LANDSCAPE MANAGEMENT PLAN
for the
Waitaha Hydro Scheme

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1. INTRODUCTION

1.1 Background

Westpower Limited (Westpower) proposes a run-of-the-river hydro-electric power scheme (**Scheme**) for the Waitaha River, approximately 60km south of Hokitika on the West Coast of the South Island, New Zealand. Further details of the project are outlined in **Section 2**. This Scheme has been approved as a "listed project" under the Fast-track Approvals Act 2024 (**FTAA**), and so it can follow the 'Fast-track process' for all required approvals.

In this document the term 'rehabilitation' is used rather than 'restoration'. Restoration implies returning the project site to its former condition. The nature of the construction works means that this is not entirely possible, however the rehabilitation aims to enable the new infrastructure to integrate and establish into its surroundings and to have a minimal effect on landscape (and ecological) values in the long-term. The Scheme can be designed and managed so that the post development environment is able to support and sustain landscape (and ecological) values of a similar nature.

1.2 Purpose

The purpose of this Landscape Management Plan (**LMP**) is to guide the construction processes on how the landscape will be managed through construction, rehabilitation and establishment phases to ensure that mitigation measures are effective.

The LMP is to be read in conjunction with a suite of management plans for the Scheme prepared by Westpower in consultation with its expert advisors, being:

(a) The FINAL Vegetation Management Plan

(b) DRAFT Construction and Environmental Management Plan ("CEMP");

(c) DRAFT Erosion and Sediment Control Plan ("**ESCP**");

(d) The FINAL Vegetation Management Plan ("**VMP**");

(e) The FINAL Avifauna Management Plan ("**AMP**");

(f) The FINAL Bat Management Plan ("**BMP**");

(g) The FINAL Lizard Management Plan ("**LizMP**"); and

(h) The FINAL Freshwater Ecology Management Plan ("**FEMP**").

The focus of this LMP is to be readily readable and implementable by the constructors and contractors developing the Scheme. Additional detail on the landscape setting and context can be found in Boffa Miskell (2025). Waitaha Hydro Scheme: Landscape Effects Assessment. Report Prepared by Boffa Miskell Ltd for Westpower Ltd. Report Dated 3 July 2025.

As quoted within Te Tangi a te Manu[1]:

'The ultimate purpose of landscape assessment is to manage landscape values'[2]

and

'A landscape effect is an outcome for a landscape value'[3].

Whilst it is acknowledged that the Scheme will create adverse landscape effects[4], this LMP represents a catalogue of principles and approaches to avoid, remedy and mitigate potential adverse landscape (and natural character) effects to the underlying landscape (and natural character) values.

The LMP contains the following:

(a) The location, ecological and landscape considerations.

(b) The rehabilitation strategy, risks and factors influencing rehabilitation.

(c) The processes and stages of the proposed rehabilitation works.

(d) Landscape management and maintenance processes.

1.3 Objectives

The objectives of this LMP are to:

(a) Ensure the design and use of construction methods and materials will appropriately minimise the landscape effects and natural character effects (including the localised impact on attributes at Morgan Gorge and Kiwi Flat as experienced by recreational users)[5] of the Scheme, including reducing visual prominence, as far as practicable.

(b) Ensure that landscape management and maintenance methods are responsive, learning from the construction process over time.

2. LOCATION AND CONTEXT

2.1 Location

As above additional detail on the location of the Scheme can be found in Boffa Miskell (2025). Waitaha Hydro Scheme: Landscape Effects Assessment. Report Prepared by Boffa Miskell Ltd for Westpower Ltd. Report Dated 3 July 2025.

The Scheme is located within the West Coast Region *(Te Kaunihera Whakakotahi o Te Tai Poutini)* within and adjacent to the Waitaha River. The majority of the Scheme (The Headworks and Power Station) is located within the Upper Waitaha Catchment, with the transmission line and access road extending across a tributary of the Waitaha River and

[1] Te Tangi a te Manu is the Aotearoa New Zealand Landscape Assessment Guidelines, published in 2022.
[2] Te Tangi a te Manu: Landscape Assessment Guidelines (2022), page 171.
[3] Te Tangi a te Manu: Landscape Assessment Guidelines (2022), page 135.
[4] Refer to Boffa Miskell (2025) Waitaha Hydro: Landscape Effects Assessment.
[5] Recreation Report, potential mitigation Table 1, operational design.

connecting to Waitaha road (via private land) north of the Scheme. The majority of the Scheme is located within an Outstanding Natural Landscape. The Waitaha River retains very high levels of natural character (and the landscape also retains significant ecological value as addressed in the relevant ecological management plans). It is ensuring that effects on these values is minimised and appropriately managed during construction that is the focus on this management plan.

The Scheme also requires:

(a) spoil from the project be disposed on the spoil disposal area on private farmland, adjacent to Macgregor Creek;

(b) gravel extraction from the sites above and the bed of the Waitaha River, and

(c) transmission lines connecting the Scheme to the local distribution network.

The Scheme is broadly in four main parts, and for the purposes of the LMP these have been categorised as follows (indicated in **Figure 2**):

(a) **Construction Area 1**

  (i) **Headworks**: Located at the lower end of Kiwi Flat. This is where water will be collected from the river and the flow into Morgan Gorge controlled, with water diverted into the tunnel via a small weir.

(b) **Construction Area 2** is divided into two parts for the purpose of the LMP:

  (i) **Area 2A - Power Station:** The Power Station and tailrace structures are proposed to be located on the true right of the river, on a naturally flat river terrace. Behind the Power Station, against the steep hillside, is the headwall, retaining wall structures and entrance to the tunnels.

  (ii) **Area 2B – New Access Road and transmission lines:** This new road provides access to the Power Station, along the true right of the river (below an existing walking track). The width of the access road varies, but is, on the whole, 17.5 meters during construction and 15 meters post construction and for permanent occupancy. The proposed ‘alternative walking track’ (to mitigate remote recreational experience effects by realigning the route to minimise the view of the Power Station) is within this area and provides a shortcut route above the Access Road towards Granite Creek, meeting the original track.

(c) **Construction Area 3**

  (i) **Spoil Disposal:** Located on private farmland. Following depositing of the spoil from the tunnel construction, the area will be contoured, topsoiled and seeded to be grazed again. Gravel extraction will also occur in this area (and the bed of the Waitaha River) as well as the main site compound.

