MATAKANUI

GOLD LIMITED

Landscape and Ecological Rehabilitation Management Plan: Part A

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Disclaimer

This report has been prepared by New Zealand Institute for Bioeconomy Science ~~Landcare Research New Zealand Ltd~~, Boffa Miskell and Habitat NZ for Matakanui Gold Limited for the purpose of it being submitted to a Panel appointed under the Fast Track Approvals Act 2024. Landcare Research New Zealand Limited, Boffa Miskell and Habitat NZ agree that this report may be used for this purpose.

1. INTRODUCTION

New Zealand Institute for Bioeconomy Science ~~Manaaki Whenua Landcare Research~~ (MWLR[1]), Habitat NZ and Boffa Miskell Limited (BML) have prepared this Landscape and Ecological Rehabilitation Management Plan (LERMP) for the proposed Bendigo-Ophir Gold Project (BOGP) within the Dunstan Mountains, Central Otago (the site). This plan is intended to manage impacts on the landscape and ecology associated with the proposed mine and its ancillary infrastructure. This plan therefore includes the direct disturbance footprint (DDF) and areas immediately adjacent to the DDF, excluding predator-proof sanctuaries and the majority of Ardgour Station (which have their specific management plans).

1.1. Purpose

The purpose of this LEWRMP is to effectively rehabilitate mining activity within the Dunstan Mountains Outstanding Natural Landscape (ONL) by establishing a mosaic of natural ecosystems, enhancing habitat diversity, and supporting native species through strategic revegetation within a reinforced conservation setting. This will include substantial changes to the physical landform and associated vegetation disrupted by mining activity, as well as associated changes to the surrounding landcover including through ecological restoration. This involves creating varied but typically deep root zones, applying ecological restoration methods, and creating rehabilitated landforms that visually integrate with the existing landscape character and transition between the south and north Dunstan Mountains.

1.2. Long-term Integrated Vision

The vision of the LERMP is to facilitate a rehabilitated landscape that integrates mining activity with the Dunstan Mountains ONL while delivering enhanced ecological outcomes through:

- **Landscape Integration:** Rehabilitated landforms that respect characteristic skylines, ridgelines, and cultural heritage values
- **Stable Landforms:** Geotechnically stable, natural-appearing landforms supporting long-term ecosystem development noting ~~except for~~ highwalls and pit lakes will not appear natural

[1] from July 1 2025 Manaaki Whenua – Landcare Research is an internal group of the Bioeconomy Science Institute, New Zealand Institute for Bioeconomy Science Limited

- **Diverse Habitats:** Resilient vegetation mosaics of native-dominated Central Otago ecosystems that include threatened and palatable plants
- **Enhanced Ecology:** Improved habitat for native tussock and shrubland, including threatened and culturally significant taxa, with resilience to drought and fire. An Applied Research Plan for cushionfields and spring annuals aims to establish rehabilitation methods for these threatened ecological elements
- **Regional Benefits:** A landscape that strengthens biodiversity conservation and maintains important cultural values and heritage associations.

1.3. Mine Elements

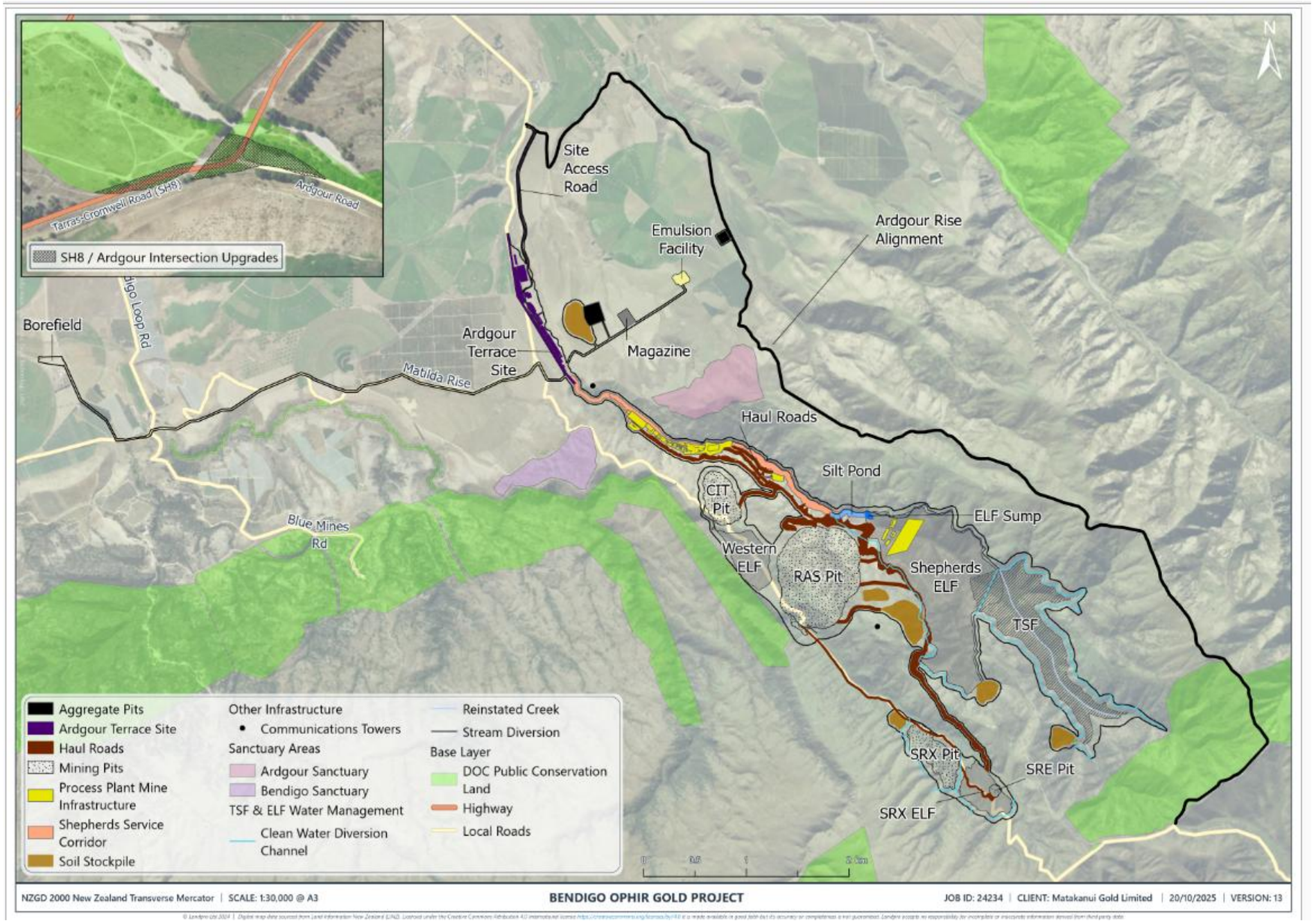
The proposed mine includes the following key elements that are proposed to be rehabilitated in accordance with Map 1 & 2 (reproduced in Appendix G) which describes the Land Management Units:

- Permanent pits
- Pit lakes: Rise and Shine (RAS) and SRX
- Engineered landforms (ELFs): Western ELF, Shepherds ELF, SRX ELF
- Tailings Structure (TSF embankment and pond)
- Stockpiles for soils and habitat rocks
- Haul roads and Plant Infrastructure
- Gravel pits and sediment ponds
- Temporary infrastructure
- Diversion drains, temporary and permanent.

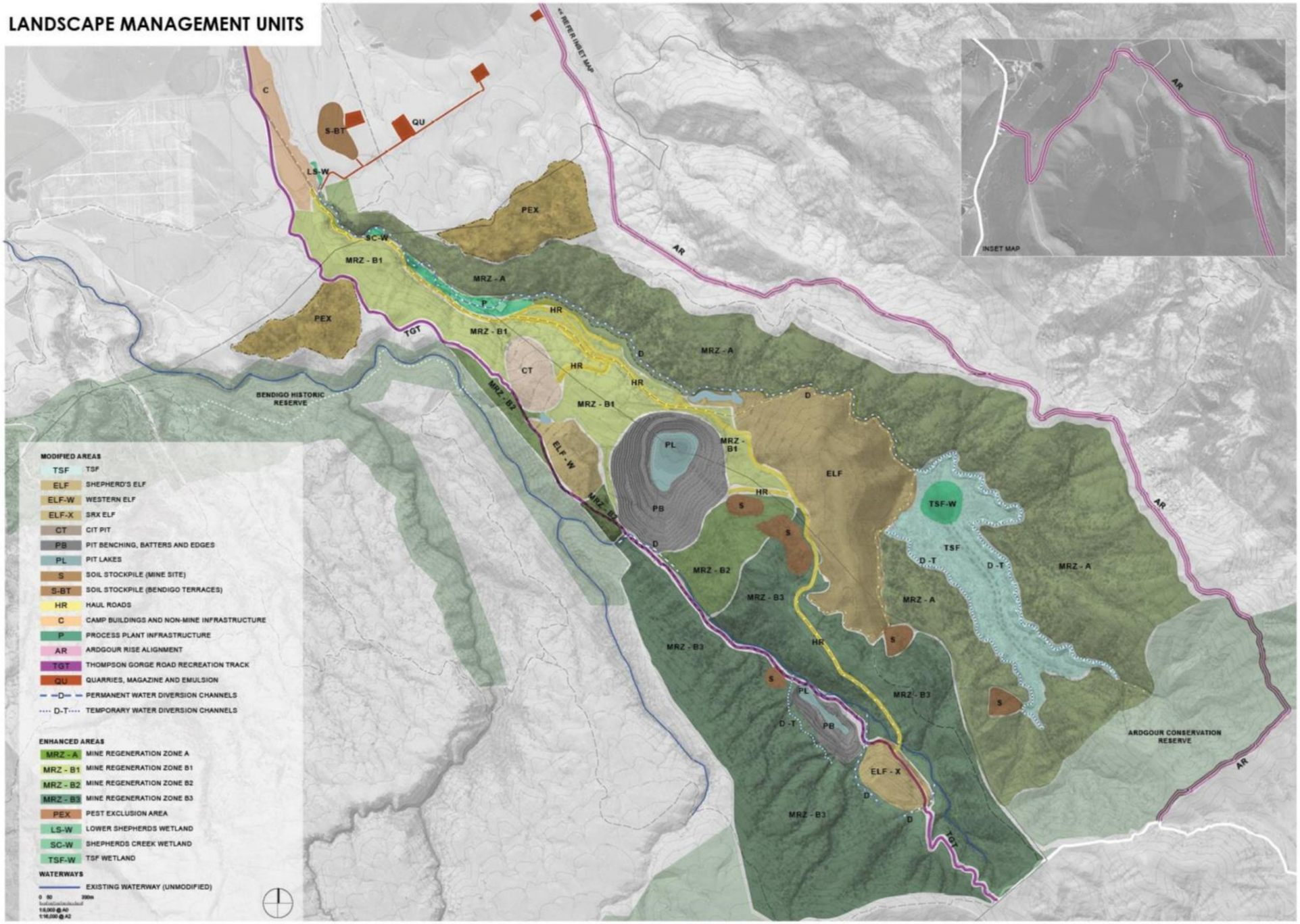
These elements are ‘wrapped’ by Mine Regeneration Zones (MRZs) which are managed to deliver an enhanced diversity and abundance of native plant and animal propagules into rehabilitated mined areas. The four MRZ are:

- MRZ A, Ardgour Station southern slopes shrubland, taramea and snowgrass
- MRZ B1, Bendigo Station cushionfields
- MRZ B2, Bendigo Station cushionfield buffer
- MRZ B3, Bendigo station shrubland and mixed tussock.

Map 1: Mine elements and associated infrastructure proposed as part of the Bendigo Ophir Gold Project. Landpro, 2025.



Map 2: Bendigo-Ophir Gold Project Land Management Units (LMUs).



2. STATUTORY AND POLICY CONTEXT

The proposed mining application is being lodged under the Fast Track Approvals Act (FTAA) 2024, which facilitates infrastructure and development projects with significant regional or national benefits.

The Assessment of Natural Character, Landscape and Visual Effects (Boffa Miskell, 2025) identifies key landscape outcomes relevant under Resource Management Act (RMA) direction within the FTAA framework:

- **Natural Character Protection (RMA s 6(a)):** The Site contains waterbodies including Rise and Shine and Shepherds Creek, requiring preservation of natural character and protection from inappropriate development
- **Outstanding Natural Landscape Protection (RMA s 6(b)):** The Site forms part of the Dunstan Mountains ONL, requiring protection from inappropriate subdivision, use and development as a matter of national importance
- **Amenity and Environmental Quality (RMA s 7(c) and 7(f)):** Requirements for maintaining and enhancing amenity values and environmental quality, where amenity values are defined as natural or physical qualities contributing to an area's pleasantness, aesthetic coherence, and cultural and recreational attributes.

3. SITE CONTEXT

3.

3.1. Location

The BOGP is located on the western Dunstan Mountains slopes, 19km from Cromwell and 10km from Tarras, within the Dunstan Mountains ONL (Map 3).

3.2. Landscape Character

The site spans Rise and Shine Creek and Shepherds Creek catchments, featuring schist tor landscape with mixed pasture, tussockland, grey scrubland, and historic mining remnants. Battery Hill forms a prominent skyline separating the catchments. A detailed understanding of the landscape characteristics and values which make up the Dunstan Mountains is set out within the Landscape, Natural Character and Visual Effects Assessment included with the FTAA application (Boffa Miskell, 2025).

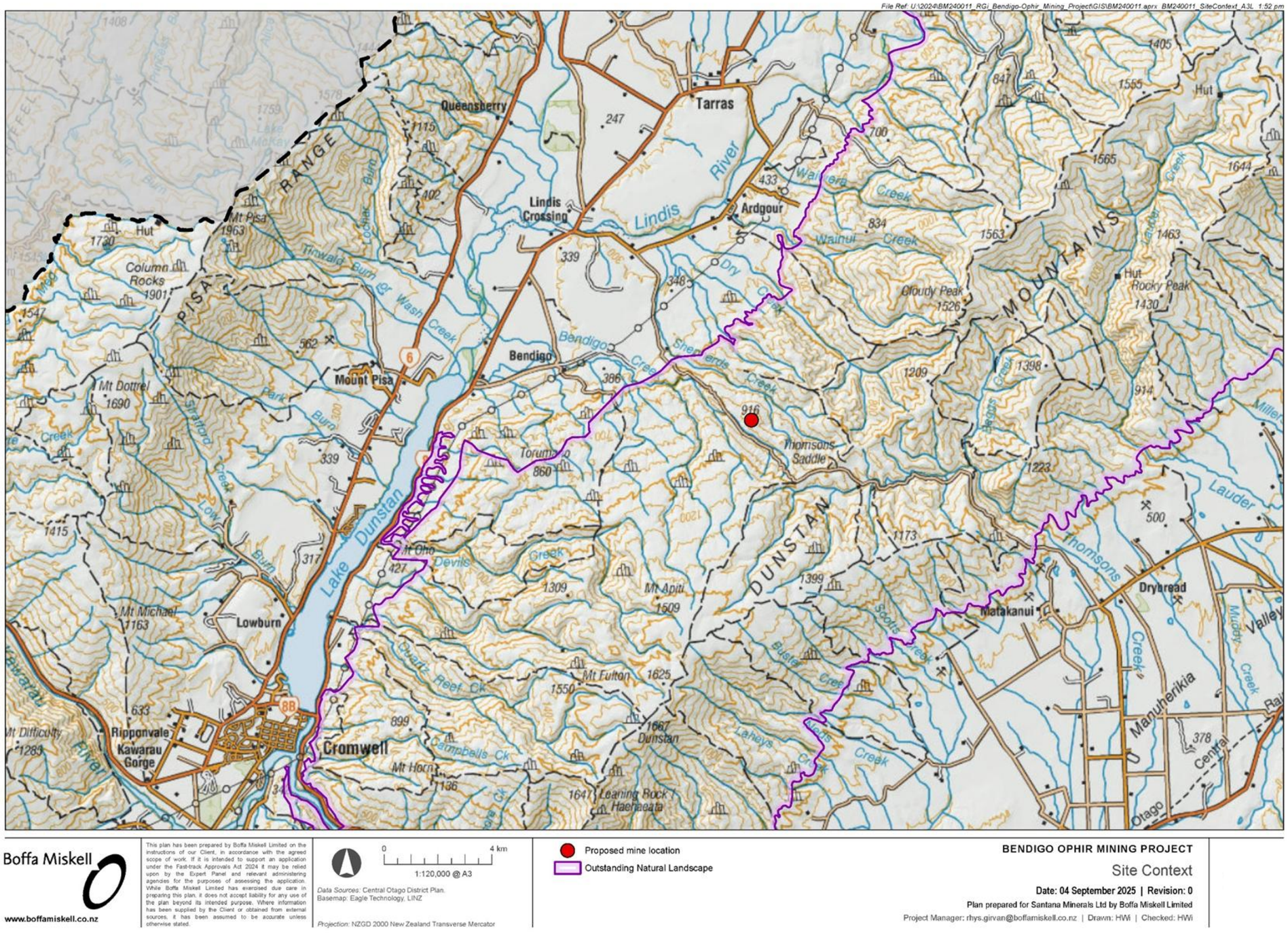
3.3. Cultural Heritage

Matakanui (Dunstan Mountains) formed part of traditional mana whenua travel routes via Thomsons Saddle for seasonal kai gathering. European settlement established extensive gold mining operations from 1862, with Bendigo becoming one of Otago's most prolific mines by 1875. Heritage sites and mining remnants remain throughout the area. European settlement from the 1850s also saw the establishment of large high-country stations and pastoral grazing.

3.4. Current Ecosystem

Historic disturbance from fires, grazing by stock, rabbit plagues, and pastoral intensification has transformed the landscape from dense native shrublands to non-native pastures scattered within degraded grey scrub and cushionfields. Human-induced pressures have completely transformed ecosystems across approximately 45% of the project area, with native vegetation diversity severely depleted, vegetation structure simplified, and species vulnerable to fire or grazing restricted to rocky refugia. In some areas, however, these pressures have allowed cushionfields and spring annual herbs to develop and persist. A detailed description of native vegetation present and its history is provided in Appendix B.

Map 3: Bendigo-Ophir Gold Project Site Context.



4. ENVIRONMENTAL CONTROLS ON REHABILITATION

Rehabilitation success is governed by three key environmental stressors: fire, climatic stress (drought and cold), and mammalian browsing. Site-specific factors including geology, soils, aspect, slope, elevation, and vegetation cover moderate the intensity of these interactions. Appendix H provides further detail on these environmental factors.

4.1. Fire Impact

Fire was rare pre-settlement but increased with Māori clearing and dramatically increased with European settlement from ~1850, when annual burning for grazing eliminated tall tussocks and converted them to grasslands and cushionfields. Fire combined with browsing created ideal rabbit habitat. While deliberate fires are now rare, climate change will likely increase future fire risk, especially near roads and tracks and for highly flammable vegetation such as kanuka shrublands.

4.2. Climatic Stress

Central Otago's semi-continental climate creates severe stress from hot, dry summers combined with strong north-west winds and harsh winter frosts (-2°C average min). The low annual rainfall of 450-650mm varies greatly year to year and month to month. Drought stress peaks on north to north-west facing slopes where soils are eroded and cushionfields dominate, while taller vegetation grows in less drought-stressed, shadier slopes and sheltered areas with deeper soils. Rock tors provide critical winter refugia (and probably drought and browser protection) for wildlife and plants.

