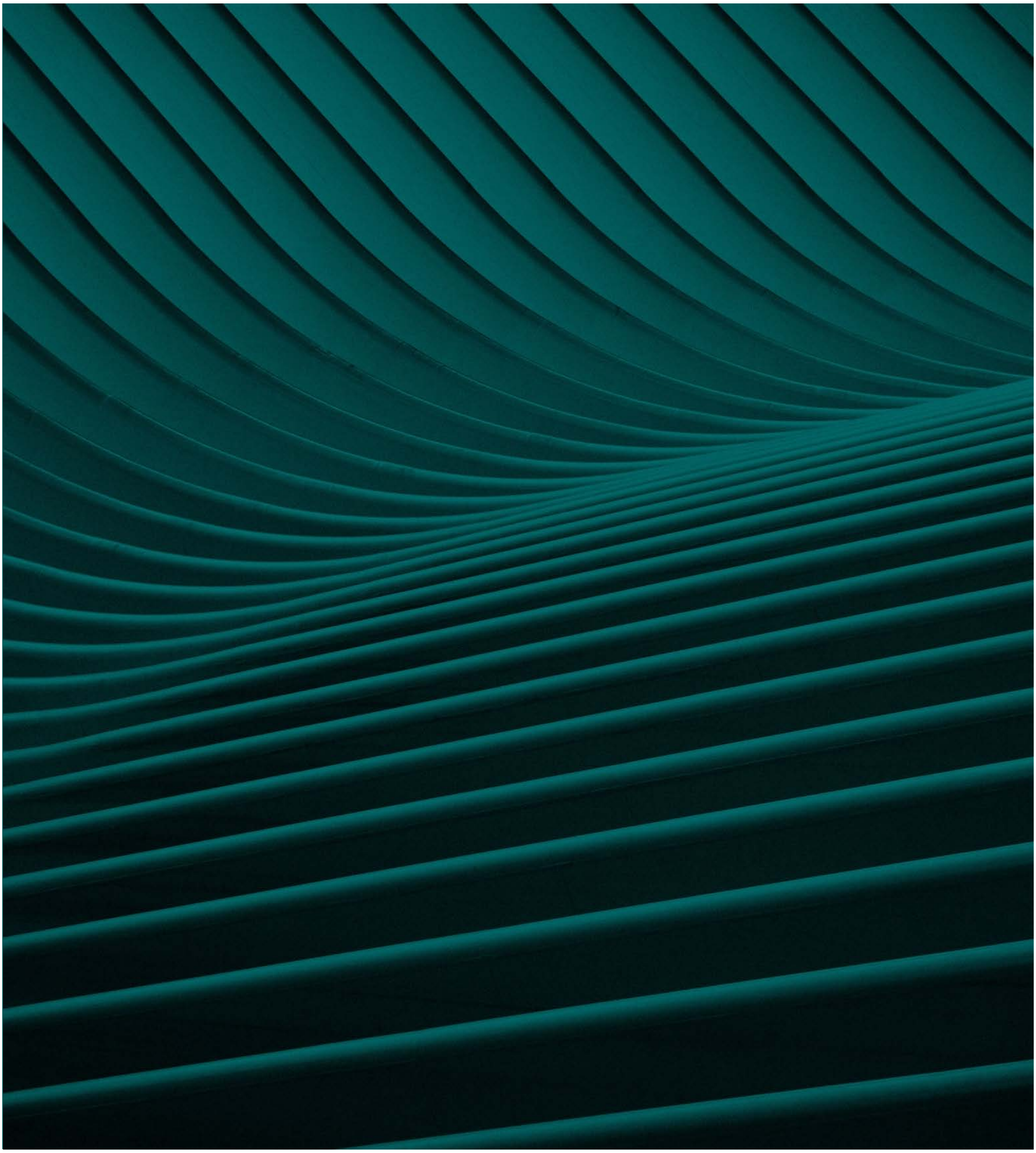
Boffa Miskell

Bendigo Ophir Gold Project

Assessment of Freshwater Ecological Effects

Prepared for Matakanui Gold Limited

20 October 2025



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Executive Summary

Matakanui Gold Ltd (MGL, a subsidiary of Santana Minerals) proposes to develop an open cut pit and underground mining complex linked to an ore processing plant located in close proximity. Any overburden will be re-deposited in Engineered Landforms (ELFs), while pulverised ore will be run through the processing plant with tailings deposited as a slurry behind a zoned-earth dam and ELF buttress in the Tailings Storage Facility (TSF). The proposed mine activity is located in the Bendigo area in the Upper Clutha Valley between the urban areas of Wānaka and Cromwell of New Zealand's South Island.

Shepherds Creek is representative of a low gradient Dunstan Mountains perennial small stream. The upper reaches of Shepherd Creek have moderate to high ecological value while downstream of the gorge section ecological values are moderate. Habitat modification increases with various impacts including water abstraction, channel modifications (e.g., the dam), crack willow, and stock impacts are evident. The Rise and Shine Creek catchment has a range of ephemeral, intermittent and perennial streams that support a fauna of high to low ecological value.

Four potential adverse effects on stream habitat resulting from the development and operation of the proposed mine are considered: complete loss of habitat; permanent diversion of streams; long term changes to stream flow; and potential water quality changes.

The functional need of the proposed activities means that the loss of watercourses is unavoidable. Although loss will be minimised as much as possible, the proposed mine activities will result in the loss of 7,139 m of permanent stream length whilst 1,631 m of intermittent stream length will be modified in Shepherd Creek.

Effects management provides remedy of 9,558 m (9,558 m^2 of stream area) of created permanent watercourse through rehabilitation of the proposed diversion of Shepherd Creek, including the reinstated stream across the surface of the TSF at closure. A further 1,196 m length (~957 m^2 of stream area) of Shepherds Creek will be enhanced to improve aquatic ecological values. This amounts to a total enhancement of 10,754 m of stream length (~10,515 m^2 of stream area) of stream values.

Some 1,483 m length of stream (~741.5 m^2) will be lost in the Rise and Shine Creek and approximately 1,600 m of stream length (800 m^2 of stream area) will be created within the catchment, and the equivalent will apply for enhancement of aquatic ecological values.

The rehabilitation aims to provide habitat within the diversion as similar in form and structure to the stream to be reclaimed (and like neighbouring tributaries). The stream profile will allow the planting of riparian vegetation close to and extending over and into the water surface at the margins to enhance habitat for the aquatic ecosystem.

Additional enhancement of some 6,700 m of Bendigo and Clearwater Creeks, located in the Bendigo Historic Reserve near the Come-in-Time

Stamper Battery immediately west of the project site is proposed. Proposed enhancement includes the management of crack willow trees and enhancement of the riparian margins of the creeks which will provide substantial benefit to the aquatic ecological values of these watercourses.

The overall effects management for the BOGP addresses the direct and indirect effects of the BOGP through intensive rehabilitation of stream diversions and additional stream enhancements. The outcome maintains the connectivity up and downstream in the catchment.

Overall, the effects of the BOGP on watercourse extent and aquatic ecological values are avoided, minimised, remedied or mitigated, and with additional compensation, the outcome of BOGP delivers a no net loss and enhanced benefit for aquatic ecological values.

Glossary of Abbreviations

Abbreviation	Meaning
BOGP	Bendigo-Ophir Gold Project
CIT	Come In Time
ED	Ecological District
ELF	Engineered Landform
ELF-W	Western Engineered Landform
ELF-X	SRX Engineered Landform
LERMP	Landscape and Ecological Rehabilitation Management Plan
MGL	Matakanui Gold Limited
RAS	Rise and Shine
RSSZ	Rise and Shine Shear Zone
SRE	Srex East
SRX	Srex
TSF	Tailings Storage Facility
WELF	Western ELF

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1.0 Introduction

1.1 Background

Matakanui Gold Limited (“**MGL**”) is proposing to establish within the Bendigo-Ophir Gold Project (“**BOGP**”), a new gold mine, ancillary facilities and environmental mitigation measures on Bendigo and Ardgour Stations in the Dunstan Mountains of Central Otago. The project site is located approximately 20 km north of Cromwell.

The BOGP is located within the footprint of Minerals Exploration Permit 60311, which overlays several pastoral stations that have grazed sheep and cattle in the area for over 100 years. MEP60311 is held by MGL under the Crown Minerals Act 1991. MGL has land access agreements with Bendigo and Ardgour Stations. The BOGP is located adjacent to land administered by the Department of Conservation (“**DOC**”), including the Bendigo Historic Reserve, the Bendigo Conservation Area and the Ardgour Conservation Area. The BOGP planned operations do not directly impact these areas.

The BOGP’s exploration has discovered numerous soil geochemical anomalies and extensive drill evaluation has defined four (4) gold deposits worthy of economic extraction. The most significant is the Rise and Shine ("**RAS**”) discovery which is the most significant gold discovery in New Zealand in the past 4 decades. The other discoveries at Come in Time (“**CIT**”), Srex (“**SRX**”) and Srex East (“**SRE**”) are smaller in size and tenor.

The defined orebodies are planned to be mined by open pit methods. Underground mining is planned for the deeper parts of the RAS orebody in the later years of development.

The majority of the mining activities, ancillary facilities and associated infrastructure will be located in the Shepherds Valley somewhat hidden from the view of the public. Access, and service and administration offices are planned to be located on the adjoining Ardgour Terrace.

Figure 1 provides an overview of the footprint associated with the establishment, operation and rehabilitation within the BOGP. Direct disturbance in the pastoral area will be approximately 380 hectares. A disturbance contingency has been allowed around the mine and infrastructure for footprint adjustments during detailed design. A further 18ha (approximately) of disturbance will be needed to establish the Thomson Gorge Road alternative alignment (Ardgour Rise). Maximum potential disturbance in the pastoral area, including contingency and Ardgour Rise, is 568ha.

Additional disturbance of approximately 52ha will be required in the agricultural area on Ardgour Terrace. This area will be used for offices, security, medical, laboratory, laydown, storage, contractor areas, topsoil storage, emulsion manufacture and magazine facilities plus quarries and roading.

Ecological work will include rehabilitation on direct disturbed areas, ecological uplift activities and pest exclusion area(s) adjacent to the footprint on nearby areas such as Ardgour and Bendigo Stations. A full description of the various activities comprising the establishment, operation and rehabilitation within the BOGP is provided in the Assessment of Environmental Effects prepared by Mitchell Daysh Limited. However, by way of summary, the BOGP includes the following components:

- The establishment of the RAS Open Pit and SRX Open Pit, which are planned to form partial pit lakes at closure;

- The establishment of RAS Underground which is planned to be backfilled with cement paste;
- The establishment of the CIT Open Pit, which is the smallest of footprints and is planned to be progressively backfilled with waste rock from the RAS Open Pit and profiled to integrate with the surrounding terrain. Rehabilitation will enable nearby native herb fields to be re-established at the completion of mining activities;
- The establishment of the small SRE Open Pit, which will be backfilled with waste rock before being covered with overburden to form the engineered landform for the adjoining SRX Open Pit ("SRX ELF").
- A conventional hard rock gold processing plant (1.2 million tonnes per annum expandable to 1.8Mtpa) applying modern Carbon-in-Leach ("CIL") technology constructed in the lower reach of Shepherds Valley. The plant will operate in a closed water circuit with the TSF. Residual chemicals in the tailings slurry will be detoxified and/or precipitated with specialist plant.
- The operation of the process plant will be supported by ancillary facilities such as maintenance workshops, raw material and process chemical storage, fuel depot, laboratory and warehousing. Mine offices, carparking and security services will also be established.
- The construction of the plant in the lower reaches of the Shepherds valley will include the realignment of Shepherds Creek;
- The establishment of water storage dams and tankage for use in the process plant, dust suppression and drinking water supply;
- The establishment of a Tailings Storage Facility ("TSF") in the upper reach of Shepherds Valley (including clean water diversion drains), which will utilise waste rock from mining activities within the project site;
- The establishment of permanent engineered landforms in the Shepherds Valley ("Shepherds ELF") and an unnamed creek west of RAS pit ("WELF");
- The establishment of temporary topsoil, vegetation and brown rock stockpiles around the project site;
- The extraction of groundwater from the Bendigo Aquifer for use in mining-related activities as well as supplying BOGP drinking water and replacing small irrigation water takes from Shepherds Creek. Bore water will be pumped to the processing plant via a pipeline over a distance of approximately 7 km.
- The establishment of supporting infrastructure / activities for the project, such as the upgrade of Ardgour Road and parts of Thomson Gorge Road to provide improved access to the BOGP, internal mine access and haul roads, water pipelines and underground utilities, and electricity supply to the project site from Lindis Crossing via a new 66kV overhead powerline that will follow the existing road reserve corridor;
- A realignment of part of Thomson Gorge Road, via Ardgour Station (Ardgour Rise) is planned to provide public access through to the Manuherikia Valley.
- Main explosives magazines and emulsion mixing facilities (located outside the project site on Ardgour Terrace);

- The establishment of non-operational infrastructure associated with the BOGP on the Ardgour Terrace, including security, first aid and administrative offices, geology facilities, high voltage substation and temporary construction workers accommodation; and
- The establishment of pest exclusion area(s) for ecological enhancement activities.

1.2 Scope of this report

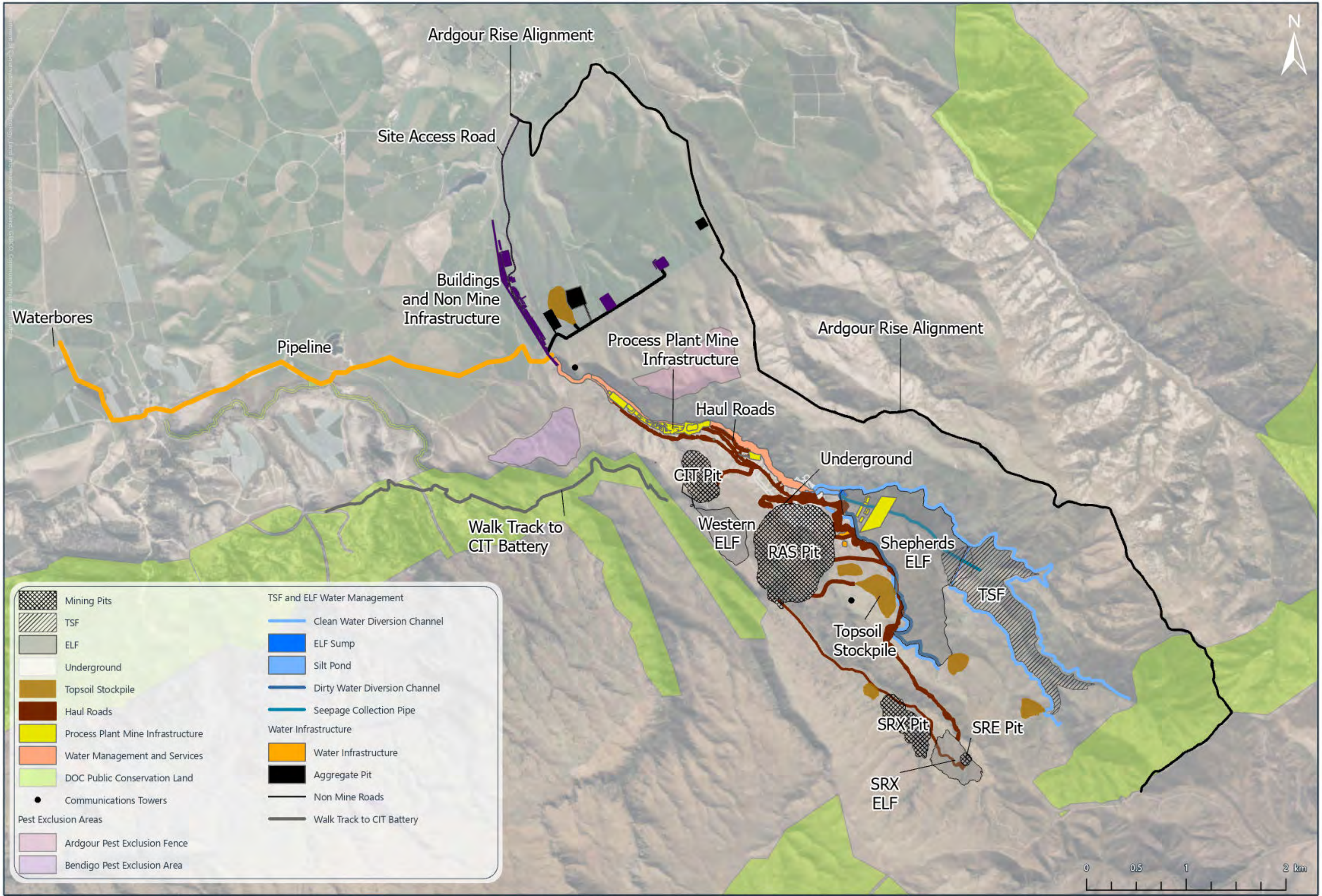
This report assesses the proposed effects management (including mitigation and potentially offsetting/compensation) provided by the freshwater diversion channels, to be included as part of the consent application.

It includes advice on other potential actions that may result in better ecological outcomes. It also sets out suggested monitoring and reporting requirements.

1.3 Information sources

Our assessment draws on the existing information set out in:

- Bendigo Ophir Gold Project: Assessment of Effects on Aquatic Habitat. Report prepared by Water Ways Consulting, June 2025.
- Bendigo Ophir Gold Project: Surface Water & Catchment Existing Environment & Effects Assessment. Report prepared by Kōmanawa Solutions Ltd., May 2025.
- Bendigo Ophir Gold Project: Landscape and Ecological Rehabilitation Management Plan. Report prepared by Manaaki Whenua, Habitat NZ, Boffa Miskell, July 2025.



NZGD 2000 New Zealand Transverse Mercator | SCALE: 1:45,000 @ A4 | Figure 1: **BENDIGO OPHIR GOLD PROJECT** | JOB ID: 24234 | CLIENT: Matakanui Gold Limited | 11/06/2025 | VERSION: 4

2.0 Location and Ecological Context

2.1 Location

The Bendigo – Ophir Gold Project (BOGP) is located in the Bendigo area of New Zealand's South Island (Figure 1). The Bendigo area is located in the Upper Clutha Valley between the urban areas of Wānaka and Cromwell.

Komanawa (2025) set out the context for the watercourses at Bendigo. Shepherds Creek does not extend as a perennial water course to its main stem at the Lindis River. Instead Shepherds Creek is lost to soakage through its bed a full three km short of the confluence with the Lindis River, thereby replenishing the Ardgour Alluvial Aquifer, which itself seeps into the Lindis River. Rise and Shine Creek is a small tributary of Bendigo Creek.

2.2 Ecological context

Bendigo sits in the Dunstan Ecological District (ED, DOC 1987). The Dunstan ED is listed as formerly predominantly tussock land, with remnants of Hall's totara woodland whilst herb field marks the lower boundary of the high alpine zone, and cushion field associations cover most of exposed high alpine zone. The environment on the north western slopes has been modified by a long history of pastoral farming and rabbits.

The Landscape and Ecological Rehabilitation Management Plan (LERMP) outlines the historic disturbance from fires, grazing by stock, rabbit plagues, and pastoral intensification that has transformed the landscape from dense native shrublands to non-native pastures scattered within degraded grey scrub and cushion fields. Human-induced pressures have completely transformed ecosystems across 45% of the project area, with native vegetation severely depleted in species diversity and vulnerable species restricted to rocky refugia.

3.0 Proposed Activities

3.1 Overview

The proposed mine will be staged in three broad phases (Appendix 1):

Phase 1: Initial startup (years 0-1) includes establishing key mine infrastructure, construction camp, ancillary infrastructure, process plant and TSF embankment. This involves identifying permanent edges to avoid impacts on high-value species and ecosystems where practicable, enriching permanent edges, and initial weed control alongside removing plants, soil, rocks and overburden to stockpiles.

The largest material volumes will be removed from RAS Pit, with initial stripping creating the Western ELF (WELF) which will be completed by startup phase end. WELF is the first substantial rehabilitation area and will include slopes and aspects suitable for cushionfield and spring annual herb field trials installed before year 3 end.

A small, though important, fraction of wetland and tussock vegetation stripped from Shepherds Creek will be transferred to live storage areas for later rehabilitation use as propagule sources (all tussock areas and small areas of wetland) and as mitigation (most of the wetland area). This phase includes constructing permanent and temporary stream diversions and sediment treatment ponds. Permanent diversions will be specifically treated to enhance aquatic ecological values.

Phase 2: Main mining (years 1-10) includes completing RAS, CIT, and SRX pits with relatively small rehabilitation areas as final landforms become available on Shepherds and SRX ELF. The temporary Site Workers Camp is dismantled and reinstated to pasture.

Phase 3: Final closure (years 10-30) includes the final closure sequence with the majority of rehabilitation on TSF, Shepherds ELF, main haul roads, RAS pit and associated stockpiles. Final landforms cannot be completed until tailings deposition stops and workshop/other facilities on Shepherds ELF terraces are decommissioned. Freshwater diversion channels around the TSF are cut and rehabilitated to allow catchment runoff onto the rehabilitated surface of the TSF and the creation of 2 ha of wetland and 4 ha of marshland. The wetland will drain to the permanent freshwater diversion channel on the north side of the ELF.

3.2 Staging of Shepherds Creek Services Corridor

The construction of the Shepherd Creek Services Corridor will be undertaken as set out below:

- A cutoff coffer dam will be constructed prior to infilling of the silt pond. The silt pond is large and complex and will take some considerable time to complete.
- During that time water will be diverted to a pipe capable of flows (up to the maximum flow recorded in the last two years of flow monitoring).
- A temporary coffer dam will be constructed at the top of the 400 m length to hold creek flow. Creek flow will be piped to beyond the works and returned to the creek below the works.
- The infill will be constructed in 400 m lengths downstream from the toe of the coffer dam wall.
- Native Wetland plants (where they exist) will be salvaged and topsoil removed to stockpile (first 400m).
- Overburden from RAS pit will be placed in compacted layers in the creek bed until design height and width is achieved.
- The clean water diversion channel will be constructed on the north side of the infill.
- A new coffer dam will be constructed at the western end of the completed section of fill and pipe installed.
- Where design allows, the surface of the infill will be progressively rehabilitated (sheeted with topsoil and rock tors created, planting/ seeding will come later).
- The original coffer dam will be removed to allow flow into the rehabilitated channel.
- The 400 m sequence will continue downstream until the infill has been completed.

- Topsoil and plants salvaged in subsequent sequences will be direct transferred onto the previous section (avoid stockpiling as far as practical).
- Services will be placed in a bunded corridor on the infill (tailings, water, waste water, TSF return water). Power and fibre will be buried in the infill.
- The clean water diversion channel will be designed and bunded to prevent infill runoff, dirty water or vehicles accessing the clean water channel (see section 10 below).

3.3 Staging of Rise and Shine Creek Workings

Key features of the activities at the Rise and Shine Creek are as follows:

- Diversion channels divert clean water around the SRX Pit and ELF.
- The SRX mining phase is very short (18 - 24 months), after which the diversion channels will be cut/flattened and the intermittent creeks will drain into SRX pit.
- At closure the pit lake will overtop into Rise and Shine Creek, so flow from the unnamed intermittent creeks will be returned to Rise and Shine Creek.
- During the 18 – 24 month mine life, the permanent Mt. Moko Creek flow will be retained between the SRX pit and SRX ELF via culvert. At the completion of mining the culvert would be removed and the creek line remedied/rehabilitated.
- The diversion channel above the SRX ELF would remain at the completion of mining due to the topography. This would be rehabilitated as part of the ELF rehabilitation program
- At the RAS pit, further down the valley, a diversion channel transfers Rise and Shine creek flow across a pit bench into the Clearwater Creek (319 m).

3.4 Proposed rehabilitation activities

The implementation of the LERMP provides for:

- Diversion of watercourses within upper Rise and Shine Creek and Shepherds Creek catchments.
- Mine regeneration zone (MRZ) establishment through fencing and establishing edges to stripped areas that limit edge effects and protect against fire. Installation of reticulated stock water supply.
- Mammalian pest management consistent with delivering MRZ objectives.
- Pest plant identification and management ensuring earthworks and soil stripping does not spread high-risk species (gorse, sedum, thyme), and pest plants controlled to levels consistent with ecological objectives.
- High-resolution mapping of cushion field, spring annual herb and taramea to guide contingency and regeneration zone management and develop effective salvage and propagation methods for identified species (Applied Research Plan for Cushion Field).
- Resource salvage and storage (soils, brown rock, hard rock, weathered boulders, wood, vegetation) for rehabilitation use, and maintaining access for use. Includes Battery Hill, SRX, and Site Workers Camp soil and brown rock stockpiles.