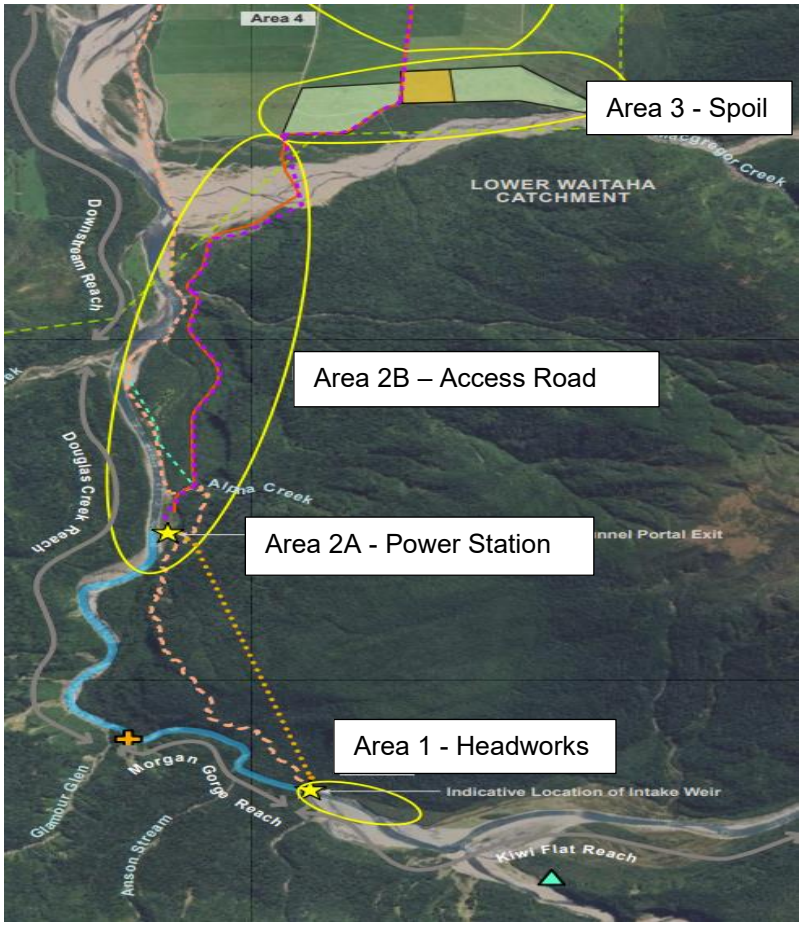


Figure 1: *Location and key parts of the Scheme.*

2.2 Ecological Context

There are numerous ecological disciplines providing advice for this scheme and each have different recommended requirements in how to manage effects. The management of ecological effects overlaps with, and has a direct relationship to, landscape values and natural character. That is why this management plan must be read in conjunction with the other management plans listed in Section 1.2.

2.3 Landscape and Natural Character Effects Context

The Landscape Effects Assessment concludes that from a broadscale the Scheme will have a range of different landscape and natural character effects in different locations of the Scheme's four main areas. An emphasis of the design rationale for the Scheme has been to use construction methods and materials where feasible that will minimise effects on the environment, including reducing visual prominence and enable recolonisation of vegetation.

The design has already considered the following mitigation measures that are integrated into the design to minimise landscape and natural character effects. These measures include:

(a) Minimising cuts and battered slopes for the construction of the access road to the Power Station and tunnel (aside from the cut necessary to facilitate the crossing across Granite Creek).

(b) Managing access road construction near the banks of Macgregor Creek; and keep works in the bed of the creek to the minimum required to construct and maintain the access road.

(c) Accelerating the weathering of the Headworks, access portal and access road at Construction Area 1 using rough-hewn concrete where plants and mosses are able to grow.

(d) Carefully placing rocks and boulders to assist in integrating the Headworks structure and portal into the natural landscape to respect the natural characteristics of the area.

(e) Using dark recessive colours and materials at the Power Station, to assist with blending it into the natural landscape.

(f) Minimising the removal of indigenous vegetation and retaining as much of the more mature areas of planting on the raised gravel bank at Construction Area 1 as practicable.

(g) Planting around the Power Station site as soon as practicable following completion of works and areas needed for construction to integrate it into the landscape quickly.

The Scheme has been designed to minimise effects on the landscape, natural character (including the localised impact on attributes at Morgan Gorge and Kiwi Flat as experienced by recreational users) and ecological values of the area, by keeping the footprint of habitat disturbance as small as practicable. This has reduced permanent indigenous vegetation removal to only 4.46 hectares.

2.4 The Scheme

For full description of the proposed Scheme, refer to the Project Description (2025). The following sections describes the Scheme in relation to the various areas.

2.5 Area 1 - The Headworks Site

Construction of the Headworks will be undertaken over a period between 2 to 3 years (depending on the frequency and duration of favourable weather and river flow conditions). Prior to the access tunnel being completed, access to Area 1 is via

helicopter. Access will predominantly be via the access tunnel once it's completed. The Site comprises the following areas:

(a) Temporary Construction Staging Area 1: The contractors' facilities will be located on an alluvial flat upstream of the tunnel portal entrance at the lower Kiwi Flat area, accessed via the temporary construction road to the weir. This area will at as a storage location for machinery and any temporary stockpiling and will be difficult to see due to the vegetative screening. A heli-pad will also be located within this area. Following construction, all temporary areas, including the small access road to the contractors' facilities will be removed. Noted as **20** in **Figure 2**.

(b) Temporary Construction road: Approximately 200 m of road. Noted as **19** in **Figure 2**.

(c) Permanent access road to river: Noted as **18** in **Figure 2**.

(d) The weir structure: The construction activity will be confined to a limited footprint within a small area of the Valley. Noted as **10** in **Figure 2**.

(e) Aggregate river maintenance: During operation, there will also be the need for maintenance work to occasionally clear gravel and boulders within the river at and above the Headworks/ sluice gates. This will involve an excavator within the riverbed moving debris that has washed down from the catchment and maintaining the channel past the sluice gates. Materials extracted from the Headworks/ sluice gate areas will remain in the riverbed, moved over to the true left, where they may remain or will be re-entrained by large flows and passed over the weir.

Figure 3 shows a visual simulation of the headworks following construction showing the low-profile nature of the weir.

Figure 2: *The Headworks Concept GA Plan, source: AusHydro.*

Figure 3: *The Headworks visual simulation, source: Boffa Miskell Landscape Effects Assessment.*

2.6 Construction Area 2A – Power Station Site

This area will be accessed via a newly constructed road. The Power Station site is made up of the following components and will have the following activities:

(a) Temporary Construction Staging Area 2 comprising of:

(i) Contractors' facilities during the construction phase;

(ii) Temporary tunnel spoil stockpile: Spoil from the tunnel excavations may be initially stockpiled within the Power Station site before being transported to

the spoil disposal areas at Area 3 (private land) where it will be used to develop and improve existing farmland.

(iii) Stormwater and water management ponds and equipment to control and treat any discharges from the tunnel and Power Station site construction.

(b) The Power Station: This building will be located on a concrete raised foundation (which will also form a flood wall (which will be masked by natural boulders)), much of the infrastructure associated with the Power Station will be located below ground. New built forms will be present on the concrete foundation. Noted as **23** in **Figure 4** and illustrated in **Figure 5**.

(c) Tailrace: Extending from the Power Station will be the tailrace for approximately 16 m and be approximately 15 m wide, with a depth of 8 m. The establishment of the tailrace will require the removal of a portion of the rocky Waitaha riverbank and riverbed. Noted as **27** in **Figure 4**.

(d) Headwalls (retaining walls): Work is also required to stabilise the rocky cliff behind the Power Station. This will take the form of a wingwall, as well as rock stabilisation indicated in green in **Figure *4***.

(e) Tunnel portals: Located in the headwalls. Noted as **10** and **14** in **Figure 4**.

Figure 5 shows a visual simulation of the Power Station Site following construction showing the low profile of the building and the naturalised flood protection wall.

