DRAFT

Boffa Miskell

MACRAES PHASE 4 PROJECT

LANDSCAPE REHABILITATION STRATEGY AND MANAGEMENT PLAN

31 AUGUST 2026

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Cover photograph: Golden Bar Pit Lake, © BML, 2025.

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1.0 INTRODUCTION

PURPOSE

OceanaGold (New Zealand) Limited ('OGNZL') commissioned Boffa Miskell to prepare a landscape rehabilitation strategy and management plan (LRSMP) associated with the proposed Phase 4 Macraes Gold Mine (MP4) in Macraes Flat, Central Otago.

The LRSMP describes the following:

- The location and landscape context of Macraes Phase 4 Project;
- General landscape principles of mine rehabilitation; and
- The overall strategy and stages of the proposed landscape rehabilitation works.

The purpose of the LRSMP is to enable the modified mined landscape to be re-integrated into the Macraes Flat landscape following the completion of proposed mining activity. This includes ensuring the rehabilitated landforms remain sympathetic to the surrounding upland rolling character with the majority of the site returned to pastoral land use that approximates the existing landscape patterns and contouring within the Macraes Flat landscape.

This long-term vision as set out in the Landscape Rehabilitation Strategy and Management Plan is expressed as follows:

- *Achieve a world leading mine closure with a stable, productive landform that visually blends with the landscape, while minimising environmental impacts and the requirement for ongoing intervention and supporting the wider community to transition to a life without mining at Macraes.*
- *Transition from operation to post closure in partnership with the community and Iwi, to leave a legacy free from economic and environmental burden.*

OBJECTIVE

The objective of the LRSMP is to inform effective landscape mitigation and the establishment and ongoing monitoring and maintenance of effective landscape rehabilitation works associated with MP4.

By its very nature, the rehabilitation of extraction activity is a lengthy process. The degree of site modification is also such that there is typically a substantial element of trialling and testing involved in finding solutions to meet the specifics of the site. It is difficult, or may be impractical or unrealistic to develop a detailed plan in advance because the precise nature of the final landform can only be determined for each section of mine as mining activity is completed. This is due to the variations in rock type that can become evident as mining proceeds, whilst ensuring that final volumes of suitable material are available to support effective rehabilitation techniques. Notwithstanding this, the foundation concepts and general approaches based on widely accepted best practice can be outlined at this preliminary design stage.

This document seeks to establish the rehabilitation outcomes and inform the process required for successful rehabilitation following mining activity and in accordance with an approved Landscape Closure Plan. This strategy forms the framework and sets out the principles to be followed and is intended to demonstrate that rehabilitation accords with best practice and is operationally achievable.

In this document the term 'rehabilitation' is used rather than 'restoration'. Restoration implies returning the mine to its former condition. The nature of a mining operation is both destructive and extractive meaning that landform and landmass are removed and recreated to the extent they cannot be restored to their original form. However, despite this, landforms can be created that are generally commensurate with broader landscape patterns and can be engineered so that finished landforms are able to support and sustain ecological values of a similar nature and achieve beneficial landscape outcomes in response to underlying landscape values.

2.0
LOCATION AND CONTEXT OF MP4

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LOCATION

The Macraes Operation is New Zealand's largest active gold producing mine owned and operated by OGNZL. It is located at Macraes Flat, approximately 30km northwest of Palmerston in the Otago Region.

Macraes Flat is located on an elevated plateau at approximately 500m above sea level. The plateau is flanked by the Taieri Ridge to the northwest, Shag Valley and Horse Range to the east, and the coastal hills and extinct volcanic cones of Palmerston and Waikouaiti to the southeast. Macraes Road provides access to Macraes Flat and the Macraes Operation, connecting to State Highway 85 (Dunback-Morrisons Road) to the east and State Highway 87 (Hyde-Middlemarch Road) to the west. While the site is accessible from population centres like Dunedin, Oamaru and Palmerston in reality, it is very much a remote location with relatively few visitors.

LANDSCAPE CONTEXT

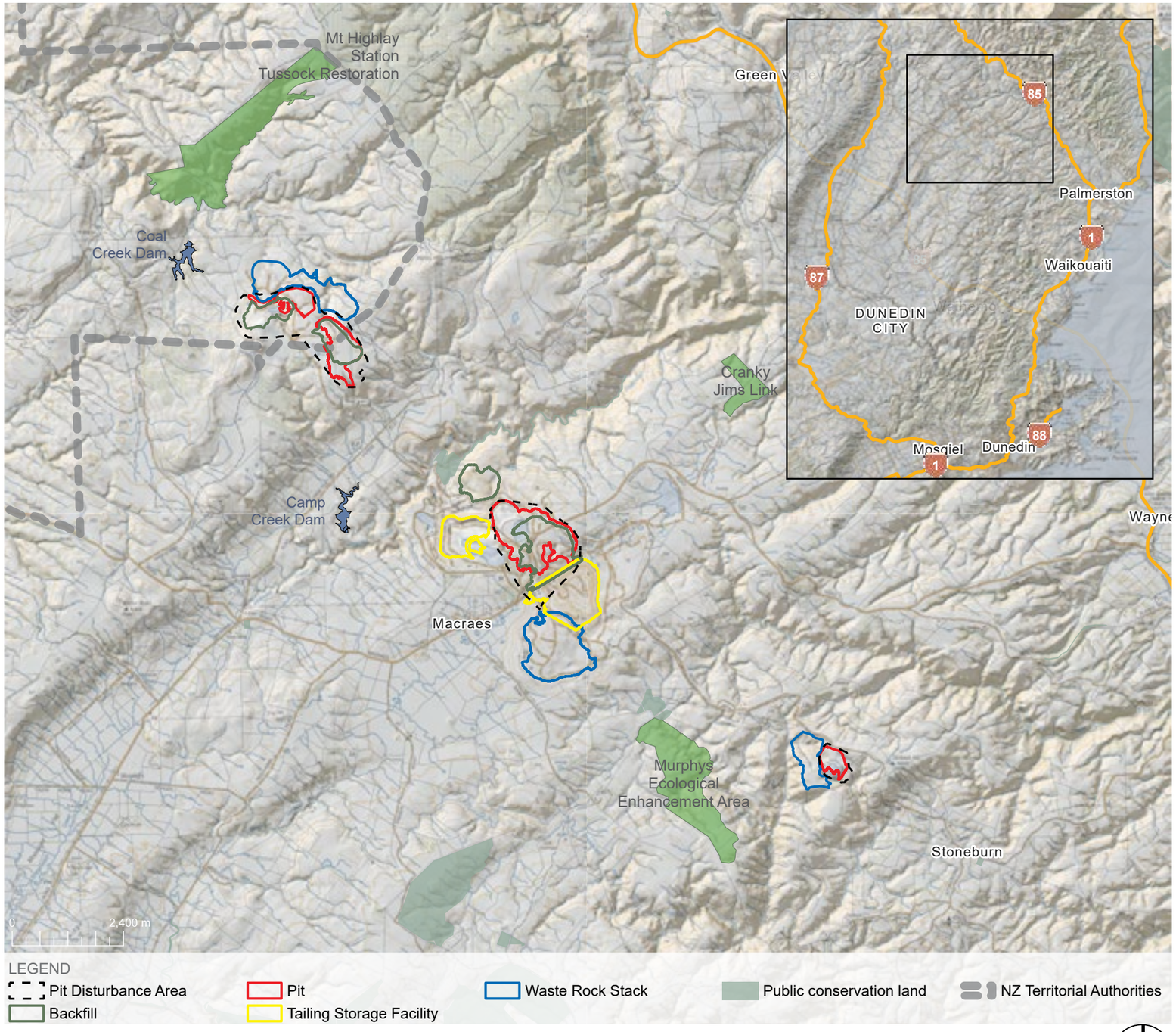
The Macraes Operation is located within a rural upland hill country landscape. The landscape is characterised by an extensive network of fluvially dissected rolling hills with broad ridge crests along which rock outcrops and tors are common, including along areas of skyline. These northeast-southwest orientated ranges and ridges enclose several narrow valley floors including Billys Flat, Moonlight Flat and Strath Taieri Plain.

The existing Macraes Operation is a distinctive feature and the primary human landform modification evident in this landscape, in conjunction with conversion to farmland. Other than Macraes township and some scattered rural lifestyle blocks and associated farmlands within the valleys, the broader area is essentially uninhabited farmland.

The area also holds strong cultural and historical significance. Macraes lies at the headwaters of the Taieri, Waikouaiti, and Waihemo river systems, which are important to mana whenua including as mahika kai areas and traditional travel routes between inland and coastal Otago. Archaeological evidence records seasonal food gathering journeys, hunting weka or harvesting eels and freshwater crays.

Long associated with gold and quartz mining, some of these early mining-related remnants and infrastructure are recognised for their significant historic values. Alongside modern operations, these historic remnants provide a number of recreation opportunities including walkway and viewing areas of the operating gold mine.

Figure 1: MP4 Setting



2.0 LOCATION AND CONTEXT OF MP4

SITE DESCRIPTION

MP4 is comprised of three distinctive parts: the Coronation Mining Area, Central Mining Area and Golden Bar Mining Area.

The Coronation Mining Area is located within an elevated, undulating basin in the northern extent of the Macraes Operation, straddling across the Dunedin City and Waitaki District. Existing mining in this mining area is defined by a combination of two large open pits, Coronation and Coronation North, waste rock stacks, and backfilled areas that collectively form a complex assemblage of engineered landforms overlaid on a broader rolling pastoral setting.

The Central Mining Area is located at the heart of the Macraes Operations, adjoining the Macraes Township to the south and forming a key part of the long-established mining landscape. The wider area is a predominately pastoral landscape characterised by gently rolling hills and steep gullies, with existing mining activities substantially altering the underlying landform. Existing mining in the Central Mining Area comprises large-scale open pits, waste rock stacks, tailings storage facilities and processing infrastructure which forms prominent elements within an otherwise open rural landscape. The Central Mining Area also sits within a landscape containing several historic heritage associations, including Innes Farm, the former upper Macraes township area, Macraes Chinese Camp and Gay Tan's Cottage. This is the main area experienced when travelling along Macraes Road.

The Golden Bar Mining Area is located in the south-east extent of the Macraes Operation within a predominantly pastoral landscape of steep and undulating rural hills with incised gullies and narrow streams associated with the Murphys Creek catchment. High sense of openness, lack of structures, stunted vegetation and exposed schist tors are the key characteristics of the broader area. Existing mining in the Golden Bar Mining Area comprises an open pit and a rehabilitated waste rock stack.

Remnants of earlier workings within this mining area contribute to the stronger historic mining legibility compared to other mining areas of the Macraes Operation

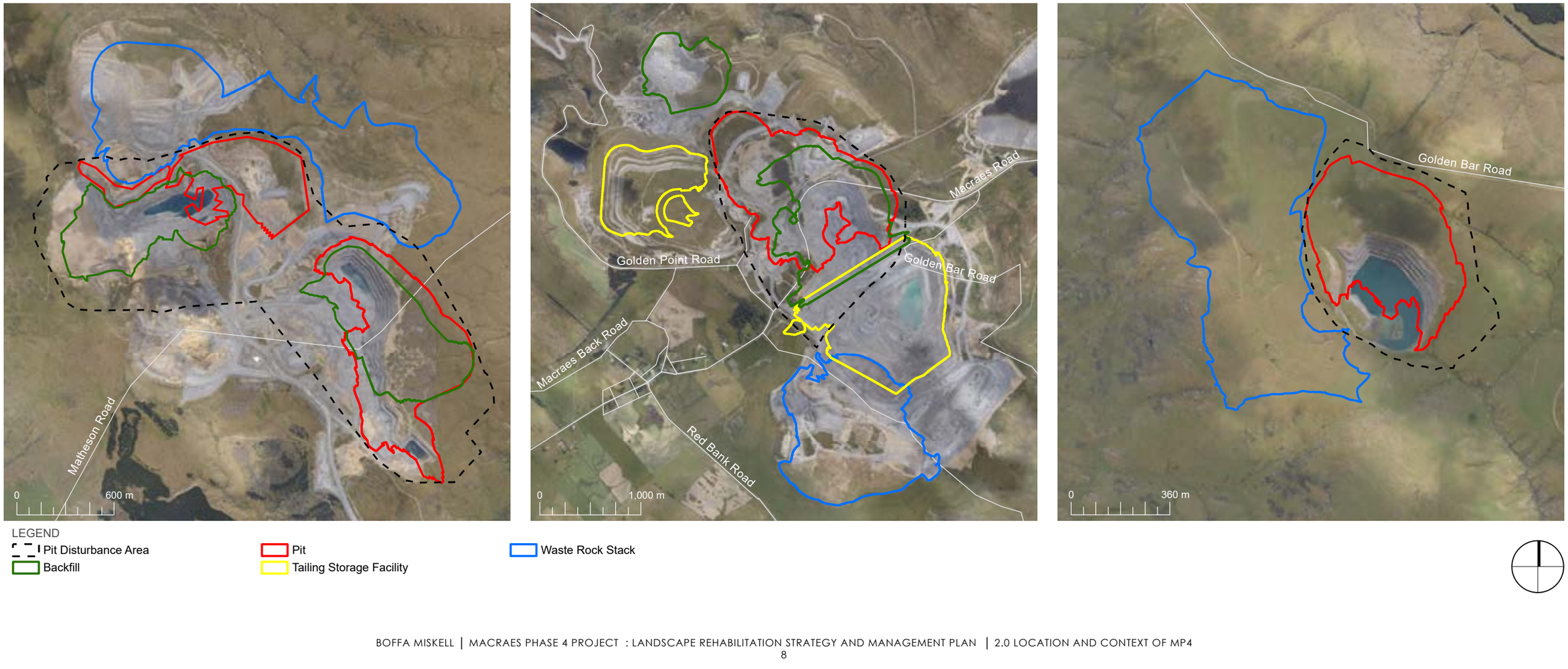


Figure 2: Site Plan (left: Coronation Mining Area; centre: Central Mining Area; right: Golden Bar Mining Area)

2.0 LOCATION AND CONTEXT OF MP4

POLICY CONTEXT

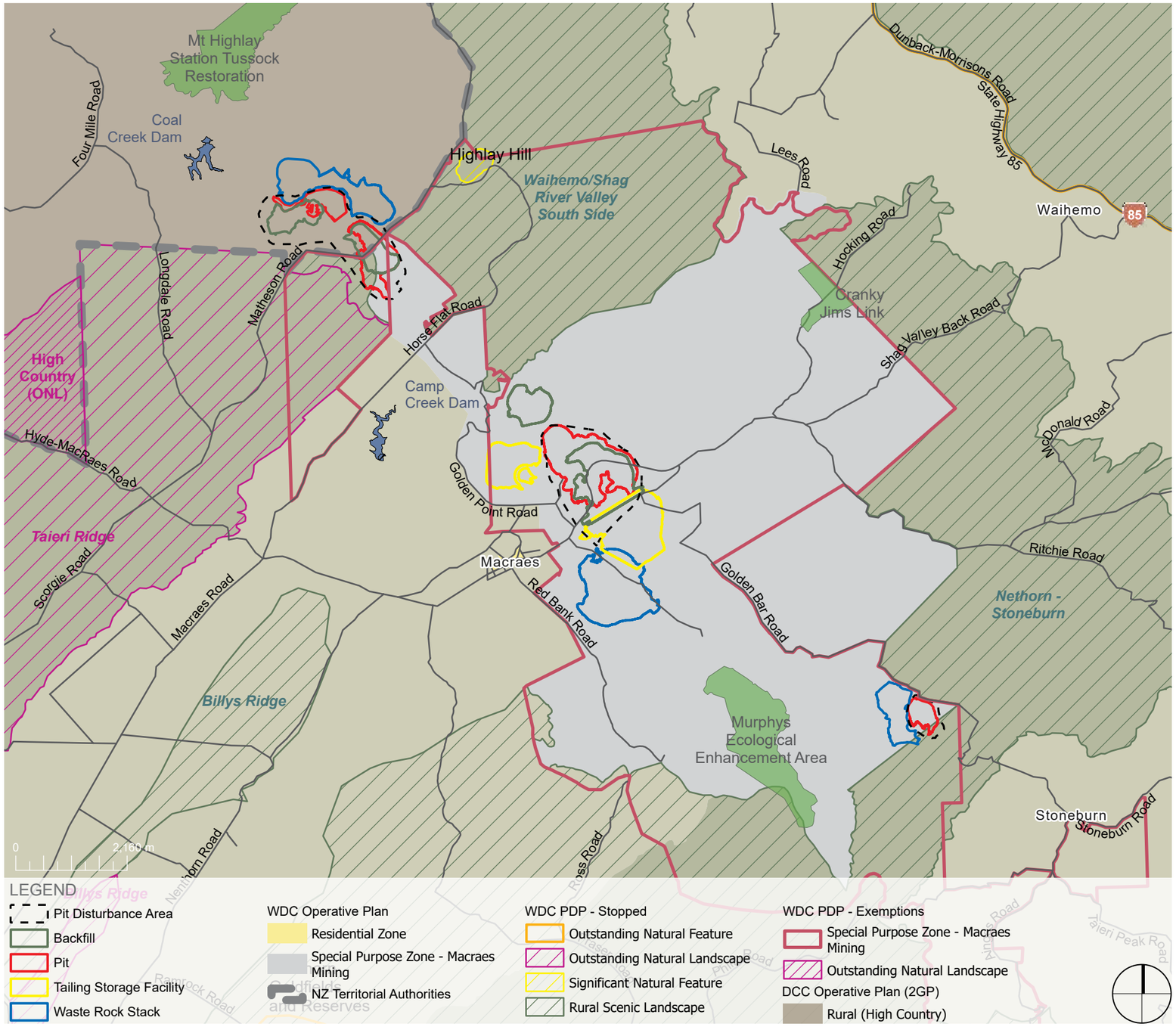
The principles, objectives and policies under the Resource Management Act 1991 (RMA) and several regional planning instruments[1] seek to protect and preserve natural character of wetlands, lakes and rivers and their margins from inappropriate development. The RMA also has particular regard to maintaining the amenity values of the landscape. The landscape context of the Macraes Operation is essentially characterised by established mining activity which adjoins established pastoral land use. This forms a distinct rural landscape character and amenity unique to the Macraes Flat area.

The majority of the Macraes Operation is located within the Waitaki District and is zoned Macraes Mining Project Mineral Zone under the Operative District Plan. This dedicated zoning enables mineral exploration and extraction while requiring adverse effects on rural amenity, environmental values and landscape character to be avoided, remedied or mitigated in response to the sensitivity of the receiving environment. It specifically provides for large-scale mining at Macraes Flat, recognising the scale of operations while requiring effective management and rehabilitation that restores post-mining landscapes to an appropriate rural use.

Part of the Coronation Mining Area is within the Dunedin City District and is located within the Rural Zone – High Country. This zoning emphasises the maintenance of the character and amenity of the Rural Zone. This includes reference to mineral exploration, and ensuring land is restored to at least the same standard prior to operation with respect to landform and productive potential.

[1] Including the proposed Otago Regional Policy Statement 2021 and Regional Plan: Water for Otago.

Figure 3: Statutory Context



2.0 LOCATION AND CONTEXT OF MP4

MACRAES MINE HISTORY

Gold mining at Macraes has a long history that extends from the early Otago gold rush to the present-day operation. The earliest mining in the area appears to have been alluvial gold working at Murphy's Flat in 1862, followed by Macraes Flat, Deepdell and Highlay Hill area in later years, which resulted in a series of small rushes around tributaries of the Shag River including Deepdell Creek. Murphy's Creek was the major early alluvial workings and there is evidence that all of its tributaries were being worked in the 1860's. The upper Murphys Creek alluvial workings benefit from protection by way of being located on DoC land and within a Historic Reserve.

Production at Macraes began in 1990, and since then, the mine has produced over 5 million ounces of gold over its continuous 35-year operating history.

Golden Point Mine to the north-west of the Central Mining area was established in 1889 and was mined over a prolonged period. Remnants that represent the different types of mining that were undertaken in the Golden Point area are still visible and can be explored today.

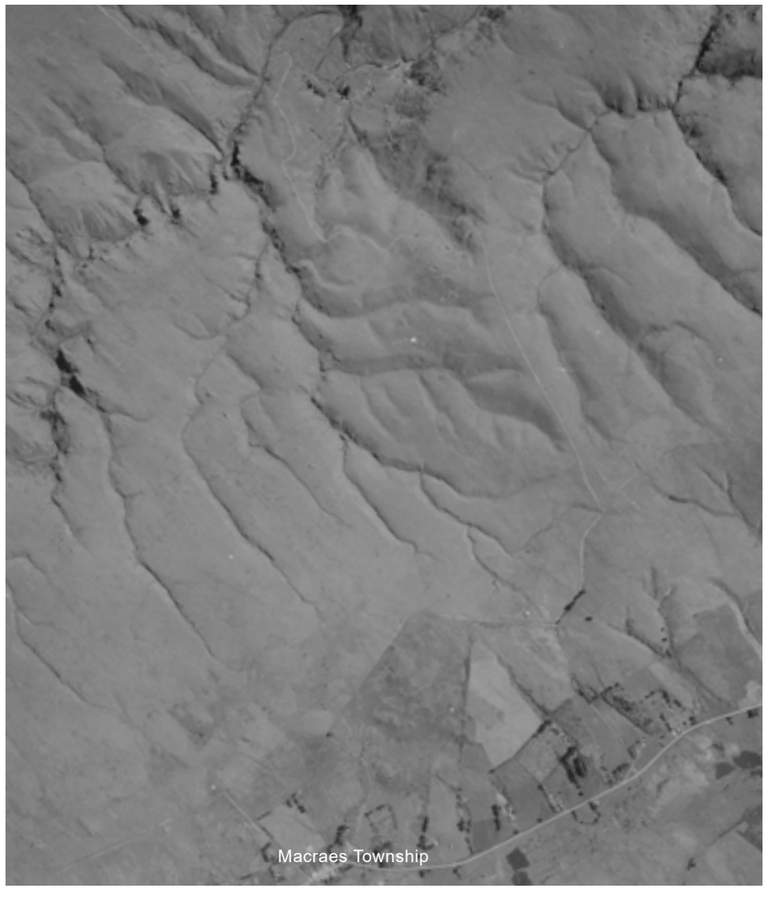


Figure 4: Historic aerials (left: Central Mining Area in December 1958; centre: Central Mining Area in December 1991; right: Central Mining Area in December 1994). Sourced from RetroLens.

