Lizard Management Plan for Homestead Bay Subdivision, Queenstown

Contract Report No. 7483b

Providing outstanding ecological services to sustain and improve our environments

Wildlands

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Contract Report No. 7483b

April 2025

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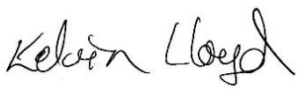

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1.0 Introduction

Remarkable Planning, on behalf of RCL Homestead Bay Limited, is preparing a Fast-track Approvals Act (2024) resource consent application for a residential subdivision of rural land at Homestead Bay, just south of Jacks Point in Queenstown. The subdivision includes two properties, Lot 8 DP 443832 and Lot 12 DP 364700, with a combined area of approximately 163 hectares.

The gently sloping site has been farmed for many decades and the vegetation is largely dominated by exotic pasture, but also contains small areas of matagouri (*Discaria toumatou*) shrublands, gullies with ephemeral streams, and small natural inland wetlands (Wildland Consultants 2025). Previous aquatic and terrestrial ecology assessments have been undertaken for the site by Beale Consultants (2023) and Water Ways Consulting (2023).

Remarkable Planning engaged Wildland Consultants Ltd (Wildlands) to undertake a lizard assessment over the entire site. This survey was carried out in February 2025, under Wildlife Act Authority 96003-FAU. One lizard species was commonly found and widespread over the site: McCann's skink (*Oligosoma maccanni*; Not Threatened). It is possible that the site could also have small remnant populations of tussock skink (*Oligosoma chionocloescens*; At Risk - Declining) or mountain beech gecko (*Woodworthia "south-western";* At Risk - Declining).

A Lizard Management Plan (LMP; this document) and Wildlife Act Approval (WAA) is therefore required. This LMP follows the principles outlined by the Department of Conservation (DOC) in their guidelines (DOC, 2019) (Table 1). These principles describe steps to take and enable the outcome of successful lizard management (including salvage, if determined to be the right mitigation option).

1.1 Project site and context

1.1.1 Subdivision Configuration

RCL Homestead Bay Limited is proposing the creation of residential subdivision of rural land at Homestead Bay, involving the creation of approximately 2,800 lots over 205 hectares. The proposed development includes residential lots (including low, medium and high-density areas), commercial areas, reserves and wastewater treatment areas (Figure 1).

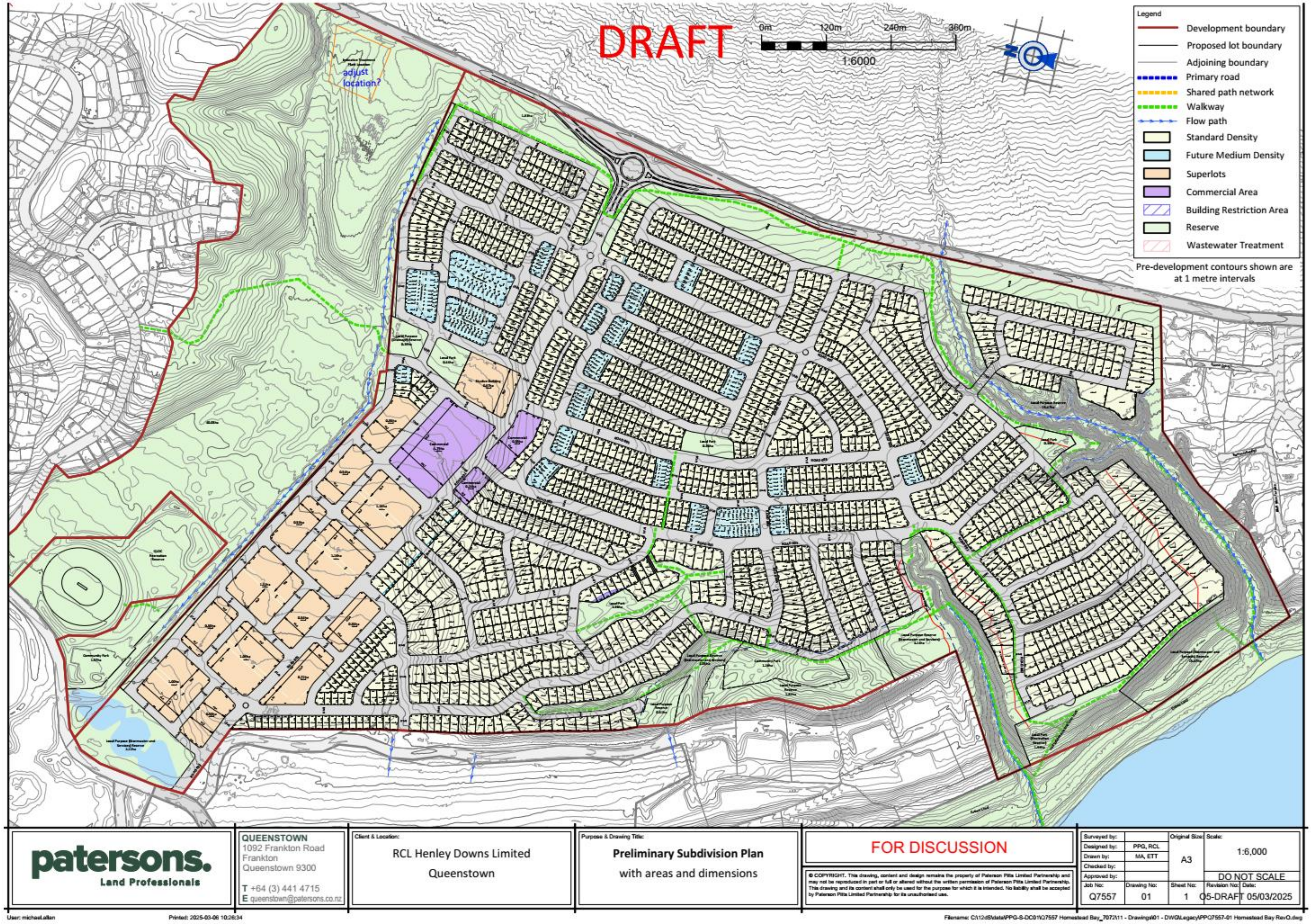

Figure 1 – Draft Plan for Homestead Bay Subdivision. Provided by Remarkable Planning.