4.3. Geology and Soils

Otago Schist shaped by glacial erosion and tectonic activity, with elevated tors and the inactive Thomson Gorge Fault. Loess cover from Quaternary ice ages overlies parts of the area but has been eroded. The dominant Pallic and Semi-Arid Soils have low organic matter, weak structure, and are vulnerable to erosion when vegetation is removed. Many native plants develop deep root systems that follow cracks to access water and invest in very large root systems – with relatively small leaves and stems. Many plants have roots that extend 1 to over 3 m depth.

4.4. Topography and Aspect

North to north-west aspects support Raoulia cushionfields on moderate slopes between 400 and800m that have experienced erosion. South-facing slopes favour woody regeneration. Elevation also influences precipitation and temperature which drives vegetation transitions from matagouri/olearia at lower levels to short

tussocklands above 800m and taramea herbfields on higher ridgelines. None of the original snow grass remains at high altitudes.

4.5. Slope and Microtopography

Mining will reshape the landscape by creating open pits, engineered fill landforms, and temporary stockpiles with varying slopes and gradients. Maps showing slopes, aspects and topography of rehabilitated landforms are provided in Appendix G, noting the SRX landforms have not been refined. These new landforms—such as steep, benched pit faces, haul roads, and a near-flat tailings pond—affect airflows, moisture storage and availability, and temperature, which combine with root zone depths to shape the ecosystems that can develop. Gentle slopes beneath steeper slopes, swales, rocks, and small surface depressions are microtopographic features that help concentrate and trap water and shelter plants, allowing more diverse, taller native vegetation to grow in these areas.

Ecological restoration will focus on designing landforms with a high degree of naturalness that have varied shapes and microtopography to support a range of habitats. These habitats include wetlands and valley floors for less climate-tolerant species. An exception is current areas in pasture and crops on lowland terraces outside the mined area. These areas will largely be re-established for agricultural use, with a small gully converted from pasture to a fenced wetland with adjacent riparian zone planted in native species.

5. CURRENT ECOLOGICAL CONDITIONS

5.1. Vegetation Communities

The site supports a mosaic of the following distinct vegetation communities shaped by 150+ years of disturbance and distinctive climate and topography, all of which contain a substantial cover of non-native species.

5.1.1. Non-native (exotic) pastures

Pastures dominated by non-native species dominate terraces and lower elevations (20%+ of study area) but also on gentle to moderate south-facing slopes at high elevations with sweet vernal, cocksfoot, browntop, and legumes. Remnant native tussocks and shrubs are present in uncultivated areas. Non-native pasture species are also present within all other vegetation communities

5.1.2. Native dominant tussockland

Tussockland occurs at higher elevations on gently sloping sites and covers just 4% of the DDF. Native tussocks are conspicuous (20% of cover) and taramea (*Aciphylla aurea*) can be locally common. Shrubs are sparse.

For the purposes of this report, this unit includes native taramea herbfield and shrubland which is mapped in 2 ha of the DDF at the highest elevations.

5.1.3. Mixed tussock shrubland/grassland

Mixed tussock shrubland and exotic grassland covers nearly half the DDF area, with silver tussock generally on sunny northerly aspects (600-800m) and Festuca/blue tussock on shaded southerly slopes with scattered to patchy shrubland. Average tussock cover within this vegetation community is less than 20% and clovers are often present among the non-native grasses that dominate the vegetation cover.

5.1.4. Cushionfields

Cushionfields, mapped as ‘mixed depleted herbfield (cushionfield) and grassland’, are the most biodiverse ecosystem present, covering 10% of the area. Cushionfields support disproportionately high numbers of Nationally Threatened and At-Risk species (21+ plant species, plus at-risk invertebrates and lizards). Cushionfields occupy the driest, most degraded slopes and are mainly below about 700 m. They have a high proportion of rock and bare ground and are dominated by raoulia (scabweed). They contain threatened native spring annual herbs and *Pimelea aridula*.

5.1.5. Mixed scrubland

Mixed scrubland is an important landscape component covering about 20% of the DDF occurring mainly in gullies below 700 m and grading into native scrubland at higher elevations and shadier aspects. Dense scrub patches (39% of cover) are separated non-native grassland (34% of cover) and bare ground (11% of cover).

5.1.6. Native Shrubland

Native dominant shrubland covers 12% of the study area. Matagouri, olearia, and Coprosma dominate 2-3m canopies in deep gullies and south-facing slopes. Vines are occasionally present. About 12 kowhai patches containing about 40 sapling and trees survive within or near the footprint — remnants of historically more widespread and dominant communities.

5.2. Ecological Values

Despite degradation, each vegetation type supports distinctive native species assemblages. Olearia shrubland has highest invertebrate diversity, tussocklands support threatened grass skinks, taramea herbfields support threatened invertebrates, and cushionfields have the highest native plant values as they support spring annuals, lizards and at-risk invertebrates. The native ecosystem mosaic with rocks and tors creates diverse habitat conditions.

5.3. Hydrology and Wetlands

Small areas of wetlands are present in this dryland environment, with a total area estimated at 3.12 ha. The most numerous wetlands are scattered, small fens (0.49 ha) and seepages (0.13 ha). Shepherds Creek contains seepages feeding ephemeral to perennial streams with gentle reaches, riffle-pools, and a rocky gorge with waterfalls. Rise and Shine Creek has steep tributaries and a boulder-strewn gorge. Historic gold workings created broader valleys with accumulated sediment that support the largest wetlands (approximately 2 hectares), including areas with threatened sedge species from sluicing activities.

6. REHABILITATION APPROACH

6.1. Implementation Strategy

Rehabilitation is designed to establish a sustainable vegetation mosaic through natural establishment from seed spreading from conventionally planted 'nodes', enriched MRZs and enhanced areas of the 'contingency zone' that are immediately adjacent to stripped areas. Natural establishment is enabled by a) creating many protected microsites using rock (individual rocks, rock stacks and rubble pits), scalloping and dimpling surface treatments, strategic inoculation with transplanted large tussocks, and nodes of nursery-grown tussock. Minimum areas of d~~Surface rock and d~~eep root zones (2 m depth) are re-established on engineered landforms (ELFs)~~into mined areas~~ and fire buffers underpin the mosaic. Appendix F provides a photographic summary of rehabilitation targets.This approach responds to key environmental influences, refined through ongoing ecological surveys and applied research on cushionfields and spring annual herbs. Areas on Ardgour Terraces will largely be returned to dense pasture ~~species~~ on ploughable soils to enable ongoing intensive agricultural use.

The MRZs will strengthen existing native shrubland and tussock vegetation with targeted historic ecosystem components, prioritising indigenous outcomes and building resilience to fire and drought. This is delivered by comprehensive plant pest and browser management, strategic planting and plant establishment programs, targeted habitat creation and integrated fire protection strategies as core management approaches. This will enhance opportunities for expanded areas of native vegetation and habitats within LMUs as part of closure. There is no single, historic "pre-degradation state" that is suitable as a target for rehabilitated areas under a future of increased drought stress (Appendix B).

6.2. Landform Design

The topography and surface treatments of engineered features support their effective integration into the natural landscape and rehabilitation. Geotechnically-stable, natural slopes are mimicked and linear landforms avoided (except in permanent open pits and pit lakes)(Appendix G). Natural refugia are mimicked to reduce climatic stress: spot mounding, ripping, and scalloping/dimpling are used to create ~~undulating~~ surfaces with many protected microsites that capture water and are sheltered from wind; localised areas of deep root zones interact with these to create localised areas with highest~~r~~ water storage (Appendix D). R~~; r~~ock stacks and rubble pits ~~replicate natural rock tor functions. These rock structures~~ are designed to provide habitat for gecko and skink, the invertebrates they eat and the diversity of flowering and fruiting plants that support both lizards and invertebrates (Appendix C)~~winter refuges for wildlife while creating microsites with higher moisture, shelter and plant diversity~~.

7. REHABILITATION OBJECTIVES

7.1. Overall Landscape Objectives

The rehabilitation strategy is guided by the following overarching landscape objectives that include public access:

- Recognise and protect backdrop and skyline integrity when shaping mine elements within the context of an ONL
- Ensure rehabilitated and closure landforms (including rock stacks) remain responsive to the underlying ONL context
- Create safe, stable engineered landforms with high erosion resistance
- Address heritage place loss through maintaining public vehicle access over Dunstan mountains during and following mining via Ardgour Rise Road (replacing Thomson Gorge Road)
- Identify and respond to cultural values including mana whenua
- Provide for waterway ecological and instream values
- Reinstate public recreation access to Rise and Shine Creek valley and through the natural low point of Thomson Saddle at closure for walking (other uses to be confirmed).

7.2. Rehabilitation objectives

The rehabilitation strategy is guided by the following overarching rehabilitation objectives:

- Create landforms and land covers that reflect coarse, heterogeneous mosaics characteristic of native-dominated Central Otago ecosystems
- Enhance ecological values and resilience across MRZ
- Support native plants, invertebrates, birds and lizards, including nationally threatened, at-risk, or socially/culturally important species.

Rehabilitation includes objectives for the establishment and maintenance of infrastructure:

- Retain or repurpose selected built infrastructure post-mining where beneficial (such as parts of gravel pits and plant areas which do not detract from the underlying landscape)
- Maintain or establish light-vehicle tracks for ongoing ecological management
- Provide truck access, storage, and turn-around areas for decades until water treatment facilities and passive wetlands are decommissioned.

7.3. Post-mining Land Uses

Ecological conservation will be established as the primary and dominant post-mining land use within the DDF and adjacent MRZs. Sheep grazing in these areas will be limited to that required to support ecological values, and this will be primarily areas managed for cushionfield and spring annual herb conservation. No cattle, horse, goat or deer grazing will occur throughout the BOGP site Mine Regeneration Zones (MRZ). Defined existing agricultural areas on Ardgour Terraces will be returned to conditions that support continued agricultural use, including sheep and cattle grazing and intensive crop production.

7.4. Regulatory compliance

The rehabilitation strategy is guided by the following overarching regulatory compliance objectives:

- Meet all rehabilitation requirements specified in proposed consent approval conditions for the BOGP project
- Integrate rehabilitation with mining operations across RAS, CIT, and SRX Pits, and ELFs, the TSF, and road and water course construction areas
- Implement a staged rehabilitation plan throughout the project duration.

8. IMPLEMENTATION TIMELINE AND SEQUENCING

8.1. Sequential Implementation

Effective rehabilitation outcomes require careful sequencing aligned with mining phases. The quality of closure outcomes is strongly influenced by actions in the early stages of mining, particularly ~~including~~ the quality and quantity of materials salvaged and stored (live plants, soils and other root zone components, boulders), the sharpness of edges to stripped areas ~~edges~~, enhancement of native dominance and diversity in adjacent areas, and the extent of stripped footprint. Rehabilitation of the BOGP will be undertaken throughout the following stages:

Phase 1 (Years 0-1) - Initial Startup

Establish mine infrastructure, construction camp, process plant and TSF embankment. Critical early activities include identifying permanent edges to avoid impacts on high-value plant and invertebrate species ~~impacts~~, enriching areas along those permanent edges (by moving ~~with~~ tussock and rock and removing pest plants), initial plant pest control, salvaging high-value vegetation (as live direct transfer and as dead material), and stockpiling vegetation with soils, ~~as~~ rocks and overburden suitable for root zones ('brown rock). The Western ELF will be completed as the first major rehabilitation area with suitable slopes for cushionfield and spring annual herb trials. The Western ELF will also be used to establish rock stacks, rock pits, and a range of ~~associated~~ planting and transplanting trials (including cushionfield and spring annuals per the Applied Research Plan). These operational-scale treatments ~~which~~ will then be monitored and results used to refine ~~to~~ large scale rehabilitation practices and bonds~~assess natural development~~. At least 1 ha of wetland vegetation communities from Shepherds Creek will be transferred to create permanent wetland (e.g. Lower Shepherd's wetland and Ardgour Terrace wetland if constructed) and at least 25,000 tussocks transferred to live storage for later replanting on rehabilitated surfaces. Permanent and temporary stream diversions and sediment treatment ponds will be constructed, with permanent diversions enhanced at construction to maximise ~~for~~ aquatic invertebrate values. This ~~,~~ includes~~ing~~ enriching ~~adjacent undisturbed~~ edges with salvaged ~~translocated~~ rock, tussock and sedges ~~at the time diversions are constructed~~. SRX stripping includes soils with elevated arsenic which must be retained within the catchment and placed in specific areas and depths within rehabilitated areas. Fencing and stock water are maintained or established to facilitate required grazing and exclusion regimes, particularly for cushionfields (MRZ-B1 and B2) and seeds are collected to enable nurseries to propagate and grow seedlings.

Phase 2 (Years 1-10) - Main Mining

~~Complete RAS and SRX pits with progressive rehabilitation of pit edges and available final landforms on Shepherds ELF and SRX ELF as they become available. Complete CIT if conditions related to cushionfield and spring annual herbs are met. The temporary Site Workers Camp will be dismantled and reinstated to productive pasture during this phase.~~ Most of the enrichment planting and more intensive regeneration management of MRZs occurs during this phase to develop the diverse, native dominant ecosystems wrapping around the mined areas. This phase focuses on building and maintaining rehabilitation momentum while active mining continues, tracking the quality and quantity of all rehabilitation resources in stockpiles to ensure adequacy for closure, monitoring development of early rehabilitation to optimise techniques used in final closure, and monitoring regeneration in MRZ to ensure meeting closure conditions.

Complete RAS and SRX pits with progressive rehabilitation of pit edges including placement of root zones along at least 20 m of benches where they contact natural ground, and rehabilitation of parts of Shepherds ELF and SRX ELF as they become available. Complete CIT if conditions related to cushionfield and spring annual herbs are met. The temporary Site Workers Camp will be dismantled and reinstated to productive pasture during this phase.

Phase 3 (Years 10-30) - Final Closure

Implement the final closure sequence. T~~with t~~he largest areas of rehabilitation occur~~ring~~ on TSF, Shepherds ELF, main haul roads, RAS and SRX pit haul roads and associated stockpiles. Substantial areas of final landforms cannot be completed until tailings deposition stops and workshop facilities on Shepherds ELF are decommissioned. Temporary water diversion drains are dis-established allowing water to flow over the TSF surface and support the large wetland complex. Fire buffers and permanent tracks are finalised with long-term surfacing, watercourse crossings, water tables, and where necessary, features to exclude or enhance public access. This phase represents the most intensive rehabilitation period. During this period the MRZ continue to be maintained and ecological responses monitored.

8.2. Critical Implementation Requirements

- **Infrastructure Development:** Light vehicle access roads, wetlands and tussock storage areas, soil and rock storage areas, Ardgour Terrace wetland base, nursery hardening-off facilities, and biosecurity treatment areas
- **Environmental Management:** Seepage and sediment capture, water treatment, erosion control, dust control, hydroseeding required areas, and artificial light controls

- **Ecological Preparation:** High-resolution mapping of cushionfield and taramea areas, specific plant pest removal or soil quarantining and fauna salvage prior to stripping, resource salvage and storage systems
- **Ongoing Management:** Mammalian pest management, pest plant identification and control, reticulated stock water supply installation and maintenance for areas that may be grazed with sheep.

8.3. Climate and Adaptive Management

The harsh climate with unpredictable spring/early summer drought and cold severity will likely result in years with lower planting survival (dry years) and higher pasture competition (wet years). Rehabilitation management in the MRZ will commence outside the mine footprint during operation and continue for minimum 20 years after mining completion, with total approval duration of 35 years. This extended timeframe allows for 'waves' of planting and adaptive management. Since the program includes components completed early, some rehabilitation measures should meet closure standards during mining operations or shortly after mining ends. This includes Ardgour Terrace and Shepherds Gully wetlands, pasture on Ardgour Terraces, parts of MRZs, Western ELF.

9. VISUAL AMENITY AND LANDSCAPE INTEGRATION

9.1. Visual Context

A key rehabilitation outcome is reintegrating mining activity within a coherent natural mountain backdrop as viewed from surrounding public and private viewpoints. During operations, aspects of both CIT and RAS pits and associated overburden will be visible from parts of the Upper Clutha Basin, typically against Battery Hill's skyline. The nature of available views is set out in detail within the Assessment of Natural Character, Landscape and Visual Effects (Boffa Miskell, 2025).

9.2. Progressive Visual Mitigation

Landscape mitigation has been undertaken in two stages. Project shaping has included influencing the location of mine elements in response to the underlying landscape characteristics and values. This has included maintaining the locally distinctive skyline associated with the Dunstan Mountains, including the local form of Battery Hill, and reinstating Thomson Gorge Road as a walking track through Thomsons Saddle.

Secondary mitigation measures have been adopted to ensure mine elements are progressively mitigated within the surrounding rehabilitated landscape context. The Western ELF will be completed during initial mining and immediately rehabilitated, commencing with hydroseeding. This will require input from landscape architects, including in the location of rock stacks on this landform. Temporary stockpiles below Battery Hill and parts of the Shepherds ELF will be visible along the skyline until rehabilitation reduces visual impacts. The Process Plant, SRX and TSF remain contained within the folded landform west of Thomsons Saddle, where rehabilitation emphasizes ecological functions within permanent modifications during mine closure. Conversely, the edges of RAS and SRX Pit high walls will be treated to assist with integration within the surrounding landform and reinforced vegetated context.

9.3. Landscape Integration Strategy

Landform rehabilitation focuses on areas where visible mining activity could create adverse visual impacts in the context of more extensive ecological rehabilitation and reinstated recreation access. Final landforms will be contoured to integrate with the existing landscape character, responding to the natural transition between the south and north Dunstan Mountains while maintaining the integrity of characteristic skylines and ridgelines. This means rehabilitated engineered landforms will avoid benching and minimise the extent to which permanent highwalls will remain visible in the context of an enduring broader visible mountain backdrop. Landscape integration is also delivered by enhancing diversity of plant community and structural diversity across the

otherwise uniform TSF seen in the context of the broader MRZs. Varying the depth of root zone capping, creating swales and creating wetlands enables shrubland, wetland and tussockland to be established across the TSF. Linear features such as the TSF embankment and haul roads will also be disrupted during rehabilitation using variable backfill and root zones.

10. REHABILITATION PRINCIPLES

10.1. Overview

The LERMP responds to landscape and ecological assessments while considering the broader Dunstan Mountains ONL context and its specific ecological values. Its aim is to create resilient native ecosystems, not to restore current or historic past conditions. After 150 years of farming and mining with introduced mammals altering vegetation, ecosystems have fundamentally changed to a range of currently degraded states (Appendix B). Mining is being used as an opportunity to enhance unmined areas and rehabilitate mined zones by: gradually replacing non-native pasture grasses and herbs with native vegetation site-wide; enriching native plant species diversity and structural diversity combined with browser control to allow use of palatable species; removing invasive species in targeted areas; enhancing resilience to fire; and strengthening connectivity between areas managed for native biodiversity around the mined areas. Where grazing is stopped some existing ecological features that are sustained by current management, such as wetland herbfield, will shrink. –The project will also remove cushionfields and threatened spring annual herbs for which rehabilitation techniques are untested and speculative. These techniques will be attempted ~~developed~~ in an Applied Research Plan for cushionfields and spring annual herbs.

10.1.1. Implementation Timeline

This document guides development of detailed final site rehabilitation plans, specifying procedures to maintain and enhance landscape values while preserving natural character. Success depends on immediate actions during mining and stripping, in particular: the quality and quantity of salvaged materials, the precision of boundaries with high-quality native seed sources, native species preservation, and minimizing the disturbance footprint. Actions in the first two years of project development will impact overall rehabilitation success.