3.0
FACTORS INFLUENCING REHABILITATION

3.0 FACTORS INFLUENCING REHABILITATION

INTRODUCTION

The success of rehabilitation requires an understanding of the context within which mining will occur, including environmental influences affecting future rehabilitation. This understanding will be further developed through implementation.

A summary of the key influences relating to the rehabilitation of Phase 4 Macraes Gold Mine are set out in the following sections.

Figure 5: A view of the Frasers Open Pit from the Tour Hub

3.0 FACTORS INFLUENCING REHABILITATION

GEOLOGY AND SOILS

The geology of the area has been shaped by a series of natural and geomorphic processes including tectonic uplift, erosion, marine transgression and volcanism, which formed the iconic Otago Schist landscape present today. These schist rock outcrops and tors are typical landscape features in the area.

The base rock of the broader area is chlorite zone schist and the peneplain landform within which Macraes Flat is located characterises Tertiary sedimentary rocks including limestones, greensands and mudstones. The Macraes gold deposits present within the Hyde-Macraes Shear Zone (HMSZ) occurs in Textural Zone 3 (TZIII), within which the Macraes Operation largely sits. The Coronation Mining Area and Central Mining Area also straddles across Textural Zone 4 (TZIV) and areas of the Manuherikia Group, Holocene anthropic deposits and Late Pleistocene river deposits. The Billys Ridge Fault runs northeast-southwest across the Central Mining Area.

The rehabilitation areas occur within the broader Otago schist landscape, where exposed schist, rocky slopes and tors are characteristic landscape features. Rehabilitation should respond to this context through the appropriate shaping of completed landforms and, where practicable, the retention or creation of natural-looking schist exposures.

Pre-mining soils of the broader area are primarily Brown soils and Pallic soils, with a relatively small portion of Recent soils. Brown soils within the Coronation Mining Area and Golden Bar Mining Area generally have good drainage and structure whereas Pallic soils in the Central Mining Area have weak soil structure and are dry in summer and wet in winter. These characteristics will influence soil salvage, storage and replacement, erosion control, drainage design and the selection and establishment of vegetation. Site-specific soil conditions should therefore be confirmed and addressed through the rehabilitation implementation plans for each area.

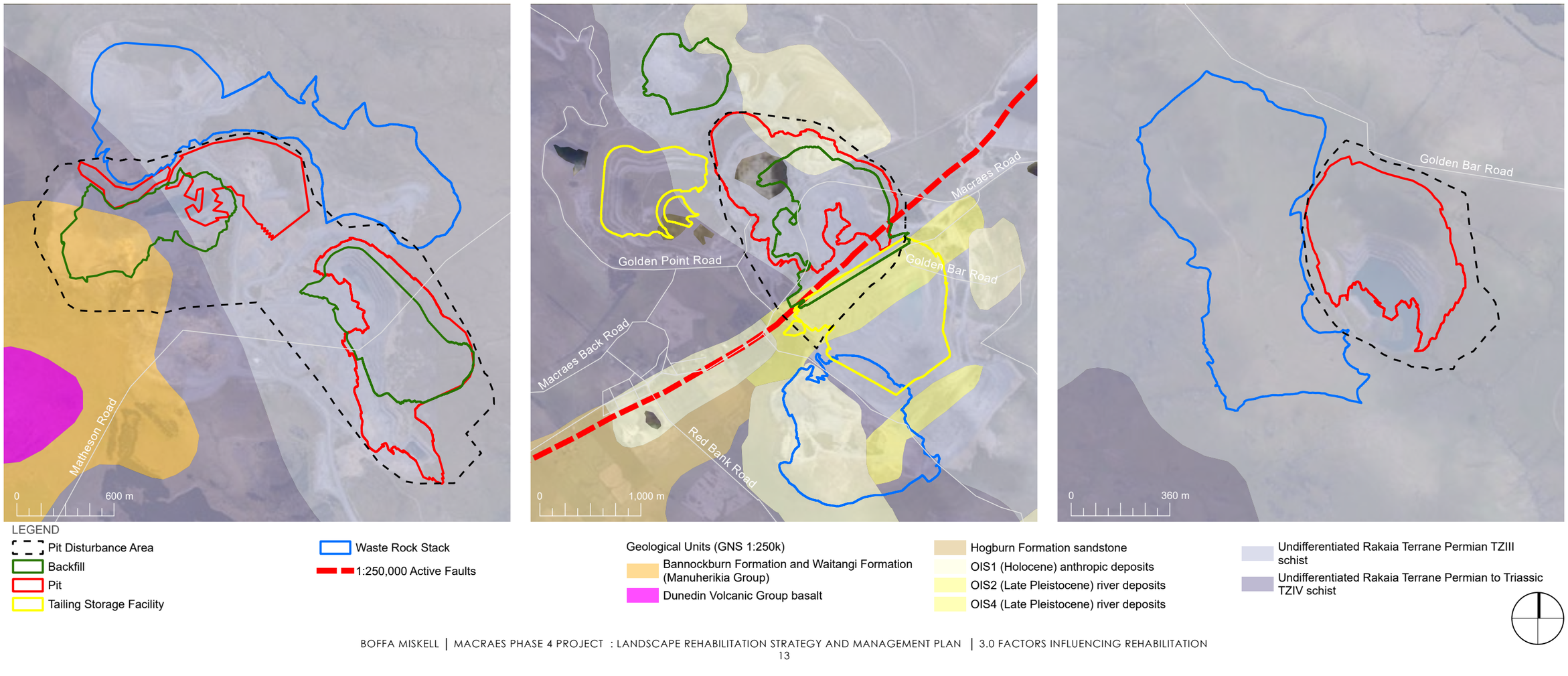


Figure 6: Geology (left: Coronation Mining Area; centre: Central Mining Area; right: Golden Bar Mining Area)

3.0 FACTORS INFLUENCING REHABILITATION

THE MACRAES ECOLOGICAL DISTRICT

The Macraes Ecological District forms part of the Lammerlaw Ecological Region in Otago (Bibby 1997). It has a moderate climate, with occasional winter snow and summer drought. The landscape is characterised by rolling hills, broad flattened ridges and shallow to deeply incised gullies and streams. Schist rock outcrops occur mainly along drainage systems, with occasional tors on ridge crests. The underlying geology is predominantly schist, with local quartz reefs and areas of younger sediment. Soils are generally loess-derived upland and high-country yellow-brown earths.

CLIMATE

Macraes Flat is situated within an area which experiences both coastal and inland climates, where westerly-moving low pressure systems create higher rainfall and more moderate temperatures than the Central Otago. Cold fronts associated with southerly and south-westerly winds bring most of the rain and snow to the area. Cool moist north-easterly winds are predominant during the summer, with periods of dry north-westerly winds tending to occur during late spring and summer. Inversion fog is common in stream valleys and on the plains, particularly during winter.

Within the context of the Macraes Operation area, daily temperatures average 15°C in summer and 5°C in winter, with maximums ranging up to just over 30°C in summer with winter minimums down to -7°C. Periodic snow falls during winter months and sometimes in spring. There are also occasional summer droughts.

Average annual rainfall is approximately 650mm with little season variation and the area is subject to extended dry periods. In the wider east Otago region, droughts lasting for two to three years have been recorded every 10 to 20 years.

Long term detailed wind data is not available for the Site; however, within NIWA's 2015 report on Otago's climate and weather[2], the mean annual wind speed at Middlemarch was recorded as 9.3km/h.

[2] NIWA (2015) The Climate and Weather of Otago, 2nd Edition.

Figure 7: A view of the wider Macraes Flat landscape from Golden Bar Road

3.0 FACTORS INFLUENCING REHABILITATION

ASPECT

The aspect mappings for MP4 demonstrated a varied distribution of slope orientations across all mining areas, reflecting both existing engineered landforms of the Macraes Operations and the rolling hills landform of the wider Macraes Flat landscape. The mapping identifies the full range of aspect classes, including flat areas, the cardinal directions, and all intercardinal orientations, indicating that no single dominant slope direction characterises the Site. This variation in aspect creates a diversity of microclimatic conditions that will influence earthworks behaviours, revegetation potential, and the landscape and ecological rehabilitation approach.

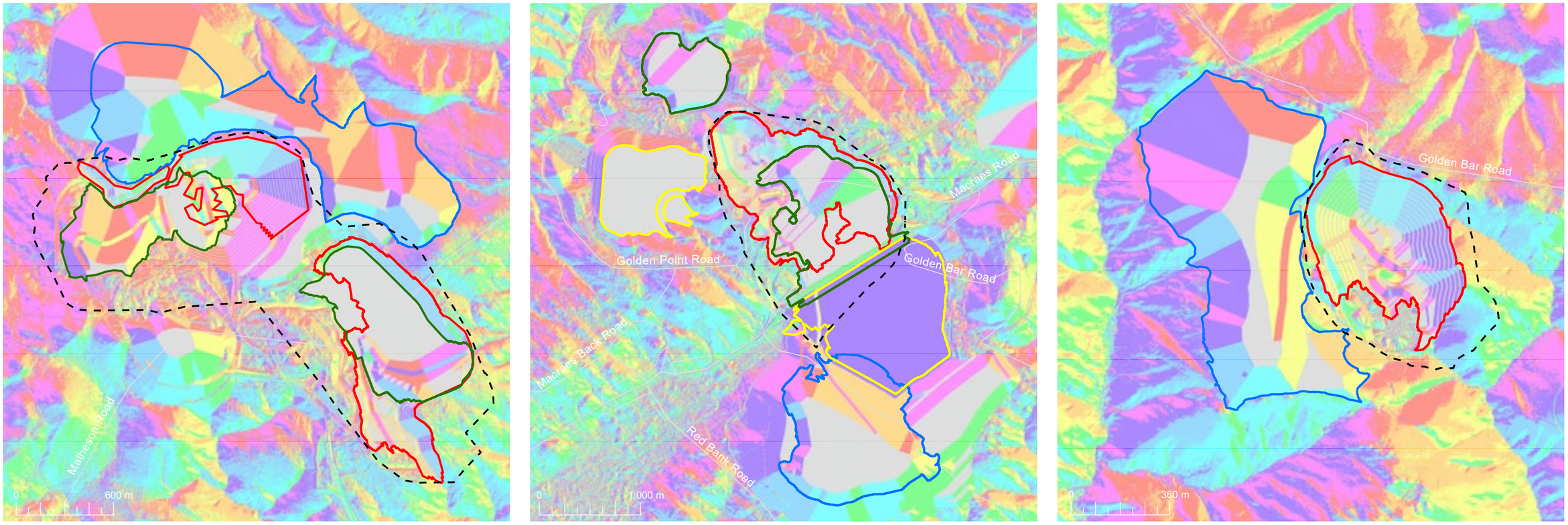
Extraction activities of MP4 will extend the existing approved dome form of the Waste Rock Stacks and the amphitheatre form of the open pits. Flatter areas are typically associated with the ‘crests’ of waste rock stacks and backfills which shall be designed to ensure they are water shedding with a suitable fall to limit percolation into the Waste Rock Stacks.

In the Coronation Mining Area, Coronation Pit and Coronation North Pit have aspects primarily facing south-south-west, north-west and north, while Coronation North waste rock stack creates diversified aspects, with north-north-east aspects dominating the eastern extent of the WRS.

The Central Mining Area demonstrates a variety of aspects, with Innes Mills Pit having aspects generally facing north-east and south-south-west. An area of western aspect is also created on the dry capped Frasers Tailings Storage Facility. The proposed MP4 will also create flat areas at the Mixed Tailings Impoundment, backfill areas and Frasers West WRS.

A similar variety of aspects are also created in the Golden Bar Mining Area, where the Golden Bar Pit have aspects generally facing east-southeast, south-south-west and west. Golden Bar waste rock stack generally have south-west to north-west facing aspects, with an area of eastern aspect adjoining the Golden Bar Pit.

Figure 8: Aspect (left: Coronation Mining Area; centre: Central Mining Area; right: Golden Bar Mining Area)



3.0 FACTORS INFLUENCING REHABILITATION

SLOPE

MP4 illustrates a diverse range of topographic profile, from a flat slope class of 0-3° to very steep slopes of >34°. In general, surface extraction of materials entails the creation of batters and benching at all pits, with the resultant faces consistently reaching >35°. Benches are graded to accommodate machinery during operation of MP4 and typically have slopes 3-7°. The slopes 'crests' of waste rock stacks and the floors of pits, haul roads, as well as the Mixed Tailings Impoundment in the Central Mining Area are typically smaller than 3°. Slopes of 7-15° and 15-25° are primarily formed at the batters of the waste rock stacks, with steeper slopes (25-34°) appearing on northwestern slopes of Golden Bar WRS.

Figure 9: Slope (left: Coronation Mining Area; centre: Central Mining Area; right: Golden Bar Mining Area)

3.0 FACTORS INFLUENCING REHABILITATION

ELEVATION

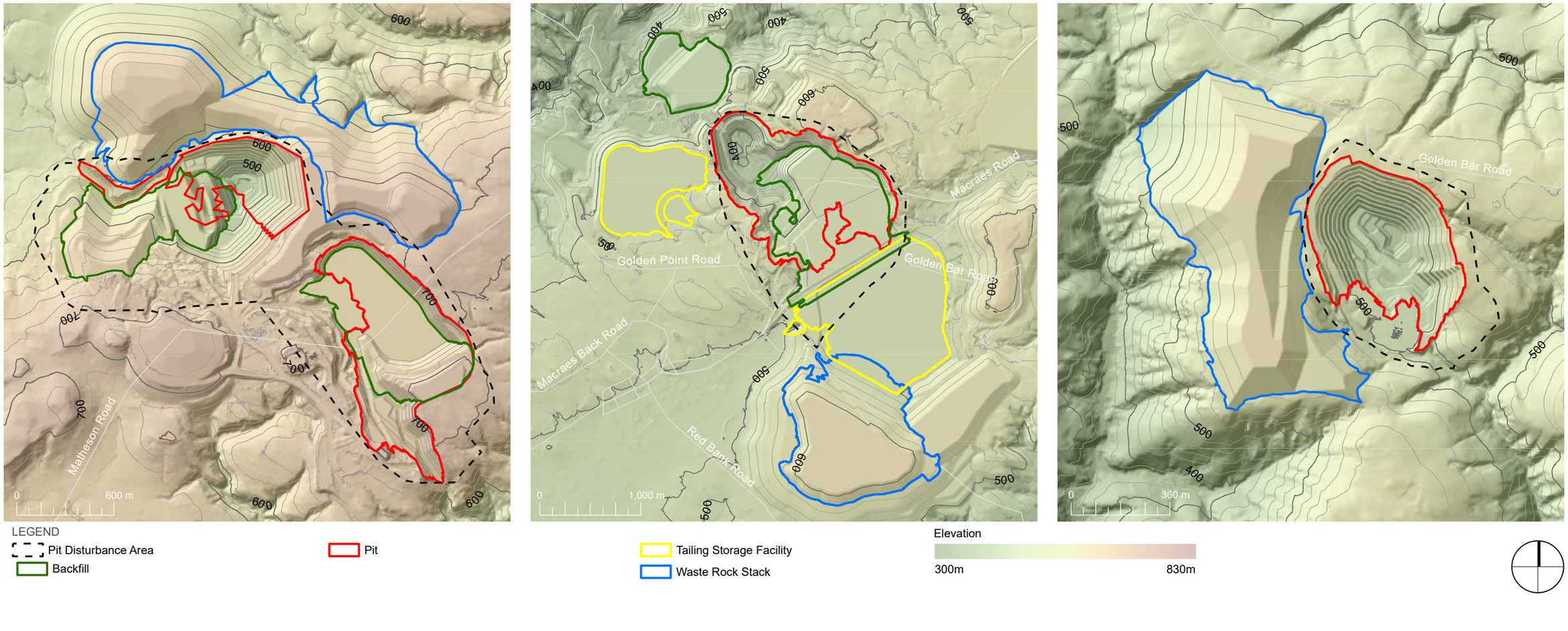
The elevation of MP4 is largely shaped by historic and existing mining operations, through progressive extraction of materials in open pits and disposal of overburden over waste rock stacks.

Elevation within the Coronation Mining Area appears to be the highest amongst the three mining areas. Extraction activities of MP4 will deepen the Coronation North Pit, lowering its pit floor to approximately 442m. The disposal of overburden will, on the other hand, raise the elevation of the waste rock stack and backfill areas to a range between 620m and 740m, reaching the highest elevation at the eastern extent of the Coronation North waste rock stack.

Elevation within the Central Mining Area generally sits between 300m to 600m. Similarly, extraction activities will further lower the floor of Innes Mills Pit to approximately 310m, the lowest elevation within the Macraes Operation. The highest elevation will be created at Frasers West WRS, reaching approximately 610m.

In the Golden Bar Mining Area, elevation will also broadly range between 400m to 600m, with the lowest point of 410m at Golden Bar Pit floor. Golden Bar WRS will be raised to approximately 600m.

Figure 10: Elevation (left: Coronation Mining Area; centre: Central Mining Area; right: Golden Bar Mining Area)



3.0 FACTORS INFLUENCING REHABILITATION

HYDROLOGY

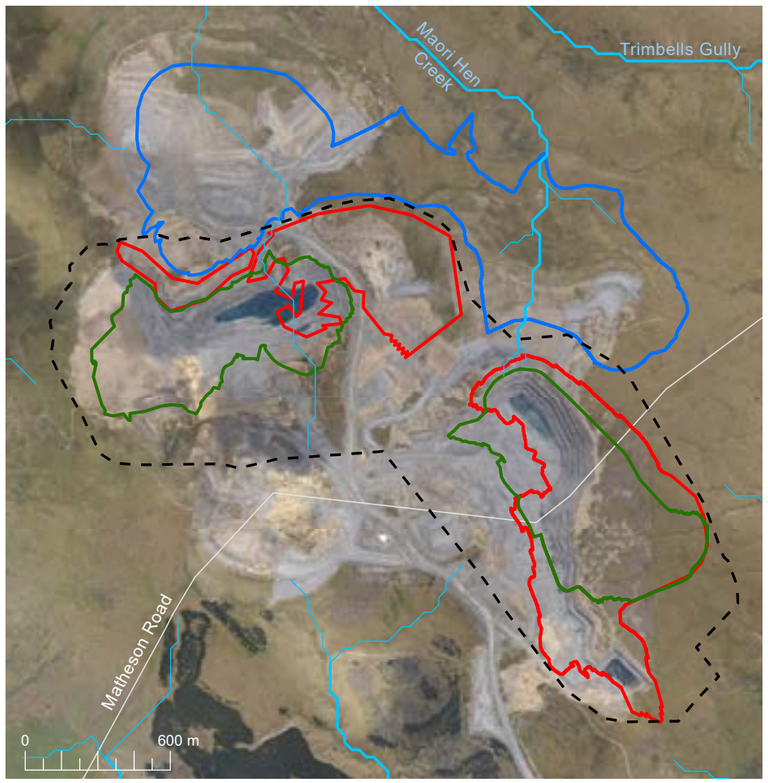
The surface hydrology of MP4 impact area comprises the small tributaries and upper reaches of the Taieri, Waihemo/Shag and Waikouaiti Rivers. Much of the length of these streams have been modified by long history of agricultural and pastoral practices, as well as the operation of the Macraes Mine and ongoing land management.

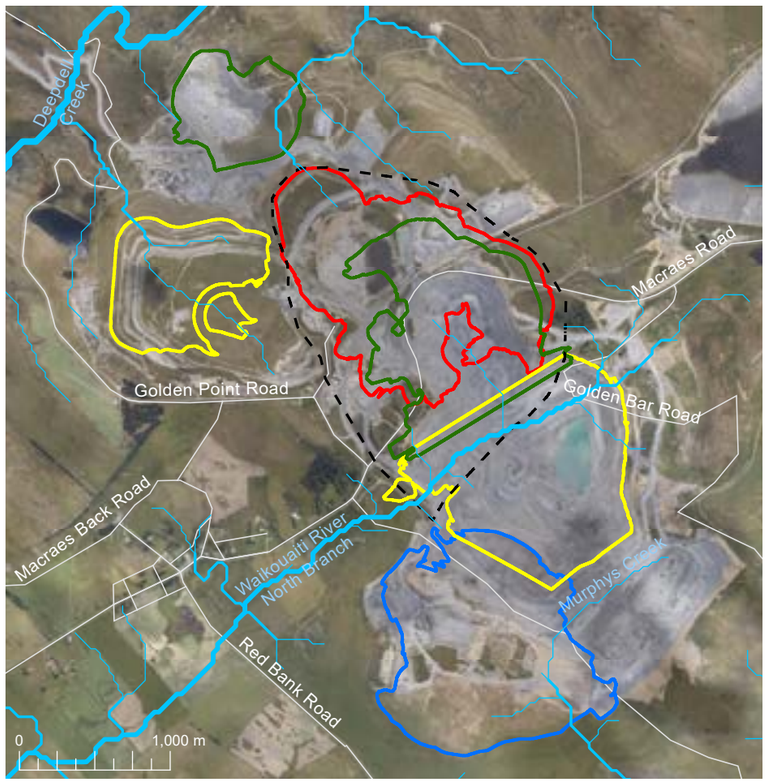
The Coronation Mining Area straddles two local catchments, sitting within the Trimbells Gully catchment in the north and the Deepdell Creek catchment in the south. These catchments comprise several intermittent and permanent streams extending from higher elevations at the Coronation Mining Area including Trimbells Gully, Coal Creek, Māori Hen Creek, Deepdell Creek and Highlay Creek. Some of these streams, in particular those within the Deepdell Creek catchment, are occasionally subject to drying out during summer months in their lower reaches.

