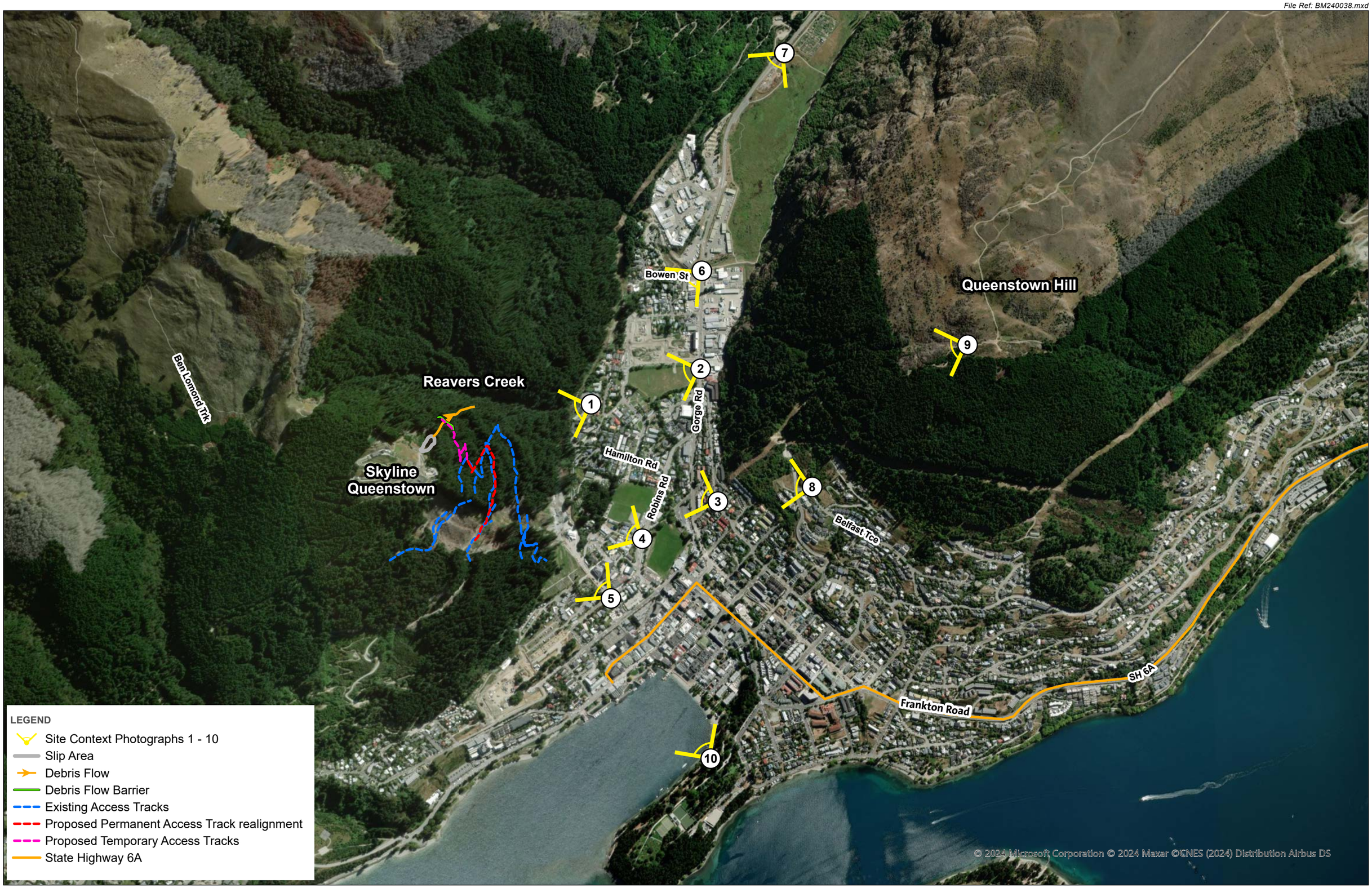

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0 400 m

1:12,000 @ A3

Data Sources:
Bing Map, and LINZ Data Service.

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

Reavers Catchment Debris Removal

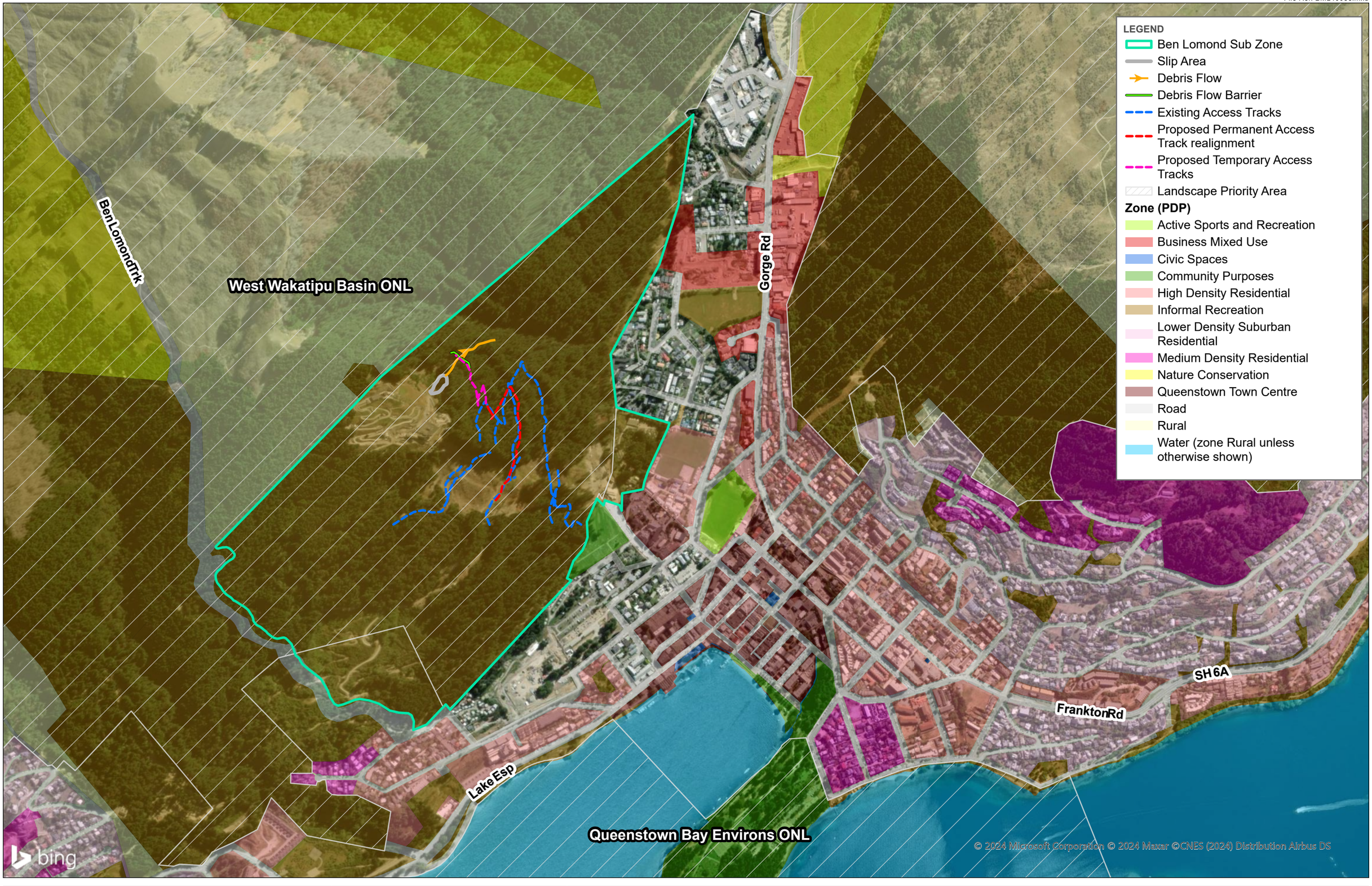
Visual Appraisal

Date: 20 August 2024 | Revision: 2

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Figure 3



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0 400 m

1:10,000 @ A3

Data Sources:
Bing Map, LINZ Data Service, and Queenstown Lakes District Council.
Projection: NZGD 2000 New Zealand Transverse Mercator

Reavers Catchment Debris Removal

Statutory Context

Date: 20 August 2024 | Revision: 2

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Figure 4

Site Appraisal Photograph A: Photograph taken from southwestern edge of the slip in the Reavers Creek catchment, looking in a northeasterly direction downslope towards the debris flow. The upper slip is located above the existing Douglas fir forest.

Site Appraisal Photograph B: Photograph taken from a location an existing access track, looking in a northeasterly direction towards the Skyline Gondola and the existing Douglas fir forest.

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Viewpoint Details

Horizontal Field of View	: 90°
Vertical Field of View	: 30°
Projection	: Rectilinear
Image Reading Distance @ A3 is 20 cm	

REA ERS CATCHMENT DEBRIS REMO AL

Site Appraisal Photographs A - B

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Appraisal Photograph C: Photograph taken from a location on an existing upper access track, looking in a northwesterly direction. The track is currently inaccessible due to the September 2023 storm damage.

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Viewpoint Details

Horizontal Field of View	: 90°
Vertical Field of View	: 30°
Projection	: Rectilinear
Image Reading Distance @ A3 is 20 cm	

REA ERS CATCHMENT DEBRIS REMO AL

Site Appraisal Photograph C

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Existing access track to be realigned as part of the proposal

Site Appraisal Photograph D: Photograph taken from a location on an existing upper track, looking in a southeasterly direction.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is 50 cm	

REA ERS CATCHMENT DEBRIS REMO AL

Site Appraisal Photograph D

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Appraisal Photograph E: Photograph taken from a location on the upper proposed temporary access track, looking in a south easterly direction towards the lower proposed temporary access track and existing access track.

Site Appraisal Photograph F: Photograph taken from the middle of the debris flow, looking in a southeasterly direction towards the location of the proposed debris flow barrier.

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Viewpoint Details

Horizontal Field of View	: 90°
Vertical Field of View	: 30°
Projection	: Rectilinear
Image Reading Distance @ A3 is 20 cm	

REA ERS CATCHMENT DEBRIS REMO AL

Site Appraisal Photographs E - F

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Appraisal Photograph : Photograph taken from the middle of the debris flow, looking in a southwesterly direction towards the upper extent of the debris flow.

Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is	50 cm

REA ERS CATCHMENT DEBRIS REMO AL

Site Appraisal Photograph G

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Appraisal Photograph H: Photograph taken below the proposed debris flow barrier location, looking in a northwesterly direction towards the lower extent of the debris flow.

Viewpoint Details

Horizontal Field of View	: 90°
Vertical Field of View	: 30°
Projection	: Rectilinear
Image Reading Distance @ A3 is 20 cm	

REA ERS CATCHMENT DEBRIS REMO AL

Site Appraisal Photograph H

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Conte t Photograph 1: Photograph taken from Reavers Lane looking in a southwesterly direction towards the Site, approximately 270 metres northeast of the Site. The Site is not visible from this viewpoint.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is	50 cm

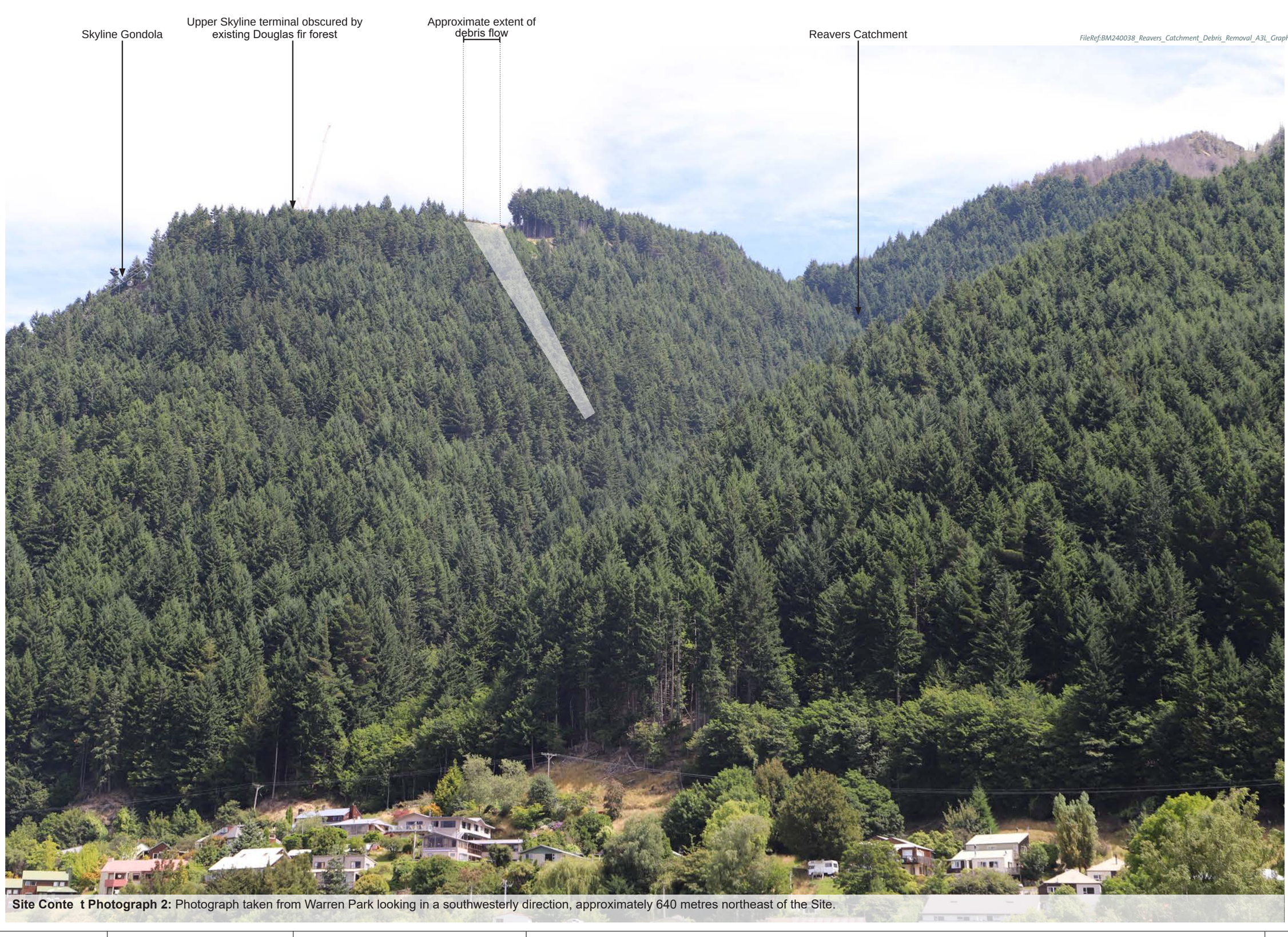
REA ERS CATCHMENT DEBRIS REMO AL

Site Context Photograph 1

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi



Site Conte t Photograph 2: Photograph taken from Warren Park looking in a southwesterly direction, approximately 640 metres northeast of the Site.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is	50 cm

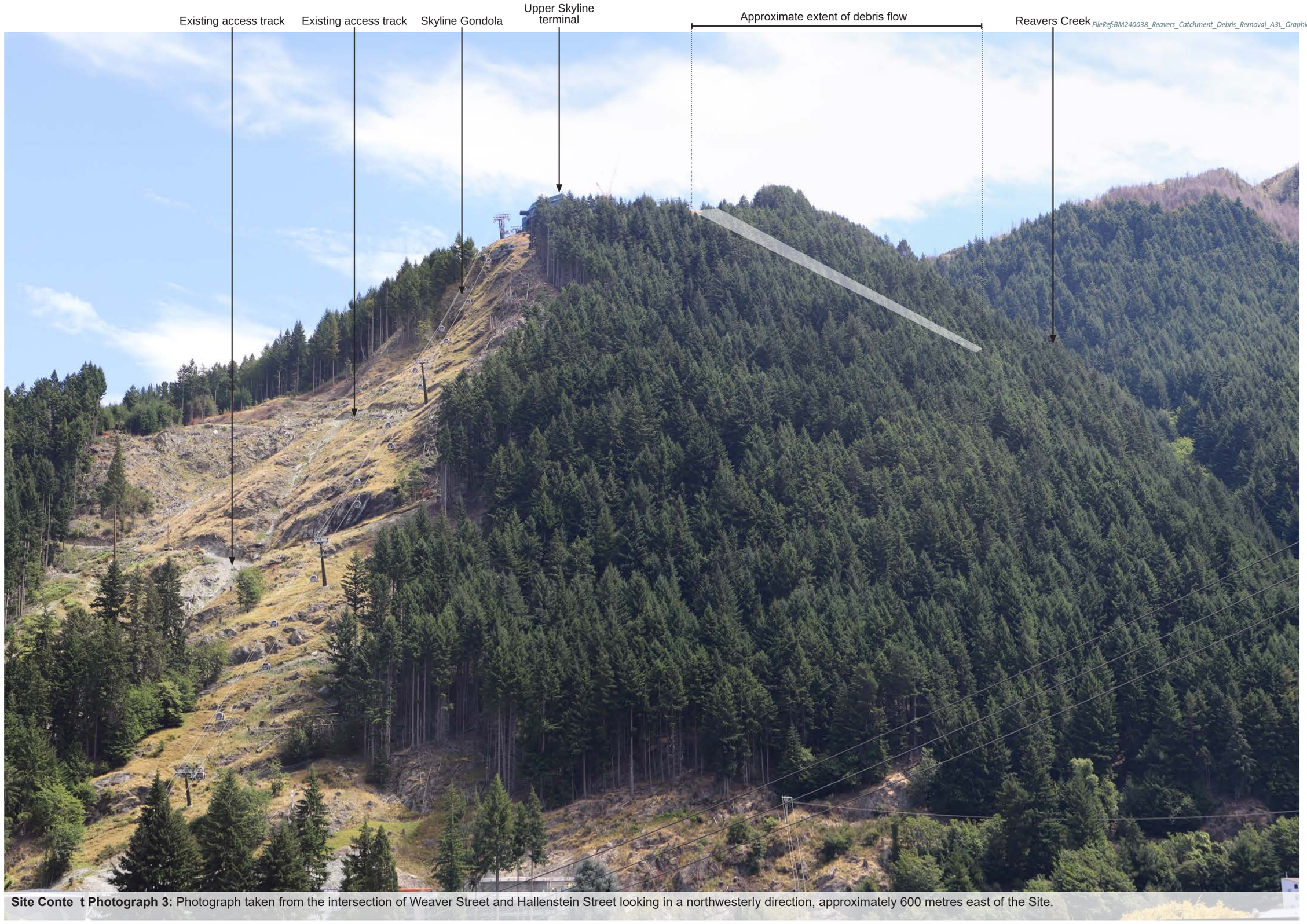
REA ERS CATCHMENT DEBRIS REMO AL

Site Context Photograph 2

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi



Site Conte t Photograph 3: Photograph taken from the intersection of Weaver Street and Hallenstein Street looking in a northwesterly direction, approximately 600 metres east of the Site.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is 50 cm	

REA ERS CATCHMENT DEBRIS REMO AL

Site Context Photograph 3

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Conte t Photograph 4: Photograph taken from Robins Road looking in a northwesterly direction, approximately 340 metres east of the Site.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is 50 cm	

REA ERS CATCHMENT DEBRIS REMO AL

Site Context Photograph 4

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Conte t Photograph 5: Photograph taken from the intersection of Isle Street and Brecon Street looking in a northwesterly direction, approximately 320 metres southeast of the Site.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is	50 cm

REA ERS CATCHMENT DEBRIS REMO AL

Site Context Photograph 5

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Conte t Photograph 6: Photograph taken from the intersection of Bowen Street and Gorge Road looking in a southwesterly direction, approximately 860 metres northeast of the Site.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is	50 cm

REA ERS CATCHMENT DEBRIS REMO AL

Site Context Photograph 6

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Conte t Photograph : Photograph taken from Queenstown Harvest Community Gardens on Gorge Road looking in a southwesterly direction, approximately 1.6 kilometres northeast of the Site. Skyline Luge and the slip area are visible from this viewpoint.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is 50 cm	

REA ERS CATCHMENT DEBRIS REMO AL

Site Context Photograph 7

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Conte t Photograph 8: Photograph taken from the start of Queenstown Hill walking track on Belfast Terrace looking in a northwesterly direction, approximately 920 metres east of the Site. Skyline Gondola and upper Skyline terminal are largely visible from this viewpoint.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is	50 cm

REA ERS CATCHMENT DEBRIS REMO AL

Site Context Photograph 8

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Conte t Photograph 9: Photograph taken from Queenstown Hill above the tree line looking in a southwesterly direction, approximately 1.5 kilometres northeast of the Site. Skyline upper terminal base and the upper debris flow are largely visible from this elevated viewpoint.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is	50 cm

REA ERS CATCHMENT DEBRIS REMO AL

Site Context Photograph 9

Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Site Conte t Photograph 10: Photograph taken from Queentown Garden looking in a northwesterly direction, approximately 940 metres southeast of the Site.

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Viewpoint Details

Horizontal Field of View	: 40°
Vertical Field of View	: 25°
Projection	: NA
Image Reading Distance @ A3 is	50 cm

REA ERS CATCHMENT DEBRIS REMO AL

Site Context Photograph 10

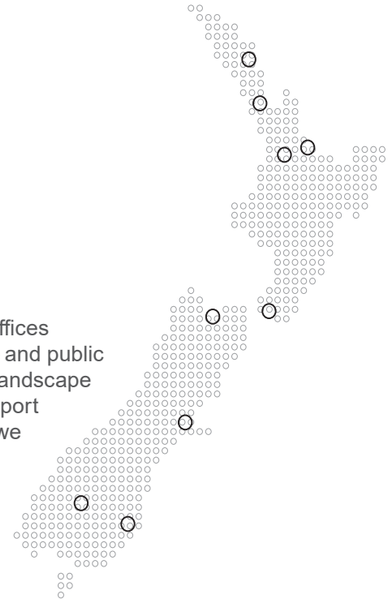
Date: 20 August 2024 | Revision: 0

Plan prepared for Queenstown Lakes District Council by Boffa Miskell Limited

Project Manager: Hannah.Wilson@boffamiskell.co.nz | Drawn: SCh | Checked: HWi

Together. Shaping Better Places.

Boffa Miskell is a leading New Zealand environmental consultancy with nine offices throughout Aotearoa. We work with a wide range of local, international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, Te Hīhiri (cultural advisory), engagement, transport advisory, climate change, graphics and mapping. Over the past five decades we have built a reputation for creativity, professionalism, innovation and excellence by understanding each project's interconnections with the wider environmental, social, cultural and economic context.



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Assessment of ecological effects for remedial works in Upper Reavers Creek, Queenstown

Contract Report No. 7111a

Providing outstanding ecological services to sustain and improve our environments

Wildlands

Assessment of ecological effects for remedial works in Upper Reavers Creek, Queenstown

Contract Report No. 7111a

March 2024

Project Team:

Lucian Funnell - Report author and technical adviser

Meredith Davis - Technical review

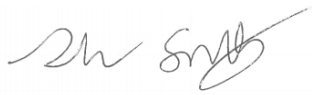
Prepared for:

Skyline Enterprises Ltd

53 Brecon Street

Queenstown 9348

Reviewed and approved for release by:



_____

8/04/2024
Des Smith
Senior Principal Ecologist/South Island Regional Manager
Wildland Consultants Ltd

Cite this report as follows:

Wildland Consultants (2024). *Assessment of Ecological Effects for remedial works in Upper Reavers Creek, Queenstown.* Wildland Consultants Contract Report No. 7111a. Prepared for Skyline Enterprises Ltd. 15pp.

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Contents

1.0 Introduction

Skyline Enterprises Ltd (Skyline) is renovating the restaurant and gondola on Bob's Peak, Queenstown. In September 2023, exceptionally heavy rainfall resulted in the saturation and mobilisation of stockpiled fill material located adjacent to the Skyline development area on Bob's Peak. This resulted in *c.*750m^3 of fill entering Reavers Creek. Reavers Creek is a small, rocky, intermittent stream flowing down a steep valley forested predominantly by Douglas fir trees. On January 2024 Wildland Consultants (Wildlands) assessed the ecological impact of this event and the subsequent emergency remediation work (Wildland Consultants, 2024).

Skyline is seeking consent for additional work necessary to prevent future subsidence by removing additional *c.*2,500m^3 of logs, debris and soil from the highly erodible hillside (>40° slope) above Reavers Creek. The consent application requires this addendum to the original Assessment of Ecological Effects (AEE), to assess any potential adverse effects of the additional works on the waterway, and ways to mitigate these effects.

