Lizard Management Plan for Southern Link Inland Port, Mosgiel

Contract Report No. 7987b

Providing outstanding ecological services to sustain and improve our environments

Wildlands

Lizard Management Plan for Southern Link Inland Port, Mosgiel

Contract Report No. 7987b

August 2026

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1.0 Introduction

Southern Link Property Ltd (SLPL) has submitted a substantive application under the Fast Track Approvals Act (FTAA, 2024), for a 40-ha inland port located at 270–292 Dukes Road North, Mosgiel, Taieri. e3Scientific Ltd (e3s) prepared a Terrestrial Ecological Impact Assessment (EcIA) to support the application (e3s 2026).

The majority of the site comprises pasture grassland and surrounding shelterbelts with smaller areas of residential buildings and rank grassland (e3s 2026). A lizard assessment of the site was undertaken for the project (LizardExpertNZ). This included a lizard survey undertaken in November 2025, which recorded 16 southern grass skinks (*Oligosoma chionochloescens*; At Risk – Declining[1]) on site (e3s 2026). Proposed project works include the removal of lizard habitat (vegetation clearance and earthworks).

All indigenous lizards are protected under the Wildlife Act (1953) and lizards and their habitats cannot be disturbed or otherwise impacted without an approved Wildlife Act Authority (WAA) from the Department of Conservation (DOC), which is typically supported by a Lizard Management Plan (this document).

Following correspondence between SLPL and DOC, the WAA will be sought outside of the FTAA process and will be applied for separately following the standard WAA application procedure (Joanne Dowd, Senior Environmental Planner, Port Otago Ltd pers. comm. April 2026).

Port Otago Ltd, on behalf of SLPL, has asked Wildland Consultants Ltd (Wildlands) to prepare a Lizard Management Plan (LMP) and WAA application for the project. This LMP follows the principles outlined by DOC in their guidelines (DOC, 2019) (Table 1). These principles describe steps to take to enable the outcome of successful lizard management (including salvage, if determined to be the right mitigation option). These include undertaking a thorough assessment of the lizard values and site significance, both at the site of impact and potential release sites, and an assessment of the actual and potential effects of the works impact on the lizards present.

2.0 Wildlife Act 1953

Due to the presence of indigenous lizards, the proposed work requires a WAA under the Wildlife Act (1953).

All indigenous lizards are protected under the Wildlife Act (1953), and a permit under the Wildlife Act must be obtained from DOC before any indigenous lizards can be disturbed or relocated. Lizard mitigation work will be undertaken by a DOC-approved herpetologist who has been authorised to implement lizard management for the project through a WAA issued for the project.

This draft LMP is required to accompany the WAA application and must be submitted to DOC and approved prior to undertaking any activities that potentially impact lizard populations, and any lizard management proposed to mitigate these effects.

[1] The species at the site was referred to as tussock skink (*Oligosoma chionochloescens*; e3s 2026). However, the common name has recently been revised to southern grass skink (Hitchmough *et al*. 2026).

3.0 Implementation of the Plan

3.1 Responsibilities

Any lizard management must be carried out in consultation with DOC, appropriate iwi representatives, and Dunedin City Council (DCC) respectively.

Delivery of, and compliance with, this LMP will be the responsibility of the permit holder, who will liaise with the Site Manager, Project Herpetologist, and other contractors as/if required. Responsibilities for each management item in this LMP are outlined at the end of each section.

3.1.1 Authorised personnel

The authorised personnel for the project will be those suitably qualified as being trained and approved by the DOC lizard Technical Advisory Group, and they will be responsible for implementing lizard management at the site.

3.1.2 Pre-start meeting

Prior to any construction or earthworks on site, a pre-start meeting must be undertaken with the following personnel present on site:

- Site supervisor/Contractor representative.
- Project Herpetologist.
- Client representative.

At this meeting, the logistics and timings of mitigation techniques will be discussed, so that all parties understand their roles and responsibilities. In addition, a walk over of the site will be conducted with the above parties, to delineate the areas of works and ensure that all parties understand where works are permitted to occur.

3.2 Implementation

3.2.1 Earthworks outside of lizard habitat

Where any mutually agreed lizard habitat is not present, earthworks may proceed following the conditions below:

- If works begin before a WAA permit has been granted or outside of lizard season (October– April), a ten-metre setback between any proposed earthworks and lizard habitat (lizard habitats are highlighted in Figure 1) will be created by temporarily installing UV stabilised sediment control fencing, or an earthen bund. This will be installed by SLPL and will be assessed by the herpetologist prior to earthworks commencing.
- The IDP must be followed (Appendix 3).

3.2.2 Earthworks staging

The earthworks are currently set out in three Stages (Appendix 4). The proposed timing for each Stage is below:

- Stage 1: proposed to commence in 2026/27.
- Stage 2: proposed to commence in 2030/31.
- Stage 3: proposed to commence approximately ten years after Stage 1 (*c.*>2036).

This LMP will be reviewed following salvage and monitoring of Stage 2. The review will be completed to determine if lizard habitats are the same as described in this LMP, and if any additional management is required.

Table 1 – Key Principles for lizard salvage and transfer in New Zealand and corresponding section in this LMP that details the application of each principle.

Key Principle	Summary	Section in this Document that Addresses the Principle
Lizard species' values and site significance must be assessed at both the impact (development) and receiving sites	One At Risk – Declining species, southern grass skink, is present at the development site. No lizard surveys have been conducted at the receiving site, but it is expected that southern grass skink will be the only species present.	Section 4.0 Section 7.4
Actual and potential development-related effects and their significance must be assessed	Effects include, but are not limited to, accidental injury/death/displacement, disturbance to lizards during earthworks, loss of indigenous lizard habitat and breeding failure/behavioural effects.	Section 6.0
Alternatives to moving lizards must be considered	Avoidance of lizards and their habitats is not possible. The entirety of the site and identified lizard habitat within the site will be earth worked.	Section 7.1
Threatened species require more careful consideration than less-threatened species	No Threatened species have been detected on site or are expected at the site. While highly unlikely, if they are encountered, the Incidental Discovery Protocol will address the unexpected discoveries, including Threatened species.	Section 4.0, Appendix 3
Lizard salvage, transfer and release must use the best available methodology	Use standard accepted procedures (DOC Toolbox for Herpetofauna; Hare, 2012a & Hare, 2012b).	Section 7.3
Receiving sites and their carrying capacity must be suitable in the long term	The receiving site is likely to be suitable for the species to be released. It will be enhanced through pest plant management, enhancement planting, the creation of additional habitat units and pest mammal management.	Section 7.4
Monitoring is required to evaluate the success of the salvage operation	Post-release monitoring is required for this salvage due to the substantial number of lizards predicted to be salvaged. Monitoring will be conducted to determine the success of the salvage and enhancement of the receiving site.	Section 8.0
Reporting is required to communicate outcomes of salvage operations and facilitate process improvements	Standard reporting is required to the DCC, DOC, and relevant iwi on the completion of works.	Section 9.0
Contingency actions are required when lizard salvage and transfer activities fail	Contingencies are accounted for throughout the lizard salvage process, including additional pest control and completion. The Incidental Discovery Protocol will also be followed throughout works.	Section 7.6


Dukes Road North
Stedman Road
Odlins Place
Legend
Site boundary
Cadastral boundaries
Lizard habitats
Low-quality
Moderate-quality
Location Map
Mosgiel
Dunedin
1
Data Acknowledgment
Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, ©
Report: 7989
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Client: SLPL
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Figure 1. Lizard habitat at the Southern Link Inland Port
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Scale: 1:5,000
Date: 29/06/2026
Cartographer: LW
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4.0 Lizard Values

A lizard habitat assessment and a lizard survey setup were undertaken during an initial site visit between 2–5 November 2025. The lizard survey recorded 16 southern grass skinks on site (e3s 2026).

The full results of the assessment and surveys are provided in the EcIA, which includes lizard habitat mapping (e3s 2026).

4.1 Impacted lizard habitats

The EcIA estimated the extent of lizard habitat at the site at 5.64 ha (e3s 2025). The site was visited by a Wildlands herpetologist on 13 May 2026 to reassess the lizard habitat. It was determined that much of the mapped area includes features that are not considered suitable lizard habitat, such as buildings, roads, gravelled areas, lawns, and densely shaded trees and hedges. Therefore, the extent of actual lizard habitat within the site is estimated to be approximately 2 ha.

The areas of lizard habitat from this assessment are outlined in Figure 1. The lizard habitat includes shelterbelts, rank grassland and curtilage areas. Habitats also include fence lines in the north-eastern paddock (which is grazed pasture), and these are recorded as likely lizard habitat. Of the proposed *c.*40 ha development, it is estimated that *c.*2 ha of lizard habitat will be impacted, with most of the habitat of low quality (Table 2). An initial estimate of southern grass skinks present at the site was between *c.*200–300 (e3s 2025). This is a coarse estimate based on the density at which skinks were caught or observed at the site. This estimate is likely lower following the reduction of habitats within the site (between 160–250).

Table 2 – Quality of lizard habitat on site and the estimated area within the site.