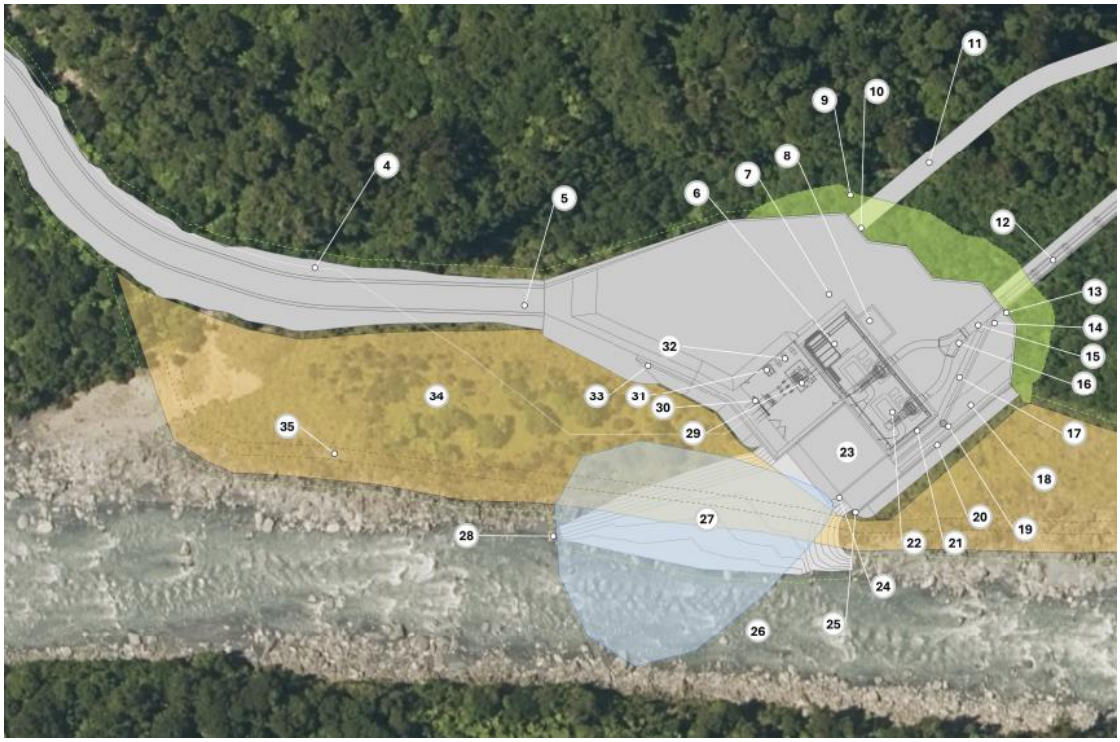


Figure 4: *The Power Station Concept GA Plan, source: AusHydro.*

Figure 5: *The Power Station visual simulation, source: Boffa Miskell Landscape Effects Assessment.*

2.7 Construction Area 2B – Access Road and transmission lines

This access road is 4.6km long connecting the Power Station with the end of the existing Waitaha Road. Construction will take approximately 10 months. The Site is made up of the following components (see **Figure 6**) and will have the following activities:

(a) McLean's farm: the existing access road through the farm will be upgraded.

(b) Road: The corridor for the transmission lines and road has an average width of 17.5 meters for construction and 15 meters for permanent occupancy. Mostly the road is constructed on fairly flat ground and is formed with aggregates filled and compacted.

(c) Macgregor Creek Crossing: Drift-Deck crossing structure comprised of arched segments fitted to concrete footings in the mostly dry riverbed (and creek maintenance as required).

(d) Granite Creek Bridge: A bridge is required where the road crosses Granite Creek.

(e) Alpha Creek Bridge: A concrete box culvert will be required where the road crosses Alpha Creek.

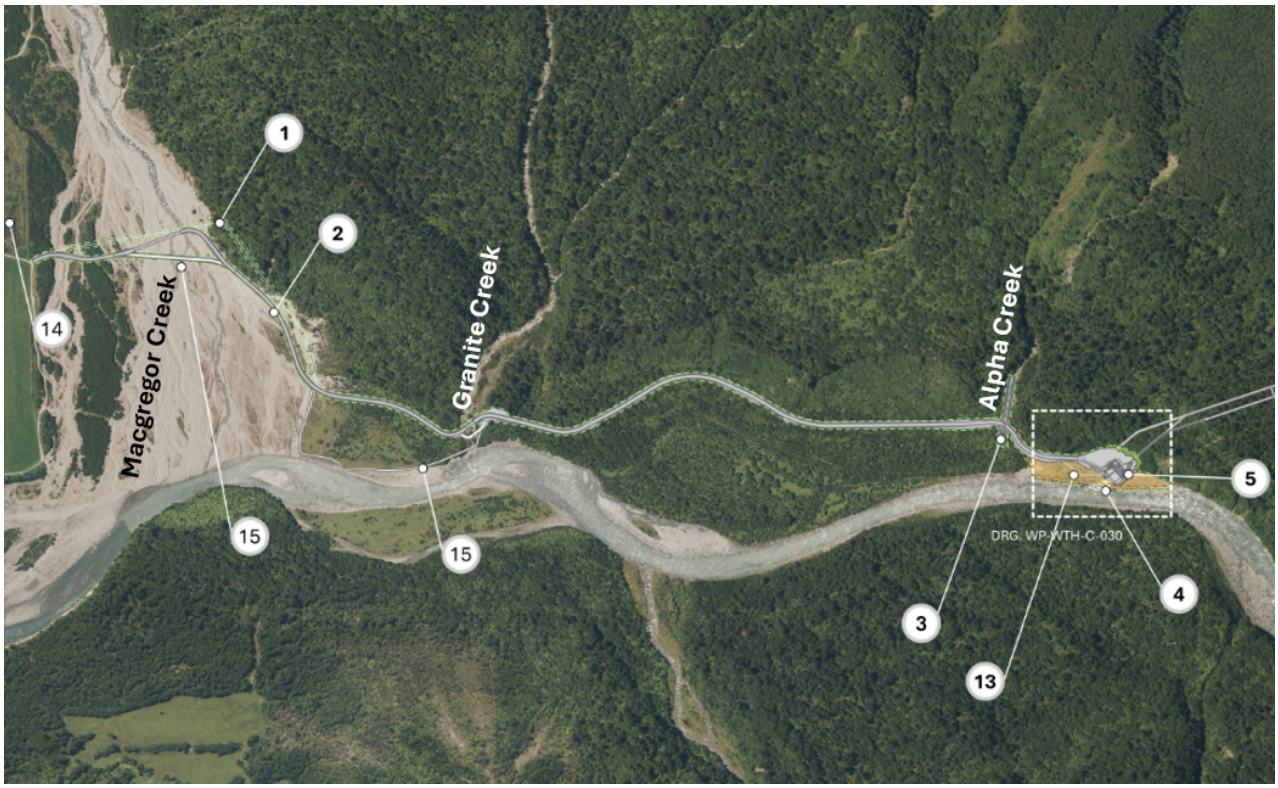


Figure 6: *The Access Road Concept GA Plan, source: AusHydro.*

2.8 Area 3 – Spoil Disposal Area

The Spoil Disposal Area are located on private farmland on the west of Macgregor Creek, **Figure 7**. Following depositing of the spoil from the tunnel construction, the area will be

contoured, topsoiled and seeded to be grazed again. Before spoil is deposited some (or all) of this area will be used for gravel extraction of up to 100,000 m^3 of gravel.

Figure 7: *The Spoil Disposal Area, source: Westpower GIS (2025).*

In addition, temporary Construction Staging Area 3 will be located in this area (see **Figure 7**) comprising of:

(a) Contractors' facilities during the construction phase;

(b) Site offices and vehicle washdown;

(c) Concrete batching plant

(d) Helipad.

Extraction of up to 23,000 m^3 of gravel will also occur in the Waitaha River bed during the construction phase. This extraction occurs within the area which Westland Schist have a resource consent and currently operate. Westland Schist, however, takes bigger rock and not the gravel sizes sought by Westpower. Westland Schist may extract this gravel for Westpower and leave it in a temporary pile in a dedicated screening area on the McLean's farm.

3. LANDSCAPE MANAGEMENT

The management of the landscape (and the natural character of the Waitaha River and its margins) effects, and the and maintenance of their values (as practicable) will be important throughout construction (given the timescale) and the rehabilitation phase, as the landscape mitigations are establishing. **Section 4.0** outlines details of how

rehabilitation measures are to be applied. The management of vegetation and weed monitoring and control is set out in the Vegetation Management Plan.

3.1 Landscape Management

Throughout the development of the Waitaha Scheme design Westpower has worked with its expert landscape consultants to reduce the Scheme's adverse effects on the landscape's natural character. The Scheme incorporates numerous design features which seek to minimise adverse effects on landscape (and as set out in the other management plans ecological) values, as outlined in **Section 3.2**.