2.0 Methods

An assessment of the ecological values at the site prior to the slumping event were approximated via a site visit to similar streams in the area. A further assessment of the effects of the heavy rain event were assessed through a combination of desktop assessments and a field survey. Methods used are detailed in Wildland Consultants (2024). The proposed work plans supplied by Skyline Enterprises were considered alongside the findings of the previous report.

3.0 Ecological Context

Reavers Creek is part of the Horn Creek catchment within the Shotover Ecological District. The district's climate is characterised by hot summers and cold winters. Weather patterns are often affected by northwest winds and occasional strong gales. Over winter, snow is commonly present for weeks at altitudes higher than 1,000 metres above sea level. Rainfall is moderate to high, ranging from 650-1,600 millimetres per annum.

3.1 Overview

Reavers Creek is a small, intermittent stream that runs through a steep gully covered in mixed exotic conifer forest. The creek originates in the Ben Lomond Scenic Reserve and flows less than one kilometre down the steep hillside to the edge of Queenstown where it enters the Queenstown Lakes District stormwater system. A debris flow barrier is installed across Reavers Creek above its confluence with the stormwater system. Here Reavers Creek joins with Horn Creek that flows into Lake Wakatipu (Figure 1). There are multiple points where the stormwater system that Reavers Creek enters, discharges into Horn Creek. The upstream outlet is the most direct.

Surrounding hillside land use is primarily mature, exotic, plantation pine trees; however, within the Reavers Creek gully the canopy is dominated by sycamore trees (*Acer pseudoplatanus*). There is minimal subcanopy and the ground cover is predominately leaf litter. There are occasional prickly shield fern (*Polystichum vestitum*) and lance fern (*Blechnum chambersii*), with rare occurrences of *Asplenium* sp. and exotic herbs such as foxglove (*Digitalis purpurea*) and wall lettuce (*Mycelis muralis*).

Figure 1. Reavers Creek and Horn Creek, Queenstown

3.2 Aquatic Habitats

Reavers Creek is a small, steep, hard-bottomed creek. Benthic substrates include bedrock, boulders and cobbles, with gravel and fine sediment in slow flowing areas (Wildlands 2024). It is an intermittent stream - a waterway that is typically responsive to precipitation and routinely flows for an extended period of time (i.e., a few months) but is dry at other times (Storey and Quinn 2008). When Reavers Creek was visited in January 2024, some reaches of the creek were flowing and others were pooled. At that time, the creek's flow was observed to disappear underground or emerge in bedrock waterfalls (Wildlands 2024). During heavy rain or snow melt, the creek can transport significant amounts of water over a short period of time.

3.3 Aquatic Fauna

Reavers Creek is utilised by pollution intolerant invertebrates with aquatic larval stages such as mayflies (*Deleatidium* spp.) and stoneflies (Order Plecoptera) as well as more tolerant species such as sandflies (*Austrosimulium* spp.) (Wildlands 2024). There are no fish surveys recorded in the New Zealand Freshwater Fish Database for Reavers Creek (Crow 2017). Due to its ephemeral nature, fish cannot utilise Reavers Creek as long-term habitat, making it a low priority waterway for fish surveys. In addition to this, the long, underground pipes, and pollutants entering the stormwater system are likely to be deterrents to fish (Franklin *et al.* 2018).

The fish present downstream, in Horn Creek, include brown trout (*Salmo trutta* -Introduced) and common bully (*Gobiomorphus cotidianus* – Not threatened) (Dunn *et al* 2018, Wildlands 2024). Kōaro (*Galaxias brevipinnis* – At Risk) have also been recorded in low numbers within Horn Creek. While longfin eels (*Anguilla dieffenbachii* – At Risk) have not been recorded, they are present in Lake Wakatipu and have access to Horn Creek (Dunn *et al.* 2018). Therefore, although unlikely, it is possible that some of these fish species periodically inhabit areas of Reavers Creek while it is flowing.

4.0 Ecological Values

A formal assessment of the ecological significance of aquatic habitat in Reavers Creek was undertaken using the criteria outlined in Schedule 4 of the Otago Regional Councils Regional Policy Statement (Appendix 1).

Reavers Creek is significant within the RPS and has **moderate ecological values**. Although the creek's flow is intermittent, often low, and/or subsurface, with occasional flash floods, this is natural and common to many high altitude, headwater streams in Aotearoa New Zealand. Such streams can support abundant macroinvertebrate and microbial communities, transport significant loads of organic debris and nutrients downstream to receiving waterways, and temporarily host uncommon or rare taxa (Storey and Quinn 2011). Macroinvertebrates provide food for avifauna, transient fish, and other invertebrates living within the surrounding environment. Reavers Creek is well shaded, keeping the water cool and low in algae. The creek's flow varies across its reaches and diverse substrates provides a range of habitats for aquatic invertebrates and microorganisms. There are no known point sources of pollution into Reavers Creek.

Horn Creek is significant within the RPS and has **moderate ecological values.** This waterway has been heavily modified and urbanised, but in many parts, it still retains a natural character and provides habitat for both At-Risk fish species and aquatic invertebrates. Horn Creek is also likely used by fish migrating between the lake environment and the headwaters of Horn Creek.

5.0 Assessment of Potential Ecological Effects on Aquatic Habitats

5.1 Proposed Work

The proposed work is to remove debris located along the hillside above Reavers Creek. In some areas, this will be completed using machinery and will involve repairing and building tracks to access the debris material (Appendix 2). One debris barrier will be installed along the slip path in these areas, and then the debris will be pushed down to the barrier for removal by excavators, and then trucked off site. Once the debris is removed from the hillside, the debris barriers and tracks will be removed and the ground contour restored.

The remaining debris is located; on the hillside bellow the proposed debris barrier, and within and along the margins of Reavers Creek. These two areas are inaccessible to machinery due to the bluffs and steep valley side, therefore the debris will be removed via hand excavation.

For the area on the hillside bellow the proposed debris barrier, a small channel has been formed where the debris flow event has scoured the existing ground to the underlying bedrock c. 0.5 meters depth and 1-2 meters width. Small volumes of loose material are still present within this channel that are proposed to be removed with hand tools. The material outside the channel may also be partially removed, if a risk of mobilisation is present (to be assessed during works), however it is anticipated that this will be minimal.

For the debris within and along the margin of Reavers Creek, there is approximately 200mm depth and 2-3m width through the majority of the creek that could be removed. However, it is likely that most of this debris will likely be left onsite, with ongoing servicing of the already installed lower debris flow barrier, to catch any mobile debris.

For the debris that will be removed in these two areas, it has been recommended by GeoSolve that helicopter removal of the material within the channel and immediately adjacent areas. Material beyond this can remain on slope without posing a risk, this material is to be dictated by Geotech on site during works.

5.2 Sediment and Debris Contamination of Reavers Creek

The removal of debris from the area above Reavers Creek will rely on the use of heavy machinery to cut tracks, remove vegetation, install barriers and remove debris. The use of heavy machinery and each of these activities carry the potential to disturb and mobilise sediment, particularly over winter when precipitation is generally highest. Additional risk for sediment loss is associated with the steep profile present in the valley, meaning any loose sediment or debris is likely to be washed downhill into Reavers Creek during if not mitigated appropriately.

Increased sediment within Reavers Creek may have adverse effects on habitat and, if sustained, induce trophic (food web) changes in the immediate and downstream areas. Sediment is also a primary transportation method for nutrients (e.g., phosphorus) and terrestrial microorganisms (e.g., faecal bacteria and *E. coli*) into waterways. If a significant amount of sediment and debris is washed downstream during a rain event, it would have **more than minor** adverse effects on the ecology of Reavers Creek and water quality. In addition to this, if the sediment barriers in Reavers Creek were to fail, the effects could carry downstream also having a **more then minor** adverse effect on Horn Creek.

5.3 Loss of Riparian Vegetation

The ecological values of the trees expected to be felled and are low-medium and the vegetation expected to be removed is relatively small compared to the wider forest of the Reavers Creek catchment (Wildlands 2024). Under the current proposed plan, no trees within the vicinity of the Reavers Reek riparian area are expected to be felled. If plans change and canopy trees from the riparian vegetation were removed this could result in a significant loss of stream shade in the currently well-shaded Reavers Creek, which could lead to adverse algae blooms and premature drying up of the stream after rain events. Finally, removal of riparian vegetation can exacerbate sediment and debris entering the creek during and well after the works finish. The clearance of the vegetation within the riparian area of Reavers Creek could have a **more than minor** adverse effect on the aquatic ecosystem values, but under the current proposed work, this is not expected to happen.

5.4 Chemical Contamination of Water

The use of machinery in the vicinity of the waterway could result in contaminants entering the waterway, including petrochemicals and heavy metals. Petrochemicals can originate from spills, machinery being washed off, or from driving through pooled rainwater. Contaminants can be toxic to aquatic life, causing fatalities, mutations, and affecting physiological processes including reproduction. Reavers Creek is not otherwise affected by contamination, therefore any pollution entering it would have a greater effect on the ecosystem than it would on Horn Creek, which is probably already degraded to some extent by contaminants from road stormwater and other sources.

In the event of freshwater contamination occurring, the level of the effect on the aquatic receiving environment has the potential to be **more than minor** because of the slow water flow and dispersal, downstream into Horn Creek. However, it would take a large spill of contaminant into the waterway with no subsequent containment to cause this level of effect.

5.5 Invertebrate Injury and Mortality in the Stream Bed

The manual removal of excess sediment in Reavers Creek by hand will disturb the stream bed and is likely to be, at least partially, remediated by the natural flashy flows during the wet season. The direct impact of the stream bed disturbance will likely crush and kill invertebrates and alter the microbial communities living within the stream bed. Microorganisms are responsible for the vast majority of carbon sequestration, organic matter breakdown, and nutrient cycling in Aotearoa New Zealand's freshwater systems. Whether by hand or using machines, dredging should be avoided whenever possible. Depending on the hydrology of the creek and surrounding land, dredging has the potential to change the character of Reavers Creek significantly. This activity would have a **more than minor** adverse effect on the freshwater values of Reavers Creek.

5.6 Resuspension of Fine Sediment within Reavers Creek

The instream work within Reavers Creek, to remove the debris from the September 2023 event, will remobilise fine sediment settled in the creek from the initial debris flow. During the site visit in January 2024 there was evidence that the level of fine sediment in Reavers Creek was slightly higher than would be naturally expect (Wildlands 2024). The amount of deposited fine sediment has likely been naturally remediated during subsequent rain events and collected in the sediment fence located before Reavers Creek enters the storm water system (Wildlands 2024). However, there may still be fine sediment within the creek which could be resuspended in the water column during the work within the steam. Suspended sediment within the waterway will have adverse effects on the aquatic food web of the immediate and downstream areas by smothering fauna, their habitats and refugia, and making it harder to find food. If this work is unmitigated, it could have a **more than minor** adverse effect on the

freshwater values of Reavers Creek. If the sediment disturbance was significant enough and the current sediment barriers in Reavers Creek fail, the effect could carry downstream also having a **more than minor** adverse effect on Horn Creek.

6.0 Suggestions to Avoid, Remedy, or Mitigate Potential Adverse Effects

6.1 Erosion and Sediment Control Measures

While the earthworks, vegetation clearance, fence installation and debris removal all pose a significant risk to the mobilisation of sediment, these risks are known to the client who have detailed plans to mitigate these risks as a part of their Environmental Management Plan (EMP). The EMP covers erosion and sediment control measures, goes into detail about sediment control devices and their maintenance, as well as contingency measures. If the erosion and sediment control measures in the EMP are adhered too, then this should reduce the risk of significant amounts of sediment moving downhill and into Reavers Creek and should reduce the expected impact of sediment loss associated with these works on Reavers Creek to be **less the minor.**

6.2 Minimising Riparian Vegetation Removal

The extent of vegetation removal should be minimised where possible. However, the removal of some vegetation within the Reavers Creek catchment is unavoidable and is required to create access tracks to get machinery in to install new debris flow fences and to remove debris from the hilltop area. As vegetation clearance of the riparian zone of Reavers Creek not proposed, the expected ecological impacts of the vegetation clearance on the Reavers Creek are **less than minor**.

If plans are changed and vegetation within the Reavers Creek riparian area need to be cleared, it should be undertaken in a way that Reavers Creek retains its shading from the forest canopy. This will help prevent the currently well shaded stream from over exposure to the sun, and keep any potential adverse effects of the vegetation clearance on the freshwater environment as less than minor.

6.3 Avoidance of Freshwater Contamination

A Spill Response Plan has been prepared in the EMP to prevent and address any accidental leaks of fuel or hydraulic fluid from heavy machinery from entering the watercourse during sediment and woody debris removal. As outlined in the EMP, machinery should be regularly monitored, maintained, and serviced to ensure there are no leaks of petrochemicals. Machinery should be serviced and refuelled in an area where, should a spill occur, contaminants cannot flow or be washed into the waterway. If the protocols within the EMP are followed, and there are no substantial petrochemical leaks, then the risk of freshwater contamination occurring will be **less then minor**.

6.4 Minimising Disturbance of Reavers Creek Stream Bed

Heavy rain events and the movement of stream beds are a natural occurrence in steep catchments, and it is likely that the aquatic fauna of aquatic invertebrate species within Reavers Creek are recovering and the stream will be already creating a new, stable streambed after the September event (Wildlands 2024). Additionally, this is an intermittent stream who's flow path will follow the contours of the land and flow where there is the least resistance. The work to clear the remaining debris and sediment from the stream bed should aim to remove the debris that poses a significant risk of mobilisation and property damage, but should also avoid disturbing areas of stable streambed to avoid

disturbing the recovering macroinvertebrate and microbial communities. In cases where the streambed is indistinguishable from the debris, it is best left undisturbed, as long as it does not pose any other risks.

To greatly reduce the direct impacts on the macroinvertebrate and microbial communities, this work should be undertaken while the creek is dry and has been dry for a few days, as the invertebrate larvae will not be utilising the habitat.

If care is taken to prevent disturbing the stream bed were possible, and the work is conducted while there is no flow and has been no flow for a few days, the direct adverse effects on the Reavers Creek instream works are likely to be **minor** for the aquatic environment of Reavers Creek. This impact should be temporary if the recommendations are followed, and the macroinvertebrate and microbial communities should recover.

6.5 Minimising Fine Sediment Resuspension

While the resuspension of fine sediment is to some extent unavoidable. Resuspension of sediment is associated with increased *E. coli* concentrations in the water column, reduced visibility for in-stream fauna, and a reduction in photosynthesis resulting in lower dissolved oxygen levels. Avoiding the use of machinery within the creek, will minimise the resuspension of sediment.

The current sediment fence in place, should reduce the amount of sediment entering Horn Creek; however, additional, temporary sediment fences should be used to limit the amount of suspended fine sediment moving downstream. Sediment fences should be emptied and removed at the completion of the works.

To greatly reduce the resuspension and mobilisation of fine sediment, the work should be conducted while the creeks water levels are low, or ideally dry. This will also reduce the impact on the invertebrate community.

If care is taken to prevent disturbing the stream bed were possible, and mitigation measures to capture sediment suspended within the water are in place, the adverse effects on the Reavers Creek instream works should be **minor** for the aquatic environment of Reavers Creek and, and **less then minor** for Horn Creek.

Table 1 – Potential impacts and effects of proposed works on the waterways, and their likely adverse effects with and without mitigation actions.

Impact	Likely Adverse Effects	Level of Adverse Effects Without Mitigation		Mitigation Recommended	Level of Adverse Effects with Recommended Mitigation	
		Reavers Creek	Horn Creek		Reavers Creek	Horn Creek
Sediment inputs into Reavers Creek	Smothering instream habitats and refugia.	More than Minor	More than Minor	Erosion and sediment control measures	Less than minor	Less than minor
Loss of riparian vegetation	Loss of stream shade and terrestrial inputs	More than Minor	N/A	Avoid removal of riparian vegetation were possible to retain stream shade	Less than minor	N/A

Impact	Likely Adverse Effects	Level of Adverse Effects Without Mitigation		Mitigation Recommended	Level of Adverse Effects with Recommended Mitigation	
		Reavers Creek	Horn Creek		Reavers Creek	Horn Creek
Potential freshwater contamination	Potential Contamination of Reavers Creek and Horn Creek	More than Minor	More than Minor	Spill Response Plan	Less than minor	Less than minor
Disturbance of Reavers Creek stream bed	Crushing and killing of aquatic invertebrates and microbial communities	More than Minor	N/A	Avoid disturbing stream bed were possible. Work conducted during while creek dry.	Minor	N/A
Resuspension of fine sediment	Disturbance of fine sediment	More than Minor	More than Minor	Work conducted during low or no flow and install additional sediment fences where possible	Minor	Less than Minor

7.0 Conclusions

Skyline proposes the removal of debris from the hillside and the remaining debris with Reavers Creek from a slumping event in September 2023. The predominate risk of the works on the aquatic values of Reavers Creek and the downstream Horn Creek are:

- Increased fine sediment inputs, from the earthworks and heavy equipment use.
- The resuspension of fine deposited sediment within Reavers Creek.
- The loss of riparian vegetation, resulting in higher in-stream temperatures, habitat loss, and trophic changes.

With the appropriate measures outlined in the EMP, the potential adverse effects of sediment disturbed by the earthworks being washed downhill into Reavers Creek can be mostly mitigated. The manual work to clear the remaining debris and sediment from the stream bed should take place over summer to autumn, during a time of no precipitation, and when no flow is present and has not been present for a few days. It should also aim to remove only the debris (and not sediment) that is at risk of further mobilisation, and should aim to avoid disturbing areas of stable streambed, to avoid disturbing macroinvertebrate and microbial communities. Additional sediment fences should be installed where possible to limit the distance sediment can be transported. Some level of impact of the instream work on the aquatic macroinvertebrate and microbial communities will be unavoidable, but these impacts should be temporary.

Acknowledgments

Thank you to Sean Dent from Southern Planning Group for information about the project.

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Appendix 1

Ecological significance assessment of aquatic habitat using the criteria outlined in the Otago Regional Council Regional Policy Statement 2021.

Criteria	Reavers Creek	Horn Creek
Representativeness An area that is an example of an indigenous vegetation type or habitat that is typical or characteristic of the natural diversity of the relevant ecological district or coastal marine biogeographic region. This may include degraded examples of their type or represent all that remains of indigenous vegetation and habitats of indigenous fauna in some areas.	Criterion met. Although the riparian vegetation is exotic, Reavers Creek is an example of an intermittent stream habitat that is characteristic of the steep valley catchments of central Otago.	Criterion met. Although the stream is modified and urbanised, Horn Creek is still a degraded example of a stream habitat that is characteristic of central Otago.
Rarity *An area that supports:*		
(a) An indigenous species that is threatened, at risk, or uncommon, nationally or within an ecological district or coastal marine biogeographic region;	Criterion not met	Criterion met. Longfin eels and kōaro are both At Risk species
(b) Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened, at risk, or uncommon, nationally or within the relevant ecological district or coastal biogeographic region.	Criterion not met	Criterion met. Longfin eels and kōaro are both At Risk species
(c) Indigenous vegetation and habitats within originally rare ecosystems.	Criterion not met	Criterion not met
Diversity An area that supports a high diversity of indigenous ecosystem types, indigenous taxa or has changes in species composition reflecting the existence of diverse natural features or gradients.	Criterion not met	Criterion not met
Distinctiveness *An area that supports or provides habitat for:*		
(a) Indigenous species at their distributional limit within Otago or nationally	Criterion not met	Criterion not met
(b) Indigenous species that are endemic to the Otago region	Criterion not met	Criterion not met
(c) Indigenous vegetation or an association of indigenous species that is distinctive, of restricted occurrence, or has developed as a result of an unusual environmental factor or combinations of factors	Criterion not met	Criterion not met
Ecological context *The relationship of the area with its surroundings, including:*		
(a) An area that has important connectivity value allowing dispersal of indigenous vegetation and fauna between different areas;	Criterion not met	Criterion met. Horn Creek likely provides access for indigenous fish species to go further upstream.
(b) An important buffering function that helps to protect the values of an adjacent area or feature	Criterion not met	Criterion not met
(c) An area that is important for indigenous fauna during some part of their life cycle, either regularly or on an irregular basis, e.g. for feeding, nesting, breeding, or refuges from predation.	Criterion met. Important aquatic habitat for indigenous invertebrate species with an aquatic life stage	Criterion met. Important aquatic habitat for indigenous fish and invertebrates with an aquatic life stage

Appendix 2

Geosolve report figure of site area and slip material.

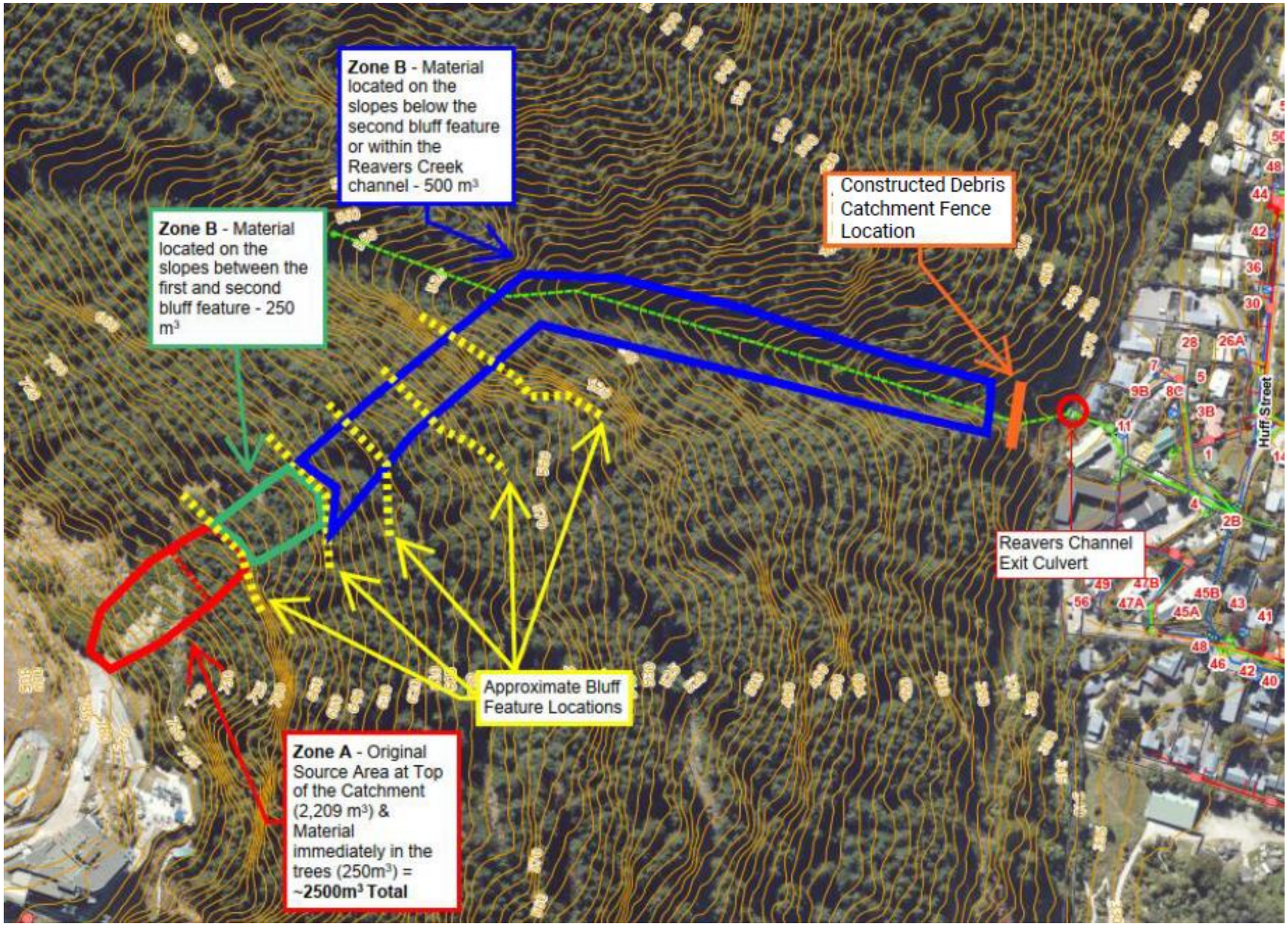

Figure A2.1: Location of slip material to be removed. The areas in red and green are above the proposed debris barrier, while the area of blue is below the barrier. The area of blue will have the have the debris removed by hand. (Figure source: Geosolve Report, March 2024).