	Habitat Quality	Approximate ha
Stedman Road boundary area	Moderate	0.5
Rank grass along farm road	Moderate	<0.1
Curtilage areas	Low	1.3
Shelterbelt	Low	<0.1
Total area impacted	Low to Moderate	**2.0**

5.0 Ecological Significance

The habitats identified in Figure 1 meet the ecological significance criteria for rarity/distinctiveness in the proposed Otago Regional Policy Statement (pORPS 2021) and the National Policy Statement for Indigenous Biodiversity (NPS-IB; Ministry for the Environment, 2023) because of the presence of southern grass skink, which are nationally and regionally At Risk – Declining (Jarvie *et al.* 2025, Hitchmough *et al.* 2025). The presence of indigenous fauna at this site requires consideration under the NPS-IB, and particularly the NPS-IB's objective to achieve no overall loss in indigenous biodiversity.

6.0 Effects on Lizards

Potential effects on lizards resulting from the proposed development are broadly outlined in the EcIA (e3s 2025). Potential effects on lizards from the proposed development works have been assessed at a local population scale, using the Quality Planning Extent of Adverse Effects criteria (Quality Planning, 2017), and are detailed below.

6.1 Potential effects

The potential effects on lizards resulting from the proposed development are detailed below.

Accidental injury/death/displacement: The proposed works will result in the permanent displacement, injury and death of an estimated 160–250 individual lizards within the construction footprint. This effect is likely to be **more than minor** without mitigation.

Disturbance during earthworks: Disturbance during earthworks to lizards includes dust, vibration and noise. This disturbance is likely to disrupt normal behaviour, including social dynamics in lizard populations adjacent to the construction footprint as a result of construction activity. Across the site, this effect is likely to be **minor** without mitigation.

Habitat loss and fragmentation: The proposed activity is expected to result in the loss of *c.*2 ha of southern grass skink habitat. This will result in permanent habitat loss for the estimated 160–250 indigenous lizards at this site.

Southern grass skinks are estimated to be at moderate densities across the site. This species is classified as nationally At Risk – Declining and regionally Declining (Jarvie *et al.* 2025, Hitchmough *et al.* 2025). However, the surrounding land use (farmland, unmaintained pasture) provides contiguous habitat for this species. Therefore, at a local population level, the effect is likely to be **minor** for southern grass skink without mitigation.

Breeding failure/behavioural effects: The proposed works may lead to temporary effects on behaviour of lizards and/or social interactions, such as increased stress, leading to reduced population functionality, such as poor breeding and low population recruitment. This effect is likely to be **minor** without mitigation.

6.2 Significance of effects

The level of ecological effects on indigenous lizards without mitigation actions taken is presented in Table 3.

Table 3 – Potential significance of effects to lizards and their habitats without mitigation.

Effect	Level of Effect Without Mitigation
Accidental injury/death/displacement	More than minor
Disturbance during earthworks	Minor
Habitat loss	Minor
Breeding failure/behavioural effects	Minor

7.0 Lizard Management

In the sections below, we describe how effects on lizards may be avoided, remedied, or mitigated in the first instance.

7.1 Avoidance

Avoidance of lizards and their habitats at the site is not possible. The entire site will be earth worked to prepare for industrial development. In addition, small amounts of lizard habitat can be found widely throughout the site. Therefore, avoidance is not possible.

7.2 Ongoing site maintenance

Lizard habitats are restricted to small areas of ungrazed or unmaintained areas, such as fence lines, hedgerows, soil bunds, and house sites. Grazed pasture comprises the majority of the development site, surrounding the lizard habitats.

The areas of grazed paddocks should continue to be grazed/maintained to prevent the establishment of lizard habitat across the site.

If the grazed paddocks are left ungrazed, these may need to be managed through the same methods highlighted in this LMP (Section 7.3 Lizard salvage). If delays to earthworks/site clearance occur, following obtaining consent, and the site is not maintained, the site will need to be reassessed by the Project Herpetologist, prior to scheduled clearance.

Ongoing site maintenance applies to any area that has been cleared of vegetation, post lizard salvage, where earthworks/construction has not yet been completed. This ongoing site maintenance is intended to prevent the re-establishment of vegetation that may provide lizard habitat (and therefore the recolonisation of lizards), which would have to be re-salvaged following the methods described in Section 7.3 below.

Responsibility: SLPL.

7.3 Lizard salvage and release

A salvage and relocation programme will be implemented within areas all lizard habitats at the site (across each Stage of works; Appendix 4). All lizards will be trapped using live capture traps and will be relocated to the proposed release site. The release site will be created on land currently owned by SLPL, near the project site, but outside of the impact area, and outside of the homing range of relocated skinks.

The release site will be enhanced with appropriate indigenous plantings and created rock or wood piles to increase carrying capacity. Increased pest animal management will also be part of site management (Section 7.4.3, Release site enhancement).

7.3.1 Timing

Salvage across the site will be undertaken in three Stages (as per the scheme plan; Appendix 4). Most of the lizard habitat is within Stages 1 and 2, with only a small area of lizard habitat within Stage 3. The approximate areas of lizard habitat and salvage effort are described in the next section, and in Table 4.

Following each stage of lizard salvage, all hedgerows, fences, buildings and vegetation piles from within the salvaged areas will be removed, and earthworks and construction will commence at the site.

If earthworks are delayed, the paddocks should be maintained to control grass and vegetation growth for fire reasons, to minimise organic material, and to prevent lizard habitat from re-establishing in the site, before the commencement/continuing of earthworks, as per Section 7.2.

Responsibility: SLPL.

7.3.2 Salvage effort

The amount of salvage effort and range of methods proposed for use at the site are aimed at enabling the removal of as many individuals as possible, representing a high proportion of the total number of southern grass skinks present.

Habitat types have been separated into areas of 'low quality' (requiring an estimated ten days of trapping) and 'moderate quality' (requiring an estimated 14 days of trapping) (Figure 1, Table 4). Lizard salvage in all habitat types across a Stage will be undertaken across consecutive days, inclusive of both normal working days and weekend days.

Table 4 addresses the approximate number of traps that may be required for each habitat type, the number of lizards estimated to be salvaged in each habitat type, and the minimum number of trapping days per habitat type.

Table 4 – Summary of approximate effort required for the lizard salvage for each earthworks stage.

Earthworks Stage	Habitat Type	Habitat Quality	Approx. No. of Traps Required	Approx. No. of Salvage Effort (Trap Days)	Manual Searches Required (Hours)	Estimated No. of Lizards Salvaged
Stage 1	Stedman Road Boundary area	Moderate	160	14	10	60–130
	Rank grass along farm road	Moderate	5	14	None	5
	Curtilage areas	Low	30	10	None	20
	Shelterbelt	Low	30	10	None	15
Stage 2	Rank grass along farm road	Moderate	45	14	4	30
	Curtilage areas	Low	60	10	None	20-40
Stage 3	Curtilage areas	Low	20	10	None	10
Totals			**Stage 1: 225** **Stage 2: 105** **Stage 3: 20** **Total: 350**	**Stages 1 and 2: 10–14 days** **Stage 3: 10 days**	**14 person hours**	**Stage 1: 120–170** **Stage 2: 85** **Stage 3: 10** **Total: 160-250**

7.3.3 Salvage methods

- Live-capture lizard traps will be placed at 5-10 metre spacings prior to earthworks.
- Traps used may be a mix of funnel or pitfall traps, but funnel traps will **not be used** within any areas with significant patches of rank grass, to avoid incidental mouse predation.
- All live capture traps will be baited with canned pear or Juicy Burst lollies, Natural Confectionary Co.™ (known lizard attractants).
- All live capture traps will be padded with grass to provide shelter and prevent desiccation, in addition to preventing mice from predating upon caught skinks.
- Hand-searching techniques will be used to capture additional basking/active skinks. This will involve manually searching through and destructing the debris piles (where possible) at the end of the salvage to locate and capture any additional lizards.
- The length of trapping past the minimum requirements will be up to the discretion of the Project Herpetologist.
- Any lizards captured will be handled and held following best practice and released as soon as practical to the pre-selected lizard release area.

Pitfall traps consist of a plastic container (≥2 litre depth) dug into the ground which lizards may fall into and be unable to exit. The pitfalls will be covered with Onduline Artificial Cover Objects (**ACOs**) to provide additional thermoregulatory advantages and attract more lizards to the traps. A damp sponge will be added, in addition to the Onduline ACO, to provide shelter and prevent desiccation of skinks within the trap. Pitfall traps will be installed one to six weeks prior to habitat clearance and will be closed during this time to allow for lizards to become habituated to the traps and for the traps to weather in (as per the DOC Herpetofauna Toolbox for Pitfall Trapping; Hare, 2012a).

Funnel traps. The funnel traps will be covered with or nestled into the surrounding vegetation (as per the DOC Herpetofauna Monitoring Toolbox for Funnel Trapping; Hare, 2012b).

Moderate-quality lizard habitat

In the area mapped as moderate-quality lizard habitat, live capture traps will be checked daily for a **minimum of ten** consecutive days. Trapping will cease when one of the following conditions are met;

- If there are no skinks captured after day ten,
- If trapping reveals trends of decreasing numbers of skinks over the course of 14 days, or
- If live capture traps continue to get the same or high numbers of skinks over 14 days (>3 individuals per day), trapping will continue for three-day increments until no more skinks are caught or <3 individuals are caught on any one day after day 14.