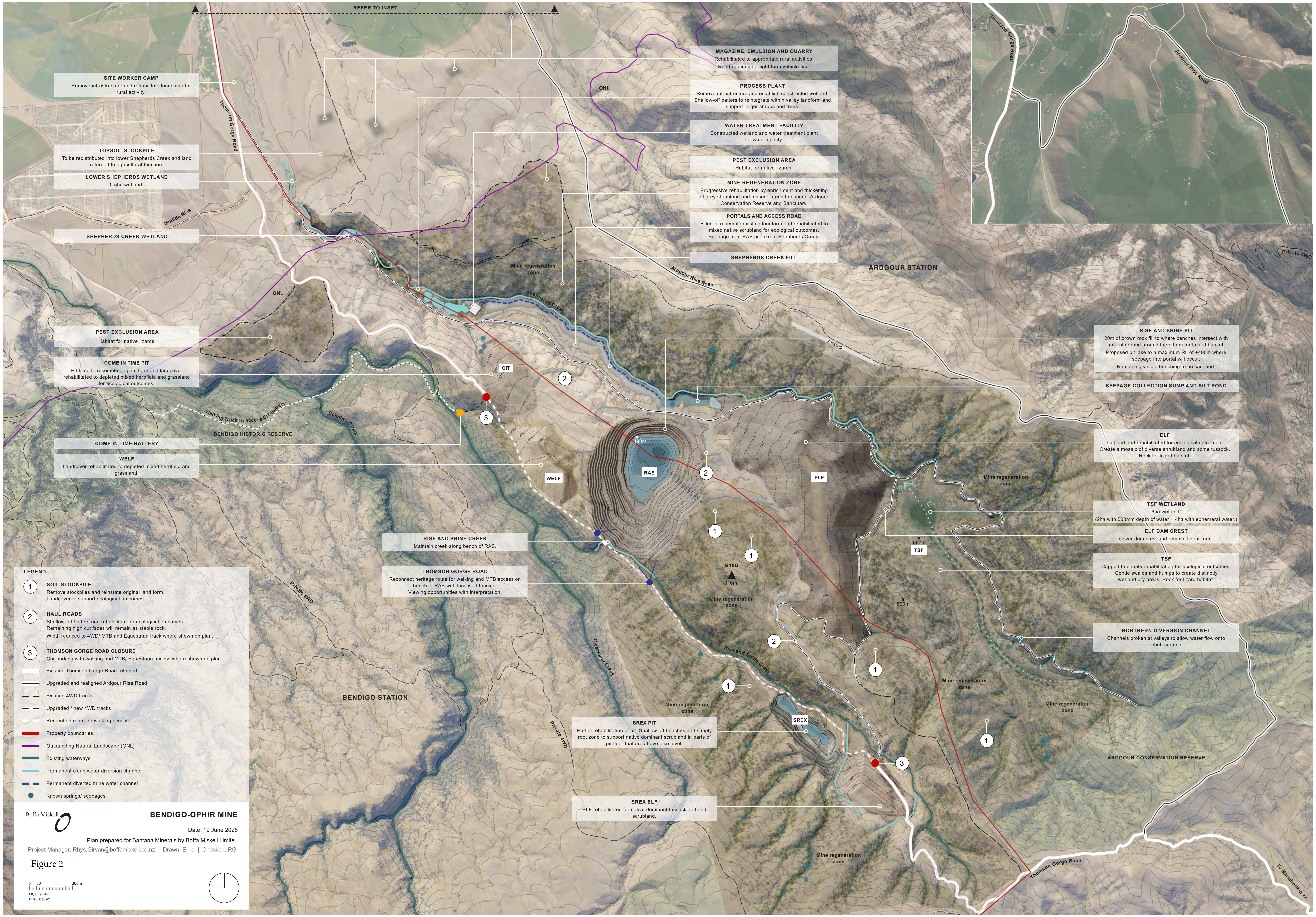
- Key infrastructure construction enabling rehabilitation: light vehicle access roads, wetlands and tussock storage areas, nursery hardening and plant processing areas, and biosecurity treatment areas (vehicle wash).
- Seepage and sediment capture/containment, water treatment requirements and erosion control.
- Dust and artificial light controls to levels minimizing fauna and ecosystem impacts
- Landform construction sympathetic to Dunstan Mountains backdrop and local landscape features such as Battery Hill.
- Variable micro-topography and root zone depth construction with minimum 'deep soil' areas over disturbed areas supporting native vegetation establishment and habitat feature installation where appropriate.
- Ongoing land use relationships including limited pastoral grazing to support specific native ecosystems and fire management approach.
- Ongoing pest management and control of identified pest-plant and mammalian pest species plus ongoing biosecurity monitoring identifying and responding to incursions.

3.5 Closure Plan

The overall closure plan is provided in Figure 2.

LANDSCAPE CLOSURE PLAN

FINAL DRAFT



4.0 National Policy Statement – Freshwater Management (NPS-FM)

4.1 Introduction

In this section we identify the relevant definitions and policies to be applied to aquatic ecological features of the BOGP and identify the criteria to be applied in assessing freshwater environments. We emphasise that this section is not a statutory assessment; rather it provides the link between the National Policy Statement Freshwater Management (2020) (NPS-FM) and the outcomes delivered by the BOGP.

4.2 Policy and Regulations

The NPS-FM directs regional councils to undertake a variety of policy inclusions or modifications to policy, as well as to undertake specific tasks. The NPS-FM also directs Council to be satisfied that the 'Effects Management Hierarchy' is applied to the existing and potential values where appropriate and is provided for in the policy and regulations.

The NPS-FM applies to all freshwater (including groundwater) and, to the extent they are affected by freshwater, to receiving environments.

The following policies are relevant to the proposed mining activities:

> *Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai.*
>
> *Policy 2: Tangata whenua are actively involved in freshwater management (including decision-making processes), and Māori freshwater values are identified and provided for.*
>
> *Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.*
>
> *Policy 5: Freshwater is managed (including through a National Objectives Framework) to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.*
>
> *Policy 6: There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.*
>
> *Policy 7: The loss of river extent and values is avoided to the extent practicable.*
>
> *Policy 8: The significant values of outstanding water bodies are protected.*
>
> *Policy 9: The habitats of indigenous freshwater species are protected.*
>
> *Policy 12: The national target (as set out in Appendix 3) for water quality improvement is achieved.*
>
> *Policy 13: The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.*

Clause 3.24 also requires that:

> Every regional council must include the following policy (or words to the same effect) in its regional plan:
>
> The loss of river extent and values is avoided, unless the council is satisfied that:
>
> (a) there is a functional need for the activity in that location; and
> (b) the effects of the activity are managed by applying the effects management hierarchy.

4.3 National Objectives Framework

Subpart 2 of the NPS-FM requires certain attributes to be managed within a compulsory National Objectives Framework (NOF). The NOF requires that water quality is maintained or improved to establish water quality attribute bands for a variety of parameters. The NPS-FM requires that Councils apply compulsory values to stream management units in their respective regions as part of the NOF (Subpart 2, 3.9(1)). Those compulsory values relevant to freshwater ecology are:

> **Ecosystem health** refers to the extent to which an Freshwater Management Unit (FMU) or part of an FMU supports an ecosystem appropriate to the type of water body (for example, river, lake, wetland, or aquifer).
>
> There are five biophysical components that contribute to freshwater ecosystem health, and it is necessary that all of them are managed. They are:
>
> *Water quality* – the physical and chemical measures of the water, such as temperature, dissolved oxygen, pH, suspended sediment, nutrients and toxicants
>
> *Water quantity* – the extent and variability in the level or flow of water
>
> *Habitat* – the physical form, structure, and extent of the water body, its bed, banks and margins; its riparian vegetation; and its connections to the floodplain and to groundwater
>
> *Aquatic life* – the abundance and diversity of biota including microbes, invertebrates, plants, fish and birds
>
> *Ecological processes* – the interactions among biota and their physical and chemical environment such as primary production, decomposition, nutrient cycling and trophic connectivity.
>
> In a healthy freshwater ecosystem, all five biophysical components are suitable to sustain the indigenous aquatic life expected in the absence of human disturbance or alteration (before providing for other values).
>
> **Threatened species** refers to the extent to which an FMU or part of an FMU that supports a population of threatened species has the critical habitats and conditions necessary to support the presence, abundance, survival, and recovery of the threatened species. All the components of ecosystem health must be managed, as well as (if appropriate) specialised habitat or conditions needed for only part of the life cycle of the threatened species.

5.0 Freshwater Ecological Values

5.1 Overview

In their assessment of effects, Water Ways (2025) characterised each of the watercourses and their catchments, in particular Shepherds Creek and Rise and Shine Creek. In general, the study found that the ecological value of the Shepherds and Rise and Shine Creeks and associated tributaries varied from moderate-to-high in the upper reaches to moderate-to-low in the lower reaches. It is not our intention to repeat the findings here, but we summarise the ecological values below.

5.2 Shepherds Creek

The presence of the Ardgour Conservation Area in the headwaters provides a clean water supply to the stream and there is a low level of nitrogen increase in the farmed perennial reach of Shepherds Creek indicating that stock impacts are more limited to physical damage than to declines in water quality.

Shepherds Creek has several tributaries that, aside from Jean Creek, can be divided into two groups: the perennial flowing spring fed streams and the ephemeral streams that have very short duration flow periods. Shepherds Creek is considered representative of a low gradient Dunstan Mountains perennial small stream. This assessment indicates that Shepherds Creek can be divided into reaches:

- The upper reaches of Shepherd Creek: moderate to high ecological value. From the Ardgour Conservation Area boundary to at least the downstream gorge section in the middle of the project area. This reach has good water quality, low to moderate habitat diversity and no introduced aquatic species.
- Downstream of the gorge section: moderate ecological value. Habitat modification increases with various impacts including water abstraction, channel modifications (e.g., the dam), crack willow, and stock impacts are evident.

Water Ways (2025) report that most of the main stem of Shepherds Creek is a gentle gradient single channel stream 0.5 - 1.0 m wide flowing along a 10 - 100 m wide valley floor.

5.3 Rise and Shine Creek

Water Ways (2025) report that the Rise and Shine Creek catchment has a range of ephemeral, intermittent and perennial streams that support a fauna of high to low ecological value:

- The stream draining Mt Moka in the upper Rise and Shine catchment is considered a high-quality habitat area, aside from the lower 200 m where historic and present modifications occur.
- Rise and Shine Creek downstream of the Mt Moka Stream confluence is a perennial stream and is considered to have low to moderate ecological value.
- Rise and Shine Creek and its tributaries upstream of the Mt Moka Stream confluence are intermittent and ephemeral water courses.

Water Ways (2025) report that none of the stream channels are large with a maximum width of 0.5 m and most less than 0.3 m wide.

6.0 Assessment of Freshwater Ecological Effects

6.1 Overview

Water Ways (2025) provide an assessment of the ecological effects of the proposed BOGP, and summarise four potential adverse effects on stream habitat:

- Complete loss of habitat;
- Permanent diversion of streams;
- Long term changes to stream flow; and
- Potential water quality changes.

We note that these effects are not spread evenly across the water courses or the stream classifications in the project area. Ephemeral watercourses do not provide habitat for aquatic biota, and act as a surface flow path during rain events. The effects of the proposed BOGP are greatest on the perennial stream habitat, and our focus is on the direct effects of the proposed activities on these perennial watercourses.

We set out below the main effects of the key mine development and operational features on the watercourses at the location. We have drawn on the information and assessment provided in Water Ways (2025).

Water Ways (2025) estimate stream loss within Shepherds Creek and Rise and Shine Creek as 8,536 m resulting from the construction and operation of the proposed TSF, ELF, and mine pits amount (13,710 m when ephemeral, intermittent and perennial watercourses are included). An additional 2,090 m of 2nd order + perennial stream will be realigned to accommodate the process plant and services corridor in Shepherds Creek. This gives rise to direct impacts on a total 10,626 m of perennial stream. Water Ways (2025) quantify the effects of stream loss as detailed in Table 1.

Table 1: *Summary of the length of stream modified by the BOGP footprint (from Water Ways 2025).*

Stream type	Ephemeral	Intermittent	Minor perennial order	Perennial 2nd order +	Watershed	Total
Stream length lost Shepherd Creek	4,474 m	1,631 m	1,236 m	5,903 m	1,438 m	*14,682 m*
Stream length realigned, Shepherd Creek	0 m	0 m	0 m	2,960 m	0 m	*2,960 m*
Stream length lost, Rise and Shine Creek	700 m	0 m	305 m	1,092 m	0 m	*2,097 m*
Non-permanent stream length loss at soil storage sites	672 m	97 m	19 m	0 m	312 m	*1,100 m*
Total	*5,846 m*	*1,728 m*	*1,560 m*	*9,955 m*	*1,750 m*	***20,839 m***

6.2 Effects of the activities on Shepherds Creek habitat

6.2.1 TSF, TSF wall, ELF, runoff sump and the silt collection pond

As set out in Water Ways (2025), the TSF is in the head waters of Shepherds Creek and will fill the valley to an altitude of approximately 700 m. The TSF has two parts, the main tailings storage area (TSF) and a wall feature at the downstream end that forms the downstream end of the TSF (referred to as the TSF wall). Combined these two features create a single area for the TSF. The TSF size will be constrained by the construction of the clean water drains that run around the hillsides above the TSF and is not expected to increase in size. We understand that, for this reason, no buffer zone has been used for the TSF when the stream loss was determined.

TSF is the largest area of stream habitat loss in the project footprint. The mapped footprint for the storage facility will also cover predominately perennial stream courses with a smaller area of ephemeral and watershed lost (Water Ways 2025).

Most of the loss of watercourses occurs in Shepherd Creek (7,139 m of perennial and intermittent stream length). The main area of loss is due to the placement of the Tailings Storage Facility (TSF) and the Engineered Landform (ELF) in the upper Shepherds Creek valley (Figure 3) and realignment within the lower Shepherds Creek valley to provide for establishment of infrastructure.

We set the length of stream loss in Table 2. We emphasise that the total stream loss under the TSF, TSF wall, ELF, runoff sump and the silt collection pond is less than the total area for each component due to the overlapping nature of these features. The combined stream loss for these four components is split amongst perennial, intermittent, ephemeral streams and watersheds (Figure 3). The overlap amongst these combined features reduces the loss of Perennial 2nd order + streams when compared to the losses for individual features by some 268 m (Water Ways 2025).

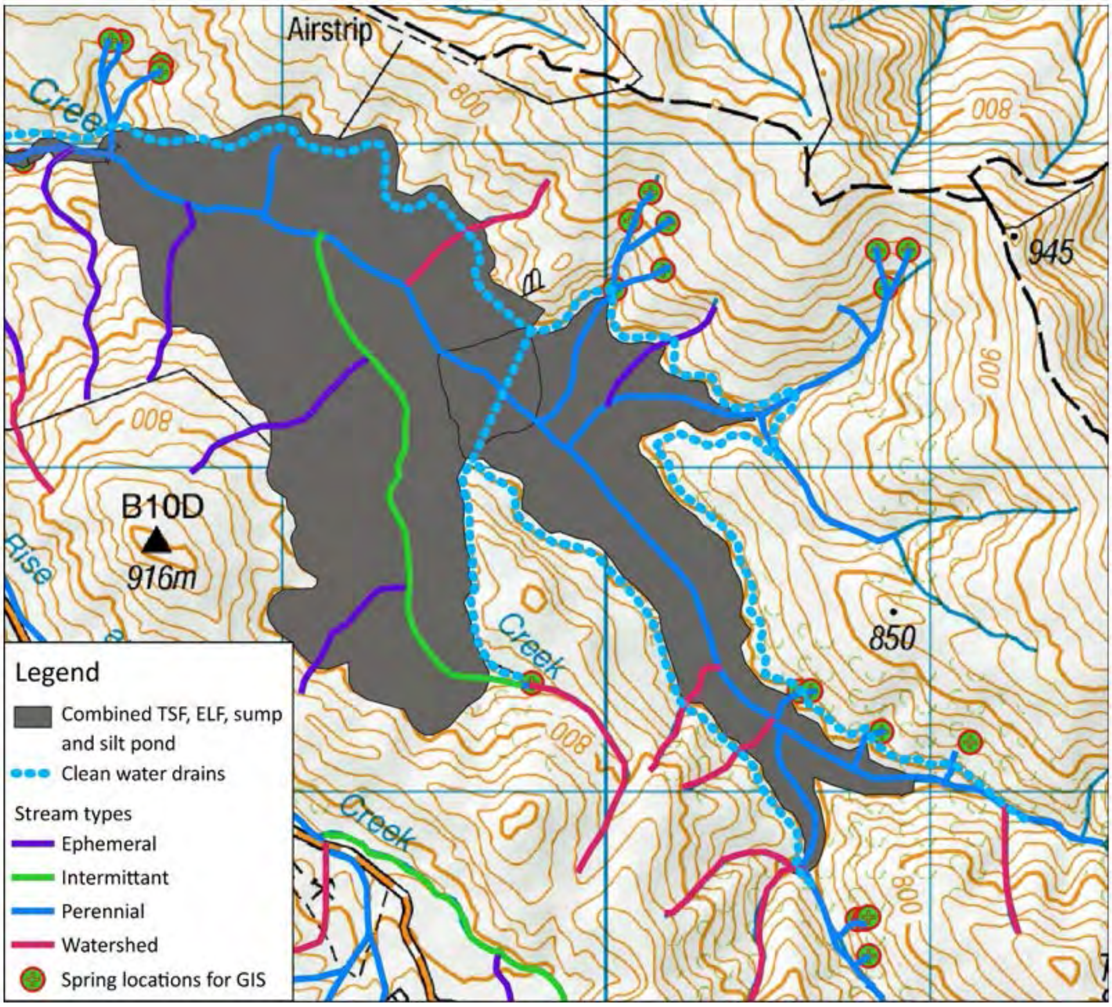


***Figure 3:** Stream classifications of area of Shepherds Creek covered by combined TSF, ELF (incl. 50 m buffer) silt settling and runoff pond (from Water Ways 2025).*

Table 2: *Total stream loss within Shepherds Creek associated with the TSF, ELF and slit retention and collection sump pond (from Water Ways 2025).*

Stream type	Ephemeral (m)	Intermittent (m)	Minor perennial streams (m)	Perennial streams (2^{nd} order +) (m)	Watershed (m)	Total	Total intermittent and perennial stream
TSF							
Stream length	248	-	*630*	*3,182*	310	4,370	3,812
ELF							
Stream length	1182	*1,631*	*301*	*1,531*	292	4,937	3,463
Silt retention and collection sump ponds							
Stream length	72	-	*42*	*366*	-	480	408
RAS Pit							
Stream Length	1504	-	-	-	394	1898	-
CIT Pit							
Stream Length	336	-	-	-	-	336	-
Topsoil Storage Areas							
Stream Length	122	*97*	*19*	-	312	550	116
Total	**1,502**	***1,728***	***992***	***5,079***	**1,308**	**9,787**	**7,799**
Total adjusted#	**1,524**	**1,728**	**931**	**4,811**	**1,308**	**10,302**	**-**

#The total stream loss under the TSF, TSF wall, ELF, runoff sump and the silt collection pond is less than the total area for each component due to the overlapping nature of these features (see text for further details).

6.2.2 RAS pit

The RAS pit (along with 100 m buffer) is expected to intersect with several ephemeral water courses in the Shepherd Creek but will not result in any direct loss of aquatic habitat in the Shepherds Creek catchment as these water courses do not support aquatic life.

6.3 Effects of the activity on Rise and Shine Creek habitat

6.3.1 RAS and SRX pits

The key effects of the activity on the Rise and Shine Creek occur from the construction of the RAS and SRX pits which will result in an overall loss of some 1.4 km of stream length (Figure 4, Table 3). The main stream loss is the perennial Mt. Moka stream as this watercourse provides continuous flow for Rise and Shine Creek, and this stream is also the highest quality habitat in the catchment. The reaches of the Mt. Moka stream lost can be divided across the two tributaries with the perennial stream loss split is into 465 m of moderate to low quality stream and 412 m of high-quality stream.

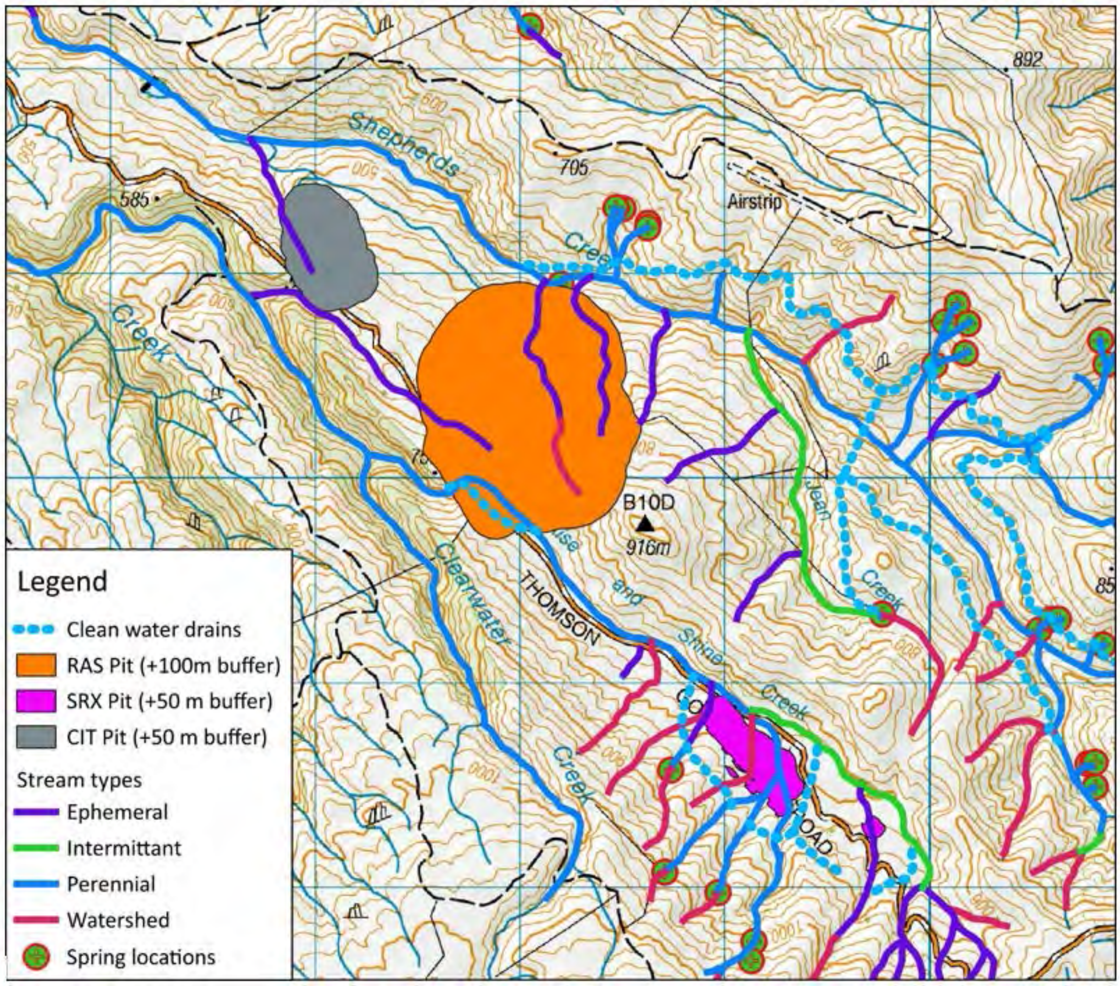


Figure 4: *Stream classifications of area of Shepherds Creek and Rise and Shine Creek catchments covered by combined RAS, SRX and CIT Pits (including buffers). From Water Ways (2025).*

Table 3: *Total stream loss within Rise and Shine Creek associated with the RAS, SRX and CIT Pits including buffers (from Water Ways 2025).*

Stream type	Ephemeral (m)	Intermittent (m)	Minor perennial streams (m)	Perennial streams (2nd order +) (m)	Watershed (m)	Total
RAS Pit						
Stream length	410	-	-	606	-	1,016
SRX Pit						
Stream length	-	-	-	877	-	877
SRX Engineered Land Form (SRX ELF)						
Stream length	357	-	-	-	-	357
Topsoil Storage Areas (Clearwater Stream)						
Stream length	550					550
Total	1,317	-	-	1,483	-	2,800

6.4 Effects on stream flows

Water Ways (2025) highlight three areas of mine activity that can potentially lead to additional impacts to surface flow, affecting both low and high flow states in the watercourses:

- Mine pit dewatering
- Loss of water in stream diversions
- Loss of flow via the ephemeral streams.