Environmental Management Plan (Rev H)

Skyline – Reavers Slip Repair Works

November 2024

enviroscope

Document Control	
Title	Skyline – Reavers slip repair - Environmental Management Plan
Address	53 Brecon Street, Queenstown 9300
Consent Number	RM240333, RM240657, RM240658
Client	Skyline Enterprises Limited
Our Reference	24007
Prepared by and	 **Quinn McIntyre** (MSc, CEnvP) Principal Environmental Consultant   **Tom Grandiek** (BAppSc, CEnvP) Senior Environmental Consultant 

Document Control			
Revision	Revision Date	Revision Details	Prepared by
A	8/03/2024	For client review	QM
B	18/04/2024	ESCP update to reflect revised earthworks plans	QM
C	22/04/2024	For council	QM
D	9/05/2024	ESCP update after May Monthly Environmental Inspection	QM
E	18/07/2024	EMP update following work progress	TG
F	12/08/2024	Updated to reflect revised survey plans	TG

G	01.10.2024	EMP and ESCP updated following peer review	TG
H	12.11.2024	ESCP updated to reflect revised survey plans	TG

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Appendix 7	Complaints Register
Appendix 8	Environmental Non-Conformance Register
Appendix 9	Water Quality Monitoring Results Form
Appendix 10	Archaeological Discovery Protocol

Disclaimer

Enviroscope has exercised due skill, care, and attention in preparing this EMP on the basis of their understanding of the subject site through their own site visits as well as information provided by the client and its consultants. Enviroscope has no control over the physical actions, detailed design, equipment, services, and methodologies undertaken by the client or other third parties tasked with implementing Enviroscope's instructions or recommendations. Enviroscope does not accept any responsibility for any environmental incidents or other defects of control measures if there is any departure or variance from the measures detailed in this EMP and any supporting documentation. This document does not attempt to provide hazard or ground stability management and it is recommended that specialist geotechnical and hydrological advice is sought.

Emergency Contacts

Contact made with any of the following shall be undertaken with due consultation of the Environmental Representative or Project Manager.

Table 1: Emergency Contacts

Element	Emergency Contact	Details
Pollution incident	Otago Regional Council (ORC) Spill Hotline	0800 800 033 compliance@orc.govt.nz pollution@orc.govt.nz
Environmental complaint	Environmental Representative	Warren McGregor Beaver Contracting 027 200 9808
Discovery of contaminated land	Environmental Representative	
Unexpected heritage finds	Environmental Representative	
Human remains	New Zealand Police	111
Fire including bushfire	Fire and Emergency New Zealand (FENZ)	111
Public utilities	Queenstown Lakes District Council (QLDC)	(03) 441 0499 rcmonitoring@qldc.govt.nz
Internal contacts	Project Manager	Paul Embleton-Muir Skyline 021 630 403 Sean Donohoe Verve Projects 021 2616 514
Internal contacts	Environmental Consultant	Tom Grandiek Enviroscope 027 2633 113

1.0 INTRODUCTION

1.1 Purpose and Scope

On behalf of Skyline Enterprises Limited, Enviroscope has prepared this Environmental Management Plan (EMP) for debris removal and remedial works for the Reavers Catchment at Skyline. This EMP aims to reduce the effects of the project's construction activities on the environment and sensitive receptors.

This EMP is prepared in general accordance with the Queenstown Lakes District Council (QLDC) *QLDC Guidelines for Environmental Management Plans*, *June 2019* (EMP Guidelines). It is considered to have a 'High' environmental risk level as per the risk categories outlined in the EMP Guidelines.

The erosion and sediment controls associated with the access track have been designed in accordance with the New Zealand Forest Owners Forestry Association's (NZFOA) *New Zealand Forest Road Engineering Manual, 2020* (Forestry Manual). Where conflicts arise between the EMP Guidelines and the Forestry Manual, the guidance of the Forestry Manual shall prevail in accordance with the letter received from QLDC's Parks Team on 14 February 2024 outlining their expectations for the works.

The purpose of this EMP is to be an effective and practical reference manual for construction personnel that applies to all project activities during the construction phase and includes the following:

- Strategies to manage environmental aspects and risks, based on associated best practice.
- Provides for contingency planning.
- Provides a framework for monitoring, reporting, review and continual improvement.
- Defines roles and responsibilities.
- Procedures to investigate and resolve environmental non-conformances and initiate corrective and preventative actions.

An overview of the project and sequencing can be found in the construction methodology at **Section 2.0**.

1.2 Site Overview

The works for this proposed activity involve the removal of debris from a landslip that occurred in the rain event of 22nd September 2023 downslope of the upper Skyline building. The topography of the site is considered steep to very steep with slope gradients approximately 40 – 45 degrees with numerous bluffs within the site. The site is part of the upper catchment of Reavers Creek, with evident flow paths within the slip debris and crossing access tracks. Debris is present down the length of Reavers Creek from the slip location to the existing stormwater intake at Reavers Lane.

The general vegetation onsite is dominated by a canopy of mature Douglas Fir trees.

The slip is accessed by existing forestry tracks, of which require upgrading to allow temporary access to access the slip. The surrounding land uses are forestry, recreational use of Skyline's facilities, the gondola passing overhead to the west and residential dwellings to the east of the downslope portion of the site adjacent Reavers Lane.

This is depicted in **Figure 1** below.

Figure 1: General location of the slip in yellow (Source: QLDC GIS)

1.2.1 Soils and Geotechnical Summary

A geotechnical report has been prepared by Geosolve (dated March 2024) which details site investigations and reports on the geotechnical conditions. The report details the general geological stratigraphy which can be summarised as:

- **Localised uncontrolled fill** (where deposited and overlying), containing the debris bulb which mostly comprises schist rock scalpings broken into well graded granular material primarily comprising gravel, cobble and boulder sizes with a minor sand and silt fraction. The mid and lower overland flow paths of the catchment beneath the debris bulb comprises finer grained excavated schist rock that has mobilised from the debris bulb. This is described by Geosolve as being shallow in depth (< 1.0 m).
- **Colluvium** (overlying), variable in composition, comprising a mixture of loose sand, gravel and cobbles or soft silt. Geosolve notes that this may be underlain by glacial till in some locations;
- **Glacial till** (overlying) observed in localised pockets comprising light brown sandy silt or silt sand with variable fractions of gravel and cobbles;

- **Schist bedrock** underlies the areas of interest at shallow to moderate depth and is exposed in many locations.

Geosolve also expect that perched ground water conditions are expected to be present at the schist/colluvium contact and in some locations through fracturing in the rock mass. They note that localised groundwater flows may develop as seeps or ephemeral streams following periods of extended rainfall.

1.2.2 Summary of Earthworks

A total of approximately 2,500 m^3 of slip material will be removed from the debris bulb at the upper portion of the Reavers Catchment (Zone A depicted in **Figure 2**). A further 500 – 750 m^3 of soil will be removed from the Reavers Channel and the slopes between the top source area and Reavers Creek Culvert (Zone B depicted in **Figure 2**).

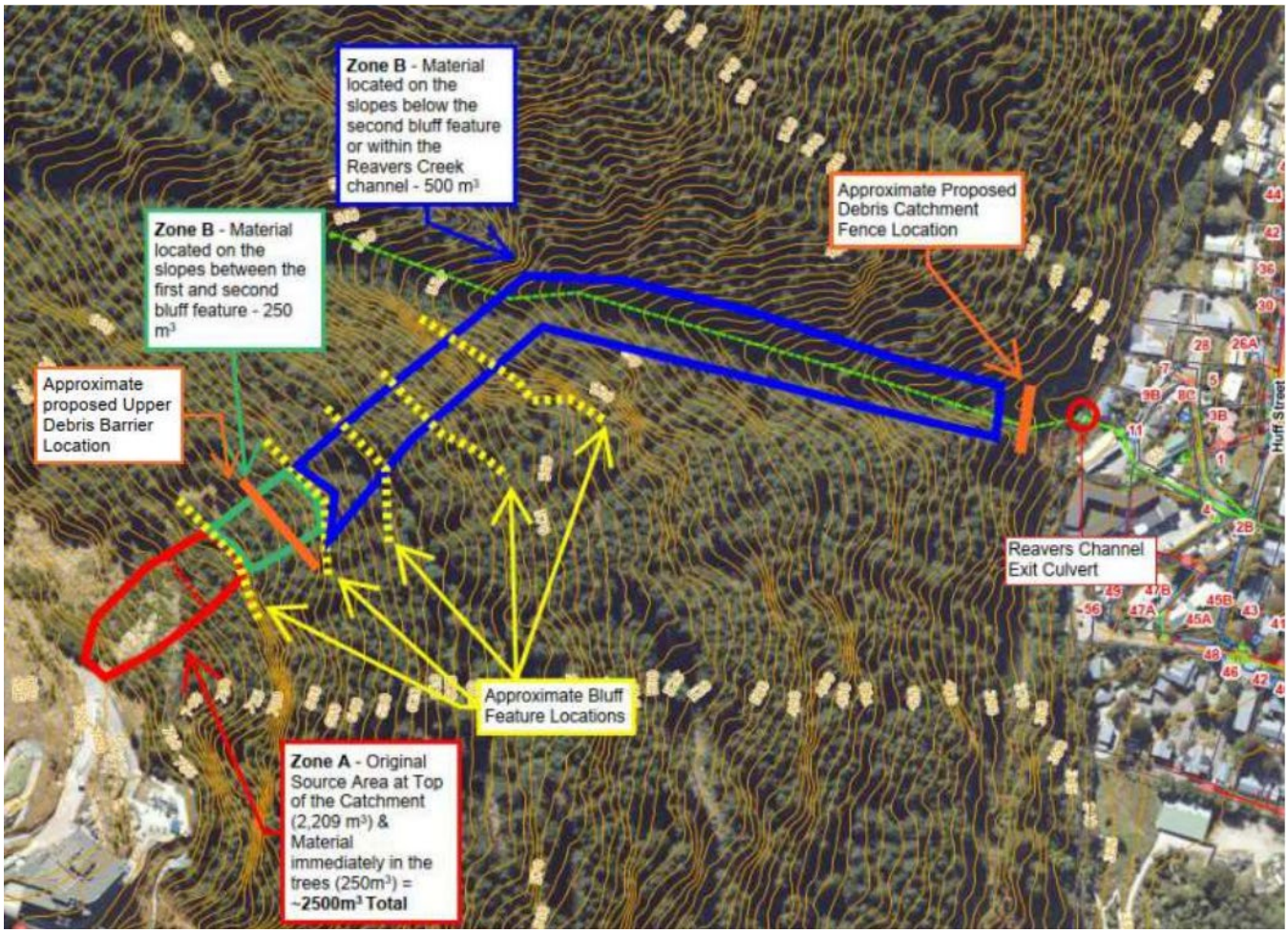


Figure 2: Slip material to be removed (Source: Geosolve Report, March 2024)

Furthermore, existing forestry tracks and new access tracks will need to be temporarily installed to allow site access for haulage trucks to remove the slip material. Once the slip material is removed, the temporary tracks will be removed/reinstated to restore the natural ground contours and overland flow paths. Some minor localised earthworks (benching and drilling) will also be required to install the debris fence and associated anchor points.

1.3 Suitably Qualified and Experienced Professional

This EMP has been prepared by Quinn McIntyre of Enviroscope Limited. Quinn is a Certified Environmental Practitioner (CEnvP) and holds a Master of Science. Quinn has worked in various environmental roles on a range of construction projects, including bulk earthworks in New Zealand and Australia. Quinn has extensive experience in the preparation and monitoring of EMPs and ESCPs.

This EMP has also been prepared by Tom Grandiek of Enviroscope Limited. Tom is a certified Environmental Professional (CEnvP) and holds a Bachelor of Applied Sciences degree, majoring in Environmental Management. He spent five years working in RMA compliance with local government. Tom has extensive experience in the preparation and monitoring of EMPs and ESCPs.

Quinn and Tom meet the criteria of a Suitably Qualified and Experienced Professional (SQEP) for the purposes of preparing this EMP and overseeing the environmental aspects of this project.

2.0 CONSTRUCTION METHODOLOGY

2.1 Sequencing of Works

The following sequencing will ensure the earthworks are undertaken efficiently while ensuring good environmental outcomes. This is a preliminary staging methodology and may be subject to change based on site conditions encountered during construction.

The methodology below is focused on timing and inputs for erosion and sediment control installation and general environmental management measures. It is adopted from and therefore shall be read in conjunction with the *Upper Debris Removal Methodology* prepared by Skyline and the Erosion and Sediment Control Plan (ESCP) attached as **Appendix 1**.

Preliminary works and site establishment

- Ensure the current EMP is available onsite.
- Complete site induction with Environmental Consultant.
- Establish site laydown area.

Stage 1 – Enablement – establishment of access to debris field

In order to access the site to facilitate debris removal, the existing Andrews Haulage Track (AHT) needs to be restored/upgraded and additional temporary access tracks are to be constructed. The construction and restoration of these access tracks is to be completed as follows as it relates to erosion and sediment control:

- Remove trees and forestry slash from the path of the access tracks and dispose of appropriately.
- Remove loose material from the upslope side of the track and bench to accommodate wider track (minimum 4.0 m). Excess material is to be removed from site utilising 4x4 dumpers.
- As the access tracks are constructed, the surface shall be graded into the slope to divert any surface water flows into a ditch, which is to be constructed in accordance with schematics provided in ESCP-006. This channel will convey any surface water flows from the upslope catchment and track surface to culverts which will be installed at regular intervals, in accordance with the NZFOA, to ensure that water remains in its natural catchment.
- Install rock ballast on the portion of the access track surrounding the existing 450 mm culverts (Culvert A on ESCP) associated with the Breacon Street Catchment gully.
- Install sediment traps as per ESCP-002- ESCP-005.
- Culvert flume socks are to be attached to the outlet of the pipe to convey water over fill areas to be discharged below the works extent to prevent erosion.
- The outlet of the culverts or culvert sock flumes are to be stabilised effectively as per engineering design in accordance with the schematic provided in ESCP-011.
- Rock breaking and removal may be required in order to accommodate a four-metre-wide track. If this is not possible, temporary retaining may be required to provide the required track width. If required, retaining structures are to be installed in accordance with engineering design and geotechnical advice.

Culvert installation

The proposed access tracks are to be constructed to have a minimum width of four metres with gradients of 1:6 or better if possible. A series of culverts are to be installed along these tracks to ensure that water stays within its natural catchment. As per the guidelines provided by the New Zealand Forest Owners Forestry Association's (NZFOA) *New Zealand Forest Road Engineering Manual, 2020* (Forestry Manual), at least one 325 mm diameter culvert is to be installed every 65 m along the new access tracks. Additional culverts are to be installed as per ESCP-001, **Appendix 1** to ensure that water remains in its natural catchment. Culverts are to be installed in accordance with the following methodology:

- Ensure there is a minimum 3% crossfall to prevent sediment accumulation and blockages.
- If possible, the culverts should be installed on hard ground, not fill material. Culvert locations may require amendment by the Environmental Consultant if this is not possible.
- Undertake backfill of the trench in progressive layers, compacting appropriately with each layer to ensure structural integrity of the pipe is maintained.
- Where a culvert outlet is positioned to discharge flows onto an area of fill, socks are to be clamped to the outlet of the culvert and extended over the fill area to discharge flows beyond the toe of the works extent. Culvert sock flumes may also be utilised to divert the discharge location of culverts to ensure that water remains in its natural catchment. These culvert socks are to be secured in place by anchoring the sock eyelet and attaching it to the ground over the entire length, this will prevent twisting and displacement of the sock.

Stage 2 – Debris fence installation

- Prior to debris fence installation, the location of anchor points are to be confirmed by the Geotech and surveyor.
- Establish designated concrete washout pit as per ESCP.
- Install silt fence on the benched area immediately downslope of the proposed location of the debris fence prior to any works commencing. This fence must be keyed at least 200 mm into the ground in order to operate effectively, if this cannot be achieved, alternative solutions are to be discussed with the Environmental Consultant.
- Establish water take line from the Skyline Luge bottom station.
- Install anchor points utilising drill rig and grout. Excess grout is to be removed from the rockface immediately and disposed of in designated waste bins.
- Install debris fence as per geotechnical engineer design.

Stage 3 – Debris removal

- Works to remove debris is only to be undertaken in fine weather. Ensure that vehicle movement is limited after rain events to reduce erosion and sediment transport.
- Remove any trees within the toe of the debris field. Remove trees from the debris site and place them in identified safe locations.
- Remove MacMat from the upper slip area and set aside for reinstallation after debris has been removed. Remove existing drains as encountered by excavator when removing debris.
- Remove debris utilising spider excavator to push debris downslope to the debris fence. Ensure that debris does not overtop the fence and damage the downslope silt fence. From here the debris is to be removed from the debris field and transported off site utilising 4x4 dumpers.
- Install silt fence downslope of the stockpile area at Skyline access road.
- Removed material is to be transported to the designated stockpile at Skyline access road, from here the material is to

be loaded into standard 6-wheel trucks and transported to an approved site.

- Slip material downslope of the tracks and in Reavers Creek to be manually removed by placing sediment into impermeable bags for extraction by helicopter.

Stage 4 – Decommission of track

- When debris material has been removed and the batter slope has been constructed to 35 – 40 degrees, the slope can be stabilised.
- Apply suitable grass seed to surfaces upslope of the debris fence when all debris has been removed. Grass seed species shall include a suitable mix of quickly establishing perennial ryegrass, and deeper rooting brown top and fescues. Other erosion matting may be required as per geotechnical advice.
- When the upslope catchment has reached 80% stability and the debris fence, and all associated infrastructure, has been removed and transported from site the silt fence can be decommissioned.
- Utilise excess fill to return the tracks to the original contour. Apply approved grass seed to stabilise finalised surfaces.
- Once works are completed, the temporary tracks shall be filled in and associated devices to be removed to restore site to natural contours. These areas are to be immediately topsoiled and seeded. Additional controls such as silt fences and water bars may be required. This will be undertaken in consultation with the Environmental Consultant.

2.2 Hours of Operation

Construction activities and the associated hours of operation shall comply with *NZS 6803:1999 Acoustics - Construction Noise Guidelines*. Site works may be undertaken between 0730 and 1800 hours, Monday to Saturday. No works are to be undertaken on Sundays or Public Holidays. However, this does not preclude any emergency works or works required for incident investigation or response. Additional detail relating to noise-producing activities are to be undertaken in accordance with Section 7.0 of this EMP.

3.0 EMP IMPLEMENTATION

3.1 Environmental Roles and Responsibilities

3.1.1 Project Manager

The Project Manager is responsible for the effective implementation of the EMP and has overall responsibility for the environmental performance of the project. Duties include:

- Ensuring adequate resources are in place to implement the EMP.
- Ensuring all staff and sub-contractors operate within the guidelines of the EMP.
- Ensuring that an EMP is prepared and that environmental standards, processes and procedures meet relevant resource consent conditions.
- Overseeing the successful implementation, monitoring and review of the EMP.
- Ensuring that inspections are carried out in accordance with the relevant EMP.
- Restricting or stopping any activity that has the potential to or has caused adverse environmental effects.
- Providing notification and reporting of Environmental Incidents to Council and other environmental reports as required by The Guidelines.
- Delegating authority of the above responsibilities.

3.1.2 Environmental Representative

The Environmental Representative supports the Project Manager in the day-to-day implementation of the EMP. Duties include:

- Ensuring the installation of environmental controls as per the EMP.
- Undertaking environmental site inspections.
- Undertake water quality sampling during rainfall events.
- Overseeing the maintenance and improvement of defective environmental controls.
- Providing environmental inductions to all staff and sub-contractors.
- Assisting the project leadership in attending to Environmental Incidents and Complaints.

The Environmental Representative shall be familiar with environmental risks associated with the project, the EMP and best practice erosion and sediment control principles and practices.

3.1.3 Environmental Consultant

The Environmental Consultant (SQEP) will provide technical environmental management advice as required. Key tasks include delivering the Site Environmental Induction to core staff and providing as-built confirmation of erosion and sediment controls to Council**.** The Environmental Consultant shall undertake monthly monitoring of the site and submit Monthly Environmental Reports to QLDC.

3.1.4 All Staff and Sub-Contractors

All staff and sub-contractors have a responsibility to undertake all activities in accordance with the requirements of this EMP. This includes reporting any activity that has the potential to or has resulted in an Environmental Incident to the Project Manager or Environmental Representative.

3.2 Site Environmental Induction

All staff and subcontractors shall attend an Environmental Induction to ensure they are aware of the project's environmental risks as well as their responsibilities to help manage these risks. Prior to ground-disturbing activities, the Environmental Consultant will deliver the induction to core staff. During the project, the Environmental Representative will induct sub-contractors and new staff.

The site induction handout is attached as **Appendix 3** and all persons inducted will be recorded on the Induction Register attached as **Appendix 4**.

3.3 Environmental Inspections

Table 2 outlines the regular environmental inspections to be undertaken.

Table 2: Environmental inspections

Environmental Inspection	Timing	Purpose
Weekly Inspection	Every seven days following the last round of rain event monitoring.	A comprehensive environmental inspection will: • Confirm that all environmental controls are present, functional, and adequate. • Identify any activities that may cause an environmental incident or actual or potential environmental effects. • Identify maintenance requirements for implemented management measures. All weekly inspections shall be recorded on the Weekly Site Inspection form attached as **Appendix 5**.

Environmental Inspection	Timing	Purpose
Pre-Event Inspection	Prior to a significant rain event [1]	To ensure that erosion and sediment controls are present, functional, and adequate for forecast rain event. This inspection will inform any preventative work required and may result in the Rapid Response Procedure being implemented (see Section 4.6).
Rain Event Monitoring (where safe to do so)	During a significant rain event	To ensure that: • Erosion and sediment control devices continue to function correctly and inform any necessary emergency responses. • Ditches, sediment traps and culverts are functioning effectively and have capacity available. • No 'conspicuous change in colour or visual clarity' in receiving waters below the activity area [2]. Observations and remediation measures taken will be recorded in a daily job diary.
Post-Event Inspection	Immediately following a significant rain event	Any observations and corrective actions should be recorded in a daily job diary.

3.4 Monthly Environmental Inspection and Reporting by SQEP

The Environmental Consultant (SQEP) will monitor the site monthly to ensure that the EMP is correctly implemented, identify any unforeseen issues arising and advise on alternative environmental solutions.

The Environmental Consultant (SQEP) will also submit a Monthly Environmental Report to QLDC within five working days of the end of each month. The report will include the following information:

- Updates to the EMP and the Erosion and Sediment Control Plan (ESCP) during the month.
- Number of weekly and pre and post-rain event site inspections completed.
- Summary of corrective actions undertaken.
- Positive environmental outcomes achieved and opportunities.

[1] A significant rain event is defined as any forecast/actual rain event of 10 mm within a 12-hour period or a rain event that can generate overland flow, noting that this varies seasonally.

[2] As per the New Zealand Forest Road Engineering Manual, 2020.

3.5 Environmental Incident Management

Environmental incidents shall be responded to as soon as the project team becomes aware of them occurring. The response will generally involve oversight by the Environmental Consultant and will involve:

- Immediate cessation of the activity that caused the incident.
- Investigation into the cause of the incident.
- Initial response to bring the incident under control.
- Implement any remediation works.

The Project Manager shall notify QLDC of the details of any Environmental Incident within 12 hours of becoming aware of the incident. Notification will be through a phone call to Council monitoring staff (see Emergency Contacts on Page 4).

The Project Team shall provide an Environmental Incident Report within ten working days of the incident occurring. The Incident Report form is attached as **Appendix 6**.

3.6 Complaints Procedure

Any complaint received will be recorded and an investigation will be carried out. The complainant will be provided with a response acknowledging receipt of the complaint and outlining corrective actions to be implemented. After the investigation, any necessary corrective actions will be carried out and a follow-up of the original complaint is to be conducted to ensure the actions implemented have been effective.

All complaints will be recorded on the Complaints Register attached as **Appendix 7**.

3.7 EMP Non-Conformance and Corrective Actions

EMP non-conformances found during site inspections, monitoring or as a result of environmental incidents or complaints shall be recorded in the EMP Non-Conformance Register. The non-conformance register attached as **Appendix 8** will detail when corrective actions are due, how they are to be carried out and the close out date.

The non-conformance register ensures that issues do not escalate or are missed, as well as, providing a clear record of evidence that can be used to defend any potential complaint or formal enforcement action.

3.8 Records and Registers

The records listed below will be collated onsite. If a request is made by a QLDC official, the records shall be made available to the official within 24 hours of the request being made.

- Environmental Induction Register - **Appendix 4**.
- Weekly Environmental Inspection Form - **Appendix 5**.
- Environmental Incident Reports - **Appendix 6**.
- Complaints Register - **Appendix 7**.
- EMP Non-Conformance Register - **Appendix 8**.
- Water Quality Monitoring Results - **Appendix 9**.
- Rain event inspection observations.