Low-quality lizard habitat

In the area mapped as low-quality lizard habitat, live capture traps will be checked daily for a **minimum of seven** consecutive days. Trapping will cease when one of the following conditions are met;

- If there are no skinks captured after day seven,
- If trapping reveals trends of decreasing numbers of skinks over the course of ten days, or

- If live capture traps continue to get the same or high numbers of skinks over ten days (>3 individuals per day), trapping will continue for three-day increments until no more skinks are caught or <3 individuals are caught on any one day after day ten.

The length of trapping past the minimum requirements will be up to the discretion of the Project Herpetologist.

Responsibility: Project Herpetologist.

7.3.4 Data collection

Lizard capture data will include species identity, sex, length and tail regeneration. Each day of salvage will be recorded, including start/stop time, GPS coordinates and a habitat description for the capture location, date and time. Weather conditions will be recorded during and at the beginning and end of each salvage event.

Responsibility: Project Herpetologist.

7.3.5 Temporary holding of lizards

All captured lizards will be temporarily placed in clean individual lizard cloth bags, and stored in ventilated, hard-sided containers (to prevent accidental crushing), in cool, full shade until release. A small amount of damp leaf litter or vegetation from the capture site will be placed inside the cloth bags with the lizard to provide cover and prevent dehydration. Lizards will be released within two hours of capture into the pre-selected release area.

Responsibility**:** Project Herpetologist.

7.3.6 Habitat clearance

All vegetation found within the lizard habitat mapped in Figure 1 will be removed post-salvage, without supervision. **All unsupervised vegetation clearance of salvaged areas will occur within two weeks of the completion of salvage**, to ensure any remaining lizards do not move back into the habitats that have been salvaged. The Incidental Discovery Protocol must be followed (Appendix 3).

Responsibility: SLPL, suitably qualified contractor.

7.4 Lizard release

7.4.1 Overview

The lizard release site will be created on land currently owned by SLPL. This site is adjacent to the eastern side of the development area, alongside the upper banks of the Silver Stream (*c.* 0.85 ha; Figure 2). The release site will be enhanced, and additional habitat will be created with the aim of accommodating all of the lizards salvaged over all of the earthwork stages.

The release site has three different sections (Figure 3):

- Current lizard habitat area:
  - The mid to lower banks of the Silver Stream at this site (approximately 0.5 ha) contain rank grass and a few young exotic trees.
  - This area is highly likely providing lizard habitat for a resident population of southern grass skinks.
  - This area will have pest plants controlled.

- Lizard enhancement area:
  - An earth bund (*c.*0.15 ha) has previously been created on the top bank of Silver Stream, which is comprised of herbaceous weed species (Figure 3).
  - A flat area of rank grass in the eastern corner (*c.*0.05 ha).
  - It is likely that the herbaceous weeds and grass in these areas currently provide low-quality lizard habitat.
  - This will be enhanced through pest plant control and planting of appropriate lizard-friendly plantings.
- Lizard habitat creation area:
  - North of the bund is a grazed paddock.
  - Approximately 0.15 ha of this paddock will be used to create an area of new lizard habitat.
  - This will be enhanced through planting of appropriate lizard-friendly plantings and the creation of additional habitat units.

Table 5 below addresses the criteria for consideration of a release site for lizard release for either option (based on Principle 6 of the lizard mitigation guidelines; DOC 2019).

7.4.2 Release methods

Southern grass skinks will be transported by car or foot to the release site. The hard-sided containers that skinks are temporarily held in will be placed in larger bins (fish bins) securely in the car (seat belted), so movement is limited. Lizards will be checked on release for any signs of stress or illness.

Lizards will be released into pre-constructed habitat units (rock or wood piles) first to prevent initial dispersal of lizards outside of the release site. Between 10–20 southern grass skinks (depending on the numbers caught) will be released into each habitat unit, to minimise unnecessary competition. Where any lizards are found together or in an aggregation (i.e. multiple captures in one trap), they will be released in groups together.

Responsibility: Project Herpetologist.

Figure 2. Location of proposed lizard release on SLPL-owned land on the true right bank of Silver Stream Mosgiel, Taieri

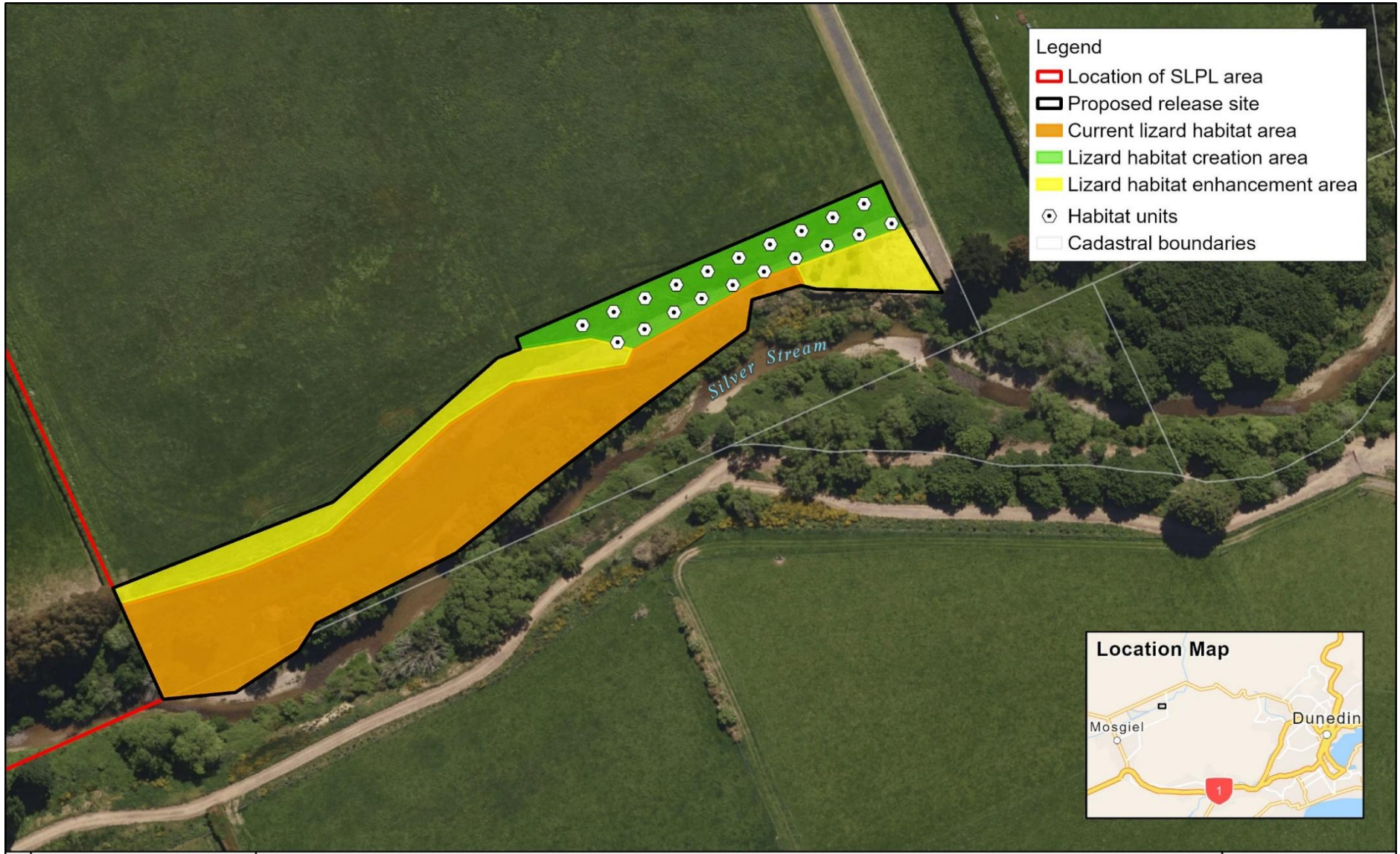

Figure 3. Proposed lizard release on SLPL-owned land on the true right bank of Silver Stream Mosgiel, Taieri

Table 5 – Assessment of lizard release site options based on Principle 6 of the lizard salvage guidelines (DOC, 2019).