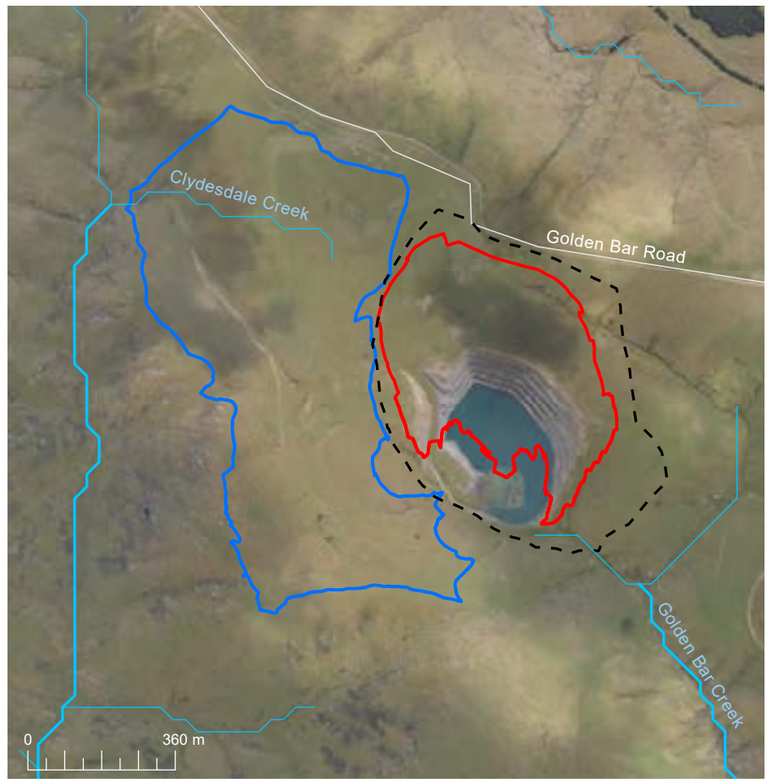
The Central Mining Area spans both the Waihemo catchment and the headwaters of the Waikouaiti River. Combined with pastoral farming and historic mining activities, the existing Macraes Operation has altered the drainage patterns and landform of these waterways. The upper catchment of the Waikouaiti River North Branch is intermittent and can experience extended dry periods.

The Golden Bar Mining Area is adjacent to Clydesdale Creek and Golden Bar Creek, both of which form part of the headwaters of the Waikouaiti River North Branch. Similar to waterways in the other two mining areas, Clydesdale Creek and Golden Bar Creek have been influenced by mining activities and agricultural land use, which altered the hydrology and habitats of these creeks. Pugging caused by stock grazing is also evident within the active bed and margins of creeks.

Figure 11: Hydrology (left: Coronation Mining Area; centre: Central Mining Area; right: Golden Bar Mining Area)







LEGEND

- Pit Disturbance Area
- Backfill
- Pit
- Tailing Storage Facility
- Waste Rock Stack

Stream Order (REC)

- 1
- 2
- 3
- 4
- 5+

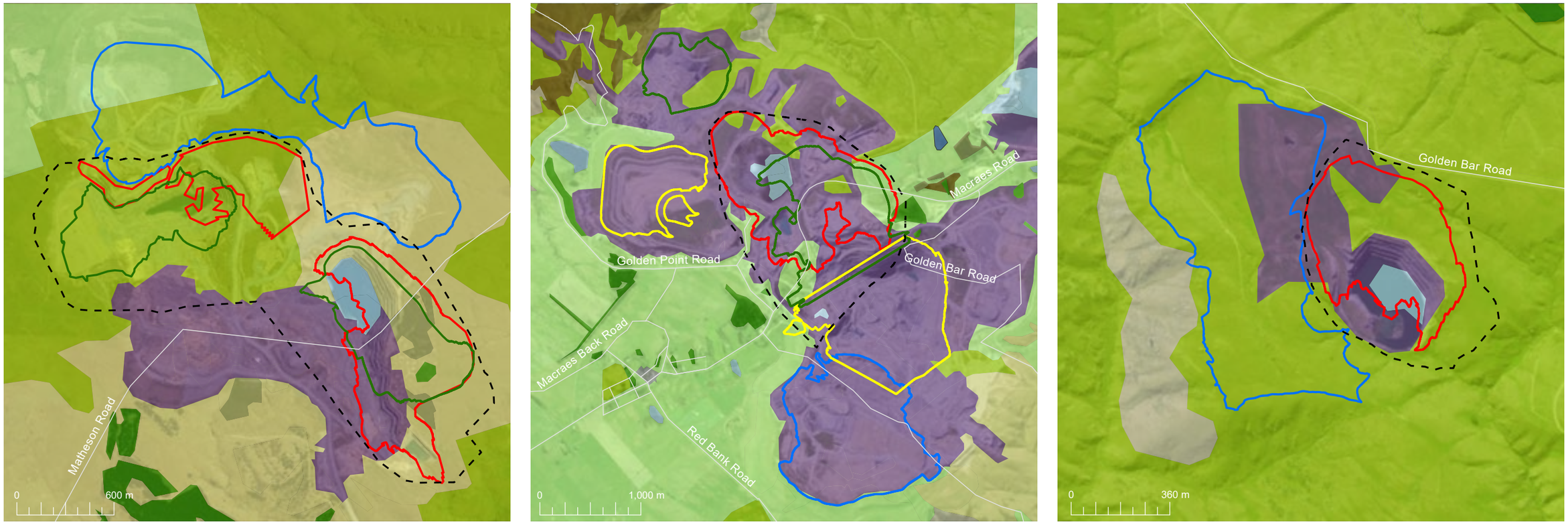
3.0 FACTORS INFLUENCING REHABILITATION

VEGETATION AND ECOLOGY IMPACTS

As an operational mine, the MP4 disturbance footprint is generally void of existing vegetation where ore extraction and waste rock stack development has occurred. Where extraction activities have not previously occurred, these areas are primarily covered in exotic grassland as well as 80.5 ha of dense tussock grassland, 11.3 ha of moderately dense tussock grassland and 3.1 ha of grey scrub[3]. The majority of the proposed clearance occurs within the Coronation Mining Area where this extends into the tall tussock grassland to the north-east of the existing open pit, with comparatively smaller areas of grey scrub and moderately dense tussock grassland at Golden Bar. Based on this identified loss, the landscape strategy seeks to replace the loss of native vegetation with an appropriate density of native vegetation as part of project closure.

[3] Bioresearches (18 May 2026) Residual Effects Analysis Ecology: Terrestrial Ecology.

Figure 12: Land Cover (left: Coronation Mining Area; centre: Central Mining Area; right: Golden Bar Mining Area)



3.0 FACTORS INFLUENCING REHABILITATION

CULTURAL LANDSCAPE VALUES

Macraes Flat forms part of a wider cultural landscape associated with mana whenua relationships with the headwaters of the Taieri, Waihemo/Shag and Waikouaiti river systems, including mahika kai values, traditional movement between inland and coastal Otago, and responsibilities to sustain the mauri of whenua and wai. Rehabilitation should therefore be developed and refined in consultation with mana whenua, including through detailed closure and rehabilitation planning. Relevant outcomes include protecting and enhancing waterway margins, using locally appropriate indigenous species, recognising taoka species where identified, and providing opportunities for cultural values and narratives to inform the final rehabilitated landscape where this is supported by mana whenua.

VISUAL AMENITY

As part of assessing the effects of extraction activity on visual amenity, a key consideration also relates to potential visual impact within the context of the visual backdrop of the Macraes Mine seen from the surrounding landscape. This assessment of visual impact is set out in detail within the Landscape, Natural Character and Visual Effects Assessment[4]. In visual terms, a key outcome of this rehabilitation strategy is to reinstate a coherent landscape which becomes readily absorbed within the broader Macraes Flat, and free from evident linear modification on completion.

THE ROLE OF STAKEHOLDERS

MP4 forms part of the wider Macraes mining landscape, where previous decisions, established rehabilitation commitments and experience from rehabilitation undertaken to date provide a reasonable starting point for considering future outcomes. Stakeholder engagement can help confirm and refine these outcomes in response to MP4-specific values and circumstances, rather than requiring the overall approach to mine rehabilitation to be reconsidered.

Effective rehabilitation relies on input from a range of parties with an interest in the post-mining landscape, including mana whenua, landowners, regulatory authorities, technical specialists, the mine operator and, where relevant, the wider local community. These parties may have different interests in relation to landform stability, water quality, ecology, cultural values, heritage, rural land use, visual amenity, recreation and long-term maintenance.

Stakeholder input is important because rehabilitation is not only a technical closure exercise. It also involves decisions about the future character, use, management and legibility of the post-mining landscape. Early and ongoing engagement can help identify rehabilitation opportunities, constraints and priorities that may not be apparent from mine planning or landscape assessment alone.

For the purposes of the LRSMP, stakeholder engagement should assist with:

- confirming the intended post-mining land use and landscape outcomes;
- identifying cultural, ecological, heritage, water management and rural production considerations relevant to rehabilitation;
- informing detailed revegetation, riparian enhancement and habitat restoration measures;
- identifying practical maintenance and access requirements;
- supporting adaptive management where monitoring shows that rehabilitation methods need to be refined; and
- ensuring that rehabilitation outcomes are clearly understood, measurable and capable of being implemented over time.

Engagement with mana whenua is particularly important where rehabilitation relates to waterways, wetlands, mahika kai values, indigenous vegetation, cultural landscape associations, monitoring and interpretation. The LRSMP should therefore be implemented alongside ongoing engagement with mana whenua and relevant technical specialists so that detailed rehabilitation plans can respond to cultural values information and any agreed project-specific processes.

Stakeholder engagement should continue through detailed design, implementation, monitoring and review. This will help ensure that rehabilitation remains responsive to site conditions, technical requirements and community expectations, while maintaining a clear focus on achieving stable, coherent and enduring post-mining landscape outcomes.

[4] Boffa Miskell (2026) Macraes Phase 4 Project: Landscape and Natural Character Effects Assessment.

4.0
REHABILITATION OUTCOMES

4.0 REHABILITATION OUTCOMES

OVERVIEW

This document is intended to influence the landscape management of the final form of the Site following rehabilitation. Within this framework, detailed plans should specify rehabilitation procedures that maintain and enhance landscape values and preserve natural character, including monitoring to be undertaken as work progresses during mining activity.

Rehabilitation works occur incrementally as mining progresses, whilst responding to site conditions. On this basis the LRSMP has a timeframe spanning the project from implementation to closure as landform modification and associated revegetation is undertaken prior to, during and following mining. During the overall mining operation, rehabilitation activity will occur progressively, encompassing landform modification and the re-establishment of pasture interspersed with native planting and habitat enhancement which will continue to advance as mining continues. This will remain beyond the completion of this project and influence enduring beneficial landscape outcomes in the longer term.

Because each operation is different, every rehabilitation programme requires adaptation in response to results achieved; that is, progressively refining details. This means that rehabilitation programmes usually include techniques to identify the most successful methods and approaches specific to that site to ensure rehabilitation is optimised, both in terms of reducing time frames to achieve a successful outcome and reducing implementation costs.

The Project forms part of an established mining operation where substantial areas have already been rehabilitated. This provides an accumulated body of site-specific knowledge concerning landform construction, soil handling, revegetation methods, species performance and ongoing management. Future rehabilitation will build on the approaches that have performed well, while refining or replacing methods where monitoring and experience indicate that outcomes could be improved.

While the strategy recommends one approach it also describes how this could be refined based on regular monitoring of results and outcomes. This enables the most efficient and effective measures to be used. This process of continually responding and optimising management approaches ' is important because it improves certainty of anticipated outcomes as further local experience is acquired and re-applied to the Site. Revegetation measures will also vary according to the specific riparian context, exposure and substrate.

OUTCOMES

The proposed LRSMP will work together in an integrated way with the proposed extraction activity within the Coronation Mining Area, Central Mining Area and Golden Bar Mining Area.

Monitoring and management of the rehabilitation will also continue after extraction works are complete. Rehabilitation works are integral to the operation of the mine and are implemented during and at the completion of each stage of extraction activity. It is therefore important that a sequential staging plan is adopted which can be adhered to over the duration of the works. Whilst timing of stage completion can adapt to the identified resource, the sequence of mining activity forms the basis upon which rehabilitation processes will occur.

The overall outcomes of the rehabilitation works can be summarised as follows:

- Ensure rehabilitated landforms remain well integrated in the context of the wider upland rural landscape.
- Integrate opportunities for habitat restoration alongside suitable post mining land uses.
- Protect and enhance the natural character of the headwaters of Taieri River, Waihemo/Shag River and Waikouaiti River.
- Bring forward rehabilitation and mitigation planting/habitat creation wherever practicable.
- Integrate mitigation measures with future land use and recreation opportunities as part of addressing identified landscape effects.
- Embed and support enduring mana whenua values.

TIMEFRAMES AND SEQUENCE

A key objective of the LRSMP is to ensure conditions supporting effective rehabilitation outcomes will occur. These can be influenced by the following key overriding systems and dynamics which change overtime:

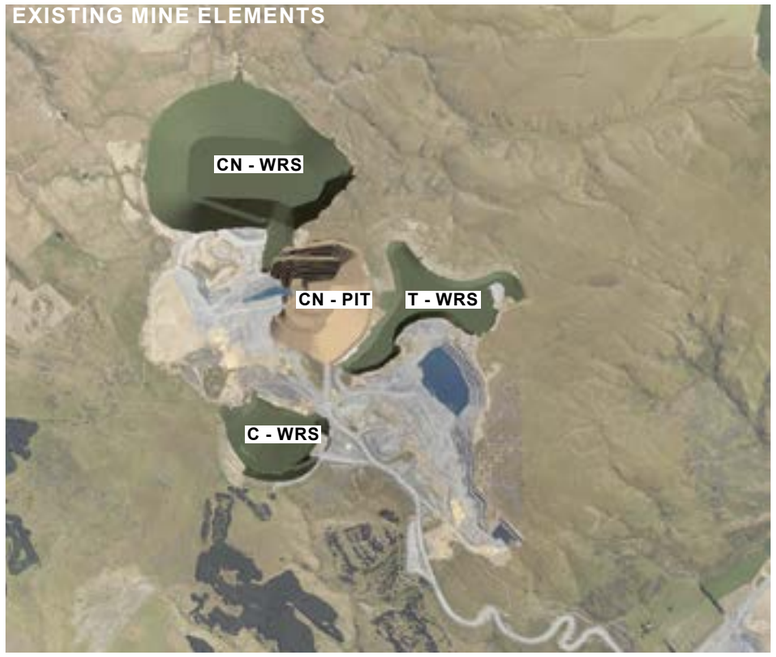
- Final landform;
- Aspect;
- Climate;
- Soils;
- Seed; and
- Animal and Plant Pests.

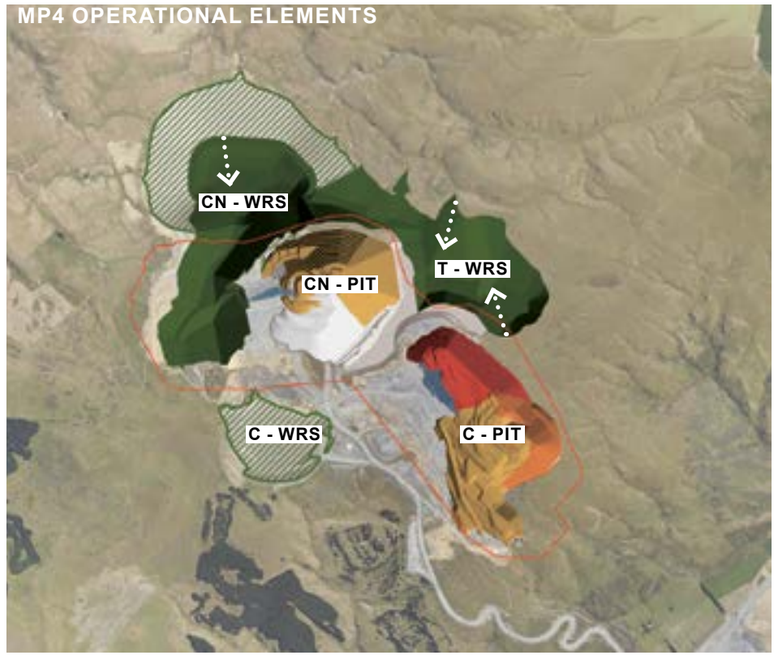
The proposed MP4 will involve extension of mining activities at varying phases. Broadly, extraction activities in the Coronation Mining Area and Central Mining Area will complete by indicative Year 10 and by Year 8 in the Golden Bar Mining Area. Full site rehabilitation will commence in Year 11.

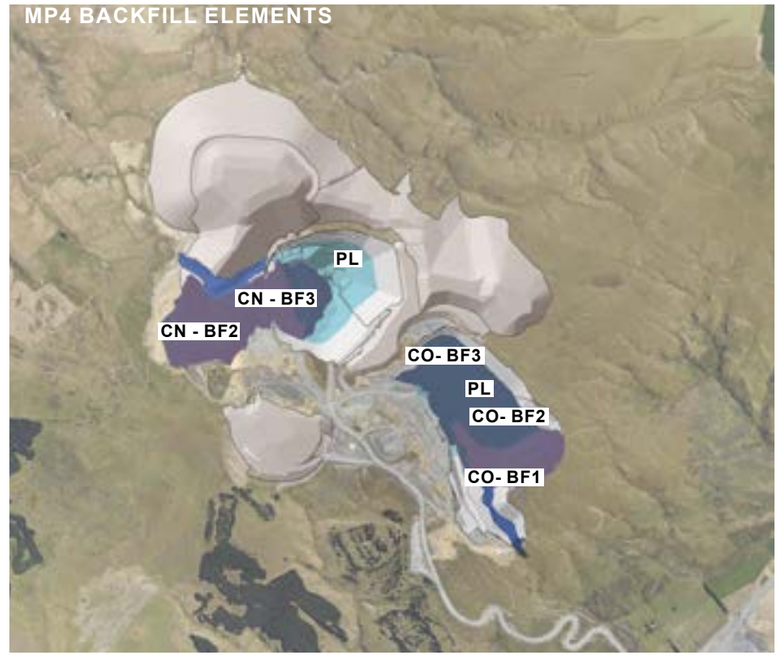
4.0 REHABILITATION OUTCOMES

CORONATION MINING AREA DEVELOPMENT STAGES

The following images illustrate the development stages in Coronation Mining Area as they progress over to closure.







OPEN PIT

CN - PIT	Coronation North Pit Stage 5

WASTE ROCK STACK

CN - WRS	Coronation North Waste Rock Stack
C - WRS	Coronation Waste Rock Stack
T - WRS	Trimbells Waste Rock Stack

Proposed open pit disturbance area

OPEN PIT

CN - PIT	Coronation North Pit Stage 6
C - PIT	Coronation Pit Stage 6
C - PIT	Coronation Pit Stage 7
C - PIT	Coronation Pit Stage 8

WASTE ROCK STACK

CN - WRS	Coronation North Waste Rock Stack height raise
T - WRS	Trimbells Waste Rock Stack height raise and extension

REHABILITATION

Rehabilitated completed elements

Progressive rehabilitation during operation

Refer to Closure Plan for detailed description on full closure rehabilitation.