3.9 EMP Updates

The EMP will be regularly reviewed throughout the project to ensure the document remains fit for purpose and to drive continual improvement. This may be initiated by:

- Significant changes to the construction methodology.
- Improvements identified as a result of an Environmental Incident or Corrective Action.
- Where directed by QLDC's Monitoring and Enforcement team.

All EMP updates will be managed through the document control table on page one and shall be submitted to QLDC and ORC for acceptance.

4.0 EROSION AND SEDIMENT CONTROL MEASURES

4.1 Performance Criteria

Design, install and maintain erosion and sediment controls in accordance with industry best practices.

- New Zealand Forest Owners Association's (NZFOA) *New Zealand Forest Road Engineering Manual (2020).*

4.2 Erosion and Sediment Control Principles

Erosion and sediment control ('ESC') devices shall be installed, maintained and decommissioned in accordance with the following principles:

- Erosion and sediment controls are integrated with construction planning.
- Construction is staged to minimise the duration and area of exposed soil open at any one time.
- A 'treatment train' approach so that the sediment retention devices operate as efficiently and effectively as possible.
- The extent and duration of soil exposure is minimised.
- Controls are always maintained in proper working order.
- Progressively stabilise and revegetate disturbed or completed areas.
- The site is monitored, and erosion and sediment control practices are adjusted to maintain the required performance standard.
- Soil erosion is minimised as far as reasonable and practical.
- Avoidance of sediment discharge off-site and protection of receiving environments.

4.3 Guidance on Erosion and Sediment Control Devices

The effective control of surface water shall be achieved through the utilisation of carefully selected erosion and sediment control devices to achieve a specific purpose. These guidelines for the devices employed on this project shall be read in conjunction with the ESCP attached as **Appendix 1** of this document.

4.3.1 Site Definition

At the commencement of the project, the following components onsite will be clearly defined as detailed in **Table 3**.

Table 3: Site definition specifications

Site component	Method of Demarcation
Site boundaries	Temporary fencing or hoardings
Internal 'no-go' areas (protected or sensitive areas)	Bunting or flagging tape with waratahs

4.3.2 Stabilised Entranceway

An existing stabilised entrance is located off Lomond Crescent. This stabilised access services the wider skyline road and forestry tracks. This stabilised access is considered appropriate for the scope of these works and will be monitored regularly to ensure it is operating effectively to minimise sediment tracking onto Lomond Crescent.

4.3.3 Ditches

The access tracks are to be installed with a roadside ditch. This ditch is to act as a dirty water diversion channel to divert any water from the road surface and upper contributing catchment to regularly spaced culverts. The ditches are to be lined with rock or geofabric in steeper sections to reduce erosive potential. Check dams are to be utilised within the ditches at regular intervals between the sediment traps to slow in-channel flow velocity. These ditches are to be constructed accordance with the schematic diagram in ESCP-006, **Appendix 1.**

Ditches designed in accordance with NZFOA specifications have a width of 600 mm and depth of 300-500 mm. In order to construct ditches in accordance with these specifications, the excavations and therefore the area of exposed soil required would increase significantly in order to accommodate the extra width. The volume provided by these ditches is significantly larger than required for this site, recording a buffer of 5,961 % for the ditch for the largest contributing catchment (being combined Catchment 1).

Therefore, due to space constraints on site and excessive buffer provided by NZFOA design specifications, for this site ditches have been designed to cater up to a 5% AEP event (as a minimum) in accordance with GDO5 specifications (complete guidelines on pages 43-46 of GD05). It is considered appropriate to utilise channel design as per GDO5 specifications as the channel design accommodates much less space and still records a conservative buffer of 884 % for the largest contributing catchments (1). Full calculations for both GDO5 and NZFOA are included in **Appendix 2**.

4.3.4 Check Dams

Rock check dams will be deployed primarily to reduce the velocity of concentrated flows in the ditches. They will also act to capture some coarse sediment. Check dams are to be constructed from 100 mm to 300 mm mix rock and installed at regular intervals along the entire track network in accordance with the table provided in ESCP-008. The check dams will be constructed in accordance with the schematic diagram in ESCP-008, **Appendix 1** (complete guidelines on page 127 of NZFOA).

4.3.5 Sediment Traps

Sediment traps will be used within the ditches to allow the heavier coarse sediments to drop out, preventing them from entering the culverts and reducing loads on these devices. Placements and locations of sediment traps depicted on ESCP-002 to ESCP-005 are indicative only. Sediment trap spacings will vary throughout the site in accordance with the table provided in ESCP-007. Generally, the sediment traps are to be constructed every 10-20 m as a conservative approach. The sediment traps will be constructed in accordance with the image reference in ESCP-007, **Appendix 1** (complete guidelines on pages 135-136 of NZFOA).

4.3.6 Temporary Culverts

Culverts shall be used onsite to transport water from one side of the access tracks alignment to the other. Culverts shall consist of a PVC, farm-grade, plastic drainage coil. A variation of pipe diameter will be utilised around the site to accommodate differing contributing catchments as depicted in calculations provided in **Appendix 1**. However, as per NZFOA, at least one 325 mm culvert is to be installed every 65 m of the track.

Where the culvert outlets onto an area of fill, a culvert sock is to be clamped on the outlet of the pipe to convey water over the fill area to be discharged below the works extent and onto natural ground. Energy dissipation pads constructed from rock will need to be placed at the outlet to prevent scouring of the natural surface by the concentrated flow. This will minimise any erosion of the fill area whilst it progresses towards stabilisation. The energy dissipation pads shall be constructed in accordance with the schematic diagram in ESCP-011, **Appendix 1**.

Calculations are provided in **Appendix 2** to demonstrate the culverts can accommodate the upslope run-on water. Culverts shall be constructed in accordance with the schematic diagram in ESCP-007, **Appendix 1**.

4.3.7 Culvert socks

Culvert socks shall be used to transport water from outlet of the culvert to an appropriate location below the works extent without causing erosion. This is the most suitable measure for these locations as the slope steepness is greater than 3:1. These culvert sock flumes are to be secured in place by anchoring the sock eyelet and attaching it to the ground over the entire length, this will prevent twisting and displacement of the sock. As per above, the outlet of the sock is to be stabilised effectively with rock armouring to prevent erosion. The sock will be installed in accordance with the schematic diagram in ESCP-009, **Appendix 1** (complete guidelines on pages 133-135 of NZFOA).

4.3.8 Silt Fences

A silt fence will be used to capture potential sheet flows from the debris field below the debris fence. It is important that the silt fence is installed along a contour to prevent any concentrated flow accessing the fence or pooling water upslope of the fence. The silt fence will be installed in accordance with the schematic diagram in ESCP-010, **Appendix 1** (complete guidelines on pages 120-125 of GD05).

4.3.9 Temporary Stockpiles

Stockpiles may be formed as part of earthworks. It is recognised that the location of stockpiles will change with the progress of the earthworks. Stockpiles shall be constructed in accordance with the schematic diagram in ESCP-012, **Appendix 1.**

4.3.10 Progressive Rehabilitation

Progressive stabilisation of earthworks is to occur promptly as areas are finished to minimise the area of exposed soil and thus the generation of sediment-laden water. Prior to final landscaping, this can comprise temporary grassing, turfing or clean aggregate.

4.3.11 Removal of Sediment from Mid/Lower Reavers Catchment and Creek

As no machinery will be able to track far from the lower Reavers Catchment track, any removal of sediment will be undertaken manually (by shovels) and placed into impermeable bags to be lifted out by helicopter. This will have the added benefit of causing no further disturbance to the natural surface.

During any manual works in the creek, care will need to be taken to ensure that disturbance to the natural bed is avoided. This will in turn minimise disturbance and suspension of sediment from the creek bed. It is noted that some suspension of sediment is unavoidable given the constrained nature of the creek and rocky substrate of the gully making it impossible to install temporary measures such as silt curtains.

During works within Reavers Creek, the creek will be regularly monitored 50 m downstream to ensure that there is no conspicuous change in colour or visual clarity of the creek. If this cannot be achieved, contingency measures such as sandbags to capture coarser sediments can be installed. This shall be undertaken in consultation with the Environmental Consultant.

4.4 As-Built Verification

The Environmental Consultant will provide the Council with as-built confirmation to verify that the erosion and sediment controls have been installed in accordance with the approved ESCP.

4.5 Maintenance of Erosion and Sediment Control Devices

Ongoing maintenance of the site shall be undertaken as follows:

- Clean out sediment of erosion and sediment controls as soon as 20% capacity has been reached.
- Any cleaned-out sediment shall be stockpiled, dried and reused as planting media for revegetation.
- Clear excess sediment caught in silt fences.
- Monitor the inlets and outlets of culverts and culvert socks to ensure they are not impeded prior to forecast rainfall events.
- Ensure all culvert socks are secured to the culverts.
- Ensure drop-out pits and check dams are formed and operational prior to forecast rainfall events. Remove excess sediment build up as soon as 20% capacity has been reached.
- Remove excess slash built up in any overland flow paths, culvert inlets or public use areas.

4.6 Rapid Response Procedure for Significant Rain Events

The Environmental Representative will stay vigilant of weather forecasts. If a significant rain event is imminent, all works will cease in sufficient time for staff to inspect and maintain erosion and sediment control devices and undertake any stabilisation required. Observations will continue through the rain event to ensure the functioning of erosion and sediment control devices.

4.7 Decommissioning and Removal

Erosion and sediment control devices will remain in place until ‘stabilisation’ of the site has been achieved. This is generally defined as 80% vegetative cover as depicted in **Figure 2**.

It is noted that the removal of controls may result in minor soil exposure. Any soils exposed during decommissioning will be stabilised with either grass, mulch or other appropriate erosion control.

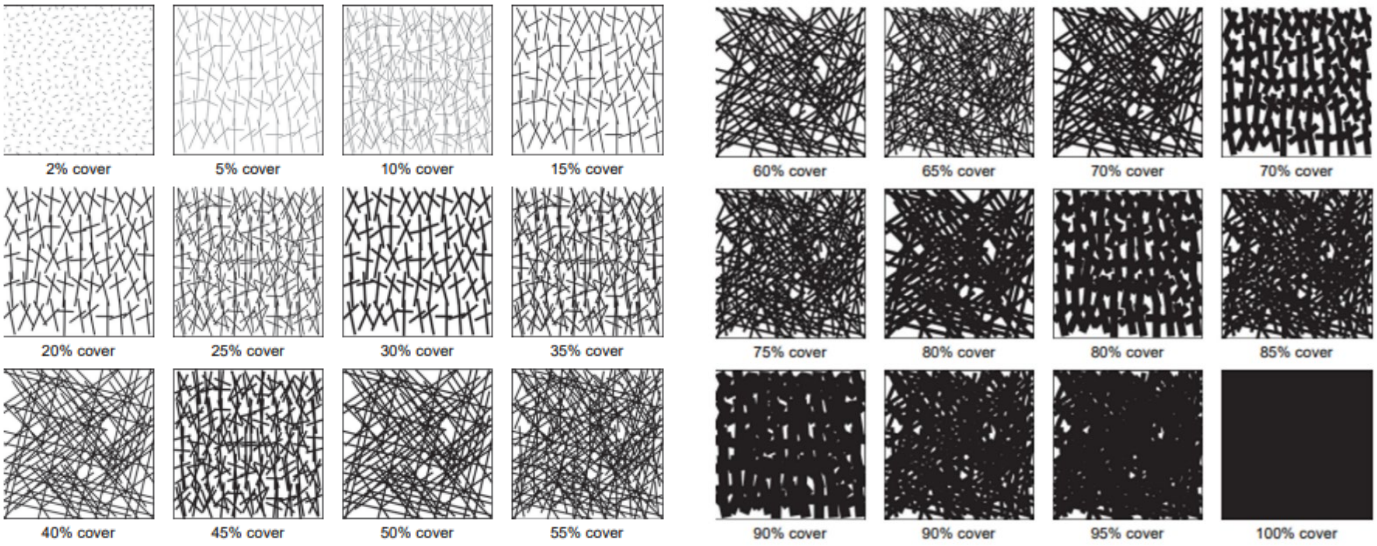


Figure 2: Visual cover estimation (Source: Catchments and Creeks Pty Ltd)

4.8 Inspections and Monitoring

Details of inspections and monitoring are stated in Section 3.3.

4.9 Contingency Measures

The following contingency measures in **Table 4** shall be deployed as required.

Table 4: Erosion and sediment control contingency measures

Issue	Contingency Measure
Sediment-laden stormwater flowing across the site boundary	Undertake measures to stop the flow immediately. Ensure controls are installed according to the ESCP. Contact the Environmental Consultant (SQEP) who will initiate the incident response.
Controls do not appear to be working as intended	Contact Environmental Consultant (SQEP) to inspect, advise and revise ESCP as required.
The site is inappropriately exposed prior to imminent rain event	Cease works and shift effort to checking erosion and sediment controls and stabilisation via the Rapid Response Procedure outlined in Section 4.6.
Abatement notice issued by Council	Contact the Environmental Consultant (SQEP) immediately to advise on methods to meeting abatement notice requirements within the time stated by the abatement notice.

4.10 Erosion and Sediment Control Incident

An erosion or sediment control incident is considered to have occurred where performance criteria outlined in Section 4.1 is not met. The incident procedures outlined in Section 3.5 shall commence.

5.0 WATER QUALITY MANAGEMENT

5.1 Receiving Waterbodies

The slip has occurred within the upper catchment of Reavers Creek. The debris has been deposited within the creek bed and on adjacent slopes, thus works will be required to be undertaken within close proximity of the creek to remove/stabilise debris. The upper catchment of Reavers Creek is characterised by steep slopes, numerous bluffs and mature Douglas fir pine trees. The creek is fed by numerous flow paths that convey water in high flow events. These flow paths intersect the access roads that are to be constructed as part of this development.

Reavers Creek runs into a formalised intake connected to QLDC's stormwater network and eventually to Lake Wakātipu. The site is situated 780 m from Lake Wakātipu from the outlet of Reavers Creek. The southern end of the access tracks to be upgraded are located in the Brecon Street Catchment. Overland flows here will flow down to Brecon Street and the Queenstown Cemetery. Effects on receptors are expected to be mitigated through the adoption of best-practice erosion and sediment controls, and environmental management measures that avoid the generation and discharge of contaminants associated with earthworks and general construction activities. The discharge limits recommended below are commensurate with the receiving environment and will prevent potential adverse effects on receptors.

Figure 3: Waterways within and in proximity to the site

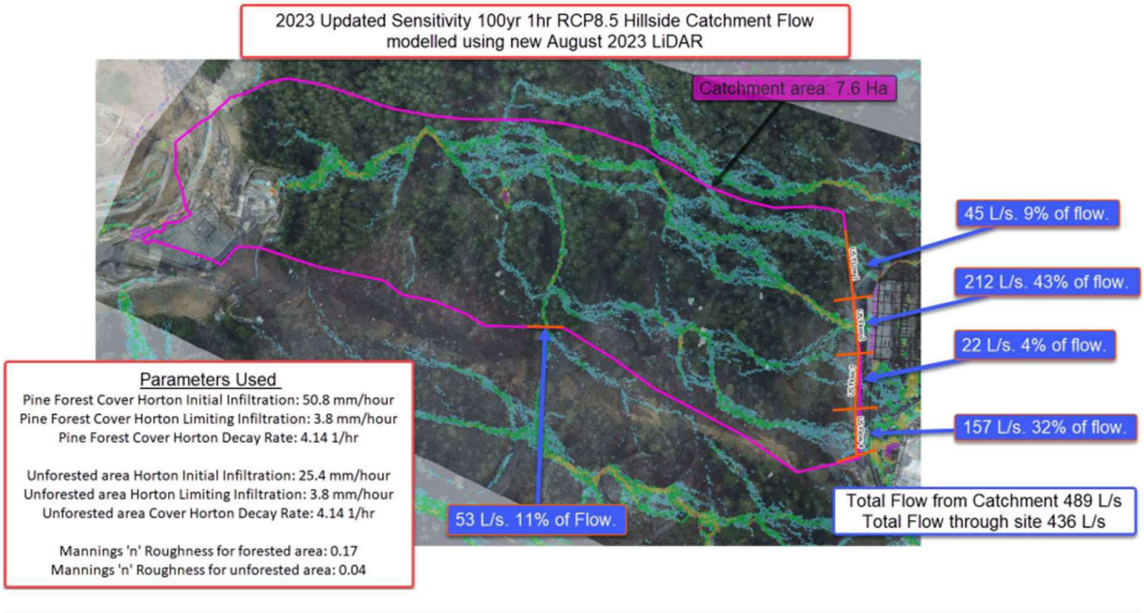


Figure 4: Hydraulic modelling results focusing on the Brecon Street catchment (Fluent Report, 2023)

5.2 Performance Criteria

Any waters flowing across the site boundaries will meet the criteria in **Table 5**.

Table 5: Water quality discharge criteria

Parameter	Discharge Criteria
Clarity of receiving waters	No 'conspicuous change in colour or visual clarity' in receiving waters below the activity area
pH [3]	5.5 – 8.5
Hydrocarbons or tannins	No visible trace
Waste	No waste or litter is visible

5.3 Management Measures

The following measures will be deployed to ensure the protection of water quality:

[3] pH to be tested only when chemical treatment is undertaken.

- Erosion and sediment controls will be implemented and maintained in accordance with the Erosion and Sediment Control Measures in Section 4.0.
- Refuelling, servicing and storage of hydrocarbons will be in accordance with the relevant procedures in the Chemicals and Fuels Management in Section 10.0.
- All plant and equipment onsite will be inspected regularly to ensure they are of an acceptable standard.
- Stockpiling of any organic, erodible or hazardous material onsite is not to be placed within close proximity of a watercourse/major drainage line, unless appropriate controls are in place.

5.4 Monitoring

Water quality will be monitored in accordance with **Table 6**.

Table 6: Water quality monitoring measures

Sampling Scope	
Objective	To confirm that all controlled and uncontrolled water flowing from the site meets the Discharge Criteria referred to in Section 5.2.
Responsibility	On site water quality sampling is to be completed by the nominated Environmental Representative. Note: The Environmental Consultant is available to provide training and guidance regarding on site sampling and can provide sampling services as required.
Spatial boundaries	All water that enters and exits the site from rainfall or overland flow.
Frequency	Immediately following 10 mm of rain in a 12-hour period or when water is flowing across the boundary of the site. Where a Significant Rain Event occurs through the night, monitoring shall be undertaken as soon as practically possible, the following morning. Regularly during manual removal of sediment from Reavers Creek.
Sampling Design	
Water Quality Criteria	As outlined in the Discharge Criteria referred to in Section 5.2.
Sampling Locations	Reavers Creek 50 m above the discharge point from the overland flow path. Reavers Creek 50 m below the lowest discharge point from the overland flow path.

Sampling Method	• Water clarity – visual observations • pH – pH meter – only if utilising chemical treatment • Gross pollutants – visual observations • Tannins – visual observations (any unusual darkening of waters?) • Hydrocarbons – visual observations (is there any oily film [4] on surface or smell?)
Quality Control	Any water quality meter will be calibrated according to manufacturer instructions. All observations will be recorded and analysed.
Recording	
Recording Results	All results will be entered into a spreadsheet and kept onsite (form attached as **Appendix 9**).
Actions	
Non-conformances	Any exceedances observed will be reported to the Project Manager/ Environmental Consultant who will investigate and ensure appropriate corrective actions are implemented immediately.

5.5 Contingency Measures

The following contingency measures in **Table 7** shall be adopted if required.

Table 7: Water quality contingency measures

Issue	Contingency Measure
Exceedance of water quality criteria	• Contact the Project Manager and Environmental Consultant (SQEP) immediately. • Works will cease or be modified to remove further risk of contamination. • QLDC will be verbally notified. • The Environmental Incident procedure will commence. • Remedial measures will be implemented and the Environmental Incident will be closed out by the Environmental Consultant (SQEP), with a copy of an Environmental Incident report to the Project Manager, QLDC.

5.6 Water Quality Incidents

A water quality incident is considered to have occurred where the water quality performance criteria outlined in Section 5.2 is breached. The incident procedures outlined at Section 3.5 shall commence.

[4] Some bacteria produce a naturally occurring film on the water surface. Bacteria films breaks apart in angular shapes when disturbed whereas hydrocarbon film separates as globules.

6.0 DUST MANAGEMENT

Dust from construction activities, vehicle movements and stockpiles can contribute to sediment runoff and create a nuisance to the public, neighbouring properties, adjoining roads and service infrastructure. The key risks associated with dust occur during the bulk earthworks phase of the project.

There are a range of activities that may produce dust onsite including but not limited to:

- General disturbance of soil (particularly during drier months).
- Vehicle movements along access tracks.
- Slow or ineffective revegetation procedures.

It is noted that the dense forest of mature, evergreen Douglas fir will provide opportunities for dust screening across much of the work site. However, this should not be fully relied upon. There will be an element of adaptive management to control dust.

6.1 Sensitive Receptors

Key sensitive receptors to protect from the effects of dust include visitors and recreational users of Ziptrek and Skyline facilities, mountain bike trails and Tiki Trail. The prevailing wind conducive to dust generation during the summer months, is generally from the north-west. Being located above Lake Wakātipu, wind direction and speed can be highly variable. Contractors shall remain vigilant for variations in wind conditions.

It should be noted that the exposure of the forementioned sensitive receptors to the effects of dust are temporary in nature, therefore the effects of dust anticipated to be less than minor.

6.2 Performance Criteria

The project must ensure that reasonable and practical measures are taken to avoid dust moving across the boundaries of the site at all times.

6.3 Management Measures

The following measures will be deployed to ensure dust generation onsite is minimised:

- Stage works where possible to minimise soil exposure extents and timeframes.
- Progressive application of aggregate to tracks.
- Revegetate batters/disturbed areas progressively throughout construction.
- Dust suppression of exposed areas by water trucks or other methods approved by Environmental Representative. [5]
- If dust activities cannot be controlled during high winds, works will cease until favourable conditions return.

[5] Ensure a consented water take permit is approved by the local authority. If taking water from lakes and or rivers, ensure that the permitted volume of water is taken.

- Only designated access points and haul routes are to be used.
- A maximum speed limit will be posted as 15 km/hr, unless deemed otherwise by the Project Manager.
- To avoid spillage risks, trucks will not be overloaded.
- All trucks must have tail gates up and swept or cleaned prior to exiting to external roads.
- Stockpile heights are to be minimised where possible (< three metres) unless they are covered (e.g. an erosion blanket, chemical sealant, temporary cover crop or mulched).
- Long-standing stockpiles (greater than four weeks) shall be appropriately stabilised.
- Within two weeks of completion, all earth worked areas will be sown out with grass, landscaped or otherwise stabilised by an appropriate erosion control.

6.4 Monitoring

Site staff will maintain continual vigilance for any increases in wind to ensure measures are deployed prior to dust crossing site boundaries. Weekly Environmental Inspections and the Monthly SQEP Environmental Inspections will also ensure that the management measures described above are sufficient and performing effectively.

6.5 Contingency Measures

The contingency measures in **Table 8** shall be adopted if required.

Table 8: Dust contingency measures

Issue	Contingency Measure
Excessive dust creation from soil disturbance	• Spray down excavation areas and activities where excavator bucket is operating. • Cease excavation during high winds, particularly if wind direction is likely to impact sensitive receivers.
Excessive dust creation from hauling operations	• Reduce truck speeds. • Cover or spray down loads causing dust impacts. • Apply new skim of aggregate over the haul road surface.
Excessive dust creation from stockpiles	• Spray stockpiles with water or apply a temporary polymer. • Hydro-mulch, seed or stabilise stockpiles, cover stockpiles with geofabric. • Locate stockpiles further away from sensitive receptors.
Abatement notice issued by Council	Contact the Environmental Consultant (SQEP) immediately to advise on methods to meeting abatement notice requirements within the time stated by the abatement notice.

6.6 Dust Incident

A dust incident is considered to have occurred where:

- Dust is observed crossing the boundary into sensitive receptors or,
- A justified complaint is received regarding dust emissions across the boundary of the site.

The incident procedures outlined at Section 3.5 shall commence.

7.0 NOISE AND VIBRATION MANAGEMENT

Noise and vibration generated during construction has the potential to impact sensitive receivers by reducing comfort, impeding communication, causing cosmetic damage to structures and damaging household possessions.

The following assessment and management measures are intended for standard construction equipment that is not expected to induce noise or vibration beyond the maximum limits in the QLDC District Plan. Where upper noise and vibration levels of district plans will be breached, an Acoustic Specialist may need to be engaged to assist with the management of these nuisance effects.

