there are prolonged periods without rainfall (>2 weeks) the Restoration Contractor will implement supplementary watering. The monitoring and water monitoring visits would be in addition to the minimum 12 visits listed for maintenance of plantings.
Grazing pressure	Monitor grazing by pest animals	Restoration Contractor to monitor damage to native plants caused by grazing. Restoration Contractor to inform client immediately of losses if they occur so that pest control can be implemented. The monitoring checks are to be undertaken during the plant maintenance visits (minimum of 12 visits).
10-year audit	An audit will be completed at contract completion, ten years post-planting.	The Project Ecologist or Project Landscape Architect will inspect the planting to ensure no more than 10% maximum plant loss, minimum 80% canopy coverage of plantings, and no adverse weed invasion. A summary report of the audit will be prepared by the Project Ecologist or Landscape Architect and submitted to AC. If Key Performance Indicators described in Section 11 are not met during the 10-year audit, then AC and the Project Ecologist or Project Landscape Architect will meet to determine the appropriate response.

11 Key Performance Indicators

This section provides a summary of the key performance indicators which the Restoration Contractor(s) will need to comply with:

- All planting shall include quality plant stock, true to form and shape with healthy signs of growth
- All planting shall be 100% complete at practical completion, with maximum 10% plant loss being acceptable at the completion of the defect's liability and maintenance period, losses are spread evenly throughout the planting and there are not noticeable bare patches
- Planting shall achieve an 80% canopy coverage of the ground by end of maintenance period (5 years after planting)
- Pest plants and animals shall be managed to ensure the establishment of all plantings
- All defects shall have been progressively rectified during the maintenance period
- At contract completion the Project Ecologist or Project Landscape Architect will conduct a 10-year audit and inspect the planting to ensure there is no more than 10% maximum plant loss, minimum 80% canopy coverage, and no adverse weed invasion.
- Opportunity is provided to Mana Whenua representative(s) to inspect the planting to ensure that it meets the Landscape Restoration Plans and specifications.

12 Mana Whenua involvement

Opportunities will be provided to Mana Whenua to attend inspections and monitoring. Notification will be provided to Mana Whenua by the Communications and Engagement Manager or Environment Lead for the project (once confirmed by the Contractor) at least 10 working days before the start of the inspection period.

13 Schedule

Schedule is listed below table.

Table 8 Programme schedule for tasks and responsibility of this HRP

Task	Year	Month											
		J	F	M	A	M	J	J	A	S	O	N	D
Pre-planting pest plant management	1												
Restoration planting	2												
Post planting maintenance[1] (pest plant management)	2												
Monitoring plant survival and replacement	3- 5												
Final monitoring against KPI's and project sign off[2]	10												

[1] See table above for an additional discussion for the scope of post planting maintenance. Inspection of silt fences and watering requirements are included in this task.

[2] To be completed by the Project Ecologist or Project Landscape Architect

14 References

AECOM & BECA drillhole/borehole log, DH10

Auckland Council. (n.d.). Native forest restoration guide. Retrieved from: https://www.aucklandcouncil.govt.nz/environment/plants-animals/plant-for-your-ecosystem/Documents/nativeforestrestorationguide.pdf

Auckland Council. (2020). Auckland Regional Pest Management Plan 2020 – 2030.

Auckland Council. (2021). The Auckland Code of Practice for Land Development and Subdivision Chapter 7: Landscape. Version 1.

Baber, M., Dickson, J., Quinn, J., Ussher, G., Heggie-Gracie, S., Jacson, S. 2021. Biodiversity Compensation Model for New Zealand – A User Guide (Version 1). Prepared by Tonkin & Taylor Limited. Project number 1017287.0000P

Baber, M, Christensen, M, Quinn, J, Markham, J, Ussher, G and Signal-Ross, R. 2021b): The use of modelling for terrestrial biodiversity offsets and compensation: a suggested way forward. Resource Management Journal, Resource Management Law Association (April 2021)

Baber, M., Dickson, J., Quinn, J., Ussher, G., Heggie-Gracie, S., Jacson, S. 2021. Biodiversity Compensation Model for New Zealand – Excel Calculator Tool (Version 1). Prepared by Tonkin & Taylor Limited. Project number 1017287.0000P

Biosecurity Act 1993.

Eastern Busway. (2022). Eastern Busway (EB2 and EB3 Residential): Terrestrial and Freshwater Ecological Effects Assessment.

Eastern Busway. (2023a). Eastern Busway: Draft Lizard Management Plan.

Eastern Busway. (2023b). Eastern Busway (EB2 and EB3 Residential): Draft Stream Offset and Restoration Plan.

Health and Safety at Work (Hazardous Substances) Regulations 2017.

Hitchmough, R. A., Barr, B., Knox, C., Lettink, M., Monks, J.M., Patterson, G.B., Reardon, J.T., van Winkel, D., Rolfe, J., Michel, P. 2021. *New Zealand Threat Classification Series* 35. Conservation status of New Zealand reptiles, 2021. 23 p, 978–1–99–115292–3–0.

McEwen, W. M. 1987. Ecological regions and districts of New Zealand: districts in the northern Kermadec to Mayor. New Zealand Biological Resources Centre, Publication No. 5, Part 1. Wellington: Department of Conservation.

Ministry of Primary Industries. National Pest Plant Accord (NPPA) 2020

Singers, NJD; Rogers, GM. 2014. A classification of New Zealand's terrestrial ecosystems. Science for Conservation 325. Department of Conservation, Wellington.

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. Auckland: Auckland Council.

Standards New Zealand. (2021). NZS 8409:2021 - Management of agrichemicals.

Appendix A: Restoration/Pest Control Contractors Checklist

Table 9 Checklist to monitor progress

Stage of works	Restoration Contractor	Client representative
Site preparation		
- Set-out		
- Identification of services (utilities)		
- Protection measures for existing vegetation and features of nature conservation value		
- Vegetation clearance		
- Fence installation		
- Lizard refugia installed		
- Monitoring track left clear of plantings and pitfall traps installed		
- Restoration Contractor(s) to be familiar with resource consent conditions		
Biosecurity		
- Plant pest control		
- Animal pest control		
Quality control		
- Plant selection and quality review		
- Planting		
- Maintenance of plantings		
Defects liability and maintenance		
- Inspect for plant failures		
- Remedy any defects		
- Final sign off at the end of defects period		
- Final sign off at the end of the maintenance period		

Appendix B: Uru Whakaaro Lizard Management Plans

Appendix C: Site Landscape Plan