BACKFILL

CN - BF	Coronation North Backfill Stages 2-3
CO - BF	Coronation Backfill Stages 1-3

PIT LAKES

PL	Pit Lake

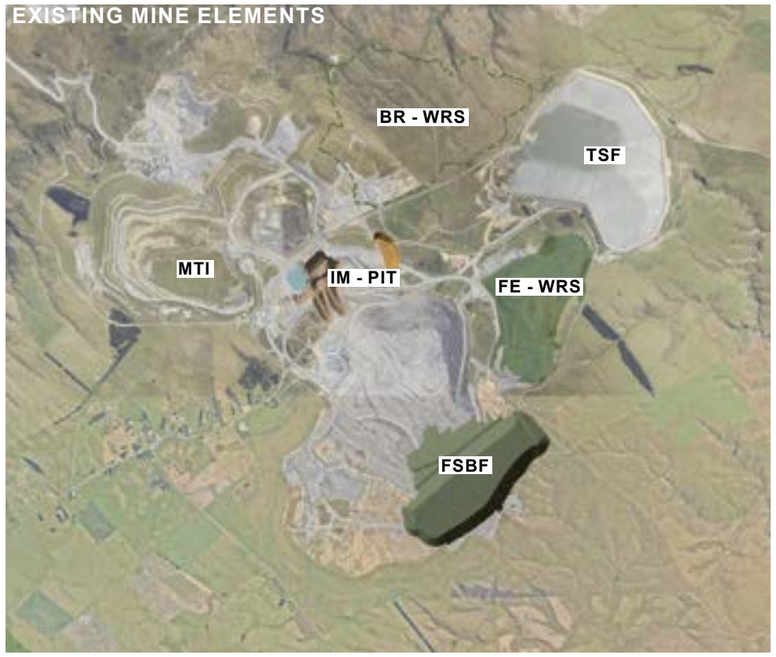
SPILLWAY

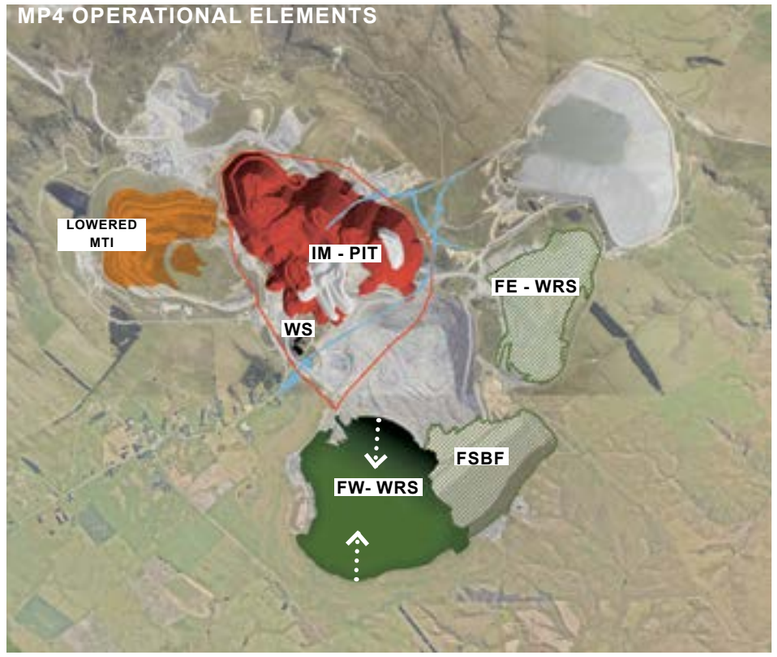
Spillway

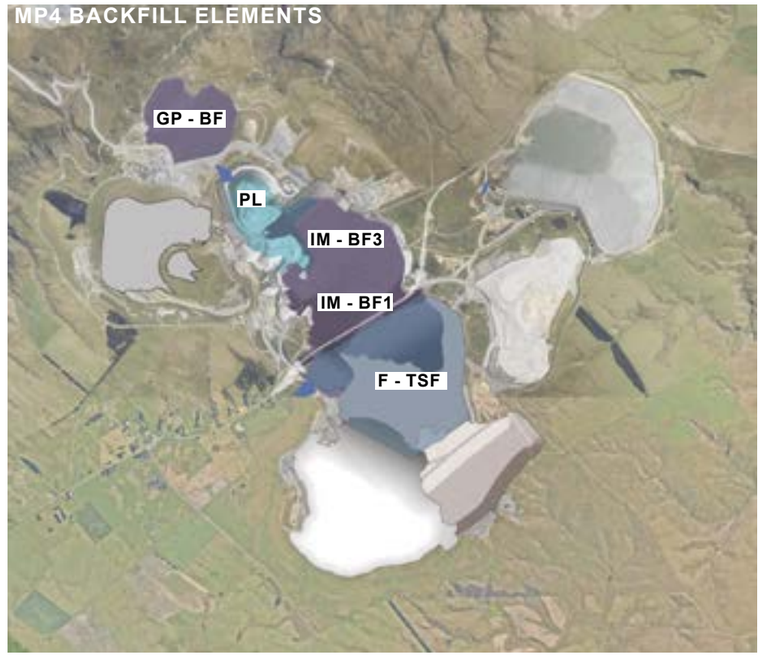
4.0 REHABILITATION OUTCOMES

CENTRAL MINING AREA DEVELOPMENT STAGES

The following images illustrate the development stages in Central Mining Area as they progress over to closure.







OPEN PIT

	IM - PIT	Innes Mills Stage 9
	IM - PIT	Innes Mills Stage 10

WASTE ROCK STACK

	FSBF	Frasers South Backfill
	FE - WRS	Frasers East waste rock stack

KEY EXISTING CONSENTED ELEMENTS

- - - -	**BR - WRS**	Back Road Waste Rock Stack (consented but not to be built)
	MTI	Mixed Tailings Impoundment

Proposed open pit disturbance area

OPEN PIT

	IM - PIT	Innes Mills Stages 11 - 13

WASTE ROCK STACK

	FW - WRS	Frasers West Waste Rock Stack height raise

WORKSHOP

	WS	Proposed workshop buildings

TAILINGS STORAGE FACILITY

	MTI	Lowered Mixed Tailings Impoundment

ROAD DIVERSION

Road diversion Stage 1 and 2

REHABILITATION

Rehabilitated completed elements

Progressive rehabilitation during operation

Refer to Closure Plan for detailed description of rehabilitation.

BACKFILL

	IM - BF1	Innes Mills Backfill 1
	IM - BF3	Innes Mills Backfill 3
	GP - BF	Golden Point Backfill

TAILINGS STORAGE FACILITY

	F-TSF	Frasers Tailings Storage Facility

PIT LAKE

	PL	Pit lake

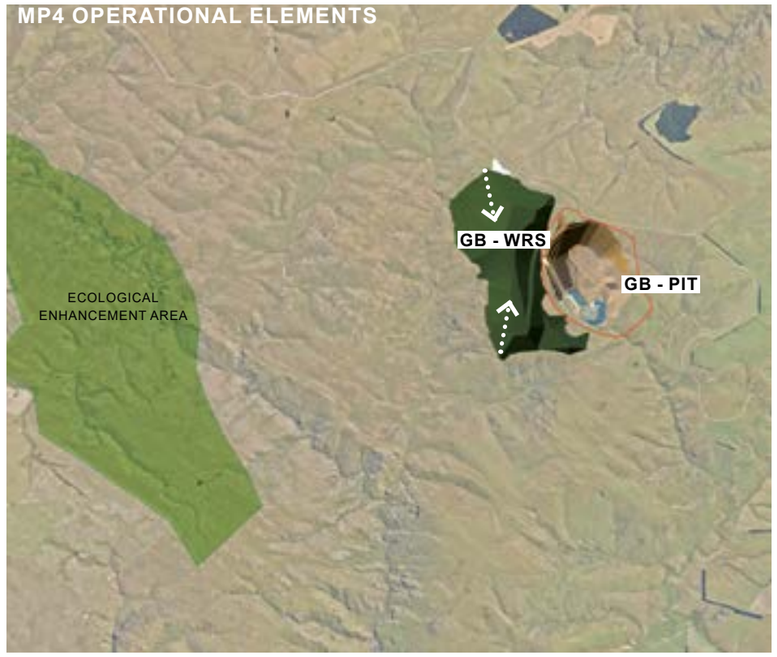
SPILLWAY

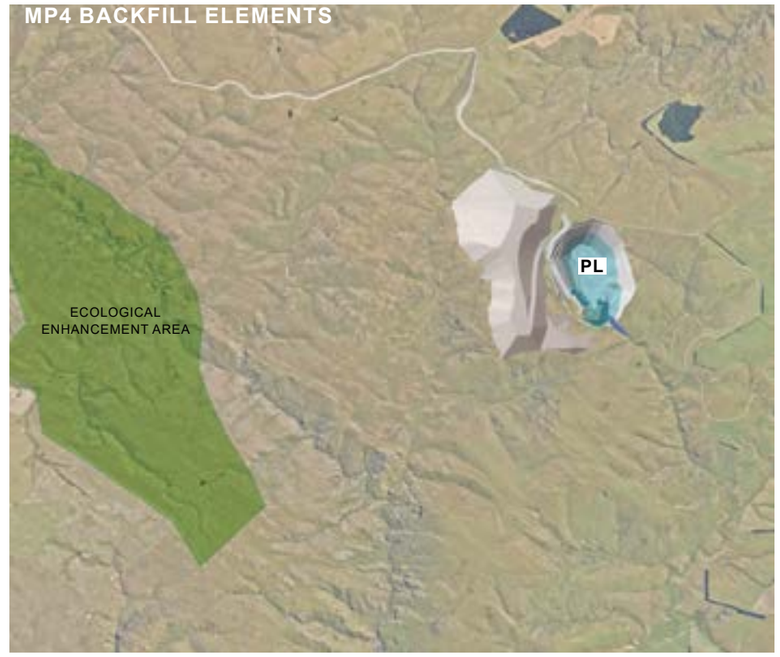
Spillway

4.0 REHABILITATION OUTCOMES

GOLDEN BAR MINING AREA DEVELOPMENT STAGES

The following images illustrate the development stages in Golden Bar Mining Area as they progress over to closure.





OPEN PIT

GB - PIT Consented pit

WASTE ROCK STACK

GB - WRS Golden Bar Waste Rock Stack

Proposed open pit disturbance area

OPEN PIT

GB - PIT Golden Bar Stage 2

GB - PIT Golden Bar Stage 3

WASTE ROCK STACK

GB - WRS Golden Bar Waste Rock Stack extension

ECOLOGICAL ENHANCEMENT AREA

Murphy's Ecological Enhancement Area

REHABILITATION

Progressive rehabilitation during operation

Refer to Closure Plan for detailed description of rehabilitation.

PIT LAKE

PL Pit lake

SPILLWAY

Spillway

Golden Bar pit has no backfill elements and the pit lake will form in the open pit

5.0
PROPOSED WORKS

5.0 PROPOSED WORKS

OVERVIEW

Within any mine site, there are different areas that require different rehabilitation approaches and methodologies. These are commonly referred to as 'domains' and include pits, waste rock stacks, tailings storage facilities, roads, infrastructure, topsoil stockpiles, stream diversions, ramps and undisturbed areas. The full extent of the proposed modified areas and enhanced areas addressed within the LSRMP are illustrated in Figures 14-16.

The proposed MP4 includes a combination of haul roads, open pits, engineered landforms (waste rock stacks), backfills, water diversion, tailings storage facility, and enhancement area and corridors for rehabilitation. These components of MP4 have been identified as individual Landscape Management Units which will have specific landscape rehabilitation responses.

LANDSCAPE REHABILITATION STRATEGY

The LRSMP has been prepared in accordance with the current sequential operation of MP4. The landscape management units which makes up the LRSMP are set out in Figures 14-16 and are described as follows. These are subsequently supported with Mine Rehabilitation Actions (Section 6.0) and Monitoring and Review (Section 7.0).

LANDSCAPE MANAGEMENT UNITS

Key management units or components of the Rehabilitation Strategy include:

1. Waste rock stacks and Backfills

Permanent engineered landforms formed from the disposal of overburden/ waste rock. Pit Benching, Batters and Edges. Aspects of Coronation, Central Mining Area and Golden Bar which remain on completion of extraction.

1. Tailings Storage Facility

The Frasers Tailings Storage Facility which will hold the tailings from the ore processing in perpetuity.

2. Mixed Tailings Impoundment

The remaining Mixed Tailings Impoundment following the partial relocation to the Frasers Tailings Storage Facility.

3. Pit Disturbance Areas

Pit disturbance areas are the modified ground surrounding the MP4 open pit extensions, required to support mining operations and later rehabilitation, but excluding the final pit voids themselves.

4. Open Pit Workshop

The Open Pit Workshop will be used primarily during extraction and will be removed on completion of extraction.

5. Hauls Roads

The Haul Roads will connect the extraction areas, Processing Plant and Waste Rock Stacks located within the three mining areas.

6. New Roads / Recreation Tracks

Macraes Road realignment, a new road which extends from Matheson Road within the Coronation Mining Area and recreation tracks which may be created within the Central Mining Area.

7. Permanent Water Diversion

Permanent Water Diversion of a tributary of Waikouaiti River North Branch along the embankment adjoining Macraes Road above the Frasers TSF.

8. Waterway Enhancement

Enhancement to new and existing waterways will include riparian planting along a section of the Waikouaiti River North Branch and parts of the expanded mining area. Refer to Stream Compensation Management Plan.

9. Spillways

Spillways are linear features constructed to enable any excess overflow to discharge to the wider water catchment.

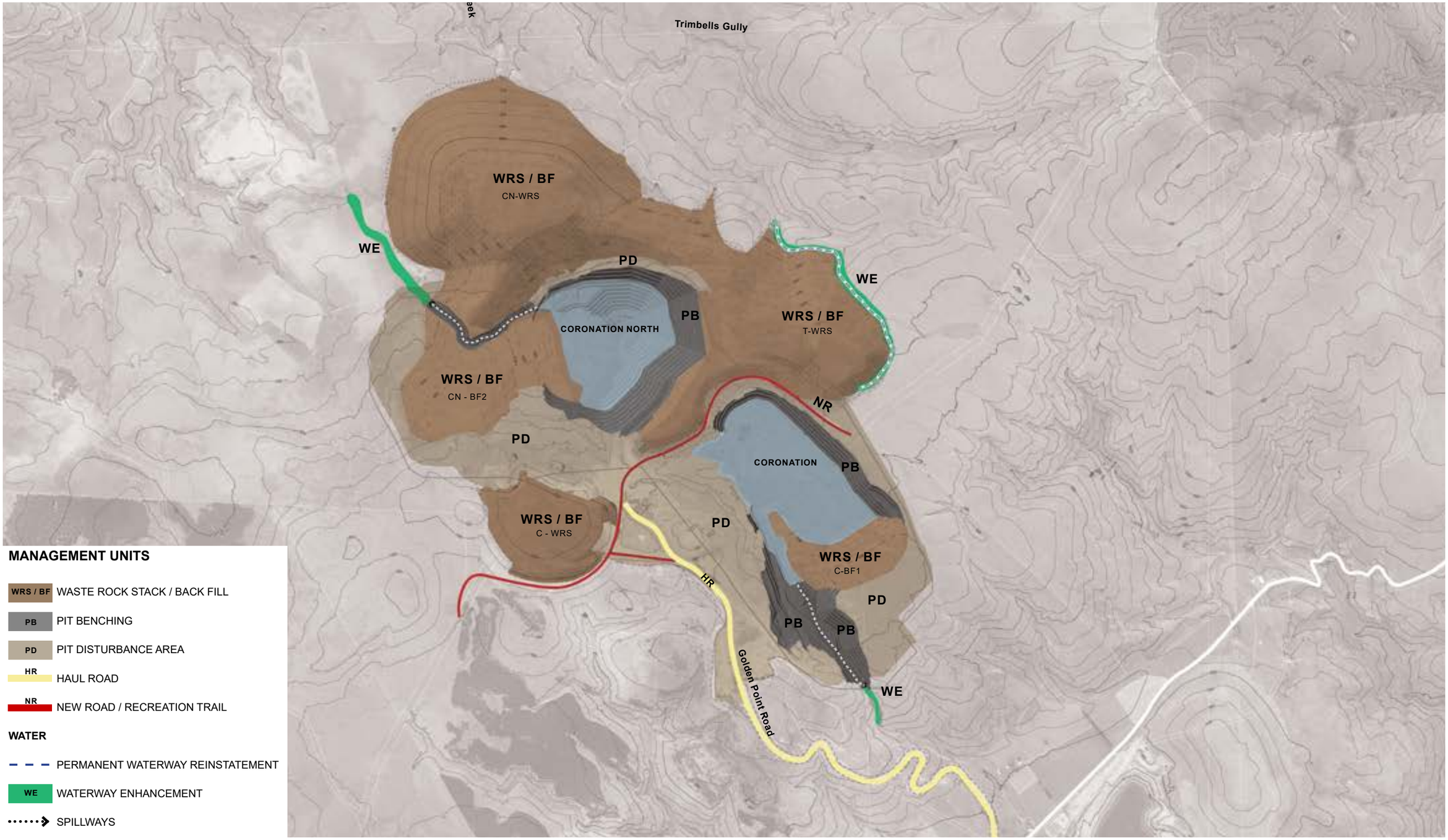
The LRSMP is separate from, but supports and should be read alongside, the ecological enhancement measures proposed in the following areas:

- The **Murphys Ecological Enhancement Area** will provide for predator exclusion, habitat protection and enhancement, tussock restoration, and improved ecological connectivity towards the Redbank Covenant. Associated works will include predator-proof fencing, access tracks and site facilities.
- The **Cranky Jims Link** will connect existing ecological covenants through approximately 60 ha of dry shrubland restoration, together with the protection and enhancement of existing shrubland and rock outcrop habitat.
- The **Mount Highlay Tussock Restoration Area** will provide approximately 175ha of tussock restoration planting, together with the protection and enhancement of existing tussock, shrubland and rock outcrop habitat.

5.0 PROPOSED WORKS

PROPOSED MODIFIED AREAS AND ENHANCED AREAS IN THE CORONATION MINING AREA

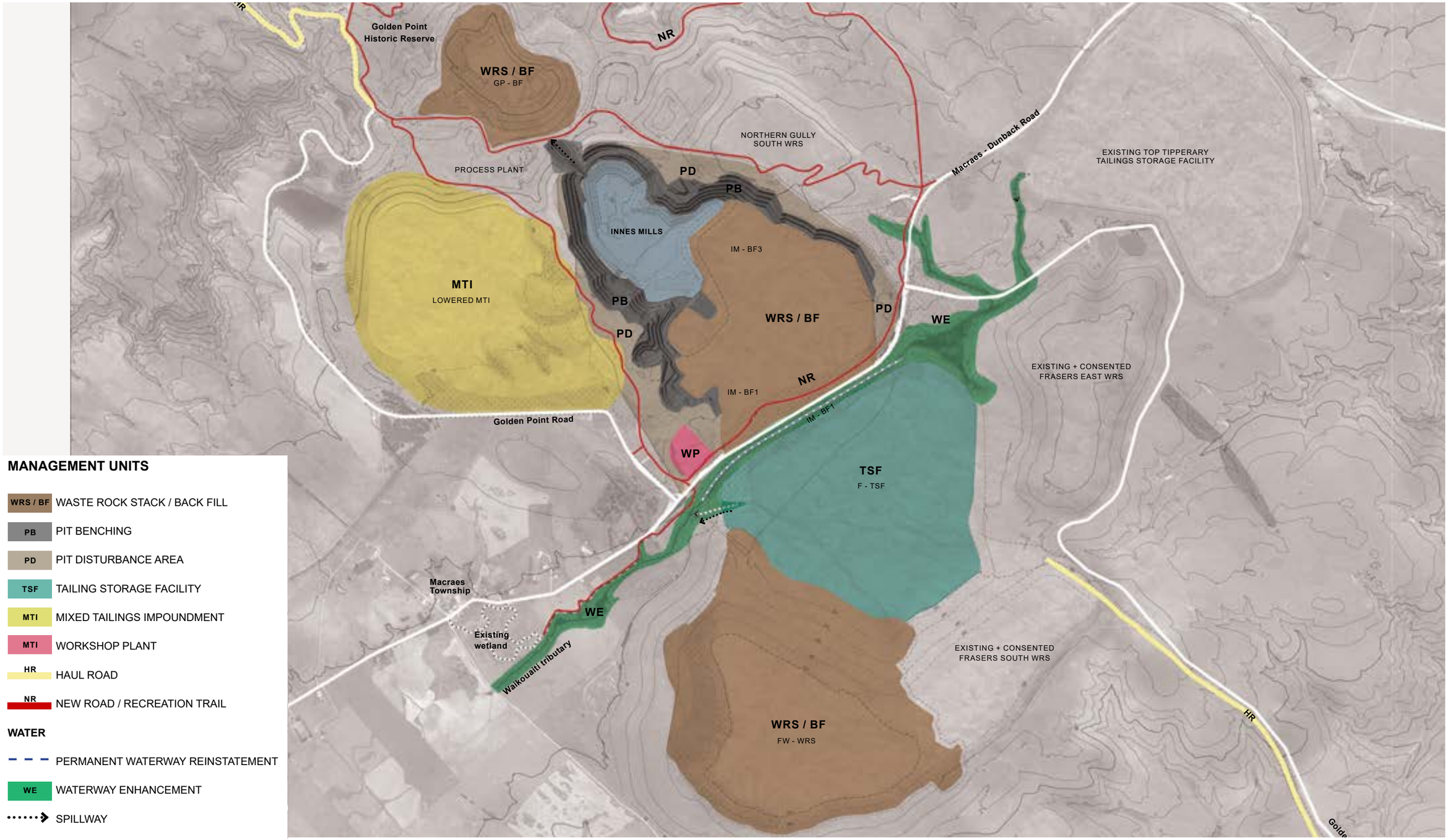
Figure 13: Coronation Mining Area Landscape Management Units