Potential noise and/or vibration effects may be generated by the following:

- Excavation and earth moving plant
- Ancillary plant and equipment
- Piling equipment
- Rock breaking

7.1 Sensitive Receptors

Nearby sensitive receptors include residential dwellings at the outlet of Reavers Creek, and visitors and recreational users of Skyline and Ziptrek facilities. Geosolve note in their March 2024 report that given the distance from the site to neighbouring properties, the risk of vibration issues for third parties is low.

7.2 Performance Criteria

1. Construction activities shall meet relevant noise limits specified under Rule 36.5.13 of the Queenstown Lakes Proposed District Plan. This rule requires Construction sound at any point within the site must comply with the limits specified in Tables 2 and 3 of *NZS 6803:1999 Acoustics - Construction Noise*, when measured and assessed in accordance with that standard (see **Table 9** below).
2. Construction activities shall meet relevant vibration limits specified under Rule 36.5.10 of the Queenstown Lakes Proposed District Plan. This rule requires vibration from any activity must not exceed the guideline values given in *DIN 4150-3:1999 Effects of vibration on structures* on any structures or buildings on any other site.
3. Construction activities shall be undertaken in accordance with the permitted hours of operation outlined at Section 2.2 above.

Table 9: Upper limits in dB(A) for construction work noise in residential areas for more than 20 weeks

Time of Week	Time Period	$L_{Aeq(t)}$	L_{Afmax}
Weekdays	0630 – 0730	55 dB	75 dB
	0730 – 1800	70 dB	85 dB

	1800 – 2000	65 dB	80 dB
Saturdays	0630 – 0730	45 dB	75 dB
	0730 – 1800	70 dB	85 dB

Table 10: Vibration Thresholds for Structural Damage (PPV mm/s)

	Short Term				Long-Term
	At Foundation			Uppermost Floor	Uppermost Floor
Types of Structures	0 to 10 HZ	10 to 50 Hz	50 to 100 HZ	All Frequencies	All Frequencies
Commercial/Industrial	20	20 to 40	40 to 50	40	10
Residential	5	5 to 15	15 to 20	15	5
Sensitive/Historic	3	3 to 8	8 to 10	8	2.5

Note: When a range of velocities is given, the limit increases linearly over the frequency range.

7.3 Management Measures

The following measures will be deployed to ensure noise and/or vibration associated with the project are appropriately mitigated:

- Notify surrounding sensitive receptors prior to commencing particularly noisy or vibration inducing activities.
- Where practicable, select lower noise producing equipment or use lower noise generating alternatives.
- Regularly service equipment to ensure plant is running optimally.
- Plant and equipment to be fitted with noise control/attenuation devices as appropriate and maintained and operated in accordance with manufacturer's specifications.
- Revving of engines will be limited. All plant and vehicles will be turned off when not in use and if safe to do so.
- The use of audible alarms on mobile equipment will be limited, and two-way communication will be used.
- Undertake activities that may lead to noise or vibration effects, during reasonable and practical hours.

7.4 Monitoring

All earthworks activity will be closely monitored by the operator to ensure that noise and vibration remains within the required limits. If monitoring finds the activity cannot comply with performance criteria, an Acoustic Specialist may need to be engaged to assess the project and provide appropriate mitigation measures and monitoring. Weekly Environmental Inspections and Monthly SQEP Environmental Inspections shall include an assessment of the site to determine the effectiveness of noise and vibration management controls.

7.5 Contingency Measures

The following contingency measures in **Table 11** shall be adopted if required.

Table 11: Noise and vibration contingency measures

Issue	Contingency Measure
Noise and/or vibration complaint received	Manage the complaint in accordance with the Environmental Complaints procedure in Section 3.6.
Exceedance of performance requirement criteria	The Environmental Consultant (SQEP), in consultation with the Environmental Representative, will investigate and implement actions to reduce noise and/or vibration levels to below criteria levels.
Ongoing noise and/or vibration issues	Where noise or vibration emissions consistently exceed the performance criteria despite the site staff's best efforts, an Acoustic Specialist will be engaged to assist.
Abatement notice issued by Council	Contact the Environmental Consultant (SQEP) immediately to advise on methods to meeting abatement notice requirements within the time stated by the abatement notice.

7.6 Noise and Vibration Incident

A noise or vibration incident is considered to have occurred when a justified complaint is received and on investigation is found to exceed the performance criteria. The environmental incident procedures outlined in Section 3.5 shall commence.

8.0 CULTURAL HERITAGE MANAGEMENT

The loss or damage of cultural heritage items could be caused by construction activities. The damage or loss of artefacts can lead to the loss of culturally or historically significant items and information.

Examples of cultural heritage items include:

- Koiwi tangata (human skeletal remains).
- Waahi taoka (resources of importance).
- Waahi tapu (places or features of special significance).
- Māori artefact material.
- A feature or archaeological material predating 1900.
- Unidentified archaeological or heritage site.

8.1 Location of Known Cultural Heritage Significance

A search of QLDC's database indicates the extent of works does not directly intersect any known areas of historic heritage features.

Skyline is located within the Te Taumata o Hakitekura, Ben Lomond, under the Heritage Protection Order. Its values are listed as Wāhi taoka, wāhi tapu. It's recognised threats are listed as; Exotic species including wilding pines, buildings and structures, utilities, new roads or additions/alterations to existing roads, vehicle tracks and driveways and activities affecting the ridgeline and upper slopes. However, due to the scope of the works being temporary and remedial in nature, it is not anticipated to conflict with these matters. **Figure 5** describes the identified areas of cultural significance.

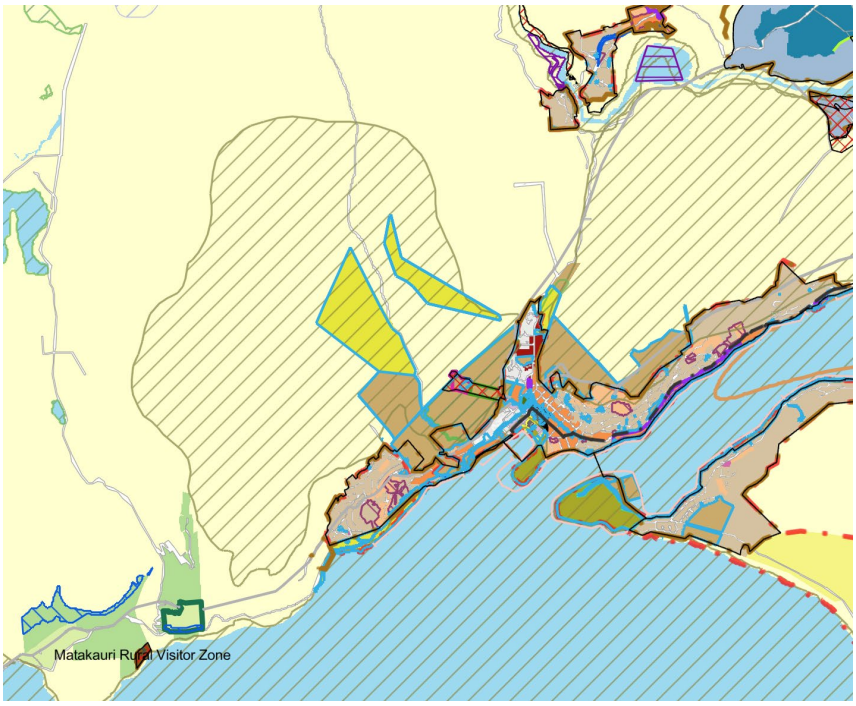


Figure 5: Locations of areas with cultural significance (Source: QLDC Maps)

8.2 Performance Criteria

- The protection of cultural heritage artefacts and places in accordance with the *Heritage New Zealand Pouhere Taonga Act, 2014*.
- Strict adherence to Heritage New Zealand's *Archaeological Discovery Protocol* (attached as **Appendix 10**) in the case of unexpected finds.

8.3 Management Measures

All works on this project will be undertaken in accordance with the obligations of the *Heritage New Zealand Pouhere Taonga Act*, 2014.

8.4 Monitoring

Weekly inspections shall include a visual assessment of the site to ensure that no new significant artefacts have been encountered. However, operators must remain vigilant for such encounters as they occur.

8.5 Accidental Finds

If any unknown artefacts are uncovered, the project will work to Heritage New Zealand's *Archaeological Discovery Protocol* (attached as **Appendix 10**).

9.0 VEGETATION MANAGEMENT

The site is predominantly covered in mature Douglas Fir pine trees. Some forestry has occurred within the area to remove some trees for thinning purposes and to generate a fire break around the Skyline infrastructure. However, the vegetation cover around the area of the slip is predominantly pine trees.

9.1 Sensitive Receptors

There is no identified protected vegetation within proximity of the site, therefore, there are no other specific protections or management measures. However, any existing indigenous vegetation discovered during works will be demarcated as 'no-go zones'.

9.2 Performance Criteria

- Avoid the clearance of indigenous or protected vegetation where possible during excavation works.
- Avoid the spread of noxious weeds onsite or to other sites.

9.3 Management Measures

The following measures will be deployed to manage vegetation:

- Demarcate any discovered protected vegetation areas as no go zones.
- Treating weeds prior to disturbance of the natural surface.
- Maintain existing indigenous and or any protected vegetation.

9.4 Monitoring

Weekly Environmental Inspections and Monthly SQEP Environmental Inspections shall include a visual assessment of the site to determine the effectiveness of vegetation management controls.

9.5 Vegetation Incident

A vegetation incident is considered to have occurred where:

- Protected vegetation is damaged or removed.
- A no-go zone is breached.

The environmental incident procedures outlined at Section 3.5 shall commence.

10.0 CHEMICALS AND FUELS MANAGEMENT

Hazardous substances can endanger both human health and the environment. Used incorrectly they can cause catastrophic accidents, such as fires and explosions, and serious harm to people who are exposed to them.

10.1 Sensitive Receptors

Key sensitive environmental receptors include staff members working on the site, neighbouring properties and users of Skyline's facilities.

10.2 Performance Criteria

- Chemicals and fuels are stored and used in a manner that avoids contamination of site and surrounding environment.
- All spills are cleaned up immediately and the contaminated soils/waters disposed of appropriately.

10.3 Management Measures

The following measures will be deployed to ensure chemicals and fuels associated with the project are appropriately managed.

- All hazardous substances to be stored, transported and used according to the safety data sheet requirements.
- Storage of chemicals and fuels shall be located as far as practicably possible from waterways and concentrated flows.
- Refuelling of vehicles and plant onsite will occur in the designated refuelling bay as shown in ESCP-013, **Appendix 1**.
- All concrete washing is to be undertaken in the designated concrete wash-out pit as per the design specifications in ESCP-013, **Appendix 1**.
- One 240 L Oil and Hydrocarbon spill kit and one 240 L Chemical spill kit will be located in close proximity to the location of liquid hazardous materials storage and refuelling areas.
- The volumes of the hazardous substances listed in **Table 12** will not be exceeded.

Table 12: Maximum volumes of chemicals and fuels

Chemicals and Fuels	Maximum Volume	Storage Location
Diesel	1,000 L	Fuel tank or Jerry cans in lockable container
Unleaded Fuel	100 L	Jerry cans in lockable container
Oil	10 L	Packaging in lockable container
Lubricant (WD40 or similar)	Six Cans	Packaging in lockable container
Grease	5 L	Packaging in lockable container

Chemicals and Fuels	Maximum Volume	Storage Location
Spot marking paint	2 L	Packaging in lockable container

10.4 Monitoring

Weekly Environmental Inspections and Monthly SQEP Environmental Inspections shall include a visual assessment of the site to determine the effectiveness of chemicals and fuels management.

10.5 Contingency Measures

The following contingency measures in **Table 13** shall be adopted if required.

Table 13: Chemicals and fuels contingency measures

Issue	Contingency Measure
Spills response	• Stop works in proximity to the spill and assess the safety of all personnel. • Take immediate action to contain the spill to prevent discharge into stormwater drains or natural waterways. • Use spill kits to contain and treat the spill. • Notify Environmental Consultant to advise on next steps. • If necessary, notify the Regional Council spill response unit. • Remove contaminated material to a suitable contained location for remediation/disposal (require any necessary approvals/permits from ORC). • The spill kits shall be replaced by an approved supplier.
Inappropriate storage	• Upgrade facility. • Clean-up of storage area. • Notify and train staff.
Inappropriate handling/transport	• Notify and train staff through toolbox meetings on the appropriate handling and transport methods.
Inadequate spill kit materials	• Order more materials. • Investigate types of chemicals onsite and consult a supplier for advice on appropriate equipment. • Develop or revise spill material monitoring and ordering system.
Inappropriate disposal of chemicals or fuels	• Provide appropriate disposal facilities or service providers. • Notify and train staff.

Issue	Contingency Measure
Inaccurate or insufficient records	• Advise staff and update records. • Monitor through inspections.

10.6 Chemicals and Fuels Incident

A chemicals and fuels incident is considered to have occurred where:

- A spill more than five litres has occurred.
- A situation is discovered where a spill of more than five litres would likely have occurred before it happens where the management measures listed above have not been followed.

The environmental incident procedures outlined at Section 3.5 shall commence.

11.0 WASTE MANAGEMENT

Waste from construction activities can create a nuisance to the public, neighbouring properties, and adversely affect flora and fauna.

11.1 Sensitive Receptors

Key sensitive environmental receptors include staff members working on the site, neighbouring properties and users of Skylines facilities.

11.2 Performance Criteria

- Non-recyclable waste generation is minimised, and the site and surrounds are kept free from waste at all times.
- Wastes shall be stored safely and in an organised manner until recycling, reuse, or disposal.

11.3 Management Measures

The following measures will be deployed to ensure waste management associated with the project is appropriately mitigated:

- The Waste Management Hierarchy philosophy will be implemented, as illustrated in **Figure 6**.

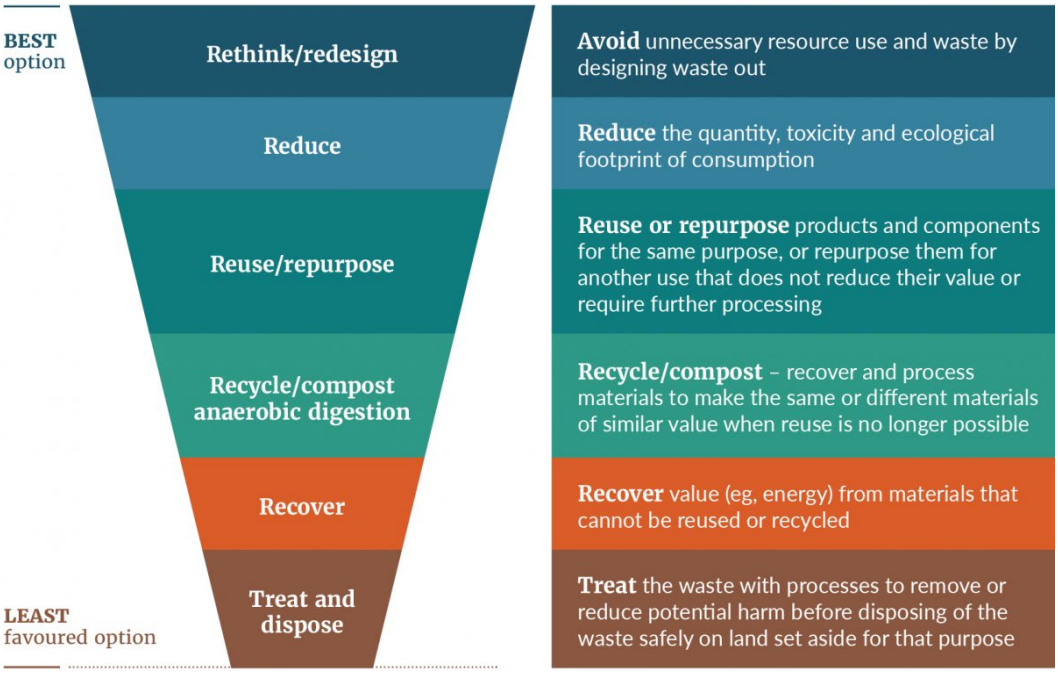


Figure 6: The Waste Hierarchy (Source: Ministry for the Environment).

- Measures will be implemented to ensure the site is maintained in a safe, clean and tidy state.

- Where possible, waste shall be segregated into labelled bins with lids: General, Hazardous and Recyclables.
- Wastes onsite shall be suitably contained and prevented from migrating offsite.
- The waste is to be contained so it doesn't contaminate soil, surface or ground water, create unpleasant odours or attract vermin.
- Any material dropped in or adjacent to open drains shall be recovered immediately after it occurs.
- Waste storage is not permitted in or near drainage paths.
- The burning of waste is strictly prohibited.
- No wastes shall be disposed of onsite.
- Wastes shall be removed from site regularly and at completion of works.

11.4 Monitoring

Site staff will be briefed on waste processes prior to works commencing and shall maintain continual vigilance for excess waste around the site and following appropriate disposal procedures. Weekly Environmental Inspections and Monthly SQEP Environmental Inspections shall include a visual assessment of the site to determine the effectiveness of waste management controls.

11.5 Contingency Measures

If waste items are accumulating or are stockpiled, the following contingency measures will be adopted:

- Arrange for collection by approved licensed contractor.
- Provide additional bins with lids if available.
- Remove waste offsite as soon as possible.

11.6 Waste Incident

A waste incident is considered to have occurred where:

- Waste from the site is found within a sensitive environment or where it may reasonably migrate to a sensitive environment,
- A complaint is received regarding inappropriate management of waste and on investigation is warranted.

The environmental incident procedures outlined at Section 3.5 shall commence.

12.0 CONTAMINATED SITE MANAGEMENT

A search of Council records has not provided any indication of the site being used in the past for a HAIL activity.

12.1 Sensitive Receptors

Key sensitive environmental receptors include staff members working on the site, neighbouring properties and users of Skylines facilities.

12.2 Performance Criteria

- Effectively identify and manage any sites where contaminants are found and ensure they do not contaminate beyond the location they are found (including offsite) or present a risk to human health.

12.3 Management Measures

The following measures will be deployed to ensure contaminated soil associated with the project is appropriately mitigated:

- If any evidence of contamination is noticed in the field, the personnel noting the contamination shall immediately notify the Environmental Representative.
- Any known contaminated soil to be removed must be undertaken wearing appropriate PPE.
- Many of the controls required to manage potential for effects associated with low level contaminated soil is based on best practice erosion and sediment control and dust management techniques. These are outlined in Section 4.3 (erosion and sediment controls) and Section 6.4 (dust controls). Both sections cover management of stockpiles.
- All surplus fill material requiring removal shall meet the Ministry for Environment definition of clean fill, as specified in Section 2.2 of the report "A Guide to the Management of Cleanfills", prepared by *Beca Carter Hollings & Ferner Ltd for the Ministry for the Environment and dated January 2002*.
- Trucks removing or transporting any soil from the site will be covered or sealed to prevent dust, leakage or loss of materials during transport.

12.4 Monitoring

Unless any higher-level contamination is accidentally found during earthworks, no specific monitoring of soil, groundwater or water quality will occur (other than what is detailed in the water quality criteria outlined at Section 5). If material is found it is expected that monitoring may be required but this shall be at the direction of the soil contamination expert.

12.5 Contingency Measures

It is not expected that contaminated material will be encountered, however this cannot be ruled out. If a potential contaminated site is identified (e.g., by landfilled waste, odour) during construction works, the following contingency measures will be undertaken:

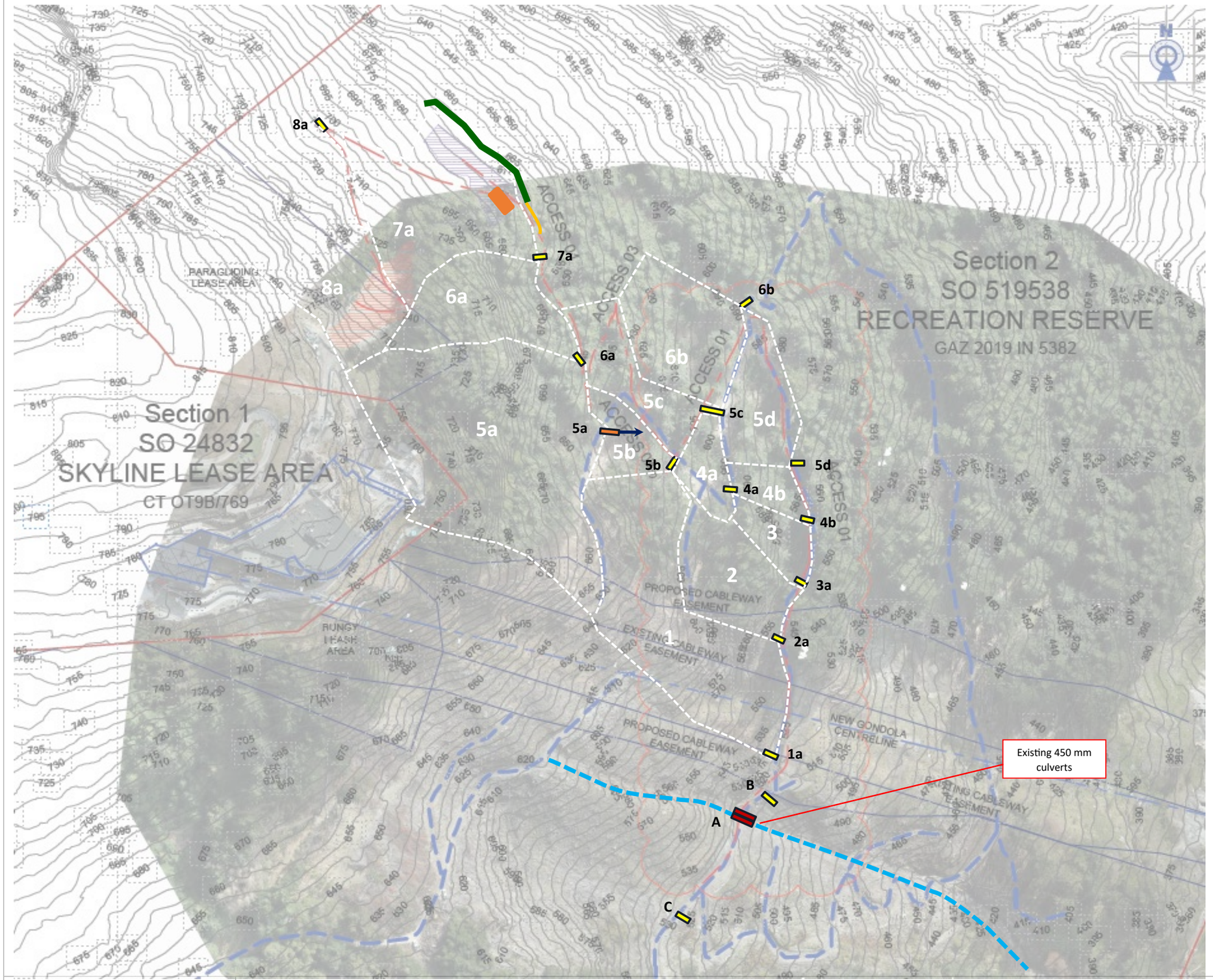
- Immediately notify the Project Manager.
- Prevent spread of contamination by installation of silt fencing, covering material with plastic or geofabric material. This will be done wearing appropriate PPE as outlined in the Health and Safety Management Plan.
- Engage the Environmental Consultant who will advise on the engagement of a Contaminated Soil expert.
- EMP to be amended to manage any new contaminated soil encountered in coordination with the contaminated soil expert (if engaged).

12.6 Contamination Incident

An environmental incident is considered to have occurred where inspection finds that excavation or other work continues within contaminated soil without report or remedial action.

The environmental incident procedures outlined in Section 3.5 shall be followed.

APPENDIX 1 Erosion and Sediment Control Plan Drawing



Legend

	Ephemeral flow path
	Silt fence
	Temporary culvert (325 mm minimum)
	Temporary culvert (150 mm minimum)
	Permanent culvert
	Existing tracks
	New access tracks
	Catchment boundaries
	Laydown area

Notes

- This plan is to be read in conjunction with the Environmental Management Plan document prepared by Enviroscope.
- All locations of erosion and sediment control (ESC) devices are indicative and exact placement to be confirmed onsite.
- ESC devices to be installed and maintained in accordance with the New Zealand Forest Owners Forestry Association's (NZFOA) *New Zealand Forest Road Engineering Manual, 2020* and manufacturer's instructions where relevant.
- All devices are to be inspected daily and pre and post-rain event to ensure they are fully functional.
- Ditches on slopes greater than 10% are to be stabilised by installing rock armouring. For ditches with gradients less than 10%, check dams are to be installed in accordance with the table in ESCP-008 as per NZFOA.