Principle Relating to Salvage and Release	Description	Detail/Activity
1. The site must be ecologically appropriate and have long-term security.	**Resident lizard communities must be understood.** *Will released lizards increase viability of population, or be released in high enough numbers to start new population?*	Southern grass skinks are considered highly likely to be present at the release site given the proximity to the lizard population within the adjacent impact site, and will be released in high enough numbers to increase the viability of the existing population.
	The release site must be an appropriate distance from the impact site to prevent lizard homing, but close enough that it provides similar habitat.	The release site is neighbouring the impact site, yet still >300m away from the lizard habitat to be salvaged.
	The location must be within the species natural geographic range. *Ensure no mixing of potentially genetically structured populations.*	The release site is adjacent to the impact site, so they are within the same geographical range and Ecological district (Tokomairiro).
2. The habitat at the site must be suitable for the salvaged species.	**Vegetation composition and size.** Predominantly indigenous vegetation and sufficiently large and continuous for residents, release lizards and allowing for population growth.	The SLPL-owned release site will be supplemented with pest plant management, enhancement planting, creation of additional habitat units and pest mammal management.
	Must contain sufficient resources for potential population. For example, food, cover, retreats.	The habitat at the release site will contain sufficient habitat resources for the relocated population after enhancement has been undertaken, which will improve the quality of the habitat.
	Habitat enhancement. Must be ongoing in an ecologically relevant timeframe.	Habitat will be improved using lizard-friendly plants, pest plant management and the addition of habitat units. Predator control will be implemented to reduce pressures to the population after release.
	Edge effects. The release site must be buffered from intermittent climatic extremes, such as drought.	The site will be rectangular in shape (to reduce edge effects), and is adjacent to, but raised above, a stream, so will be both sufficiently damp to buffer lizards from droughts and avoid flood events.
3. The site must provide protection from predators.	*Habitat must protect from predators, or effective pest control must be in place. Must include full suite of predators including trapping for mice.*	Pest mammal management in the form of trapping and baiting, as per a pest management control plan prepared by a suitably qualified contractor.
4. The site must be protected from future human disturbance.	*Land tenure must ensure long term protection from disturbance.*	The release site will be protected by the client and avoided from disturbance for the duration of the consent for the project.

7.4.3 Release site creation and enhancement

Habitat creation and enhancement described below will provide protective benefit to the lizards proposed to be salvaged from the development site. Proposed release site creation and enhancement includes pest plant control, enhancement planting and plant maintenance, the construction of additional habitat units and pest mammal management.

Additional habitat will be created in the paddock, and habitat enhancement on the bund of the release site will increase the quality of lizard habitat, providing additional resources for both the resident and released populations of lizards. Although enhancement planting will not increase carrying capacity in the short term, it will provide additional habitat, which will increase the carrying capacity of the site over time.

Enhancement has been described below in the order it is intended to be implemented. Table 6 summarises the proposed enhancement and the timeline in which it will be implemented.

Responsibility: SLPL, suitably qualified contractor.

Table 6 – Implementation schedule for the proposed enhancement of the SLPL-owned release site for the next five years. SLPL will commission and arrange for the appropriate contractors to undertake the enhancement outlined. ■* means the requirement will be assessed by the herpetologist at the time.

Task		Prior to Stage 1 Lizard Salvage	Stage 1 Salvage	Year Zero (following Stage 1 Salvage)	Year 1	Year 2	Year 3	Prior to Stage 2 Lizard Salvage	Stage 2 Salvage	Year 4	Year 5
Habitat creation and enhancement	Additional habitat units	■						■*			
	Initial pest plant control			■							
	Enhancement planting			■				■*			
Ongoing release site control and monitoring	Pest mammal management	■		■	■	■	■			■	■
	Pest plant and enhanced planting monitoring				■	■	■			■	■
	Lizard monitoring				■	■	■			■	■

7.4.4 Pest plants

Initial weed/pest plant control will occur as soon as possible, prior to lizard release. Control should focus on any woody and herbaceous weeds to reduce their abundance within the site and preserve the current lizard habitat values (associated with exotic grass). All 'woody weed' pest plant species on the site (as per the Otago Regional Council[1]), such as broom (*Cytisus scoparius*) and gorse (*Ulex europaeus*) on the upper to lower banks. If the larger exotic trees on the upper and mid banks can be removed, they should be cut down to prevent them from maturing and shading out the release site or seeding further trees in the release site. Trees on the lower bank of Silver Stream, or trees providing bank stability, can be left alive but may have to be trimmed back.

Control will be implemented in order to have minimal disturbance to lizards.

Control methods will include:

- Herbicide control (e.g. drill and fill, foliar spray, cut and paint, basal bark spray).
- Manual removal (hand pull small seedlings, cutting down larger trees).
- Combination methods (e.g. manual and herbicide to avoid damage to indigenous biodiversity).

Weeds will be controlled using the most effective and appropriate control methods, ensuring that any control causes minimal damage to indigenous plants (if present) and fauna (e.g. lizards). If lizards are seen in the vicinity of a pest plant during weed control, then foliar or basal bark spray herbicide methods will not be used. Any operator undertaking weed control must be suitably trained and experienced to ensure that weeds are accurately identified and indigenous fauna (or plantings) are not accidentally harmed or damaged during control work.

Each pest plant or infestation will be assessed for the best control option, which depends on the size and maturity of the plant and the situation it is growing in (see Appendix 1 for different types of control methods). Weed control will be carried out during the appropriate seasons when weeds can be more easily identified and targeted for control, and control is likely to be most effective (i.e. during the growing season for deciduous species). All control will follow manufacturers' guidelines, current best practice procedures, and NZ Standards of agrichemical management (NZS8409:2021). Signs may need to be erected to notify the public during weed control works if the release site has public access.

Large trees may be felled and, where safe and appropriate, remain onsite if they are species that do not readily regenerate (e.g. willow species). Retaining the dead wood will provide habitat for lizards.

Follow up control can be undertaken in conjunction with planting maintenance once indigenous planting is completed (see enhancement planting below). The monitoring of pest plants is outlined in Section 8.2.2.

Responsibility**:** SLPL, suitably qualified contractor.

7.4.5 Site preparation

Control of any rank grass and groundcover vegetation is necessary before planting, and habitat unit creation, as grasses and woody weeds can smother young indigenous plants during their first season. Additionally, pest plants can overtake wood or rock piles, restricting basking opportunities for lizards.

SLPL will commission a contractor to undertake preparation of the site for planting. Groundcover vegetation will be cleared in a lizard-friendly manner (through use of hand weeding or use of a weed eater, on warm, fine weather days), or through spot spraying, if determined necessary.

Responsibility**:** SLPL, suitably qualified contractor.

[1] https://www.orc.govt.nz/environment/biosecurity-and-pests/plant-pests/

7.4.6 Enhancement planting

Lizard-friendly, small dense shrubs and groundcover will be planted within the release area. Appropriate, lizard-friendly plants that are listed in Table 7. These plantings are appropriate for the release site and the remediation planting on the impact site.

Plants will be kept well-watered from the time of departure from the nursery until the day of planting. Plant stock will be handled with care to minimise plant damage. If planting of a site is to take an extended period of time (e.g. weeks not days), a temporary nursery for holding the stock will be established at the planting site.

Plants will be planted in clumps to provide a uniform density of ground cover. Plants will be spaced at 0.5-1metre spacings where possible to facilitate effective ground cover over a shorter timeframe. In addition, dense plant clumping will help to prevent woody weeds from outcompeting the new plantings.

The use of weed mats, mulch, bark and woodchip in the enhancement areas will be avoided. These types of ground covers inhibit the establishment of suitable habitat and vegetation often relied upon by lizards for cover, and reduce the presence of invertebrate communities that provide important food resources for lizards. Small amounts of woodchip or individual weed mats (wool or coconut fibre) may only be used around the bases of new plantings if required for weed suppression.

Plants will be installed between May and October, when soil moisture is sufficient and must be implemented prior to salvage, to minimise disturbance to the released lizards. Monitoring of the enhancement planting is outlined in Section 8.2.2.

Table 7 – The proposed enhancement plant species and the benefits they provide for lizards at the remediation areas and release site. Plants with an * can be planted on the swale banks for the onsite planting.

Species Name	Common Name	Structural Class	Benefits to Lizards	Density
*Carex geminata**	Cutty grass, rautahi	Sedges	C, I	High
*Carex virgata**		Sedges	C, I	High
*Carex secta**	Purei, Pūkio	Sedges	C, I	High
Poa cita	Wi/Silver tussock	Grasses	C, I	High
Festuca novae-zelandiae	Hard tussock	Grasses	C, I	High
Muehlenbeckia axillaris	Creeping Pōhuehue	Liane	R, N, F	High
Melicytus alpinus	Porcupine shrub	Shrub	C, R, F	Moderate
Coprosma propinqua	Mingimingi	Shrub	C, N, F, I	Moderate
Coprosma crassifolia	Thick-leaved mikimiki	Shrub	C, N, F, I	Moderate
Coprosma virescens		Shrub	C, N, F, I	Moderate
*Cortaderia richardii**	South Island Toetoe	Grasses	C, R, I	Moderate
Phormium tenax	Harakeke, flax	Flax	C, R, N, I	Low
Cordyline australis	Ti Kouka	Shrub	R, F	Low

Key to known benefits to lizards: C = cover, R = retreats, N = nectar, F = fruit, I = invertebrates

Responsibility**:** SLPL, suitably qualified contractor.

Enhancement planting, weed monitoring, and maintenance

SLPL will commission ongoing maintenance and monitoring of the enhancement planting to ensure the successful establishment of plantings (refer to Appendix 2 for planting guidelines). Planting will be followed by monitoring visits two to three times a year for at least the first three years to ensure the uptake and survival of plantings and to undertake weed inventory monitoring to assess the presence and spread of pest species (Section 8.2.2). Monitoring visits will determine what plant maintenance is required and to determine the need for, and type of, any further weed control measures. Post-planting maintenance will include:

- Plants kept free of weeds by means of hand weeding only or weed eaters when absolutely necessary. Weeding will be undertaken two to three times a year to ensure that weeds do not compromise plant growth.
- Hand weeding around the plants will allow for better establishment of the plants and limits disturbance to skinks.
- No mulching will be undertaken.
- The areas between plantings will be left to establish on their own, without maintenance, forming a mosaic of ground cover.
- Where plant loss exceeds 10%, these will be replaced.