During mining of the RAS pit and the SRX pit, 1,524 m (after adjustments) of ephemeral streams to Shepherds Creek and 1,317 m of ephemeral streams to Rise and Shine Creek, respectively, will be lost. The effects of loss of periodic overland flow from these ephemeral streams to Shepherds Creek and Rise and Shine Creek will be minimised through diversions to capture the water and transfer it back into the creeks. Details of these proposed diversions are described in section 7 below.

The mining activities to re-position overburden and extract ore would occur across the Shepherds and the Rise and Shine creek catchments. As the mining surface activities extend across the three deposit areas, RAS, CIT, and Srex (SRX, plus Srex East pit), a set of water management perimeters would be established in order to intercept or retain stormwater, other mine-impacted water and shallow groundwater seepage from entering downstream natural water during the operational phase of the mine site. Komanawa (2025) have indicated that these expanding water management cut-offs would reduce the natural flow rates of Shepherds Creek and, for a briefer period, Rise and Shine Creek (Bendigo catchment), during the operational phase of active mining. We note that the Shepherds Creek catchment contains the Tarras Farm Limited Partnership irrigation intake, which diverts up to approximately 50% of the creek volume out of the creek water course and out of catchment[1]. It is anticipated that this irrigation intake will be abandoned along with the abstraction from Shepherds Creek, more than doubling the mean flow downstream of the previous point of take.

Komanawa (2025) conclude that during operations Shepherds Creek would lose some 20% to 30% of previous upper catchment flow contribution and would be affected by RAS pit dewatering related groundwater depletion. The proposed northern diversion of clean water around these impact zones and removal of irrigation abstraction from Shepherds Creek currently below the operations area would remedy these temporary operational catchment losses. SRX pit dewatering would briefly draw off a significant portion of creek flow passing the immediate vicinity of the pit's northwest corner in the latter operational stages of mine life, although upstream diversions above the SRX pit would preserve the majority of upper Rise and Shine Creek flows; this creek is in any case a small tributary among much larger Bendigo catchment tributaries. The loss of Rise and Shine flood flows, which could not pass the straddle culvert to the RAS pit sump, is considered by Komanawa (2025) be of low impact.

The active closure and post-closure creek network would be significantly restored to their former hydrological function, with the exception of the RAS pit lake and drainage to lower Shepherds Creek through flooded underground workings, altered former ELF and TSF substrates, and the former SRX pit lake. Post-closure catchment hydrology for both Shepherds and Rise and Shine Creeks would be affected by the change in substrates and retention of soil moisture, resulting in higher catchment flow yields and more stable creek flow. Komanawa (2025) consider that long-term this would be a beneficial outcome for creek hydrology in a water-short part of Otago.

Komanawa (2025) conclude that overall, the proposal for mining activities in the current location is assessed to have environmental effects in terms of catchment flows, surface water depletion and groundwater resource allocation that are less than minor.

7.0 Effects Management

7.1 Functional Need

As outlined above, Policy 7 of NPSFM seeks to ensure the loss of river extent and values is avoided to the extent practicable. This is supported by clause 3.24 of the NPSFM which requires regional councils to include a new policy in their regional plans which guides how this policy will be implemented at a regional level. Together, these provisions direct that river loss should be avoided, unless:

- there is a functional need for the activity in that location; and
- the effects of the activity are managed by applying the effects management hierarchy.

The planning assessment for the BOGP (Mitchell Daysh 2025) demonstrates that a functional need exists to reclaim these watercourses and accordingly, the effects of the BOGP therefore

[1] Resource consent number RM17.301.15

need to be managed in accordance with the effects management hierarchy described in the NPSFM.

The effects management hierarchy is set out below and followed by detail of how effects management is satisfied.

7.2 Effects management hierarchy

As outlined above, the approach in the NPS-FM (2020) to the effects management for the loss of extent and values of the watercourses follows the effects management hierarchy[2]:

effects management hierarchy, in relation to natural inland wetlands and rivers, means an approach to managing the adverse effects of an activity on the extent or values of a wetland or river (including cumulative effects and loss of potential value) that requires that:

(a) adverse effects are avoided where practicable; then

(b) where adverse effects cannot be avoided, they are minimised where practicable; then

(c) where adverse effects cannot be minimised, they are remedied where practicable; then

(d) where more than minor residual adverse effects cannot be avoided, minimised, or remedied, aquatic offsetting is provided where possible; then

(e) if aquatic offsetting of more than minor residual adverse effects is not possible, aquatic compensation is provided; then

(f) if aquatic compensation is not appropriate, the activity itself is avoided.

7.3 Effects management for Shepherds Creek

7.3.1 Introduction

As outlined above, the loss of sections of Shepherds Creek is **unavoidable** due to the functional need of the BOGP. Although loss has been **minimised** as much as possible in the mine design, the proposed mine activities will result in the loss of 7,139 m of perennial stream length, 1,631 m of intermittent stream length.

In this section we set out the effects management for the loss of Shepherds Creek, including establishing principles of how the outcome will be achieved.

7.3.2 Stream diversion

As the functional need for the location of the proposed activities has been demonstrated, the loss of Shepherds Creek **cannot be avoided**. We propose that as much as possible of the extent of Shepherds Creek is diverted to form a functioning watercourse. The proposed diversion only accounts for the sections of Shepherds Creek that are reclaimed by the proposed mining activities (the upper and lower catchment reaches of Shepherds Creek remain as is).

The Shepherds Stream Diversion will be an extension of the upstream clean water diversion channels established to divert clean water around the Shepherds ELF and TSF and will manage

[2] Effects Management Hierarchy as set out in section 3.21(1) of the NPS-FM (2020).

clean water for the full length of Shepherds Creek, until the creek exits the lower Shepherds Creek gorge and enters the Ardgour Terrace. It will also take treated water from various sediment retention ponds that will be located throughout the mining areas (including the Shepherds Silt Pond) after the settlement of solids and take overflows from these ponds during high rainfall events.

In addition, a further clean water diversion channel is proposed to be constructed at final elevation along the southwestern extent of the Shepherds ELF (South SW ELF). This channel will report to a pipe that will convey clean surface water from the catchment across the Shepherds Valley, along the base of the TSF and into the northern diversion channel (which then conveys flows to the downstream Shepherds Stream Diversion (North SW ELF).

Achieving a functioning water course can be guided through the implementation of a series of principles aimed at the future engineering and design of the diversion channel. These principles are detailed further in section 8.

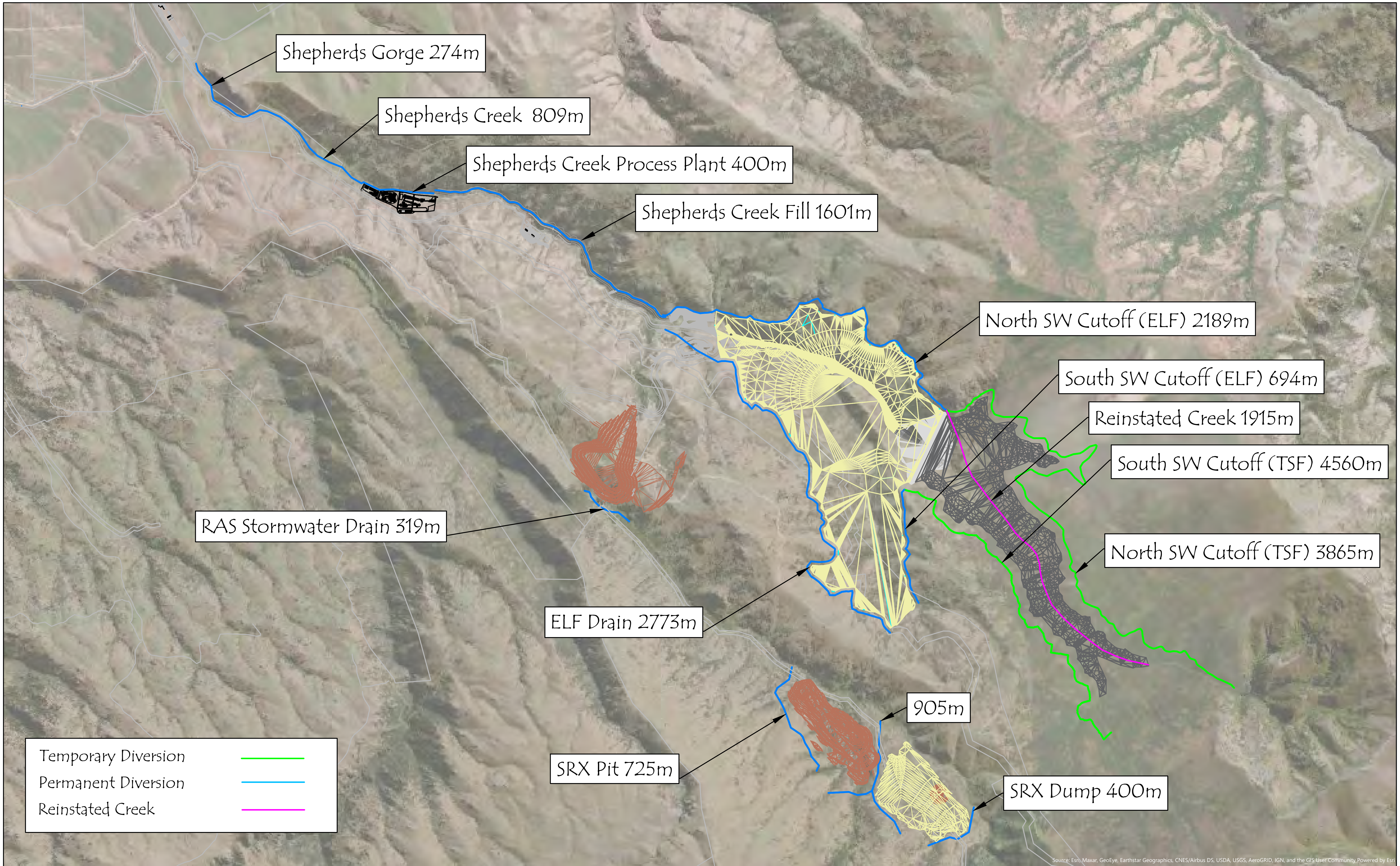
The rehabilitated diversion of Shepherd Creek is an appropriate **remedy** for the stream reclamation, i.e., the watercourse is moved and is retained as a functioning ecosystem. Where there is a shortfall in the extent of remediation provided and not all the extent loss can be remedied then the effects management hierarchy requires that an aquatic offset and/or compensation is required.

Some 9,558 m of functional stream will be created through the development and rehabilitation of the diversion, including the reinstated stream on the surface of the TSF at closure. The lengths of diversion that make up the created watercourse are set out in Table 4 and Figure 5.

Table 4: *Make-up of the diversion lengths Shepherds Creek.*

Shepherds Creek		
Created watercourse* (with enhancement)	**Total length (m)**	**Total area (m^2)**
North SW ELF	5,768	5,768
Reinstated stream TSF (at closure)	1,915	1,915
Shepherds Creek fill	1,601	1,601
Shepherds Gorge	274	274
Total watercourse creation (remedy)	**9,558**	**9,558**
Retained watercourse# (with enhancement)		
Shepherds Creek	1,196	957
Total watercourse enhancement	**10,754**	**10,515**

*Assumes an average width of the rehabilitated diversion of 1.0 m. #Assumes an average width of Shepherds Creek of 0.8 m. ^Upper Shepherd Creek to ELF is retained and not rehabilitated.



MATAKANUI GOLD LIMITED

Figure 5

Bendigo - Ophir Gold project
Storm Water Drain Lengths

September 2025

Scale 1:20,000 @A3
Date 29/09/2025
Drawing No: BOGP-ENV-SP-09-D
Drawing By: Josh C
Sheet No. 1 of 1

7.3.3 Staging of stream diversion

As outlined in section 3.2 above, with the exception of the reinstated TSF stream, the construction of the permanent (and temporary stream diversions) as well as the sediment treatment ponds will occur in the first year of proposed activities. This means that the diversion for Shepherds Creek will be in place before or as the Creek is reclaimed.

7.3.4 Mine closure and rehabilitation

At mine closure, the surface of the TSF will be fully dry capped with brown rock, topsoil, and revegetated, with the tailings contoured to enable water to flow to the northwest corner of the TSF. The portions of diversion channels upstream of the TSF embankment crest will be reprofiled, and their footprint rehabilitated, to allow surface water runoff from the catchment to drain towards the rehabilitated TSF surface. This amounts to some 1,915 m of rehabilitated stream length. Essentially the NW diversion is re-created on the surface of the TSF and rehabilitated as stream habitat.

A shallow amount of water will be allowed to pond on the dry capping at the northwest corner of the TSF to attenuate flood flows and form a wetland. Water will flow from the wetland into the northern diversion channel and then into the Shepherds Stream Diversion below the Shepherds ELF.

Seepage from the TSF and Shepherds ELF will continue to collect in the underdrainage and the Shepherds Seepage Collection Sump at the toe of the Shepherds ELF. During mine closure the seepage will be conveyed to an active WTP (or passive treatment ponds) before being discharged into Shepherds Creek.

7.4 Effects management for Rise and Shine Creek

7.4.1 Stream diversion

As for Shepherd Creek, the functional need for the location of the proposed activities has been demonstrated and the loss and modifications to Rise and Shine Creek **cannot be avoided**. Much of the proposed diversion is temporary and/or short term and is rehabilitated at closure.

At closure the pit lake will overtop into Rise and Shine Creek, so flow from the unnamed intermittent creeks will be returned to Rise and Shine Creek.

For Mt. Moko Creek, flow will be retained between the SRX pit and SRX ELF via culvert and thus the watercourse remains connected. At the completion of mining the culvert would be removed and the creek line re-established and rehabilitated.

At the time of writing, there are two options for the design of this diversion channel. The option will be determined when the pit is being expanded across the Rise and Shine Creek. Either option will ensure that this channel will be rehabilitated as a functional watercourse.

The re-establishment and rehabilitation of Rise and Shine Creek is an appropriate **remedy** for the modifications and meets the requirements of the effects management hierarchy (Table 5). We consider that a stream diversion designed in general accordance with the diversion principles (see section 8) will not result in an adverse aquatic ecological outcome.

Table 5: *Make-up of the diversion lengths Rise and Shine Creek.*

Created and/or rehabilitated watercourse* (with enhancement)	Length (m)	Total length (m)	Total area (m^2)
SRX diversion	725	400	200
Mt. Mocha Stream	880	880	440
RAS drain	319	319	160
Total watercourse creation/remediation		**1,599**	**800**

7.5 Further enhancements

Enhancements to the created and retained watercourses will also provide for aquatic ecological values. However, whilst the creation of diversions occurs before or at the same time as the loss of streams in some cases, in other circumstances there is a time lag between the loss and creation of watercourses. Similarly, there is a time lag between the commencement and the achievement of enhanced ecological values within the watercourses.

Accordingly, following the remedy for the extent of watercourses, there remains a residual effect. As the principles of aquatic offset as set out in the NPS-FM cannot be satisfied as a no net loss is not achieved, compensation is proposed which is described further below. The application of the principles of aquatic offset and aquatic compensation are set out in Appendix 2.

Additional enhancement of some 6,700 m of Bendigo and Clearwater Creeks, located in the Bendigo Historic Reserve near the Come-in-Time Stamper Battery immediately west of the project site is proposed as aquatic compensation. Proposed enhancement includes the management of crack willow trees and enhancement of the riparian margins of the creeks which will provide substantial benefit to the aquatic ecological values of these watercourses (see further detail in section 9).

7.6 Compensation Activity

MGL proposes to manage crack willow trees out of the Bendigo and Clearwater Creeks, located in the Bendigo Historic Reserve near the Come-in-Time Stamper Battery immediately west of the project site. These works will include the spraying of herbicide to kill willow trees, the progressive and / or partial removal of willow trees, and the partial replacement of cover with native vegetation.

The location of the proposed crack willow removal activities is shown in Figure 6. The proposed enhancement in the form of management of existing willows and transformation to native riparian vegetation over some 6,700 m of Bendigo and Clearwater Creeks (Willow concession area). It is expected that this will occur over a 10-year period, with the purpose of re-establishing a native vegetated riparian margin to the Bendigo and Clearwater Creeks.

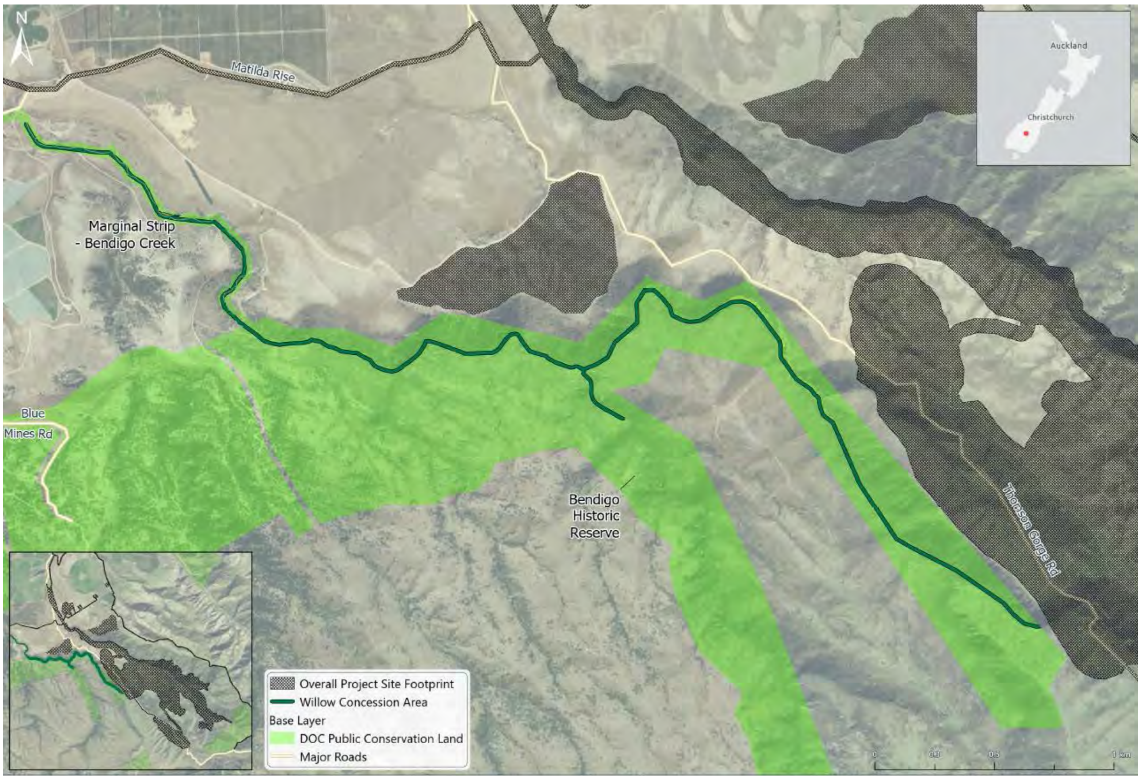


Figure 6: *Location of willow concession area and stream length of proposed willow removal and stream enhancements (project site with the Bendigo Historic Reserve shown in green shading.*

7.7 Summary effects management

As established above, the functional need of the proposed activities means that the loss of watercourses is unavoidable. Although loss will be minimised as much as possible, the proposed mine activities will result in the loss of **7,139 m of permanent stream** length whilst 1,631 m of intermittent stream length will be modified in Shepherd Creek. Effects management provides **remedy of 9,558 m (9,558 m^2 of stream area) of created permanent watercourse** through rehabilitation of the proposed diversion of Shepherd Creek, including the reinstated stream across the surface of the TSF at closure. A further 1,196 m length (~957 m^2 of stream area) of Shepherds Creek will be enhanced to improve aquatic ecological values. This amounts to a total enhancement of **10,754 m of stream length (~10,515 m^2 of stream area)** of stream values.

Estimates of stream loss and modification in Rise and Shine Creek suggest that some 1,483 m length of stream **(~741.5 m^2)** will be lost and approximately **1,600 m of stream length (800 m^2 of stream area) will be created** within the catchment, and the equivalent will apply for enhancement of aquatic ecological values.

Compensation is provided through the proposed management of existing willows and transformation to native riparian vegetation over some 6,700 m of Bendigo and Clearwater Creeks (Willow concession area).

Accordingly, policy 7 of the NPS-FM is satisfied as there is no loss of extent of watercourse arising as a result of the BOGP.

8.0 Principles of Diversion Design

8.1 Diversion design

The following high-level principles of design will be applied to the permanent and temporary diversion of the affected parts of Shepherds Creek and Rise and Shine Creek (see Figures 6 to 8):

- As much as practicable, the diversion should be designed with an average width of no less than 0.8 m, and preferably 1 m for Shepherds Creek, and no less than 0.5 m for Rise and Shine Creek.
- As much as possible, the steam diversion channel must be a similar length and stream area than the channel to be reclaimed. This aims to ensure that there is no loss of extent and values of the watercourse.
- The channel design does not have to replicate the form of the channel to be reclaimed but would benefit from a low-flow (or baseflow) channel, a bank full channel and where available, a floodplain area.
- As much as possible, water flow should mimic the hydrology of the existing watercourse (i.e., flows intermittently or permanently same as existing channel).
- The channel should mimic, as much as practicable, the natural meanders of the stream to be reclaimed.
- Hydrologic heterogeneity and instream habitat complexity can be achieved through the creation of natural features such as runs, riffles and small and large pools.

In addition, we recommend the following:

- As much as possible, the habitat within the diversion is of a similar form and structure to the stream to be reclaimed (and like neighbouring tributaries). The final substrate present should mimic that naturally occurring in similar sized tributaries in the wider catchment.
- The stream profile should allow the planting of riparian vegetation close to and extending over and into the water surface at the margins to create ample stream edge habitat. This can be low stature planting that provides vegetation overhang over and into the watercourse and to enhance habitat for the aquatic ecosystem.
- As much as possible, riparian vegetation is be planted along the length of the stream diversion. Riparian vegetation plays an important role in the ecological success of a stream diversion. Appropriate riparian species selection will enhance stream ecology through providing shade to the stream, reducing water temperature, producing habitat and providing a food source. As much as possible, riparian vegetation should extend along either side of the diversion channel.

When implemented the recommended principles and actions will provide acceptable remediation for the loss of the extent and values of Shepherds Creek and Rise and Shine Creek.

8.2 Fish passage

The absence of fish within Shepherds Creek and Rise and Shine Creek means that provision for fish passage and habitat is not a necessary requirement for the diversion channel.

8.3 Stream Construction

The following high-level principles of design will be applied to the construction of the stream diversion channel:

- The stream diversion channel should preferably be constructed offline and prior to any instream works within the creek.
- Once the construction of the diversion channel is complete, it should be inspected by a Freshwater Ecologist to ensure the ecological principles (as set out above in section 10.1) have been integrated into the final construction.

Schematic examples of rehabilitated watercourse outcomes are shown in Appendix 3, and for lowland stream is repeated in Figure 7.

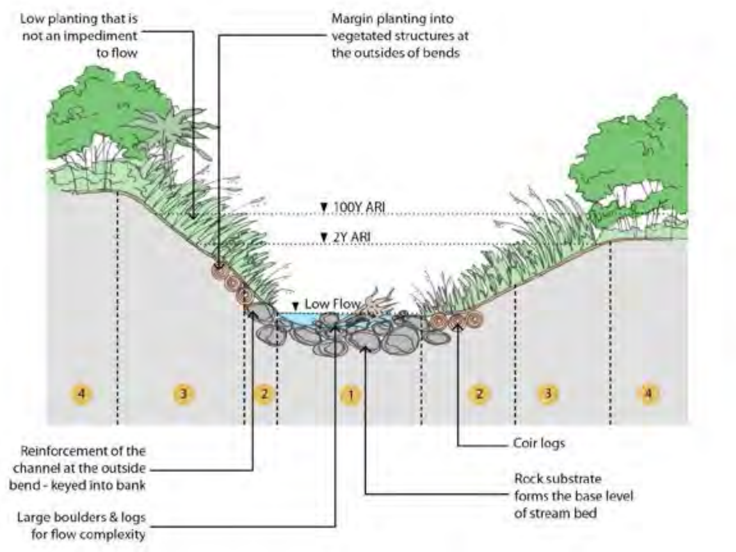


Figure 7: *Example schematic of a channel design, illustrating a low flow channel in a steep and the use of rocky substrates and woody debris.*

8.4 Post-Construction

The stream diversion channels should undergo inspections by a freshwater ecologist to ensure it is meeting its ecological objectives and is performing according to designs. Inspections of the channels should be undertaken prior to and shortly after livening, with a further inspection within three years.