5.0 PROPOSED WORKS

PROPOSED MODIFIED AREAS AND ENHANCED AREAS IN THE CENTRAL MINING AREA

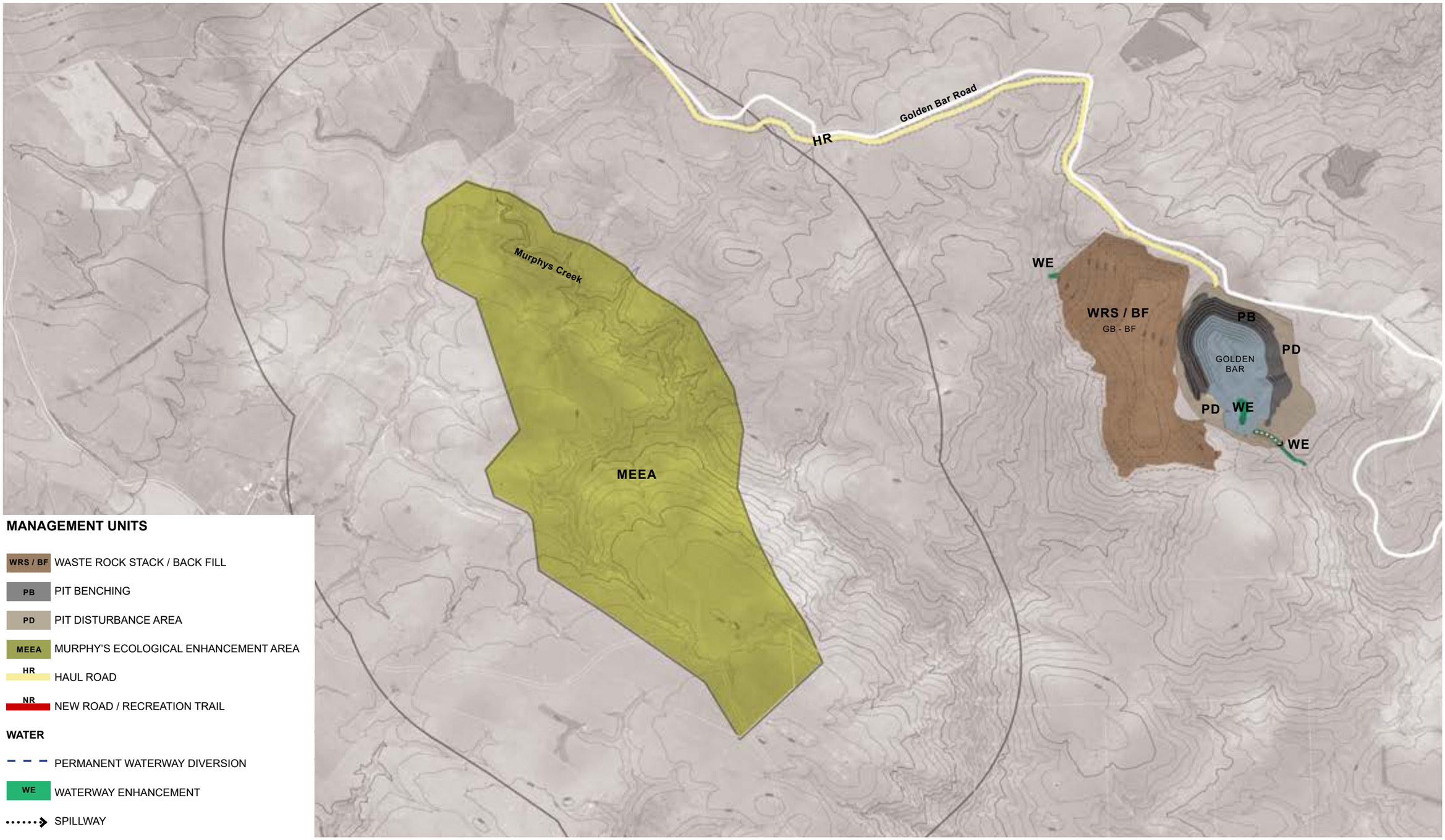
Figure 14: Central Mining Area Landscape Management Units



5.0 PROPOSED WORKS

PROPOSED MODIFIED AREAS AND ENHANCED AREAS IN THE GOLDEN BAR MINING AREA

Figure 15: Golden Bar Mining Area Landscape Management Units



5.0 PROPOSED WORKS

WASTE ROCK STACKS AND BACKFILLS

BACKGROUND

Consistent with ongoing mining practices at Macraes Flat, waste rock resulting from mining activity will form significant permanent features within the landscape. For MP4, this relates to the expansion of five existing Waste Rock Stacks which will be formed by the disposal of overburden/waste rocks from open pit mining and underground mining (to a lesser extent) .

Coronation Pit, Coronation North Pit and Innes Mills Pit will also be partially backfilled to create stable, coherent surfaces that tie into adjoining natural ground, retained pit edges, waste rock stacks and future pit lake margins.

Rehabilitation of the Waste Rock Stacks and Backfills will be designed and constructed in accordance with the established rehabilitation principles which have been developed as part of the existing Macraes Mining Operation and have been adapted over time to be more sympathetic to the natural environment. Upon closure, these will be progressively revegetated to ensure that they appear complementary to the surrounding landscape.

REHABILITATION REQUIREMENTS

Based on these existing principles, the overarching rehabilitation requirements for Waste Rock Stacks which which receive waste from mining authorized by MP4 remain unchanged and are outlined as follows:

- *Slopes shall be suitably concave in cross-profile to match nearby natural slopes;*
- *Slope gradients shall be no steeper than nearby natural surfaces;*
- *Transitions between natural and formed surfaces shall be rounded and naturalised;*
- *Contours should be curvilinear in plan form, in keeping with original natural contours in that area;*
- *The skyline shall be variable and curved, simulating natural skylines;*
- *New landforms shall be aligned and located so they seem to continue, not cut across, existing landscape patterns; and*
- *Where silt ponds are not required for post-closure water management, they shall be removed and the site rehabilitated or be converted to stock water drinking ponds following completion of mining operations and rehabilitation.*

In addition to the existing rehabilitation requirements outlined above, a key dimension of the expanded form of MP4 is seeking to ensure the final landcover is integrated within the existing landscape. This is directed by the following additional rehabilitation requirement:

- *To identify areas of tussock grassland, grey scrub and rock stacks to improve habitat diversity and textural variation*

PROCESS

Waste Rock Stacks will be progressively rehabilitated as each landform reaches its final design profile and is no longer required for active mining operations. Rehabilitation will be integrated with mine planning so that completed outer slopes can be shaped, capped, stabilised and revegetated as early as practicable, while avoiding subsequent disturbance of completed rehabilitation areas.

Final landform shaping will be undertaken in accordance with geotechnical and mine engineering requirements. Within those constraints, the outer faces, crests, benches and transitions of the Waste expanded Waste Rock Stacks proposed as part of MP4 will be shaped to reduce obvious linear benching, abrupt breaks in slope and artificial symmetry. The intent is to create stable landforms that read as part of the broader rolling upland Macraes Flat landscape, including rounded crests, varied slope lengths, softened toe transitions and, where practicable, localised surface variation and indigenous planting that reflects the surrounding schist hill-country character.

The placement of waste rock, capping material and growth media will be confirmed through mine planning, geochemical and engineering advice. Final cover systems will be designed to provide a suitable growth medium while maintaining the required geochemical and erosion-control functions of the rehabilitated surface.

Drainage will be incorporated into the final landform design to manage surface runoff, minimise erosion and avoid uncontrolled concentration of flows. Final drainage paths, swales and discharge points will be confirmed through detailed design and hydrological input, including consideration of downstream receiving environments. Drainage features will be shaped and stabilised so they remain functional over time while also being integrated into the final landform and revegetation pattern where practicable.

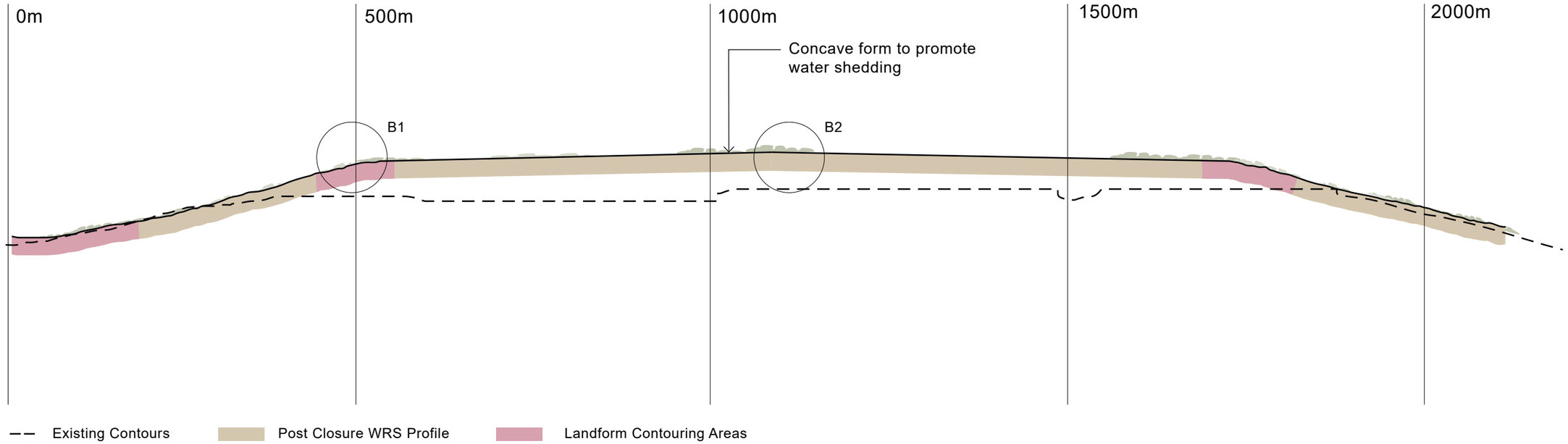
Following confirmation of the final landform and cover design, rehabilitated surfaces will be dressed with suitable growing media. This may include available topsoil, subsoil, brown rock, mulch or other soil-forming material, depending on material availability and suitability. The final depth, composition and placement method will be confirmed through detailed rehabilitation design and informed by soil, ecology and operational advice. Surfaces will be prepared to support pasture establishment, tussock grassland, grey shrubland or other native vegetation communities where identified as appropriate.

Revegetation will be undertaken progressively following surface preparation. Hydroseeding will be used to provide rapid surface stabilisation and reduce erosion risk. Native planting or seeding will be targeted to areas where it will contribute to landscape integration, habitat diversity, ecological enhancement and remediation of affected native vegetation values as detailed on landscape closure plans. The final location, extent, density and species composition of tussock grassland, grey scrub, rock stacks or other native vegetation areas will be confirmed through detailed revegetation plans prepared with ecological input.

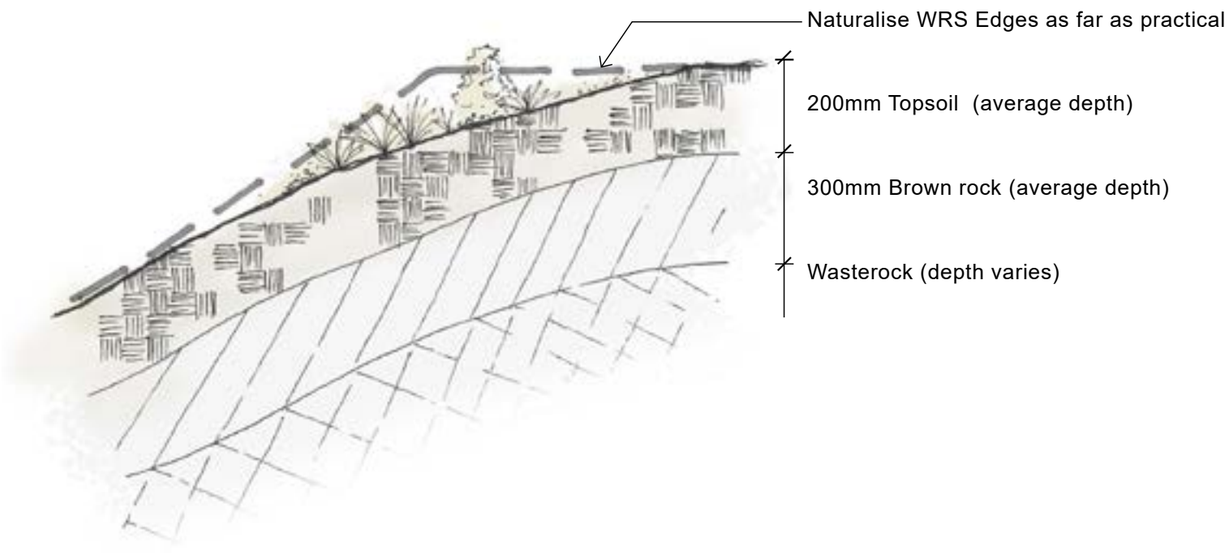
Pest plant and pest animal control will be implemented during establishment and maintained as necessary to support successful revegetation.

5.0 PROPOSED WORKS

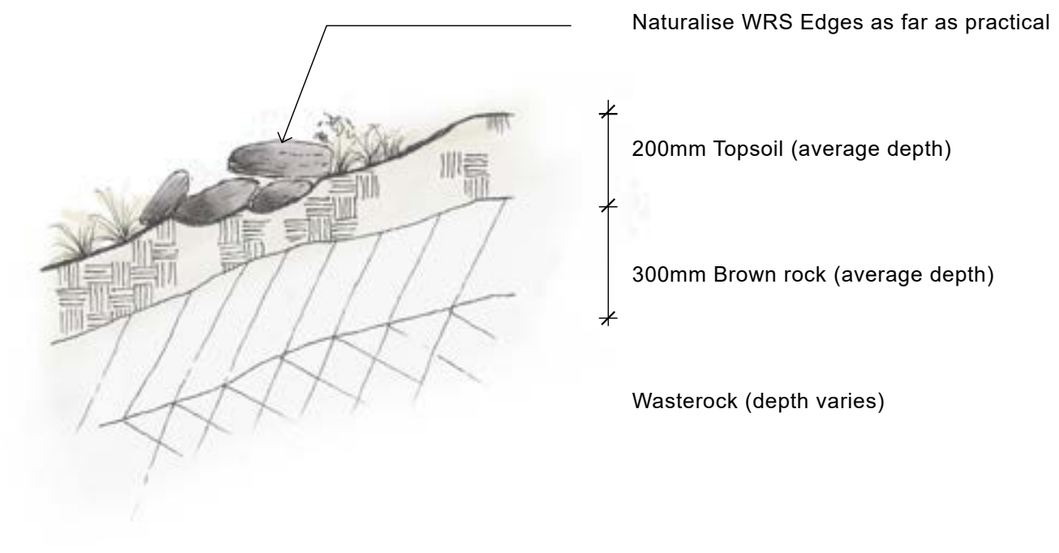
WASTE ROCK STACKS TYPICAL SECTION



WASTE ROCK STACKS COMPOSITION



LANDFORM CREATION DETAIL



5.0 PROPOSED WORKS

BENCHING, BATTERS AND EDGES

BACKGROUND

Pit Benching, Batters and Edges comprise the exposed faces, benches, upper pit margins and transition areas associated with the open pits that will remain visible following the completion of extraction. These areas form part of the permanent post-mining landform and will retain a degree of engineered character because of the stability, safety and operational requirements associated with open pit mining.

The rehabilitation challenge for these areas is different from that of waste rock stacks or backfilled landforms. Pit benches, batters and highwalls cannot always be fully reshaped or revegetated due to geotechnical, safety, access, substrate and exposure constraints. The rehabilitation focus is therefore to stabilise exposed surfaces, manage drainage and erosion, soften upper edges and transitions, and establish vegetation where conditions allow.

Particular attention will be required where pit edges intersect with natural ground or adjoining rehabilitated landforms. In these locations, edge treatment, surface preparation and native planting can help reduce the abruptness of the pit margin, improve visual integration, and provide habitat diversity. Where planting is proposed, this will generally be concentrated around accessible and stable pit edge areas and adjoining disturbed ground, rather than across exposed pit faces.

The final treatment of pit benching, batters and edges will need to be confirmed through detailed mine closure design and informed by geotechnical, hydrological, geochemical, ecological and heritage advice. This will ensure that any landscape integration, planting, access control or edge-softening measures are compatible with long-term pit stability, water management, safety and any relevant heritage constraints.

REHABILITATION REQUIREMENTS

Based on the existing principles outlined above, the overarching rehabilitation requirements are outlined as follows:

- *Reduce the visual abruptness of retained pit edges, particularly where they intersect with natural ground or adjoining rehabilitated landforms.*
- *Soften exposed upper pit margins through contouring, crest rounding, surface treatment and planting where practicable.*
- *Ensure retained pit benches, batters and highwalls form part of a coherent post-mining landscape, while recognising that some engineered mining features will remain legible at closure.*

PROCESS

The completion of rehabilitation of pit benching, batters and edges will be undertaken progressively where final pit edges and adjoining disturbed ground have reached their final form and are no longer required for active mining operations. In some areas, particularly where benches, batters and highwalls are required for long-term pit stability or safety, the pit form will remain legible as a permanent engineered mining feature. Rehabilitation will therefore focus on stabilising, softening and integrating these features rather than implying full naturalisation or restoration of the original landform.

Final treatment of pit benches, batters, highwalls and edges will be confirmed through geotechnical and mine engineering advice. Safety, long-term stability, rockfall risk, access control and maintenance requirements will determine where reshaping, bench retention, bunding, fencing, rock scaling or other treatments are required. Within those constraints, exposed upper edges and transitions between natural ground and pit landform will be shaped to reduce abrupt breaks in slope and to better integrate with adjoining rehabilitated landforms.

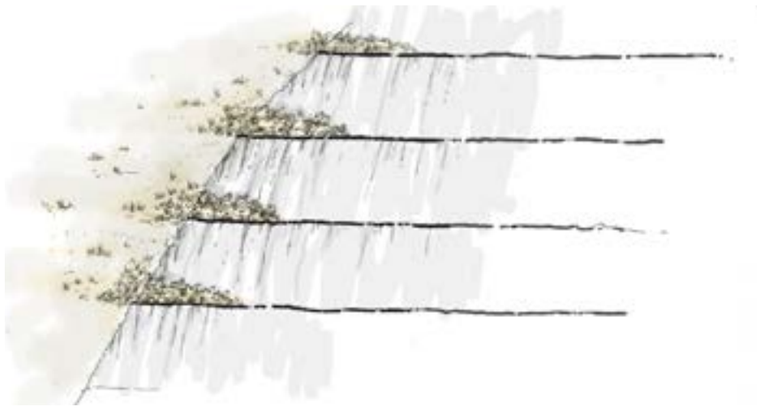
Where practicable, disturbed ground around pit edges will be recontoured to create smoother transitions into surrounding natural or rehabilitated surfaces. This may include rounding outer crests, removing redundant windrows or operational tracks, softening angular edges, redistributing suitable material and creating variable surface textures that are more consistent with the surrounding schist hill-country character. Treatments will avoid creating artificial, regular or overly engineered edge profiles where more natural-looking transitions can be safely achieved.

Drainage around pit edges and benches will be designed to manage surface runoff, minimise erosion and avoid uncontrolled discharge over unstable faces or into sensitive receiving environments. Detailed drainage treatment will be confirmed through mine planning, geotechnical and hydrological input. Where drainage channels, bunds or diversion features are required, these will be integrated into the final edge treatment as far as practicable while maintaining their required safety and erosion-control function.

Revegetation will be targeted to pit edges and adjoining disturbed ground where establishment is likely to be successful and where it will contribute to landscape integration, erosion control, habitat diversity and visual softening. The location, width, density and species composition of planting will be confirmed through detailed revegetation plans prepared with ecological input and having regard to exposure, substrate, slope, pest pressure and long-term maintenance access.

Rock placement, surface roughening or retention of suitable exposed rock may be used where this would assist with visual integration, erosion resistance or habitat creation. These treatments should be guided by the existing schist landscape character and should avoid appearing decorative or overly arranged

PIT BENCHING



5.0 PROPOSED WORKS

TAILINGS STORAGE FACILITY

BACKGROUND

Frasers Tailings Storage Facility (TSF) will provide permanent storage for tailings associated with the Macraes Operation, including tailings relocated from the Mixed Tailings Impoundment and SP11 TSF, as well as tailings generated during MP4. The TSF is therefore a permanent engineered closure landform that will remain part of the post-mining landscape.

At closure, the TSF will be dry-capped and rehabilitated in accordance with the mine closure design. The final form, cover system and surface water management will be determined by engineering, geotechnical, geochemical and water management requirements, including the need to provide long-term containment, stability, erosion control and protection of downstream receiving environments.

The key landscape rehabilitation outcome is to achieve a stable and functional closure landform while reducing the visual prominence of engineered edges, overly uniform surfaces and artificial drainage features. Final treatment will need to balance landscape integration with the technical requirements of TSF closure, including capping performance, surface drainage, erosion control, maintenance access and long-term monitoring dependant on ongoing consultation and engagement with mana whenua.