Working in conjunction with the vegetation management plan for the rehabilitation vegetation the LMP seeks to reduce adverse effects by:

Returning the landscape to 'as close as practicable' to the natural pre-development state to support long-term landscape (and ecological) values.

The key aims of the rehabilitation measures are set out in **Table 1**.

3.2 Construction methods and materials

Throughout the development of the Waitaha Scheme design Westpower has worked with its expert landscape consultants to reduce the Scheme's adverse effects on the landscape's natural character.

The Scheme design has therefore already considered and incorporated many mitigation measures to minimise landscape (and natural character) effects. These are discussed below.

(a) The main upstream access portal being reduced in size (originally 5m by 7.5m) and is now 5m x 5m.

(b) The portal entrances have been aligned with the striations of the surrounding rock. Rough-hewn concrete will be used to enable weathering and for plants and mosses to take hold and successfully grow. There will be the careful placement of rocks and boulders around the Headworks to assist in integrating the portals into the natural landscape. The need for ancillary structures, such as a canopy portal cover to prevent rock fall, were considered but through design have been avoided, due to a better understanding of the surrounding geology.

(c) The entrance to the portals will be left as uncovered rock and designed to blend in with the natural lines of the surrounding schist, rather than strengthening the outer facing edges of the entrance with concrete and geometrically shaping the entrance. This gives the portals a more naturalistic cave-like appearance and further reduces the level of effect on natural character.

(d) The intake portal has been designed so it will sit below water level and will not therefore be visible. Only the access portal will be visible, and this is close to the water level to reduce its visual impact and the need for significant cuts and battered slopes in proximity to riverbank features. This also minimises the length and landscape impact of the access ramp down to the riverbed for ongoing maintenance.

(e) The Power Station Site is compact and located further upstream reducing its overall footprint to one smaller than previously proposed.

4. LANDSCAPE REHABILITATION

4.1 Landscape Rehabilitation Process

Because this project will be constructed over a period of approximately 3-4 years, how the landscape is managed and rehabilitated during this time has been carefully considered over the various phases of the project. This extends from pre-construction through to the establishment phase. Throughout all phases of the project, management, monitoring and maintenance will be important in a successful outcome for landscape and ecology. Pre-construction Considerations

All condition and management plan requirements must be complied with, the appended figures specify key interactions between effects on landscape and natural character and the management of other ecological effects.:

4.2 Rehabilitation of Four Key Areas

The four following plans explain the landscape rehabilitation options available for treatment of the landscape to fulfil the intended outcomes of this LMP and the key interactions with the management of other ecological effects through those management plans. These are separated into four Areas, indicated in **Figure 1**.

REHABILITATION AREAS

AREA 1 - THE INTAKE

This area of the Site has difficult access, with all plant and materials needing to be helicoptered in. This area benefits from the isolated nature of the location with very few weeds. Minimising the importing of plant and material, as well as minimising the working footprint is the best outcome for the landscape.

NOTE: Refer to Section 1.2 for abbreviation references.

CONSTRUCTION IMPACT	LANDSCAPE CONSIDERATIONS / REHIBILITATION OPTIONS
A **Construction of permanent structures:** Weir, sluice gate channel, intake channel and intake, access portal, access way down to river.	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **CEMP, ESCP** and **FEMP**. The design is low profile to minimise landscape effects of the structure on the natural river environment. In addition to the above, use the following rehabilitation measures: • Type 5 - Placement of landforms and rocks, and; • Type 7 - Creating rough surfaces to built forms to accelerate weathering.
B **Construction access road to laydown area:**	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **VMP, BMP, LizMP** and **AMP**. Use the following rehabilitation measures: **Type 1 - Natural Regeneration**
C **Construction laydown area**	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **VMP, BMP, LizMP** and **AMP**. Take every practicable step to retain present whio habitat features in this riparian zone, including a five-metre setback from the steep bank at the construction laydown area. Stockpiling of topsoil for reuse will also be within this area. Use the following rehabilitation measures: **Type 1 - Natural Regeneration**

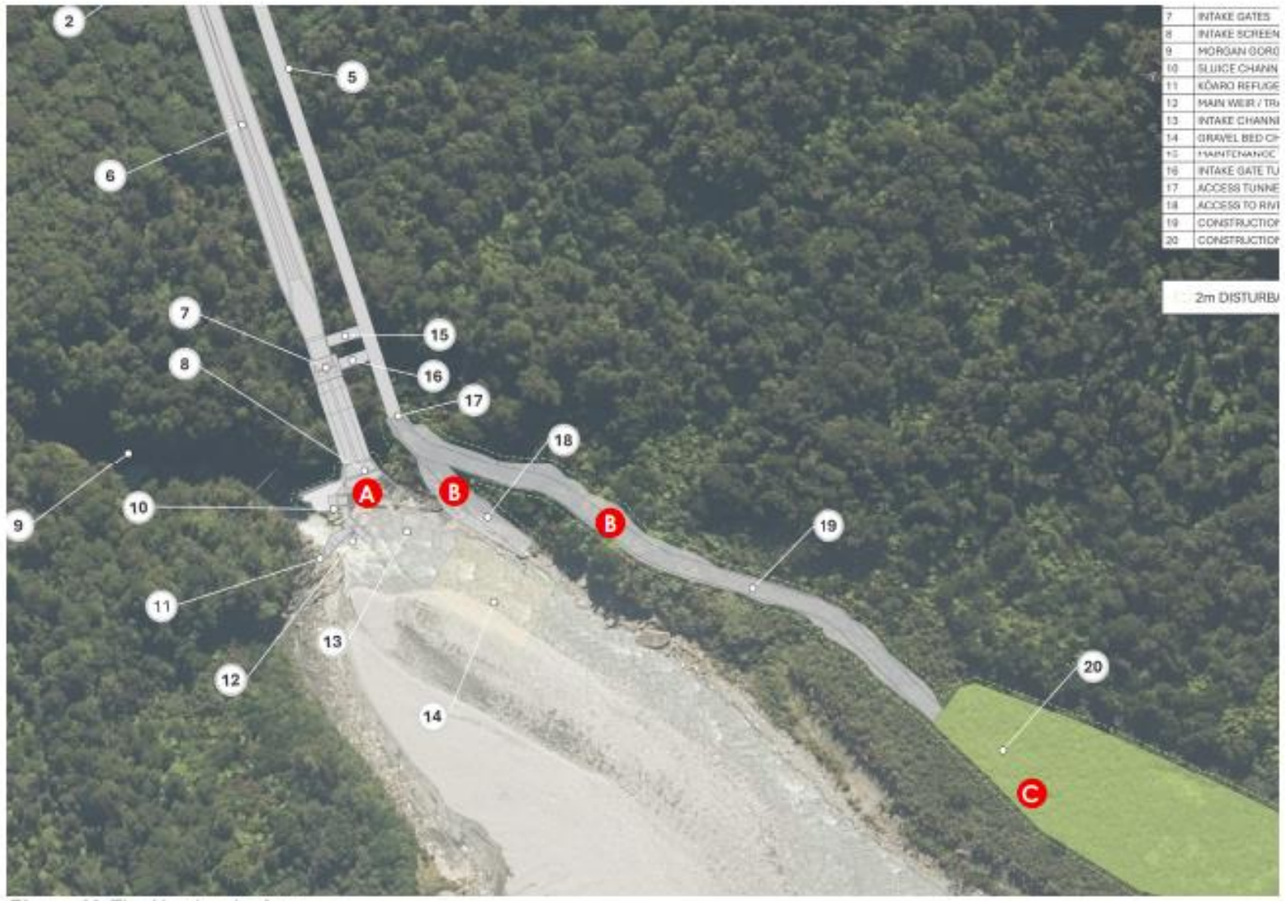


Figure 11: *The Headworks Area*

REHABILITATION AREAS

AREA 2A - POWER STATION AREA

NOTE:

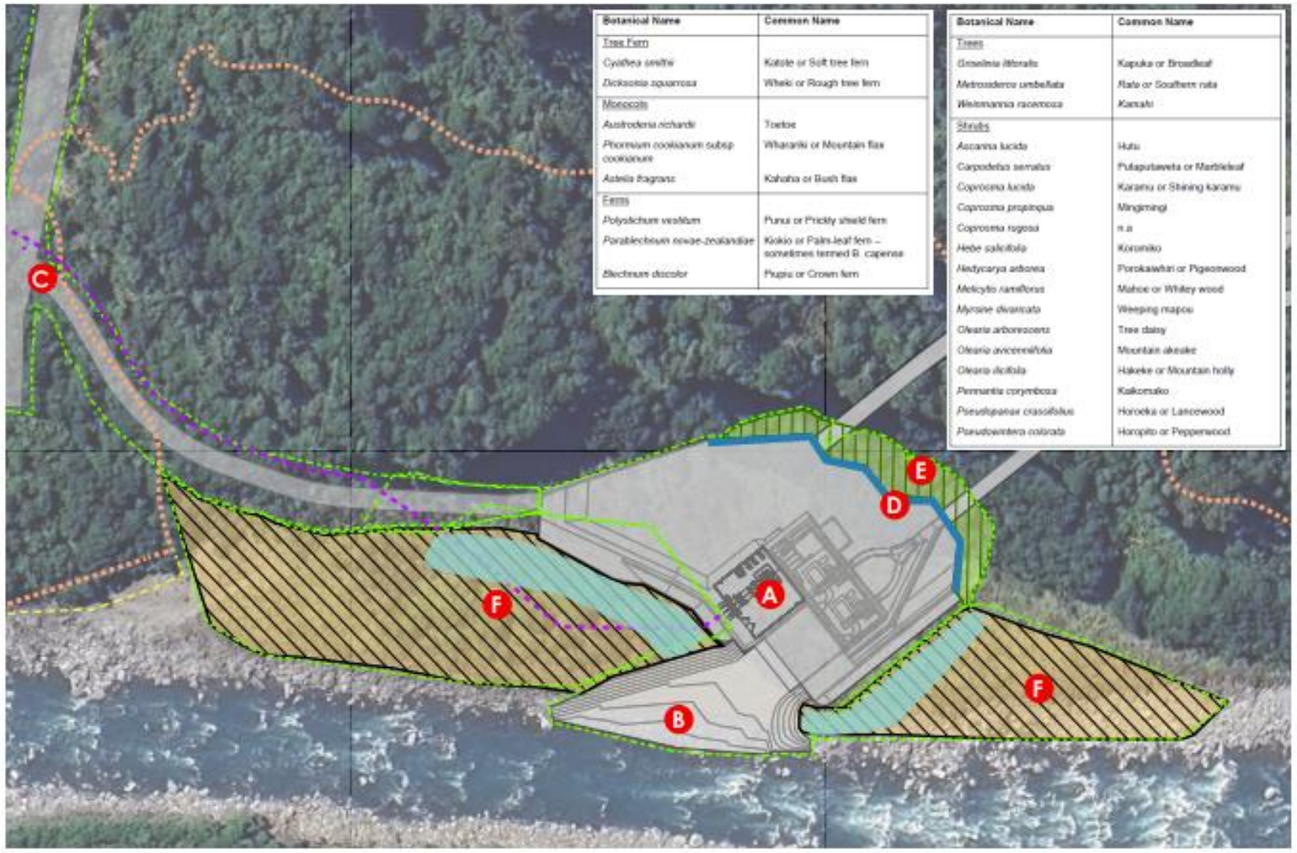
1. Refer to following page for plan.

2. Refer to Section 1.2 for abbreviation references.

CONSTRUCTION IMPACT	LANDSCAPE CONSIDERATIONS / REHIBILITATION OPTIONS
A **Power Station Building** Visual impacts on the immediate surroundings.	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **CEMP**, **VMP**, **BMP**, **LizMP** and **AMP**. That the built forms at the powerhouse use dark recessive colours and materias, to assist with blending them into the natural landscapes. A comprehensive Planting Plan will be developed immediately surrounding the Power Station.
B **Powerhouse Access Ramp**	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **CEMP**, **ESCP** and **FEMP**. Use the following rehabilitation measures: Type 1 - Natural Regeneration
C **Alpha Creek Bridge**	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **CEMP**, **VMP**, **BMP**, **LizMP** and **AMP**. Use one of the following rehabilitation measures: Type 1 - Natural Regeneration Type 2 - Indigenous Planting - if highly visible
D **Headworks access portal and retaining walls**	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **CEMP**, **VMP**, **BMP**, **LizMP** and **AMP**. Headworks access portal and associated access road will be integrated into the rock as much as possible, where lichen, moss and ferns will be encouraged to grow to further reduce the visual presence of this part of the Power Station. The batter above the headwall will have a Shotcrete treatment, which is suitable for weathering. The rockfall prevention wall (or wingwalls) will be up to 6m in height and located adjacent to the exposed tunnel portal entry. To visually soften its appearance, use one of the following rehabilitation measures: • Type 7 - Creating rough surfaces to cut faces • Type 9 - Flex MSE bags
E **Batter Slopes**	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **CEMP**, **VMP**, **BMP**, **LizMP** and **AMP**. The immediate part of the batter above the portal will have shotcrete, which provides stabilisation. Additionally use the following rehabilitation measures: • Type 1 - Natural Regeneration **ADDITIONAL MITIGATION MEASURES / OPTIONS:** The following additional options which could be considered depending on the site conditions, these include: • Type 6 - Creating Benches into cut faces • Type 7 - Creating rough surfaces to cut faces • Type 8 - Erosion control tubes • Type 9 - Flex MSE bags • Type 10 - Compost Blankets • Type 11 - Engineered Mats
F **Potential Construction Disturbance Area**	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **CEMP**, **VMP**, **BMP**, **LizMP** and **AMP**. This area will have significant disturbance and will be rehabilitated with placing of topsoil from the site and planted, using the following rehabilitation measures: Type 2 - Indigenous Planting

REHABILITATION AREAS

AREA 2A - POWER STATION AREA



Botanical Name	Common Name
Tree Fern	
Cyathea smithii	Katote or Soft tree fern
Dicksonia squarrosa	Wheki or Rough tree fern
Monocots	
Austroderia richardii	Toetoe
Phormium cookianum subsp cookianum	Wharariki or Mountain flax
Astelia fragrans	Kahaha or Bush flax
Ferns	
Polystichum vestitum	Punui or Prickly shield fern
Parablechnum novae-zelandiae	Kiokio or Palm-leaf fern – sometimes termed B. capense
Blechnum discolor	Piupiu or Crown fern

Botanical Name	Common Name
Trees	
Griselinia littoralis	Kapuka or Broadleaf
Metrosideros umbellata	Rata or Southern rata
Weinmannia racemosa	Kamahi
Shrubs	
Aciphylla lucida	Huhu
Carpodetus serratus	Putaputaweta or Marbleleaf
Coprosma lucida	Karamu or Shining karamu
Coprosma propinqua	Mingimingi
Coprosma rugosa	n.a
Hebe salicifolia	Koromiko
Hedycarya arborea	Porokaiwhiri or Pigeonwood
Melicytus ramiflorus	Mahoe or Whitey wood
Myrsine divaricata	Weeping matipo
Olearia arborescens	Tree daisy
Olearia avicenniifolia	Mountain akeake
Olearia ilicifolia	Hakeke or Mountain holly
Pennantia corymbosa	Kaikomako
Pseudopanax crassifolius	Horoeka or Lancewood
Pseudowintera colorata	Horopito or Peppenwood

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KEY

- Rehabilitation Vegetation
- Construction Envelope
- Waitaha Walking Track
- Transmission lines
- Headworks access portal and retaining walls
- Type 5 - Placement of landforms (included in Scheme Design)

Figure 12: *The Power Station Area*

REHABILITATION AREAS

AREA 2B - ACCESS ROAD

The road alignment has been laid out in collaboration with the ecologist to minimise damage to vegetation, especially large (60+ cm dbh) hardwood trees and podocarp trees (30+ cm dbh) as a priority.