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 Not Threatened species has been confirmed present at the site. It is possible that two other species (At Risk – Declining) may be present.	Section 4
Actual and potential development-related effects and their significance must be assessed	Effects include but are not limited to disturbance during earthworks, death and injury, fragmentation of habitat, loss of habitat, ongoing disturbance, and increased predation to lizards.	Section 6
Alternatives to moving lizards must be considered	Alternatives to moving lizards have been considered through avoidance of high-quality habitats (matagouri shrublands and rocky gullies).	Section 7
Threatened species require more careful consideration than less-threatened species	It is highly unlikely that Threatened species are present. The Incidental Discovery Protocol will address any unexpected discoveries, including Threatened species.	Section 4, 8
Lizard salvage, transfer and release must use the best available methodology	Use standard accepted procedures (Hare, 2012a & 2012b).	Section 7.3.3
Receiving sites and their carrying capacity must be suitable in the long term	Lizards will be released unaffected areas on site. Habitat enhancement will be undertaken throughout these areas.	Section 7.3.4
Monitoring is required to evaluate the success of the salvage operation	If a substantial number of lizards (more than 100 McCann's skinks or if any additional species are found) are salvaged from the extent of works, monitoring will be conducted to determine the success of salvage, and enhancement of the release site.	Section 9
Reporting is required to communicate outcomes of salvage operations and facilitate process improvements	Standard reporting will be undertaken for the success of the LMP implementation. Reports will be provided to the consenting authority, mana whenua and DOC on the completion of salvage.	Section 10
Contingency actions are required when lizard salvage and transfer activities fail	Contingency actions include: • Incidental Discovery Protocol to be followed throughout works. • Management of reconstructed habitats if they fail to uptake. • Management measures where more lizards than expected are salvaged.	Section 7.4, 8

2.0 Relevant legislation

Due to the presence and abundance of indigenous lizards, the proposed subdivision requires a Wildlife Act Approval under Schedule 7 of the Fast-track Approvals Act (2024) which includes approvals relating to the Wildlife Act (1953).

All indigenous lizards are protected under the Wildlife Act (1953) and approval under the Schedule 7 of the Fast-track Approvals Act must be obtained in order to permit the activity occurring. This includes before any indigenous lizards can be disturbed or relocated on site (Schedule 7(2, 2, i)).

In order to ensure that protective benefit is achieved for lizard populations within the site, appropriate mitigation measures have been provided in the LMP. Lizard mitigation work will be undertaken by a Department of Conservation-approved herpetologist who has been authorised to implement lizard management for the project through a Department of Conservation Wildlife Act Approval (WAA) issued for the project.

A LMP (this document) is required to accompany the WAA application and must be submitted to the Department of Conservation (via the EPA) and approved prior to undertaking any activities that potentially impact on lizard populations, and any lizard management proposed to mitigate these effects.

3.0 Lizard management approach

3.1 General

Any lizard management must be carried out in consultation with DOC, Queenstown Lakes District Council (QLDC), Otago Regional Council (ORC) and mana whenua. We consider avoidance, remediation and salvage and release will provide the best opportunity for protective benefit at this site, given the surrounding landscape, and likelihood of lizards persisting/thriving (see Section 7.3 for more detail).

3.2 Roles and responsibilities

Table 2 identifies the roles and responsibilities for the implementation of actions identified in this Lizard Management Plan. Responsibilities for specific actions are also identified in the sections below.

3.2.1 Wildlife Approval holder

RCL Homestead Bay Limited is the applicant of the subdivision under the Fast-track Approvals Act and will therefore act as approval holder, and will be responsible for compliance with the Wildlife Approval and implementation of the LMP. The applicant has never been convicted of any offence under the Wildlife Act, nor has any current criminal charges under the Wildlife Act pending before a court.

3.2.2 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 will be implementing lizard management at the site:

- Cameron Thorp – Wildland Consultants Ltd; Herpetologist – Project Herpetologist
- Jade Christiansen – Wildland Consultants Ltd; Herpetologist
- Samantha King – Wildland Consultants Ltd; Senior Ecologist and Herpetologist

Delivery of, and compliance with this LMP will be the responsibility of approval holder (RCL Homestead Bay Limited) who will liaise with the Site Manager, Site Engineer(s), Project Herpetologist and vegetation clearance and earthworks contractors as required.

Pre-start meeting

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

– Site supervisor
– 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.

Table 2 – Identified project roles and responsibilities for LMP implementation

Title	Responsibility	Timeline
Project Owner • RCL Homestead Bay Limited	• Delivery of the Project, including overall compliance with resource consents, LMP and subsequent WAA conditions to be issued for the project.	TBC
Contractor/ Construction • TBC Project Manager • TBC	• Compliance with LMP and subsequent WAA issued for the project. • Implementation of actions required by the LMP and WAA including the following: - Reading and understanding the LMP and WAA requirements. - Facilitating a project start-up meeting with the Project Herpetologist and Contractors before vegetation clearance for construction commences. - Maintaining clear lines of communication with both the Project Owner, Project Herpetologist and Contractors regarding changes to the works schedule. - Implementing actions where responsibility has been identified. - Briefing new personnel about the contractor's responsibilities under this LMP.	TBC

Title	Responsibility	Timeline
Project Herpetologist - Authorised Personnel on the WAA	The Project Herpetologist has been engaged by the Project Owner to provide technical advice to the Project Engineer(s), and to assist Project Engineer with compliance checks against this LMP and WAA. The Project Herpetologist will: • Prepare and update the LMP as required. • Ensure any required WAA permits are attained and on hand during site works. • Where necessary, assist with contractor training. • Complete the required compliance reporting.	TBC
Contractors - Wildland Consultants Ltd - TBC	The Contractor(s) will be engaged by the Project Owner to implement the Project. The Contractor(s) will report and work daily with the Contractor/ Construction Site Manager. The Contractor(s) will: • Implement lizard management • Implement habitat enhancement requirements including creation of aggregate piles. • Implement annual pest plant incursion monitoring • Undertake surveys in lizard habitats • Assist the Project Herpetologist with compliance and monitoring reporting.	Lizard salvage within two weeks of each work stage Habitat creation during works

4.0 Lizard Values

4.1 Desktop assessment/literature review

Department of Conservation BioWeb Herpetofauna Database observations within 20 years, and 20 kilometres of the site, were assessed to provide context for lizard fauna recorded within the site and inform an assessment of ecological values for the Project Area (Table 3).