Rehabilitation in the DDF begins when final landforms are available, starting with stream diversions, enhancement of permanent edges, and construction of Ardgour Terrace wetland with at least 0.5 ha of salvaged wetland. The Western ELF completes in years 2-3 at which point rehabilitation of this area can commence, with additional large areas able to be rehabilitated following SRX mining completion. MRZ enhancement runs throughout the approval period with most enrichment planting and intensive plant pest interventions in the first 10 years (i.e., during active mining when DDF planting is low), but this may be ongoing in some areas depending on success of outcomes. Most rehabilitation in the DDF occurs post-mining, culminating with the TSF and stockpile areas. The Foundation phase (Years 0-2) establishes systems and infrastructure,

followed by Main Implementation (Years 2-10) to rehabilitate most mined areas, and Completion and Monitoring (Years 10-30) for long-term management and monitoring.

10.1.2. Management Complexity and Key Challenges

This management plan covers a portion of the BOGP site and complements other management plans that guide activities across different areas of the site. These include the Ardgour Restoration Area Management Plan (managing restoration across most of Ardgour Station) and the Matakanui Sanctuary Management Plan (setting out the management of two predator-proof sanctuaries; one on Ardgour station and one on Bendigo Station).

This management plan establishes the strategic framework and required outcomes for terrestrial ecological management for the area it covers, providing methodologies for physical rehabilitation activities and detailing the overarching conservation direction for the area.

The plan operates in conjunction with several specialised management plans that address specific threats and species groups. Invasive species control is managed through the Mammalian Pest Management Plan (MPMP) and Biosecurity and Pest Plant Management Plan (BPPMP), which implement coordinated measures for mammal and plant pest species respectively, ensuring alignment with the broader conservation and rehabilitation objectives.

Species-specific protection is addressed through targeted management plans. The Lizard Management Plan (LMP) and Terrestrial Invertebrate Management Plan (TIMP) detail measures to avoid or minimise effects on indigenous lizards and terrestrial invertebrates through salvaging and relocation operations. The Avifauna Management Plan (AMP) focuses on protecting indigenous birds, particularly through avoiding active nesting sites during operations.

Supporting these species-focused plans, the Habitat Impact Management Plan (HIMP) and the Applied Research Plan for Cushionfields and Spring Annual herbs (ARP). The ~~HIMP provides~~HIMP provides measures to minimise vegetation impacts through salvaging operations and serves as the central reference for effects management during vegetation clearance activities. The ARP establishes a research and monitoring framework to improve cushionfield ecosystems and create new cushionfield and kōwhai shrubland areas in managed and mined landscapes. Results from this program will inform LERMP processes and practices to achieve optimal outcomes for cushionfield and spring annual herb populations in rehabilitated areas.

Monitoring and adaptive management are addressed through the Biodiversity Outcome Monitoring Plan (BOMP), which establishes the monitoring framework and contingency

measures to ensure that stated ecological outcomes for rehabilitation, offset and compensation of terrestrial ecology values are achieved.

While this plan describes specific outcomes for wetland areas within the terrestrial management scope, freshwater ecological management is principally addressed through the separate Freshwater Ecology Management Plan.

Different Land Management Units (LMUs) require tailored approaches (Appendix A). S~~s~~ince each LMU contains multiple vegetation types and management will enhance some species but negatively impact others. Removing browsing mammals (stock, deer, goats, possums, pigs, hares, most rabbits) enables native plant and invertebrates to regenerate and also allows establishment and growth woody plant pests (brier, gorse, willow, poplar) and competing pasture species. Where browsing mammals are removed (specifics of this is described in the MPMP), short-stature plants that are currently present as minor components will likely be supressed / shaded out by taller native and non-native plants and area of bare ground will reduce, impacting species that use these habitats.

Some ecosystems like Raoulia-dominated cushionfields and spring annual herbs are unlikely ~~may not be able~~ to be fully rehabilitated ~~(~~as there have been ~~there have been~~ few attempts to rehabilitate them (with no records of success)~~and techniques need to be developed~~. Both cushionfields and spring annual herbs are ~~appear to be~~ maintained in areas that have not been cultivated and have had minimal fertiliser and/or pasture oversowing combined with by rabbit browsing and/or sheep grazing, which together slow woody plant and tussock establishment. However, mammalian grazing degrades other native plant communities by removing palatable species, limiting recruitment (seedlings are often more palatable), reducing mature biomass and physically damaging soil (especially in wetlands, seepages and stock camps). Applying different managements across LMUs (as detailed in Appendix A) is designed to enhance overall landscape ecological values at a scale that is practical to manage using sheep grazing.

10.1.3. Climate Considerations

The harsh climate, especially unpredictable spring/early summer drought variability, will create years with poor planting survival (dry years) and increased pasture competition (wet years). The rehabilitation response to this is to establish rehabilitation with deep, variable root zones and with many sheltered, water-harvesting pockets that include rock stacks and rubble pits. This surface will be stabilised using a very low rate of non-native grass~~es~~ species that are currently present across most of the site. Relatively small 'nodes' of native plants will be established in the most favourable sites, including salvaged tussocks. These nodes and the adjacent MRZs will provide seeds that will establish in years with favourable conditions. Planting density/diversity or

control of competing vegetation will be increased if the natural spread in rehabilitated areas is not fast enough. This approach is based on rehabilitation management beginning outside the mine footprint during operations and continuing for minimum 20 years after mining completion and throughout the 35-year approval duration.

The following principles guide how ~~we achieve our~~ rehabilitation objectives are achieved while balancing practical mining needs, safety requirements, and ecological goals.

10.2. Core Principles

10.2.1. Minimise Impacts

Goal: Minimise the mine footprint while protecting adjacent areas from indirect impacts of~~like~~ dust, sediment, noise, vibration, and artificial lighting that degrade and disrupt wildlife and ecosystems.

What this means:

- Minimise the mine footprint that gets stripped of plants and soil or covered over
- Reduce edge effects like dust, sediment, light and vibration
- Prioritise biodiversity for avoidance that has:
  - Highest threat-ranking plant species (e.g., spring annual herbs)
  - Highest value ecosystems (e.g., cushionfields)
  - Lowest re-establishment potential / highest uncertainty (e.g., spring annuals, seepages)
  - Greatest age (e.g., kowhai trees, large-basal diameter shrubs)
  - High ecosystem values (e.g., rock outcrops, seepages)
  - High cultural values (e.g., taramea – which also has high invertebrate values).

How to achieve it:

- Identify high value individuals and ecosystems in areas along the edges of cleared areas in the DDF in undisturbed ground (i.e. the Contingency Zone)
- Identify options to avoid or limit the footprint (e.g. rock abutments)
- Prioritise minimising disturbance footprint by steepening slopes, which may require retaining or rock buttressing. Constrain ~~over~~side-cast by defining limits, using rock, or translocated tussock and sediment fences ~~laying back slopes (which increases footprint)~~
- Focus protection on ecosystems and species that are hardest or slowest to replace or where impacts can spread downstream.

10.2.2. Start Early

Goal: Begin rehabilitation actions in Year 1 of mining to establish the foundation for successful long-term rehabilitation outcomes.

Year 1 priorities are to:

- Establish MRZs
- Start weed control prioritising contingency zone edges and sedum, thyme, gorse, broom and low-density, palatable species (because these will be 'released')~~and edges~~
- Exclude stock and farm vehicles from defined areas
- Install edge protection for MRZs and in contingency zones to identify and avoid high-value plants and ecological features
- Enrich edges by transplanting tussocks and sedges and weathered rock into areas where there is non-native pasture species. Transplant taramea into suitable areas (as an inoculation and enrichment method for invertebrates, while not expecting survival of taramea)
- Take cuttings from the oldest individual in each kowhai cluster (i.e. up to 12 kowhai trees total) to provide at least 20 nursery seedlings from each cluster of kowhai that will be removed. Record location of collection for each seedling to enable establishment away from nearby genetic stock. ~~(i.e. up to 12 kowhai trees total)~~
- Translocate (direct transfer) at least 0.5ha of wetlands to Ardgour Terrace or Lower Shepherd's wetland. ~~and establish the riparian zone on either side of the gully (Appendix D).~~
- Salvage arsenic enriched rocks with crustose, cryptogram lichens from RAS footprint and relocate into suitable areas of MRZ beside Thompson's Gorge Road.
-
- Construct permanent and temporary stream diversions with permanent diversions specifically treated to enhance aquatic invertebrate values.
- Salvage, stockpile and protect high quality soil, resource and reuse material, segregating soils that contain long-lived plant pests such as gorse to Ardgour Terrace quarantine zone and salvage surface soil containing spring annual herbs for propagation/research. Manage soils from SRX according to Salvage soils with high arsenic

10.2.3. Create Safe and Stable Landforms

Goal: Build safe, stable landforms that protect people, livestock, and farm equipment and create surfaces that are resistant to wind and water erosion.

Safety considerations:

- Manage highwall risks near public access areas
- Ensure safety for stock and farm vehicles in areas that may be ~~potentially~~ grazed ~~areas~~
- Create stable surfaces resistant to wind, frost and water erosion
- Restrict access to pit lakes by vehicles, people and stock (and wildlife if required)
- Prevent access beyond mine portal, ~~(~~i.e. prevent ~~no~~ underground access~~)~~
- Ensure ongoing stability of diversions.

Design approach:

- CIT pit, if mined, will be completely backfilled to near-natural landforms but with very small areas of slopes over 20 degrees (Appendix G)
- Some uppermost areas of SRX pit~~areas~~ may be 'laid back' to ~~more gentle~~ slopes that ~~to~~ enable development of dense shrubland ~~and tussocks~~ by allowing a placement of a root zone
- Strategic root zone and rock placement along ~~on edge of~~ haul road cuts ~~s bases where adjacent cuts are >3 m height~~
- At least 20m of pit benches adjacent to natural ground provided with root zone that will support shrubland and tussocks (Appendix D, Figure D-1)
- Establish riparian and emergent vegetation across the predicted intersection of haul road and pit lake in RAS and SRX (depending on water quality), us~~e~~ing boulders to exclude~~limit~~ vehicle access, place root zones on in-pit haul roads above lake levels ~~and enhance riparian and aquatic ecosystem values~~ to establish tussock and shrubland to further restrict access
- Exclude cattle from mined areas including stream diversions in perpetuity
- Prevent establishment of tall trees on TSF and ELFs in perpetuity (e.g. willows, pines).

10.2.4. Create Diverse, Natural-Looking Surfaces

Goal: Create rehabilitated landscapes that mimic natural terrain where possible by creating ~~through~~ heterogeneous landforms with varied slopes, aspects, micro-topography and growing conditions, and avoiding permanent linear forms including benching outside (with the exception of the permanent pits)

How to create heterogeneous surfaces:

- Develop varied slopes, micro-topography, aspects and root zone depths to support native vegetation, to infiltrate rain and thereby minimise erosion risk. Root zones are detailed in Appendix D
- Ensure minimum rock cover and construct at least one~~>500~~ rock stack per hectare and 1 ~~s and >100~~ rubble pit per five hectares~~s~~ (detailed in Appendix C)
- Establish nodes of native vegetation as soon as possible after final surfaces are present targeting rock stacks, rubble pits and favourable microsites (detailed in Appendices C and E)
- Remove non-native tree species site-wide, including from TSF and ELFs, to minimise treefall risk and capping exposure while maximising ecological values
- Ensure suitable hydrology in rehabilitated wetlands to support wetland species.

How to deliver natural landforms:

- Prioritise high public visibility areas (CIT pit, ELFs) for backfill and creation of natural forms to minimise impacts
- Break up and disrupt extensive linear features ~~like roads and stockpiles and avoid permanent terracing on ELFs~~. Break up permanent linear forms by covering benching on ELFS, filling against cut slopes along haul roads and strategically breaking roadside bunds, locally widening the TSF embankment, and establishing root zones that match adjacent vegetation across linear infrastructure.
-
- Cover outer 20 m (minimum) of pit benches to enable plant growth
- Minimise uniform slope areas by creating varied aspects and root zone depths, and using scalloping treatments.
- Place rock stacks and rubble pits in consultation with landscape architect to deliver natural ~~appearance~~appearance, location and clustering
- Establish coarse, heterogeneous mosaics of native vegetation associations across ELFs, TSF and decommissioned infrastructure.

Exception: This objective excludes permanent pit lakes and benched pit landforms. North and west-facing RAS pit walls will develop very sparse vegetation very slowly. This objective also excludes gravel pits within the Ardgour Terrace agricultural area.

10.2.5. Protect, Enhance and Re-Establish Ecological Values

Goal: Work within mine plan, schedule, and safety requirements to enhance ecological values where this can be achieved or provide offset or compensation for effects on native plants, invertebrates, birds and lizards.

Target improvements:

- Where possible enhance ecological values overall for native plants, invertebrates, birds and lizards
- Include functionally absent plants (e.g., palatable species with little recruitment under current management and/or that are now absent or in very low densities, threatened and at-risk species, snow tussock), and taramea (high cultural importance) (Appendices E3, E5 and E7)
- Include species that reinstate key ecological functions such as structural diversity (vines and emergent trees) and nectar/pollen (taramea and olearias) (e.g. Appendices E3, E4)
- Salvage and translocate tussock to 'inoculate' mined areas.

How to protect and enhance through MRZ:

- Establish MRZs around project north, south and east margins
- Enhance MRZs through pest plant and mammalian pest control and targeted native species planting
- Permanently exclude stock from key areas (MRZ A and B3) including seepage headwaters, streams and riparian zones
- Manage grazing timing and intensity in MRZ B1 and B2 to support cushionfields and spring annual herbs
- Stop over sowing and top dressing with fertiliser.

Management priorities for each MRZ are summarised in Appendix A.

Exception: Spring annual herbs and cushionfields require ongoing research detailed in the ~~through~~ Applied Research Plan~~s~~.

How to re-establish ecological values in mined areas:

- Salvage and conserve plants and soil stripped from mined areas, so they are in good condition for placement~~re-use~~ into rehabilitated areas~~ion~~. This includes small areas of direct transfer wetlands, at least 25,000 short tussocks~~(tussock and wetland)~~, and larger areas of living soils and native plants at the surfaces of soil stockpiles. ~~It includes also includes taramea~~

- Salvage wood and weathered rock stripped from mined areas for reuse; high value, weathered lizard habitat rock should be separately stored in accessible areas for priority use
- Salvage arsenic enriched rocks with crustose, cryptogram lichens from RAS footprint
- Create suitable topographies, root zone depths and surfaces including rock placement, rock stack and rubble pit construction
- Use short-term erosion control with low rates of non-native grasses that have low competitiveness with native species
- Support native species expansion from initial plantings, including through control of competing non-native species
- Prevent invasion and/or spread of competing plant and animal species, and new non-native species through biosecurity controls (includes removing soils containing gorse to Ardgour terrace).

10.2.6. Conserve Local Genetic Resources

Goal: Salvage, protect, and for specific species enhance, local genetic resources to ensure that rehabilitated ecosystems maintain genetic characteristics of populations specifically adapted to Upper Clutha (i.e. 'local') conditions.

This approach ensures rehabilitated ecosystems maintain the genetic characteristics of local populations, except where local populations are depleted. It avoids introducing ~~external~~ genetic material that may not be adapted to local conditions. Plant sourcing for propagation is consistent with the Ardgour Restoration Area to enhance resilience to current and future drought.~~.~~

What to salvage:

- Required ~~Minimum~~ proportions and diversity of specified native plants (including wetlands)~~, wetlands and animals~~ from stripped areas including 25,000 short tussocks and threatened plants (Appendices E5 and E7) and crustose lichens
- At-risk and threatened species (or equivalent), notably spring annuals as informed by the ~~Cushionfields and spring annuals~~ Applied Research Plan
- Species with low local genetic diversity, noting DDF ~~ably~~ kowhai is the only species propagated using cuttings.
- Species that can be successfully relocated including lizards, some tussocks and sedges

- Species thatlikely to support threatened invertebrates in their leaves, stems or roots (taramea, native brooms, *Olearia bullata* and *Olearia odorata*) as specified in Invertebrate MP. Only parts of plants may be salvaged (e.g. stem galls).

Sourcing policy:

- NOnly native plant species local to the Upper Clutha with a priority on drought-prone areasused for establishment (except erosion control species). Species are listed in Appendix E.
- Includes native species likely to have been naturally and historically present in the area (see Appendix B, which describes vegetation successionsE3 and E8).

10.2.7. Conserve Soils and Surface Rocks

Goal: Maximise the recovery and protection of valuable soils and suitable root zone materials and rock materials. CSoils include all materials that can be components of root zones include : plants, topsoils, most subsoils, organic-enriched layers from current and historic wetlands, all surface (weathered) rock and boulders >0.5 m diameter and weathered brown rock. No saline soils have been identified on site – if these are present they should be salvaged separately as should organic wetland soils (sometimes called 'unsuitables') and materials with concentrations of arsenic that require them to specifically managed.

Resource management:

- Identify pest plants. Separate topsoils under these plants to prevent spreading these weeds through stockpiles and place in discrete, marked areas of Ardgour Terrace stockpile. Pest gorse, thyme, sedum or broom into general stockpiles
- Identify boulders >0.5 m that have high lizard habitat value and salvage, stockpile separately. Identify arsenic-enriched boulders with crustose lichens near RAS pit intersection with Thompson's Gorge road to salvage and place these in suitable areas of adjacent MRZ, matching aspect and exposure as closely as possible.
- Strip upper soils (topsoils) together with vegetation and rocks <0.5 m diameter in a way that minimises handling and maximises retention of structure (i.e. using back acters, not bull dozers). Transport this material in discrete truckloads (i.e. not mixed with underlying soils) and preferentially place on the surface of stockpiles. Ensure stockpiles are no greater than 1.5m in height
- Identify and avoid incorporating soils with gorse into general stockpiles
- Identify areas of wetland or organic-enriched soils and where practicable, stockpile in discrete areas at the edges of stockpiles or immediately use for wetland rehabilitation

- Salvage, strip and stockpile soils from SRX separately and do not use outside SRX valley. Identify areas with ~~(they may have~~ elevated ~~levels of~~ arsenic and ~~are to be~~ manage~~d~~ in accordance with the Soil Management Plan~~)~~
- Manage stockpiles to protect soil quality and plant life, e.g. establish~~ing~~ and maintain~~ing~~ a favourable vegetation cover, managing plant pests and allowing survival and regeneration of native species
- Maintain records of stockpile volumes and location ~~-~~by type and soil stockpile surface vegetation cover condition
- Immediately use fresh (not stockpiled) soils where possible for rehabilitation. This avoids double-handling and maximises quality of soils.

10.2.8. Enhance Resilience to Drought

Goal: Create drought-resilient landscapes that support native plant establishment and long-term survival under increasingly variable rainfall and drought-stress. (Appendix A, Table 8).

Water management techniques:

Use techniques that accentuate 'wetter' and 'drier' areas at fine scale and avoid large, smooth, homogeneous areas. These techniques include the following:

- Create rough, 'dimpled' or 'scalloped' topography and swales to slow, infiltrate and locally ‘harvest’ rainfall and snowfall
- Establish minimum areas of deep soil (1-3m rooting depth) through ripping, spot mounding, and soil replacement to provide for deep rooting depths (Appendix D)
- Establish rock stacks and rubble pits, and deliver rehabilitated surfaces with at least minimum rock cover, except for areas rehabilitated to high-producing pasture on Ardgour Terraces (Appendix C)
- Use organic-enriched soil for wetlands where possible and use organic mulches in key areas
- Establish and maintain ~~Install low-permeability sub-grades and/or other methods of creating~~ hydrolog~~y~~ies that supports wetlands. On TSF ~~and~~ establish bunds and ~~topographic variation and~~ taller plants in adjacent areas to enhance shelter ~~(~~to help reduce evaporation losses~~)~~.