Prior to construction, establishing the best location for stockpiling, turning and construction works will be important to minimise hauling rocks and landscape materials in and out of the area. Ideally these remain within the access road environment to minimise dispersal of weed seeds and other contaminants.

NOTE: Refer to Section 1.2 for abbreviation references.

CONSTRUCTION IMPACT	LANDSCAPE CONSIDERATIONS / REHIBILITATION OPTIONS
A Cutting access road and edge of forest treatment Part of reducing the overall effect of the Scheme on terrestrial invertebrates and bats is to manage edge effects where taller indigenous forest vegetation has been cleared.	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **CEMP**, **VMP, BMP, LizMP** and **AMP**. **ADDITIONAL MITIGATION MEASURES / OPTIONS:** The use of some dense plantings of site-appropriate species to create an armoured edge with the adjacent forest habitat will help reduce air movement through the exposed edge, which can change the micro-climate. This method can be used where large trees are removed, resulting in areas where root-plates create areas of land depression. An option for margins of the road is to place a layer of topsoil from the site and implementing one or more of the following landscape rehabilitation options (noting some measures will accelerate establishment faster than others): • Type 1 - Natural Regeneration • Type 2 - Indigenous Planting • Type 4 - Hydroseeding indigenous Planting • Type 10 - Compost Blankets
B Batter Slopes Refer to examples illustrated in Figure 14 and 15.	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **CEMP**, **VMP, BMP, LizMP** and **AMP**. **ADDITIONAL MITIGATION MEASURES / OPTIONS:** Typically the road is formed on a flat area or in areas where there are limited cuts. These areas may require landscape treatments to stabilise or prevent erosion, depending on extent and slope. Encourage greening to cut faces of rock for slope stabilisation. Stabilisation options depend on how steep the slopes are. • Type 1 - Natural Regeneration • Type 2 - Indigenous Planting (consider if highly visible) • Type 6 - Creating Benches into cut faces • Type 7 - Creating rough surfaces to cut faces • Type 8 - Erosion control tubes • Type 9 - Flex MSE bags • Type 10 - Compost Blankets Type 11 - Engineered Mats Type 12 - Gabions
C Construction laydown areas	**LANDSCAPE CONSIDERATIONS HAVE ALREADY BEEN INCLUDED IN THE SCHEME DESIGN.** In application of this Construction Impact, apply the **CEMP**, **VMP, BMP, LizMP** and **AMP**. Take every practicable step to retain key habitat features in this riparian zone. Use one of the following rehabilitation measures: • Type 1 - Natural Regeneration, or • Type 2 - Indigenous Planting

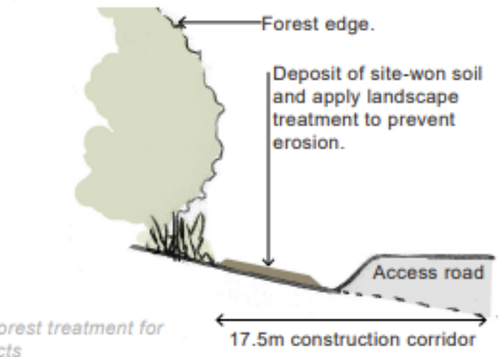

Figure 13: *Edge of forest treatment for mitigating edge effects*

Figure 14: *Cross-section through the Access Road at Granite Creek, which has a significant cut. Chainage 1500 is shown.*

Figure 15: *Typical cross-section through the Access Road where there is a section of cut and fill. Shown in Chainage 1100.*

AREA 3 - SPOIL AREA

Spoil disposal from the tunnel excavations (approximately 120,000 m³) will be placed on nominated farmland outside of the Conservation Area.

LANDSCAPE CONSIDERATIONS

- The spoil will ultimately be compacted and grassed for grazing purposes.
- Any watercourses would be avoided.
- The natural drainage patterns shall be retained and if contouring is significantly impacting on drainage (especially since the land will be grazed), riparian margins should be considered. Refer to Dairy New Zealand's Riparian guidance for the West Coast[1].
- Spoil (soil / rock) shall be placed in layers of 200mm and compacted.
- 200mm topsoil shall cap the spoil layers.
- Lawn seed suitable for pasture (agreed in consultation with the farmer) shall be seeded at a time of year when plant growth is optimal, and apply grass seed to reduce the amount of time before the area is stabilised.
- Considerations to dust and erosion management.

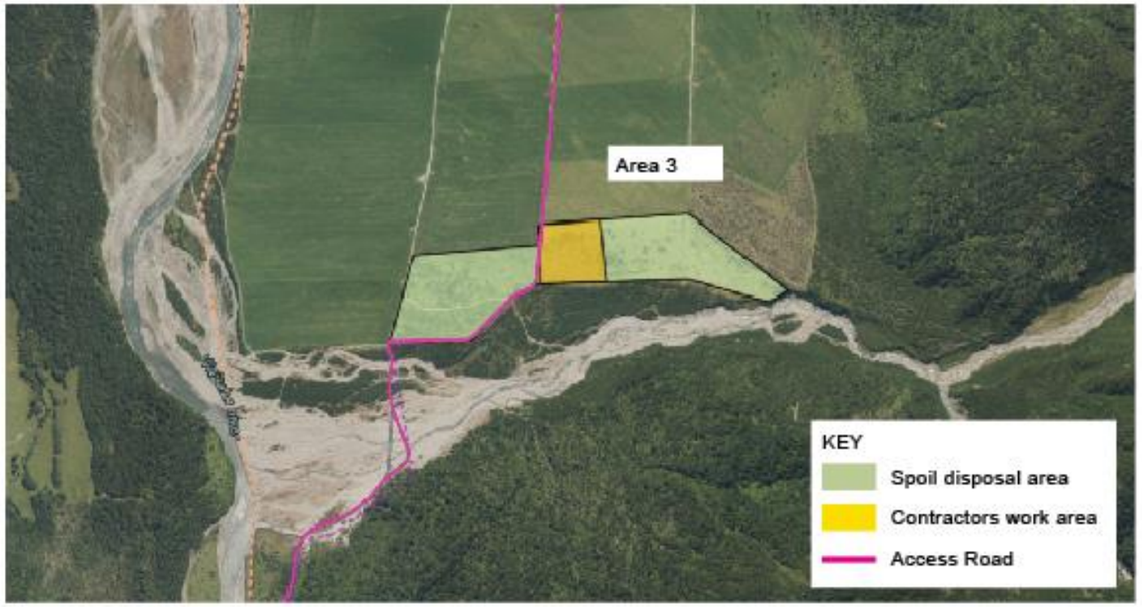

Figure 16: *Spoil Area*

[1] https://www.dairynz.co.nz/media/lz4f5rbk/riparian-mgmt-west-coast.pdf

4.3 Rehabilitation of landscape following unforeseen events

The Scheme is within a highly dynamic environment, where natural hazards can occur frequently, this is part of the landscape character. In working in a highly dynamic natural environment, a number of natural or construction-related events could occur which create scenarios where further landscape treatments, additional to those of the Scheme, are required to protect the landscape (or planting) or infrastructure from further damage, or to enable construction works to continue.