8.5 Shepherds Creek Diversion Rehabilitation

8.5.1 Approach and objective

The approach to the establishment and rehabilitation of Shepherds Creek and Rise and Shine Creek diversions is set out below. The objective is to design, construct, revegetate and maintain the diversion to achieve a no net loss of extent and values of Shepherds Creek.

8.5.2 Key features of the diversion rehabilitation

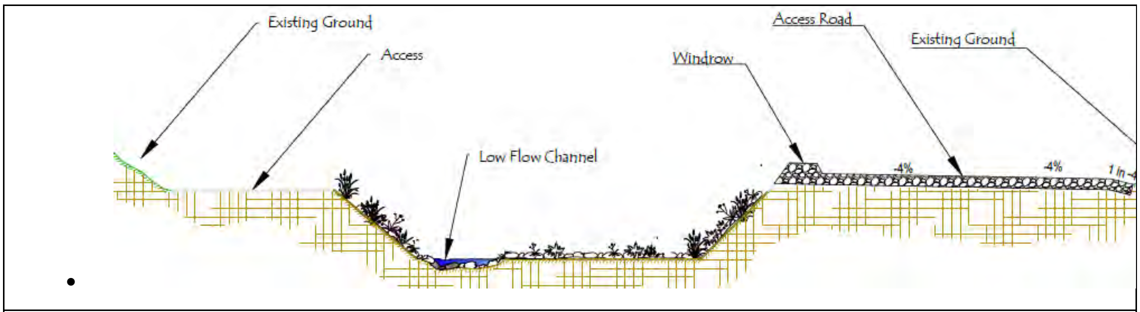
Overall rehabilitation principles are set out in the LERMP (see below), and the key features of the diversion rehabilitation are outlined below and in Table 6:

- Drop structures and/or weirs designed to create series of stream pools and habitat diversity.
- Tree trunks embedded in the stream to provide flow complexity and habitat diversity.
- Mixed substrate diversity (occasional large boulders along with large, moderate and small sized gravels).
- Bund or swale alongside road edge to prevent road silt and materials entering the diversion channel.
- Transplant of plants from Shepherds Creek to diversion channel via holding area.
- Engineered structures may be necessary in more complex or steeper reaches.

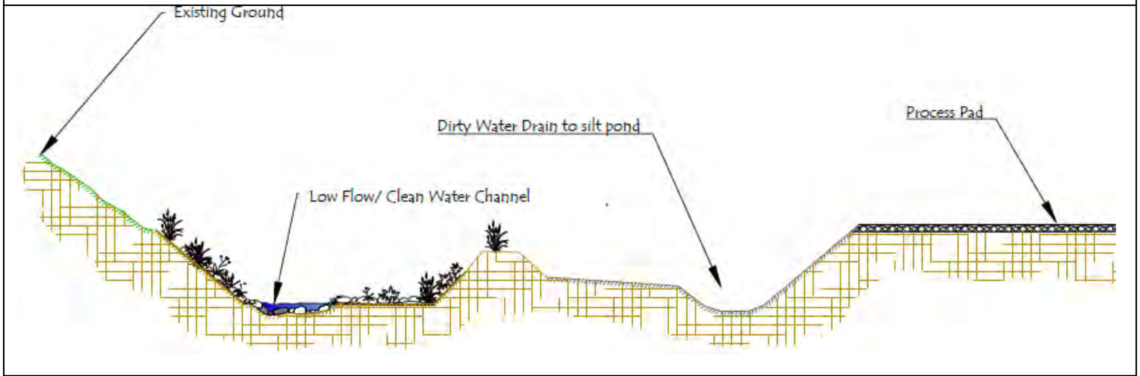
Access for maintenance and other purposes is required alongside the diversion. Example cross section of how this will be approached in the design are shown in Figure 8 (taken from the Shepherd's Creek overall plan, Appendix 4). Example and indicative cross-sections of the proposed landscape diversion channel are shown in Figure 9 and drawn from the rehabilitation plan provided in Appendix 5.

Table 6: *Key features of the Shepherds Creek and Rise and Shine Creek diversions and applied to Diversion principles.*

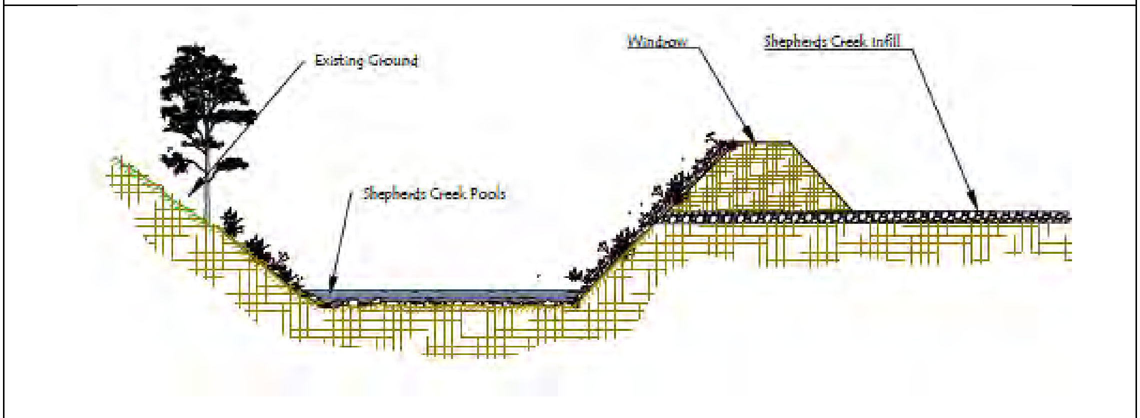
Diversion Principle	Shepherds Creek	Rise and Shine Creek
• As much as practicable, the diversion should be designed with an average width of no less than 0.5 m, and preferably 1 m.	The diversion is expected to be formed with an average width of no less than 0.8 m, and preferably 1 m.	The diversion is expected to be formed with an average width of no less than 0.5 m, and preferably 1 m.
• As much as possible, the steam diversion channel must be a similar length and stream area than the channel to be reclaimed. This aims to ensure that there is no loss of extent and values of the watercourse.	The steam diversion channel length and stream area of the diversion does not meet the equivalent of loss and compensation is proposed.	The steam diversion channel length and stream area of the diversion does not meet the equivalent of loss and compensation is proposed.
• The channel design does not have to replicate the form of the channel to be reclaimed but would benefit from a low-flow (or baseflow) channel, a bank full channel and where available, a floodplain area.	The proposed design features a low-flow (or baseflow) channel, a bank full channel and where available, a floodplain area.	The proposed design features a low-flow (or baseflow) channel, a bank full channel and where available, a floodplain area.
• As much as possible, water flow should mimic the hydrology of the existing watercourse (i.e., flows intermittently or permanently same as existing channel).	Hydrological conditions of the diversion channel is expected to mimic the hydrology of the existing watercourse, or features will be designed to accommodate modified hydrology.	Hydrological conditions of the diversion channel is expected to mimic the hydrology of the existing watercourse, or features will be designed to accommodate modified hydrology.
• The channel should mimic, as much as practicable, the natural meanders of the stream to be reclaimed.	The diversion channel will mimic natural stream character.	The diversion channel will mimic natural stream character.
• Hydrologic heterogeneity and instream habitat complexity can be achieved through the creation of natural features such as runs, riffles and small and large pools.	The diversion channel will mimic natural stream character.	The diversion channel will mimic natural stream character.



a) Shepherds Creek cross-section A-A

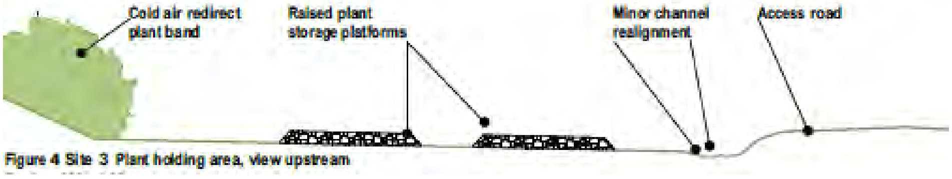


b) Shepherds Creek cross-section B-B

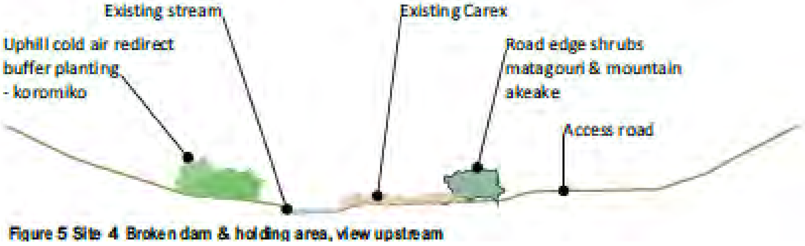


c) Shepherds Creek cross-section C-C

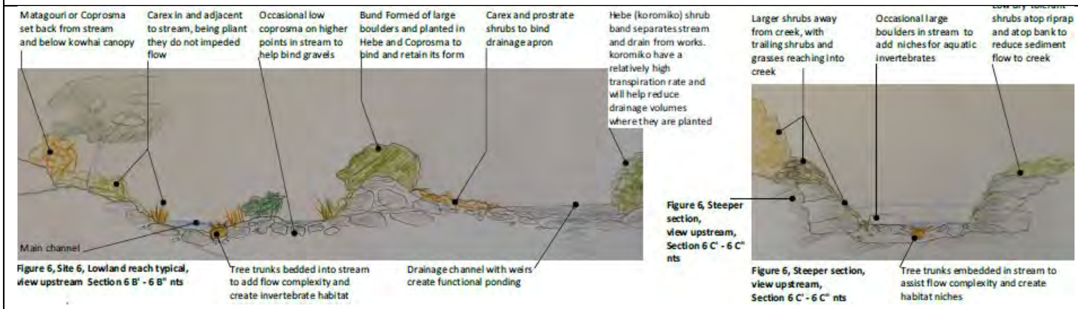
Figure 8: *Example of access bench alongside the proposed stream diversion, Shepherds Creek (also provided in full in Appendix 3).*



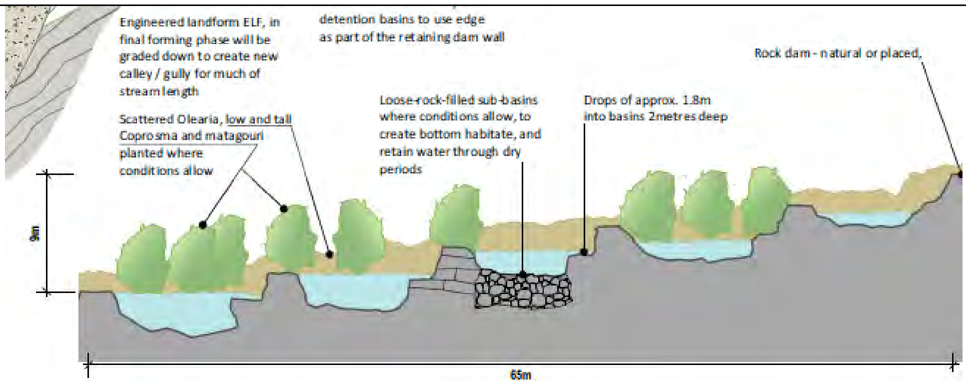
a) Plant holding area



b) Broken Dam and holding area



c) Indicative lowland and steeper sections



d) Drop series

Figure 9: *Indicative cross-sections of the proposed rehabilitated Shepherds Creek diversion (from Growplan, Appendix 5).*

8.6 LERMP

8.6.1 LERMP Objectives

The LERMP is relevant to the overall stream diversion through the proposed enhancements to the land use of the catchment. The rehabilitation objectives are drawn from the LERMP and guided as follows:

- Recognise and protect backdrop and skyline integrity when shaping mine elements within the context of an Outstanding Natural Landscape.
- Create safe, stable engineered landforms with high naturalness and erosion resistance.
- Address heritage place loss through maintained access.
- Provide for waterway ecological and instream values.
- Reinstate Thomson Gorge Road recreation access for walking.

The key features of the overall rehabilitation plans are shown in Figure 3 and key staging of site rehabilitation in Appendix 6.

8.6.2 LERMP Ecological Approach

Landforms and land covers will reflect heterogeneous mosaics typical of native-dominated Central Otago ecosystems (LERMP 2025). Rehabilitation aims to enhance ecological values relative to pre-mining conditions for native plants, invertebrates and lizards, including nationally threatened, at-risk, or culturally important species. The exception is the existing agricultural areas on Ardgour Terraces which will be largely returned to agricultural use (intensive pasture/crop). The same purpose applies to the enhancement of the aquatic ecological values of the watercourses.

8.6.3 Post-mining Land Use

Ecological conservation will be the dominant post-mining land use (LERMP). Sheep grazing will be limited to that required to support ecological values, primarily in cushion field areas. No cattle, horse, or deer grazing will occur throughout the BOGP site Mine Regeneration Zones. The same purpose applies to the enhancement of the aquatic ecological values of the watercourses. The removal of grazing stock from the MRZ is important as the proposed land use is beneficial for watercourses and prevents stock access and the continued fertiliser and other treatments to the land.

9.0 Proposed Management Plan and Monitoring

9.1 Purpose

A management and monitoring plan is proposed for the construction and operation of the stream diversions. The purpose of the management and monitoring is to set out:

- Responsibilities and competencies.
- Protocol for effects minimisation.
- Design and construction protocols.
- Monitoring.
- Reporting.

9.2 Frequency and content of ecological monitoring

Ecological Monitoring of the stream channel should be undertaken after years 2 and 5 and 10 post-livening to ensure it is meeting ecological objectives.

It is recommended that the following is undertaken at each survey:

- Habitat assessment.
- Macroinvertebrate assessment.
- Riparian planting extent and condition.

10.0 Application of effects management hierarchy

The location of the resource at the BOGP means that alternative options for locating the mine and associated activities are unavailable and thus total avoidance of effects are not available. Here we provide a summary of how the application responds to the effects management hierarchy for management of the potential aquatic ecological effects of the proposed BOGP (Table 7).

The overall effects management for the BOGP provides a remedy for the direct and indirect effects of the BOGP through intensive rehabilitation of stream diversions. The final outcome maintains the connectivity up and downstream in the catchment. Additional compensation is offered.

Accordingly, the effects of the BOGP on watercourse extent and aquatic ecological values are remedied, and with additional compensation, the outcome of BOGP delivers a no net loss and enhanced benefit for aquatic ecological values.

Table 7: *Effects management hierarchy applied to freshwater values for the BOGP.*

Effects management		
	Shepherd Creek	**Rise and Shine Creek**
Ecological values	Moderate to high	Low to moderate
Avoid	Options to locate the project elsewhere are not available due to the location of the gold resource. Unavoidable reclamation of some 7,799 m of perennial and intermittent stream length. This equates to approximately 7,000 m^2 of stream area[#].	Options to locate the project elsewhere are not available due to the location of the gold resource. Unavoidable reclamation of some 1,483 m of perennial stream length (741.5 $m^{2\$}$) and no loss of intermittent stream. Temporary diversion of some 880 m (440 $m^{2\$}$) of perennial Mt. Mocha stream is unavoidable. This amounts to a total of approximately 1,181 m^2 of stream area[$].
Minimise	Diversions to capture water from ephemeral watercourses and transfer it back into the creeks.	Diversions to capture water and transfer it back into the creeks.
Remedy	Creation of some 7,643 m rehabilitated stream diversion (7,643 m^{2*}). Diversion channel to be created in year 1 ahead or at same time as the reclamation of Shepherds Creek. Rehabilitation of 1,196 m of Shepherds Creek retained in existing bed above gorge. Reinstatement of some 1,915 m of stream on surface of TSF at mine closure.	At the completion of mining the temporary diversion of 880 m of the Mt. Mocha Creek line will be remedied and rehabilitated, and with other diversion design requirements leads to creation of some 1,599 m (800 m^2) of stream. Remediation of the connected flow between the SRX pit and SRX ELF.
Offset	Principles of offset cannot be fully satisfied due to lag time from full loss to full gain in values.	Principles of offset cannot be fully satisfied due to lag time from full loss to full gain in values.
Compensation	Additional compensation is proposed in the form of management of existing willows and transformation to native riparian vegetation over some 6,700 m of Bendigo and Clearwater Creeks (Willow concession area). Compensation completes the effects management by providing for the lag time to achieve ecological values.	

[#]Assumes an average width of Shepherds Creek of 0.8 m. [*]Assumes an average width of the rehabilitated diversion of 1.0 m. [$]Assumes an average width of Rise and Shine Creek of 0.5 m.

11.0 Conclusion

Ecological values vary across the project area, ranging from moderate to high values in Shepherds Creek catchment, and low to moderate in the Rise and Shine Creek catchment. No fish were recorded in Shepherds Creek or Rise and Shine Creek.

The proposed BOGP comprises several features that affect the watercourses. The proposed activities give rise to direct impacts in the manner of reclamation of some 10,626 m of perennial stream.

We consider that with rehabilitated stream diversions plus provision of stream enhancement, and additional compensation (management of willows and rehabilitation of Bendigo and Clearwater Creeks) along with the proposed WNP activities, there is no permanent loss of streams or any loss of extent of watercourses. Streams are either replaced within a short timeframe (ecologically functional diversions) or re-established and rehabilitated later (Mt. Mocha Creek) or separately, Bendigo Creek and Clearwater Creek are subject to specific management (willow management and rehabilitation). Accordingly, the effects management hierarchy is satisfied and the outcome of the BOGP provides for a no net loss of stream extent and ecological values.

12.0 References

DOC (1987). Ecological Regions and Districts of New Zealand. New Zealand Biological Resources Centre Publication No. 5. Department of Conservation, Wellington.

Water Ways (2025). Bendigo Ophir Gold Project: Assessment of Effects on Aquatic Habitat. Report prepared by Water Ways Consulting, June 2025.

Kōmanawa Solutions Ltd (2025). Bendigo Ophir Gold Project: Surface Water & Catchment Existing Environment & Effects Assessment. Report prepared by Kōmanawa Solutions Ltd., May 2025.

Appendix 1: Mine plan

MATAKANUI GOLD LIMITED J-NZ0233-016-R-RevA

2.2 Mine Plan

The mine plan for the Bendigo-Ophir site is outlined in Table 1. The schedule describes the timing of construction of different mine-site infrastructure and water-management components (illustrated in Figure 1), and subsequent mining operations. The schedule is also used to inform development of operational phase and closure phase water-management plans.

Table 1: BOGP Mine plan schedule.

MONTH	YEAR	MINING PHASE	DESCRIPTION OF PHASE
		Pre-startup	Detailed design phase
0 to 6	0 to 0.5	**Startup**	Pioneering / RAS Pre-Strip, Initial Jean Creek Silt Pond, earthworks at process plant.
6 to 24	0.5 to 2	**Project Development**	Construction of process plant, TSF, Shepherds Creek Silt Pond, North Diversion Channel, Commissioning, mining RAS pre-strip (Pre-strip ends month 19). Construction of the WELF begins
		Operations	
25 to 54	3 to 4.5	RAS pit mining on its own	Operations (Pit ore production in month 20. UG Development begins month 54). WELF construction complete.
54 to 72	4.5 to 5	RAS pit with UG development	Operations (UG Ore production begins month 70)
72 to 132	6 to 11	RAS pit plus RAS UG	Operations (UG Ore production months 70 to 150)
		RAS Pit plus RAS UG plus CIT Pit	Operations (CIT Pit mined months 102 to 114)
		RAS Pit plus RAS UG, plus CIT backfilled, plus Srex	Operations (Srex Pit mined months 145 onwards)
120 - 160	10 to 13.3	RAS UG continues on its own with CIT and Srex open pit feeds	Operations (all mining halted month 160)
		Closure	
160 - 372	11 to 31	**Active Closure** [1]	All mining halted. Active closure of pits, TSF, and wider site, plus setup of active water treatment plant (option).
372 -	31 onwards	**Post-Closure**	Passive treatment and maintenance

UG = Underground

1. Presented as two decades as part of the Pre-feasibility Mine Plan.

Source: BOGP_high_level_schedule_PFSconsent.xlsx (Santana, 2025)

Appendix 2: Application of NPS-FM Offset and Compensation Principles

Application of Offsetting Principles

The NPS-FM sets out principles that apply to the appropriateness of offsetting for the loss of values and extent of natural inland wetlands and streams.

Application of NPS-FM (Appendix 6) Offset Principles to Bendigo Ophir Gold Mine.

Aquatic Offsetting Principles	Project Evaluation	Principle Outcome
1. **Adherence to effects management hierarchy:** An aquatic offset is a commitment to redress more than minor residual adverse effects, and should be contemplated only after steps to avoid, minimise, and remedy adverse effects are demonstrated to have been sequentially exhausted.	Project site selection examined all practicable options for operation in the wider district. Effects on catchment drainage and groundwater assessed and remediated/ mitigated as far as practicable.	Principle satisfied
1. **When aquatic offsetting is not appropriate:** Aquatic offsets are not appropriate in situations where, in terms of conservation outcomes, the extent or values cannot be offset to achieve no net loss, and preferably a net gain, in the extent and values.# 2.	Loss of extent of watercourse cannot be fully offset to achieve no net loss because replacement is not technically feasible within an acceptable timeframe.	Principle achieved in part; lag time required to complete enhanced aquatic values.
3. **No net loss and preferably a net gain:** This is demonstrated by a like-for-like quantitative loss/gain calculation and is achieved when the extent or values gained at the offset site (measured by type, amount and condition) are equivalent to or exceed those being lost at the impact site.	A like-for-like quantitative loss/gain calculation, that demonstrates extent or values gained at the offset site (measured by type, amount and condition) are equivalent to or exceed those being lost at the impact site is not achievable.	Principle achieved in part; lag time required to complete enhanced aquatic values.
4. **Additionality:** An aquatic offset achieves gains in extent or values above and beyond gains that would have occurred in the absence of the offset.	No restoration & enhancement is otherwise provided for outside of this project.	Principle satisfied.
5. **Leakage:** Aquatic offset design and implementation avoid displacing harm to other locations (including harm to existing biodiversity at the offset site).	No displacement of adverse effects anticipated.	Principle satisfied.

Aquatic Offsetting Principles	Project Evaluation	Principle Outcome
6. Long-term outcomes: An aquatic offset is managed to secure outcomes of the activity that last at least as long as the impacts, and preferably in perpetuity.	Restoration & enhancement areas permanently protected	Principle satisfied.
7. Landscape context: An aquatic offset action is undertaken where this will result in the best ecological outcome, preferably close to the impact site or within the same ecological district.	Offset site as close as practicable to impact site and within same catchment.	Principle satisfied in part.
8. Time lags: The delay between loss of extent or values at the impact site and the gain or maturity of extent or values at the offset site is minimised so that the calculated gains are ideally achieve within the consent period.	Gains anticipated within a short timeframe (10 years) for streams.	Principle generally satisfied.
9. Science and mātauranga Māori: The design and implementation of an aquatic offset is a documented process informed by science where available, and mātauranga Māori at place.	Restoration principles and practices are well established	Principle satisfied in part.
10. Tangata whenua or stakeholder participation: Opportunity for the effective and early participation of tangata whenua or stakeholders is demonstrated when planning aquatic offsets, including their evaluation, selection, design, implementation, and monitoring.	Tangata whenua feedback addressed in the Assessment of Effects report.	Principle satisfied.
11. Transparency: The design and implementation of an aquatic offset, and communication of its results to the public, is undertaken in a transparent and timely manner.	Reporting of assessment methods and outcomes provides transparency	Principle satisfied.

[#]Examples of an offset not being appropriate would include where: (a) residual adverse effects cannot be offset because of the irreplaceability or vulnerability of the extent or values affected; (b) effects on the extent or values are uncertain, unknown, or little understood, but potential effects are significantly adverse; (c) there are no technically feasible options by which to secure proposed no net loss and preferably a net gain outcome within an acceptable timeframe.

Application of Compensation Principles

The NPS-FM sets out principles that apply to the appropriateness of compensation for the loss of values and extent of natural inland wetlands and streams.