Planting strategy:

- Establish low density of non-native erosion-controlling grasses that will be facultative (i.e. help natural establishment of native species) rather than compete for moisture

- Use nursery plants that are very well hardened-off, so they already have form, leaves and roots and physiology that are resistant to moisture stress
- Plant DDF in high-density, self-sheltering clusters concentrating plants in the most favourable micro-sites (i.e. bottom of dimples, in the lee of rocks)
- Plant low overall densities of native seedlings (~1500 plants/ha) in DDF~~in mined areas)~~, and encourage natural seedling establishment
- Plant MRZ in clusters within the most favourable micro-sites, avoiding seepage herbfields and cushionfields, using sheltered gaps in existing native cover and pasture-dominated sites
-
- Keep fertility levels on DDF low initially to encourage deep root development and minimise competition from non-native grasses and herbs
- Investigate amendments and establishment techniques that enhance resilience or can be applied after planting in years when drought stress is earlier than usual.

10.2.9. Enhance Resilience to Fire

Goal: Establish fire protection measures to safeguard native vegetation communities that are most vulnerable to fire damage and would take decades to recover if lost (Appendix A, Table A-1)

Fire buffer strategy:

- Create low-biomass fire buffers using grazing and/or rocky surfaces and/or cushionfields
- Strategically place fire buffers along ridgelines and roads and linking ~~, using~~ cushionfields and permanent pit walls (SRX and RAS)
- Strategically protect shrubland/tussock areas retired from grazing
- Create and maintain a network of vehicle access tracks.

Specific fire management:

- Low-vegetation biomass strips for access through rehabilitated areas based on rehabilitated haul roads
- Special protection for kowhai areas and valley forest (very vulnerable to fire being slow growing and long-lived).

Fire break locations:

- Public tracks and roads (key risk areas)
- Strategic ridgeline positions

Around high-value, slow-growing vegetation.

10.2.10. Control Pest Plants

Goal: Control and effectively eliminate reproducing non-native plant species that degrade native ecosystems to ensure successful rehabilitation outcomes, by MRZ.

Target species for elimination of reproductive plants:

- Gorse, broom, willow, poplar, buddleia, wilding conifers, thyme, sedums, non-native vines, male fern and bird dispersed plants throughout MRZ and DDF, consistent with the Weed MP
- Maintain outcomes for project duration (at least 10 years post-closure)
- Control existing environmental and agricultural pest plants and any new pest plants ~~and exclude new pest plants~~
- Control non-native plants that degrade native ecosystems in soil stockpiles
- Deliver targeted pest plant control recommended by the Applied Research Plan for Cushionfields and spring annual herbs.

Management approach:

- Specific pest plant species lists developed ~~through Applied Research Plan~~ for cushionfields and spring annual herbs through Applied Research Plan for this ecosystem and these native species
- Evidence-informed management based on monitoring results
- Prevention of establishment of reproductive populations of new pest plants ~~establishment~~.

10.2.11. Use Evidence-informed Management

Goal: Enhance ecological values through systematic monitoring and research by using evidence-informed management of high-value ecosystems and individual management units.

Research components:

- Applied Research Plan for Cushionfields and Spring Annuals
- Applied Research from Western ELF trials
- Optimisation of specific rehabilitation methods (e.g. rock stacks, rubble pits, invertebrate inoculation using salvaged taramea and native broom, tussock seeding using drilling and encapsulation, management of mammalian browsers).

Adaptive management:

- Adopt recommendations from Applied Research Plan and Western ELF trials
- Record management practices and monitor outcomes in MRZs and DDF across shrubland, tussock, and taramea herbfield and adjust methods
- Assess outcomes against closure requirements
- Start with recommended techniques and low-risk, low regrets techniques
- Refine approaches based on results (Table 1 outlines key contingency actions for planted areas to enhance plant survival and growth).

10.2.12. Achieve Closure Within 20 Years

Goal: Meet ecological closure criteria within realistic timeframes

Timeline expectations:

- MRZ closure criteria achieved within 20 years of mine start
- Rehabilitation criteria in stripped (mined areas) within 20 years of initial revegetation, i.e. by year 22 for Ardgour Terrace wetland and Western ELF and later for areas revegetated at mining end (TSF, parts of the Shepherd's ELF, associated stockpiles and plant area)
- TSF rehabilitation starts after tailings deposition finishes, allowing capping with brown rock and soil.

Success measures:

Table 6a summarises initial, intermediate and closure success measures.

- Ecological criteria met within 20 years of initial revegetation treatment
- Self-sustaining native ecosystems established over most of the site (nearly all shrubland, tussock and taramea ecosystem) not requiring grazing by sheep
- Minimal ongoing (i.e. in perpetuity) intervention required. These interventions will include removal of tall trees from TSF and most ELFs in perpetuity, maintenance of fire buffers, and exclusion of cattle. Ongoing pest plant and mammalian pest management is required to maintain 'closure' ecological values.

Table 1. Key contingency actions for planted areas to enhance plant survival and growth

Issue / location	Treatment	Vegetation type	Notes
Tussock transplants – unacceptable mortality and failure to thrive (informed by W-ELF trial and tussock stockpile data)			
Inadequate root mass	Review drainage, aeration, depth of loose root zone in transplant storage area Review transplant extraction method – change to increase root ball Allow to grow on to larger minimum size or if too large to handle, split up and develop size that matches equipment used	Tussock	Explore variety of machinery options and match bucket sizes to create holes/trenches or budget and schedule soil backfill.
Drought stress	Review transplant method (timing, live root mass recovered, length of root exposure, size, preparation of receiving holes, damage during transport) Review location in relation to rock stacks and rubble pits and landform microsites and increase use of more favourable microsites. Review outer vs inner tussocks in each clusters to inform spacing that enhances sheltering and whole-cluster outcomes Apply pre-planting treatments to increase soil moisture holding (e.g. add organic matter, polyacrylamides, biochar etc) and direct water to tussocks (by concentrating localised runoff to planting site e.g. using boulders) Apply post-planting treatments to reduce soil moisture losses e.g. organic or inorganic mulches or matting, protective shelters (individual plant cloches)	Tussock	Learn from excavated tussocks in year 1 to large-scale storage, also relocation of tussocks into permanent edges and W-ELF. Also asses soil stockpile regeneration.
Other	Check for browse from rabbits, hares and other mammals	Tussock	
Nursery seedlings – unacceptable mortality and failure to thrive (to be informed by W-ELF data)			

Issue / location	Treatment	Vegetation type	Notes
Competition with short term erosion control grasses	Adjust grass seed rate and/or timing in relation to planting native species, method of seeding (e.g. broadcast, drilled, hydroseeded, hydromulched), microsite creation, and/or species. Reduce competition with native species mechanically or chemically in ways that avoid initiating erosion (wind, rain or frost)	All native species	No hay is to be used at this site
Drought stress	Review nursery plant grade, form (height and bushiness) and root:shoot ratio and source material (i.e. if seed from a particular source has higher survival) Increase root depth and volume by changing pot dimensions Increase trimming of woody species to reduce height Review hardening off to ensure plants have tough dense growth form resistant to wind, suitable leaf phenology (small thick) leaves and adapted drought physiology Review planting method (timing, size and preparation of receiving holes) and micro-site selection (location in relation to rock, protection and water harvesting) and increase use of more favourable microsites. Review location in planting clusters to inform spacing that enhances sheltering and whole-cluster outcomes Apply pre-planting treatments to increase soil moisture holding (e.g. add organic matter, polyacrylamides, biochar, wool etc) and direct water to plant base by concentrating localised runoff to planting site e.g. using boulders Apply planting treatments to enhance initial moisture supply and resilience, e.g. plant soaking in buckets, initial irrigation, post-plant drench with specific additives (e.g. seaweed)	Tussock	Learn from W-ELF trials at scale Requires meticulous planting records to be kept and post-plant monitoring that includes growth and condition of erosion-control grasses and weeds – these may facilitate establishment or reduce establishment. Some annual weeds may help conserve moisture Relate to season assessment – some years are tough and will have higher mortality Timing includes responding to predictions of seasonal conditions

Issue / location	Treatment	Vegetation type	Notes
	Apply post-planting treatments to reduce soil moisture losses e.g. reduction of competition with non-native grasses or weeds while using some to reduce exposure, organic or inorganic mulches or matting, protective shelters (individual plant cloches)		
Fertility stress	Add slow-release fertilisers in slits >10 cm depth (i.e. not broadcast to reduce stimulating weed and grass growth) depth and P-enriched fertilisers to native legumes.	Legumes	Native legumes probably respond to phosphate fertilisers, e.g. matagouri, brooms but only apply on one side of root ball to minimise impact on mycorrhizae (providing P and water) M target for mast year once plants are established to encourage seeds with larger carbohydrate stores
Browse	Add protective shelters, apply pest deterrents, increase pest control and monitoring frequency, manage growth to create protective pasture 'buffers' for some woody seedlings	All native species (hares) and palatable species as indicators	
Wind/frost damage	Check hardening off duration and extent, add protective shelters, manage growth to create protective pasture 'buffers' for some woody seedlings	All native species	
Degradation of vegetation in Contingency Zones			
Earthworks material spill – fill sites	Remove material ASAP including by hand within 20 cm of woody stems (can attempt to wash off thin, fine accumulations uphill of slopes above water table)	All	

Issue / location	Treatment	Vegetation type	Notes
Water-washed sediment	Remove where impacting high value vegetation that is vulnerable (cushionfields); may leave where under woody vegetation and instead add mulch to improve infiltration and prevent repellent crusts developing	All	
Exposure of roots	Apply treatment to cover and to buffer roots; this may include pinning wool, jute or coir fabric (and watering it) on the surface with or without additional soil or compost or surface rocks. For very high value plants consider adding rigid edge (rock and or retaining materials) and backfilling with loose soils. For gentle slopes use organic mulch with rock on top to stabilise.	Cushionfield (including Pimelea, Carmachaelia) taramea and kowhai	Exacerbated by Frost heave so ensure treatment provides protection. Greater investment where cuts are permanent, likely final and plants or vegetation have high value
Increased exposure to wind/sun			Likely for plants within rock outcrops and taller plants
Dust accumulation	Increase water truck intensity in adjacent areas, temporary dust fences to protect high value vulnerable vegetation?	Cushionfield, high value plants espec those with hairy leaves (pimelea)	Likely for hairy-leafed plants of high value including cushionfield
Change in hydrology (drying out)	Check larger cuts in deeper soils especially uphill side	Kowhai, taramea	Likely to occur uphill of cutoff drains and road cuts through wetter areas / seepages
Weed or exotic pasture smothering	Control of vegetation at time of year that optimises longevity and effectiveness of outcomes and avoids creating bare ground when conditions are moist. E.g. cut grass low after flowering but before seeding and leaving as mulch (exception: cushionfield, spring annual habitat in which case remove grass)	Cushionfield, tussock and tarmaea	Treatment will depend on the weed and vulnerability of the native species; greatest change likely for areas where stock have supressed pasture/weed growth, e.g. brier and wetter areas, stock camps

11. MINE REHABILITATION ACTIONS

11.1. Overview

To facilitate rehabilitation plan implementation, the project area has been divided into Land Management Units (LMUs). The LMUs group together modified landforms (disturbed areas in the DDF) with common attributes and describe MRZ (undisturbed areas) to enable systematic rehabilitation and management approaches. Nearly all LMUs will be rehabilitated to a mosaic of up to four vegetation associations (and wetlands) based on modified pre-mining vegetation associations:

- Cushionfields (depending on the Applied Research Plan for Cushionfields outcomes)
- Tussock
- Grey shrubland
- Taramea shrubland.

Specific LMUs are rehabilitated to other outcomes, including Pit lakes, highwalls, wetlands and terraces currently in high-productivity pasture (construction camp and associated infrastructure).

Table ~~Table 21~~ describes each landscape management unit, its current ecological state, primary use, key features and ecological state on closure. Table ~~Table 2~~ sets out the key rehabilitation actions that will occur in each management unit, while Table ~~Table 3~~ presents a risk management matrix for key rehabilitation risks in each LMU, including mitigation measures and contingency plans to deal with these risks should they arise. Table ~~Table 4~~ shows the comprehensive success criteria and monitoring framework for each landscape management unit, defining measurable targets for vegetation establishment, habitat functionality, and infrastructure performance. The monitoring schedule ensures regular assessment of rehabilitation progress across all management units through systematic surveys and inspections. A detailed breakdown of the management actions to be undertaken within each LMU is set out in **Appendix A**.

Appendix B provides further context in relation to vegetation successions and target ecosystems. **Appendix C** sets out further detail relating to the methods for lizard habitat rehabilitation including figures showing a) the typical form and distribution of rock stacks and rubble pits which integrate within this landscape context and b) the treatment of highwalls and their buffer zones. **Appendix D** summarises the root zones for each unit with supporting figures; **Appendix E** provides information on vegetation associations and plant species used for revegetation in the DDF and MRZs. **Appendix F**

provides a photographic summary of rehabilitation objectives and outcomes. **Appendix G** provides maps of rehabilitated aspects, slopes and topography.

11.2. Management Actions Summary – Overview

Table ~~1~~2: Landscape Management Unit Characteristics and Ecological Transitions.

Unit Code	Management Unit	Initial Habitat Area (ha)	Primary Objective	Timeline	Key Features
TSF	Tailings Storage Facility	75	Native vegetation establishment with large wetland. Ecosystems protect capping to prevent exposure of tailings. Landform integration.	Years 10-12	Tussock shrubland vegetation mosaic with 6ha wetlands, 0.5ha open water, 137 rock stacks above 1 in 10-year ponded area
ELF-S	Shepherds ELF	116	Landform Integration. Native revegetation and habitat enhancements. A fire break and long-term light vehicle access	Year 10-12	Vegetation mosaic with 212 rock stacks, 60 rubble pits and fire buffer across ridgeline
ELF-W	Western ELF	18	Landform Integration. Trial site for rehabilitation techniques	Years 2-3	Cushionfield and general rehabilitation trials, 33 rock stack and rubble pit refinement (min 10 rubble pits)
ELF-X	SRX-ELF	15.8	Landform Integration, Native revegetation and habitat enhancements	Years 8-12	Vegetation mosaic with 29 rock stacks and 8 rubble pits, taramea
PB	Pit Benching & Batters	92	Highwall vegetation establishment on benches at edges; rough surfaces	Years 1-8	Root zone wedges 0.1 to 4 m depth extend along benches ≥ 20 m from natural ground
CT	CIT Pit (backfilled)	13.8	Landform integration. Spring annual herbs & cushionfield over minimum 4.5 ha, small	Years 8-12	Native herbfield, specialized grazing, 25 rock stacks, 7 rubble pits:

Unit Code	Management Unit	Initial Habitat Area (ha)	Primary Objective	Timeline	Key Features
			patches of palatable species		patches of kowhai, native broom
PL	Pit Lakes	18.1	Haul road vegetation establishment with riparian grey shrubland. Restrict human access	Years 8+	Emergent aquatic vegetation on haul road, kowhai patch. Boulder placement
S	Soil Stockpiles (Mine site)	24	Landform rehabilitation Native revegetation and habitat enhancements.	Throughout	Staged removal and rehabilitation, 44 rock stacks, 13 rubble pits
S-AT	Soil Stockpile - Ardgour Terraces	6.8	Agricultural restoration	Years 1-3	Agricultural production (tillable, homogenous soils) and infrastructure capability
HR	Haul Roads	50	Landform and native revegetation that disrupts linear form. Some fire breaks and long-term light vehicle access	Throughout	Light vehicle access; low biomass fire buffers; targeted deep spot mounding, root zone wedges against cuts >2 m height
C	Construction Camp & Ancillary	1.2	Site rehabilitation to agriculture, with Ardgour Terrace wetland and riparian strip in gully	Years 4-10	Complete removal and restoration to support productive, tillable pasture
P	Process Plant Mine Infrastructure	4.3	Mixed rehabilitation with small wetlands, small forest, water treatment ~~plant and~~plant and truck access/turnaround	Years 10+	Area of wetland, 0.5 ha trees in deep soils, enable water treatment infrastructure
AR	Ardgour Rise Alignment	Variable	Alternative vehicle access to Thomson Saddle	Years 1-2	Vehicle Access Rehabilitated fill batters
TGT	Thompson Gorge Recreation Track	Variable	Historic connection through Dunstan Mountains	Years 10-12	Walking access, revegetation enhances

Unit Code	Management Unit	Initial Habitat Area (ha)	Primary Objective	Timeline	Key Features
					safety and minimises fire risk
QU	Quarries, Magazine & Emulsion	6.56	Agricultural/infrastructure restoration	Years 1-5	Gravel pit development, magazine restoration
W	Wetlands	7	Wetland ecosystem establishment; conservation of wetland species as >0.5 ha direct transfer (* sites)	Years 1-30	TSF wetlands, Ardgour Terrace*, Lower Shepherds* and Process Plant wetlands
D	Clean Water Diversion Channels	Variable	Water management. Aquatic and riparian habitat creation for permanent diversions. Terrestrial vegetation for temporary diversions	Throughout	Permanent access along some diversions, habitat enhancement
Mine Regeneration Zones					
MRZ-A	Mine Regeneration Zone A	434	Native regeneration & connectivity, taramea enhancement	Years 1-35	Stock exclusion, snow tussock planting, taramea expansion
MRZ-B1	Mine Regeneration Zone B1	69	Cushionfield & spring annual protection, kowhai patches	Years 1-35	Controlled grazing, species protection
MRZ-B2	Mine Regeneration Zone B2	30	Buffer to MRZ-B1 cushionfields. Shrubland and tussock expansion and enhancement, kowhai patches	Years 1-35	Controlled grazing, enrichment planting, plant pest and competition management
MRZ-B3	Mine Regeneration Zone B3	357	Taramea, tussock and shrubland expansion and enhancement, kowhai patches	Years 1-35	Browse control then exclusion, enrichment planting, plant pest and competition management

Note: * these wetlands are likely to change in area but the total area will remain the same and construction will still deliver the required minimum areas of direct transfer sods containing the specified Carex species to be consistent with Conditions.

Appendix A sets out the actions required for each Landscape Management Unit in more detail. Cushionfield and spring annual herb rehabilitation is described in the Applied Research Plan (Simcock and Brownstein 2025).

11.3. Key Actions by Management Unit

Table ~~23~~: Key Rehabilitation Actions by Management Unit.