These scenarios could be caused by:

(a) Extreme weather, slips, erosion etc.

(b) Collapses during excavation, drilling or blasting.

(c) Rock collapses or slips, which could occur on the steeper faces and where drilling or blasting is occurring.

(d) Additional worksite requirements (for stockpiling, vehicle turning etc).

Table 3 outlines the range of Landscape Treatment Options available in various scenarios, details of Landscape Treatment Options are fully outlined in **Appendix 1**. When considering the options for landscape treatment, more natural treatments (treatments 1, 2 and 4) will produce more desirable outcomes, which are in line with the LMP primary objective. However, if safety or the protection of infrastructure are necessary, the more engineered treatments are appropriate. For example, rock protection measures such as Type 11 – Engineered mats.

Table 3: Decision matrix for unforeseen events

UNFORESEEN ISSUE / RISK	**SCENARIO**	**LANDSCAPE TREATMENT OPTIONS** *Refer to Appendices 1 for details of the landscape treatments.*
Exposed rock faces		
	Highly visible and opportunity to manipulate the slope / cuts	Type 6 - Creating Benches into cut faces Type 7 - Creating rough surfaces to cut faces
	Highly visible but no opportunity to manipulate the slope / cuts	Type 9 - Flex MSE bags as cladding to a limited height
	Requires rock control / stabilization	Type 11 - Engineered Mats with Indigenous Planting Type 12 - Gabion walls
Exposed soil slopes	Not highly visible and no requirement for erosion control	Type 1 - Natural Regeneration

	or stabilization (on gentler slopes)	
	Highly visible and requirement for erosion control or stabilization (less than 1:3 slope)	Type 1 - Natural Regeneration Type 2 - Indigenous Planting Type 4 - Hydroseeding indigenous Planting Type 10 - Compost Blankets Indigenous Hydroseed Type 8 - Erosion control tubes
	Highly visible and requirement for erosion control or stabilization (greater than 1:3 slope)	Type 9 - Flex MSE bags Type 8 - Erosion control tubes Type 11 - Engineered Mats with or without Hydroseeded Indigenous Planting Type 12 - Gabions
High erosion zones	Near overland flow paths or at the base of steep slopes where soil needs protecting	Type 9 - Flex MSE bags Type 8 - Erosion control tubes Type 11 - Engineered Mats with or without Hydroseeded Indigenous Planting Type 12 - Gabions
Riparian zones disturbed (assuming sensitive habitats are within these zones)	Highly visible	Type 1 - Natural Regeneration Type 2 - Indigenous Planting Type 4 - Hydroseeding indigenous Planting Type 8 - Erosion control tubes Type 10 - Compost Blankets with Indigenous Hydroseed
	Not highly visible	Type 1 - Natural Regeneration

4.4 Factors influencing rehabilitation

The success of rehabilitation requires an understanding of the context and influences within which it will occur.

The key influences relating to the Scheme are:

(a) Favourable climate for establishment of indigenous plants (and weed species, requiring responsive management of weeds).

(b) High rainfall (5.5m annually at the intake), which causes a highly dynamic environment and could pose natural hazards to work around (slips etc.).

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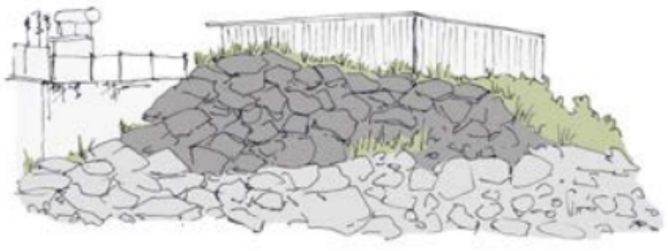
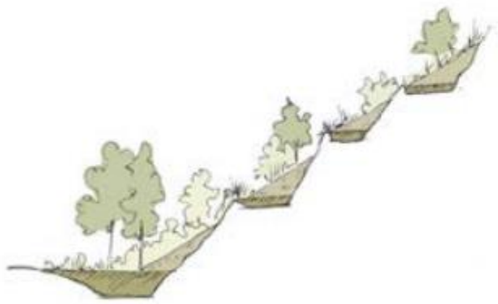
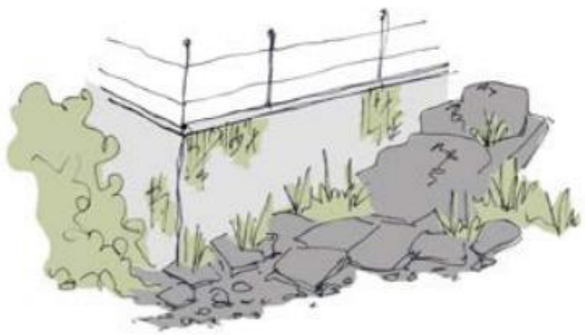
APPENDIX 1: LANDSCAPE REHABILITATION OPTIONS

REHABILITATION OPTION	APPLICATION	METHODOLOGY / SUPPLIER
1 NATURAL REGENERATION The principal objective of the LMP is to allow natural revegetation wherever possible, capitalising on the significant seed source and favourable climatic conditions. Sites left to regenerate naturally can often be the most successful means of getting vegetation established. Soil preparation is a key element of a successful rehabilitation plan both for areas left to regenerate naturally and for areas to be planted. With good planning, soil can be sourced from the site to minimise contamination and weed risks.	• The preferable rehabilitation option. • On retired worksites and less visually sensitive locations where rapid visual rehabilitation is not required. • On sites where additional erosion, stabilisation or rock control is not required.	• If ground has been within the construction zone, it will likely have compacted ground conditions. Rip base soil to a depth of 300mm (ideally) with a tractor / excavator or available machinery. • Spread Site-won topsoil across the area to a minimum depth of 300mm. • Weed and pest management is integral to the success of this method.
2 INDIGENOUS PLANTING For use where fast establishment and immediate impact is required, in highly visible or more sensitive ecological environments (such as riparian margins). Soil preparation is a key element of a successful rehabilitation plan both for areas left to regenerate naturally and for areas to be planted. Only site-won soil is able to be used for planting areas.	• Visually sensitive locations where rapid visual rehabilitation is required. • Ecologically sensitive locations (such as riparian margins). • More expensive and requires imported materials. • Quicker initial visual impact, but natural regeneration will look similar after a few years.	• Base of planting area ripped with a tractor (or other available machinery) to loosen the base and enable drainage. • Place 300mm site-won soil and 100mm depth of site-sourced mulch. • Planting needs to be well planned so that the right species are planted at the right time. Usually, at least a year lead time is required to enable sufficient quantities of appropriate locally sourced plant species to be propagated; • Species will be sourced from local plant populations to ensure that they are ecologically compatible and suitable for the environs (i.e eco-sourced within 200km of the Site); • All plants will be suitably acclimatised to local conditions prior to planting. • Small grade plants will be used (i.e. root trainers up to PB3 or 1L grade) because they will acclimatise and establish more readily than larger grades; • Areas to be planted will need to be spot sprayed with a contact herbicide or openings cut in woody nurse crops to reduce local competition for light and resources as part of site preparation prior to any planting works; • Plants will receive locally applied fertiliser (e.g. fertiliser tab or long-release granules) and be marked with a stake to facilitate re-location in the future; • Plants are generally planted in a naturalistic pattern that is easy to locate in the future during follow up maintenance work and so that the level of plant survival can be easily determined • Bio-degradable Combi-guard (or similar) could be considered if pests are anticipated to be an issue.