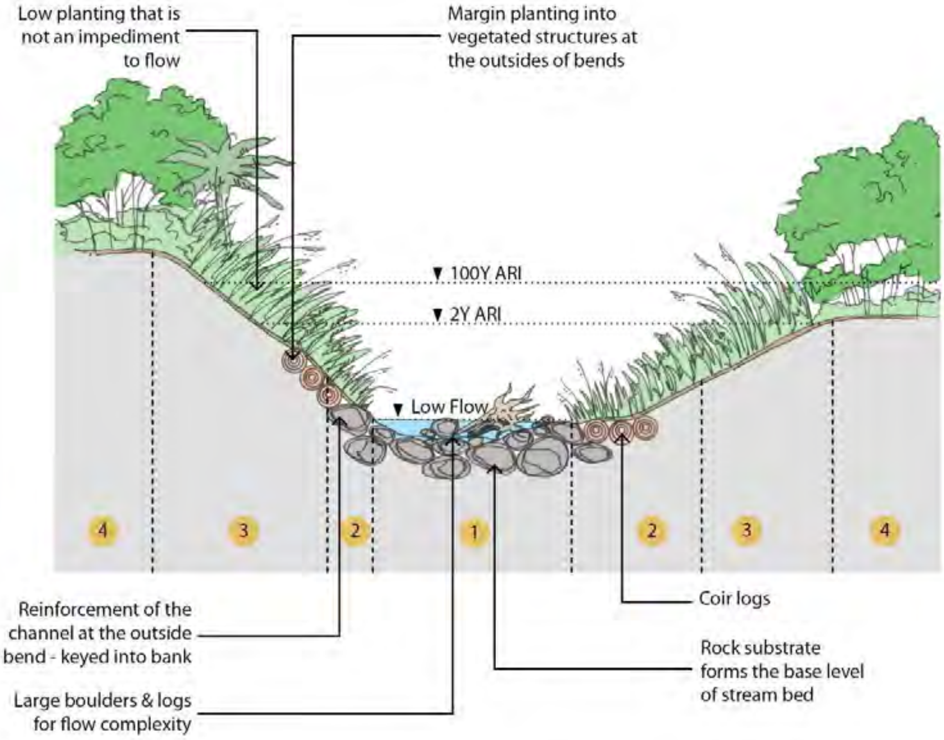
Application of NPS-FM (Appendix 7) Compensation Principles to Bendigo Ophir Gold Mine.

Aquatic Offsetting Principles	Project Evaluation	Principle Outcome
1. **Adherence to effects management hierarchy:** Aquatic compensation is a commitment to redress more than minor residual adverse effects, and should be contemplated only after steps to avoid, minimise, remedy, and offset adverse effects are demonstrated to have been sequentially exhausted.	Project site selection examined all practicable options for operation in the wider district. Effects on catchment drainage and groundwater assessed and remediated/ mitigated as far as practicable.	Principle satisfied
2. **When aquatic compensation is not appropriate:** Aquatic compensation is not appropriate where, in terms of conservation outcomes, the extent or values are not able to be compensated for.	Loss of extent of watercourse can be fully compensated and in terms of conservation outcomes, the extent or values are able to be compensated.	Principle satisfied.
3. **Scale of aquatic compensation:** The extent or values to be lost through the activity to which the aquatic compensation applies are addressed by positive effects that outweigh the adverse effects.	The extent or values to be lost through the activity to which the aquatic compensation applies are addressed by positive effects that outweigh the adverse effects.	Principle satisfied.
4. **Additionality:** Aquatic compensation achieves gains in extent or values above and beyond gains that would have occurred in the absence of the compensation.	No restoration & enhancement is otherwise provided for outside of this project.	Principle satisfied.
5. **Leakage:** Aquatic compensation design and implementation avoid displacing harm to other locations (including harm to existing biodiversity at the compensation site).	No displacement of adverse effects or harm to existing biodiversity at the compensation is anticipated.	Principle satisfied.
6. **Long-term outcomes:** Aquatic compensation is managed to secure outcomes of the activity that last as least as long as the impacts, and preferably in perpetuity.	Restoration & enhancement areas permanently enhanced and protected	Principle satisfied.
7. **Landscape context:** An aquatic compensation action is undertaken where this will result in the best ecological outcome, preferably close to the impact site or within the same ecological district.	Compensation site is as close as practicable to impact site and within same catchment.	Principle satisfied .

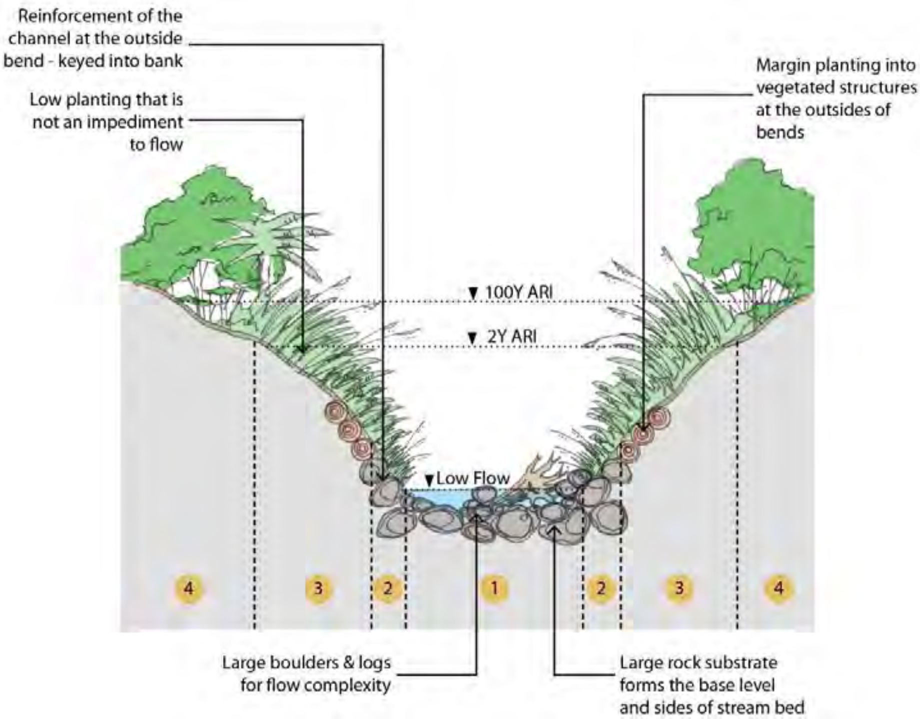
Aquatic Offsetting Principles	Project Evaluation	Principle Outcome
8. Time lags: The delay between loss of extent or values at the impact site and the gain or maturity of extent or values at the compensation site is minimised so that the calculated gains are achieved within the consent period.	Gains anticipated within a short timeframe (10 years) for streams.	Principle satisfied.
9. Trading up: When trading up forms part of aquatic compensation, the proposal demonstrates that the aquatic extent or values gained are demonstrably of greater or higher value than those lost.	Trading up not applied.	Principle satisfied.
10. Financial contribution: A financial contribution is only considered if it directly funds an intended aquatic gain or benefit that complies with the rest of these principles.	Financial contribution not required.	Principle satisfied.
11. Science and mātauranga Māori: The design and implementation of aquatic compensation is a documented process informed by science where available, and mātauranga Māori at place.	The design and implementation of aquatic compensation is a documented process informed by science where available, and mātauranga Māori.	Principle satisfied.
12. Tangata whenua or stakeholder participation: Opportunity for the effective and early participation of tangata whenua or stakeholders is demonstrated when planning aquatic compensation, including its evaluation, selection, design, implementation, and monitoring.	Tangata whenua feedback addressed in the Assessment of Effects report.	Principle satisfied.
13. Transparency: The design and implementation of aquatic compensation, and communication of its results to the public, is undertaken in a transparent and timely manner.	Reporting of assessment methods and outcomes provides transparency	Principle satisfied.

Appendix 3: Stream Diversion Design Schematics

STREAM CHANNEL DIVERSION DESIGN



Stream Diversion Type 1 – Lowland stream cross section



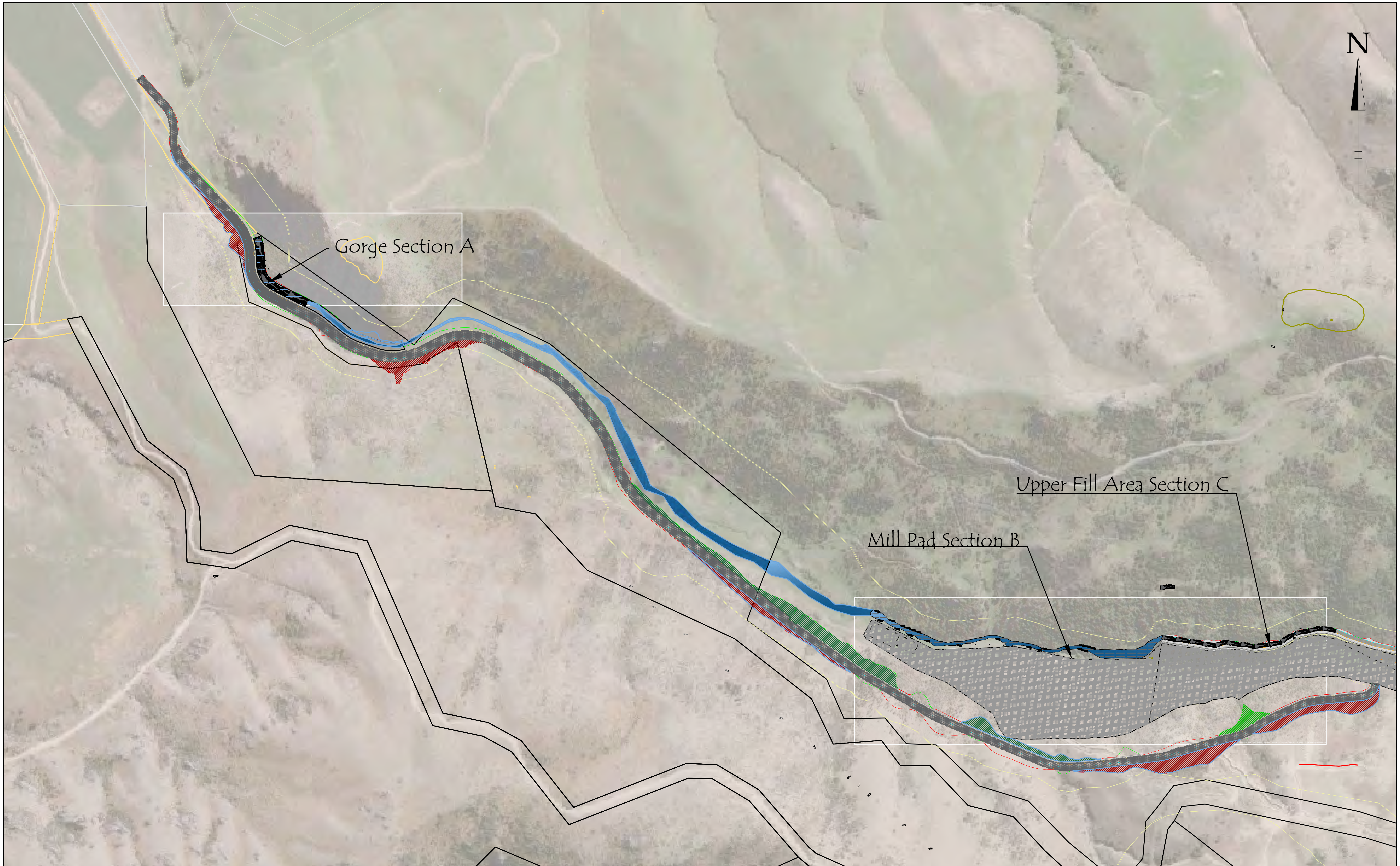
Stream Diversion Type 2 – Steep stream cross section

Rock-Lined Flow Channel for High Flow and/or Steep Gradients

Grass-Lined Flow Channel for Low Flow and/or Flat Gradients

Stream Diversion Type 3 – Flow channel cross section

Appendix 4: Shepherd Creek Overall Plan



MATAKANUI GOLD LIMITED

Shepherds Creek Overall Plan

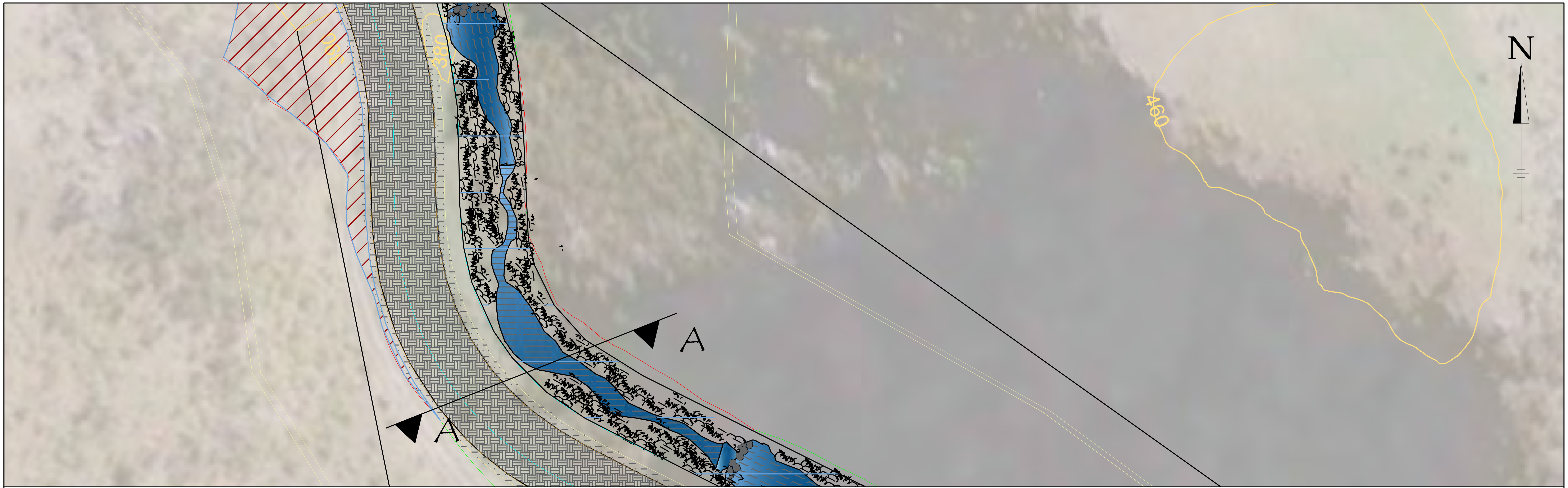
June 2025

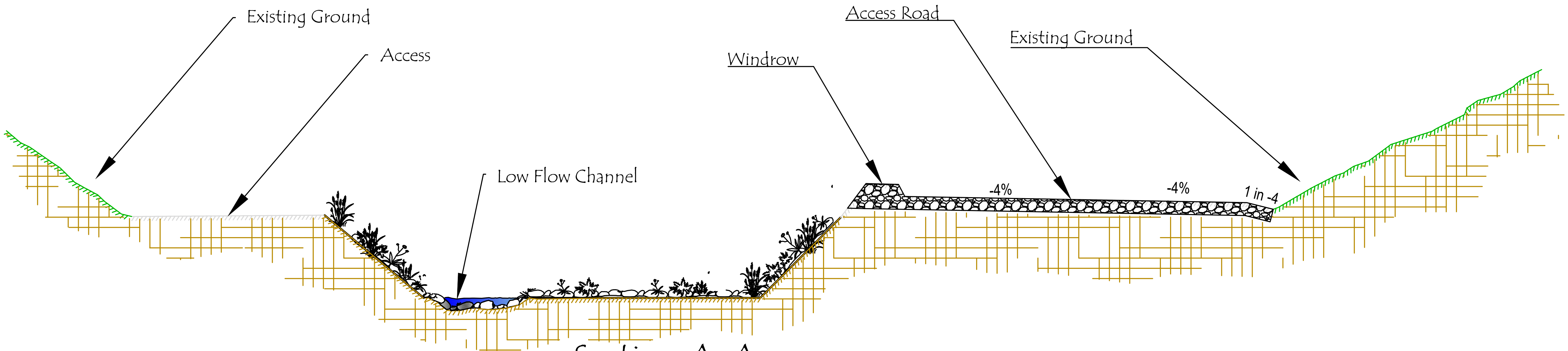
Scale 1:500@ A3

Date 11/0/2025

Drawing By: Josh C

Sheet No. 1 of 4





Section A-A

MATAKANUI GOLD LIMITED

Shepherd's Creek Cross sections

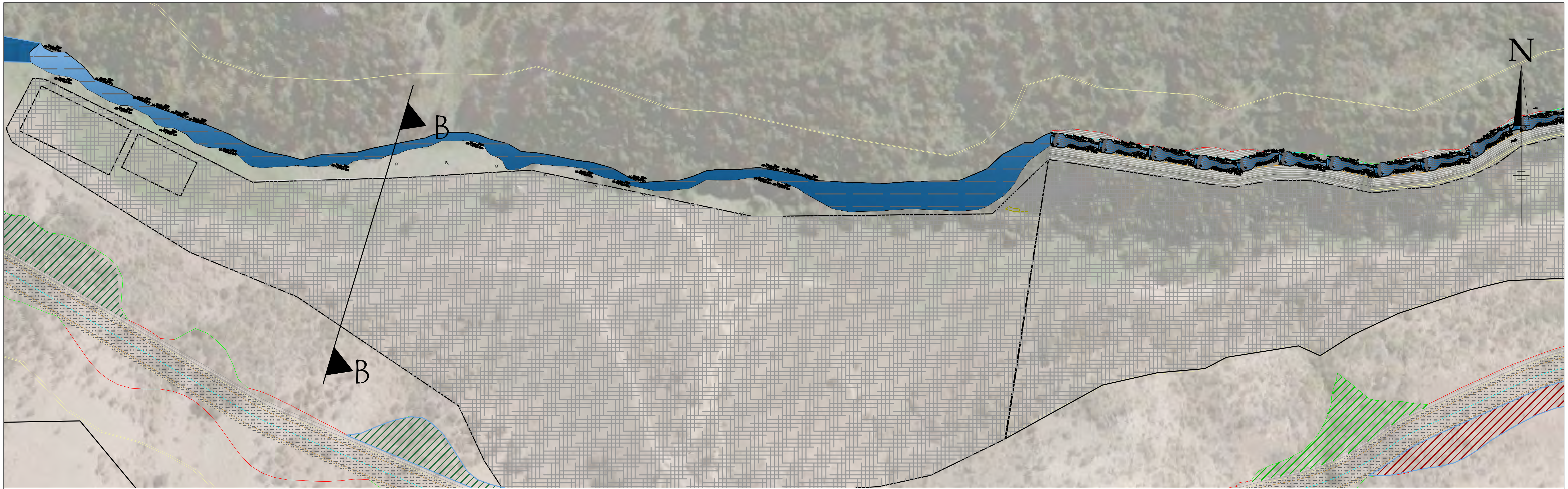
Gorge Section A-A

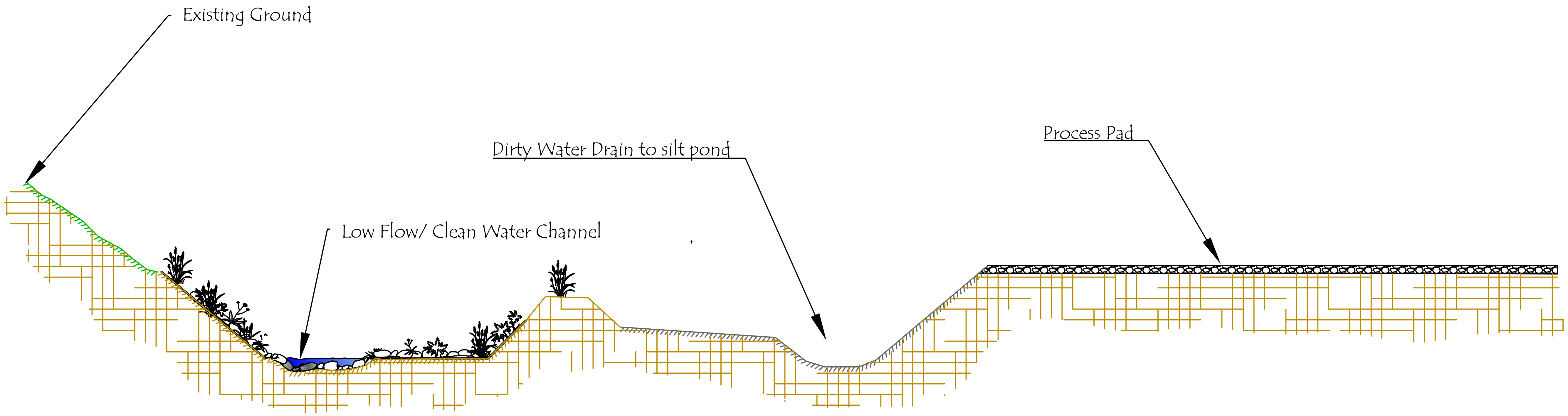
June 2025

Scale Nil

Date 11/06/2025

Drawing By: Josh C





Section B-B

MATAKANUI GOLD LIMITED

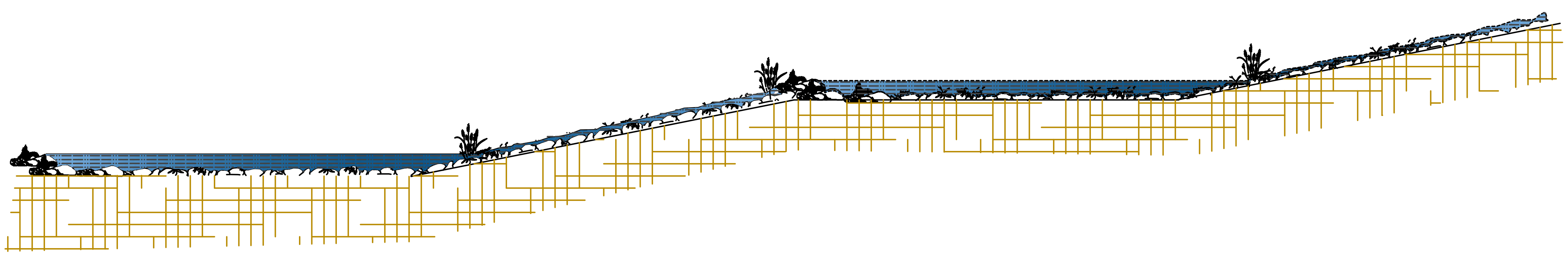
Shepherd's Creek Cross sections
Mill pad Section B-B