Unit	Infrastructure Actions	Vegetation Actions	Habitat Enhancement	Water Management
TSF	Install ≥1.2 m protective cap Build embankment access track and naturalise form Install outlet infrastructure and 'break' diversion drains	Temporary erosion control Hydroseed Plant wetlands at 7,500 plants/ha Plant swales and bunds at >1,500 plants/ha Remove non-native trees in perpetuity	Build 137 rock stacks above inundation level Create swale/bund topography (additional depth on bunds) Establish tussock clusters	Create ≥2ha permanent wetland Build ≥4ha ephemeral wetland Maintain ≥0.5ha open water patches (a mosaic) Install engineered outlet Bring water from diversion drains onto TSF
ELF-S	Shape final landforms, scallop, apply 1-2 m brown rock, then 10 to 50 cm soil Remove linear terracing Create access roads, fire buffer Install drainage systems	Temporary erosion control-hydroseed Plant native nursery stock at 1500 plants/ha in clusters Transplant salvaged tussocks Establish shrubland mosaic	Create 25 to 50% deep root zones Build 212 rock stacks Create 60 rubble pits Deliver ≥5% rock cover Create fire buffer zones	Build permanent diversion Create riffle and pool sequences Install riparian planting and salvage from adjacent areas Design low flow and high flow habitat features
ELF-W	Complete landform by year 2 Install trial infrastructure	Hydroseed Trial plant establishment techniques	Build 33 trial rock stacks (refine technique)	Refine erosion control methods Monitor drainage patterns

Unit	Infrastructure Actions	Vegetation Actions	Habitat Enhancement	Water Management
	Refine root zone construction methods	Apply RAP Cushionfields Monitor establishment rates Monitor growth and spread	Create 10 trial rubble pits (refine technique) Monitor lizard colonization Monitor use of habitats	Assess water retention Refine design approaches
ELF-X	Complete landform integration by year 12	Hydroseed Vegetation mosaic including taramea	Build 29 rock stacks Create 8 rubble pits	Manage surface water flows to minimise erosion
PB	Place root zone wedges Treat upper benches Install bench edge treatments Develop access systems	Hydroseed Enhance edge vegetation Reduce edge plant pests Enhance bench revegetation Monitor natural colonization	Enhance edge habitat with strategic rocks Enhance edge connectivity	Manage surface water flows Manage flows in in-pit diversions Enhance habitat in permanent in-pit diversions
CT (if mined)	Backfill pit Landform integration by year 12	Spring annual herbs & cushionfield focus	Build 25 rock stacks Create 7 rubble pits	Manage surface water flows to minimise erosion
HR	Break linear features Scarify cut faces	Hydroseed Enhance edge vegetation and plant long-term bunds	Deliver ≥5% rock cover	Manage surface water flows to locally concentrate and infiltrate water in ways that maintain

Unit	Infrastructure Actions	Vegetation Actions	Habitat Enhancement	Water Management
	Place root zone wedges against cuts >2m, deconstruct bunds Create access roads, fire buffer Rip or spot mound >0.5 m depth except permanent tracks, spread root zone	Reduce edge plant pests Move parts of bunds with plants and root zone, plant native nursery stock and establish seed germination zones		surface stability and assist vegetation establishment. Remove culverts where practical and replace with fords
PL	Place boulders within lake edge along haul road and on haul road Place root zone on haul road above lake level using wedges Exclude vehicles	Hydroseed Plant above lake level along haul road Establish kowhai, grey scrub	Install boulders across lake edge in clusters ensuring part of the submerged boulders will emerge above the water	Manage surface water flows (pit walls and haul road) Minimise lake edge erosion
S	Restore original landform contours that are stable Re-establish drainage Rip or spot mound stockpile base Scallop surface and spread root zone	Temporary erosion control Hydroseed Plant native nursery stock at 1500 plants/ha in clusters Establish vegetation mosaic that complements adjacent areas	Build 44 rock stacks Create 13 rubble pits Deliver ≥5% rock cover	Manage surface water flows to minimise erosion Reinstate ephemeral watercourses and seepages Use armouring where necessary

Unit	Infrastructure Actions	Vegetation Actions	Habitat Enhancement	Water Management
C, QU	Remove hard infrastructure Maintain culverts or convert to fords Shape final landforms, ensure suitable drainage Spread root zone or gravel Fence riparian zone	Enhance soil stockpile quality Establish dense pasture or cereal cover Minimise agricultural plant pests Establish riparian zone planting	Establish riparian zone to wetland Establish kowhai in riparian zone	Manage runoff quality and quality from roads, hardstand Minimise risk of upstream erosion and manage hydrology within Ardgour Terrace wetland Enhance resilience of unfenced watercourse sections
MRZ-A	Install stock-proof boundary fencing Build maintenance access Establish fire breaks	Control targeted plant pests Enhance plant species diversity Control pest browsers Establish snow tussock Expand taramea	Enhance habitat structure and leaf litter habitats Create habitat corridors Increase plant species hosting threatened invertebrates Monitor fauna response	Enhance riparian zones Exclude stock Enhance degraded seepage zones
MRZ-B1	Install stock fencing to allow grazing Build stock watering system (troughs) Install rabbit exclosures around kowhai and high value plants	Control targeted plant pests Control competing plant pests Protect, enhance cushionfields Manage grazing timing Enhance spring annuals	Establish new high-value plants (seedlings) Protect high-value plants Increase cover and health of high-value plants Monitor threatened species	Stop stock water extraction Protect seepage areas from stock Enhance degraded seepage zones Enhance natural stream flow

Unit	Infrastructure Actions	Vegetation Actions	Habitat Enhancement	Water Management
	Establish access tracks	Control pest browsers		
MRZ-B2	Install ~~boundary~~ fencing (temporary and permanent boundary fences) Create internal subdivisions if necessary to allow grazing Create rabbit ~~kowhai~~ exnclosures around kowhai Build stock watering system Maintain access routes Establish fire breaks	Control targeted plant pests Protect, enhance cushionfields Enhance plant species diversity (enrichment planting) Control competing plant pests Manage grazing intensity Protect remnant kowhai Control pest browsers	Enhance rock features Establish kowhai Enhance habitat connectivity Monitor lizard populations Increase plant species hosting threatened invertebrates	Protect riparian zones Enhance degraded seepage zones
MRZ-B3	Install boundary fencing Install temporary stock water supply (for sheep) Build maintenance access Establish fire breaks	Control targeted plant pests Control competing plant pests Protect, enhance remnant kowhai and taramea Enhance plant species diversity Control pest browsers	Create habitat corridors Enhance rock features Establish kowhai in exclosures Increase plant species hosting threatened invertebrates Monitor fauna response	Protect Jean Creek headwaters Enhance wetland areas Control, then exclude stock Improve aquatic habitat

11.4. Risk Management Matrix

Table ~~34~~: Risk Management Matrix for Key Rehabilitation Risks by LMU.

Unit	High Priority Risks	Medium Priority Risks	Mitigation Measures	Contingency Plans
TSF, W	Material supply shortfalls Wetland hydrology Vegetation salvage failures	Access track erosion Surface flooding Pest plant and invasive tree establishment	Volume tracking systems Water balance modelling Early salvage scheduling Regular monitoring	Alternative material sources Supplementary irrigation Nursery backup plants Outlet modifications
ELFS. HR, S, P, CT	Landform contouring inadequacy Root zone inadequacy Plant establishment failure	Erosion control failure Fire risks Climate change effects	Design approval processes Root zone standards and approvals before planting Multi-layer erosion control Regular inspections	Landform modifications Additional soil placement Enhanced surface treatments Sediment capture systems
MRZs	Grazing management failures Plant pest control challenges Mining-related damage	Exclosure fence breaches Damage by road users New plant pest establishment Fire	Adaptive grazing protocols Integrated plant pest management Dust and sediment controls Regular monitoring with triggers for intervention	Alternative grazing regimes Enhanced plant pest control Enhanced protection measures Remedial planting/seeding

Unit	High Priority Risks	Medium Priority Risks	Mitigation Measures	Contingency Plans
PB	Inadequate root zone placement In adequate roughness of pit surfaces Coordination protocols Stream diversion failure	Degraded natural edges Surface re-treatment impractical Slumping of pit benches	Additional root zone placement Natural edge (re) treatment Develop a range of surface treatment and vegetation establishment methods Protective barrier installation Emergency stream management	Construction monitoring Surface assessments Quarterly vegetation surveys Continuous stream monitoring

Detail of management risks per Landscape Management Unit is included in **Appendix A**.

11.5. Success Criteria & Monitoring

Table ~~4~~5: Success Criteria and Monitoring Framework by Landscape Management Unit.

Unit	Vegetation Success Criteria	Habitat Success Criteria*	Infrastructure Success Criteria	Monitoring Schedule
TSF	≥75% planted seedling survival at 3 years and active growth ≥66% native wetland vegetation cover with target threatened species established Native species dominance Minimal invasive plant species; pest plant covers diminishing	≥137 functional rock stacks ≥2ha permanent wetland, 0.5 ha open water at spring maxima as a mosaic ≥4ha ephemeral wetland Lizard colonization evidence (tussock skink and gecko)	Capping integrity maintained Outlet functionality confirmed Access track, fords and diversion drains stable Embankment stability	Annual vegetation surveys Quarterly water monitoring Bi-annual lizard surveys Monthly infrastructure checks
ELF-S	>75% planted seedlings survival at age 3 years and active growth ≥20% native plant cover by year 10 post establishment Vegetation mosaic established and tussock nodes expanding by year 10 post establishment Minimal erosion occurrence Species diversity targets met	≥212 rock stacks functional ≥60 rubble pits occupied Wildlife corridor established Habitat mosaic established with variation in native vegetation structure and dominant species	Landform stability maintained Drainage system functional Visual integration achieved Fire buffer effective	Annual vegetation monitoring Seasonal erosion surveys Bi-annual fauna surveys Quarterly infrastructure inspections

Unit	Vegetation Success Criteria	Habitat Success Criteria*	Infrastructure Success Criteria	Monitoring Schedule
MRZ-B1	Expansion of cushionfield area Enhanced cushionfield condition Increase in spring annual populations and individuals Elimination of reproductive brier	Regeneration of *Pimelea aridula* and native brooms in exclosures Natural recruitment of kowhai seedlings in exclosures containing adult trees and active growth of planted kowhai within 5 years	Fence integrity maintained Stock water system functional	Plant monitoring determined by ARP Cushionfields Quarterly infrastructure checks
MRZ-B2	Cushionfield area maintained Spring annual population stable Forms an effective buffer for Cushionfields No expansion of brier Minimal invasive plant species; pest plant covers diminishing Reduction in pasture cover Target plant species naturally recruiting	Enhanced native plant species diversity Enhanced plant structure in scrub areas with vines Threatened lizard species populations enhanced	Fence integrity maintained Water system functionality Access track condition maintained Grazing infrastructure effective	Two-yearly plant surveys Bi-annual threatened species counts Monthly grazing assessments Quarterly infrastructure checks
MRZ-B3	Increase in cover and structural diversity of native-dominated vegetation associations.	Connectivity established across areas that were dominated by pasture	Fire buffers and access track condition maintained. Public access tracks and gates meet required standards	Two-yearly plant surveys Bi-annual planted threatened species counts

Unit	Vegetation Success Criteria	Habitat Success Criteria*	Infrastructure Success Criteria	Monitoring Schedule
	Increase in native woody plant with active growth of planted nursery seedlings, including all threatened species (exceeding targets for each species in Appendix G) Reduction in pasture cover Minimal invasive plant species; pest plant covers diminishing and <5%	Planted kowhai thriving with minimal evidence of mammalian browse Taramea recruitment observed within 5 years, >5% increase in taramea area within 10 years		Quarterly infrastructure checks
MRZ-A	As for MRZ B3 and Over 5000 snow tussock established in nodes over at least 5 ha with long-lived woody trees; natural recruitment of snow tussock observed within 10 years	Connectivity established across areas that were dominated by pasture Taramea recruitment observed within 5 years, >5% increase in taramea area within 10 years	Fire buffers and access tracks condition maintained	Two-yearly plant surveys Bi-annual planted threatened species counts Quarterly infrastructure checks
PB	Native vegetation established on areas with root zones (20m) Native dominated edges thriving Erosion control effective Pest plant species fail to establish (are not reproductive)	Edge connectivity established with batters Lizard access to batters confirmed Habitat diversity created	Safety standards maintained	Two-yearly vegetation surveys by drone Quarterly safety inspections

Unit	Vegetation Success Criteria	Habitat Success Criteria*	Infrastructure Success Criteria	Monitoring Schedule
HR	Per ELF and S	Per ELF and S	Reduced to light vehicle access tracks Fire buffer established	Per ELF and S
TGT	N/a	N/a	Recreation route reinstated Wayfinding and lookout opportunities Safety standards maintained Fire buffer established	Quarterly safety inspections Annual road surface assessments to maintain free-drain, gravel surface Six-monthly plant pest and fire buffer assessments

The above rehabilitation outcomes are summarised and illustrated using photographs in Appendix F. Specific revegetation methods for DDF and MRZ are described in Appendix E2, Tables 2.1 (DDF) and 2.2 (MRZ). These rehabilitation methods are designed to achieve the ~~following overall~~ vegetation success criteria for the DDF that are summarised in Section 11.6 and detailed in Table 6a below presented by mapped vegetation association and in Table 6b by pest plant category. Estimated ~~, with expected~~ changes in covers of vegetation associations within MRZ discussed in Appendix E1 Table 1.1.

Table 6a:DDF Vegetation Establishment Criteria, Intermediation and Closure Success Criteria, Trigger for contingency and Contingency Action by Vegetation Type

Vegetation Type	Numbers / Quantities	Location	Ecological Success Target (out-come of input)	Trigger for Contingency and (*Monitoring*)	Contingency Action (see Table below for detail)
1. Exotic pasture or herbfield | pre-mining 79 ha in DDF → post mining Ardgour Terraces returned largely to ploughable pastoral agriculture (15 ha); all other areas initially established in low density of low-fertility grasses as below, converting to native vegetation types over time					
Erosion control grasses (sweet vernal / browntop) across areas where native plant communities are established	~3 kg/ha seed mix	All disturbed DDF surfaces except pit walls and Ardgour Terraces	Erosion-resistant cover established on all disturbed surfaces within one growing season of seeding, with no active rilling or wind eroding patches (>X m^2) evident at first-year inspection (and maintained). Non-native grass cover reducing relative to native cover by Year 5 post initial revegetation, consistent with native establishment objectives.	Erosion or rilling observed, or non-native grasses suppressing (rather than facilitating) native planted or naturally- established seedlings. *(Monitoring needs cross reference to Erosion and Sediment Control Plan)*	Adjust grass seed rate, timing, method (e.g. hydro seeding or hydro mulching) and/or species. Apply additional mechanical erosion controls (short or longer lived). Reduce competition with native species mechanically or chemically in targeted areas to avoid initiating erosion.
2. Mixed depleted herbfield (cushionfield) and grassland | 104 ha DDF→ post mining target 19 (experimental) + contingency zone					
Cushionfield community	Up to 19 ha experimental total includes W-ELF: up to 5 ha by Year 3. CIT pit: min 4.5 ha (if mined).	Suitable aspects of Western ELF (Year 2–3 trials) and Shepherd's ELF if WELF successful. CIT pit backfill if pit mined. Contingency Zone	ARP research including W-ELF trials inform adaptive management of this community in contingency zone and establishment of new cushionfields by Years 3 (W-ELF) and 5. Contingency zones: Raoulia mat species showing stable or expanding cover.	W-ELF trials unsuccessful in establishing cushionfield at Year 5, 10. ARP success criteria for *C. pungens* and *M. brevis* not met Damage to cushionfield in contingency zone including (but not	Use ARP W-ELF results to inform Shepherd's root zone and landform design. Contingency zone: apply interventions to remediate damage/loss and prevent further

Vegetation Type	Numbers / Quantities	Location	Ecological Success Target (out-come of input)	Trigger for Contingency and (*Monitoring*)	Contingency Action (see Table below for detail)
	Contingency zone[2] (highest priority for avoidance of disturbance)		Spring annuals present at >75% of sites (within X m) of records in 2025/26 surveys ARP determines maximum pasture, native herb and woody cover	restricted to) weed invasion, grass competition, sediment/dust *(Locations and criteria defined by detailed mapping in year 1 as part of ARP that includes contingency zone)*	damage/loss (e.g. enhanced weed/ pasture grass /sediment / dust control)
3. Mixed tussock shrubland and exotic grassland | 187 ha DDF → rehabilitation target: 222 ha 'tussockland'					
'Tussockland' community defined by >20% cover of short tussocks (*Festuca novae-zelandiae, Poa cita, Poa colensoi*)	Min 25,000 large tussocks salvaged from DDF and transplanted (AEE Table 14). Clusters of ≥50 tussocks at 0.5–1 m spacing planted at density of ≥20 nodes/ha (nursery-grown or transplants)	All DDF ecological rehabilitation areas — excluding cushionfield areas, highwalls, pit lakes, and wetlands. Rock stacks, sheltered areas, pit edges, and stream edges prioritised.	Tussock cover in retained areas of contingency zones higher in year 5 and year 10 than pre-mining Planted tussock actively growing 3 years post-planting and exceeding required densities except on W-ELF trial area. Planted native tussock cover ≥10% 10 years post-planting. At closure tussock cover is > 20%. Evidence of self-established tussocks	At year 3, <75% survival of planted or <50% survival of transplanted tussock or densities are lower than specified minima. Inadequate natural regeneration within and between planted nodes. Cover not tracking toward 10% and 20% at intermediate reviews.	Additional planting to enhance survival and/or growth (see contingency table) Surface treatments (micro-habitats, moisture, shelter) adjusted. Enhanced weed management. .

[2] Noting that contingency zones are not planned to be stripped but MGL reserves the right to do so if required.

Vegetation Type	Numbers / Quantities	Location	Ecological Success Target (out-come of input)	Trigger for Contingency and (*Monitoring*)	Contingency Action (see Table below for detail)
			in ≥20% of permanent monitoring plots in tussock areas >10 years old and ≥40% of tussock areas at closure Minimum numbers of threatened plant species established	*(monitoring per BOMP.* *Requires aeria//drone mapping of tussock in contingency zone)*	
4. Mixed scrubland | 124 ha DDF → rehabilitation target: 230 ha 'native grey shrubland'					
Native grey shrubland community defined by >20% cover of grey shrubland woody species	Planting >1,500 nursery seedlings/ha across DDF including >20 nodes per ha each with >30 shrub seedlings (and >10 tussocks) (self-sheltering clusters) centred on rock stacks and rubble pits. More than ≥10,000 *Olearia odorata* and defined numbers of other specified threatened plants.	All DDF ecological rehabilitation areas except potential cushionfield, highwalls, pit lakes, wetlands, and Ardgour Terraces. South-facing slopes, rock stacks, sheltered areas, swales with higher shrub densities relative to tussock.	Three years post-planting shrubs actively growing and numbers exceeding required densities (and more than 75% survival) except on W-ELF trial area. Ten years post-planting native shrub cover in grey shrubland rehabilitation areas is ≥10% and tracking toward the 20% closure target. Evidence of self-established native shrubland species in ≥20% of permanent monitoring plots in shrubland areas older than 10 years and >50% of shrubland areas at closure Minimum numbers of threatened plant species established	< 75% survival at Year 3. < 20% native plant cover at Year 5 on ELF-S. Non-native competition preventing growth over 2 successive seasons in W-ELF trials. *(monitoring per BOMP)*	Additional planting using additional treatments to enhance survival and/or growth. Surface treatments (micro-habitats, moisture, shelter) adjusted Enhanced weed management.