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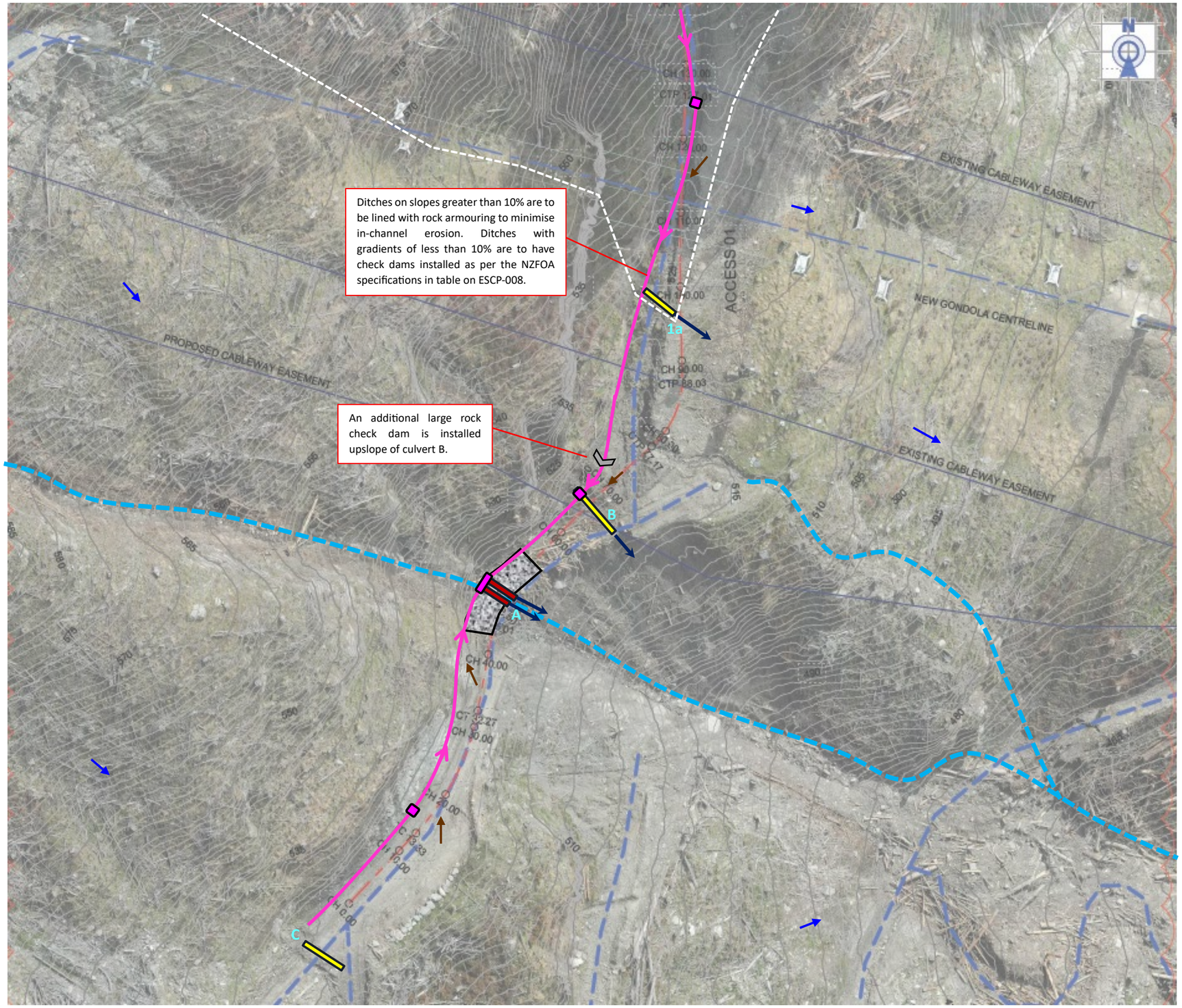
Project: Skyline – Reavers Slip Repair

Description: Erosion and Sediment Control Plan Drawing – Sub-Catchment Overview

Drawn	Approved	Date	Drawing No.	Revision
TG	TG	12/11/2024	ESCP - 001	H



Legend

	Clean water overland flow
	Dirty water overland flow
	Ditch
	Ephemeral flow path
	Silt fence
	Temporary culvert (325 mm minimum)
	Temporary culvert (150 mm minimum)
	Permanent culvert
	Culvert flume sock
	Existing tracks
	New access tracks
	Catchment boundaries
	Sediment traps
	Check dam (Additional to NZFOA requirements)
	Rock Ballast
	Laydown area

Notes

- This plan is to be read in conjunction with the Environmental Management Plan document prepared by Enviroscope.
- All locations of erosion and sediment control (ESC) devices are indicative and exact placement to be confirmed onsite.
- ESC devices to be installed and maintained in accordance with the New Zealand Forest Owners Forestry Association's (NZFOA) *New Zealand Forest Road Engineering Manual, 2020* and manufacturer's instructions where relevant.
- All devices are to be inspected daily and pre and post-rain event to ensure they are fully functional.
- Ditches on slopes greater than 10% are to be stabilised by installing rock armouring. For ditches with gradients less than 10%, check dams are to be installed in accordance with the table in ESCP-008 as per NZFOA.

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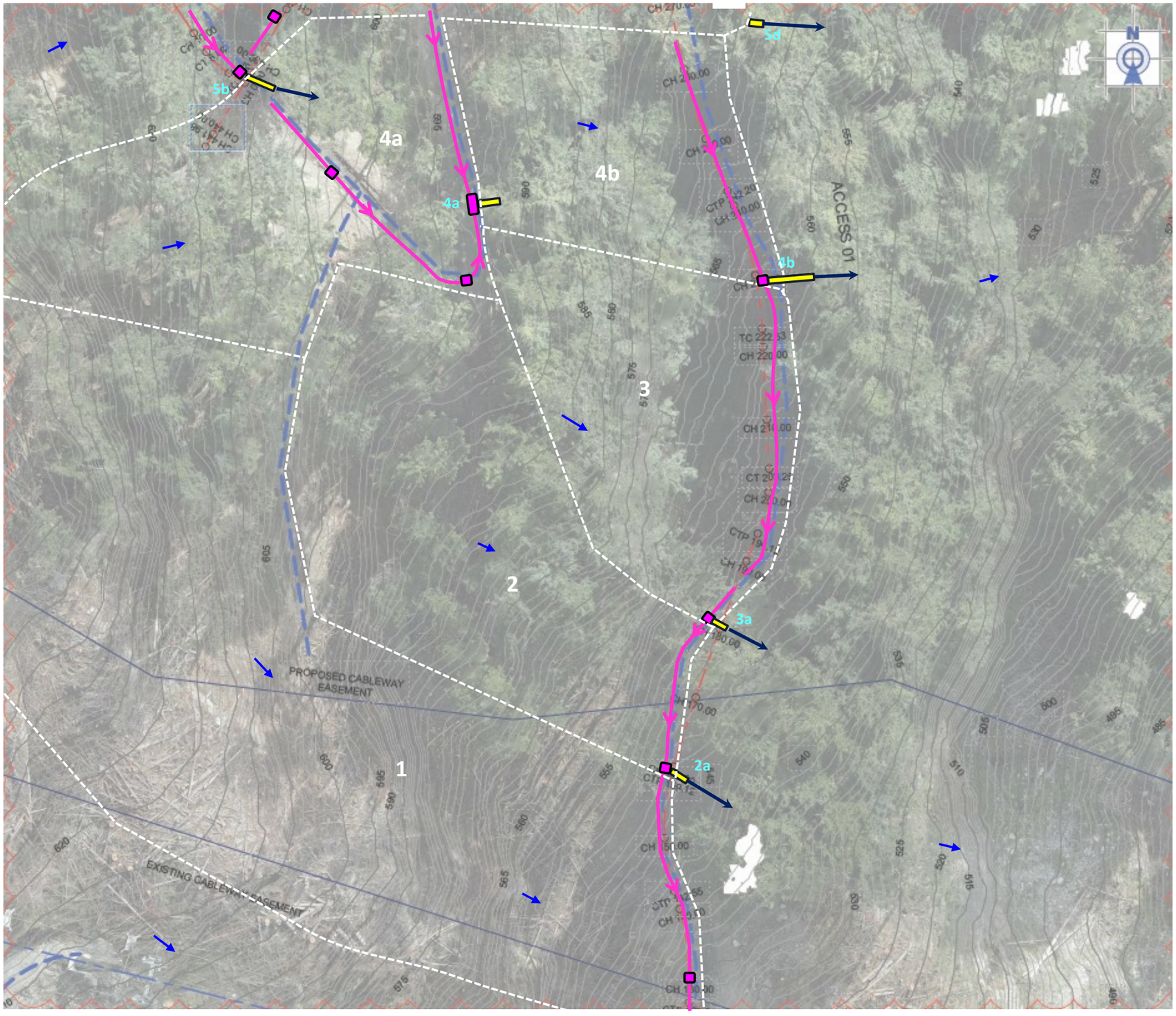
Project: Skyline – Reavers Slip Repair

Description: Erosion and Sediment Control Plan Drawing

Drawn	Approved	Date	Drawing No.	Revision
TG	TG	12/11/2024	ESCP - 002	H



Legend

	Clean water overland flow
	Dirty water overland flow
	Ditch
	Ephemeral flow path
	Silt fence
	Temporary culvert (325 mm minimum)
	Temporary culvert (150 mm minimum)
	Permanent culvert
	Culvert flume sock
	Existing haul road
	New access tracks
	Catchment boundaries
	Sediment traps
	Check dam (Additional to NZFOA requirements)
	Laydown area

Notes

- This plan is to be read in conjunction with the Environmental Management Plan document prepared by Enviroscope.
- All locations of erosion and sediment control (ESC) devices are indicative and exact placement to be confirmed onsite.
- ESC devices to be installed and maintained in accordance with the New Zealand Forest Owners Forestry Association's (NZFOA) *New Zealand Forest Road Engineering Manual, 2020* and manufacturer's instructions where relevant.
- All devices are to be inspected daily and pre and post-rain event to ensure they are fully functional.
- Ditches on slopes greater than 10% are to be stabilised by installing rock armouring. For ditches with gradients less than 10%, check dams are to be installed in accordance with the table in ESCP-008 as per NZFOA.

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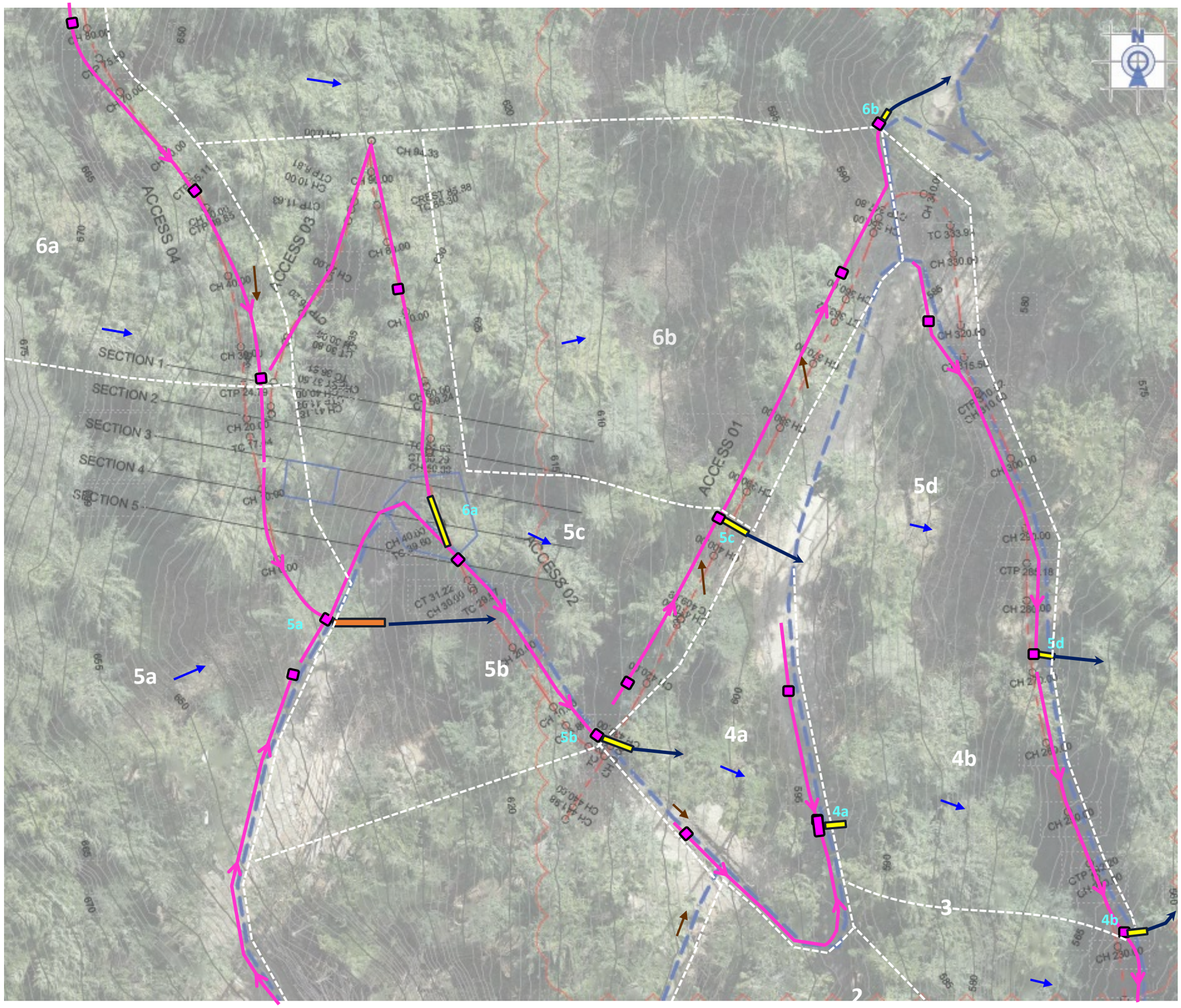
Project: Skyline – Reavers Slip Repair

Description: Erosion and Sediment Control Plan Drawing

Drawn	Approved	Date	Drawing No.	Revision
TG	TG	12/11/2024	ESCP - 003	H



Legend

	Clean water overland flow
	Dirty water overland flow
	Ditch
	Ephemeral flow path
	Silt fence
	Temporary culvert (325 mm minimum)
	Temporary culvert (150 mm minimum)
	Permanent culvert
	Culvert flume sock
	Existing haul road
	New access tracks
	Catchment boundaries
	Sediment traps
	Check dam (Additional to NZFOA requirements)
	Laydown area

Notes

- This plan is to be read in conjunction with the Environmental Management Plan document prepared by Enviroscope.
- All locations of erosion and sediment control (ESC) devices are indicative and exact placement to be confirmed onsite.
- ESC devices to be installed and maintained in accordance with the New Zealand Forest Owners Forestry Association's (NZFOA) *New Zealand Forest Road Engineering Manual, 2020* and manufacturer's instructions where relevant.
- All devices are to be inspected daily and pre and post-rain event to ensure they are fully functional.
- Ditches on slopes greater than 10% are to be stabilised by installing rock armouring. For ditches with gradients less than 10%, check dams are to be installed in accordance with the table in ESCP-008 as per NZFOA.

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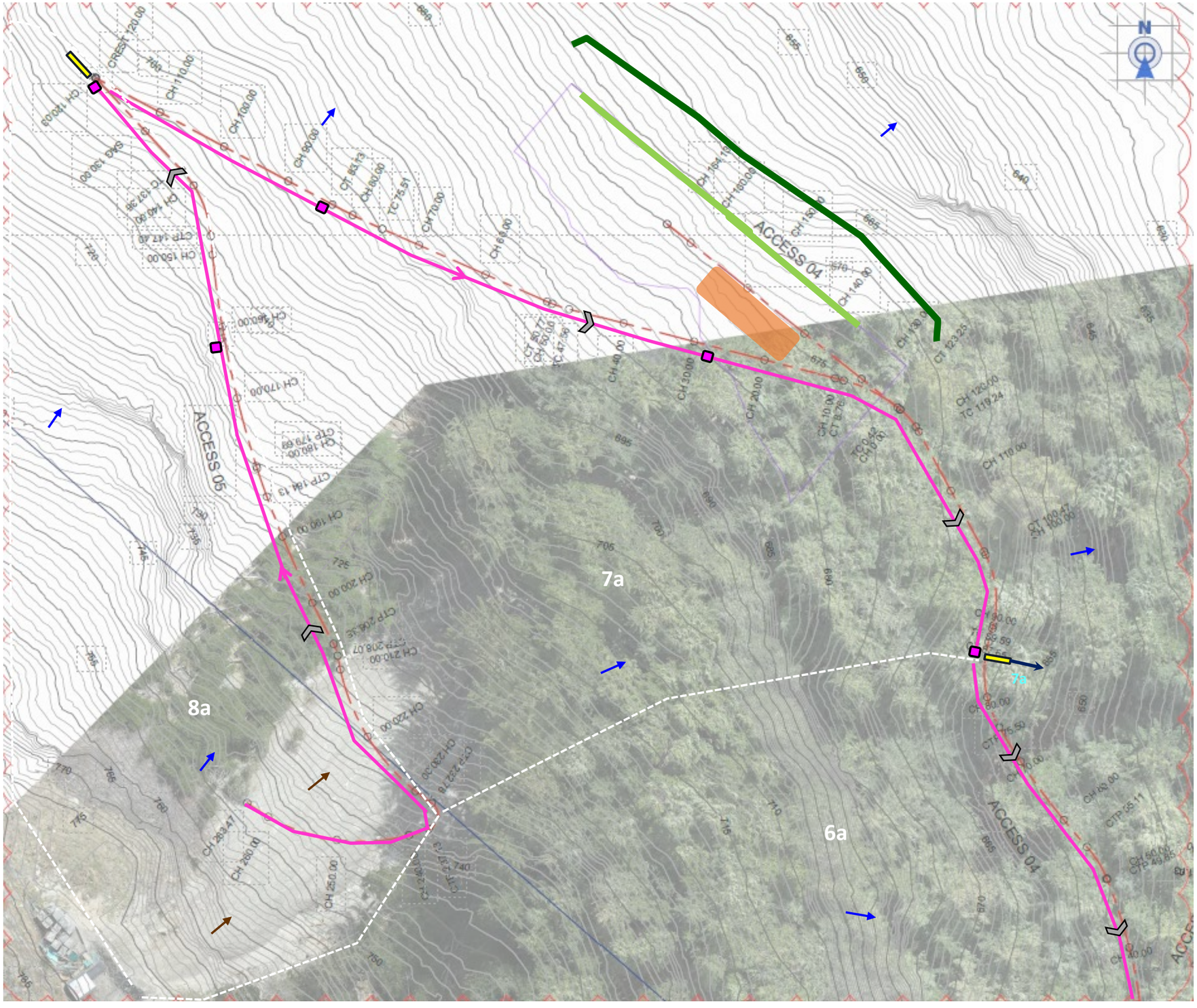
Project: Skyline – Reavers Slip Repair

Description: Erosion and Sediment Control Plan Drawing

Drawn	Approved	Date	Drawing No.	Revision
TG	TG	12/11/2024	ESCP - 004	H



Legend

	Clean water overland flow
	Dirty water overland flow
	Ditch
	Ephemeral flow path
	Silt fence
	Super silt fence
	Temporary culvert (325 mm minimum)
	Temporary culvert (150 mm minimum)
	Permanent culvert
	Culvert flume sock
	Existing access tracks
	New access tracks
	Catchment boundaries
	Sediment traps
	Check dam (Additional to NZFOA requirements)
	Laydown area

Notes

- This plan is to be read in conjunction with the Environmental Management Plan document prepared by Enviroscope.
- All locations of erosion and sediment control (ESC) devices are indicative and exact placement to be confirmed onsite.
- ESC devices to be installed and maintained in accordance with the New Zealand Forest Owners Forestry Association's (NZFOA) *New Zealand Forest Road Engineering Manual, 2020* and manufacturer's instructions where relevant.
- All devices are to be inspected daily and pre and post-rain event to ensure they are fully functional.
- Ditches on slopes greater than 10% are to be stabilised by installing rock armouring. For ditches with gradients less than 10%, check dams are to be installed in accordance with the table in ESCP-008 as per NZFOA.

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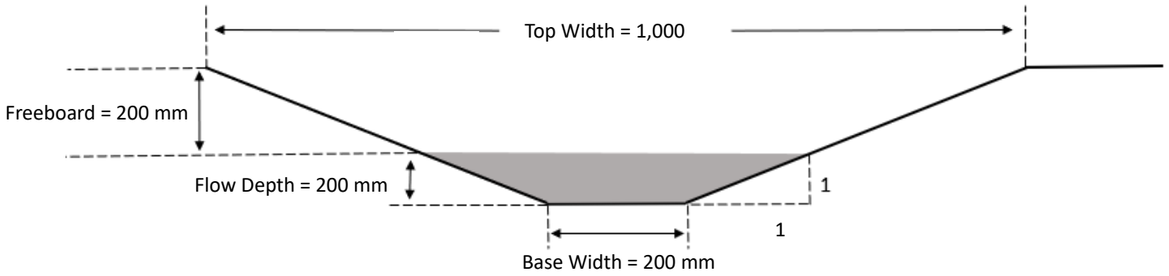
Project: Skyline – Reavers Slip Repair

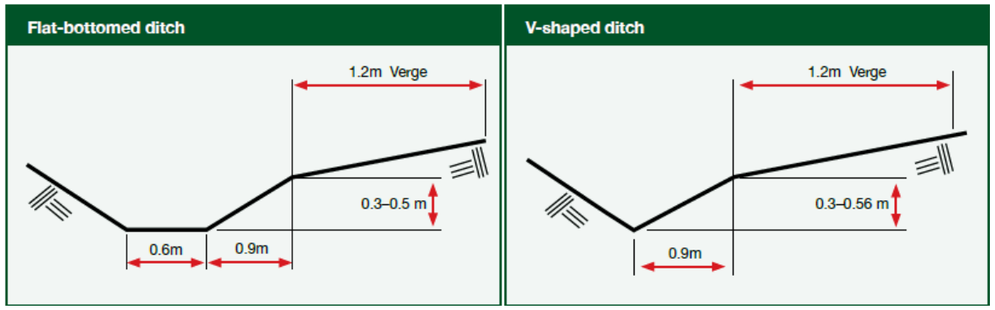
Description: Erosion and Sediment Control Plan Drawing

Drawn	Approved	Date	Drawing No.	Revision
TG	TG	12/11/2024	ESCP - 005	H

DITCH

(Pages 124-127 from NZFOA)





Base Width	Top Width	Flow Depth	Freeboard Height	Batter ratio	Channel slope	Buffer
200	800	200	200	1:1	25	869 %

Base Width	Top Width	Flow Depth	Freeboard Height	Batter ratio	Channel slope	Buffer
600	1500	300	200	1:1.5	25	5,867 %

- This has been designed to convey upto a 5% AEP design event.
- Check dams required.
- Rock armouring required.
- Flat bottomed shape as per schematic provided.
- Note ditches have been designed as per GDO5 specifications as per the schematic above. This deviates from the ditch design specifications recommended by the New Zealand Forest Owners Association as shown in the schematic to the right.
- Full calculations for both GDO5 dirty water diversion channel and NZFOA ditch are included in **Appendix 2**.

enviroscope	**Project:** Skyline – Reavers Slip Repair **Description:** Erosion and Sediment Control Plan - Schematics				
	Drawn	**Approved**	**Date**	**Drawing Number**	**Revision**
	TG	TG	12/11/2024	ESCP - 006	H

SEDIMENT TRAPS

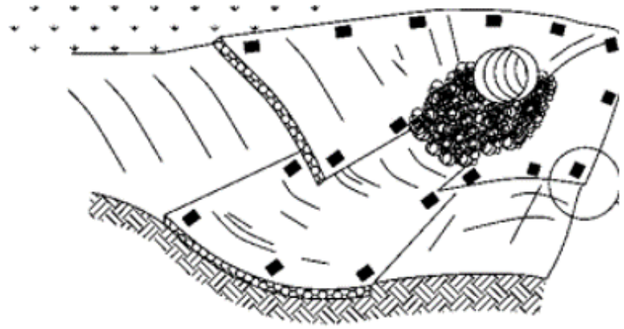
Pages 135 and 136 from NZFOA

- Sediment traps should be 1 m deep by 1.5 m long. A good length to width ratio is 3:1.
- Spacings of Sediment traps will vary throughout the site with differing gradients. However, generally the sediment traps are placed every 10-20 m.
- As a contingency measure, sediment traps can be increased in size and lined to prevent any scour of the pit.