June 2025

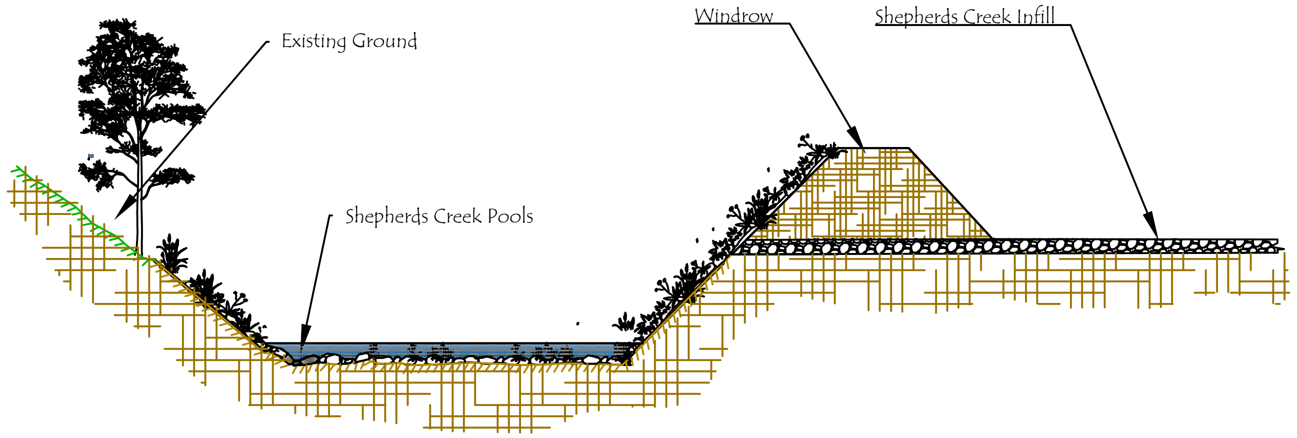
Scale Nil

Date 11/06/2025

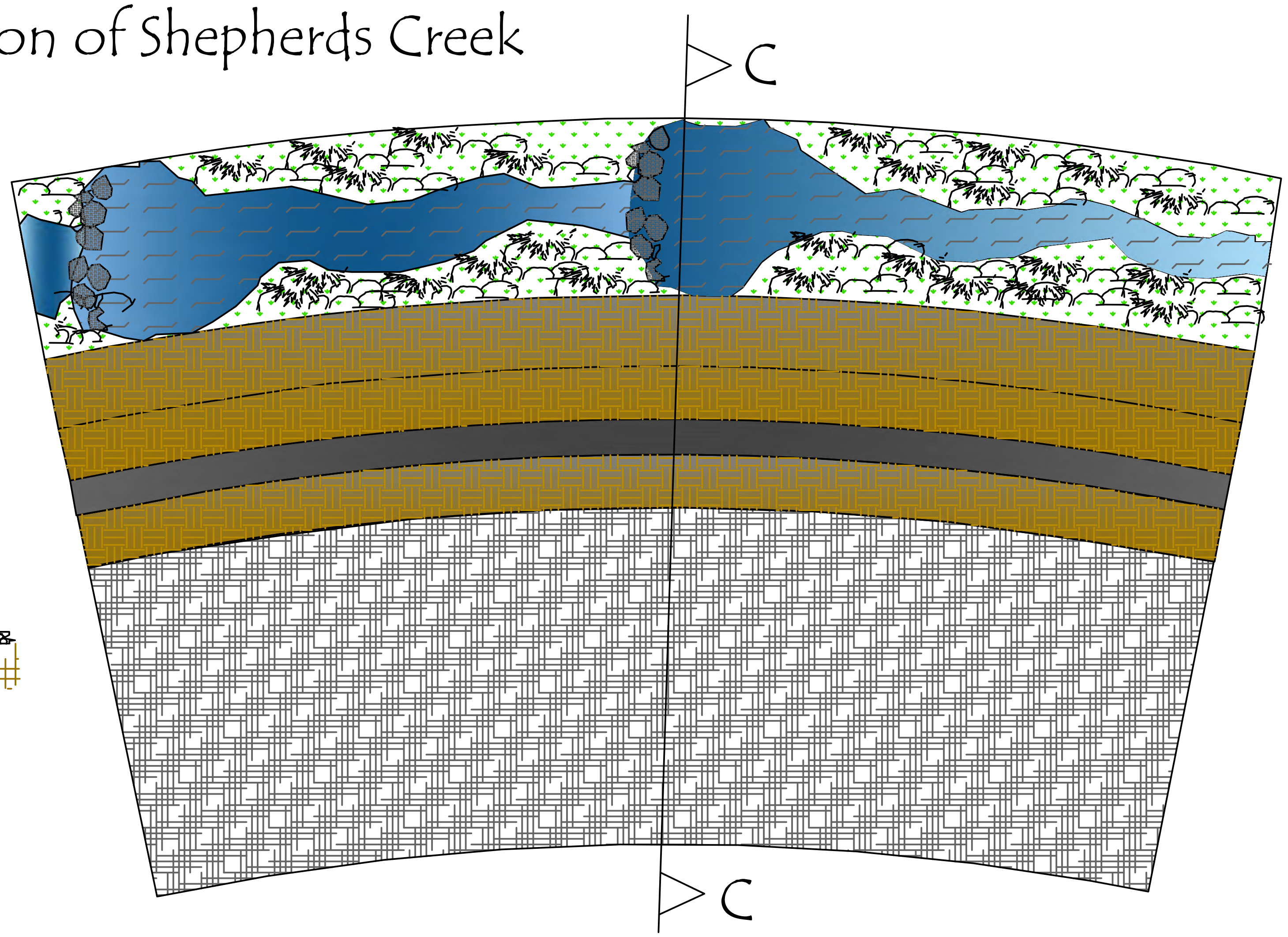
Drawing By: Josh C



Long-section of Shepherds Creek



Cross Section C-C



Plan View of Shepherds Fill and C

MATAKANUI GOLD LIMITED

Shepherd's Creek Fill Sections
Upper Fill Section C-C

June 2025

Scale Nil

Date 11/06/2025

Drawing By: Josh C

Appendix 5: Shepherd Creek Rehabilitation Plan (Growplan 2025)

Approach and outline

Plant selection and planting design is a combination of ecological function for the particularities of the site, with aesthetic elements primarily as cues for care

To increase understanding and valuing of the planted landscape it is essential planting makes sense and is not seen as 'just weeds'. Patterns and forms that look 'designed' are cues for care and inquisitiveness - this increases staff buy-in and can help toward having qualified staff to manage the two-decade closure phase

The overarching approach is to design, construct, revegetate and maintain for a no-net -loss outcome

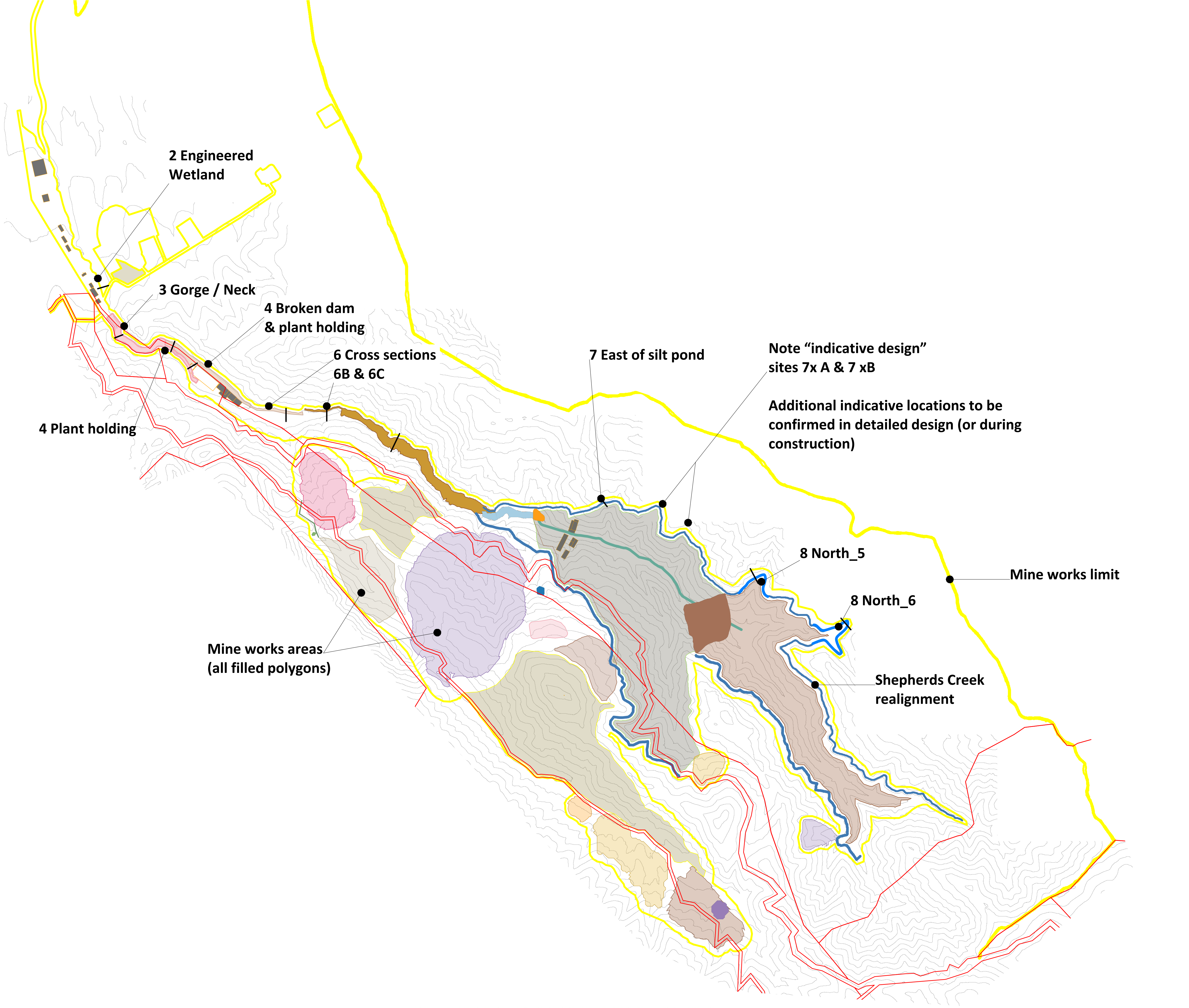
Plant selection is based on several factors:

- Known to occur on-site now, or within circa 15Km from site, or known to have been present within the last 5000 years
- Beneficial to and supportive of wildlife - birds, skinks and geckos, and terrestrial and aquatic invertebrates
- Weighted towards aesthetic value
- Valued by Maori
- Will withstand local climate and site conditions
- Lower palatability plants where possible to lessen effects of grazing pests, and eventually sheep post closure

Trees and/or shrubs overhanging creeks help sustain invertebrates via leaf breakdown products entering the water, shading also helps keep water cooler

Utilizing hard materials from site (or local area), and transplanting plants where practicable

Depending on site conditions and site context the water drop structures may be partly formed in basement rock, and constructed in boulders, sheet piling, or precast concrete, or a combination thereof and the forms naturalised



20250711

drawing Overview
location Bendigo
client Santana Minerals

scale 1:25000 @ A3
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file #_SantanaMin.277
• confirm services
• do not scale off plan
• verify all dimensions

DRAFT

Nigel Cowburn
growplan ltd
west otago nz

GROWPLAN
People ∩ Plants ∩ Place

0 2000 m
Contour interval 20m this page only
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Situation

Shepherd's Creek leaving the hills

Height change upstream to down approx. 8 metres

Approach

An engineered wetland as a final polishing and monitoring stage, including aquatic species as living sensors e.g koura (a forest fire-fighting pond practice) and *Daphnia* species

Channel enters and exits wetland in its natural position and flows through five detention basins / ponds

Stream realigned above existing ground and channel invert, with pond depth a maximum of 1.5 m above invert

Existing channel filled with loose angular rock to maintain some dry weather flow. This would also reduce the deep incision / erosion of this channel

Ponds lined with oxidized brown loess - a ubiquitous local soil mineral used to line local orchard irrigation ponds. Flow exits ponds over a low drop of approx. 1m on to a rock rubble base and exits pond into a slow flowing channel to the next basin

Plant selection for ability to thrive in riparian and wet zones of dryland areas

Planting layout and pattern leaves the channel and ponds in low grasses and sedges occasionaly planted to fenceline to enable views into the space

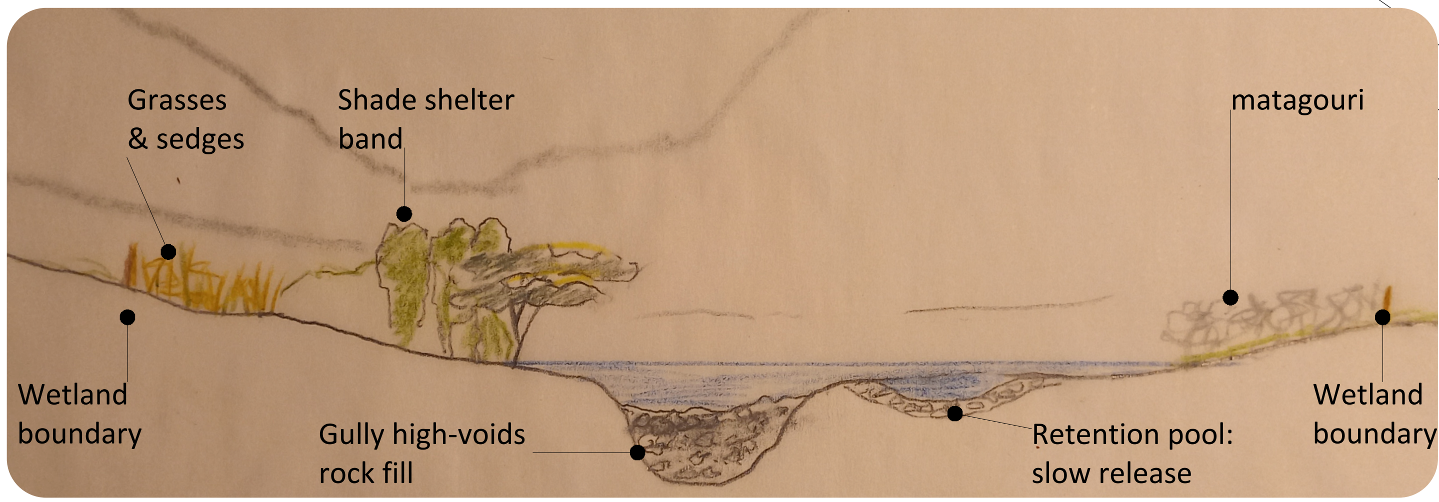
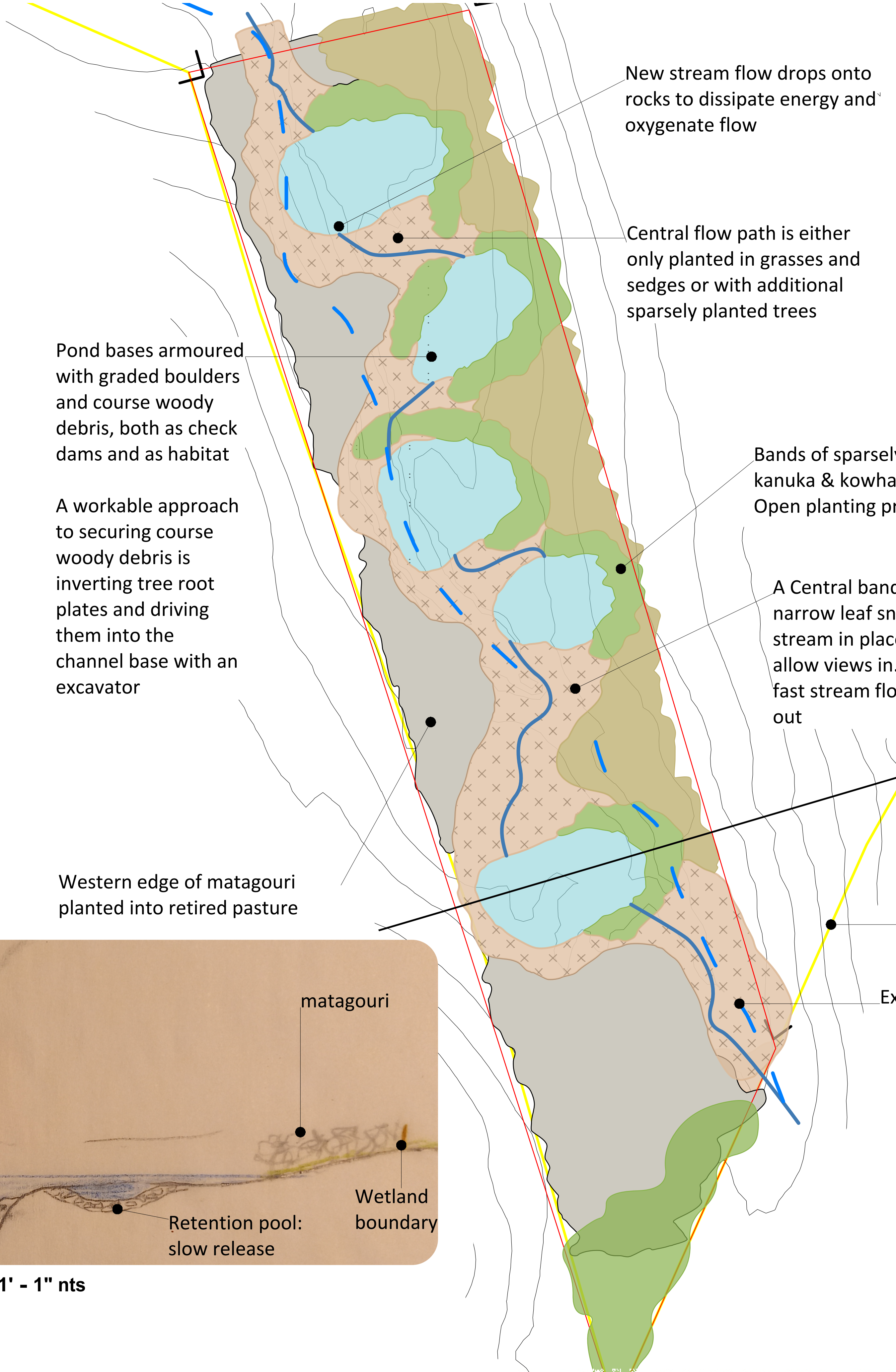
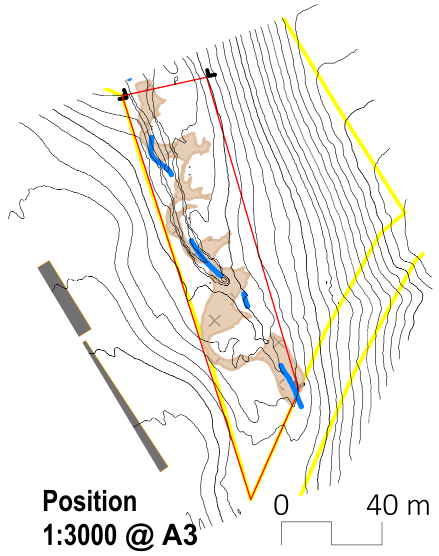
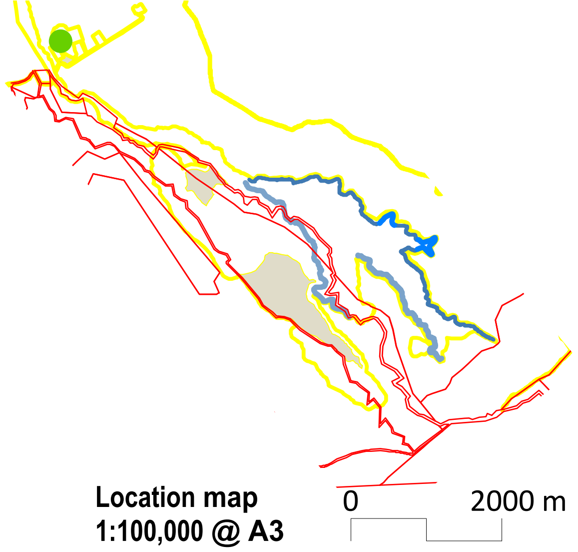


Figure 2, Site 1 Engineered Wetland, view upstream Section 1' - 1" nts







Plants for engineered wetland	
Chionochloa rigida	narrow-leaf snow tussock
Carex coriacea	cutty grass
Discaria toumatou	matagouri
Halocarpus bidwilli	bog pine
Kunzea ericoides	kanuka
Sophora microphyla*	kowhai

Halocarpus bidwilli bog pine

0 40 m

2 20250711 N

drawing Site 1 Engineered Wetland
location Bendigo
client Santana Minerals

scale 1:600 @ A3 main
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027 214 7791

file #_SantanaMin.277
• confirm services
• do not scale off plan
• verify all dimensions

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GROWPLAN
People ∩ Plants ∩ Place

Title linework linz.data_CC_by_4.0

Contour interval 1 metre

Situation

Shepherd's Creek passing through The Neck

Approach

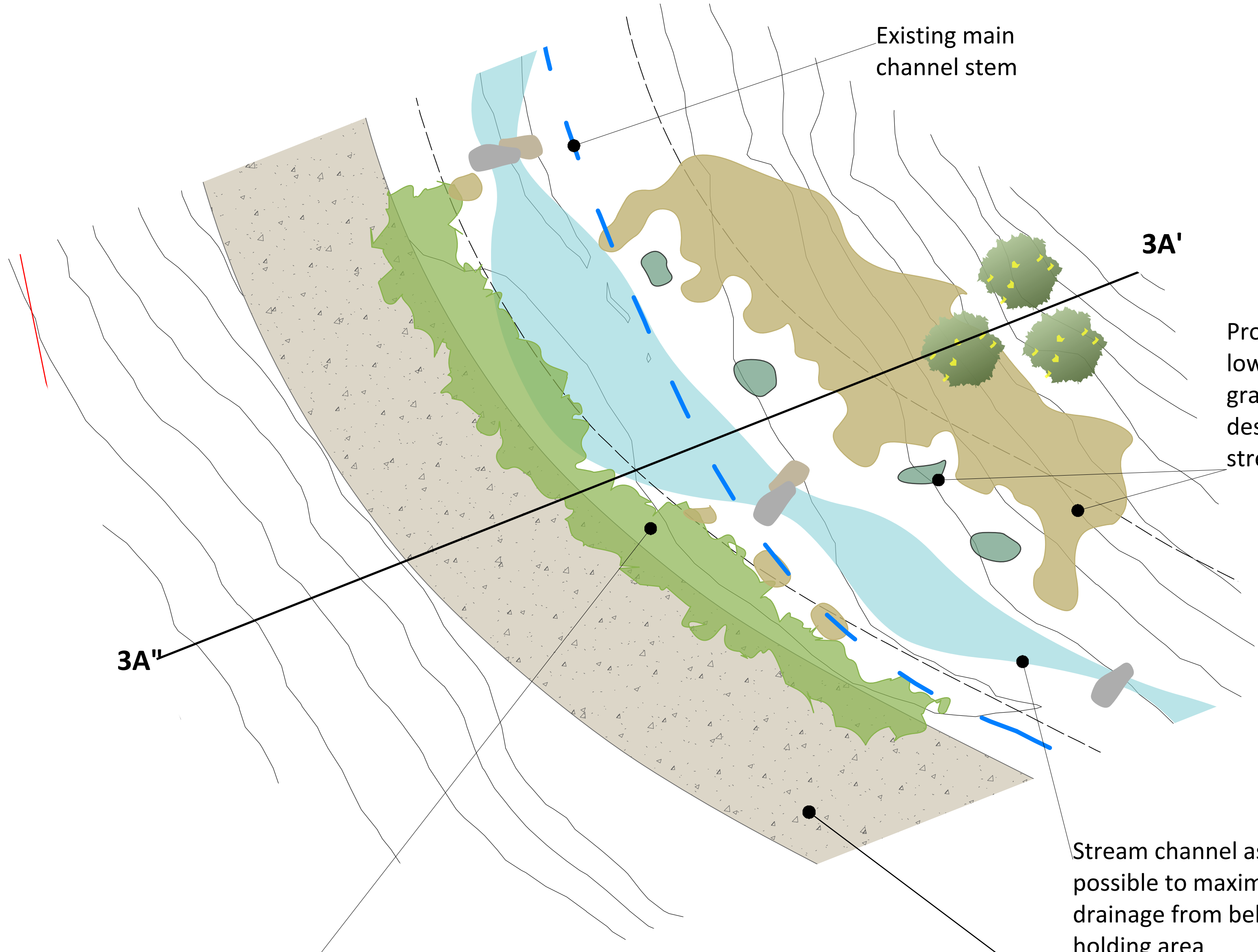
Channel remains at its existing height, but moved towards slope with some minor slope cut to facilitate this

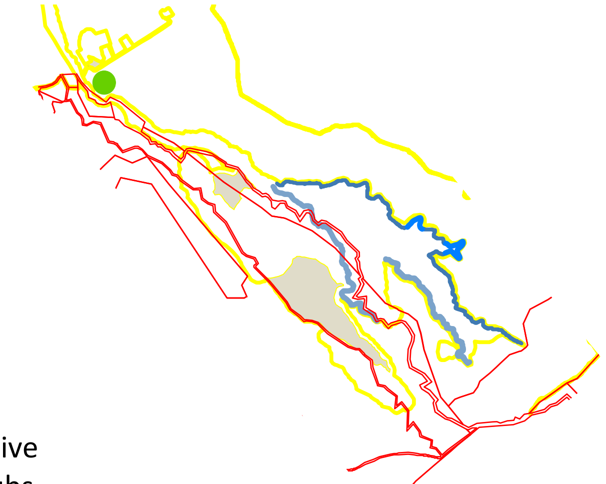
Continuation of pool rifle sequence as designed into reaches upstream

Low shrubland planting atop riprap adjacent access road

Planting able to thrive in riparian and wet zones of dryland areas

Planting is low and sparse to maximize stage flow





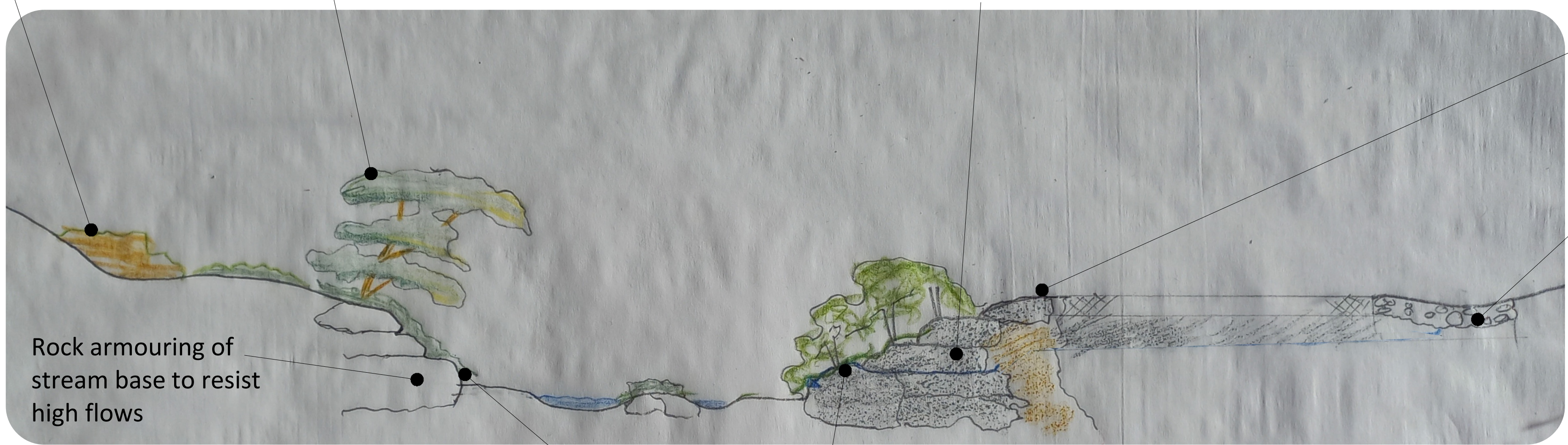


Figure 3 Site 2 Gorge at the Neck, view upstream
Section 3A' - 3A" nts

Plants for the Gorge at the Neck
Carex dipsacea
Carmichaelia sp.
Hebe salicifolia
Hebe subalpina
Pimelea notia
Sophora microphyla