Vegetation Type	Numbers / Quantities	Location	Ecological Success Target (out-come of input)	Trigger for Contingency and (*Monitoring*)	Contingency Action (see Table below for detail)
5. Native-dominant tussockland | 25 ha DDF → included within 3 above					
			At least 25 ha with mean >28% tussock? (for further discussion in response rehab outcomes at year 10)		
6. Native taramea herbfield and shrubland | 2 ha DDF → rehabilitation target: 2 ha DDF					
Taramea / speargrass (*Aciphylla aurea*)	≥2 ha established in DDF via nursery planting to rock stacks and natural expansion from individuals in retained contingency zone. NB inoculation transplants into contingency zone placed near existing taramea patches for invertebrate enrichment (survival secondary).	DDF: with rock stacks and rubble pits above 800 m ASL, near existing taramea patches in contingency zones adjacent to MRZ-A and B3 (SRX haul road) Provide for mana whenua input that may include accessibility for harvest	Contingency zones: Within 10 years of edge excavation, taramea cover stable or expanding relative to pre-mining. Within 5 years of planting into DDF areas taramea are actively growing. At closure: Area and/or number of taramea in DDF unmined (retained) contingency zones is ≥20% greater than the pre-mining baseline At closure (Year 35): ≥2 ha taramea established in DDF including in >25% of rock stacks above 800 m ASL	Mortality exceeding expected rates. Active pig rooting or hare browse suppressing seedling recruitment. Treatment of contingency zones adversely impacting seedling recruitment or seedling / adult health *(requires detailed mapping of taramea in contingency zone before disturbance around SRX from drone/aerial images)*	Remedial planting of nursery seedlings in DDF after review of successful and failed sites combined with additional treatments to enhance survival, growth (see list of interventions). Intensify pest control in affected areas and/or add physical protection. Address impacts on contingency zone (e.g. add retaining, add soil amendments /fill /surface mulches or fabrics to reduce erosion/ exposure of roots and drought stress

Vegetation Type	Numbers / Quantities	Location	Ecological Success Target (out-come of input)	Trigger for Contingency and (*Monitoring*)	Contingency Action (see Table below for detail)
7. Native dominant scrubland | 86 ha DDF → generally included within 4 above.					
Native dominant shrubland community as above (4) Kowhai nodes (*Sophora microphylla*) in DDF including around old trees that are in retained part of contingency zone. Valley floor tree species including thin barked totara (LERMP Appendix E)	See Habitat 4 above. Kōwhai: 24 nodes × 24 to 30 seedlings each to deliver a minimum of 480 trees at closure; genetic material from ≥10 source clusters per node (12 are in DDF see LERMP Appendix EX). At least 0.5 ha valley floor 'forest' in deeper soils at >2500 stems/ha equivalent. Deliver diversity and number of threatened plants in this vegetation type as specified in LERMP Appendix E7	See Habitat 4 above. Kōwhai nodes: Contingency Zone, MRZ-B1 to B3, Ardgour Terrace riparian, Shepherds riparian, lower pit haul roads with rabbit-proof exclosures. Valley floor trees in gullies above frost drainage where deep soils are placed (i.e. fire buffered).	See Habitat 4 above. or At least 86 ha with mean >44% (not agreed by Matakanui) Kōwhai: ≥ 66% survival 3 years after planting and 10 years after planting At closure (Year 35): ≥480 established kōwhai >1 m height, actively growing within rabbit-fenced areas over at least 5 years (expect some dieback in drought years). Kōwhai seedlings establishing naturally (unplanted) within 100 m of retained trees, demonstrating functional recruitment. At least 0.5 ha valley floor 'forest' established with ≥66% survival and >2500 stems/ha with plants demonstrating active upward growth above sheep browse height.	*(monitoring per BOMP)* < 66% planted seedling survival or less than 480 kowhai trees. > 10% browse damage in exclosures Insufficient natural establishment *(monitoring by tagging all planted kōwhai and valley floor trees and measuring survival and growth at five-year intervals per ARA method)*	Nursery backup from retained cuttings from original Kōwhai trees combined with additional treatments to enhance survival, growth (see list of interventions). Repair/enhance rabbit-proof exclosures. Intensify browser control.

Vegetation Type	Numbers / Quantities	Location	Ecological Success Target (out-come of input)	Trigger for Contingency and (*Monitoring*)	Contingency Action (see Table below for detail)
			Minimum numbers of threatened plant species established		
8. Wetlands (seepages, fens, swamps/marshes) | 3.12 ha DDF → rehabilitation target: 7.5 ha total swamps marshes					
Wetland sedges, rushes, and herbs (incl. *Carex kaloides, C. diandra, C. buchananii*)	7,500 nursery plants/ha in planted wetland areas over minimum 6.5 ha (TSF + Process Plant). Direct transfer: min 0.5 ha intact sods (incl. *Carex kaloides*) + 0.5 ha additional as sods or individuals at Ardgour Terrace (Year 1), lower shepherds (Year 1). TSF: ≥2 ha permanent swamp + ≥4 ha ephemeral marsh + ≥0.5 ha open water at spring maxima.	Ardgour Terrace or Lower Shepherd's Creek wetland (0.4–0.5 ha; Year 1) and lower Shepherds Creek wetland (0.4–0.5 ha; Year 1). TSF wetland complex (6 ha; Years 10–12). Process Plant wetland (0.5 ha; Year 10+).	At 5 years post establishment wetland vegetation cover is >66% measured in permanent vegetation plots. At Year 5 post-establishment (TSF): ≥0.5 ha open water present at spring maxima, and ≥2 ha permanent swamp with native sedge cover. Ten years post-rehabilitation the area of the individual rehabilitated wetland is greater than specified, stable or expanding. *Carex kaloides* present and actively growing in Ardgour Terrace wetland. At closure *Carex kaloides* also established in at least two other DDF wetland areas and threatened wetland plant criterion met	< 66% wetland vegetation cover at Year 5. Open water < 0.5 ha at spring maxima on two successive surveys. Sod salvage insufficient to meet 0.5 ha direct transfer target. *(monitoring per BOMP)*	Supplementary irrigation installed. Outlet infrastructure modified. Additional nursery wetland planting Alternative salvage material sourced from contingency areas within DDZ.
Rock habitat features | Cross-cutting across all habitat types | DDF-wide: min 1/ ha rock stacks + 0.5/ ha rubble pits					

Vegetation Type	Numbers / Quantities	Location	Ecological Success Target (out-come of input)	Trigger for Contingency and (*Monitoring*)	Contingency Action (see Table below for detail)
Rock stacks and rubble pits	Rock stacks: ≥1 per ha DDF (480 total); min 1 ha total; ≥5% rock cover in ecological rehab areas. Rubble pits: 1 per 5 ha DDF); min 0.5 ha total. Min 20% of rock stacks with pre-excavated trench ≥1 m depth. >10 salvaged short-tussocks each >10 cm basal diameter per structure	Throughout all DDF ecological rehabilitation areas. Key densities: TSF ≥50 ELF-S ≥115 W-ELF ≥20 ELF-SrX ≥16 Haul roads ≥50 Stockpiles ≥24 CIT (if mined) ≥14.	Construction verified against specification (crevice dimensions, depths, spacing). Habitat connectivity: max 300 m between rock stack clusters. By year 3 post-planting transplants and nursery plants are actively growing and meet plant species diversity and numbers specified for rock stacks and rubble pits Target: 20% of rehabilitated area supports suitable lizard habitat by Year X	Rock stack spacing > 300 m < 20% of rehabilitated area supporting lizard habitat at Year 5. Target species not detected in 20% of rock stacks within 5 years.	Additional rock stacks constructed in gaps. Review and adjust crevice dimensions to specification or updated specification based on lizard monitoring results. Redeploy additional salvaged weathered rock. Increase planted species number and/or diversity around rock stacks and/or. Apply treatments to enhance survival, growth and spread of plant species (see list of interventions)

NOTES

1. Contingency zones are not planned to be stripped but MGL reserves the right to do so if required. Mining or disturbing these areas would trigger higher numbers of rock stacks and rubble pits (1/ha and 0.2/ha respectively). Contingency area includes 5.8 ha of mainly cushionfield around CIT (50 m buffer); 2.7 ha on northwestern side of RAS (mostly cushionfield) and 4.1 ha on southeastern side of RAS (which has 100 m buffer) totalling about 12.6 ha. This is equivalent to 2/3 of the 19 ha that is proposed to be a minimum attempted cushionfield rehabilitation (and not including the CIT which may not be mined).

2. The LERMP specifies rehabilitation of the DDF and MRZ. The EEA requires DDF simplified 'tussock' and 'shrubland' communities which are combinations of vegetation classes from the vegetation survey reported in AEE Terrestrial Ecology, Section 4.1 (Table 5) and Section 4.2 (Table 6). The simplified DDF outcomes cover most areas are 222ha 'Tussock' and 232 ha 'Shrubland' at closure. The DDF 'Tussock' combines 'mixed tussock shrubland and exotic grassland' (187 ha) and 'native dominant tussockland' (25 ha). The DDF 'shrubland' combines 'mixed shrubland' (224 ha) and 'native dominant shrubland (7 ha)

3. The DDF 'tussock' and 'shrubland' are designed to develop from a consistent per hectare planting approach. Medium-term differentiation into a tussock and shrubland mosaic is driven by initial planting pattern which is based on establishing tussock patches and mixed shrubland patches centred on a reconstructed macro-topography of rock stacks and rubble pits. Over time landform differences (slopes, aspects, exposure, altitude, water accumulation) is expected to drive where tussock or shrubland

spreads. *This means the DDF landscape mosaic will need to be delineated into nascent 'tussock' and shrubland' units about 10 years after planting and confirmed at closure to meet the required 222 ha tussock and 232ha shrubland*. In many ungrazed areas shrubland is expected to gradually dominate as short tussock is an induced vegetation type (see vegetation history). As well as tussock and shrubland, the DDF also has small areas of forest (0.5 ha), fenced kowhai nodes, taramea (>2 ha), wetlands (>7 ha) and cushionfield. Outcomes for 'de novo' cushionfield are highly uncertain, however most of the cushionfield in contingency zones is expected to be retained. *(NB. Change LERMP Appendix Table 1.1 to 222 ha tussockland (from 8+6=14 ha) and 232 ha scrubland to align with AEE)*

4. The plant establishment requirements (species and numbers) are detailed in the LERMP Part A v003 02 August 2025 and species in LERMP Appendices E1 Table 1.1'Vegetation community types in DDF in 2024/25 and rehabilitated area after 35 years' and Table 1.2, 'existing covers' column), E2 'Summary of revegetation methods table 2.1 and E7 'Plants with a threat status within the DDF and rehabilitation management', and in AEE Tables 14 and 15. Pest plant criteria are separate. Cushionfield will be refined by Applied Research Plan (ARP).

5. The table below complements establishment requirements. It includes intermediate success criteria based on time since planting/establishment. Closure outcomes (nominally year 35) are included from Table 1.1 and 1.2 from LERMP Appendices. Outcomes are broadly consistent with the approach in the Ardgour Restoration Area Management Plan (Norton, Biodiversity Solutions Ltd., September 2025) that include natural spread and increasing cover of target vegetation (these are new, additional measures).

6. Offset/compensation modelling used 20% tussock cover and 20% shrubland cover. However, an enhance option would deliver all vegetation types with covers of target native plants that are greater than mean pre-disturbance covers, as summarised in LERMP Appendix table 1.2 pg 86. i.e. >28% cover for 'tussock' and 44% cover for 'shrubland' at closure (within 20 years of establishment). The need for interventions to achieve these higher cover values would be informed by *results of plant establishment and growth trials in the Western ELF as this is established in year 2, with most rehabilitation not until year 10, allowing decision on increase of planting density*. In the table new material, i.e. additional to that in LERMP or AEE is highlighted. This Table can be used as a summary for consent condition purposes and should be cross-checked with consent conditions.

7. The Biodiversity Outcome Monitoring Plan (BOMP, G.12) lists high level ecological outcomes measured by metrics: spatial extent, indigenous dominance, mean indigenous plant richness, % occurrence and relative abundance of notable plants' per Table 1 and Table 2 of BOMP). Most outcomes below inform outcomes in BOMP Section. However, 'plant salvage and relocation' are only in LERMP (and included below, i.e. >25,000 large tussocks, >1 ha wetland plants with >0.5 ha direct transfer. BOMP Table 1 states five outcomes for DDF within 35 years of approvals granted, allowing for 20+ years of plant development after initial revegetation and 30-32 years in the Western-ELF.

    - >70% of 610 ha DDF covered in a native vegetation mosaic dominated by woody shrubland and tussock with lesser amounts of cushionfield, taramea, marsh and swamp wetland.
    - An increase in mean native plant species richness relative to the pre-mining state for native tree shrub and liane species across the habitats within the DDF relative to Pre MS
    - An increase in indigenous dominance of vegetation relative to the baseline (may conflict with 20% tussock in 25 ha and 20% shrubland in 86 ha being 28 and 44 % respectively)
    - An increase in mean Threatened or At Risk plant species richness and combined relatively abundance relative to Pre Mining State (Pre MS)
    - An increase in mean abundance of seed dispersing native avifauna relatively to PMS across DDF

Table 6b. Weed / pest plant management - success and closure criteria (DDF and MRZ)

Source: LERMP Part A s.10.3.10 and s.11.8 Strategy 1; Table 4 (MRZ-B1). Detailed pest plant species lists and cushionfield-specific weed management are developed through the Applied Research Plan (ARP) and the Biosecurity and Plant Pest Management Plan (BPPMP).

Weed / Pest plant category	Target species / scope	Where applies (DDF / MRZ / both)	Ecological success / closure criterion (outcome-based)	Trigger for contingency action	Contingency action
A. Priority pest plant species					
Priority pest plant species	All 27 target species in BPPMP Table 1 including gorse, broom, willow, poplar, wilding conifers, , non-native climbers (incl. *Clematis tangutica*), thyme, stonecrop.	DDF, all MRZ, Ardgour Restoration Area, and Ardgour Sanctuary have the same criterion. Maintained for ≥10 years post-closure.	No stonecrop on site. No reproductive individuals of any target woody weed species present in DDF or MRZ at any annual surveillance visit, from Year 1 and maintained throughout project duration and ≥10 years post-closure. Ongoing surveillance detects and responds to new incursions within one growing season of detection.	Any reproductive individual of a target species recorded at an annual surveillance visit. New species establishing on site and not detected within one growing season.	Targeted removal of affected species within that growing season. Escalate surveillance frequency. Review biosecurity protocols for vehicles and imported materials.
B. Brier rose (*Rosa rubiginosa*) in cushionfield and spring annual herb areas					
Brier rose in cushionfield	Brier rose	MRZ-B1 cushionfield contingency zones and MRZ-B2 cushionfield areas. DDF cushionfield trial areas (W-ELF, CIT) - criteria to be finalised by ARP.	No reproductive brier individuals in cushionfield and spring annual herb areas from Year 5 onwards. MRZ-B1 weed cover (all exotic shrub species combined) <5% in monitoring plots. Brier control approach confirmed by ARP by Year 3.	Reproductive brier present in cushionfield areas after Year 5. Exotic shrub cover exceeds 5% in MRZ-B1 monitoring plots at any review. ARP unable to confirm brier control approach by Year 3.	Immediate targeted removal of all reproductive brier. Escalate intensity of follow-up programme. Review of control method.

Weed / Pest plant category	Target species / scope	Where applies (DDF / MRZ / both)	Ecological success / closure criterion (outcome-based)	Trigger for contingency action	Contingency action
C. Non-native grass and herb competition in planted DDF areas					
Non-native grass and herb competition in DDF	Non-native grasses and herbs competing with planted and self-establishing native seedlings across DDF rehabilitation areas. Specific competing species identified through W-ELF monitoring and BPPMP.	All DDF ecological rehabilitation areas. Primary focus in Years 1–10 while native vegetation establishing. Methods informed by W-ELF trial results from Year 3 onward.	Non-native plant competition allows planted native seedlings to demonstrate active growth over three successive years from planting. Non-native grass cover reducing relative to native cover by Year 5 post initial revegetation in all DDF areas. Existing native shrubs and tussocks in MRZ expanding in cover over each 5-year review period with self-established native seedlings present.	Non-native grass biomass suppressing native seedling growth (no net height or cover gain over two successive growing seasons) in planted nodes. Native shrub or tussock cover in MRZ not expanding over a 5-year review period. Self-established native seedlings being supressed by non-native species	Targeted spot-treatment of competing non-native vegetation around native planting nodes (mechanical or chemical). Adjust erosion control grass seed rate or species in future planting programmes based on W-ELF trial data. Increase browsing management in affected MRZ areas to reduce grass competition indirectly.
D. Weed-contaminated soils and biosecurity | * Bendigo-specific (gorse seed bank in stripped soils; SRX arsenic quarantine)					
Weed-contaminated soils; biosecurity *	Gorse-contaminated stripped soils (long-lived seed bank). New weed species entering site via vehicles, imported materials, nursery plants, or stock movements. Also see BPPMP and biosecurity protocols.	Ardgour Terrace quarantine zone (gorse-contaminated soils). All site entry points and equipment movement corridors (biosecurity).	Gorse-contaminated soils maintained within Ardgour Terrace quarantine zone throughout project and not dispersed to DDF or MRZ rehabilitation areas. No new weed species detected within one growing season of entry on site (confirmed by annual biosecurity surveillance).	Evidence that gorse-contaminated soils have been moved outside the quarantine zone. Gorse seedling emergence recorded in DDF or MRZ areas not known to have a pre-existing seed bank. New weed species detected on site not recorded in baseline weed map.	Trace and remove displaced contaminated soil. Intensify gorse seedling control in affected areas. Conduct root cause investigation of biosecurity breach and rectify. Update biosecurity protocols and re-brief all site contractors. For new species: immediate targeted removal and update BPPMP species register.

Notes (1) The closure standard in criterion A (no reproductive individuals; new incursions detected and managed within one growing season) applies consistently across Bendigo DDF, MRZ, Ardgour Restoration Area and Ardgour Sanctuary. Criterion C applies consistently across Bendigo DDF and Ardgour Restoration Area. Criteria B and D are Bendigo-specific. (3) Cushionfield weed management criteria (brier thresholds, pasture grass targets) will be refined by the Applied Research Plan (ARP)d. The values above are interim pending ARP Year 3 outputs. (4) For competition management thresholds

for rehabilitated DDF areas (criterion C), methods will be informed by W-ELF trial experience from Year 3. (5) The BPPMP holds the operative weed species register, surveillance schedule, and treatment protocols.

11.6. Establishment of Habitat

The following specific outcomes will be achieved through implementation of this management plan:

- 222 ha of indigenous tussockland that contains at least 20% tussock cover in the DDF. Within MRZ B2, MRZ B3 and MRZ A tussock will be managed to naturally expand ~~its area~~ and thicken existing areas (i.e. increase proportion of cover) within and between open scrubland canopy, replacing non-native pasture. ~~Pasture currently covers 47% of areas mapped as tussock and 45% of mixed-tussock shrubland~~
- 230 ha of Indigenous woody scrubland in the DDF. Within MRZ A, parts of B2 and B3 mixed scrubland will be managed towards native dominant scrubland
- 19 ha of cushionfield with increased number of sub-populations of the three spring annual herb species being managed through the Applied Research Plan. These outcomes are uncertain and experimental, as they are dependent on the success of the Applied Research Plan and implementation of its recommendations. Appendix E6, Table 6.1 lists the cushionfield species with a threat status with preliminary conservation notes
- 2 ha of taramea herbfield and shrubland
- 3.5 ha Swamp wetland with 0.5 ha of open water elements (3.5 ha)
- 4 ha of Marsh wetland including >0.5 ha of direct transferred material in year 1 to form the new Ardgour Terrace wetland, a minimum 0.4 ha wetland established in lower Shepherd's Valley before the end of year 2, and small wetland in the vicinity of the plant established when mining ceases. Appendix E5 lists threatened wetland plants to be established in mined areas
- Establishment of at least 24 reproductively viable kōwhai clusters across the DDF and MRZ. These clusters will be established within the first 2 years around retained kowhai (probably no more than 8), and include seedlings grown from cuttings retrieved from those kowhais that are removed to enable mining, as well as kowhai from the wider upper Clutha area (Appendix E, Table 3.1)
- Deployment of ~~at least 480~~ rock stacks to provide habitat for lizards, invertebrates and nursery-grown plants ~~(~~at a nominal 1 per ha~~)~~. Creation of ~~at least 96~~ rubble pits ~~(~~at a minimum density of 1 per 5 ha~~),~~ totalling approximately 1.5 ha of rock piles and rubble pits. Establishing >5% rock cover (ideally 10%) in all rehabilitation units measured within 2 years of revegetation (except wetlands and pit lakes). Adoption of specific planting requirements for rocks stacks and rubble pits (Appendix E4 Table 4.1)

- Salvage of at least 25,000 larger tussocks as clusters in sods and as individuals from the stripped footprint and their replacement in clusters at a nominal 1 m spacing to favourable sites in mined areas to inoculate mined areas and accelerate establishment of habitat nodes to complement nursery-grown plants. At least 90% of the entire root ball of tussocks is to be salvaged including at least to the interface with subsoil (generally 20 to 30 cm depth), and tussocks must be placed so root balls are covered with soil or other root zone material.
- Establishment of specific minimum numbers of individuals of threatened plants in the DDF as identified in Appendix E7 (with no less than 100 individuals of each species established), with plant species and proportions to be used in MRZ listed in Appendix E3, Table 3.1.