McCann's skinks were confirmed during site surveys. McCann's skinks are often found in modified dry, open environments where there is a complex of rocky outcrops, tussock and scrub. This species is considered to be highly abundant throughout Central Otago.

It is possible that tussock skink (*Oligosoma chionocloescens*) may be present within the site, at low densities in damper areas. However, in these areas on site, mice were observed at high densities during the site survey.

Mountain beech gecko (*Woodworthia* "south-western") could possibly inhabit rocky scrubland present on site, particularly in the south-eastern gully. However, due to the very small and fragmented rocky habitat available, and apparent high mouse densities, this species is unlikely to be detectable. There are several records indicating remnant mountain beech gecko populations nearby, but all are in areas with different rocky habitats (torr, scree or boulder field) available.

Cryptic skinks (*Oligosoma inconspicuum*) and short-toed geckos (*Woodworthia 'Southern mini'*) have both been recorded nearby (6.4 and 3.2 kilometres, respectively). These nearby observations were all in the sub-alpine and alpine rocky slopes of the nearby Remarkables. The Homestead Bay site lacks the high quality rocky or tussock habitats likely needed to support populations of cryptic skinks, and the subalpine habitat required by short-toed geckos. It is highly unlikely that any other species of indigenous lizard typically found in the

region are present within the site, due their habitat requirements (orange spotted gecko; *Mokopirirakau* “Roys Peak”; alpine specialist), slow life history characteristics (Lakes skink; *Oligosoma* aff. *chloronoton* “West Otago”) and the geographic separation between the site and location the species was recorded (Kawarau gecko; *Woodworthia 'Cromwell'*).

Table 3 - Results of the Department of Conservation Bioweb herpetofauna database search, within a 20-kilometre radius of the site, and an assessment of the likelihood of the presence of these species at the site. Conservation status as per Hitchmough *et al*. 2021 and Jarvie *et al.* 2023. The likelihood of occurrence at the project site has been assessed for each species based on their known habitat preferences and distribution in the area and surrounds.

Species	Common name	Conservation status	Regional status	Record distance (km)	Preferred habitats	Likelihood of occurrence
Oligosoma maccanni	McCann's skink	Not Threatened	Regionally Not Threatened	1.3	Open habitats- dry rocky environments such as rock outcrops, and montane grassland	Presence confirmed during site surveys
Woodworthia "south-western"	Mountain beech gecko	At Risk - Declining	At Risk- Regionally Declining	3.0	Mature indigenous forests, rocky scrub/grasslands, boulderfields and scree	Possible
Woodworthia 'southern mini'	Short-toed gecko	At Risk- Declining	At Risk- Regionally Declining	3.2	Alpine and subalpine areas (600 - 1,700m). Scree boulderfield, creviced rock outcrops. Occasionally rocky scrubland or pasture.	Highly unlikely
Oligosoma inconspicuum	Cryptic skink	At Risk- Declining	At Risk- Regionally Declining	6.4	Prefers tussock grasslands, wetlands and rocky areas such as rocky screes.	Unlikely
Mokopirirakau "Roys Peak"	Orange spotted gecko	At Risk - Declining	At Risk- Regionally Declining	10.4	High-altitude (1,100-1,800m) alpine and subalpine creviced rock outcrops, rocky shrubland, boulderfield, talus, scree and rocky tussockland	Highly unlikely
Oligosoma chionocloescens	Tussock skink	At Risk - Declining	At Risk- Regionally Declining	14.3	Range of habitats including coastal dunes, wetlands, grassland, shrublands, rocky shrubland/herbfield, screes, tussock, stony river beds and even cities	Possible
Woodworthia 'Cromwell'	Kawarau gecko	At Risk- Declining	At Risk- Regionally Declining	15.8	Rocky scrubland, talus, and creviced rock outcrops (from lowland to alpine areas, <1,300m).	Highly unlikely
Oligosoma aff. *chloronoton* "West Otago"	Lakes skink	Nationally Vulnerable	Regionally Vulnerable	18.0	Grassland, scrubland, tussockland, rocky areas, scree, herbfield, fellfienld, stony riverbeds, terraces and lake edges (from montane to alpine areas).	Highly unlikely

4.2 Lizard survey

4.2.1 Field survey methods

A five-day survey was carried out over the Homestead Bay site by herpetologist Jess Randall (Wildland Consultants) from 2nd to 6th of February, 2025, under Wildlife Act Authority 96003-FAU. The surveys were carried out in weather conditions suitable for lizard activity in Central Otago (average minimum air temp 10.7°C – maximum average air temperature 23°C). Where possible, lizards detected were captured and identified prior to release.

Fifty-two Gee's minnow (funnel) traps were used during the survey. Systematic daytime searches were also conducted across suitable habitat, including lifting of debris (metal sheets, logs, plastic pipes etc.), rocks and searching vegetation.

Lizard survey methods sometimes have poor detection rates because of typically low population densities, species' cryptic colouration, difficulty in surveying preferred habitats and behaviour/activity patterns. As such, even intensive lizard surveys are unlikely to detect all individuals in the population or, possibly, all species present.

4.2.2 Field survey results

A total of 42 skinks were observed over the survey (Table 4). Of these, 35 were captured and identified as McCann's skinks. 28 skinks were caught in funnel traps set across the site, while a further 14 skinks were observed or caught during systematic searches. One skink was recaptured on one occasion.

Funnel traps were not able to be placed in all possible lizard habitat on site, due to the high capture rates of mice in large areas of rank grass. Mice were captured on 21 occasions, and when mice were caught traps were removed from the area and relocated to a safer location.