Maintenance will take place on warm, sunny days when the daily temperature exceeds 14 degrees as this is when skinks are most active. Contractors will refrain from using sprays in and around lizard habitats (specifically the additional habitat units), as the effects herbicides and insecticides have on lizards are largely unknown.

Responsibility: SLPL, suitably qualified contractor.

7.4.7 Additional habitat units

To increase the amount of suitable lizard habitat, provide additional shelter and protection from predators, and increase carrying capacity within the site, the release site will also be enhanced through the deposition of wood and/or rock piles.

Rock piles will be either up to two metres in diameter, or be created in longer meandering corridors. All piles will be ≤1 metre deep in the centre and comprise of clean rocks of 50–200-millimetre grade to provide optimal interstitial spaces amongst the piles for lizard occupation. Rocks will be sourced from a landscape supplier or local quarry prior to lizard release. Washed rock prevents the establishment of any unwanted pest plants to the area.

All rock and wood piles will be spaced at least 5 metres apart in open, clear areas without shade from existing vegetation, providing lizards with basking opportunities. The placement of the wood and rock piles will be supervised by the Project Herpetologist to ensure they are placed correctly and ensure that disturbance to the site is minimised. Additional habitat units will be installed prior to the release of lizards.

Responsibility**:** SLPL, suitably qualified contractor, Project Herpetologist.

7.4.8 Pest mammal management

SLPL will be preparing a Pest Management Plan for the development site, which can also include pest control within the release site. The Project Herpetologist will assess and contribute to this plan by providing guidance on target pest species and appropriate management approaches relevant to lizards. Detailed pest management methods will be outlined within the Pest Management Plan itself.

Responsibility: Suitably qualified contractor, SLPL, Project Herpetologist.

7.4.9 Constraints

There are inherent risks associated with lizard capture, salvage and relocation as a management tool for mitigation purposes. In particular, there is high risk of poor capture rates for lizards during pre-survey capture and salvage activities. This will be managed by maximising lead-in time for pre-clearance capture and using a range of tools suitable to the species in question.

Lizard salvage climatic constraints:

Many lizard species are inactive below 14°C. Hot summer temperatures (>25°C) also reduce lizard emergence and detectability. Lizard salvage and transfer often has the best results when temperatures are consistently over 16 degrees. Because of these constraints, salvage will be undertaken between October–April (inclusive), when:

- The temperature is between 16°C and 25°C,
- Rain is no heavier than 0.1–2.0 mm per hour, and
- The wind is not strong.

Relocation of lizards is a complex process, and many factors must be considered before animals are moved. Consideration will need to be given to assess whether the release site has sufficient habitat and resources to support lizards (or additional lizards if some lizards are already present).

When lizards are first translocated, they will be unfamiliar with the landscape and may be unable to find suitable refugia to hide from predators and competitors, and they may therefore potentially disperse away from the release site. By releasing lizards into the aggregate piles first, this may help to orientate and maintain translocated individuals at the site.

Responsibility: SLPL, suitably qualified contractor, Project Herpetologist.

7.5 Remediation

7.5.1 Lizard-friendly plantings

While the majority of the site will be developed, the periphery of the site will be planted out with indigenous species, which will coincide with swales and acoustic walls (Appendix 4). The swales included as part of the development plan are flood management measures, and are expected to remain dry. The swales will be planted with grass and managed to prevent the grass from overgrowing and impacting water flow during a flood event.

Lizard-friendly plants will be planted along the Dukes Road North Boundary and Stedman Road Boundary (Kiwi Rail land). The variety of lizard-friendly plants listed in Table 7 will provide a wide range of resources for lizards. This remediation will not only replace some of the lizard habitat lost but also increase the available lizard habitat on the edges of the site over time. Any planting plans provided in the Landscape Concept Plan will be updated to include the species listed in Table 7.

Planting plans will be reviewed by the Project Herpetologist. All planting will be carried out by a suitably qualified contractor funded by SLPL.

The Dukes Road North Boundary already has *Carex* planting proposed along the swale edges, and this edge will be extended to incorporate additional lizard-friendly plants.

On the Stedman Road Boundary (the western side of the site), there is a proposed shelterbelt of *Pittosporum*, including a 17-metre-wide swale between the shelterbelt and the development site. Along the edges of the swale, a *c*.5-metre-wide area will incorporate lizard-friendly plants. These lizard-friendly planting areas can include the edges of the swale if the ground is free-draining and does not retain standing water for extended periods after rainfall, and these areas of the swale are not actively mowed or maintained.

Responsibility: SLPL, suitably qualified contractor.

7.6 Contingencies and risks associated with proposed management

7.6.1 Risks associated with salvage

Potential risks to lizards as a result of the proposed salvage, and management actions to reduce these risks, are outlined in Table 8.

Table 8 – Risks associated with the lizard salvage and proposed management to reduce the risk.

Risk	Issue	Action
Overheating	Lizards may overheat when temporarily held in containers during salvage.	Lizards will be placed in individual containers, kept cool, and handled minimally to reduce stress. Traps will be checked at least once daily, and more frequently when temperatures exceed 25°C.
Overcrowding, competition, and displacement	Releasing lizards into an already occupied site may lead to competition, predation, or displacement.	Habitat enhancement (planting, weed control, pest management, and new habitat creation) will increase carrying capacity and reduce these risks. This will reduce the amount of competition and potential displacement of released skinks.
	More lizards than expected are salvaged.	Salvage will continue for a minimum of 10– 14 days until **three or less** skinks are captured, or until **no** skinks are captured during the latter stages of salvage (see Section 7.3).
		If **more than 270 lizards are salvaged,** the release site will be extended into the contingency release area (see Section 7.6.5).
Injury/death	Incorrect trapping or handling by untrained staff may harm lizards.	All capture and handling will be done or directly supervised by qualified and authorised herpetologists, using best practice and hygiene protocols to minimise injury, death, or disease.
	Predation of lizards within traps.	Funnel traps will not be used within any areas with significant patches of rank grass, to avoid incidental mouse predation.

Risk	Issue	Action
		In areas where predation within traps is possible, a small (*c.*10 cm) length of plastic hosepipe will be added to traps to provide a refuge to lizards to assist in evading mice, and Funnel Traps will be checked twice daily (morning and evening) to minimise the likelihood of mice being captured at the same time as lizards. If mouse predation occurs, funnel traps will be removed from the area.

7.6.2 Contingencies

There is inherent uncertainty in the outcomes of lizard salvage and release as a result of the complexities of the process and long-term management of the release site for species conservation. In some cases, threatened species may be discovered during salvage, the release site may not be viable in the long term, or the predator control regime has been found ineffective. The main risks and resulting contingencies relating to the proposed management are detailed in Table 9.

Table 9 – Risks associated with salvage and proposed management.

Risk Associated with Salvage	Detail	Contingency
Additional lizard species encountered.	Although unlikely, if any other species is encountered during salvage.	Follow Incidental Discovery Protocol. Stop works, notify DOC, and develop further instructions (see Appendix 3). Compensation may be appropriate (see Section 7.6.7).
Release site is not established.	Release site enhancement and pest mammal control is not fully implemented before the salvage.	If all of the required release site enhancement identified in Section 7.4.3 has not been implemented prior to the first stage of salvage, the salvage will have to be postponed, or an alternative release site will be required (see Section 7.6.3).
Release site is not suitable for the release after Stage 1.	Release site is not suitable for the release of lizards from Stage 2 or 3.	The remediation planting areas at the site will be assessed as a potential release site option. If they are unsuitable, then expansion of the release site is required.
Residual skink populations remaining after salvage completion.	It is unlikely that all lizards will be removed from the impact site and may be displaced by earthworks.	Incidental Discovery Protocol (see Appendix 3).
Release site failure.	Lizard population decline.	Post-release monitoring to determine population persistence. Any recommendations to address population declines will be recommended in annual reporting (see Sections 8.0 and 9.0).
	Enhancement planting fails.	Any more than 10% plant failure will be replaced at the cost of SLPL. This will be determined through post planting monitoring (see Section 8.0).
	Pest mammals management not prepared prior to izard salvage.	Project herpetologist will provision some interim pest mammal control measures (such as poison baiting or limited trapping).

Notable changes to the salvage and relocation protocol will be undertaken in consultation with DCC, DOC, other territorial authorities, iwi, and/or stakeholders (as required). Resulting changes and updates to the LMP, following consultations, will be effective upon confirmation with all respective groups (unless a WAA variation is required by DOC).

Responsibility: SLPL, Project Herpetologist.

7.6.3 The release site is not established by the first stage of salvage

Stage 1 of works for the development are expected to start in October 2026. If all of the required release site enhancements identified in Section 7.4.3 have not been implemented prior to the first stage of salvage, the salvage will have to be postponed, or an alternative release site will be required.

If an additional release site is required for Stage 1 of salvage, permission will be sought from the relevant release site managers and DOC before being used for lizard release.

Responsibility: SLPL, Project Herpetologist.