Soak hole spacing guide	
Site slope	Soak hole spacing
Less than 12%	40m
More than 12%	30m down to 10m

TEMPORARY DRAINAGE CULVERT

Pages 130 – 132 of NZFOA



- The culvert diameters will vary throughout the site, with at least one 325 mm culvert placed every 65 m as per the table below.
- Geofabric and rock or slash should be placed at the outlet to prevent scour from the higher velocity water exiting the culvert. This is also applicable to the outlet of culvert sock flumes.
- Full calculations are included in **Appendix 2**.

Recommended maximum spacing (m) for road drainage culverts located on roads traversing mid and lower slopes				
	Soil or rock erodibility and distance spacing guide (m)			
Grade	High	Moderate	Low	Non-erosive rock
18% (1 in 6)	40	80	120	200
14% (1 in 7)	50	90	140	220
12% (1 in 8)	55	100	160	240
11% (1 in 9)	60	115	180	260
10% (1 in 10)	65	130	210	300
8% (1 in 12)	80	165	250	350

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Project: Skyline – Reavers Slip Repair

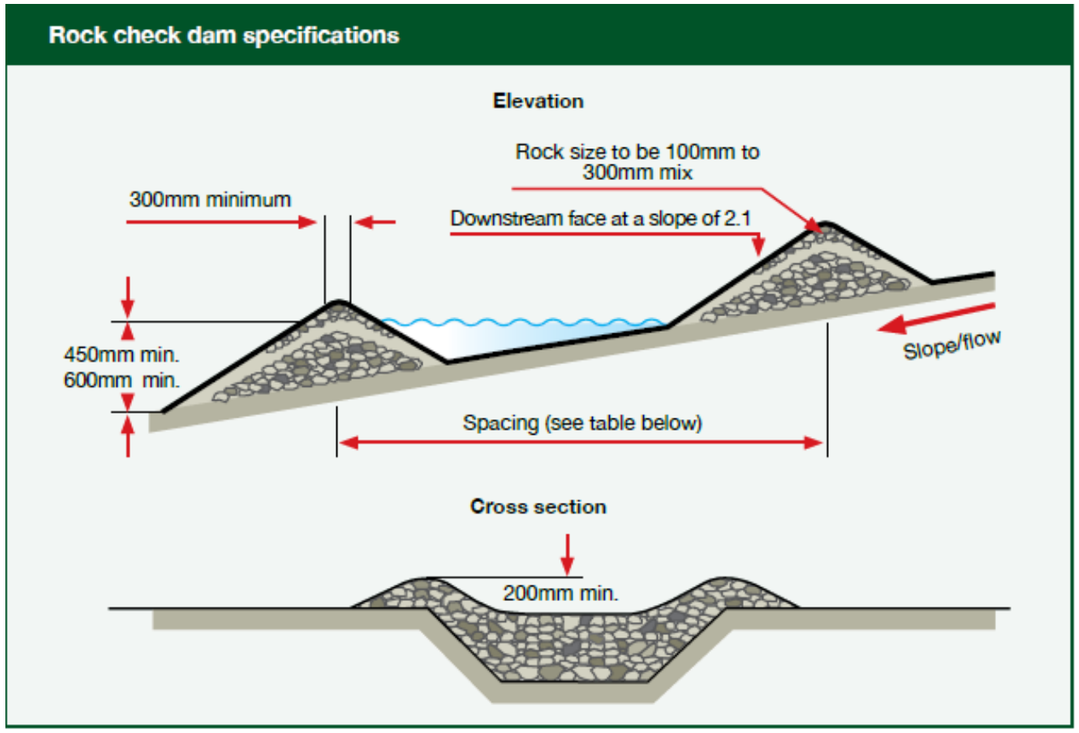
Description: Erosion and Sediment Control Plan - Schematics

Drawn	Approved	Date	Drawing Number	Revision
TG	TG	12/11/2024	ESCP - 007	H

CHECK DAMS

(Page 127 from NZFOA)

Rock check dam specifications



Slope	Spacing (m) between dams (450mm centre height)	Spacing (m) between dams (600mm centre height)
2% or less	24	30
2% to 4%	12	15
4% to 7%	8	11
7% to 10%	5	6
over 10%	Use stabilised channel	Use stabilised channel

- Check dams will be constructed out of 100 – 300 mm mix rock or sandbags.
- Check dam spacing will vary throughout the site dependant on the track gradient. Spacings shall be determined according to the table above.

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Project: Skyline – Reavers Slip Repair

Description: Erosion and Sediment Control Plan - Schematics

Drawn	Approved	Date	Drawing Number	Revision
TG	TG	12/11/2024	ESCP - 008	H

SOCKS

Pages 133-135 from NZFOA

- Culvert socks are to be installed on the outlet of culverts to protect earthworks from erosion, particularly areas of fill.
- Culvert socks will also be utilised to manipulate the culvert discharge location to reduce erosion of sensitive areas and keep flows within the same natural catchment as required.
- Culvert socks are to be clamped to the outlet of the culvert and secured to the approved location by anchoring the sock eyelets to the ground.
- Ensure the sock is installed on a slope with a minimum gradient of 5%.

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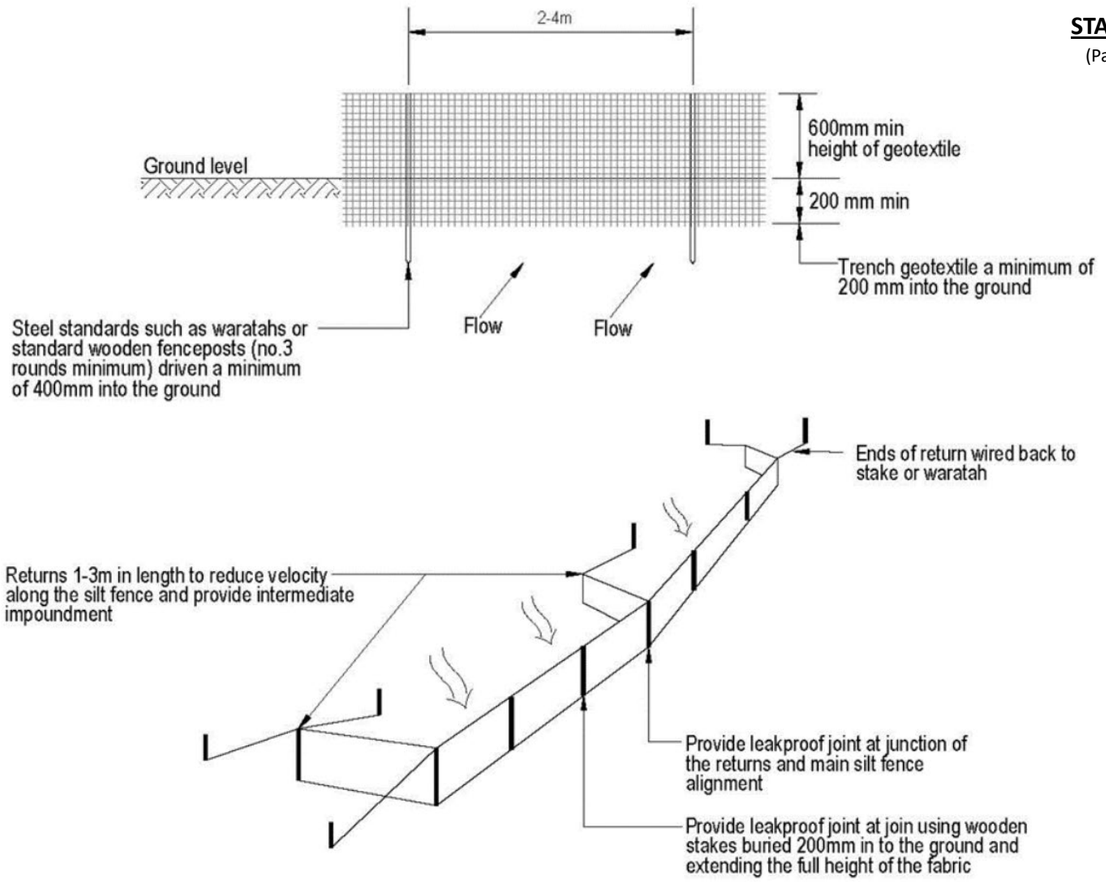
Project: Skyline – Reavers Slip Repair

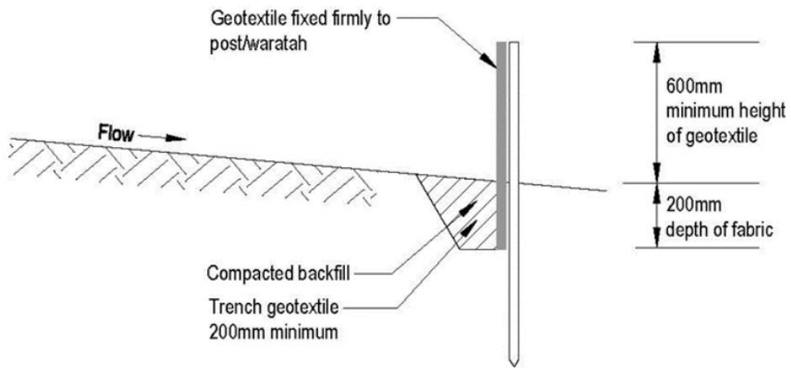
Description: Erosion and Sediment Control Plan - Schematics

Drawn	Approved	Date	Drawing Number	Revision
TG	TG	12/11/2024	ESCP - 009	H

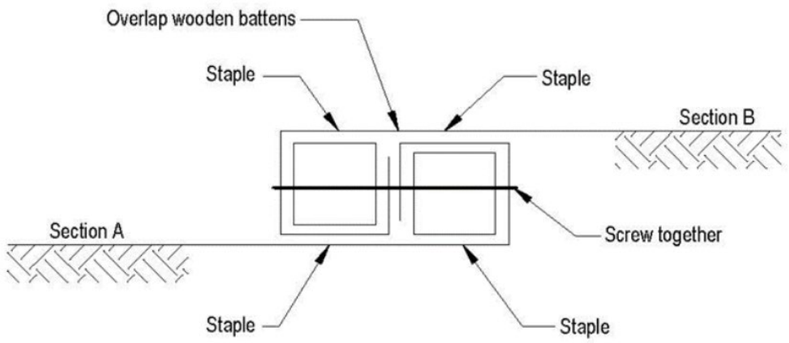
STANDARD SILT FENCE

(Page 112-119 from GD05)





Slope steepness (%)	Slope length (m) (maximum)	Spacing of returns (m)	Silt fence length (m) (maximum)
Less than 2%	Unlimited	N/A	Unlimited
2- 10%	40	60	300
10- 20%	30	50	230
20- 33%	20	40	150
33- 50%	15	30	75
Greater than 50%	6	20	40



- Ensure the silt fence is ‘keyed’ into the ground to form a good seal at ground level to capture water and avoid undermining.
- Silt fences should be 600 mm above ground level and 200 mm below ground level.
- Supporting waratahs should be placed at 2-4 m intervals.
- Returns should be formed at either end facing upslope to contain flows.
- It is also important that silt fences are installed along the contour of the slope to prevent ponding of water in a concentrated area of the fence.
- To be mucked out once 20% capacity reached.

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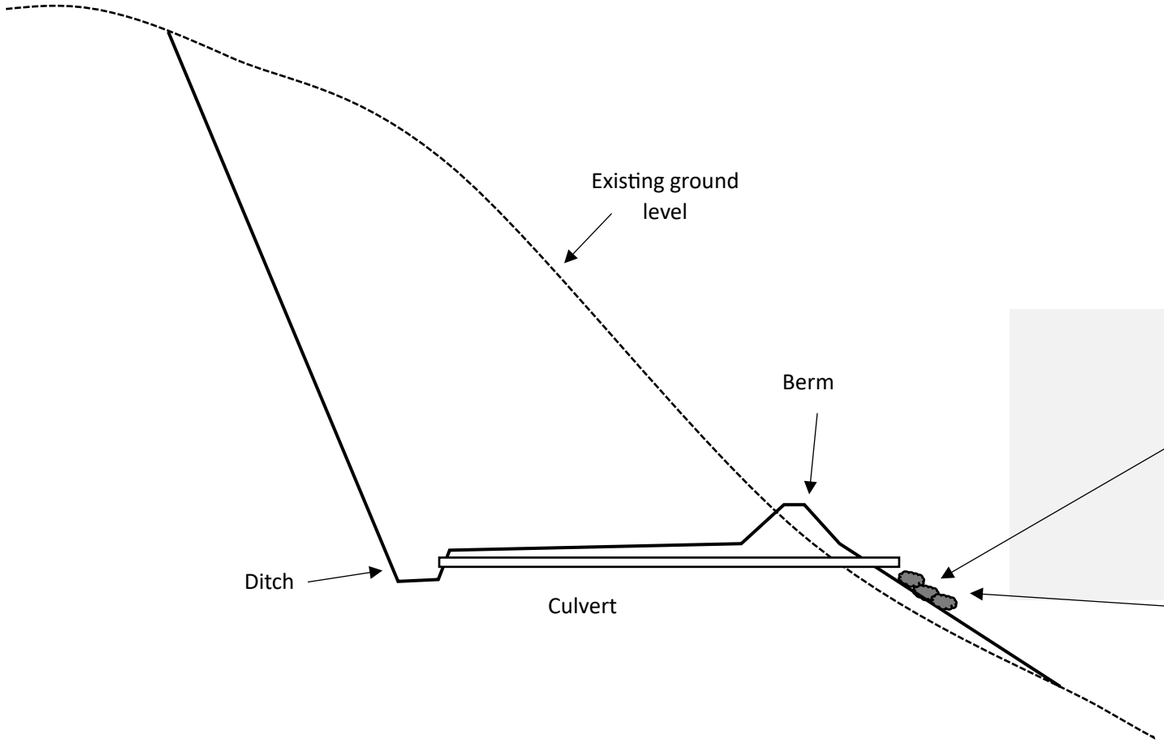
Project: Skyline – Reavers Slip Repair

Description: Erosion and Sediment Control Plan - Schematics

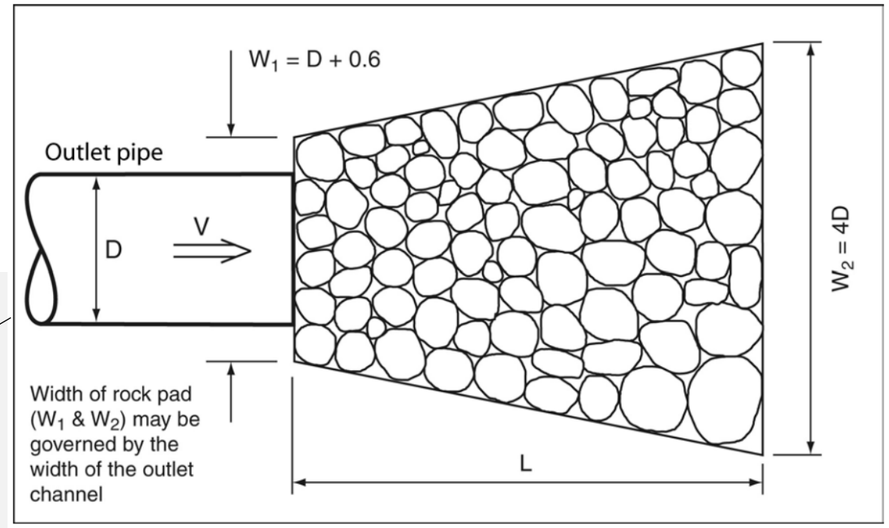
Drawn	Approved	Date	Drawing Number	Revision
TG	TG	12/11/2024	ESCP - 010	H

ACCESS TRACK CONSTRUCTION



ROCK ARMOURING CULVERT OUTLET

Page 38 of *Erosion and Sediment Control: A Field Guide for Construction Site Managers*. Catchments & Creeks Pty Limited. Witheridge, G. (2010).

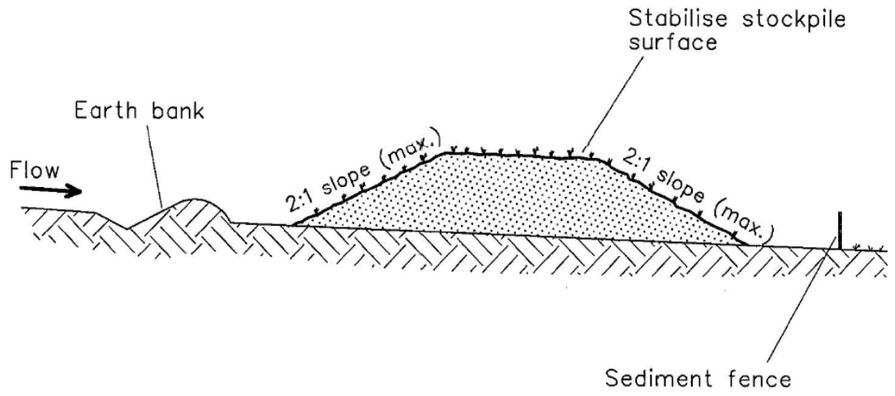


Rock armouring is to be constructed in accordance with engineering design.

Schematic sourced from: Witheridge, G. (2010). *Erosion and Sediment Control: A Field Guide for Construction Site Managers*. Catchments & Creeks Pty Limited.

enviroscope	**Project:** Skyline – Reavers Slip Repair **Description:** Erosion and Sediment Control Plan - Schematics				
	Drawn	**Approved**	**Date**	**Drawing Number**	**Revision**
	TG	TG	12/11/2024	ESCP - 011	H

TEMPORARY STOCKPILES



- Temporary stockpiles should be a maximum height of two metres to mitigate wind effects and to preserve the quality of the topsoil as future planting media for revegetation.
- If the stockpile is to be left insitu for a period of 6 weeks or more it shall be seeded with grass or erosion control matting to provide erosion and dust protection.
- A silt fence should be installed on the downslope of the stockpile.

enviroscope

Project: Skyline – Reavers Slip Repair

Description: Erosion and Sediment Control Plan - Schematics

Drawn	Approved	Date	Drawing Number	Revision
TG	TG	12/11/2024	ESCP - 012	H

REFUELING BAY

- Where possible construct a hardstand as far as practicably possible from waterways and concentrated flows.
- Ensure spill kit is located nearby.

CONCRETE WASHOUT PIT

- The concrete wash out pit consists of a plastic-lined bunded pit constructed with fill or straw bales.
- After concrete washout any water shall be left to evaporate.
- Cured concrete is to be disposed of within the plastic sheet to a licensed facility.

SPILL KITS

- One 240 L Oil and Hydrocarbon spill kit and one 240 L Chemical spill kit will be located in close proximity to the location of liquid hazardous materials storage and refuelling areas.

WASTE

- Where possible, waste shall be segregated into labelled bins.
- Wastes on site will be suitably contained and prevented from escaping off site. This may include covering skip bins during high winds.
- Waste storage is not permitted in or near drainage paths.
- Wastes will be removed from site when bin is full.

enviroscope	**Project:** Skyline – Reavers Slip Repair **Description:** Erosion and Sediment Control Plan - Schematics				
	Drawn	**Approved**	**Date**	**Drawing Number**	**Revision**
	TG	TG	12/11/2024	ESCP - 013	H

APPENDIX 2 Calculations for Erosion and Sediment Controls

CATCHMENT AND CULVERT CALCULATIONS - REAVERS SLIP REPAIR

Catchment	Individual CatchmentApprox Area (m2)	Individual Qp L/sec	Combined Catchment Area (m2)	Combined Qp L/sec	Minimum Culvert Diameter Recommended (mm)*	% Buffer on recommended culvert
1	6,800	37.1	6,800	37.1	325	834
2	2,200	12	2,200	12	325	2,786
3	600	3.3	600	3.3	325	10,482
4a	550	3	550	3	325	11,444
4b	525	2.9	1,075	5.9	325	5,860
5a	12,400	67.6	12,400	67.6	325	412
5b	600	3.3	13,000	70.9	325	388
5c	750	4.1	13,750	75	325	362
5d	1,400	7.6	15,150	82.6	325	320
6a	6,000	32.7	6,000	32.7	325	958
6b	3,300	18	9,300	50.7	325	583
7a	5,850	31.9	5,850	31.9	325	985
8a	15,000	110	15,000	110	325	200
Total	55,975					

CATCHMENT- SKYLINE - REAVERS SLIP REPAIR

Specifications	Value 1	Value 2	Value 3	Value 4	Value 5	Units	Reference/Notes
Site Details							
Contributing catchment					1.5	ha	Worst case - largest contributing catchment
Design rainfall event					0.05	AEP	
Time of Concentration							
Overland sheet flow path length (L)					135	m	
Hortons roughness value (n)					0.2		Very steep, heavily forested catchment
Slope of surface (S)					77.4	%	
Time of Concentration (Tc)					5.7	minutes	
Rounded Tc to align with HIRDS					10	minutes	10 minute minimum required if Tc <10
Rational Method: Q = (C*I*A)/360							
Area ground cover	Grass	Concrete	Forest	Shrubs	Bare soil		
Proportion of catchment	0	0	0.85	0	0.15		
Runoff coefficient (C)	0.4	1	0.6	0.5	0.9		Manning's Roughness Coefficient (n)
Rainfall intensity (I)	41.3	41.3	41.3	41.3	41.3	mm	
Catchment Area (A)	0.00	0.00	1.28	0.00	0.23	ha	
Qp (Peak runoff flow)	0.0000	0.0000	0.0878	0.0000	0.0232	m3/s	Rational Method: Q = CIA
Total Qp (Peak runoff flow)					0.1110		

CULVERT SIZING - SKYLINE - REAVERS SLIP REPAIR

Specifications	1	2	3	4	Value	Units	Reference/Notes
Pipe diameter					325	mm	
Pipe material					Drainage coil		
Pipe length					6	m	
Drop					0.2	m	
Flow velocity					4.17	m/s	
Flow discharge					0.346	m3/s	Provides necessary capacity for worse case scenario
Flow discharge in L/s					346	L/s	
Buffer					212	%	

DITCH CALCULATIONS - SKYLINE- REAVERS SLIP REPAIR

Specifications			Units	Reference/Notes
Site Details				
Contributing catchment		1.5	ha	
Design rainfall event		0.05	AEP	5% AEP as required by GD05
Time of Concentration				
Overland sheet flow path length (L)		65	m	
Hortons roughness value (n)		0.2		
Slope of surface (S)		60.0	%	
Time of Concentration (Tc)		4.7	minutes	
Rounded Tc to align with HIRDS		10	minutes	10 minute minimum required if Tc <10
Rational Method: Q = (C*I*A)/360				
Area ground cover	Bare soil	Forest		
Proportion of catchment	0.2	0.8		
Runoff coefficient (C)	0.6	0.3		Manning's Roughness Coefficient (n)
Rainfall intensity (I)	31.7	31.7	mm	NIWA HIRDS, 10 min (Tc), 5% AEP
Catchment Area (A)	0.30	1.20	ha	
Qp (Peak runoff flow)	0.0159	0.0264	m3/s	Rational Method: Q = CIA
Total Qp (Peak runoff flow)		0.0423		
Channel Design - NZFOA				Manning's Formula Uniform Trapezoidal Channel Flow
Bottom Width		600	mm	
Batter ratio= 1 to		2	ratio	
Manning's roughness coefficient of channel (n)		0.025		Gravelly earth channel
Channel slope		25	%	
Flow depth		300	mm	
Channel depth		500	mm	
Flow (Q)		2.1859	m3/s	
Buffer		5072	%	
Top width		1500	mm	
Channel Design - GDO5				Manning's Formula Uniform Trapezoidal Channel Flow
Bottom Width		200	mm	
Batter ratio= 1 to		1	ratio	
Manning's roughness coefficient of channel (n)		0.025		Gravelly earth channel
Channel slope		25	%	
Flow depth		200	mm	
Channel depth		400	mm	200 mm freeboard selected rather than 300 mm as per GD05 to reflect the significantly less intensive rain in Central Otago (approx. 50% as intense as Auckland)
Flow (Q)		0.3549	m3/s	
Buffer		740	%	
Top width		800	mm	

APPENDIX 3 Environmental Site Induction Handout

ENVIRONMENTAL SITE INDUCTION HANDOUT

Key Roles and Responsibilities

Role	Responsibilities
Project Manager	The Project Manager is responsible for the effective implementation of the EMP and has overall responsibility for the environmental performance of the project. Duties include: • Ensuring adequate resources are in place to implement the EMP. • Ensuring all staff and sub-contractors operate within the guidelines of the EMP. • Ensuring that an EMP is prepared and that environmental standards, processes and procedures meet relevant resource consent conditions. • Overseeing the successful implementation, monitoring and review of the EMP. • Ensuring that inspections are carried out in accordance with the relevant EMP. • Restricting or stopping any activity that has the potential to or has caused adverse environmental effects. • Providing notification and reporting of Environmental Incidents to Council and other environmental reports as required by The Guidelines. • Delegating authority of the above responsibilities.
Environmental Representative	The Environmental Representative supports the Project Manager in the day-to-day implementation of the EMP. Duties include: • Ensuring the installation of environmental controls as per the EMP. • Undertaking environmental site inspections. • Overseeing the maintenance and improvement of defective environmental controls. • Providing environmental inductions to all staff and sub-contractors. • Assisting the project leadership in attending to Environmental Incidents and Complaints. The Environmental Representative shall be familiar with environmental risks associated with the project, the EMP and best practice erosion and sediment control principles and practices.
All staff and sub-contractors	All staff and sub-contractors have a responsibility to undertake all activities in accordance with the requirements of this EMP. This includes reporting any activity that has the potential to or has resulted in an Environmental Incident to the Project Manager or Environmental Representative.