Table 4 – Lizard survey effort and weather conditions at the site

Date	Weather on Survey Date	Activity and Effort	Species Detected
2-Feb-25	18°C, 60.1% r.h., S gentle breeze, breaking inversion cloud - 22°C, 51.4% r.h., SW gentle breeze, sunny.	Set 25 funnel traps.	Nothing detected
3-Feb-25	11.5°C, 72.4% r.h., S gentle breeze, overcast - 24°C, 40.0% r.h., W gentle breeze, sunny.	Checked 25 funnel traps. Set additional 27 funnel traps. 0.5 hours manual searching	1 McCann's skink
4-Feb-25	17.2°C, 62.3% r.h., E gentle breeze, sunny - 22.0°C, 45.6% r.h., S gusty wind, sunny.	52 funnel trap checks 2 hours of manual searching	16 McCann's skinks 4 uncaptured skinks
5-Feb-25	14.9°C, 63.3% r.h., W gentle breeze, sunny - 28.8°C, 34.5% r.h., E gentle breeze, high cloud.	52 funnel trap checks 2 hours of manual searching	10 McCann's skinks 3 uncaptured skinks
6-Feb-25	16.2°C, 80.1% r.h., SE moderate breeze, overcast - 19.0°C, 65.1% r.h., S moderate gusts, overcast.	52 funnel trap checks 0.5 h our of manual searching	8 McCann's skinks
Total	**Temperature range: 11.5-28.8°C**	**181 funnel trap checks**	**35 McCann's skinks captured, 7 uncaptured**

Figure 2. Lizard survey and results at Homestead Bay property development, Otago

4.3 Lizard habitat

According to Beale Consultants (2023), the present vegetation is dominated by pasture, with indigenous vegetation restricted to fragmented areas associated with gullies and steep faces. In February 2025, most paddocks were heavily grazed or being rotated with crops (beets and triticale). Small rock piles were present in paddocks throughout the site, though these did not provide adequate cover for lizards due to their small size and very heavy grazing by stock and damage from rabbits.

The extent of lizard habitat available on site is summarised in Table 5 and Figure 3. The following lizard habitats were identified across the Homestead Bay site:

- Matagouri shrubland
- Mixed indigenous – exotic shrubland
- Shelterbelts with rank grass
- Shelterbelt remnant stumps and debris with rank grass
- Indigenous amenity garden
- Rank grass
- Pine woodlot with rank grass
- Rocky substrates

Table 5 – Habitat types and approximate area at the Homestead Bay site.

Vegetation	Relative quality	Approximate area (hectares)
Matagouri shrubland	Moderate	1.41
	High	0.97
Mixed indigenous – exotic shrubland	Moderate	5.54
	High	11.35
Shelterbelt with rank grass	Moderate	0.8
Shelterbelt stumps with rank grass	Moderate	1.31
Indigenous amenity garden	High	0.7
Rank grassland	Low	6.84
	Moderate	0.56
Pine woodlot and rank grass	Low	2.5
Rocky substrate	Moderate	0.31
	High	Small scattered areas in creek bed in upper and lower sections of the south-eastern gully.
Total area		**32.29**

Small patches of remnant matagouri shrubland were found on terrace risers close to the western and northern boundaries of the site. Most of these provided relatively patchy, moderate-quality habitat, due to very heavy grazing and damage from rabbits. Populations of lizards were detected in some areas where rank grass or dense lower cover from shrubs provided better cover for lizards.

There are two gullies with ephemeral creeks on site.

The smaller south-western gully (Plate 1) currently includes a pine woodlot at the lower reaches with mixed indigenous – exotic shrubland and rank grass on the edges. Only low-quality lizard habitat was observed here during surveys, and no traps were placed due to high risk of mouse predation in traps in this area. The upper part of this gully is vegetated by sparse mixed indigenous – exotic shrubland and has been filled with approximately 30,000 m^3 of clean fill in 2018. While this area is moderate-quality habitat for McCann's skinks, and some lizards were found in this area (relatively low in the gully), it's expected that the population of lizards here will be small due to this relatively recent disturbance.

The larger south-eastern gully (Plate 2) had habitat ranging from patches of high-quality open rocky creek bed substrate at the upper and lower reaches, to large areas of moderate-quality rank grass, mixed indigenous – exotic shrubland and taller exotic woody vegetation. It's not expected that the taller vegetation in this area would provide habitat for arboreal lizard species, due to historic disturbance, recent revegetation with exotic species, high mouse abundance and a lack of habitat connectivity. A middle section of the gully close to paddock gates is characterised by exposed soil, heavily grazed pasture grass and has no rocks or indigenous shrubs to provide any suitable habitat for indigenous lizards.

Some shelterbelts provided suitable moderate-quality lizard habitat with small areas of rank grass, including those where trees had recently been removed, leaving behind stumps and woody debris that provided good cover for lizards. Other shelterbelts had no grass or other vegetation close to the ground and were not considered suitable lizard habitat.

Most paddocks were heavily grazed, with patches of rank grass in wetter areas such as around ponds or water troughs. There is a considerable area of rank grass between 'North Zone' Road and fence lines. A large paddock of triticale attracting large flocks of small birds was adjacent to this area. Trapping in many of these areas was abandoned due to particularly high mouse abundance, and rank grass habitats were largely considered low-quality habitat for lizards.

A large section of the property is currently used by a skydiving company, 'NZone', for their operations including buildings, gardens and a large mown airstrip. This airstrip was not available for surveying due to safety concerns, however did not include any potential lizard habitat. A native garden around these buildings could provide excellent habitat for indigenous lizards, however NZone staff reported a very high density of pests in this area, including mice, hedgehogs and feral cats. No lizards were detected in traps or under debris during surveys of this area.

Plate 1 – South-western gully with mixed indigenous – exotic shrubland.

Plate 2 – Erosion, rank grass and some rocky substrate in the lower section of the south-eastern gully.