7.6.4 The release site is not suitable for the release for Stage 2 and 3.

It is expected that the release site will accommodate all the lizards salvaged over the entire development. However, if more lizards are captured than expected (in later stages), or the release site enhancement and creation fails to establish, the suitability of the release site for the further earthwork Stages will need to be reassessed.

Following completion of the Stage 1 salvage and prior to the commencement of Stage 2 and 3, the suitability and capacity of the release site will be assessed to determine whether it can likely accommodate more lizards from the remaining salvage Stages. If the release site is deemed at capacity or unsuitable, then the use of the remediation planting onsite (see Section 7.5) will be assessed to determine whether it can be used as a release site for lizards from Stage 2 and/or Stage 3 of the lizard salvage. If the remediation planting site is to be used as a lizard release site, then additional habitat units will be created to further increase the habitat quality of the remediation sites. These additional habitat units will be created as per Section 7.4.7.

If the remediation planting sites cannot be used, then further expansion and/or enhancement of the current proposed release site will be required before the start of the Stage 2 salvage work.

Responsibility: SLPL, Project Herpetologist.

7.6.5 More than 270 lizards salvaged

If more than 270 lizards are salvaged, the release site area will be extended. If 270 skinks have been captured and it is likely that an additional 25 are still likely to be captured (due to consistently high numbers of skinks being caught), to accommodate the additional lizards, the release site will be extended in 25-metre sections further north into the pasture paddock as needed. This includes the addition of 3–5 habitat units and expanding pest mammal control measures per extension. The enhancement of the contingency release area must be completed prior to the release of any lizards.

The decision to proceed with further extensions, based on the likelihood of capturing additional lizards, will be made at the discretion of the Project Herpetologist.

Responsibility: SLPL, Project Herpetologist.

7.6.6 Incidental Discovery Protocol

If lizards are incidentally discovered during works following the implementation of mitigation measures, contractors will be required to follow the Incidental Discovery Protocol (IDP). This protocol outlines the appropriate steps to take in order to ensure the protection and proper handling of any lizards found on site. Appendix 3, which contains the full IDP, will be provided to all contractors and must be adhered to in the event of an incidental lizard discovery.

Responsibility: SLPL, Project Herpetologist, suitably qualified contractor.

7.6.7 Compensation

All feasible steps will be taken to avoid, minimise and/or remedy the impacts of the proposed works on lizards, including management contingencies (Table 9 and the above sections). It is considered that the management actions listed in this LMP are appropriate to address adverse effects to lizards. Therefore, in this case further compensation is not required for the project.

However, if the release site and remediation sites fail, management actions may need to be altered to appropriately address residual effects to lizards, such as compensation. If required, compensation will be provided to the Society for Research on Amphibians and Reptiles in New Zealand (SRARNZ). The compensation funding will be distributed by SRARNZ toward lizard research and conservation in New Zealand. The amount of compensation required will be determined by the Project Herpetologist and SLPL.

Responsibility: SLPL, Project Herpetologist.

8.0 Post-Release Monitoring

8.1 Overview

DOC's lizard mitigation guidelines (DOC, 2019) recommend monitoring to evaluate the success of the salvage operation. This is due to the generally low success rates of mitigation-based reptile translocations worldwide. As such, it is essential to undertake ongoing monitoring of the relocated population to assess its success over time if appropriate. DOC's lizard salvage guidelines (DOC 2019) recommend a post-release monitoring programme when (a) sufficient individuals are found during the salvage and (b) there is potential management or conservation value in knowing post-release outcomes.

If less than 20 lizards are salvaged from the impact site, there would be negligible learnings from post-release lizard monitoring, as there will be too few lizards to reasonably determine the effects of salvage and habitat enhancement on the lizard population in comparison to stochastic effects. **Therefore, if ≤20 lizards are salvaged, no post-release monitoring of released lizards will be undertaken (Objective 1).**

If any signs of population decline during monitoring are observed, it is crucial to identify and understand the underlying causes. Therefore, it is important to also monitor other environmental factors at the release site to ensure that, if issues arise, appropriate adaptive management actions can be implemented effectively.

All monitoring will be commissioned by SLPL.

Responsibility: SLPL, Project Herpetologist.

8.2 Objectives

The purpose of post-release monitoring is to ensure the success of the salvage from the industrial development site to the release site. The objectives for long-term monitoring at the release site are as follows:

Objective 1: Ensure population persistence of the released lizard population (if >20 lizards salvaged).

- Monitor southern grass skink persistence within the release site, post-release.

Objective 2: Ensure survival of enhancement plantings in the release site.

- Monitor plant growth and establishment.
- Monitor effectiveness of woody weed control.
- Determine success of plantings.

8.2.1 Objective 1 – lizard population persistence

Monitoring

If more than 20 lizards are salvaged, then post-release monitoring will be required. Post-release monitoring may not detect any changes in the population of any lizards in the short term. Therefore, post-release monitoring will be established at the release site during the first lizard active season post salvage and will be undertaken by a suitably qualified ecologist annually for three years, after which the requirement for further monitoring for an additional two years will be assessed.

Monitoring of relocated individuals for survivorship and establishment is not practical without toe clipping for this species, as they cannot be reliably identified to an individual level from their natural markings. However, this method will not be used as it is widely considered to be unethical. Therefore, the design of the post-relocation monitoring work will be focussed on achieving population persistence at the site over at least three years following lizard release.

Post-release monitoring will consist of a mark-recapture live capture survey over one week during fine weather between November and February annually. One to two pitfall traps will be placed at each wood and rock pile throughout the reserve. The pitfalls will be covered with an ACO to provide additional thermoregulatory advantages and attract more lizards to the traps. The pitfall traps will be left in place for the entire monitoring period (three years). However, the ACOs will be removed between each year of monitoring so as not to influence population dynamics. All skinks captured and measured (snout-vent length, tail vent length, regen tail length), sexed, photographed and marked with an ID number.

Numbers tracked during each monitoring session can be compared over time to provide some indication as to how skinks are faring at the site. These methods will not provide accurate estimates of population size or trends over time. However, these methods will determine skink persistence at each pile, and can inform the ongoing management prescribed for the site.

Adaptive management

If capture rates decline during the initial lizard monitoring period at the release site, post-release monitoring will continue for another two years to determine if (any) management interventions are required. Management interventions may include increased predator control, or increased habitat enhancement. These interventions will be determined in consultation with SLPL, DCC, and DOC, on an as-required basis, based on follow-up monitoring in the shoulder season (i.e. October or March), and a review of predator control success and habitat enhancement.

8.2.2 Objective 2 – Plant survival and weed control

Monitoring

Enhancement planting and weed control will be implemented at the release site. As described above in Section 7.4, monitoring and maintenance will be commissioned by an SLPL contractor for three years after planting. Planting will be followed by monitoring visits two to three times a year for three years. After three years, the need for further monitoring for an additional two years will be assessed. If required, monitoring will then be undertaken annually for years four and five.

Adaptive management

If plant monitoring indicates that plant losses exceed 10% within the first two years, the affected plants will be replaced at the expense of SLPL, as described in Section 7.4, which is a standard condition of planting contracts. In such cases, an assessment will be undertaken to determine the underlying causes of the plant loss.

If any pest plant incursions are detected during the monitoring period, a suitably qualified contractor will be commissioned by SLPL to address the incursion, following the methods previously outlined in Section 7.4 and Appendix 1.

9.0 Reporting

9.1 Salvage report

A salvage report will be prepared, including details of the lizard species, capture locations, and number of individuals salvaged and released at the release site. This report will also include details around the enhancement of the release site and compliance with the WAA issued. The report will contain information regarding the success of the lizard salvage and any adaptive management that was required.

Lizard species and location details will be provided to DOC within six months of salvage completion as a part of the Wildlife Act Authority obligations. ARDS cards will be completed and submitted to DOC.

This report will be provided to DCC, DOC, and mana whenua, as required.

Responsibility: Project Herpetologist.

9.2 Annual monitoring report

A monitoring report detailing the outcomes of the release site will be prepared annually for at least three years post-salvage. The report will contain information regarding the success of the habitat enhancement (pest plant management and enhancement planting) and lizard salvage (post-release lizard monitoring) and suggest any adaptive management that is required.

This report will be provided to DCC, DOC, and mana whenua, as required.

Responsibility: SLPL, Project Herpetologist.

10.0 Significance of Effect After Management

Accurately predicting the level of effect with mitigation in place is difficult, but Table 10 gives a broad picture of how effects can be significantly reduced with mitigation measures in place. We consider that if the effects management outlined in this plan is properly implemented, the overall level of effect will be **less than minor.**

Table 10 – Potential significance of ecological effects if effective mitigation is implemented as recommended above.