REHABILITATION OPTION	APPLICATION	METHODOLOGY / SUPPLIER
3 HYDROSEEDING GRASS In the short term, hydroseeding or other alternative such as straw mulch and grass seeding helps to stabilise cut and batter slopes, reduce runoff and erosion, bind soils preventing dust problems, provides rapid visual greening and inhibits invasion by some pest plants.	• Erosion control • Stabilise cut and batter slopes • Rapid greening in visible spaces • Longer window of application seasons than regular grass seeding. Cost effective. Higher success rate than standard grass seeding. • Limited seed protection and stabilisation. Long term maintenance costs.	• Hydroseeding needs to be carried out very soon after completion of preparatory works, before the cut face and batter slopes dry out. • Requires independent contractor for specialist application, such as Red Tree Environmental. Must use reputable contractor with appropriate quality assurance of seed and biosecurity measures to reduce the chance of introducing unwanted species. • Hydroseeding can be applied by drone onto very steep or difficult to access areas. • Application during cooler months for optimal establishment.
4 HYDROSEEDING INDIGENOUS PLANTING Provides visual greening in highly visible or ecologically sensitive locations. This can be applied to other methods (such as Engineered Matts).	• Erosion control • Stabilise cut and batter slopes • Rapid greening in visible spaces • Faster application and lower cost than standard seedling planting. • Success rates variable depending on multiple factors - site, conditions, species, weather etc. Longer establishment time. • Requires maintenance ideally, if safe access allows.	• Hydroseeding needs to be carried out very soon after completion of preparatory works, before the cut face and batter slopes dry out. • Hydroseed mixes can be grass or bespoke native seed mixes. Native seed mixes are preferable over grass and should be developed in consultation with the Ecologist and the suppliers. • Requires independent contractor for specialist application, such as Red Tree Environmental. Must use reputable contractor with appropriate quality assurance of seed and biosecurity measures to reduce the chance of introducing unwanted species. • Broadcast seeding can be applied by drone onto very steep or difficult to access areas.
5 PLACEMENT OF LANDFORMS AND ROCKS Placement of rocks, boulders and soil (which could include logs and other debris) to mimic a natural environment will assist in visually integrating constructed features/structure into the natural landscape character. 	• Assists with visual integration of built or modified forms into the landscape. • Uses materials from Site, minimising contamination risks, providing these can be stored for reuse.	• Place materials (stockpiled prior to construction) in random placement to mimic the natural environment and provide opportunities for vegetation to establish in the gaps. • Minimise transportation of materials as close to final position as practically possible. • These areas can be either left to naturally regenerate or to be planted.

REHABILITATION OPTION	APPLICATION	METHODOLOGY / SUPPLIER
6 CREATING BENCHES INTO CUT FACES Where there is space in a battered bank to create edges in rock faces for plant establishment. This outcome is preferable to a uniform / engineered face. This can be left to naturally regenerate or be planted. 	• Where there is potential to modify cut faces to create rough surfaces for plant establishment. • Highly visible faces where rapid greening is required. • Integration of built or modified forms into the landscape. • Stabilise cut and batter slopes • Assists with vegetation establishment on steeper rock faces	• Include ledges with recesses where soil and in turn, planting can establish. • Cut formed ledges can be as narrow as 300mm in width, a more generous ledge would enable large vegetation to establish. • Include a slope to the ledge to enable drainage and raised lip to contain material. • As accessibility for planting or maintaining is not anticipated to be practical in situations where this can be used, natural regeneration, hydroseeding or broadcast seeding can be applied.
7 CREATING ROUGH SURFACES TO CUT FACES / CONSTRUCTION MATERIALS Create rough surfaces on both cut faces and built walls to better enable natural regeneration and weathering. Crevasses and gaps will assist with the vegetation to naturally establish. 	• Where there is potential to modify materials or cut faces to create rough surfaces for plant establishment. • Where there is potential to influence material choice or finish. • Integration of built or modified forms into the landscape. • Vegetation establishment on steeper rock faces. • Shotcrete is an ideal material for vegetation establishment given the rough surfaces and ability to hand form ledges and textures- as used above the tunnel portals.	• Where there is an ability to influence material finishes for built forms, opting for rougher textures to accelerate aging, moss establishment etc. • Create crevasse or gaps in the form work, where not impacting on structural integrity. • Accelerating the weathering of the constructed features by the use of rough-hewn concrete where plants and mosses are able to grow.

REHABILITATION OPTION	APPLICATION	METHODOLOGY / SUPPLIER
8 EROSION CONTROL TUBES To assist with erosion and protection of edges and interfacing with other erosion control measures (such as Engineered Matts). 	• Used in conjunction with other erosion control measures. • To stabilise steep banks and minimise erosion, protects seeded topsoil from washout and encourages vegetation establishment. • Stabilisation of erosion scarps and slips. • Drainage protection. • Stockpile containment (easily removed for heavy vehicle access) • Control and direction of overland flow path.	There are a number of suitable products from suppliers such as Maccaferri and Cirtex. A key consideration is to select a material that is completely bio-degradable and plastic free.
9 FLEX MSE BAGS For vegetated retaining walls, slope stability, soil retention and erosion control. This is a solution for walls and slopes where a immediate outcome is required. 	• Erosion control and greening of nearly vertical slopes and faces. • Highly visible faces where rapid greening is required. • Integration of built or modified forms into the landscape. • Stabilise cut and batter slopes. • Assists with vegetation establishment on steeper rock faces. • Must be planted and achieve complete plant coverage within 5 years to prevent UV erosion of the bags. • Will have better success on south facing slopes.	The product is a patented engineering solution supplied by Advanced Landscape Systems – refer to supplier for specific designs and instillation methodology. Website: www.advancelandscape.co.nz/product-range/flex-mse-vegetated-wall-system/ Installed bags may be hydroseeded or directly planted.

REHABILITATION OPTION	APPLICATION	METHODOLOGY / SUPPLIER
10 EROSION CONTROL MATTING Erosion Control Matting is used for slope stabilisation, erosion control and vegetation establishment on disturbed, bare or highly erodible soils during land disturbing and construction activities. Typically used after final grading for temporary or permanent seeding applications (such as hydroseeding). 	• To stabilise plantable banks and minimise erosion on slopes between 1:3 to 1:1 • Custom seed mixes may be added and applied directly to the slope on hydroseeded or broadcast under matting. Non-seeded / planted applications shall be considered a temporary form of erosion control. • Used in conjunction with other erosion control measures. • Stabilisation of soils. • Drainage protection.	There are a number of suitable products from suppliers such as Maccaferri and Cirtex. A key consideration is to select a material that is completely bio-degradable and plastic free. For example: • Citrex - Biocoir Coconut matting or Biowool • Maccaferri Biomac-C
11 ENGINEERED MATS Engineered Matts are used for slope stabilisation, erosion control and vegetation establishment on disturbed, bare or highly erodible soils during land disturbing and construction activities. Some products have rock fall control application too. 	• Rock protection (some products) • To stabilise steep banks and minimise erosion slope 1:2 to 1:1 • To stabilise steep banks and minimise erosion, protects seeded topsoil from washout and encourages vegetation establishment. • Requires engineering input. • Can be used with hydroseeding to achieve greening.	• Maccaferri MacMat R – and also rock fall control • Maccaferri Enkamat 7018 • Cirtex Landlok or Duraslope

REHABILITATION OPTION	APPLICATION	METHODOLOGY / SUPPLIER
12 GABION RETAINING Steep faces up to vertical and where retaining is required. Vegetation (creepers etc) can establish on top. Utilise site rocks to integrate into the natural environment. 	• To stabilise cut faces / banks and minimise erosion to vertical slopes. • Use local rocks sourced from Site to integrate into natural environment. • Requires engineering input.	There are a number of suitable products from suppliers such as Maccaferri and Cirtex.