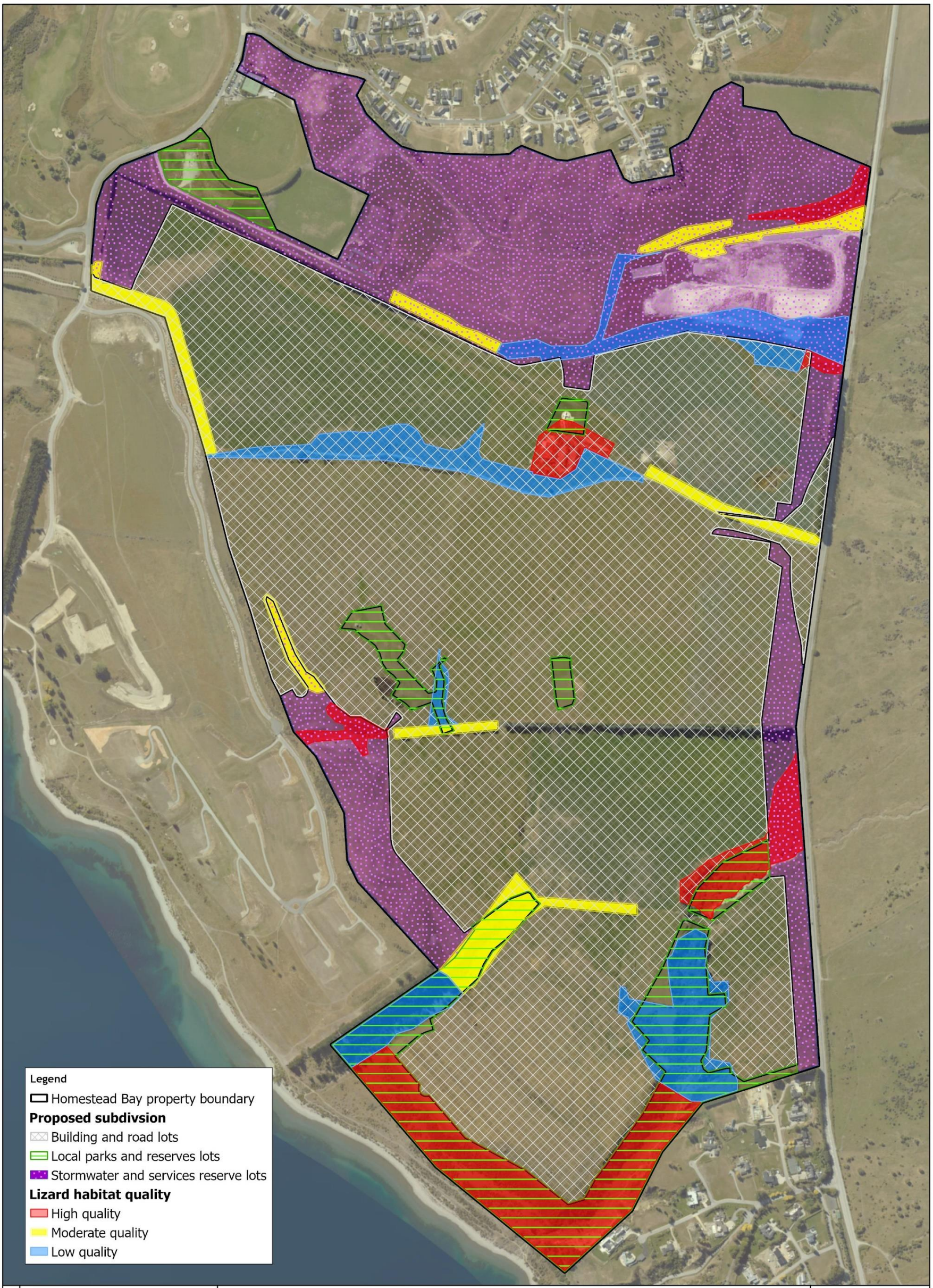

Figure 3. Lizard habitat at Homestead Bay property development, Otago

Plate 3 – A patch of rocky habitat in the upper south-east gully.

Plate 4 - Woody debris and rank grass in a former shelterbelt

5.0 Ecological significance

As per the ecological assessment by Beale (2024), the matagouri shrublands on site are considered ecologically significant as they meet representativeness and rarity/distinctiveness criteria of the QLDC Proposed District Plan (PDP). Additionally, the mixed-indigenous – exotic shrublands are considered ecologically significant as they meet the rarity/distinctiveness criteria of the PDP.

6.0 Effects on lizards

Effects on lizards from the proposed subdivision and associated earthworks have been assessed at a local population scale, using the Quality Planning Extent of Adverse Effects criteria (Quality Planning, 2017). The subdivision will be permanent in nature, and will affect a total of 7.5 hectares of lizard habitat.

Survey results suggested that patches of higher density populations of McCann's skink exist on site in areas of high and moderate quality lizard habitat. However, in lower quality habitat (such as areas of rank grass), very high pest abundance suggests low to undetectable lizard populations.

6.1.1 Proposed works

Major earthworks will be completed across the development area, including large-scale topography altering earthworks across the site. This includes the creation of screening bunds along the highway. Existing shelterbelts and vegetation within the works areas will be permanently removed during the development of lots and associated services, roads and reserves.

It is proposed to deposit additional clean fill from works on site into the upper section of the south-western gully.

Additional clean fill will be deposited into the section of the south-western gully upgradient from the pine woodlot.

6.1.2 Reserve/landscape planning

Beale Consultants (2023) has recommended the removal of the pine woodlot in the south-western gully. In addition, the removal of wilding conifers and exotic woody weeds was recommended from shrublands on the lakeside faces and south-eastern gully.

Landscape plans by STR Landscapes includes the restoration of proposed reserves by planting of red and mountain beech on lower steep gully slopes. While these habitats are not suitable for McCann's skink, these are restricted mostly to parts of the site that are currently largely unsuitable for indigenous lizards.

Low riparian planting, natural shrubland planting and natural regeneration of shrubland is also proposed for upper slopes and other parts of the site, and these plans will include lizard friendly species as described below.

Table 6 – Habitat effected within the project area, potential lizard species present, and assessment of the percentage of habitat to be disturbed by clearance of the site.

Habitat Type	Approximate total area (ha)	Approximate area to be affected by works (ha)
Matagouri shrubland	2.38	0
Mixed indigenous – exotic shrubland	16.89	1.67
Shelterbelt with rank grass	0.8	0.8
Shelterbelt stumps with rank grass	1.31	1.31
Native garden	0.7	0.7
Rank grassland	7.4	3.5
Pine woodlot with rank grass	2.5	0
Rocky substrates	0.31	0

6.2 Potential effects

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

- Accidental injury/death/displacement
- Disturbance to lizards during earthworks
- Loss of indigenous lizard habitat
- Breeding failure/behavioural effects
- Increased predation to lizards

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

Disturbance during earthworks: Disturbance during construction 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 **more than minor** without mitigation.