Effect	Level of Adverse Effect Without Mitigation	Mitigation	Level of Effect With Mitigation
Accidental displacement and harm (injury/death) to lizards	More than minor adverse effects	Lizard salvage and relocation (Section 7.3). Contingencies and risks with proposed management is considered (Section 7.6). Incidental Discovery Protocol (Appendix 3).	Minor adverse effects
Disturbance to lizards during earthworks	Minor adverse effects	Lizard salvage and relocation (Section 7.3). Contingencies and risks with proposed management is considered (Section 7.6). Incidental Discovery Protocol (Appendix 3).	Less than minor adverse effects
Loss of habitat for indigenous lizards	Less than minor adverse effects	Release site will be enhanced to create additional lizard habitat (Section 7.4). Remediation on site (Section 7.5)	Less than minor adverse effects
Breeding failure/behavioural effects to lizards	Less than minor adverse effects	Lizard salvage and relocation (Section 7.3).	Less than minor adverse effects

Acknowledgments

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Appendix 1

Weed control methods

Weed control will be carried out during appropriate seasons when weeds can be more easily identified and targeted for control. Different weed control methods are described below, but the exact method to be used on each plant will depend on the species, and its growth stage and location when the control is carried out (refer to Weedbusters[1] for more information). Where necessary, e.g. if seeds are present or as directed, weed plants or seed heads could be bagged and left in secure areas on site to rot inside the bags, to ensure seeds are not spread. These could be removed from sites, as required, subject to permit requirements for weeds designated as Unwanted Organisms under the Biosecurity Act 1993.

Manufacturers' guidelines, current best practice procedures, and NZ Standards of agrichemical management (NZS 8409:2021) will need to be followed. All mixing of chemicals, and cleaning and refuelling of equipment must be carried out greater than 20 metres from surface water bodies, and care will be taken to minimise the risk of spillage. The amount of herbicide used should be minimised by favouring more direct and manual methods over foliar spraying.

Cut stump and treat

This method is used to control woody weeds and trees that have woody stems. Trunks/stems of the plant are cut close to the ground and herbicide immediately applied to the stump. Herbicide used is either gel-based, in an applicator bottle, or a liquid in a small hand held spray bottle. This is generally recommended for woody pest plants between 0.5 metres and 3.0 metres high. For old man's beard all cut sections need to be left off the ground (e.g. by hanging in adjacent vegetation), with large plants having a 1-metre section of trunk removed to prevent aerial roots from taking root in the soil.

Drill and fill

This method is used on trees and large woody weeds, e.g. wilding conifers. The method is particularly good for large specimens, and involves drilling holes around the trunks and lower stems of the plants, at regular intervals, and immediately injecting herbicide into the holes. The dead trees can remain standing for quite some time (can be years) and this can help to reduce new weeds establishing beneath them, and can be valuable where tree habitat is needed for indigenous fauna in areas where the indigenous trees have not yet established.

Basal treatment

This method is used on trees and woody weeds, e.g. wilding conifers. This method is quicker that cutting/drilling and treating, especially for large or multi-trunked plants. Basal spray is applied via a low-powered spray unit around the entire circumference of the stems/trunks, and to the manufacturer's recommended height for that plant size and bark thickness.

Frilling

This method is another basal treatment that can be used on trees and woody weeds and is recommended when runoff, from basal bark treatment, is considered a risk to surround indigenous biodiversity. A sharp chisel or axe is used to make a deep cut into the sapwood at regular intervals around the base of the tree, taking care not to ring-bark the plant. Immediately apply the recommended herbicide to each cut using a paintbrush or squeeze bottle.

[1] https://www.weedbusters.org.nz/weedbusters/

Hand pulling (non-herbicide manual control):

This method is effective to use on seedlings and small plants of any of the weed species, provided that the entire plant and root system can be removed to ensure that re-sprouting does not occur.

All operators will carry GPS units to track their movements during weed control works, and record points of interest including weed locations or infestations. This will ensure that all necessary areas are covered and weeds encountered. GPS data will be provided to DCC and DOC so it can be accessed using their GIS. In some areas control work should be carried out in a grid formation to enable thorough searching for cryptic or scattered weeds.

Selected data can be collected during weed control works, such as: operators present, general weather conditions, ground covered during the work (via GPS tracking), weed species controlled and control method, new weed infestations located, new hazards encountered and health and safety incidences. This information will help track work that is occurring and identify possible areas for improvements, and could be collated into a spreadsheet for analysis, or (if required), regular reporting. Follow-up control, monitoring of works carried out, and surveillance for new weed infestations needs to be undertaken on an ongoing basis.

Appendix 2

Restoration planting guidelines

This appendix describes the methods that would generally be used for undertaking restoration plantings.

Eco-sourcing of indigenous species

The use of locally-sourced seed is the preferred and well-established way to grow nursery-raised plants for ecological restoration plantings. Plants used in the lizard release site planting should be sourced from the Coastal Otago Region.

Regardless of the ecological region the seed is sourced from it should be sourced from populations occupying appropriate abiotic conditions (e.g. plants for wetland sites or areas should be sourced from populations occupying wetland habitats, rather than dryland populations).

Plant size and quality

To ensure that plant stock will be in optimum condition for planting, plant stock should be checked periodically during the growing season. Plant stock should also be inspected before it leaves the nursery to ensure that it meets the following quality criteria:

- Plant materials should be first class specimens of nursery stock, true to name and type, and free from pests and diseases. They should be well hardened off prior to planting by exposing them to sun, wind and temperature that are similar to the climatic conditions of the site. Plants have high failure rates when they arrive at the planting site directly out of a shade house, and this is a significant cause of death or poor plant growth in many plantings.
- The roots should have a high percentage of fibrous roots that are just touching the edge of their containers. Plants with roots that are wound round their containers in circular fashion should be rejected.
- Plants should be free from disfiguring knots, bark abrasions, wind, or freezing injury or other disfigurements and bear evidence of proper pruning if this is necessary.
- Plants should be at least 20 cm tall. The ratio of plant height to container size, and the sturdiness of the plant, should allow for the plant to remain upright post planting without the need for staking and it should be large enough to minimise smothering by weeds.
- Root collar diameter should be a minimum of 2 mm, as this will provide plants with sturdy and upright growth.
- Only one seedling should be present in each container. Nurseries often quickly prick out a group of seedlings by pinching them between their thumb and index finger or they sow seed directly onto the potting media in the root-trainers. Having multiple seedlings in a container can result in crowded seedlings, inferior plants, and the need to thin seedlings may result in the remaining plants being damaged or not located in the centre of the container for optimum root growth.
- Plants should have a strong, single, central leader, and not be multi-stemmed or light-starved and drawn up by shaded or dark growing conditions. The leaves should be distributed evenly over the plant, and not be clustered toward the tips of the stems.

General site preparation

If required site-preparation spot-spraying will be undertaken to kill exotic ground-cover vegetation and create places for planting. **Blanket spraying of the planting area should not be undertaken on this site,** as wholesale clearance risks harming lizards and the invasion of that area by pest plants. Site preparation and planting should take place no less than 1.5 metres from any naturally occurring indigenous plants.

Planting technique

The importance of good planting technique should not be under-estimated, and the following guidelines should be followed:

- Ideally all planting should be undertaken by experienced workers in accordance with recognised industry best practice. If volunteers are used, they must be briefed and thoroughly supervised to ensure correct planting techniques are used.
- Care should be taken to ensure that the root ball is not excessively disturbed during container removal or planting.
- The planting hole should be two times the size of the root mass and the soil broken up with a spade as it is dug out of the hole.
- The root ball should be covered by a thin layer of soil. This will prevent it being exposed to the air and drying out.
- The planting hole, when filled in, should form a very shallow depression, to enable rain water to soak in. Once planted, the plant should resist being pulled out of the ground when given a gentle tug.
- If plants start to show signs of water stress (e.g. wilting leaves), watering should be carried out to reduce plant losses.

Plant protection

Newly-planted trees and shrubs can be decimated by browsing by rabbits, possums, or pūkeko (if present), so protection against browsing is critical, if planting occurs before the implementation of pest mammal management.

- Individual plant guards should be used to protect each plant from browsing. They also provide shelter, increased humidity, reduction of moisture loss, and help to prevent unintended herbicide damage.
- Guards should be removed and once the plants are large enough to outcompete surrounding exotic vegetation.
- We recommend using cardboard plant guards. The cardboard plant guard is robust, biodegradable and resilient, but are more expensive.

Planting maintenance

Weed control

Refer to Appendix 1 for detail regarding weed control.

Infill planting

If the plant survival rate is below 90% then replacement of any dead plants (infill planting) should be undertaken. This should be undertaken in years two and three after the original planting, as necessary. The number and species of infill plants should be identified in the February or March proceeding the planting season.

Appendix 3

Incidental discovery protocol

Overview

Incidental discovery protocols are set out below for development contractors, and are to be followed if any further lizards are discovered, post mitigation, during early works of the development.

Where lizards might be found

Lizards could be present in and on vegetation such as within rank grasslands including along fence lines, exotic shelterbelts, indigenous hedgerows, ornamental plantings, gardens and dwellings. They may also bask in sunny exposed spots, such as in/on debris piles. They may be uncovered when disturbed by habitat clearance or earthworks.