3
20250711

N

drawing **The Gorge at the Neck**
location **Bendigo**
client **Santana Minerals**

scale **1:300 @ A3**
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file **#_SantanaMin.277**
• confirm services
• do not scale off plan
• verify all dimensions

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GROWPLAN
People ∩ Plants ∩ Place

0 30 m

Contour interval 1 metre

Situation

Shepherd's Creek plant transplant holding* and staging area, and for re-vegetation plant handling

Approach

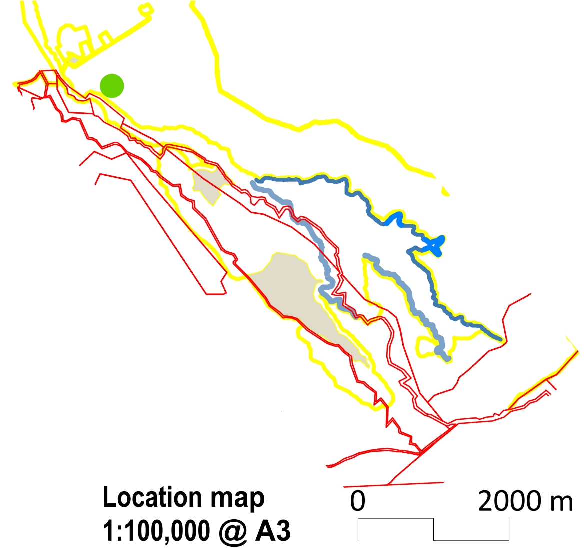
Plant storage planforms using a ridge and wide base 'furrow' for vehicle access and frost drainage, and to keep above high flow levels

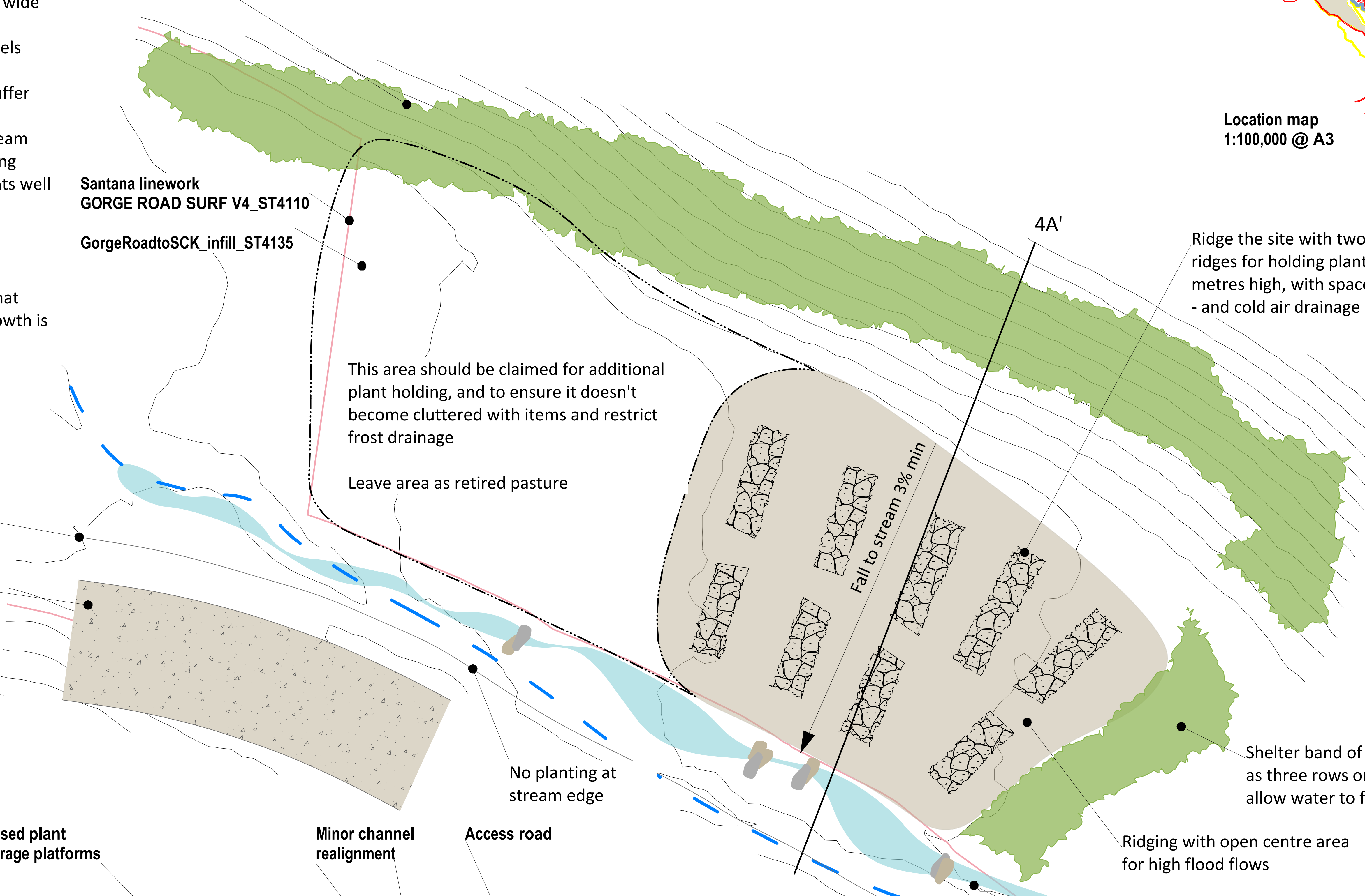
Create planted uphill cold air redirect / buffer

To maximise frost drainage limit downstream shrub planting to ground covers and trailing plants, with shrubs only as scattered plants well back from the main channel

<u>Site will require access - not shown</u>

* Not a nursery. A perception may exist that site-grown plants are more robust but growth is very slow with high mortality that it is not worthwhile





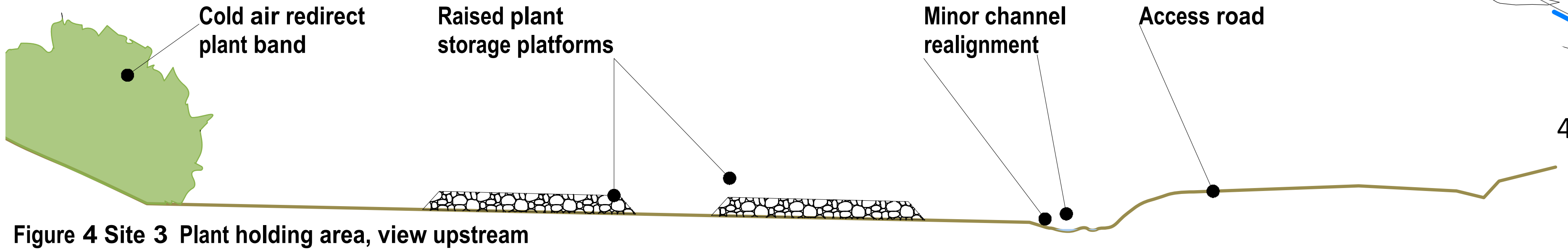


Figure 4 Site 3 Plant holding area, view upstream
Section 4A' - 4A" nts

4 | drawing Plant holding area Site 3 | location Bendigo | client Santana Minerals | 20250711

scale 1:400 @ A3
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0 20 m

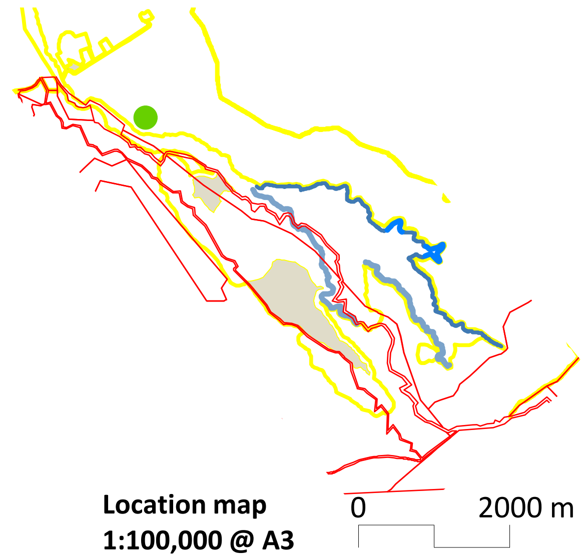
Contour interval 1 metre

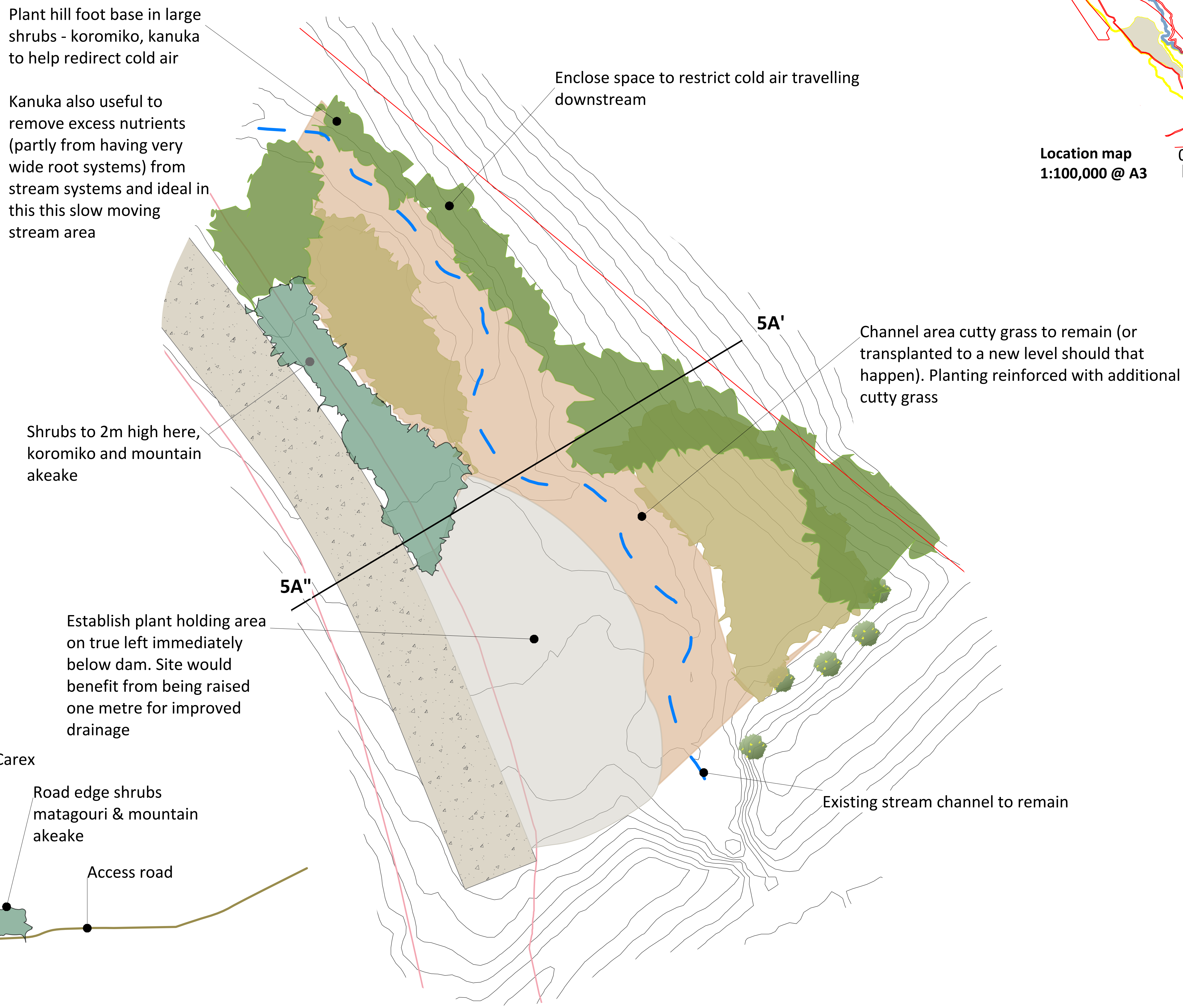
Situation

Slow-moving sinuous stream immediately downstream from broken dam, and also need for a second plant holding area

Approach

In general work with slow moving stream and planting that is already here, especially cutty grass





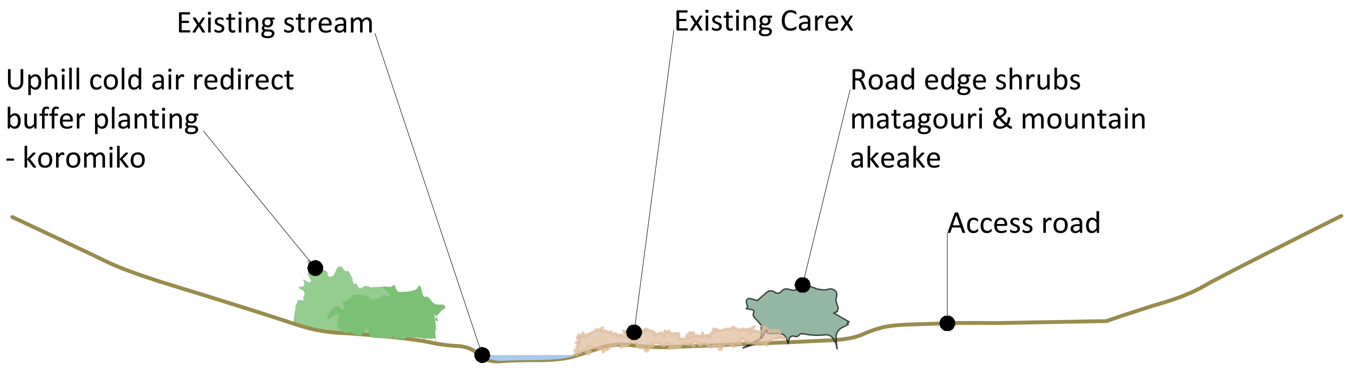


Figure 5 Site 4 Broken dam & holding area, view upstream
Section 5A' - 5A" nts

5	drawing: Site 4 Broken dam & plant holding	scale 1:600 @ A3	file #_SantanaMin.277	DRAFT
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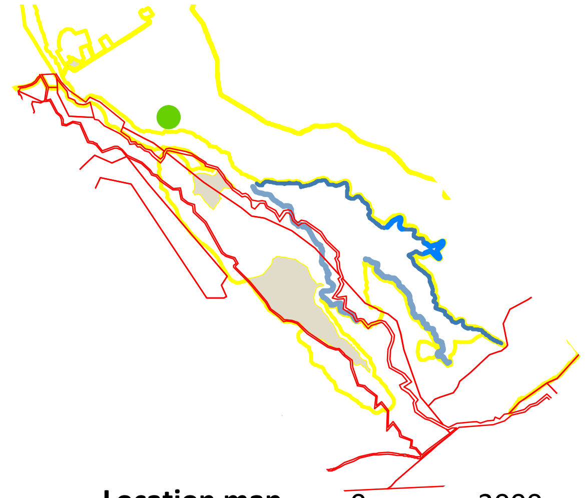
Title linework linz.data_CC_by_4.0
Contour interval 1 metre

Situation

Shepherd's Creek lowland form (with adjacent dirty water channel) east of processing plant, and steeper section at Shepherd's Fill area



Location map 1:100,000 @ A3 0 2000 m

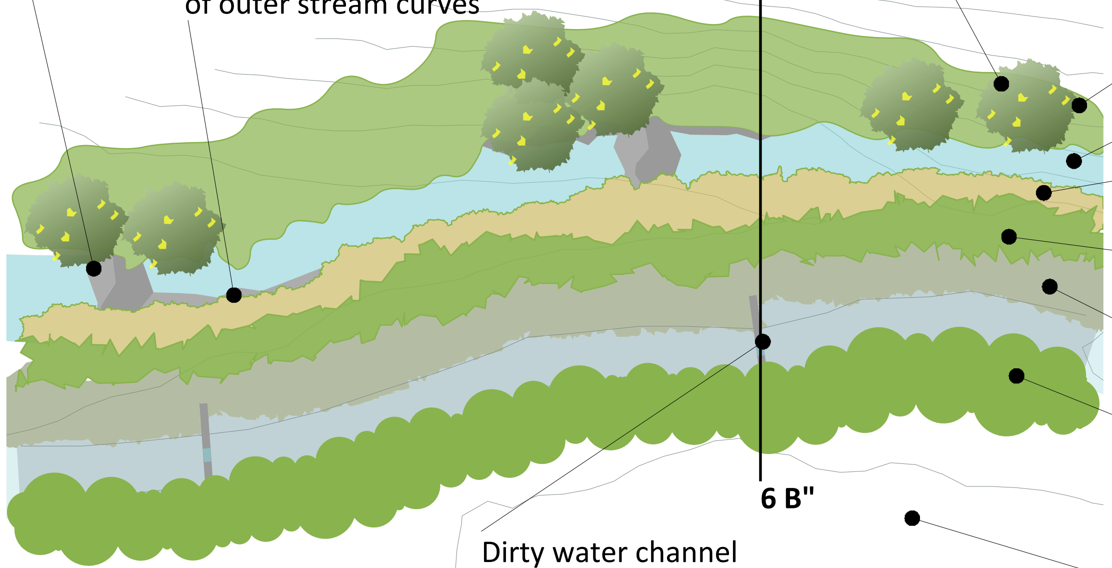


Figure 6, Site 6 B, Lowland reach plan typical, 1:300 @ A3

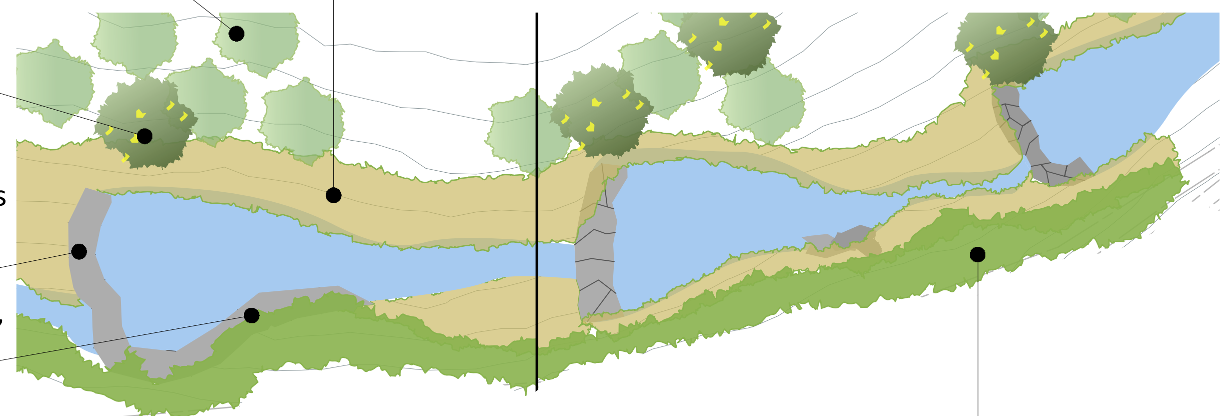


Figure 6, Site 6 C, steeper reach plan typical form, 1:300 @ A3

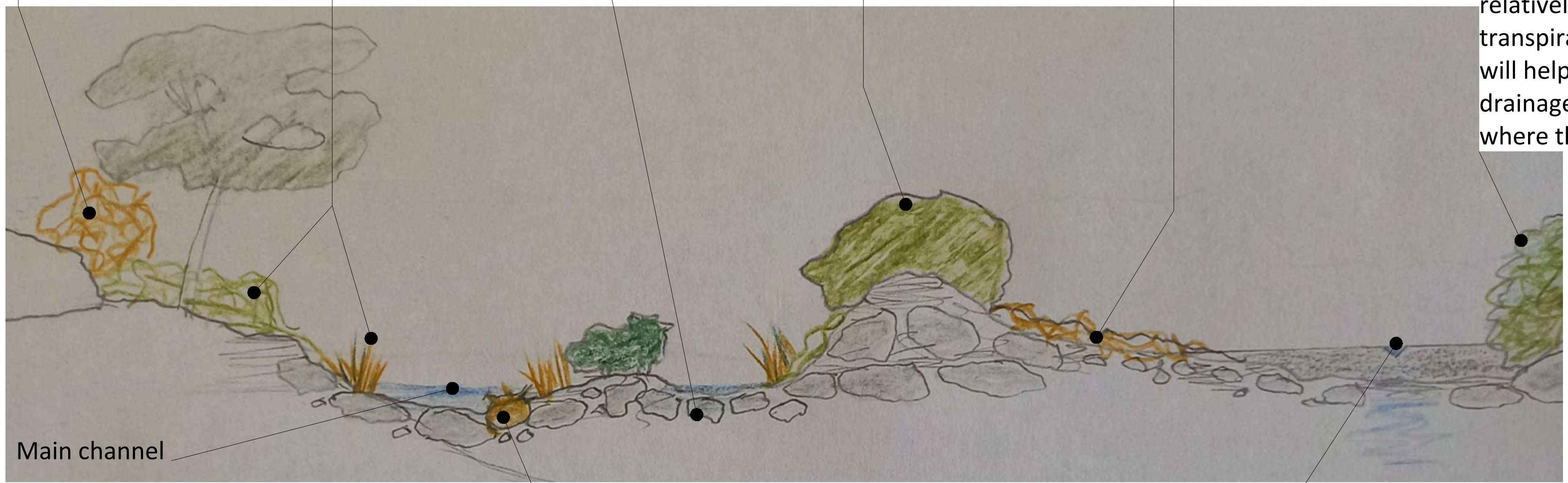


Figure 6, Site 6, Lowland reach typical, view upstream Section 6 B' - 6 B" nts

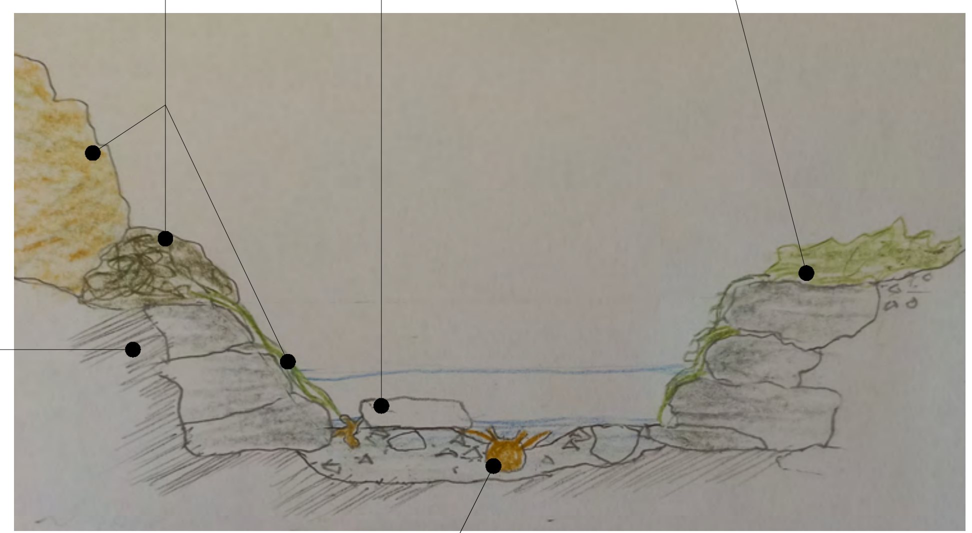


Figure 6, Steeper section, view upstream, Section 6 C' - 6 C" nts

Figure 6, Steeper section, view upstream, Section 6 C' - 6 C" nts

0 20 m

6
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drawing 6 Shepherds Creek filled areas
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client Santana Minerals