11.7. Rehabilitation Implementation

This section outlines the specific actions required to achieve successful rehabilitation outcomes. All actions fall under one of three implementation phases and are further organised into five core management strategies that apply across all LMU's.

Three Implementation Phases include:

- Phase 1: Foundation (Years 0-2)
- Phase 2: Main Implementation (Years 2-10)
- Phase 3: Completion & Monitoring (Years 10-30).

Five Core Management Strategies are:

- **Plant Pest and Browser Management:** Target and remove invasive species before they spread, reduce browsers to very low numbers, remove cattle and manage sheep/rabbit grazing
- **Plant Establishment:** Plant nursery-raised plants and targeted plants salvaged from the mine footprint in clusters, including around rock stacks and rubble pits, with enrichment transplanting and planting along mine edges, and enrichment planting in MRZ
- **Habitat Creation:** Construct ~~minimum of 480~~ rock stacks, ~~96~~ rubble pits and minimum 5% (ideally 10%) rock cover (in mined areas to provide specialized habitat features for native fauna (in addition to salvaged tussock and wetland species). This excludes wetlands, pit lakes, and returned to agricultural use
- **Drought Resilience:** Create 'dimpled' and 'scalloped' topography to create localised areas with higher moisture, establish minimum areas of deep soils (1-3m depth) using ripping and soil replacement, using rocks and boulders to create

microsites, and create swale/ bund topography on the TSF. In wetlands, enhance moisture storage by reusing stripped and separately stockpiled organic-rich soils.

Fire Protection: Low biomass fire breaks based on linking cushionfields, pit walls, parts of haul roads, and grazed zones along roads.

11.8. Implementation Phases

Phase 1: Foundation (Years 0-2)

Goal: Establish comprehensive rehabilitation management systems and infrastructure and initiate rehabilitation activities across priority areas.

Key actions for the first phase are:

- Integrate pre-stripping and rehabilitation with mine plan
- Construct mine and ancillary infrastructure (including nursery plant hardening and processing areas)
- Install fencing and stock water provision in MRZ B1 and B2 areas to be grazed
- Begin plant pest and browser control
- Start material salvage (soils, rocks, plants, wood) including tussock to live storage and cuttings from kowhai that will be removed in years 0 to 3
- Refine techniques for salvage and enhancement of final edges along stream diversions, permanent access tracks, and other contingency zones
- Start excavation of RAS pit and create TSF embankment
- Initiate Applied Research Plan including surveys of cushionfields and spring annual herbs
- Initiate erosion stabilisation and rehabilitation trials
- Initiate seed and plant propagule collection and nursery plant production
- Build Western ELF, apply rock stacks and rubble pits (refine techniques)
- Construct Ardgour Terrace wetland using salvaged wetland sods and Lower Shepherd's wetland using salvaged wetland sods and individual plants.

Success Measure: Rehabilitation systems are operational with successful material salvage programs established, plants being propagated in local nurseries, Western ELF trial site constructed, Applied Research Plan actioned, and stream diversions completed to support ongoing restoration activities.

Phase 2: Main Implementation (Years 2-10)

Goal: Rehabilitate at least one third of mined areas including SRX ELF, pit, haul road, and associated stockpiles, CIT (if mined) and temporary site workers camp

Key Actions:

- Maintain Ardgour Terrace and Lower Shepherds Wetlands, soil stockpiles and contingency zones
- Tussock continued to be salvaged and used or transferred to live storage areas
- Rehabilitate and revegetate SRX complex, including establishment of taramea
- CIT pit (if mined) backfilled to near-natural landforms including at least 4.5 ha of slopes suitable for cushionfields/spring annual herbs
- Complete edge and batter rehabilitation of permanent RAS and SRX pits as mining progresses
- Initiate Spring Annual and cushionfield rehabilitation trials
- Build Shepherds and SRX ELFs and rehabilitate areas that are complete
- Disestablish temporary Site Workers Camp and return to agricultural use
- Create rock stacks, rubble pits and habitat features, including delivering suitable ROM rock for rock features
- Plant native vegetation across all completed landforms
- Establish permanent watercourses. And SRX pit lake with terrestrial, riparian and aquatic habitats along pit haul road

Success Measure: All mined areas have rehabilitation started except TSF.

Phase 3: Completion and Monitoring (Years 10-30)

Goal: Finish rehabilitation and ensure long-term success

Key Actions:

- Rehabilitate and revegetate TSF, Shepherds ELF, haul roads, RAS pit, portal and stockpiles
- Establish and maintain fire buffers
- Dis-establish temporary diversions, allow water to flow onto the TSF
- Dis-establish and revegetate sediment ponds and other temporary infrastructure
- Establish long-term management systems
- Reinstate public walking access through Rise and Shine Creek

- Monitor and maintain all areas to agreed levels
- Review results at five-yearly intervals and adapt management based on results.

Success Measure: All areas meeting success criteria.

11.9. Core Management Strategy

Strategy 1: Plant Pest and Browser Management

This strategy addresses non-native plant species that compete with native vegetation and controls mammalian browsers that can damage newly established plantings. The integrated approach protects rehabilitation investments from both plant pest and mammalian pest threats, ensuring conditions for successful native vegetation establishment across all landscape management units.

What will be Controlled:

- **Plant Pests:** Non-native, wind and bird-dispersed pest plant species including wilding pine, thyme, stonecrop, broom, gorse, willow, hawthorn, cotoneaster, buddleia, elderberry, box thorn, flowering current, gooseberry cherry, stinking iris, malefern and all non-native climbers including *Clematis tangutica*

  (Australian bidibid, foxglove, Californian poppy and vipers bugloss will not generally be controlled). Specific methodology for plant pest management is described in the BPPMP.
- **Mammalian Browsers:** Most mammalian browsers will be reduced to very low densities including possums, deer, goats, hares, pigs. Specific methodology for mammalian pest management is described in the MPMP. All cattle will be removed. Sheep and rabbit browsing will be managed through the measures set out in the MPMP in non-cushionfield areas, and the Applied Research Plan in cushionfield areas to promote cushionfields and spring annual herbs.

How It will be Done:

Table

~~Table 57~~ outlines the plant pest and browser management strategy supporting rehabilitation success. The approach targets invasive species and controls browsers (rabbits, hares, deer, possums), while removing cattle and implementing controlled sheep grazing.

This strategy begins with comprehensive plant pest mapping and soil quarantine during stripping to identify pest plants and prevent contamination and spread. Browser control uses fencing, pest management, and managed grazing throughout the project, with ongoing targeted removal ensuring long-term control. Special consideration includes reduced rabbit control in sensitive cushionfield environments.

Table ~~57~~: Plant pest and Browser Management Implementation Schedule.

Action	When	Where	Method
Plant pest Mapping	Before any work starts. Maintain register of plant pest species	All areas	GPS mapping, species identification
Soil Quarantine	During stripping	Contaminated areas	Separate storage of plant pest-infested soils, and separate non-organic from organic soils
Ongoing Control	Throughout project	All rehabilitation areas	Targeted removal, follow-up treatments as described in Biosecurity and Plant Pest Management Plan (BPPMP)
Browser Control	Throughout project	All areas (reduced rabbit control probable in cushionfields)	Fencing, pest control, managed grazing

Success Criteria: The effectiveness of plant pest and browser management will be measured through six key indicators that demonstrate successful control and protection of rehabilitation efforts:

- Elimination of reproductive individuals of target pest plant species maintained throughout project duration; including brier rose in cushionfield areas from year 5
- Control of competition from non-native plants allows planted seedlings to demonstrate growth over three successive years, and existing native shrubs and tussocks in MRZ to expand
- <10% of highly palatable plants with mammalian browse damage in ungrazed or exclosure areas in any one year
- Natural expansion of taramea in MRZ by at least 10% area over 10 years ~~(currently limited by hare browsing of seedlings and pig rooting)~~
- Effective exclusion fencing operational with additional monitoring after snow events
- Ongoing surveillance detecting and managing new pest plant incursions.

Strategy 2: Plant Establishment

What will be planted:

- **Salvaged Plants:** at least 25,000 t~~T~~ussocks, 0.5 ha of wetland plants from stripped areas~~,~~ - a range of high-value and threatened plant species (Appendix E5 and E7) and plants identified in the Invertebrate MP including taramea, broom and olearia.
- **Nursery Plants:** Native shrubs, trees, herbs (taramea) and vines grown from local seed, with kowhai seedlings grown from cuttings taken from the oldest kowhai tree in each cluster within the DDF that is removed.
- **Erosion Control:** low density of n~~N~~on-native grass ~~e~~species that are already widespread on site (temporary) to minimise soil loss and provide shelter.

Plant establishment approach:

~~Table 6~~ Table ~~Table 8~~ presents the planting strategy for rehabilitation: plant types, sources, planting densities, and location priorities. Plant species used for different areas are listed in Appendix E. E3 lists plant species for MRZs, E4 lists species for lizard rock stacks and rubble pits, E5 lists threatened species for wetland planting, E6 identified Cushionfield plants, and E7 lists plants with a threat status that are present in the DDF and the rehabilitation response (e.g. if they are planted as seedlings other approaches).

The revegetation approach combines three key components: salvaged plants recovered from areas prior to disturbance, nursery-grown native species propagated from local seed sources, and temporary erosion control measures using non-native grasses to prevent soil loss during establishment and provide an initial cover.

The plant establishment program for most areas (i.e. excluding agricultural areas of Ardgour Terrace) prioritizes native species using relatively small areas of wetland and at least 25,000 salvaged tussocks, and large numbers of nursery-grown plants.

Strategic placement focuses initial planting in nodes within the most favourable locations such as rock stacks, stream edges, swales, and protected slopes, with specific density targets ranging from 7500 plants/ha for wetland areas to 1,000-1,500 plants per hectare for shrub and tussock communities. Erosion control seeding of sweet vernal and/or browntop at ~3kg/ha is designed to quickly stabilise bare soils while minimising competition for planted native seedlings.

Table ~~68~~: Revegetation Strategy – Plant Types, Sources, Densities, and Location Priorities.

Plant Type	Source	Planting Density	Location Priority
Tussocks	Salvaged from site and nursery grown	~~1~~2~~,~~5,000 minimum salvaged tussocks planted in clusters of 50 plants at up ~~0.5~~ to 1 m spacing	Rock stacks and rubble pits, sheltered areas (swales, hollows), pit edges, stream edges
Shrubs	Local nurseries, hardened onsite	1,000-1,500/ha in DDF, 250 to 1500 plants/ha in MRZ	Rock stacks and rubble pits, deeper soils, protected slopes and moister micro-sites
Kowhai	Local nurseries using plant sourced from Clutha Basin genetics primarily by seed with on-site cuttings	24 nodes with at least 30 seedlings per node ensuring diverse genetics	Contingency zone & MRZ B1 to B3, Ardgour Terrace riparian area, Shepherds riparian, lower pit haul road
Wetland Plants	Salvaged sods (including *Carex kaloides*).	7500 nursery plants/ha At least 0.5 ha ~~or by~~ direct transfer ~~(at least 0.5 ha)~~	Wetlands

Taramea	Nursery grown	Variable	Near existing taramea, rock stacks & rubble pits above 800m ASL
Erosion Control	Seed mix	3kg/ha sweet vernal and/or browntop	Most disturbed surfaces (not pit walls)

Success Criteria:

- 75% survival of planted vegetation at three years post-establishment; 66% survival for kowhai; exceed the minimum required numbers of each threatened plant species three years post-establishment with active growth
- Natural regeneration occurring between planted areas showing ecosystem expansion
- Pre-mining cover of native tussock and shrubs in 'mixed-tussock shrubland' and 'native dominant tussockland' achieved in DDF after 15 years, i.e. a minimum cover of 34% comprised of 7 to 28% tussock cover and 6 to 19 % native shrubs (Appendix E1, Table 1.2).
- Effective erosion control on all slopes; minimal soil losses.

Strategy 3: Habitat Creation

This strategy focuses on constructing specialised habitat structures that provide refuges, breeding sites, and movement corridors for native fauna, from small invertebrates to birds and lizards.

What will be built: This strategy targets five key habitat types needed to support diverse wildlife communities across the rehabilitation landscape, with specific emphasis on threatened species including Kawerau gecko and Tussock skink. The Applied Research Plan for cushionfields and spring annuals sits alongside these habitats.

- **Rock Stacks and rubble pits:** Both are large, engineered rock structures designed primarily for lizard habitat. Rock stacks are made from rocks >0.5 m diameter creating horizontal cracks providing communal refuges for gecko families and territorial areas for skinks. Rubble Pits are shallow excavated features (nominally 0.5m deep x 10m x 4-6m wide) filled with ~20-40mm diameter rock to provide habitat for small terrestrial invertebrates while excluding larger mammalian predators. Both rock stacks and rubble pits are planted with species that provide nectar, fruit, cover and food for lizards and invertebrates (Appendix C).

- **At least 5% rock cover in all rehabilitated areas (targetting 10%):** Isolated rocks provide habitat for lizards and some invertebrates and provide localised concentration of runoff. No rock is required in wetlands or pit lakes although emergent rocks will be placed in small section of pit lake where haul road enters the water
- **Wetlands:** Small wetlands~~Three small, engineered features~~ in ~~on Ardgour Terrace and~~ Lower Shepherds Creek and possibly Ardgour Terrace ~~(~~totalling more than 1.5 ha of which 0.5 ha is from direct transfer, and 1 ha is created in the 3 years of mining,~~ ~0.5 ha each)~~ and a large wetland complex TSF ~~(6 ha)~~ of swamp / marsh wetland with >~~with~~ 0.5ha permanent open water, >2 ha of permanent water ~~-~~and >4 ha of seasonally-inundated (ephemeral) wetland supporting aquatic invertebrates, wetland birds, and threatened sedge species like *Carex kaloides, C. diandra, C. buchananii* and *Juncus distegus*
- **Tussock Nodes:** Dense clusters of salvaged and nursery-grown native tussocks providing ground-dwelling habitat for lizards and invertebrates, with each node containing at least 50~~+~~ plants at up to ~~0.5-~~1m spacing. Salvaged tussocks have particular values as they have a larger volume of dead leaves and are anticipated to transfer and attract ~~also provide an inocula of~~ invertebrates and soil organisms.
- **Dead wood and fine organic resources:** Dead wood salvaged from footprint (particularly kowhai, willow, and cone-free pine/fir and willow sections >20cm diameter) placed into rehabilitation areas to provide invertebrate habitat. Organic mulches and/or compost will be strategically placed into parts of rock stacks.

How it will be done: The habitat construction follows detailed specifications outlined in ~~the source document's~~ Appendix C.

Construction utilizes excavator placement and engineered design techniques, with rock stacks requiring pre-excavated trenches at least 1m deep (20% of stacks) for winter refuges. Dead wood is placed immediately upon salvage rather than stockpiled, positioned near existing rock tors or within shrubland gaps in MRZs. The programme establishes minimum 500 rock stacks (average 1 per hectare), 100+ rubble pits (1 per 5 hectares), and 20+ tussock nodes per hectare. Habitat connectivity across the rehabilitated landscape is delivered by clustering rock stacks and rubble pits (Table ~~Table 7~~).

Table ~~7~~9: Habitat Construction Specifications - Types, Quantities, Methods, and Key Features.

Habitat Type	Number Required	Construction Method	Key Features

Rock Stacks	~~500+ (~~1 per ha~~)~~ (average)	Excavator placement	~~10+~~ rocks >0.5m diameter, 5-20mm cracks, >1 m depth underground, densely planted
Rubble Pits	~~100+ (~~1 per 5ha~~)~~ (average)	Shallow excavation	20-40mm crushed rock, cross-contour placement to intercept water, planted
Wetlands	≥7.5 ha total	Engineered design	Variable water depths, 7500 plants/ha if planted ~~and methods of native plant establishment~~
Tussock Nodes	20+ per ha	Clustered planting	50+ plants per node, up to ~~0.5-~~1m ~~spacing including~~spacing including at least 10 salvaged tussocks >100 mm basal diameter with full-depth of roots
Wood salvage	All available	Excavator placement	Place salvaged large wood (kowhai, willow, cone-free pine/fir) immediately in MRZs near rocks or shrubland gaps, ideally partially buried.

Success Criteria: The effectiveness of habitat construction will be measured through three key indicators that demonstrate successful wildlife habitat establishment and functionality:

- **Construction compliance:** All habitat features built to specification with verified crevice dimensions, depths, and spacing requirements
- **Wildlife occupation:** Evidence of target species (particularly Kawerau gecko and Tussock skink) using constructed habitats within 5 years, with 20% of rehabilitated area supporting suitable habitat
- **Landscape connectivity:** Habitat networks established with maximum 300m spacing between rock stack clusters and successful movement corridors demonstrated through monitoring (for more details refer to Appendix C).

Strategy 4: Drought Resilience

What will be done:

Enhancing resilience to drought by slowing, concentrating and infiltrating rainfall into sheltered microsites, some of which have deep soils and/or organic placement and/or boulders/rocks. These help plants survive dry periods by increasing water stored and water accessed and decreasing evapotranspiration. These techniques are combined with: clustering initial planting to help plants shelter each other; planting diverse plant species to better extract soil water as plants have different root architectures; thorough hardening off on-site of nursery-plants and minimising initial fertiliser helps develop drought resistant leaf and stem architecture; and, managing competition between native plants and non-native grasses (initial erosion covers or existing grasses).

How it will be done:

The methods, shown in

~~Table 8~~

Table

~~Table 10~~, are specifically designed for the semi-arid Central Otago environment where average annual rainfall is only 445mm, summer evapo-transpiration is high and severe moisture deficits limit the growing season to 2 to 3 months on average. The techniques work synergistically to maximise water retention and create optimal growing conditions for native vegetation establishment.

The techniques will be applied across all major rehabilitation areas including ELFs, TSF, haul roads, and soil stockpile areas, with priority given to the most drought-stressed north-facing slopes and where trees and taller shrubs are established as this is where water conservation is most critical for successful plant establishment.

Table ~~8~~10: Water Conservation Techniques Implementation Table.

Technique	Purpose	Application	Result
Scalloped and dimpled Surfaces	Provide shelter from wind, concentrate~~atch~~ and hold water runoff	All rehabilitated slopes except pit walls	Water concentrates in sheltered depressions and shelter from wind reduces water loss
Rock Placement	Provide shade and shelter, concentrate runoff	R~~At initial nodes (r~~ock stacks and rubble pits, across rehabilitated surfaces~~)~~ (5% minimum)	Reduced evaporation, Concentration of water, wind protection, reduced plant competition
Deep Root Zones	Allow deep rooting (1 to 3 m)	Priority areas (varies with aspect and LMU)	Deep-rooted p~~P~~lants can large soil volume~~access deep soil moisture~~, especially ~~for~~ shrubs, ~~and~~ trees, cushion plants
Organic rich soils and mulches	Increase water storage~~Reduce water loss~~ (soils), reduce water losses (mulches)	Wetlands and small parts of ~~around~~ rock stacks, high value ~~under larger shrubs~~ plants in MRZ	Higher ~~Organic matter retains~~ soil moisture retention
Managing non-native ~~-~~grass biomass	Reduce below-ground competition and above ground interception; create~~provide green~~ mulch	All sites with pasture grasses, especially MRZ	Increase soil moisture for native plants, p~~P~~rovide shelter for native plants
Relieving soil compaction	Enhance infiltration of water and reduce runoff	MRZ stock camps and compacted areas	Increased soil moisture storage

Success Criteria:

- Grass in scalloped areas is greener for longer ~~Visible water collection in scalloped areas after rain~~
- Plants showing extended ~~healthy~~ growth into summer
- Native seedlings self-establishing in scalloped, treated areas~~during dry periods~~
- Minimal plant mortality during drought years.