REHABILITATION REQUIREMENTS

The rehabilitation requirements in the TSF are outlined as follows:

- *Integrate the capped TSF surface and embankment edges with adjoining rehabilitated landforms to create a coherent post-mining landscape in the North Branch of the Waikouaiti headwaters.*
- *Reduce the visual prominence of engineered edges, overly uniform surfaces and artificial drainage features where practicable.*
- *Establish a predominantly pasture-based vegetation cover, with targeted native, riparian or wetland planting where appropriate to assist with visual integration, habitat diversity and landscape pattern.*
- *Engage with mana whenua during detailed closure and rehabilitation planning to recognise cultural landscape values and relationships associated with the Waikouaiti River North Branch headwaters.*
- *Ensure the final TSF landform reads as part of the broader rehabilitated Macraes Flat landscape, while recognising its ongoing role as a permanent engineered closure landform.*

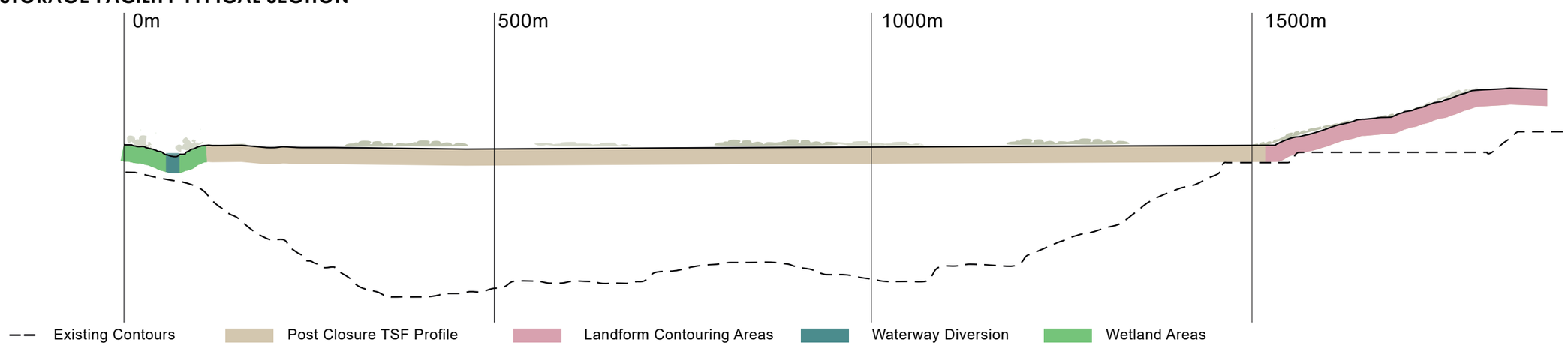
PROCESS

Rehabilitation of the TSF will begin once tailings deposition has ceased and the surface is suitable for closure works. Under MP4, the TSF will be capped and shaped to form a stable, coherent and low-maintenance landform. Detailed design will respond to engineering, geotechnical, geochemical and water-management requirements. If the mine closes early, an alternative closure treatment may be required, potentially without capping.

The rehabilitated TSF shall:

- *provide long-term containment, stability and erosion control;*
- *incorporate gentle surface variation and softened transitions to adjoining landforms;*
- *include stable drainage paths that manage runoff and protect downstream environments;*
- *use suitable growth media to support vegetation establishment;*
- *be hydroseeded promptly to stabilise the surface and establish predominantly pasture cover; and*
- *include targeted native vegetation where suitable for landscape integration, habitat diversity or ecological enhancement.*

TAILINGS STORAGE FACILITY TYPICAL SECTION



5.0 PROPOSED WORKS

MIXED TAILINGS IMPOUNDMENT

BACKGROUND

The existing Mixed Tailings Impoundment (MTI) will be lowered to approximately RL512m, with a bund retained along the perimeter at approximately RL515m. The lowered MTI will remain consistent with that consented and be rehabilitated with pasture to support grazing as part of the identified closure outcome.

REHABILITATION REQUIREMENTS

The rehabilitation requirements of the MTI are outlined as follows:

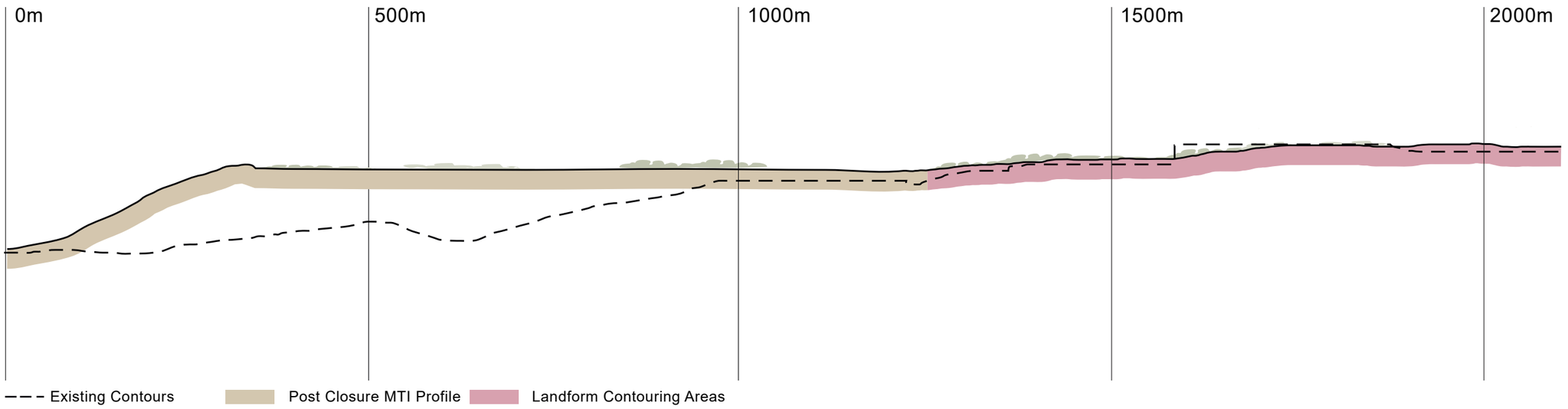
- *To recontour and distribute overburden and topsoil to reflect the surrounding landform.*
- *To hydroseed the final landform as soon as possible, softening earthworks and reinstating this area as pasture.*
- *Implement pest control to prevent weed species and pest animals from affecting the establishment of pasture or the underlying integrity of capping.*

PROCESS

The rehabilitation of the MTI will occur following removal of the upper MTI facility and is necessary to commence expanded extraction activities at Innes Mills Pit. Works associated with the MTI rehabilitation will include:

- *Smoothing and naturalise the final contours to blend in as much as possible with the adjacent landform.*
- *Dressing and distribution of topsoil to provide a growth medium for grass.*
- *Hydroseed areas that have achieved their final landform as soon as practicable.*
- *Implementation and ongoing monitoring of pest management to mitigate weed invasion, and pest animals.*

LOWERED MTI TYPICAL SECTION



5.0 PROPOSED WORKS

PIT DISTURBANCE AREAS

BACKGROUND

Pit disturbance areas comprise the disturbed ground surrounding the MP4 open pit extensions at Innes Mills, Coronation, Coronation North and Golden Bar. These areas sit outside the final pit voids but are required to support open pit mining activities during operation.

Pit disturbance areas may include temporary and semi-permanent operational areas such as ore and topsoil stockpiles, brown rock stockpiles, pipeline benches, vehicle tracks, laydown areas, pit access areas, dewatering infrastructure, monitoring infrastructure, temporary buildings, lighting, pumping and power supply infrastructure. They may also include areas where pit crests are laid back beyond the currently indicated pit shell to achieve safe and stable landforms during operations or at closure.

These areas are expected to be substantially modified during mining and should be treated as disturbed mine landforms for the purposes of landscape rehabilitation. Some parts of the pit disturbance areas will be incorporated into permanent closure features, including retained pit benches and batters, backfilled pit surfaces, pit lake margins, spillways, access routes or adjoining Waste Rock Stack interfaces. Other areas will become redundant at closure and will require recontouring, surface preparation and revegetation.

REHABILITATION REQUIREMENTS

The rehabilitation requirements for pit disturbance areas include:

- *Remove temporary operational infrastructure, redundant tracks, laydown areas and stockpile footprints where they are no longer required for closure or post-closure management;*
- *Recontour disturbed surfaces to tie into adjoining natural ground, retained pit edges, backfilled landforms, pit lake margins, spillways, haul roads and Waste Rock Stacks;*
- *Reduce abrupt changes in slope, sharp engineered edges, compacted flat pads, windrows, cut faces and visibly artificial drainage lines where practicable;*
- *Use surface roughening, localised contour variation, growth media placement and appropriate revegetation to assist visual integration and stabilisation;*
- *Retain only those access routes, benches, drains, monitoring areas and maintenance tracks required for safe long-term closure management and integrate these with surrounding landform and vegetation.*

PROCESS

Pit disturbance areas will be rehabilitated as they are no longer required for mining, stockpiling, access, water management, safety or closure construction.

Before disturbance, the extent of each pit disturbance area shall be clearly defined on the relevant construction or mine planning drawings. Topsoil and suitable growth media should be stripped, handled and stockpiled in accordance with the relevant soil management procedures. Topsoil stockpiles should be managed to remain stable, avoid unnecessary compaction, limit weed establishment and retain their value for later rehabilitation.

During operations, disturbance shall be managed to avoid unnecessary expansion of operational surfaces. Where possible, tracks, laydown areas, pipeline benches and stockpile areas should be located so they can either be reused for closure works or rehabilitated efficiently once redundant. Temporary stockpiles, windrows, drains and operational pads should be managed to avoid creating long-term artificial landform patterns that are difficult to remediate.

At closure, redundant infrastructure and temporary operational surfaces should be removed or decommissioned. Compacted areas shall be ripped or scarified where practicable. Overburden, brown rock, subsoil and topsoil should be placed as appropriate to provide a suitable surface for revegetation. Final contouring should avoid large flat engineered pads, sharp batters, continuous straight edges or visibly regular drainage lines unless these are required for safety, stability or long-term water management.

Revegetation should reflect the intended surrounding closure landcover. Where areas are planted, consideration should be given to intergration with pit lake margins, spillway corridors, drainage paths, water way diversions, gullies or adjoining rehabilitated native planting areas.

Where parts of the pit disturbance area are retained for post-closure access, inspection, monitoring, drainage or maintenance, their form and surface treatment should be integrated into the surrounding closure landscape. Redundant access routes should be ripped, recontoured and revegetated unless they are required for agreed post-closure access or recreation.

5.0 PROPOSED WORKS

OPEN PIT WORKSHOP AND PLANT

BACKGROUND

The Macraes Operation includes an established Processing Plant within the Central Mining Area, located north of the Mixed Tailings Impoundment. The Processing Plant will continue to be used during MP4 and will remain a key operational interface between the open pit mining areas, haul road network, tailings storage facilities, water management infrastructure and associated service areas.

For the purposes of this LRSMP, the Open Pit Workshop area includes the workshop and service buildings, hardstand, foundations, laydown areas, vehicle access, lighting, washdown facilities, service corridors, power, water and fuel infrastructure, and other operational surfaces.

At closure, redundant plant and associated infrastructure with open pit extraction actvities will be decommissioned and removed unless required for an approved post-mining use, closure management function, water treatment, monitoring, or ongoing site access. Following decommissioning, the remaining disturbed surfaces will be rehabilitated so they are stable, free draining, visually recessive, and integrated with adjoining rehabilitated landforms and land cover.

REHABILITATION REQUIREMENTS

The rehabilitation requirements for the Open Pit Workshop and redundant plant are:

- *Remove redundant buildings, hardstand and infrastructure.*
- *Retain only infrastructure required for an approved post-closure function.*
- *Decompact and reshape disturbed surfaces to integrate with adjoining landforms.*
- *Establish stable drainage and suitable growth media.*
- *Revegetate completed areas promptly and control pests during establishment.*

PROCESS

The workshop and associated plant will remain operational while required for MP4. Peripheral areas shall be rehabilitated progressively where practicable. At closure:

- *confirm which infrastructure will be removed or retained;*
- *remove redundant infrastructure and manage contaminated materials;*
- *decompact, regrade and drain disturbed surfaces;*
- *apply suitable growth media and revegetate; and*
- *monitor establishment and undertake remedial work where required.*

The completed area shall form a stable and coherent part of the rehabilitated Macraes landscape.

5.0 PROPOSED WORKS

HAUL ROADS

BACKGROUND

The Macraes Operation includes an established haul road network across the wider Site that supports the movement of ore and waste rock between open pit mining areas, the Processing Plant, Waste Rock Stacks and Central Mining Area.

For MP4, haul road use will include continued use of the Coro Haul Road, and recommissioning of the existing private haul road associated with the Golden Bar Mining Area. The Golden Bar haul road is located immediately west of the public Golden Bar Road and connects the Golden Bar Mining Area with the Central Mining Area.

At closure, haul roads will be treated according to their intended post-mining function. The recommissioned Golden Bar haul road and other haul road surfaces that are not required for post-closure access, monitoring, maintenance or land management will be decommissioned and rehabilitated to integrate with surrounding landform and land cover.

REHABILITATION REQUIREMENTS

The key rehabilitation requirements for haul roads are to:

- *Retain only those road sections required for post-closure access, monitoring, maintenance or land management.*
- *Coro Haul Road to be reinstated as Golden Point Road.*
- *Rehabilitate redundant haul road sections so they integrate with adjoining landform and surrounding land cover.*

PROCESS

Rehabilitation of haul roads will generally occur once the relevant road section is no longer required for active mining, construction, closure works, monitoring or ongoing land management access. Some road sections may therefore remain in use beyond the completion of nearby extraction activities where they are required to support wider site closure works.

The closure treatment of each haul road section will be confirmed through detailed closure planning and will depend on whether the road is to be retained, reduced in width, converted to rural access, or fully decommissioned.

For redundant haul road sections, rehabilitation will generally include:

- *Confirming which road sections are to be retained, reduced, realigned or decommissioned.*
- *Removing redundant road furniture, services, culverts, drainage structures, signage, lighting or other infrastructure unless required for an approved post-closure function.*
- *Ripping or scarifying compacted haul road surfaces to relieve compaction and assist infiltration.*
- *Recontouring road surfaces, shoulders, windrows, cut batters and fill batters to reduce linearity and integrate with adjacent landform.*
- *Redistributing suitable windrow material across the former road profile to create a more natural and varied surface.*

For the Coro Haul Road, rehabilitation will focus on its conversion to a gravel access road. This will include rationalising the operational haul road formation, reducing unnecessary width where practicable, softening road margins, treating redundant haul road edges, and integrating the retained access route with adjoining rehabilitated landforms and any new or modified road connections.

For the recommissioned Golden Bar haul road, rehabilitation will focus on removing its operational haul road character where it is no longer required, breaking up compacted running surfaces, recontouring road margins and reinstating vegetation cover so that the former road corridor becomes visually recessive within the surrounding land cover.

5.0 PROPOSED WORKS

NEW ROADS AND RECREATION TRACKS

BACKGROUND

Macraes Road will be realigned as part of enabling MP4. In addition, a new operational road is proposed from the northern end of Golden Point Road to maintain access between Coronation Pit and Trimbells Waste Rock Stack following the removal of part of Matheson Road. Post-closure recreation tracks are also proposed through the Central Mining Area, connecting Golden Point Road, the Process Plant, Macraes Road, Golden Point Historic Reserve and selected lookout opportunities. Final alignments and access arrangements will be confirmed through detailed closure planning.

REHABILITATION REQUIREMENTS

New roads and recreation tracks shall:

- *provide safe and practical operational, closure, maintenance and recreation access;*
- *use existing roads and disturbed land where practicable;*
- *minimise their width, earthworks and visual prominence; and*
- *integrate with surrounding rehabilitated landforms and vegetation.*

PROCESS

The final alignment, function and treatment of new roads and recreation tracks that remain the consent holder's responsibility will be confirmed through the Landscape Closure Plan, having regard to operational requirements, public safety, land ownership, access obligations, drainage, ecological constraints and ongoing maintenance. The following measures shall apply:

- *Confirm retained and redundant routes through the Landscape Closure Plan.*
- *Decommission, recontour and revegetate roads and tracks no longer required.*
- *Narrow retained routes and remove unnecessary windrows, shoulders, hardstand and engineered edges.*
- *Align new sections with existing disturbed ground and landform transitions where practicable.*
- *Provide stable, erosion-resistant drainage integrated with the wider closure drainage system.*
- *Use durable but visually recessive track surfaces, signage, gates and barriers.*
- *Monitor stability, drainage, vegetation, weeds and unauthorised access, and undertake remedial work where required.*

5.0 PROPOSED WORKS

PERMANENT WATER DIVERSION

BACKGROUND

At present the headwaters of the Waikouaiti River North Branch are disconnected from the remainder of the upper reaches. As part of MP4, this will be reconnected alongside a realigned section of Macraes Road through the Central Mining Area. Riparian vegetation will be planted each side of the active bed. The rehabilitation outcomes for the reconnection of the catchment headwaters seek to enable the future improvement in mauri of the headwaters and will remain subject to ongoing engagement with mana whenua.

An additional diversion is required adjoining Trimbells and follows the same rehabilitation principles, including naturalised channel form, stable margins, riparian planting and ongoing monitoring.

REHABILITATION REQUIREMENTS

The rehabilitation requirements for reconnecting the headwaters are outlined as follows:

- *Dressing and distribution of topsoil and brown rock to provide a growth medium for grass and riparian planting.*
- *To establish riparian plantings along margins to create a more coherent ecological connection between the upper catchment of Waikouaiti River North Branch.*
- *Engage with mana whenua during detailed design and rehabilitation to recognise cultural landscape values and relationships associated with the river headwaters.*

PROCESS

The rehabilitation of the catchment headwaters will commence concurrently with the creation of Macraes Road on the Frasers TSF embankment. Works associated with the rehabilitation of Permanent Water Diversion will include:

- *Confirming the final diversion alignment, channel profile, bed treatment, bank gradients and tie-ins with the wider drainage network.*
- *Shaping the channel and margins to provide a stable flow path and reduce the appearance of a straight or overly engineered drain where practicable.*
- *Placing suitable bed and bank materials, including brown rock or other approved material where required for erosion protection and channel stability.*
- *Dressing adjoining margins with suitable overburden and topsoil to provide a growth medium for grass and riparian vegetation.*
- *Hydroseeding or grassing disturbed margins where appropriate to provide rapid surface stabilisation.*
- *Establishing riparian planting along both sides of the active bed, using species and densities appropriate to site conditions and the intended closure outcome.*
- *Installing temporary erosion and sediment controls as required during establishment.*

SPILLWAYS

BACKGROUND

Spillways are linear feature that will be constructed at Coronation Pit, Coronation North Pit and Golden Bar Pit and as part of conveying water from the capped Frasers TSF. Spillways will enable any excess lake water overflow to discharge to the wider water catchment, including Coal Creek, Deepdell Creek and Golden Bar Creek. Spillways at Coronation and Coronation North Pits will be cut into in-situ rock to ensure long-term stability against erosion.

Spillway inverts will avoid seepage flow paths from the lake pits through adjacent engineered landform (waste rock stacks). Where practicable Riparian and wetland plantings will be implemented downstream to provide ecological outcomes.

REHABILITATION REQUIREMENTS

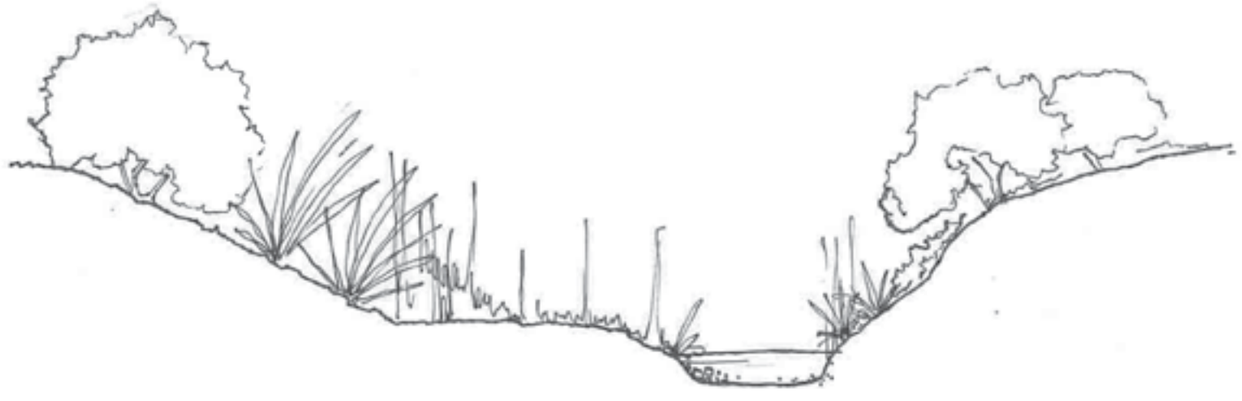
The rehabilitation requirements for Spillways are outlined as follows:

- *Engage with mana whenua so rehabilitation recognises cultural relationships with water and supports the regeneration of mauri.*
- *To establish riparian plantings downstream of margins of spillways within defined waterway enhancment areas where this promotes ecological and cultural outcomes.*

PROCESS

Spillways will be formed following completion of open pits and capped tailings areas. Their alignment, dimensions, gradients, erosion protection and outlet treatments will be determined through engineering, geotechnical and water-management design. This shall remain subject to ongoing mana whenua engagement and more detailed closure provisions.

TSF WATER DIVERSION AND WETLAND AREAS



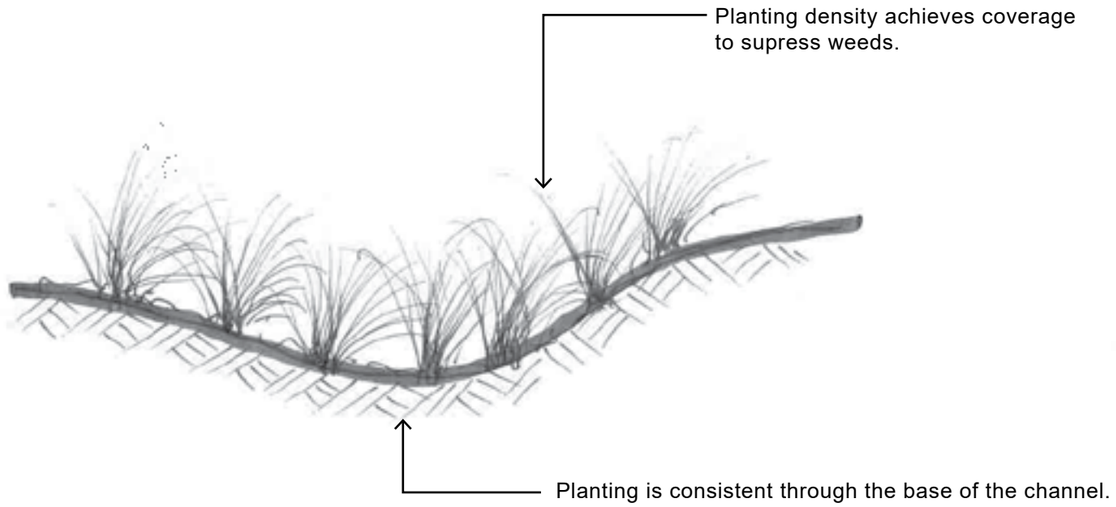
5.0 PROPOSED WORKS

RIPARIAN PLANTING

The following describes the landscape outcomes for areas marked as riparian planting on the Landscape Mitigation and Closure Plans. This applies to waterways that are outside of the reaches described in the MP4 Stream Compensation Plan (Viridis).