Habitat loss and fragmentation: Lizards and their habitat were found throughout the site and loss of some poorer quality habitats cannot be avoided. This will result in permanent habitat loss for indigenous lizards at this site. Due to the low-moderate density of lizards present, this effect is likely to be **minor** without mitigation.

Breeding failure/Behavioural effects: The proposed subdivision and associated earthworks 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.

Increased predation*:* The proposed subdivision will increase domestic cat abundance, as well as attract rodents, which may have an impact on lizard populations adjacent to the impact site. Due to the already high abundance of invasive predators including mice and hedgehogs, the effect is likely to be **less than minor** without mitigation.

6.3 Significance of effects

The level of ecological effects on indigenous lizards without mitigation actions are taken are presented in Table 7.

Table 7 – 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	More than minor
Habitat loss	Minor
Breeding failure/behavioural effects	Less than minor
Increased predation	Less than minor

7.0 Management of Effects

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

7.1 Avoidance

Most of the high quality lizard habitat within the Homestead Bay subdivision can be avoided due to minimal disturbance to the gullies and steep terrace risers present on site. Existing areas of matagouri and other indigenous shrubs will be retained where possible in stormwater services and reserve lots.

Disturbance to areas of high-quality rocky habitat and indigenous shrubs in the south-eastern gully floor will be avoided during construction of any stormwater management or paths in this area.

7.2 Remediation

Mitigation for the effects to McCann's skink can be largely achieved through on site remediation. The draft Landscape Plan by STR follows recommendations from Beale Consultants (2023) and includes the planting of large areas of indigenous shrubland and low riparian planting. The Landscape Plan will be revised to include lizard friendly plant species along with rock piles and woody debris. The remediated and enhanced areas will expand high-quality habitat available on site and will enable additional individuals salvaged from other lower quality habitats removed during the development.

7.2.1 Creation of habitats

Rocks

Rock habitats will be created using rocks that will be removed from paddock rock piles prior to earthworks and construction. These will be retained and placed in rock piles under the supervision of the Project Herpetologist. Hand placing of slab rocks across areas naturally impoverished of rock, on open and sunny sites will be undertaken. The rock habitats will be completed to form stacked rocks, with small crevices suitable for lizard occupation.

These rock piles will be placed in parts of the south-eastern gully where habitat is already present but requires additonal enhancement. All rock stacks will be marked and recorded to ensure that they can be used as supplementary release sites and for future monitoring, if required (Section 9.0).

Woody vegetation

Pine trees will be removed as part of scheduled works for the project. Pines controlled on site will be retained and placed into the south-western gully. This will provide temporary refuges for lizards until lizard friendly restoration plantings can provide adequate cover and habitat. All cones should be removed to reduce risk of spreading seeds.

Any additional woody vegetation that is to be removed within the impact site can also be placed in the south-eastern gully to provide enhanced cover for lizards during removal of exotic shrubs and trees. The contractor responsible will ensure that no unwanted organisms or pest species are placed in these areas.

Lizard friendly planting

Areas of proposed indigenous shrubland and low/riparian planting on site should be designed to consider the habitat preferences of McCann's skink. Indigenous plants suitable for Central Otago dryland sites that provide benefits to lizards have been recommended in Table 8 below.

Table 8 – Recommended planting and their benefit to lizards and growth habit.

Common name	Scientific name	Benefits to Lizards	Beneficiaries	Growth Habit
Cromwell broom	*Carmichaelia compacta*	C, R, I	Terrestrial skinks	Shrub
Coprosma dumosa	*Coprosma dumosa*	C, N, F, I	Terrestrial skinks	Shrub
Poataniwha	*Melicope simplex*	C, N, I	Terrestrial skinks, geckos	Shrub
Scrub pōhuehue	*Muehlenbeckia complexa*	C, F, I	Terrestrial skinks, geckos	Shrub
Korokio	Corokia cotoneaster	C, N, F, I	Terrestrial skinks, geckos	Shrub
Porcupine shrub	*Melicytus alpinus*	C, F, I	Terrestrial skinks, geckos	Shrub
Mingimingi	*Coprosma propinqua*	C, N, F, I	Terrestrial skinks, geckos	Shrub
Coprosma crassifolia	*Coprosma crassifolia*	C, N, F, I	Terrestrial skinks, geckos	Shrub
Scented tree daisy	*Olearia odorata*	C, N, I,	Terrestrial skinks, geckos	Shrub
Tātarāmoa / bush lawyer	*Rubus schmidelioides*	C, F, I	Terrestrial skinks, geckos	Vine

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

7.3 Minimise

7.3.1 Pest plant removal

Planned removal of pest plant species as reccomended by Beale Consultants (2023) will result in improved habitat values for indigenous lizards when completed. However, to minimise temporary risk to indigenous lizards currently using this vegetation for cover, removal and control of pest plant species should be done during the warmer months (October to March) and when temperatures are above 18°C to allow lizards to disperse from removed vegetation.

7.3.2 Ongoing site maintenance

Currently, the vast majority of the site is heavily grazed or being rotated with crops and is not suitable habitat for lizards. However, should grazing and current land-uses cease and rank grassland spread across the site prior to development, much of the site could become suitable for McCann's skink and populations could disperse across the site.

It is important that grazing is continued throughout undeveloped parts of the site and throughout the development process. This will reduce the risk of lizards dispersing into areas not currently designated as areas of potential lizard habitat.

If areas of pasture grass are not grazed or maintained, these areas may also become lizard habitat and will require salvage through the same methods highlighted below.

7.3.3 Salvage

Salvage of lizards in areas that cannot be avoided by works is restricted mostly to highly modified habitats, including:

- Mixed indigenous – exotic shrubland
- Shelterbelts with rank grass
- Shelterbelt stumps with rank grass
- Native garden

A small patch of heavily grazed matagouri shrubland to the north-eastern boundary of Lot 8 will also be impacted by works. All of the affected habitats affected are likely to hold relatively low densities of lizards due to poor habitat quality and high numbers of mice and hedgehogs present.