Strategy 5: Fire Protection

What will be protected:

High-value, fire-vulnerable vegetation that would take decades to replace if burned, including:

- Kowhai areas: "highly fire-vulnerable and slow-growing"
- 0.5 hectares of valley podocarp forest: "the most important features to buffer"
- Native shrubland: Slow to recover after fire damage.

How it will be done:

~~Table 9~~ Table ~~Table 11~~ shows the fire protection methods used to safeguard high-value vegetation from fire damage. These methods use features of natural and rehabilitated sites with existing management practices to create an integrated fire protection system. The location, width and specifications for fire buffers have not been finalised.

Table ~~9~~11: Fire Protection Methods and Implementation.

Protection Method	Location	Maintenance	Purpose
Low-Biomass Buffers	Along roads, tracks Across cushion-field areas	Maintain low-biomass rocky surfaces ~~that may be compacted and/or have thin soils~~ Graze~~ing~~ and/or cut~~ting~~ to lower biomass and limit shrub growth	Slow/prevent fire spread
Rocky Barriers	Pit highwalls	Weed control ~~Probably none~~	Create firebreaks
Grazed Areas	Strategic locations	Controlled sheep grazing to remove pasture grass biomass before	Maintain low fuel loads

		December and reduce shrub establishment	
Access	Key protection points	Maintain vehicle access	Enable fire suppression

Success Criteria:

- Fire break establishment: Low-biomass areas (cushionfields, grazed zones, some roads, pits) maintained as natural fire barriers
- Priority area protection: Kowhai areas and planned podocarp forest adequately buffered from fire risk
- Road corridor management: Grazing maintained along public roads and tracks to reduce biomass and ignition risk timed before Christmas tourism peak and after main pasture growth period
- Rock barrier effectiveness: Higher rock cover areas functioning as intended fire breaks
- Climate adaptation: Fire management considers predicted increased risk under climate change.

11.10. Quality Control and Hold Points

The following hold points and quality checks help guarantee that all rehabilitation activities meet consent conditions and technical specifications:

Before Work Starts:

- All areas surveyed and mapped (including edges)
- Permissions gained (i.e. landform, ecology signoff)
- Materials and equipment ready
- Weather conditions suitable now (and forecast for direct transfer)
- Environmental controls in place.

During Construction:

- Daily progress inspections
- Material quality checks
- Environmental compliance monitoring
- Safety protocols followed.

After Completion:

- Final inspection and sign-off
- Monitoring systems established
- Maintenance schedules activated
- Success criteria baseline established.

12. MONITORING AND REVIEW

12.1. Monitoring background

On-going annual monitoring is essential to:

- Recognise trends early to allow optimisation (e.g., identifying favourable micro-sites or successful rates of seed for short-term erosion control that allows native establishment)
- Address pest problems when first observed (e.g., removing plant pest seedlings while young or controlling browsing mammals)
- Manage changeable climatic conditions (e.g., delaying planting in drought years or applying more intensive erosion control practices in very dry years).

Monitoring and management responses form part of rehabilitation documentation and consent conditions. While some management measures are required from the outset, ongoing monitoring informs the type and timing of other actions, including refining rehabilitation methods.

Results of monitoring are used to create annual reports that:

- Describe climatic conditions in the previous year, highlighting features that influence rehabilitation outcomes
- Identify stripping, stockpiling volumes by resource (e.g., soils, tussocks, weathered rock, brown rock)
- Identify areas in different stages of rehabilitation (i.e. landforms contoured, covered with root zone, in temporary erosion cover, established with initial native plantings)
- Outline habitat construction completed (e.g., rock stacks, rubble pits, kowhai exclosures)
- Present results of revegetation with respect to conditions (e.g. survival rates by species and management zone, pest plants recorded)
- Describe areas stripped that are yet to be rehabilitated (i.e. liability) and resources required for rehabilitation
- Outline results of trials
- Identify deficiencies or inadequacies and recommendations for changes in procedures or approaches to deliver planned results
- Identify opportunities for improvements in the coming year
- Outline the programme for the coming year.

Progress photographs, including aerial photography and photographs from key vantage points looking towards the site, provide valuable monitoring tools. Collecting, collating and reporting is fundamental for Bendigo-Ophir because there is limited precedent for rehabilitation in this dryland environment.

12.2. Monitoring Programme

Monitoring and associated site management includes:

Rehabilitation Progress

- Length of final edge (i.e. within contingency zone) and length of edge enhanced with transplants, rock and treated to remove plant pests.
- Locations of final edges amended to reduce impacts on high-value ecosystems.
- Area of finished landform confirmed consistent with landscape objectives
- Observations of finished landform stability against wind and water erosion including success of specific surface treatments at providing desired short-term vegetative covers
- Areas of root zones established and deviations from design root zones and surface microtopography by root zone type, i.e. pit benches, ELFs, TSF, wetlands, pasture
- Areas (by vegetation type) established against proposed annual targets
- Number and proportion of target plant species planted and established (a minimum of 3 years after planting). Number and species with browse noted.
- Number of plants in propagation at nurseries and on-site in hardening-off area, by species
- Seed and propagules collected and supplied to nurseries from site or used directly, by species
- Habitat construction completed (e.g., rock stacks, rubble pits, kowhai exclosures).

Resource Management

- Estimates and locations of rehabilitation resources available (specifically including brown 'weathered' rock, weathered boulders, soils)
- Number and area of tussocks and wetland salvaged and in storage onsite
- Number of plants salvaged to inoculate invertebrates and their location (taramea, broom, Olearia odorata and O. bullata)
- Condition score of established edges

- Condition of surfaces of soil stockpiles: plant and rock cover, regrowth of native species.

Pest Management

- Signs of mammalian pest damage to revegetation areas serve as a trigger for undertaking additional pest control.
- Results of pest plant and pest mammalian pest control verification and monitoring, including new species found on site (and their management), species intercepted in biosecurity assessments (e.g. nursery plants, hardening off area, roadsides on site and near the entrance) species required to be controlled under statutory documents (e.g. Regional Pest Management Strategy) and species presenting risks to the success of revegetation and rehabilitation, particularly brier across the different MRZ.

Plant Performance

- Survival (years 1, 2, 3) and growth rates of salvaged, planted and transplanted species will be used to direct future propagation, hardening off, infill and planting programmes.
- Spread (through growth and generation of new seedlings) and condition of target species (e.g. taramea) and communities (e.g., tussocks, cushionfields) in MRZs will be used to direct future management
- Experimental treatments and monitoring approaches to provide direction on overall rehabilitation approaches.

Risk Management

- Fire risk and condition of fire buffers
- Pit walls, pit edges and pit lake access
- Condition of grazed areas, including seepages and wetlands in these areas
- Browser incursion: condition of plants in fenced exclosures.

12.3. Methods

A monitoring programme and methods will be developed in more detail for each stage of mining and rehabilitation activity. Methods will be consistent with the overall Ecological Biodiversity Outcome Monitoring Plan and the Ardgour Restoration Area Management Plan.

13. MANAGEMENT ACTION SUMMARY

This section provides a summary of the LERMP proposed for the BOGP. Further details on methods and specific measures are provided in Appendices A-G.

13.1. Overview

The rehabilitation strategy is structured around three core approaches designed to protect, enhance, and re-establish ecological and landscape values across the site.

Avoid Negative Impacts

This approach avoids impacts on ecosystems and species with threatened components and those that have little rehabilitation precedent by prioritising avoidance of:

- **Cushionfields and spring annual herbs** (no established rehabilitation methods)
- **Kowhai trees and coral broom** (slow-growing, culturally important)
- **Taramea patches** (culturally important and ecologically valuable)
- **Rock outcrops** (rich habitats for plants, lizards, and invertebrates).

Key Actions to avoid negative impacts are:

- **Smart Planning**
  - Map and identify the above ecological features/values at operational scale, and in detail within Contingency Zones
  - Refine infrastructure locations to avoid high-value areas
  - Schedule works to minimise impacts (e.g. allow time for salvage)
  - Use cut vs fill construction where possible (minimise fill, maximise cut).

- **Minimise Disturbance / Damage**
  - Stack materials higher/deeper rather than spread wider
  - Control sediment, dust, noise, vibration, artificial light
  - Source plants locally (within Basin if possible) with appropriate genetics
  - Ensure rigorous plant hardening and inspection to remove plant pests and pests (including molluscs) before transporting to planting sites
  - Maintain dense vegetation along public roads and paths (minimise bare soil) and/or maintain free-draining, gravelled surfaces to minimise soil movement and contact of feet or tyres with soil).

- **Prevent Contamination**
  - Screen all imported materials (gravels, mulches, plants, erosion control products including any hydromulching or hydroseeding materials)
  - Thoroughly harden off plants in onsite facility before planting out (includes a quarantine period of at least 3 months)
  - Use depotting protocols at the hardening off site for tolerant plants to minimise pest introduction
  - Clean and treat earthmoving equipment moving onto site and between areas
  - Segregate plant pest-contaminated soils.

Enhance Ecological Values

Unstripped and adjacent regeneration zones (MRZ) will be managed to accelerate and support natural spread of native species into rehabilitated areas.

Target Zones:

- Contingency zones (undisturbed project areas)
- MRZs adjacent to mining footprint.

Management Actions by Zone:

- **All Enhancement Zones**
  - Cease oversowing and fertiliser topdressing
  - Implement targeted plant pest control
  - Install fencing to manage long-term grazing
  - Control or remove browsing pressure (e.g. rabbits, hares, livestock).

- **Shrubland and Tussock Areas**
  - Encourage natural expansion and thickening of native vegetation
  - Establish diverse native species
  - Enhance stream shading and aquatic habitat
  - Improve connectivity (reduce areas in pasture).

- **Special Features**
  - Kowhai Groves: Install rabbit-proof fencing; enhance genetic variation

  - Taramea Patches: Stop pig damage and browsing pressure (hares, rabbits)
  - Snow Tussock: Re-establish in MRZ-A
  - Wetlands: Salvage and re-establish intact communities.

- **Fire Management**
  - Create low-biomass buffer zones
  - Maintain firebreaks
  - Protect vulnerable and slow-growing species.

Establish Ecological Values in Mined Areas

Creating functioning native ecosystems post-mining.

Target Vegetation Types:

- Cushionfields with spring annual herbs (requiring ongoing research)
- Taramea herbfields (cultural and ecological value)
- Tussocklands (foundational grassland type)
- Shrublands (providing structural diversity).

Foundation Activities:

- **Resource Management**
  - Maximise salvage of vegetation, soils, and surface rock
  - Segregate wetland soils
  - Create soil stockpiles with surface of mixed soil and plants
  - Audit volumes and condition of salvageable materials
  - Manage stockpiles strategically, salving plants from stockpiles.

- **Landform Design**
  - Ensure natural ridgelines and shapes (landscape)
  - Construct varied slopes and aspects
  - Incorporate heterogeneous microtopography
  - Replicate natural drainage patterns.

- **Habitat Features**
  - Install >500 rock stacks for lizard habitat
  - Create >100 rubble pits for small fauna refugia
  - Rock cover at least 5% at planting
  - Establish tussock clusters and nodes, including use of salvaged tussock
  - Construct ~7 ha of rehabilitated wetlands with 0.5 ha open water
  - Establish 24 kowhai nodes
  - Create at least 2 ha of Taramea.

- **Connectivity**
  - Create stepping-stone habitats (kowhai)
  - Link fragmented woody vegetation
  - Establish corridors for wildlife movement around both sides of DDF.

Specialised Programmes:

- **Species-Specific Actions**
  - Invertebrates: Plant host species (e.g. Olearia for moths; taramea for beetles, broom for moths including salvage and translocation of galls and whole plants)
  - Lizards: Construct and place rock habitat structures and loose rock
  - Kowhai: Implement propagation, genetic conservation and establishment programme (at least 24 nodes with at least 480 established saplings at closure)
  - Wetland Plants: Undertake direct translocation (0.5 ha as sods, 0.5 ha as sods or individuals) and nursery supplementation (at least 6 ha).

- **Pest Management**
  - Control competing non-native vegetation
  - Control invasive plant species
  - Manage mammalian browsers (e.g. possums, deer, pigs)
  - Use adaptive management based on monitoring data
  - Maintain site-wide surveillance systems to prevent the establishment of plant and mammalian pests.

13.2. Indicators of Success

Timeframe	Key Indicators of Progress
Years 1–3	Surveys complete, Infrastructure in place; initial wetland salvage operations completed; rehabilitation trials initiated on W-ELF, Habitat Features installed, MRZ fencing, MRZ plant pest and grazing management, and MRZ plantings established. Kowhai cuttings propagated from trees that require removal. Soil stockpiles vegetated and stable with separation of soils containing pest plants and wetland soils.
Years 3–10	Salvage targets met and soil stockpiles regenerating native plant cover, edge enhancement achieved, pit benches treated, vegetation establishment targets met, effective pest control. General rehabilitation methods refined (including grazing, plant pest control) on SRX. Cushionfield and spring annual herb propagation and establishment methods successful, allowing mining and rehabilitation methods to be successfully applied on CIT ELF. Temporary workers camp rehabilitated to productive pasture.
Years 10–20	Ecosystem development evident; natural regeneration ongoing with increases in area of tussock, taramea and shrubland (and decreased pasture cover), increased resilience through structural thickening and establishment of fire buffers; major rehabilitation areas completed (TSF, S-ELF and Plant area) with wetlands developing on TSF and natural colonisation of rock stacks, rubble pits and tussocks by the three lizard species. Area of cushionfields and populations of spring annual herbs are thriving in W-ELF and present in other areas.
Years 20+	Self-sustaining tussock and shrubland ecosystems requiring minimal intervention (pest plant and mammalian pest control); shrubland connected across the landscape from mountains to river terraces; fire buffers and fences remain effective. Expansion of taramea; snow tussock and kowhai patches obvious in the landscape. Area of cushionfields and populations of spring annual herbs are at least 10% greater than in year 1; Methods for managing cushionfields and spring annuals successfully adopted at Ardgour Station.

13.3. Implementation and Monitoring

Adaptive Management:

- Annual monitoring and reporting; five-yearly deeper reviews
- Method refinement based on outcomes of early trials and long-term monitoring that includes records of root zone placement and revegetation treatments.
- Flexible scheduling responsive to climatic variability and resource availability
- Emphasis on continuous improvement and adapting to variable climate (drought).

Resource Requirements:

- Local nursery partnerships for seed collection and processing, raising and hardening off seedlings
- Skilled, dedicated personnel for sensitive operations, including monitoring
- Specialised equipment for ecological restoration, e.g. matching loading and unloading buckets for excavators undertaking wetland salvage
- Long-term maintenance planning and consultation with stock manager and community

Risk Management:

- Weather-related contingency planning
- Maintaining methods with changing staff, contractors, suppliers and grazing managers
- Backup sources of restoration materials
- Range of soil stabilisation, revegetation and rehabilitation strategies
- Early warning systems and intervention protocols in place.

14. SUMMARY

This LERMP has been prepared for the proposed BOGP within the Dunstan Mountains, Central Otago. This plan is intended to manage impacts on the landscape and ecology associated with the proposed mine and its ancillary infrastructure. The purpose of the plan is to effectively rehabilitate mining activity within the Dunstan Mountains ONL by creating rehabilitated landforms with slopes and skylines that visually integrate with the existing landscape character and transition between the south and north Dunstan Mountains.

A mosaic of native tussock, shrubland and cushionfield ecosystems will be established onto the rehabilitated landforms and reinforce the natural landscape features. The mosaic is supported by a varied but typically deep (1-2 m) root zones and establishing water-harvesting micro-topographies that include rock stacks, rubble pits and surface rock. Tussock and shrubland ecosystems will be initiated using a low density of planting into the least-stressed sites of nursery-raised seedlings and salvaged tussocks. MRZs are proposed around the mined areas which are currently in a range of a currently degraded states with a high proportion of non-native pastures, reflecting over 150 years of farming and mining, with associated fire, grazing, oversowing and topdressing.

Mining is being used as an opportunity to enhance the majority of the~~se~~ unmined areas MRZ) by~~:~~ stopping over sowing, top dressing and cattle grazing, gradually replac~~e~~ing non-native pasture grasses and herbs with native vegetation; enrich~~ing~~ native shrubland and tussock ~~-~~plant species diversity and shrubland structural diversity; establish higher densities of genetically diverse kowhai and 0.5 ha of gully forest, eliminate specific pest plants from all ecosystems ~~removing invasive species in targeted areas~~; enhanc~~e~~ing resilience of the site to fire; and strengthen~~ing~~ connectivity between areas managed for native biodiversity that lie above and below the mined areas. These enhanced MRZs will provide a flow of native plants and animals to accelerate recovery of the adjacent mined areas. Growth rates in this climate are relatively slow and variable from year to year – the provision of a regular inflow of seeds combined with keeping pest plants and mammalian pests at very low levels provides resilience to variable climatic conditions. Ecological conservation will be established as the primary and dominant post-mining land use. Sheep grazing will be limited to that required to support ecological values, and primarily in areas managed for cushionfield and spring annual herb conservation

Both the mined area and MRZs contain cushionfields and threatened spring annual herbs that are adapted to the current degraded conditions, and which are high-value ecosystems rich in native fauna. Techniques for management and rehabilitation of cushionfields and spring annul herbs are untested and speculative. Techniques will attempt to be developed through an Applied Research Plan. Mined areas will include novel pit lakes and extensive rock highwalls that have very low ecological values;

however, these features provide value by contributing to fire-breaks and fire refugia which are a critical part of site resilience.

The success of this LERMP is heavily influenced by actions during mining and stripping, in particular: the quality and quantity of salvaged materials (soils, tussock, wetlands and rock), the precision of disturbance boundaries; the quality of the enhanced MRZs; and learning from early rehabilitation. These actions in the first two years of project development are critical influences on overall rehabilitation success. In these first two years plant pest and pest control enhances the MRZ and prevents transfer of long-lived seed banks to soil stockpiles, ~~,~~ at least 0.5 ha of ~~two~~ wetlands are created using direct transfer, soil stockpiles are constructed, up to 25,000 tussocks are salvaged for immediate use or later planting ~~reuse~~ into mined areas, the Applied Research Plan for cushionfields and spring annuals begins and large-scale planting / seeding trials are established on the Western ELF to refine~~, and an ELF is created on which~~ revegetation ~~methods~~ and rock habitat construction methods are refined. Monitoring of these areas over at least 5 years underpins ~~allows~~ adaptive management and cost estimates for the bulk of ~~on, as most of~~ mine rehabilitation that ~~does not~~ occurs when active ~~until~~ mining is completed ~~finishes~~ (scheduled for year 10). A minimum 20-year post-revegetation maintenance period, within a total consent duration of 35 years allows for 'waves' of planting and adaptive management with early ~~. Some~~ rehabilitation areas ~~should~~ expected to reach closure standards during the mining operation or ~~-~~early in the post-mining period. Long term exclusion of grazing over most areas combined with predator and browser control will be required to sustain ecological gains, and critically those gains associated with planting palatable plant species.