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Contour interval 1 metre

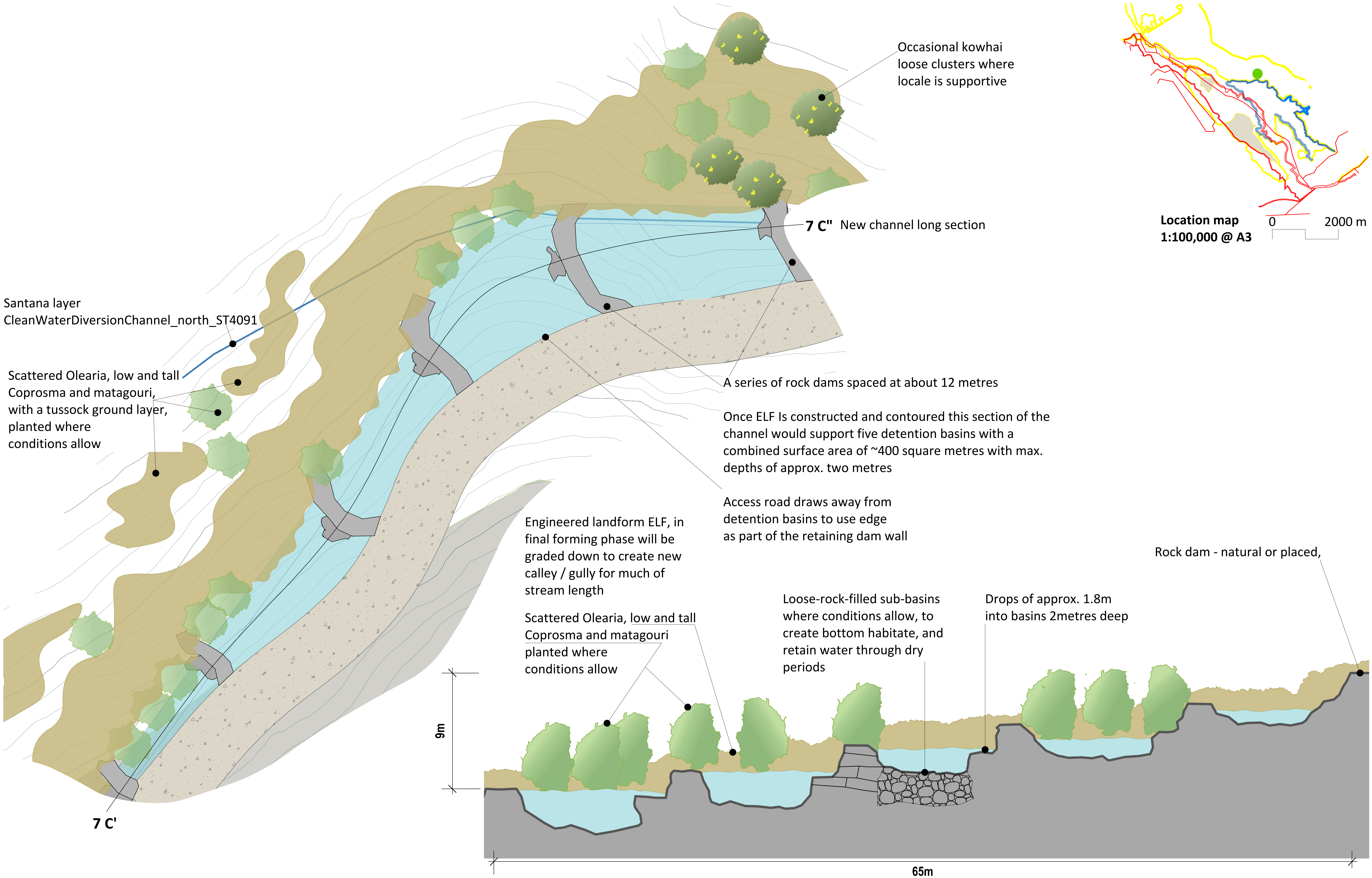

Figure 7, Site 7, drop series typical, view upstream - Long Section 7 B' - 7 B" nts, 1:250 @ A3

7	drawing	Site 7, stream water drop series example	scale 1:250 @ A3	file #_SantanaMin.277	all rights reserved
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Title linework linz.data_CC_by_4.0

Contour interval 1 metre

North_5 Upper Shepherd Creek

Hillside and diversion channel detention basin and planting concept

Water flows in to basin in high flow state and detained to preserve minumum vernal state - a seasonal wet pond

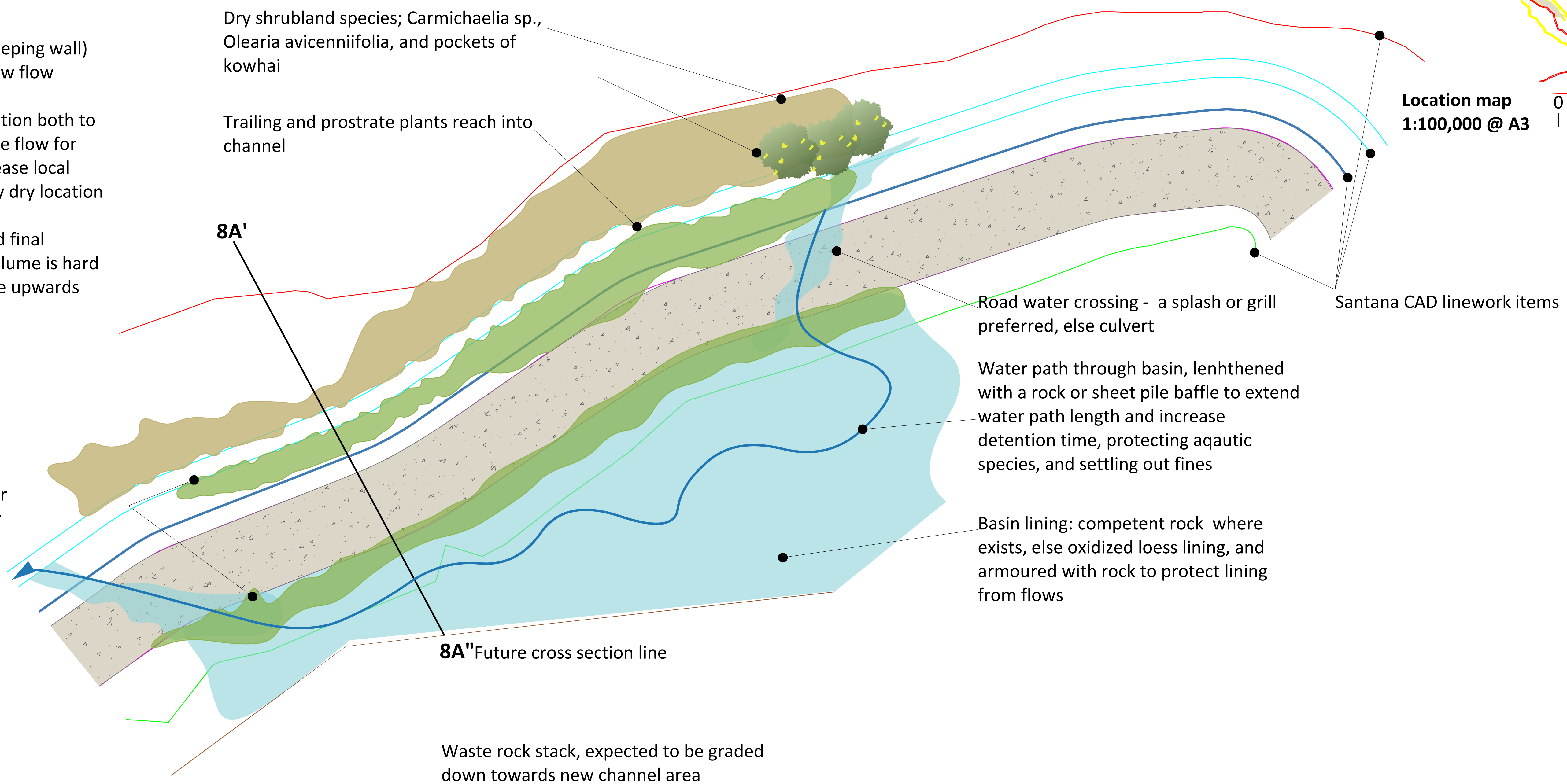
Porous in-flow wall (e.g. weeping wall) to take and release some low flow

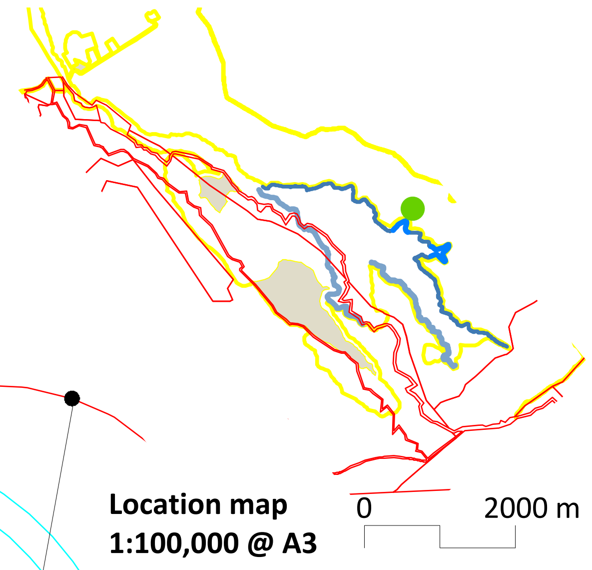
Detention basin would function both to detain flow, and retain some flow for aquatic species and to increase local humidity for plants in a very dry location

Due to uncertainties around final landform potential basin volume is hard to estimate but could range upwards from 400 cubic metres

Note

Indicative design and additional indicative locations to be confirmed in detailed design (or during construction)





Waste rock stack, expected to be graded down towards new channel area resulting in chanel area becoming a new gully

This could enable a larger dam than shown (and additional habitat), or a future dam expansion should precipitation increase

North_6 Upper Shepherd Creek

Hillside and diversion channel detention basin and planting concept, also results in an easier and safer driving path

Water inflow to basin in high flow state and detained to preserve minimum vernal state - a seasonal wet pond

Basin is a run-of-stream approach with (anchored) boulder placement to direct flow
- not shown pending discussion

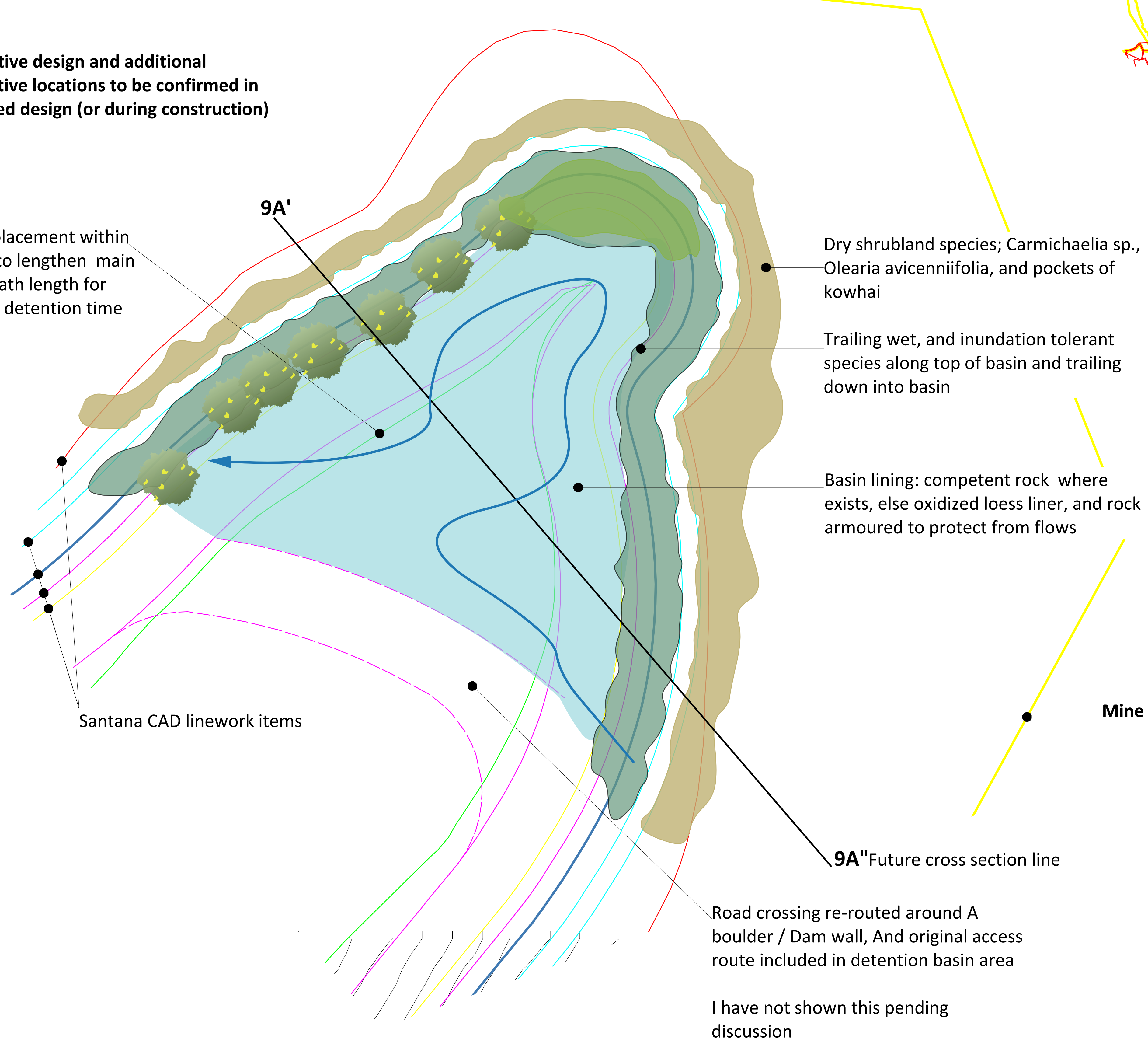
Detention basin would function both to detain flow, and retain some flow for aquatic species and to increase local humidity for plants in a very dry location

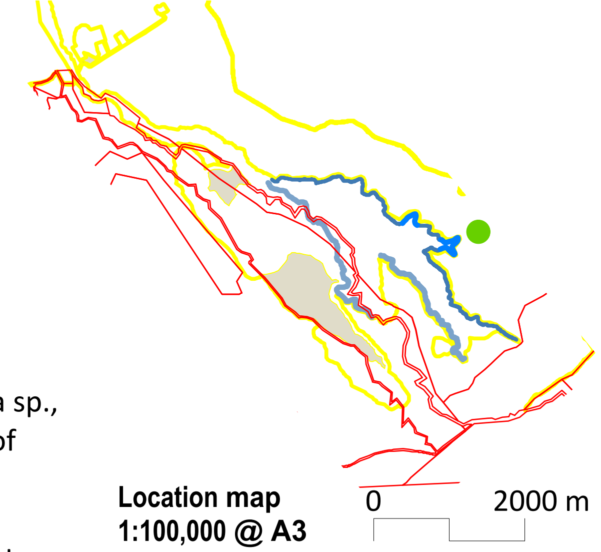
Volume would range upwards from 500 cubic metres

Data issue
No contours as data missing, need DEM file

Note

Indicative design and additional indicative locations to be confirmed in detailed design (or during construction)





Height	botanical name	common name	Position	Wildlife	in cult.	Authority	Form & notes
1.0	*Carmichaelia compacta*	native broom	dry sites		Y	Walker 2004	
1.0	*Chionochloa rigida*	narrow-leaf snow tussock	wet tolerant		Y	Exists to North & South	
1.5	*Chionochloa rubra*	red tussock	stream margins		Y	Occurs on site	
0.7	*Coprosma cheesemanii*	-	-	birds	Y	Grove 2002	Spreads post grazing
2.0	*Coprosma propinqua**	mingimingi	-	skinks	Y	Walker 2004	Low palatability
0.5	*Carex dipsacea*	teasel sedge	stream sides		Y	Dunstan ED	
0.7	*Carex comans*	sedge	stream sides		Y	Dunstan ED	
0.7	*Carex coriacea*	cutty grass	wet tolerant		Y	Occurs on site	
2.0	*Discaria toumatou*	matagouri	-	inverts.[1]	Y	Occurs on site	1 - inverts. attract birds
7.0	*Festuca matthewsii**	southern blue fescue	wet edge		Y	Has existed in area	Size highly variable
4.0	*Halocarpus bidwilli*	bog pine	wet tolerant	birds	Y	Walker 2004	
1.5	*Hebe subalpina*	-	dryland wet flushes		Y	Walker 2004	Spreading farm avail.
1.5	*Hebe odora*	-	-		Y	Dunstan ED	
2.0	*Hebe salicifolia*	koromiko	wet tolerant		Y	Has existed in area	
5.0	*Kunzea ericoides*	kanuka	wet tolerant		Y	Occurs on site	
3.0	*Olearia avicenniifolia*	mountain akeake	-	inverts.	Y	Walker 2004	
0.5	*Pimelea aridula aridula*	pimelea	-	inverts.	Y	Exists in locale	Wide low shrub
0.3	*Pimelea oreophila lepta*	pimelea	stream sides	inverts.	Y	Exists in locale	Sprawls, low palat.
0.3	*Pimelea prostrata ssp. prostrata*	pinātoro / NZ daphne	stream sides	inverts.	Y	Exists in locale	Sprawls, low palat.
0.5	*Pimelea notia*	pimelea	stream sides	inverts.	N	Has existed in area	Sprawls, low palat.
4.0	*Pseudopanax ferox*	horoeka	-	inverts.	Y	Has existed, Pole 2022	
5.0	*Sophora microphyla**	kowhai	stream sides	birds	Y	Occurs on site	3 metre tall shrub forms exist
1.5	*Teucrium parviflorum*	teucridium	stream sides	inverts.	Y	Wardle 2001	

Table 4a Plant selection and information. *** Known Maori applications / value**

Plant authorities / references

Davies-Colley, R J. & Payne G.W. 2023 Cooling streams with riparian trees: Thermal regime depends on total solar radiation penetrating the canopy. Austral Ecology, 48:1064–1073.
url: https://onlinelibrary.wiley.com/doi/10.1111/aec.13345

Pole, M. 2022 A vanished ecosystem: Sophora microphylla (Kōwhai) dominated forest recorded in mid-late Holocene rock shelters in Central Otago, New Zealand. Palaeontologia Electronica, 25(1):a1.
DOI: https://doi.org/10.26879/1169 and
https://www.palaeo-electronica.org/content/2022/3503-vanished-ecosystem

Wardle, P. 2001 Distribution of native forest in the upper Clutha district, Otago, New Zealand, New Zealand Journal of Botany, 39:3, 435-446.
DOI: https://doi.org/10.1080/0028825X.2001.9512747

Grove P.B, Mark, A.F., Dickinson, K.J.M. 2002 Vegetation monitoring of recently protected tussock grasslands in the southern South Island, New Zealand. DOI: https://doi.org/10.1080/03014223.2002.9517700

Email me if a paper is difficult to obtain as I have pdfs of all

Plant authorities / references

Walker et 2014 Effects of secondary shrublands on bird, lizard and invertebrate faunas in a dryland landscape. J NZ Ecol. Soc
url: https://newzealandecology.org/system/files/articles/3123.pdf
- Has a useful Bendigo lizards study.

ED - Ecological District classification system

A number of studies note how impoverished native species are in the Bendigo area. Researchers including Pole have proved the existence of a number of species no longer growing here but that have grown at least to the North and South of site in the last two to five thousand years

Plants and wildlife values

All non-monocots ('grasses' rushes, sedges, tussocks and trrue grasses) Produce nectar and / or pollen, and produce seeds.

Every non-monocot is in a system that includes either invertebrates, birds or lizards, and sometime all three are attracted. Above instances are known and documented examples

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Contour interval 1 metre

Carex comans
Highly variable in form and colour

Carex coriacea
Perennial sedge - dies partly back in winter

Carmichaelia compacta
Cromwell broom, develops wide low clumps

Chionochloa macra
Slim snow tussock

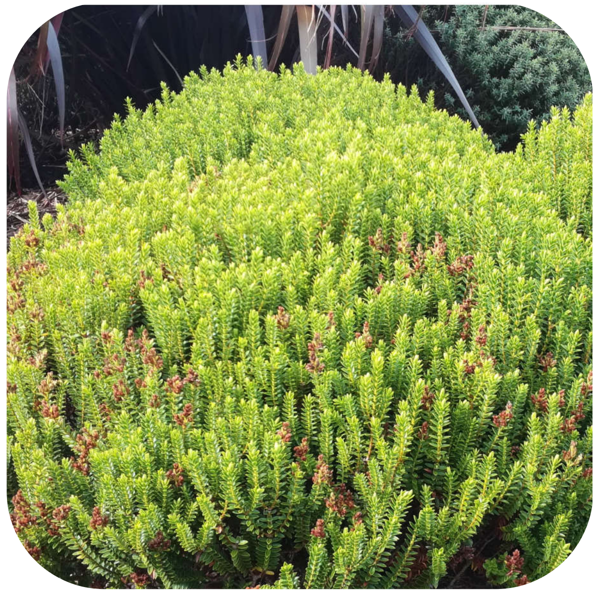
chionochloa rigida
Narrow-leaved snow tussock

Chionochloa rubra
Red tussock

Coprosma propinqua, mingimingi *
Especially of value to lizards

Discaria toumatou matagouri
An invertebrate essential

Halocarpus bidwillii
Wet tolerant, and when established dry too



Hebe odora
Garden example, in nature form more loose

Hebe salicifolia, koromiko *
* Plants with known use by Maori

Kunzea ericoides kanuka
Useful in removing excess nutrients, useful in seepage areas and gullies

Olearia avicenniifolia
Mountain akeake
Native tree daisy to 2-3 metres

Sophora microphylla, kowhai *
Highly variable form, several natural shrub and tree forms exist in Otago

Teucridium parvifolium
Deciduous shrub, attracts invertebrates

Plants without images:	Festuca matthewsii *
Carex dipsacea	Hebe subalpina
Coprosma cheesemanii	Pimelea species

3a
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drawing **Plant selection images**
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client **Santana Minerals**

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Appendix 6: Rehabilitation Staging

Sequential Implementation

Effective rehabilitation outcomes require careful sequencing aligned with mining phases. The quality of closure outcomes is strongly influenced by actions in the early stages of mining, including the quality and quantity of materials salvaged, sharpness of stripped area edges, native dominance and diversity in adjacent areas, and extent of stripped footprint. Rehabilitation of the BOGP will be undertaken through the following stages:

Phase 1 (Years 0-1) - Initial Startup

Establish mine infrastructure, construction camp, process plant and TSF embankment. Critical early activities include identifying permanent edges to avoid high-value species impacts, enriching permanent edges (with tussock and rock), initial weed control, salvaging high-value vegetation (as live direct transfer and as dead material), and stockpiling vegetation with soils, as rocks and overburden suitable for root zones (‘brown rock). The Western ELF will be completed as the first major rehabilitation area with suitable slopes for cushionfield and spring annual herb trials. The Western ELF will also be used to establish rock stacks, rock pits, and associated planting which will then be monitored to assess natural development. Small amounts of wetland and tussock vegetation communities from Shepherds Creek will be transferred to create permanent wetland (e.g. Ardgour Terrace wetland) and to live storage for later use. Permanent and temporary stream diversions and sediment treatment ponds will be constructed, with permanent diversions enhanced for aquatic invertebrate values, including enriching adjacent undisturbed edges with translocated rock, tussock and sedges.

Phase 2 (Years 1-10) - Main Mining

Complete Rise And Shine (RAS), Come In Time (CIT), and Srex (SRX) pits with progressive rehabilitation of pit edges and available final landforms on Shepherds and Srex Engineered Landform (SRX ELF) as they become available. The temporary Site Workers Camp will be dismantled and reinstated to productive pasture during this phase. Most of the enrichment planting and regeneration of MRZ occurs during this phase to develop the diverse, native dominant ecosystems wrapping around the mined areas. This phase focuses on maintaining rehabilitation momentum while active mining continues, tracking the quality and quantity of rehabilitation resources in stockpiles to ensure adequacy for closure, monitoring development of early rehabilitation to optimise techniques used in final closure, and monitoring regeneration in MRZ to ensure meeting closure conditions.

Phase 3 (Years 10-30) - Final Closure

Implement the final closure sequence with the largest areas of rehabilitation occurring on Tailings Storage Facility (TSF), Shepherds Engineered Landform (Shepherds ELF), main haul roads, RAS pit haul road and associated stockpiles. Substantial areas of final landforms cannot be completed until tailings deposition stops and workshop facilities on Shepherds ELF terraces are decommissioned. This phase represents the most intensive rehabilitation period.

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