The amount of salvage effort and range of methods proposed for use at the site is aimed to enable the removal of as many individuals as possible, representing a moderate to high proportion of the total number of McCann's skinks present.

Salvages will be staged in concurrently with the staging of works for each area. Earthworks will proceed into salvaged lizard habitats within a maximum of two weeks after the salvage has been completed. The Project Herpetologist will be notified once the works commence. If works do not proceed in this time, it is possible that lizards from the surrounding areas may move into the works area. If this occurs, the salvage will need to recommence following the methods outlined below.

Table 9 - Estimated number of lizard traps and the manual searching effort required for each habitat type requiring salvage, including estimated number of skinks caught.

Habitats	Approximate Area to be Affected by Works (ha)	Approximate Number of Traps Required	Trap Type	Manual Search Effort Required	Estimated Number of Lizards Salvaged
Matagouri shrubland	0.07	40	Pitfall traps	-	15-20
Mixed indigenous – exotic shrubland	1.67	200	Funnel traps and ACOs	-	45-50
Shelterbelt with rank grass	0.8	100	Pitfall trap	-	30-35
Shelterbelt stumps with rank grass	1.31	210	Pitfall trap	5p/h	65-70
Native garden	0.7	50	Funnel trap	5p/h	15-20
Rank grassland	7.4	555	Pitfall traps	-	50-55
Total	**11.88**	**1155**		**10p/h**	**220-250**

Trapping

Funnel traps will be baited with canned pear or berry bliss lollies (Natural Confectionary Co.™). The funnel traps will be padded with grass to provide shelter and prevent desiccation, in addition to preventing mice from preying upon caught skinks. The funnel trap will be covered with or nestled into the surrounding vegetation (as per the DOC Herpetofauna Monitoring Toolbox for Funnel Trapping; Hare, 2012a).

Pitfall traps consist of a plastic container (>2 litre depth) dug into the ground (typically baited with pear or berry bliss lollies, Natural Confectionary Co.™ (known lizard attractants)), which lizards may fall into and be unable to exit. The pitfalls will be covered with Onduline™ to provide additional thermoregulatory advantages and attract more lizards to the traps. Pitfall traps will be filled with grass and a damp sponge, in addition to the Onduline artificial cover to provide shelter and prevent desiccation of skinks within the trap. Pitfall traps will be installed at least one week 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, 2012). To prevent harm to lizards, pitfall traps will be closed when not in use (either with a sealed lid and/or by filling them with rocks). Traps will be checked at least every 24 hours when in use.

- Lizard traps will be placed at 5-10 metre spacings, as outlined above in each lizard habitat prior to earthworks. This work will be staggered with development stages.
- Once active, live capture traps will be checked daily for 7 consecutive days in low quality habitats and 10 consecutive days in moderate or high-quality habitats. If trapping reveals trends of decreasing numbers of skinks over the course of the time allocated for the habitat type, the salvage will cease.

- If traps continue to get the same or high numbers of skinks over the allocated time (≥3 individuals per day), the salvage will continue for an additional three days, or until no more lizards are caught.
- If trapping reveals trends of decreasing numbers of skinks over the course of the salvage, 7 days in low quality habitats and 10 days in moderate or high-quality habitats, with no skinks captured after day 5 or 7 respectively, trapping will cease.
- The length of trapping past the minimum requirements will be at the discretion of the Project Herpetologist.

Manual searching

Manual searching will occur in any habitats where woody debris or rocks are present. Where possible these areas will be manually searched and cleared throughout the salvage. Woody debris and rocks that could provide refuge for lizards will be manually lifted, and any lizards present will be subsequently caught (as per the DOC Herpetofauna Toolbox for Systematic Searches; Hare, 2012b). The clearance will occur until as much of the habitat, as reasonably possible, has been removed.

- Hand-searching techniques will be used to capture additional basking/active skinks. This will involve manually searching through and destructing any woody debris or rocky areas (where possible) to locate and capture any additional lizards.

Data collection

Lizard capture data will include species identity, sex, length, and any tail regeneration. Each stage 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.

Temporary holding of lizards

Any lizards captured will be handled and held following best practice and released as soon as practical to the pre-selected lizard release area. 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 full shade. 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. Any lizards captured will be handled and held following best practice and released as soon as practical to the pre-selected lizard release area. Lizards will be released within five hours of capture into the habitats nearby (into suitably enhanced habitat within reserves on site).

7.3.4 Lizard release

Release site assessment

The initial release site is a *C.* 4 hectare area in the lower section of the south-eastern gully. This site is within the Homestead Bay development area, and development plans designate the area as a Local Purpose Reserve. RCL Homestead Bay have agreed to protect the release area from future use and works.

During the survey of the works area, the release area was also surveyed to determine its suitability as a release site. Six McCann's skinks were observed during a walkover survey, as well as eight locations with unidentified skink or gecko sign (scat).

Additional enhancement of this area through the addition of aggregate piles of woody debris and rocks will increase the carrying capacity of the area, resulting in the ability to accommodate the additional individuals. Planned lizard friendly planting and exotic pest plant control will further increase capacity over the long-term.

Should more lizards be captured than expected, other suitable release sites include the upper section of the south-east gully and lower section of the south-east gully on site. These sites will also be receiving the same habitat enhancement measures as discussed in section 7.2.1.

Release methods

Lizards will be placed into pre-prepared rock piles or retained woody debris within the release site. Five to ten skinks (depending on numbers caught) will be released at each release point so as to not create unnecessary competition. Where any lizards are found together or in aggregation (i.e. multiple captures in one trap), they will be released together.

The rock/woody debris piles will provide temporary refugia while more long-term enhancement including lizard friendly restoration planting takes place. These refugia will reduce accessibility for mice and other predators, increasing the likelihood of a successful release.

7.3.5 Release site enhancement

Enhancemenet of exisiting lizard habitat in undeveloped parts of the site will require enhancement, in order to increase carrying capacity of receiving sites. Release site enhancement will include; enhancement planting, pest plant control and creation of habitat. Refer to discussion of remediation in section 7.2 for further detail.