Following the incidental discovery of a lizard

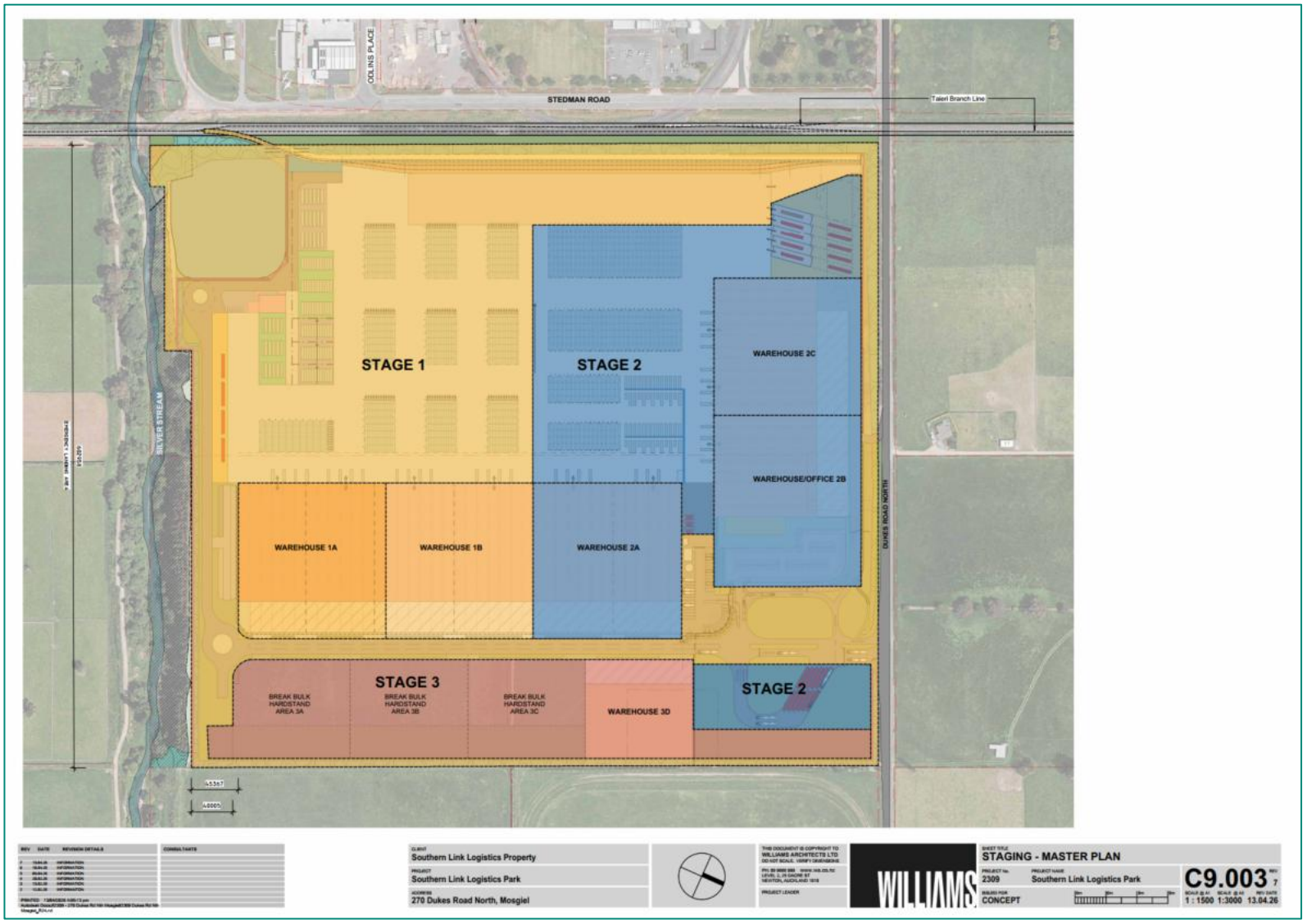
- Immediately (as soon as discovery of a lizard is made) cease any activities within 10 metres of the place of discovery. If the species encountered is a species with a Threat Classification status of 'Threatened' then all works must cease immediately, until an assessment is made of the works programme risk for that species, and any specific management identified, including avoidance.
- If possible, capture the lizard and place in a container with grass/leaf litter/moss. Ensure to create breathing holes in the container for the lizard. Hold in captivity in a **cool, shady** location out of sun until a decision is made.
- Immediately inform the project herpetologist and operations manager on site.
- Document:
  - Date and time.
  - Weather conditions.
  - Observer name(s).
  - Photographs of the animal and the location where it was found. Photograph the lizard from above trying to show the head and any markings on the upper body or back. A cell-phone picture is adequate for this and will help with identification of species.
  - Location (GPS coordinates).
  - Species.
  - If injured:
    - What part of the animal is injured? (Photograph the injury).
    - Time since injury (if known).
    - Probable cause of injury (if known).
    - Immediately (within one hour) contact a local veterinarian and the local DOC office, and arrange for the injured lizard to be delivered to the veterinarian. This may require a monetary contribution for care.
  - If a carcass is found:
    - Condition of carcass (see below).
    - Approximate time since death (if known).
    - Probable cause of death (if known).

- Notify the project herpetologist at Wildland Consultants immediately. The project herpetologist will notify DOC and ask for advice on how to proceed.
- Arrange for the carcass to be sent to Wildbase (06 350 5329), Massey University, in Palmerston North, unless advised otherwise by DOC.
- If lizards are unable to be captured and/or photographed, note as much detail as possible: what colour was it; what colour patterns; how big was it; whether it was robust or slender; what habitat was it found in? You may need to describe these details to the project herpetologist and the Department of Conservation (DOC).

Should a nationally 'Threatened' lizard species be encountered during construction, the Project Herpetologist will immediately consult with DOC to ask for advice on how to proceed. Further works may not proceed until approval has been granted to continue by the Project Herpetologist and DOC.

Appendix 4

Earthworks stages



Draft planting plan

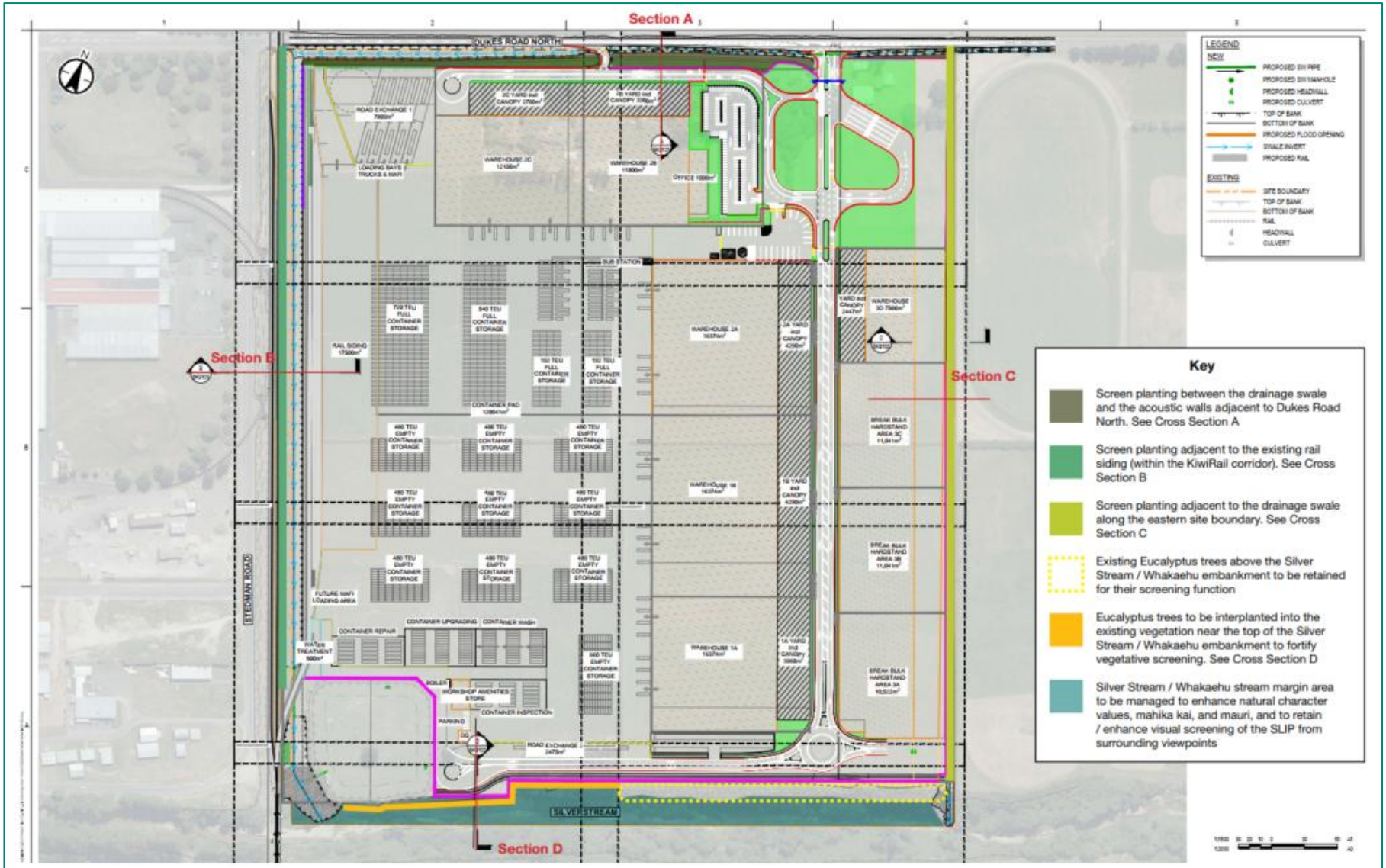


Figure 12: Proposed Southern Link Inland Port – Landscape Concept Plan

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