Riparian planting is proposed primarily to support landscape character, with potential additional benefits of improving water quality, reducing erosion, providing habitat and responding to cultural values. Planting will be fenced during establishment to protect from stock.

TYPICAL CROSS SECTION



PLANT PALETTE

Plants will be selected from the MP4 Stream Compensation Plan plant palettes and will vary according to local topography and aspect.

Waterways are expected to be predominantly ephemeral, remaining dry for much of the year and becoming inundated during storm events. Planting in these areas, including on waste rock stacks and the FTSF embankment, will be predominantly tussock species.

In steeper channels, south-facing areas, locations that remain wetter for longer periods, planting will be dominated by flax, supplemented with a range of shrub species.

In consistently wet areas, such as those immediately upstream of the FTSF embankment, wet-tolerant species should be selected.

All species selected should be capable of tolerating periodic drought conditions.
Trial plantings at each location would be beneficial to confirm species suitability and establishment success under site-specific conditions.recommended to confirm plant suitability.

EXAMPLE OF FLAX DOMINANT RIPARIAN PLANTING AT CORONATION PIT.

5.0 PROPOSED WORKS

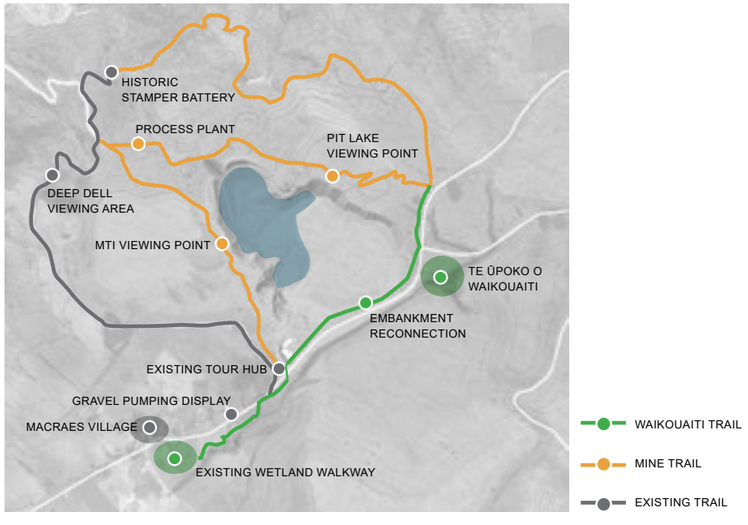
RECREATION TRAILS

A network of informal gravel walking and cycling trails is proposed to provide opportunities for visitors to explore and experience the rehabilitated mining landscape. The primary focus is the Central Mine area, with connections to Macraes township, existing recreational trails, and other points of interest throughout the site. Recreation trails are still ‘concept’ and will be subject to confirmation at closure based on compatibility with future land use and site geotechnical considerations. The trail network is intended to provide two experiences:

WAIKOUAITI TRAIL
This trail follows the restored wetland complex to the headwaters of the Waikouaiti River North Branch, a place of cultural significance to mana whenua. The route provides opportunities for visitors to connect with the awa, understand its cultural values, and appreciate the ecological restoration undertaken as part of mine closure. Potential features may include viewing platforms, cultural markers, and interpretive signage that communicate the site’s environmental, cultural, and restoration narratives.

MINE TRAIL
This trail traverses the rehabilitated mining landscape, following prominent landforms and leading visitors through the heart of the central mining area. A series of elevated viewpoints would provide opportunities to appreciate the scale, character, and transformation of the site. This trail connects the ‘new’ mining with the heritage mine features

Interpretive elements could highlight key mining features, explain the evolution of the landscape, and tell the story of both historic and modern mining activities. The trail would also connect with the wider recreational network and complementary heritage attractions within the Macraes area. If the site proceeds with recreation track creation, their layout/design will be confirmed in the Site Closure and Decommissioning Plan.




SIGNAGE TO TELL THE STORY OF WETLAND RESTORATION FLORA AND FAUNA


INTERPRETATION SIGNAGE TO DESCRIBE THE MINE FEATURES FROM VIEW POINTS


LOW IMPACT TRACKS THAT PROVIDE ACCESS WITH MINIMAL DISTURBANCE AND MAINTENANCE


GRAVEL / DIRT TRACKS SUITABLE FOR BIKES


MARKERS TO SUPPORT WAYFINDING

6.0
MINE REHABILITATION ACTIONS

6.0 MINE REHABILITATION ACTIONS

STAGING OF EXTRACTION WORKS

Planning for future rehabilitation as an integrated outcome of MP4. Ensuring rehabilitation planning is factored into the proposed sequence of the mine helps ensure that rehabilitation is undertaken in areas where mining activity has concluded, as early as possible. It also ensures that rehabilitation effort is not wasted on areas which will be disturbed again later.

ACTION:

1. Ensure mining activity adopts a sequential approach to rehabilitation that avoids or mitigates future disturbance of completed areas.

VEGETATION PROTECTION

Remnants and areas of restored vegetation during the proposed mining operation provide a vital role in future rehabilitation, acting as a seed source, providing shelter and habitat for native flora which will encourage natural seed dispersal. Prior to the commencement of operations in each stage, the extent of mining and earthworks activities will be clearly understood and may include marking on the ground and fencing to prevent accidental removal of vegetation.

ACTION:

2. Prior to commencement of earthworks, ensure that the limits of vegetation clearance are clearly known and understood to prevent vehicle access and unintended vegetation clearance or damage outside approved clearance areas.

VEGETATION REMOVAL AND STOCKPILING

Where native vegetation is removed this will be mulched and stockpiled where practicable. Similarly, the top layers of material will be stockpiled separately where practicable such that soils or substrates in the top 200mm of the extraction footprint are kept separate from the underlying overburden materials and subsoil. This is important for the successful re-use of the top layers as rehabilitation growth and seed media for establishing vegetation cover. The mulch can also be mixed with the top layer material to provide suitable substrate for planting and natural regeneration in addition to topsoil.

Mulch and topsoil stockpiles need to be in suitable locations within the Site where they will not be subject to compaction by machinery. Stockpiles should respond to the underlying landform, and will be revegetated to assimilate within the surrounding landcover and stabilise and reduce dust. The process of rehabilitation shall ensure that the soil is stored for as short as time as possible to prevent deterioration. This will entail a co-ordinated programme of stripping, storage and re-spreading as required.

In addition to top layer and mulched vegetation there are by-products such as overburden, which can potentially be used in the preparation of planting substrate. The addition of a ‘blended’ combination of these different materials to the uppermost layer of fill can improve both physical properties and fertility making the resultant areas more suitable for plant establishment and growth. The need for such a blend will depend on the properties of the fill material and would be investigated during the first years of the rehabilitation plan.

ACTION:

3. Separate the layer of topsoil up to ~200mm where it exists to that depth, mulched vegetation and underlying overburden and store separately in stockpiles which respond to the underlying landform.

LANDFORM NATURALISATION

Benches and faces that indicate an area has been mined or subjected to disposal of waste rock material usually run along the contour of the site and against the natural ‘grain’ of the landscape. Covering or removing them, reshaping to reduce benching and enabling reinstatement with vegetation is often the key to reducing their visibility. In some instances, high walls from ongoing excavation and existing benching associated with engineered landforms will remain in perpetuity.

The nature of extraction activity means ongoing landform modification forms an integral part of the overall operation and will be implemented progressively as mining activity is undertaken. This will include operations carried out to prepare the Site for rehabilitation. Through landscape rehabilitation, landform modification resulting from MP4 will facilitate the creation of sympathetic landforms which resemble the surrounding landscape alongside placing of growing medium (topsoil) and reinstating in suitable vegetation. An element of benching will inevitably remain in mined areas and may likely be required to meet drainage and future access requirements.

ACTION:

4. Ensure that the final MP4 landform will remove obvious benching and ‘soften’ and assimilate disposed material within this landscape.
5. Identify and allocate the necessary volume of overburden material to support ongoing pasture and grassland rehabilitation.
6. Modify final surfaces to reduce artificial engineered appearance and support revegetation.

6.0 MINE REHABILITATION ACTIONS

DRAINAGE AND HYDROLOGY

As part of landform naturalisation, drainage needs to be considered to prevent scouring and erosion across benches and down faces. Cut-off drains or berms are particularly important to prevent loss of replaced soils and to create stable post-mining environments for plant establishment and to ensure safe environments in future years. Drainage is also considered from the perspective of minimising unintended water retention and ponding.

Rehabilitation substrates are likely to be free-draining aggregates and water retention in suitable areas will be important to successful establishment and progressive development of vegetation communities in these areas.

ACTION:

7. Ensure drainage is included as part of the landform modification process to prevent scouring and erosion of rehabilitated landforms and planted areas.

SOIL PREPARATION

Soil preparation is a key element of a successful rehabilitation plan both for areas left to regenerate naturally and for areas to be planted. With good planning, a reasonable proportion of the soil can be sourced from within the Site by mulching vegetation, stockpiling of topsoil and inclusion of mining by-products. This strategy does not need to rely on imported topsoil, though this may be needed.

The mix of overburden and topsoil needs to be determined for each project element depending on its unique properties and planting needs. Adequate fertilisation of plants also needs to be considered in the final mix. Soils will be stabilised as each section of rehabilitation is completed to reduce erosion and dust problems.

This LRSMP seeks to make use of a suitable 'growing medium' for the successful re-establishment of grassland vegetation cover within the Site, and protection of the rehabilitated landform from erosion. The establishment of a suitable growing medium should include the following[5]:

- *Adequate infiltration capacity.*
- *An adequate available water supply.*
- *Adequate aeration.*
- *Provide an adequate rooting depth, not restricted by mechanical impedance or by hostile subsoil conditions.*
- *Capable of supplying adequate plant nutrients.*
- *Be free from excessive salinity, acidity, and alkalinity.*
- *Provide the microbial associations necessary for plant growth.*

In addition to establishing a suitable growing medium to support fast-growing, native vegetation (together with grass hydro-seeding or seeding), pest control will be required to minimise the presence of invasive weeds, and pest animals that may prevent effective establishment of native plant communities.

ACTION:

8. Identify and allocate the necessary volume and composition of growing medium required and include spreading of a suitable growth medium as an integral part of the overall operation.
9. Ensure hydroseeded grass and native vegetation is managed in conjunction with a pest control plan to minimise effects of pest animals and invasive weeds on these areas being established.

[5] Mine Rehabilitation - Leading Practice Sustainable Development Program for the Mining Industry, 2016

6.0 MINE REHABILITATION ACTIONS

REVEGETATION

Revegetation of the Site will be required in suitable areas to assist in mitigating the effects of vegetation loss and softening resultant rehabilitated landforms associated with extraction and establishment of mining infrastructure. To successfully revegetate the Site, a species list has been developed which has been informed by vegetation present within the Site, and the Site's ecological district (Macraes Ecological District).

The LRSMP provides a framework for refining rehabilitation works including plant schedules over time and requires planting plans be adapted to support successful rehabilitation (as they become available). This allows further knowledge to be gathered and applied throughout the rehabilitation process so that ground preparation and planting can be refined to deliver the most effective outcome. This also allows managers to accurately predict the future performance of native vegetation cover being established to achieve as much coverage of the Site as feasible.

Planting is employed to encourage pasture interspersed with representative native vegetation cover along rehabilitated land surfaces and waterbodies and their margins. Ultimately, this will assist with enhancing the overall landscape character and ecological outcomes. The approach taken should allow for one planting event to establish pioneer species suited to identified areas. The management of pest plants and pest animals during operation forms a key element to enhance the success of planting.

All plants should be sourced from local plant populations, where possible, to ensure that they are ecologically compatible and suitable for the environs (i.e. eco-sourced). Any holding area will need to ensure that wet tolerant plants remain in a moist environment which prevents potential damage from drying out during transportation and prior to planting.

Small grade plants will generally be used (i.e. up to PB3 or 1 litre grade) because they will acclimatise and establish more readily than larger grades. Tussock and Grey Scrub planting should achieve 1,100 plants per hectare within indicative areas shown in the approved landscape Closure Plan in accrodance with

HYDROSEEDING OR OTHER SUITABLE ALTERNATIVE

In the short term, hydroseeding or other alternative such as straw mulch and grass seeding helps to stabilise batter slopes, reduce runoff and erosion, bind soils preventing dust problems, softens visual cuts and earthworks, and inhibits invasion by some pest plants.

Hydroseeding needs to be carried out very soon after completion of preparatory works and before the slopes dry out. Timing and coordinating the hydroseeding with completion is therefore important.

PLANTING

The aim of planting is to create 'islands' of planted vegetation which spread outwards and assists the natural regeneration of adjacent areas through shelter and seed dispersal. The most favourable sites (microsites) will be selected for planting to remediate areas of mine disturbance where indigenous vegetation is cleared. All areas of planting are to be accompanied by a full planting specification to be developed progressively as part of the staged plans.

This strategy provides an indication of the plant species that may be used and the relative importance of them (Tables 1 and 2) in a prospective planting programme for areas as they become available for rehabilitation. As evidence from previously retired areas and from natural regeneration on adjacent lands cleared for farming shows, native plant species will readily colonise, establish and form self-sustaining plant communities with minimum human intervention.

On all areas that are planted as part of the landscape closure plan, the following practices will be adopted:

- Planting needs to be well planned so that the right species are planted at the right time. Usually 2-3 years lead time is required to enable sufficient quantities of appropriate locally sourced plant species to be propagated;
- The extent of planting programmed to be done each year needs to be determined in relation to the resources available for maintenance in subsequent years;
- Species will be sourced from local plant populations to ensure that they are ecologically compatible and suitable for the environs (i.e eco-sourced);
- All plants will be suitably acclimatised to local conditions prior to planting. If plants are propagated outside the Macraes Flat ecological district this may involve bringing them to a suitable holding area or nursery several months before they are planted;
- Small grade plants will be used (i.e. up to PB3 or 1L grade) because they will acclimatise and establish more readily than larger grades;
- Plants will receive locally applied fertiliser (e.g. fertiliser tab or long-release granules) and be marked with a stake to facilitate re-location in the future;
- Plants are generally planted in a coherent pattern that is easy to locate in the future during follow up maintenance work and so that the level of plant survival can be easily determined.

All revegetation work requires some maintenance; plants will most likely need to be 'released' from competing unwanted species, particularly if smothering grasses are present. Where planting is undertaken, maintenance will be programmed and costed for at least the first two to three years after planting; after that plants will likely be well established and self-sustaining. On an exposed site, maintenance work will initially involve replacing dead plants ('blanking') and cutting back/removing unwanted and competing species.

Staging a revegetation programme over several years is critical to its success. This will accommodate any unexpected seasonal events such as a particularly wet winter or a particularly dry summer. It also enables any adjustments to be made with regard to species composition timing and methods of planting that are obtained from monitoring previous planting.

Staging revegetation work over several years also allows maintenance to be more easily accommodated. The amount of planting done each year will be relative to the level of resources available for maintenance in successive years. Many revegetation programmes have failed when very large areas of planting have been completed in year one but there are insufficient resources for maintenance in subsequent years.

Plant species proposed are listed in Table 6. All of these species are present within the surrounding landscape and seed or cuttings can be sourced locally from naturally occurring populations to provide material for propagation.

ACTION:

10. Preparation of a detailed revegetation plan prior to each area or mining area becoming available for rehabilitation.
11. Revegetation programme to include design specifications and a monitoring and maintenance programme.
12. Information from monitored trial revegetation and rehabilitation sites will be used to inform future rehabilitation, including planting programmes, to maximise revegetation outcomes.
13. Where the availability of resources at prospective revegetation sites differs markedly from that described in this LRSMP, a full analysis of options and implications will be undertaken.

6.0 MINE REHABILITATION ACTIONS

Plant species proposed are listed in **Table 1**. All of these species are present within the surrounding landscape and seed or cuttings can be sourced locally from naturally occurring populations to provide material for propagation.

TABLE 1: INDICATIVE TUSSOCK GRASSLAND SPECIES LIST FOR PROPAGATION AND INCLUSION IN THE REHABILITATION PLANTING PROGRAMME. IT IS EXPECTED THAT THIS PLANT SPECIES LIST WILL BE REFINED AS PART OF AN ONGOING PROCESS OF MEASURING ON-SITE PLANT PERFORMANCE AND TAILORING PLANTING LISTS TO SPECIFIC SITE CHARACTERISTICS.

BOTANICAL NAME	COMMON NAME	GRADE (L)	SPACING(M)	COMPOSITION (%)	NOTES
Aciphylla aurea	Golden spaniard	0.25	0.5	3	Taoka species
Aciphylla subflabellata	Speargrass	0.25	0.5	5	Threatened / At Risk (TAR) insect host (*Dasyuris partheniata*) Taoka species.
Carmichaelia crassicaulis subsp. *crassicaulis*	Coral broom	1	1	8	TAR insect host (*Pasiphila* sp., *Samana acutata*, *Theoxena scissaria*) Both broom species are vulnerable to browsing from stock and pests. Will need to be planted in larger grades to improve survival. Snail bait also a useful option.
Carmichaelia petriei	Desert broom	1	1	7	TAR insect host (*Pasiphila* sp., *Samana acutata*, *Theoxena scissaria*)
Chionochloa rigida subsp. *Rigida*	Narrow-leaved snow tussock	0.25	0.5	32	TAR insect host (*Orocrambus sophistes*)
Festuca novae-zelandiae	Hard tussock	0.25	0.5	15	
Poa cita	Wī / Silver tussock	0.25	0.5	15	Taoka species
Poa colensoi	Blue tussock	0.25	0.5	15	Taoka species

6.0 MINE REHABILITATION ACTIONS

TABLE 2: INDICATIVE GREY SCRUBLAND LIST FOR PROPAGATION AND INCLUSION IN THE REHABILITATION PLANTING PROGRAMME.