7.4 Contingencies and risks associated with proposed management

7.4.1 Risks associated with salvage

Potential risks to lizards as a result of the proposed salvage, and management actions to reduce these risks, include:

- **Overheating**
  - Issue: Overheating may occur when captured lizards are temporarily held in containers during ongoing salvage activities.
  - Action: Lizards will be placed in individual containers and kept in a cool place until transported and released. Handling will be minimized to ensure they do not become stressed. All traps will be checked at least once daily.

- **Overcrowding, competition and displacement**
  - Issue: Lizards are already present in areas of the release site. The addition of supplementary lizards to the release site population may result in competition for resources and increased predation pressure and may result in displacement when released.

- Action: Enhancement planting, predator control and creation of additional habitat units within the release site will allow for a greater carrying capacity of lizards. This will reduce the amount of competition and potential displacement of released skinks.

- **Injury/death**
  - Issue: Incorrect trapping or handling during salvage by untrained staff.
  - Action: All lizards will be captured or supervised by an appropriately qualified herpetologist, following best practice and full hygiene protocols, minimising the risk of injury, death and disease transmission through inappropriate handling and capture.

7.4.2 Contingencies

There is inherent uncertainly in the outcomes of lizard management at the site, as a result of the complexities of the process and long-term management of the release site for species conservation. In some cases, additional species may be discovered during salvage, the release site is not viable in the long term, or the predator control regime has been found ineffective.

The main risks and resulting contingencies relating to the proposed lizard management include (see 10 for more details):

- Additional lizard species encountered other than those known to be on site (unexpected discovery).
- Habitat enhancement and/or planting uptake fails.
- Predator control causes negative impacts (mouse eruptions).
- More than expected lizards (>200 individuals) are salvaged from the impact site (overcrowding).

Table 10 – Risks associated with salvage and proposed management

Risk Associated with Salvage	Detail	Contingency
Additional lizard species encountered	Mountain beech geckos	Mountain beech geckos will be relocated to existing rocky areas within the release site.
	Tussock skink	Tussock skinks will be relocated to damper habitats within the release site.
	Although unlikely, if any other species (other than those listed) is encountered during salvage.	Stop works, notify DOC, and develop further instructions. Follow Incidental Discovery Protocol.
Remediation site failure	Habitat creation from salvaged rocks and woody debris is not taken up by lizards.	Continue monitoring for another two years. Any recommendations to address population declines will be recommended in annual reporting (see Section 10).
	Restoration planting fails	Any more than 10% plant failure will be replaced at the cost of RCL Homestead Bay Ltd.
More than expected lizards are relocated	Although it is not possible to accurately estimate the number of lizards that will be relocated during salvage, it is considered that more than 250 lizards will be a significant number and will require a contingency to address the risk.	Salvage will be extended as addressed in Section 7.3.3.
		If more than 250 lizards are salvaged across the site, a second on-site release site area will require enhancement (see Section 7.2).
Residual skink populations remaining	It is unlikely that all lizards will be removed from the impact site and may be displaced by earthworks.	Incidental Discovery Protocol (Section 8).

Risk Associated with Salvage	Detail	Contingency
following manual habitat clearance.		

8.0 Incidental Discovery Protocol

See attached Incidental Discovery Protocol (IDP).

9.0 Post release monitoring

The Department of Conservation's lizard mitigation guidelines (DOC, 2019) recommend monitoring to evaluate the success of the salvage operation, post release. If a substantial number of lizards (>100 McCann's skink) or any additional species are salvaged from the extent of works, monitoring is appropriate to determine the success of the salvage, and enhancement of the release site. Monitoring will be carried out at the release site during the season post salvage. This monitoring will be commissioned by RCL Homestead Bay and undertaken by a suitably qualified and permitted herpetologist.

Monitoring of translocated 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 as unethical. Therefore, the design of the post-translocation monitoring work will be focussed on achieving population persistence at the site following relocation (ACO survey over one week during fine weather between November and December). Two to three ACOs will be placed at each aggregate and talus pile in which lizards were released in throughout the release site (*C.*40 ACOs).

By conducting a live capture survey, mark-recapture of the population is possible. All lizards captured will be measured (snout-vent length, tail-vent length, regen length), sexed, photographed and marked with an ID number. Therefore, occupancy modelling can be conducted to estimate the size of the population, and trends of persistence over time, which can provide an indication as to how lizards are faring at the site.

10.0 Reporting

A salvage report will be prepared, including details of the lizard species, capture locations, the number of individuals salvaged and release locations. 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 the Department of Conservation as part of the Wildlife Authorisation permit obligations. ARDS cards will be completed and submitted to DOC.

This report will be provided to RCL Homestead Bay Limited, QLDC, ORC, DOC, and mana whenua, as required within six months of the completion of all lizard habitat removal on site.

Additionally, if post-release monitoring is required, an annual report summarising the monitoring outcomes will be reported by the Project Herpetologist to the listed stakeholders above, providing details of success, failure and any adaptive management that may be required.

11.0 Significance of effects after management

Accurately predicting the level of effect with mitigation in place is difficult, but Table 11 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 are properly implemented, the overall level of effect will be **less than minor.**

Table 1 - 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 injury/ death/ displacement	More than minor	Avoidance of high-quality habitats (Section 6.1) Lizard salvage and relocation (Section 6.3.2) Contingencies and risks with proposed management is considered (Section 6.4.1) Incidental Discovery Protocol (Section 7)	Minor
Disturbance during earthworks	More than minor	Lizard salvage and relocation (Section 6.3.2) Contingencies and risks with proposed management is considered (Section 6.4.1) Incidental Discovery Protocol (Section 7)	Less than minor
Habitat loss	Minor	Avoidance of high-quality habitats (Section 6.1) High-quality lizard habitat creation and enhancement (Section 6.2.1)	Less than minor
Breeding failure/Behavioural effects	Less than minor	Lizard salvage and relocation (Section 6.3.2) Contingencies and risks with proposed management is considered (Section 6.4.1)	Less than minor
Increased predation	Less than minor	Habitat enhancement (Section 6.2.1)	Less than minor

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