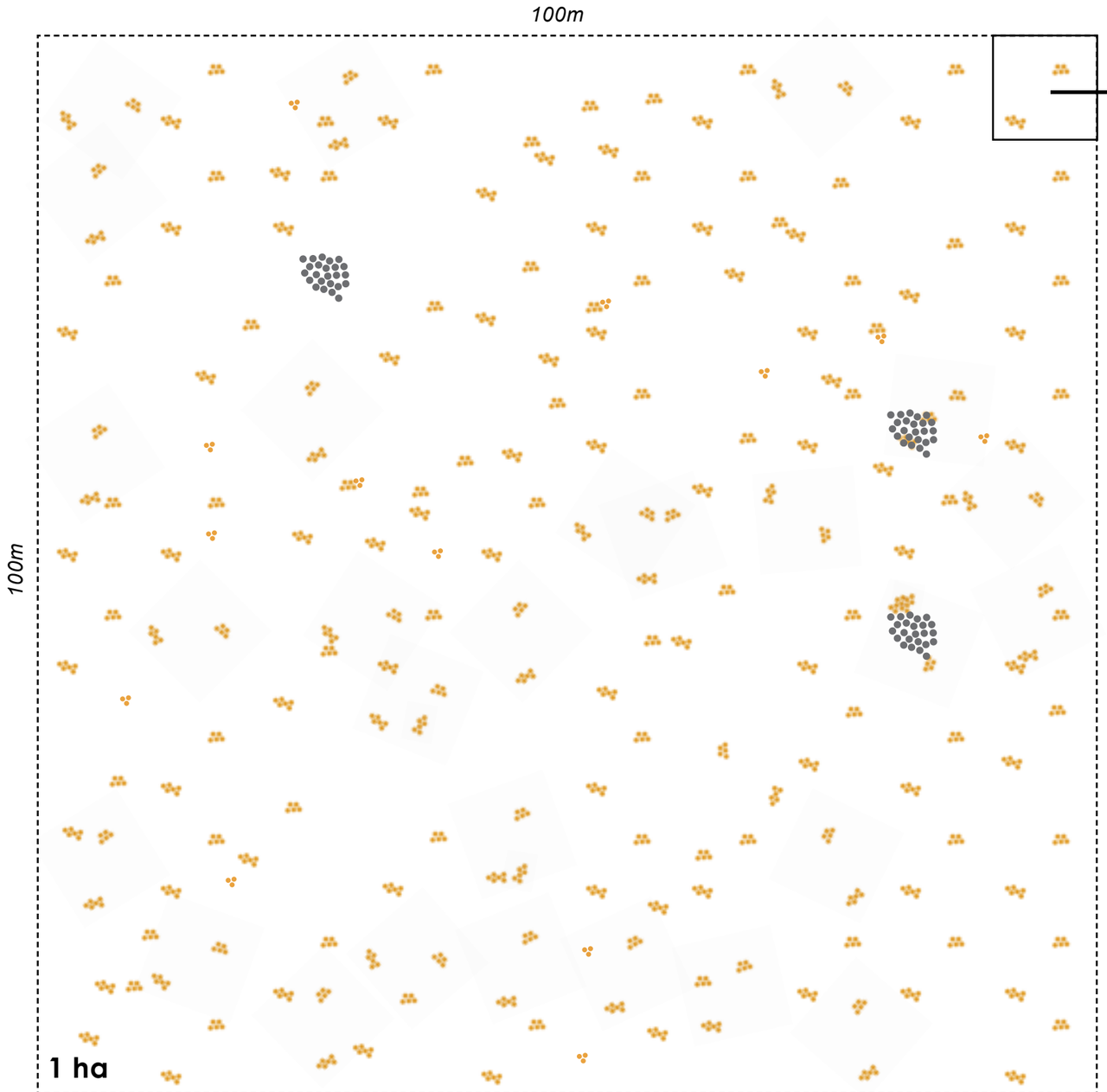
BOTANICAL NAME	COMMON NAME	GRADE (L)	SPACING(M)	COMPOSITION (%)	NOTES
Carmichaelia crassicaulis subsp. *Crassicaulis*	Coral broom	1	1	6	Threatened / At Risk (TAR) insect host (*Pasiphila* sp., *Samana acutata*, *Theoxena scissaria*)
Carmichaelia petriei	Desert broom	1	1.5	6	TAR insect host (*Pasiphila* sp., *Samana acutata*, *Theoxena scissaria*)
Coprosma crassifolia	Mikimiki	0.5	1.5	4	TAR insect host (*Bityla sericea*)
Coprosma intertexta	Coprosma	0.5	1.5	6	TAR insect host (*Bityla sericea*)
Coprosma propinqua	Mingimingi	0.5	1.5	4	TAR insect host (*Bityla sericea*)
Corokia cotoneaster	Korokio	0.25	15	4	Taoka species
Discaria toumatou	Matagouri	0.25	1.5	8	
Helichrysum lanceolatum	Niniao	0.25	1.5	6	
Leptospermum scoparium	Mānuka	0.25	3	5	Taoka species
Melicytus alpinus	Porcupine shrub	0.25	1	8	
Myrsine divaricata	Weeping matipo	0.25	1.5	4	
Olearia fragrantissima	Fragrant tree daisy	0.5	6	7	
Olearia lineata	Tree daisy	0.5	6	7	
Olearia odorata	Scented tree daisy	0.5	6	7	
Ozothamnus vauilliersii	Mountain tauhinu	0.25	1.5	4	
Sophora microphylla	Kōwhai	1	6	8	Taoka species
Teucrium parvifolium	Teucridium	0.25	1.5	6	

6.0 MINE REHABILITATION ACTIONS

TUSSOCK REHABILITATION

DISTRIBUTION

Within the areas indicated on the Landscape Closure plans, tussock and grey scrub planting covers a totla of 168 ha. to be distributed as follows. This will be subject to temporary stock exclusion.



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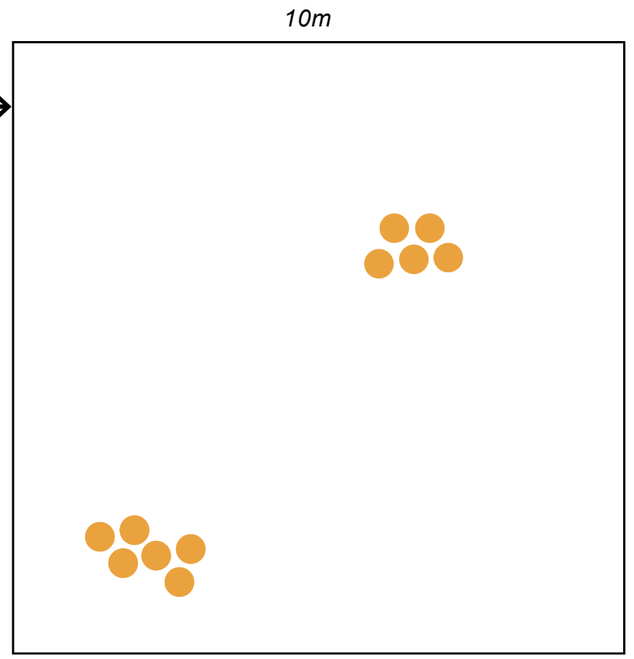

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TUSSOCK

- 1 ha = 1,100 plants
- Clustered in groups of 3-15 plants
- Avoid planting in lines, use natural composition to cluster plants.

GREY SCRUB

- 3 large clusters of 25 plants to be provided per ha.
- When rock stacks are present, colocate with the cluster.

Example of tussock and grey scrub distribution on site

6.0 MINE REHABILITATION ACTIONS

ROCK STACKS

Rockstacks reflect scattered schist rock that is characteristic features of the wider Macraes Flat upland landscape. They contribute to the visual texture, geological expression and landscape character of the surrounding rolling schist hill country, including along broad ridge crests, skyline areas, gullies and pastoral slopes.

As part of the final rehabilitation of the Waste Rock Stacks, constructed rock stack features may be incorporated as an additional landscape treatment. These features are intended to assist the visual integration of completed Waste Rock Stacks by introducing irregular rock structure, shadowing, surface texture and planting microsites that reflect the wider schist hill-country setting.

For clarity, these features are not relied on as ecological compensation or as the primary replacement of rock habitat affected by MP4. Rock habitat replacement for lizard values is addressed separately through the Lizard Management Plan, including constructed rock piles within the Murphys Ecological Enhancement Area. The purpose of this section is to guide the use of rock stacks as a landscape rehabilitation measure on completed Waste Rock Stack surfaces.

Rock stack features should be incorporated progressively as Waste Rock Stack surfaces become available for final rehabilitation. Their detailed design and placement will be confirmed through the relevant detailed rehabilitation or closure plan for each Waste Rock Stack area, having regard to final landform design, drainage, cover requirements, geotechnical stability, material availability, visibility and safe construction access.

The design should generally include:

- larger competent schist or suitable waste rock placed to form occasional tor-like clusters;
- smaller rock and boulder scatter extending downslope or around each cluster to create a natural boulder field transition;
- irregular spacing, size and orientation of rock features to avoid an engineered or decorative appearance;
- localised soil and root-zone pockets around the margins of rock features to support revegetation;
- roughened and irregular surrounding ground surfaces to reduce visual uniformity and create favourable planting microsites; and
- native tussock, grassland and shrub planting around selected rock features where this assists landscape integration and long-term vegetation establishment.

PLACEMENT AND PROFILE

Rock features should be placed on completed Waste Rock Stack surfaces where they can be safely constructed, remain stable, and contribute to landscape integration. They should generally be located on broad shoulders, upper slope breaks, selected benches, crest transitions and visible midslope areas where they can be integrated with final contouring and revegetation.

Placement should avoid pit lakes, wetlands, spillways, permanent inundation areas, engineered drainage channels, sediment-control areas, access tracks, unstable batters, capped constraint areas and locations where rock placement would compromise surface water management, geochemical cover requirements, maintenance access or long-term landform stability.

The cross-section profile should avoid the appearance of rocks being simply tipped onto a finished surface. Larger rocks should be keyed into the prepared surface so that they appear embedded within the landform. Smaller rocks should be used around the margins to create a transition from the main rock cluster into the surrounding rehabilitated surface. Soil should be placed around the lower margins and in adjacent pockets to support revegetation, but should not be used in a way that creates artificial mounding or visually regular planting beds.

The arrangement should be deliberately irregular. Rock stacks should not be placed in lines, grids or evenly spaced rows. Instead, they should be clustered in a manner that reflects natural schist outcrop patterns, with occasional larger features, smaller associated boulder scatter and intervening areas of open grassland or tussock grassland. This will help avoid an obviously engineered appearance and support the wider objective of blending rehabilitated Waste Rock Stacks into the surrounding landscape.

As an indicative landscape outcome, rock tor and boulder field clusters should be provided to replace up to 42 tors that are lost, subject to suitable rock availability, landform stability, drainage requirements, cover design and safe construction access. The final number, size and location of these features shall be confirmed through trialling and the associated detailed closure plan for each Waste Rock Stack.

The final design should make use of suitable rock salvaged or separated during mining where practicable. Larger competent rocks and boulders should be identified and stockpiled separately where they are required for later placement. Construction methods should be trialled and refined during the early stages of rehabilitation, including testing the most efficient means of placing rock to achieve stable, natural-looking forms and associated planting microsites.

Before rock stack features are incorporated more widely, OGL will undertake a construction trial in a representative location where suitable rock material and safe access are available. The trial will test the practicability of rock selection, handling and placement; integration with final cover, drainage and revegetation requirements; geotechnical stability; and the resulting landscape appearance.

The trial shall be reviewed by OGL's operations and rehabilitation teams, with input from a suitably qualified landscape architect and geotechnical specialist. Its outcomes shall be documented, including photographs, and used to determine:

- whether these features can be safely and practically constructed;
- the locations and circumstances in which they are appropriate;
- any necessary changes to their design or construction methodology; and
- whether alternative surface treatments would provide a more practicable means of achieving the intended landscape outcome.

The findings shall inform the relevant detailed rehabilitation or closure plans. Rock stack features will only be incorporated where the trial demonstrates that they are practicable, stable and compatible with the wider rehabilitation requirements.

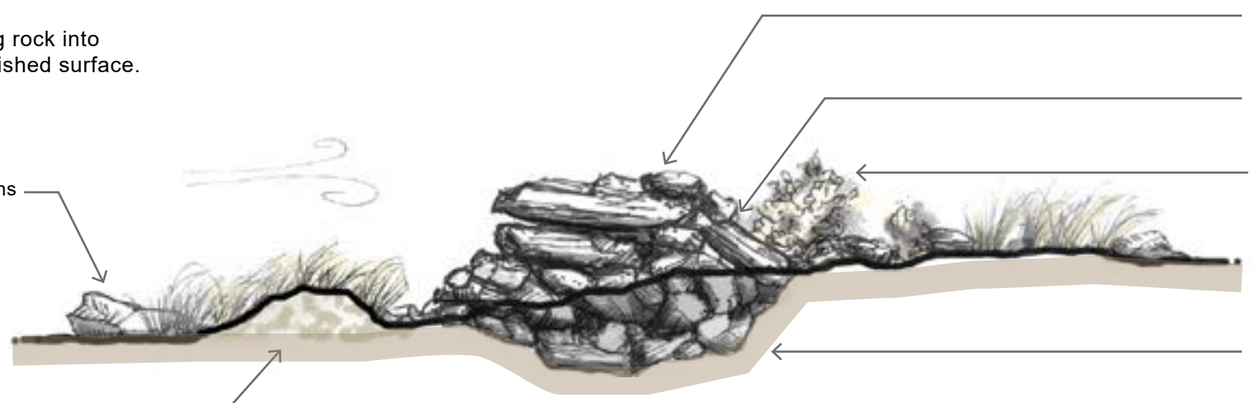
ACTION:

14. Identify and stockpile suitable larger rock and boulder material for reuse in landscape rock tor and boulder field features on completed Waste Rock Stacks.
15. Include rock tor and boulder field placement as part of the detailed rehabilitation or closure plan for each relevant Waste Rock Stack area.
16. Confirm the final number, size and location of rock tor and boulder field clusters through detailed closure design.
17. Construct rock features so that larger rocks are keyed into the final landform and smaller rocks are scattered around them to create natural-looking boulder field transitions.
18. Avoid regular, linear, evenly spaced or skyline-breaking rock placement patterns, and instead arrange features in irregular clusters that reflect the broader schist hill-country character.
19. Integrate rock tor and boulder field features with final contouring, drainage design and native revegetation, including tussock, grassland and shrub planting where this assists landscape integration and long-term vegetation establishment.

6.0 MINE REHABILITATION ACTIONS

TYPICAL FORM

The cross-section profile can entail locating rock into suitable locations as part of achieving a finished surface.



Smaller rocks should be used around the margins to create a transition from the main rock cluster into the surrounding rehabilitated surface.

Brown rock and soil used to create deeper soils on exposed side of rock stack (more protection) on waste rock cap. Soil should be placed around the lower margins and in adjacent pockets to support revegetation, but should not be used in a way that impedes drainage or creates artificial mounding or visually regular planting beds.

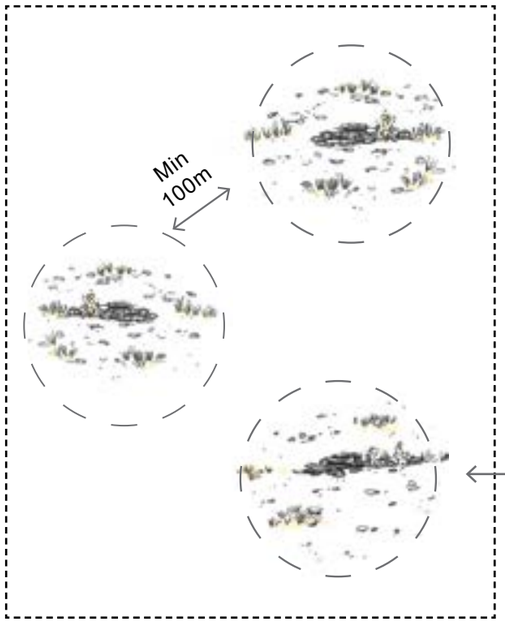
Rock stack <2m high; rocks placed to deliver clean near horizontal cracks up to 10mm as wedges. Minimum 10 rocks >0.5 diameter.

Larger rocks should be tipped onto prepared surface so that they appear embedded within the landform.

Shrubs/vines between outer boulders on the sheltered side. 25 nursery seedlings per rock stack with added organic mulches / amendments.

Rocks to be placed on capped surface formed to limit water percolation.

TYPICAL CLUSTER



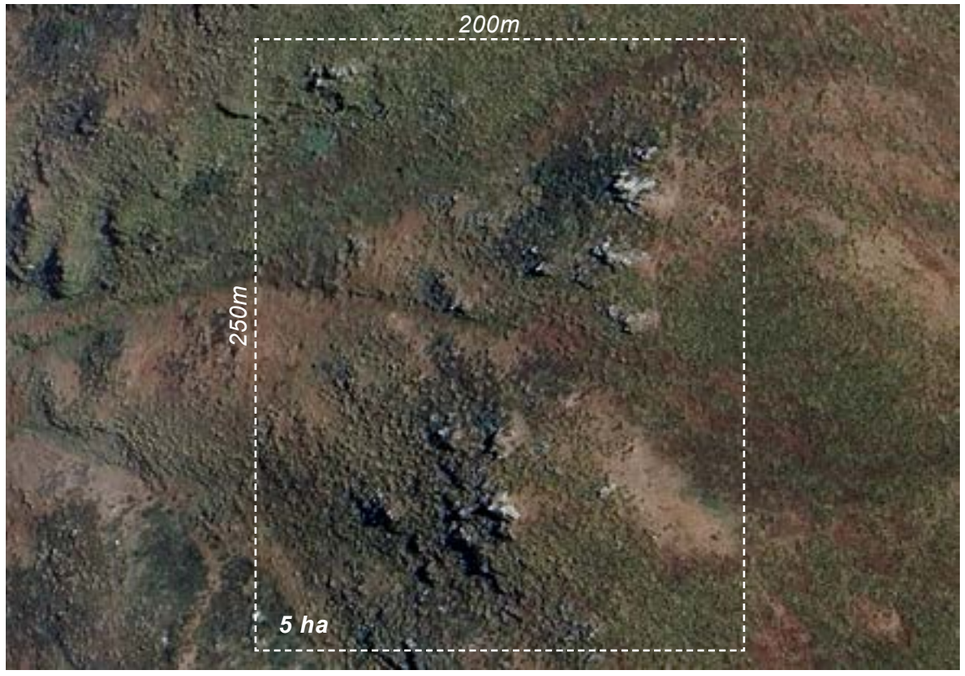
The arrangement should be deliberately irregular. Rock stacks should not be placed in lines, grids or evenly spaced rows. Instead, they should be clustered in a manner that reflects natural schist outcrop patterns, with occasional larger features, smaller associated boulder scatter and intervening areas of open grassland or tussockland.

They should generally be located on broad shoulders, upper slope breaks, selected benches, crest transitions and visible midslope areas where they can be integrated with final contouring and revegetation.

Rocks stacks placed in clusters of 3 with a central rock stack and at least 100 rocks scattered around in a natural distribution.

Up to 42 rock stacks to be provided in total.

Where implemented, rock stacks to be clustered in groups of 3 in association with grey scrub planting.



Example of natural rock distribution on site

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6.0 MINE REHABILITATION ACTIONS

PEST CONTROL

All revegetation work requires some maintenance; plants will most likely need to be 'released' from competing unwanted species, particularly those that are considered ecological weeds, such as invasive woody weeds, and smothering grasses. Pest animals can also compromise the success of rehabilitation works. Such animals may include rabbits, hares, rats (Rattus spp.), mice, and mustelids, followed by mammalian predators as indigenous habitats begin to establish.

PEST ANIMALS

Pest animal control should be staged to initially control the threat of herbivores (i.e. rabbits, hares, possums, deer, wallabies and pigs) as planting is established.

Pest animal control may also require plant guards and include several years of repeat control to enable planting to establish. Accordingly, pest management shall be detailed in an annual management plan until planting is established.

ACTION:

20. Prepare a pest animal control plan prior to commencing rehabilitation activity. This shall include but not be limited to the following:
    - Details of the suitably qualified and experienced person(s) who will be supervising preparation of the plan;
    - Design for a survey for pest animals using standard protocols which may include, but not be limited to, chew tags, traps and tracking tunnels;
    - Recommendations arising from the survey including which species will be controlled and to what level;
    - Details of methods for the control of pest animals;
    - Timeframes associated with the pest control programme;
    - Details of any post-control monitoring to confirm control levels; and
    - Details of likely reinvasion scenarios and recommendations for any on-going monitoring or control.

PEST PLANTS

During the establishment of native vegetation, management of pest plants will form a key element of work to ensure the outcome of achieving a successful canopy cover. This will entail releasing plants from competing pioneer species during plant establishment alongside control of ecological weeds listed under statutory documents (e.g. Regional Pest Management Plan).

Releasing of fast-growing species may only be necessary in the first year of establishment, however slower growing species liste may require releasing for up to 3 years.

ACTION:

21. Release native planting from competing pioneer species during establishment to enhance the success of native riparian vegetation.

22. Control the establishment of ecological weeds during rehabilitation works.

DRAFT

7.0
MONITORING AND REVIEW

7.0 MONITORING AND REVIEW

MONITORING BACKGROUND

Monitoring will include all aspects of the project, not just plant survival. Final landform creation erosion, water quality, soil fertility, drainage and pest management will also be monitored.

For landscape rehabilitation, an annual monitoring inspection would cover:

- Identification of successes of past and previous year;
- Identification of deficiencies or inadequacies including pest plants and animals;
- Identification of opportunities; and
- The programme for the coming year.

Annual reporting is important and allows the accumulation of knowledge as part of the Project Overview and Annual Work and Rehabilitation Plan. This will result in increased efficiency and reduced costs over the life of the rehabilitation project. Progress photographs (refer LNCVA), including aerial photography and photographs taken from key vantage points looking towards the Site can be a valuable monitoring tool.

MONITORING PROGRAMME

Monitoring and associated site management will include the following:

- Extent of areas rehabilitated against proposed targets;
- Observations of finished landform stability, including small-scale slumping and rock falls that may affect revegetation success. This inspection is for revegetation purposes only and will not constitute a geotechnical inspection of land stability.
- If monitoring of plant growth shows patchy plant survival or slower than anticipated growth rates, monitoring of soil fertility to optimise outcomes. It is acknowledged that growth rates at Macraes are slow and may often be impacted by weather condition;
- Incidence and persistence of invasive plant pests, particularly those required to be controlled under statutory documents (e.g. Regional Pest Management Strategy) or those deemed to present a risk of to the success of revegetation areas;
- The success of hydro-seeding at providing vegetative cover to identifed rehabilitation areas; and
- Survival and growth rates of planted tussocks and shrubs towards species most likely to thrive.

REVIEW

Monitoring results shall be reviewed annually to assess progress against the rehabilitation requirements and determine whether management or rehabilitation methods need to change. The review shall:

- identify rehabilitation successes, deficiencies and emerging risks;
- assess trends in landform stability, erosion, drainage, vegetation establishment and pest pressure;
- identify lessons from completed rehabilitation and trial areas;
- recommend remedial work or refinements to future rehabilitation methods;
- set priorities and actions for the following year; and
- maintain a photographic and written record of rehabilitation progress.

The annual review shall inform the ongoing rehabilitation programme so that successful methods are repeated, shortcomings are addressed early and practices are progressively refined in response to monitoring results and site conditions.

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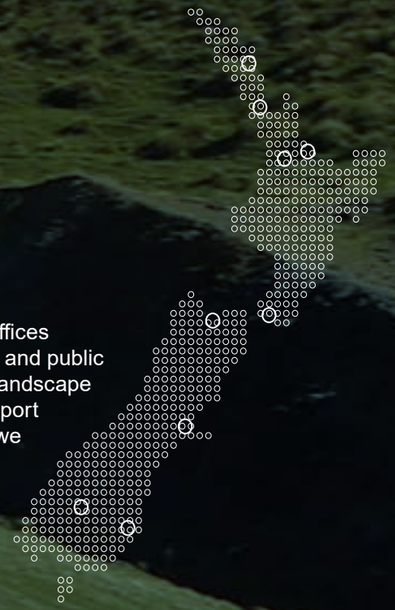

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