Key Environmental Locations

Environmentally sensitive receptors: Reavers Creek, nearby residential dwellings at the outlet of Reavers Creek, recreational users of Skylines Luging facilities, mountain bike trails and Tiki Trail.

Key Resource Consent Conditions

All resource consent conditions are important to comply with in order to avoid or mitigate adverse environmental effects.

The site EMP has been prepared in response to all environmental-related conditions of consent and therefore provides direction for how compliance with these conditions will be achieved. Provided that the EMP is followed, the project will at the same time comply with all conditions of consent.

Limits of Clearing

The sequencing of works is a key component to ensure that environmental effects of construction are appropriately managed. It is imperative that the sequencing outlined in Section 2.1 of the EMP is followed so that the site is stabilised in the most efficient manner.

All staff should be familiar with this sequence. Any potential changes to that sequence need to be approved by the Project Manager which will be discussed first with the Environmental Consultant.

Key Environmental Management Measures in EMP

Erosion and Sediment Control (Section 4 of EMP)

- Direction provided in Erosion and Sediment Control Plan (ESCP) in Appendix 1 of EMP.
- Separation of clean and dirty water is the most important principle to ensure that the contributing catchment of dirty water that needs to be treated is as small as possible.
- Progressive stabilisation (revegetation) of disturbed areas will ensure that the extent and duration of exposed soil is minimised. Keep it covered!
- All controls to be checked immediately before storm events to ensure they are in good-working order.
- Erosion and sediment control devices to remain in place until site is stabilised (defined as 80% vegetative cover).

Any works that disturb the controls outlined on the ESCP must be reinstated before moving to the next task.

Water Quality Management (Section 5 of EMP)

- Any water caught in the sediment devices to be re-used in dust suppression where possible and if required.
- Any observations of dirty water running offsite to be reported directly to the Project Manager.

Dust Management (Section 6 of EMP)

- Dust suppression should occur on any exposed soil on unsealed roads, this can be done using the water caught in the retention basin.
- Avoid all unnecessary vegetation clearing that exposes soil and work should be conducted in stages as this can increase the impact from dust in the event of strong winds.
- During high wind events and dust suppression is becoming difficult works must cease until more favourable weather conditions.
- Constant vigilance should be maintained onsite to ensure that dust is appropriately managed and weekly monitoring should be completed to ensure that management measures are effective.

Noise and Vibration Management (Section 7 of EMP)

- Noise producing works only be undertaken during the hours of 0730-1800 from Monday-Saturday and no works to be completed on Sundays or public holidays.
- Particularly noisy work should be completed during the middle of the day during business hours.
- Noise dampening should occur when possible.
- Weekly site inspections should be undertaken by the Environmental Representative to ensure the strategies in place are effective.

Historic Heritage Management (Section 8 of EMP)

- If any artefacts are found works must stop within 20 meters of the discovery and the site manager notified immediately.
- The site manager must then secure the area and notify the Heritage New Zealand Regional Archaeologist, who will advise when works can begin again.

Vegetation Management (Section 9 of EMP)

- Maintain vegetated surfaces as far as reasonably possible.
- Maintain protected or indigenous vegetation.
- Complete all landscaping and or ecological restoration in accordance with approved plans.

Chemicals and Fuel Management (Section 10 of EMP)

- Chemicals and fuels are stored and used so not to cause contamination of works areas and surrounding environment.

Waste Management (Section 11 of EMP)

- Waste management on site will ensure wastes are stored safely and in an organised manner until recycling, reuse or disposal.

Contaminated Land Management (Section 12 of EMP)

- Prevent spread of contamination.
- Engage the Environmental Consultant (SQEP) to ensure that the site can be managed in accordance with statuary requirements (i.e., National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health).

Environmental Incidents

The procedure for managing environmental incidents is outlined in Section 3.5 of the EMP, however these can be summarised as follows:

- Environmental incidents must be reported as soon as they occur, and the Project team must respond immediately to mitigate further environmental impacts.
- Investigation into the cause of the incident should be completed and a solution should be constructed to remediate the Environmental damage.
- The Project Manager must then notify the QLDC and/or the ORC of the details of the incident within

12 hours of being made aware of the incident.

Rapid Response for Storm Events

The procedure for rapid response to storm events is outlined in Section 4.6 of the EMP, however these can be summarised as follows:

- The Project Manager will observe and understand the **weather forecast** throughout the project to ensure appropriate preparation onsite.
- If a **significant storm** event is forecast all works should stop within an appropriate amount of time to inspect ESC devices and undertake any maintenance or site stabilisation required.
- The sediment controls should be in operating condition and fully functional.
- During the storm event the site should be monitored to sure the functioning of the ESC devices and maintained if required.

When storms are forecast it is crucial that tools are downed in time for the rapid response procedure to be implemented. This will help avoid environmental incidents, potential enforcement action and site shutdown.

APPENDIX 4 Environmental Site Induction Register

Skyline – Reavers Slip Repair

ENVIRONMENTAL SITE INDUCTION REGISTER

Name	Organisation	Date Inducted	Induction Delivered by	Signature

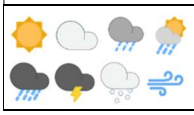
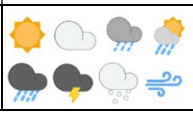
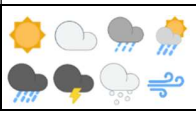
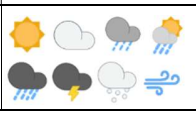
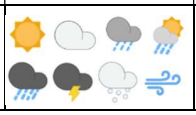
APPENDIX 5 Weekly Environmental Site Inspection Form

Skyline – Reavers Slip Repair

WEEKLY ENVIRONMENTAL SITE INSPECTION FORM

Environmental Representative: Date:

Item	Yes	No	Comment
General			
Is the EMP available onsite?	☐	☐	
Have any environmental incidents occurred during the week? If so, provide details	☐	☐	*If yes, complete environmental incident report.
Complete description of weather for upcoming week – circle applicable			

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
						

Are there any rain events forecasted for the coming week?	☐	☐	
Have pre rain event inspections been completed?	☐	☐	
Have post rain event inspections been completed?	☐	☐	
Water Quality			
Is water quality monitoring occurring when water is flowing across the site boundaries?	☐	☐	*If yes, complete water quality monitoring form
Is there visual evidence of sediment from the construction site entering Reavers Creek?	☐	☐	
Erosion and Sediment Control			
Are works contained within the current stage and site boundaries?	☐	☐	
Are completed areas being progressively stabilised?	☐	☐	
Is there any new evidence of erosion?	☐	☐	
Are erosion and sediment controls installed as per the ESCP?	☐	☐	
Is dirty water entering ditches during rain events?	☐	☐	
Do sediment controls have over 80% capacity?	☐	☐	
Cultural Heritage			
Have any finds of cultural significance been found?	☐	☐	

Skyline – Reavers Slip Repair

Item	Yes	No	Comment
Noise and Vibration			
Have any complaints been received during the week?	☐	☐	*If yes, complete Complaints Register
Are nearby sensitive receptors being notified before significant noise and/or vibration causing activities?	☐	☐	
Are works only occurring within the hours of operation?	☐	☐	
Dust			
Have any complaints been received during the week?	☐	☐	*If yes, complete Complaints Register
Have completed areas been revegetated or stabilised?	☐	☐	
Is dust suppression of disturbed work areas and stockpiles occurring?	☐	☐	
Are works ceasing during high winds?	☐	☐	
Are only designated access points and haul routes being used?	☐	☐	
Is the site access and surrounding roads swept clean of sediment?	☐	☐	
Vegetation			
Are vegetated surfaces being maintained as far as reasonably possible?	☐	☐	
Contaminated Soils			
Have any contaminants been uncovered during excavations?	☐	☐	
Chemicals and Fuels			
Are all hazardous substances on site stored, transported and used according to the safety data sheet requirements?	☐	☐	
Are vehicles and plant being refuelled in the refuelling bay?	☐	☐	
Is concrete washing being undertaken in the concrete wash-out pit?	☐	☐	
Is there an adequate supply of spill kits onsite? Have any used materials been replaced?	☐	☐	
Waste			
Is the site in a safe, clean and tidy state?	☐	☐	
Are wastes segregated into labelled bins with lids?	☐	☐	
Are skip bins not overfilled?	☐	☐	

Item	Yes	No	Comment
Is waste removed from open drains and drainage paths?	☐	☐	

Actions resulting from this inspection must be forwarded to the Project Manager any actions should be recorded in the Non-Conformance Register – Appendix 8.

Additional Comments:

Names and Signatures of inspection attendees:

APPENDIX 6 Environmental Incident Report Form

Skyline – Reavers Slip Repair

ENVIRONMENTAL INCIDENT REPORT FORM

Project Address: 53 Brecon Street, Queenstown 9300	**Consent Number:** TBC
Brief Project Description: Debris removal and remedial works for the upper reavers landslip at Skyline	

Instructions- Complete this form for all environmental incident that cause contaminants (including sediment) or environmental nuisance to leave the site. Be succinct, stick to known facts and do not make assumptions. Once completed submit to Queenstown Lakes District Council at RCMonitoring@qldc.govt.nz and Otago Regional Council at pollution@orc.govt and compliance@orc.govt.nz. Call the QLDC Regulatory team immediately on 03 441 0499 and ORC's Pollution Hotline on 0800 800 033 for any serious or ongoing incidents that cannot be brought under immediate control.

Date and Time	Date: XX/XX/XXX Time: XX:XX hours
Description? Provide a brief and factual description of what happened during the incident, include relevant details such as: - The activity being undertaken when the incident occurred - The estimated distance to nearest waterway (include stormwater and dry courses) - The estimated distance to the nearest sensitive receiver Sketches/diagrams/photos may be referenced and appended to this report to aid in the description of the incident.	
Exact Location of the incident? Include address, landmarks, features, nearest tree, etc. Maps and plans can be attached.	
Quantity or volume of material escaped or causing incident? (provide and estimate quantity)	
Who identified the incident?	Contractor ☐ Council ☐ Community ☐ Other ☐

What immediate actions/control measures were taken to rectify or contain the incident?
What initial corrective action will be taken to prevent similar incidents recurring in the near future?
Has the Queenstown Lakes District Council been notified? Yes ☐ No ☐ Will be notified ☐ **Has the Otago Regional Council been notified?** Yes ☐ No ☐ Will be notified ☐

Role of person making report: Project Manager / Site Supervisor / Environmental Representative / SQEP	
Name……..	Signature……
Organisation……..	Date……
Mobile phone number……	

APPENDIX 7 Environmental Complaints Register

Skyline – Reavers Slip Repair

ENVIRONMENTAL COMPLAINTS REGISTER

Complaint #	Date and Time Received	Complainant details (name, address, phone number)	Details of Complaint	Investigation and Findings	Outcome	Close out Date

APPENDIX 8 Environmental Non-Conformance Register

Skyline – Reavers Slip Repair

ENVIRONMENTAL NON-CONFORMANCE REGISTER

Ref Number	Date Observed	Found via (e.g., inspection, monitoring, complaint?)	Details of Non-conformance	Corrective Actions	Updated by	Close out Date

APPENDIX 9 Water Quality Monitoring Results Form

WATER QUALITY MONITORING RESULTS FORM

Date		Monitoring Trigger		Location Description	
			Yes	No	Measurement
Has there been any conspicuous change in colour or visual clarity in receiving waters below the works extent?			☐	☐	
Is the pH of the water between 5.5-8.5?*			☐	☐	pH ____
Are hydrocarbons visible?			☐	☐	
Are tannins visible in the water?			☐	☐	
Is there any waste in the water?			☐	☐	
Description of any non-conformance and actions required: •					
Include images of sampling location:					

*Enviroscope can provide Water Quality Monitoring services to measure turbidity and pH.

Skyline – Reavers Slip Repair

HOW TO: WATER QUALITY SAMPLING

1. Select a Sampling Location

Sampling a discharge

Collect sample where water crosses the site boundary or enters a sensitive receptor from a retention device. Always photograph the location you sample from.

Sampling a waterway

Collect sample from the centre of the flow and the top third of the water column where possible.

Sampling a from a Sediment Retention Device

Collect sample from the discharge location, this is either near the decanting arms, spillway, hose or the outlet pipe.

2. Collect a Water Sample

Taking a Water Sample

- ➔ Label container with site name, sampling location, date and time taken.
- ➔ Fill the container with water from the surface of your sampling location.

If you wade into the water to collect the sample, always collect the sample 'upstream' of where you're standing to avoid contamination by disturbed sediment.

Always ensure your meters are calibrated regularly to ensure accurate sampling results.

3. Measure and Record Clarity, and pH

Measuring Clarity

- ➔ Lower the seechi disc into the water sample until you can no longer see the disc. Then lift the seechi disc back up until the disc is just visible. Record the number where the water level sits.

Measuring pH using a pH Meter

- ➔ Submerge the probe of the pH meter into the water sample. Keep the probe in the water until the value on the meter is fixed. Swirling the probe can help the value fix faster. Record the pH value.

APPENDIX 10 Archaeological Discovery Protocol

HERITAGE NEW ZEALAND
POUHERE TAONGA

Heritage New Zealand Pouhere Taonga Accidental Discovery Protocol

This protocol does not apply when an archaeological authority issued under the Heritage New Zealand Pouhere Taonga Act 2014 is in place.

Under the Heritage New Zealand Pouhere Taonga Act (2014) an archaeological site is defined as any place in New Zealand that was associated with human activity that occurred before 1900 and provides or may provide, through investigation by archaeological methods, evidence relating to the history of New Zealand. For pre-contact Māori sites this evidence may be but is not limited to, bones, shells, charcoal, stones etc. In later sites of European/Chinese origin, artefacts including but not limited to bottle glass, crockery etc. may be found, or evidence of old foundations, well, drains, or similar structures. Burials/kōiwi may be found in association with any of these cultural groups.

In the event that an unidentified archaeological site is located during works, the following applies;

1. Work shall cease immediately at that place and within 20m around the site.

2. The contractor must shut down all machinery, secure the area, and advise the Site Manager.

3. The Site Manager shall secure the site and notify the Heritage New Zealand Regional Archaeologist. Further assessment by an archaeologist may be required.

4 If the site is of Māori origin, the Site Manager shall notify the Heritage New Zealand Regional Archaeologist and the appropriate papatipu rūnaka of the discovery and ensure site access to enable appropriate cultural procedures and tikaka to be undertaken, as long as all statutory requirements under legislation are met (*Heritage New Zealand Pouhere Taonga Act*, *Protected Objects Act*).

5. If human remains (kōiwi) are uncovered the Site Manager shall advise the Heritage New Zealand Regional Archaeologist, NZ Police and the appropriate papatipu rūnaka and the above process under 4 shall apply. Remains are not to be moved until such time as papatipu rūnaka and Heritage New Zealand have responded.

6. Works affecting the archaeological site and any human remains (kōiwi) shall not resume until Heritage New Zealand Pouhere Taonga gives written approval for work to continue. Further assessment by an archaeologist may be required.

7. Where iwi so request, any information recorded as the result of the find such as a description of location and content, is to be provided for their records.

8. Heritage New Zealand Pouhere Taonga will advise if an archaeological authority under the *Heritage New Zealand Pouhere Taonga Act* 2014 is required for works to continue.

It is an offence under S87 of the *Heritage New Zealand Pouhere Taonga Act 2014* to modify or destroy an archaeological site without an authority from Heritage New Zealand irrespective of whether the works are permitted or consent has been issued under the Resource Management Act.

Heritage New Zealand Pouhere Taonga Archaeologist contact details:

Nikole Wills
Regional Archaeologist Otago/Southland
Heritage New Zealand
PO Box 5467
Dunedin
Ph. +64 3 470 2364, mobile 027 240 8715
Fax. +46 3 477 3893
nwills@heritage.org.nz

Aukaha
KIA KAHA, AU KAHA

Aukaha ref. TAI6152

2 DECEMBER 2024

Skyline Enterprises Limited
PO Box 17
QUEENSTOWN 9348

Attention: Sean Dent (Consultant – Southern Planning Group)
Via email: <sean@southernplanning.co.nz>

Tēnā koe –

Resource Consent Applications – Skyline Enterprises: To remove a temporary debris flow barrier, to undertake earthworks for debris removal and track reinstatement (QLDC RM240657, ORC RM24.495); to alter the bed of Reavers Creek bed, undertake earthworks to remove debris material in the bed and upper slopes via hand excavation and removal by helicopter (QLDC RM240658, ORC RM24.493) – at Ben Lomond Recreation Reserve and Reavers Creek, Queenstown.

Te Rūnanga o Ōtākou, Kāti Huirapa Rūnaka ki Puketeraki, Hokonui Rūnanga, and Te Rūnanga o Moeraki ('**Kā Rūnaka**') understand that Skyline Enterprises applies to Queenstown Lakes District Council ('**QLDC**') and Otago Regional Council ('**ORC**') to undertake the following activities in upper Reavers Creek and Ben Lomond Recreation Reserve, Queenstown:

- *Removal of debris bulb, removal of temporary debris flow barrier, and re-instatement of tracks in Upper Reavers Creek*:
    - **QLDC RM240657**: To remove a temporary debris flow barrier, to undertake earthworks for debris removal and track reinstatement.
    - **ORC RM24.495**: To remove a defence against water and to discharge sediment to land where it may enter water whilst undertaking earthworks.

- *Hand excavation of material on lower slopes and bed of Reavers Creek and removal by helicopter*:
    - **QLDC RM240658**: To undertake earthworks to remove debris material in the Reavers Creek bed and upper slopes via hand excavation, and removal by helicopter.
    - **ORC RM24.493**: To alter the bed of Reavers Creek and undertake earthworks for debris removal.

The applications have arisen in relation to debris flow that was catalysed by the September 2023 rainfall event in Queenstown. This debris flow concerned stockpiled material[1] in the Ben Lomond Recreation Reserve that was mobilised onto the slopes below. This led some material to enter Reavers Creek and to inundate a QLDC stormwater pipe.

Kā Rūnaka note that written approval was provided to QLDC to retrospectively authorise the construction of a debris flow barrier in lower Reavers Creek, and those works were also deemed as emergency works per s330A RMA (applications RM240181 and RM24.159 in the name of QLDC– Aukaha ref. TAI5648).

The Affected Parties – Kāi Tahu Papatipu Rūnaka

Aukaha writes this letter on behalf of Te Rūnanga o Ōtākou, Kāti Huirapa Rūnaka ki Puketeraki, Hokonui Rūnanga, and Te Rūnanga o Moeraki, whose takiwā includes the subject site and the landscape in which it is situated.

Kā Rūnaka share an area of interest in the inland roto and mauka with Kāi Tahu papatipu rūnaka within Otago, and with those papatipu rūnaka located beyond the boundaries of the Otago region. Kā Rūnaka represent hapū who uphold the mana of the whenua in this district, and interests in the inland lakes and mountains and along the Mata-au are shared with Ngāi Tahu ki Murihiku.

Representatives for Kā Rūnaka have received and provided direction on the present applications.

Comment on applications

The applications arise in an area of historic and contemporary cultural significance for Kā Rūnaka, as recognised via Wāhi Tūpuna mapping under the QLDC Proposed District Plan in which the subject site occurs in the mapped area of **Te Taumata o Hakitekura** (Wāhi Tūpuna ID 27).

Recorded values for Te Taumata o Hakitekura include:

- Whakapapa, rakatirataka, kaitiakitaka, mana, mauri. Wāhi taoka, wāhi tapu.

Recorded threats for Te Taumata o Hakitekura include:

a. Exotic species including wilding pines;
b. Buildings and structures, utilities;
c. New roads or additions/alterations to existing roads, vehicle tracks and driveways;
d. Activities affecting the ridgeline and upper slopes

The land use and land management practices that contributed to the flood event, and the debris removal earthworks now required to remediate the catchment,[2] can be identified within the listed Threats (a), (b), and (d) to the Values of Te Taumata o Hakitekura Wāhi Tūpuna.

It is the vision and the expectation of Kā Rūnaka that habitats and land are restored to uphold and enhance the mauri of the wai in the Reavers Creek and Horn Creek catchments.

[1] It is understood that the stockpiled material was related to works carried out by Skyline Enterprises Limited.

[2] Applications RM240657 and RM240658, respectively, require resource consent under QLDC PDP Rule 25.4.2 for earthworks associated with the removal and deposition of material deposited by a natural hazard event that do not comply with Standard 25.5.10A in Table 25.2 as there are more than 10m^3 of earthworks being undertaken in the mapped Wāhi Tupuna Te Taumata o Hakitekura (ID: 27).

Decision

In this instance, Kā Rūnaka reluctantly **provide written approval** to the proposed activities as applied for.

It is understood that the QLDC classifies the site as a "high risk site" for earthworks. Land management practices, and environmental management protocols under the QLDC and ORC consents, should take all steps to avoid and prevent discharges of sediment-laden water into water.

This letter is specific to the above application and any changes made to the application will require further consultation with Kā Rūnaka.

I have the authority to sign on behalf of Te Rūnanga o Ōtākou, Kāti Huirapa Rūnaka ki Puketeraki, Hokonui Rūnanga, and Te Rūnanga o Moeraki.

Nāku noa, nā

Dr Kate Timms-Dean
General Manager
Mana Taiao

Address for Service
Aukaha
PO Box 446
Dunedin 9054
Phone: *(03) 477 0071*
E-mail: consents@aukaha.co.nz

cc Te Rūnanga o Ōtākou
Kāti Huirapa Rūnaka ki Puketeraki
Hokonui Rūnanga
Te Rūnanga o Moeraki

AFFECTED PERSON'S APPROVAL

FORM 8A

QUEENSTOWN LAKES DISTRICT COUNCIL

Resource Management Act 1991 Section 95

RESOURCE CONSENT APPLICANT'S NAME AND/OR RM

Skyline Enterprises Limited - RM240658

AFFECTED PERSON'S DETAILS

I/We Bungy New Zealand Limited

Are the owners/occupiers of

Ben Lomond Recreation Reserve and operators of the ledge bungy.

DETAILS OF PROPOSAL

I/We hereby give written approval for the proposal to:

Resource consent is sought to undertake earthworks being the removal of the mobilised material that sits in the Reavers Creek catchment, both in the waterbody itself and on the slope between the temporary upper debris flow barrier and Ravers Creek.
The proposal will involve helicopter removal of approximately 300m3 of material from the Reavers Creek catchment.

at the following subject site(s):

Ben Lomond Recreation Reserve, Queenstown

☑ PLEASE TICK I/We understand that by signing this form Council, when considering this application, will not consider any effects of the proposal upon me/us.

☑ PLEASE TICK I/We understand that if the consent authority determines the activity is a deemed permitted boundary activity under section 87BA of the Act, written approval cannot be withdrawn if this process is followed instead.

WHAT INFORMATION/PLANS HAVE YOU SIGHTED

☑ PLEASE TICK I/We have sighted and initialled ALL plans dated and approve them.

attached + full AEE

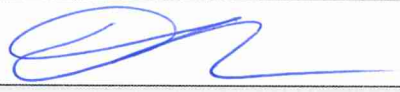
APPROVAL OF AFFECTED PERSON(S)

The written consent of all owners / occupiers who are affected. If the site that is affected is jointly owned, the written consent of all co-owners (names detailed on the title for the site) are required.

A

Name (PRINT): DAVID MITCHELL, CEO, BUNZL NZ

Contact Phone / Email address: 027 515 9485

Signature: 

Date: 29/10/24

B

Name (PRINT):

Contact Phone / Email address:

Signature:

Date:

C

Name (PRINT):

Contact Phone / Email address:

Signature:

Date:

D

Name (PRINT):

Contact Phone / Email address:

Signature:

Date:

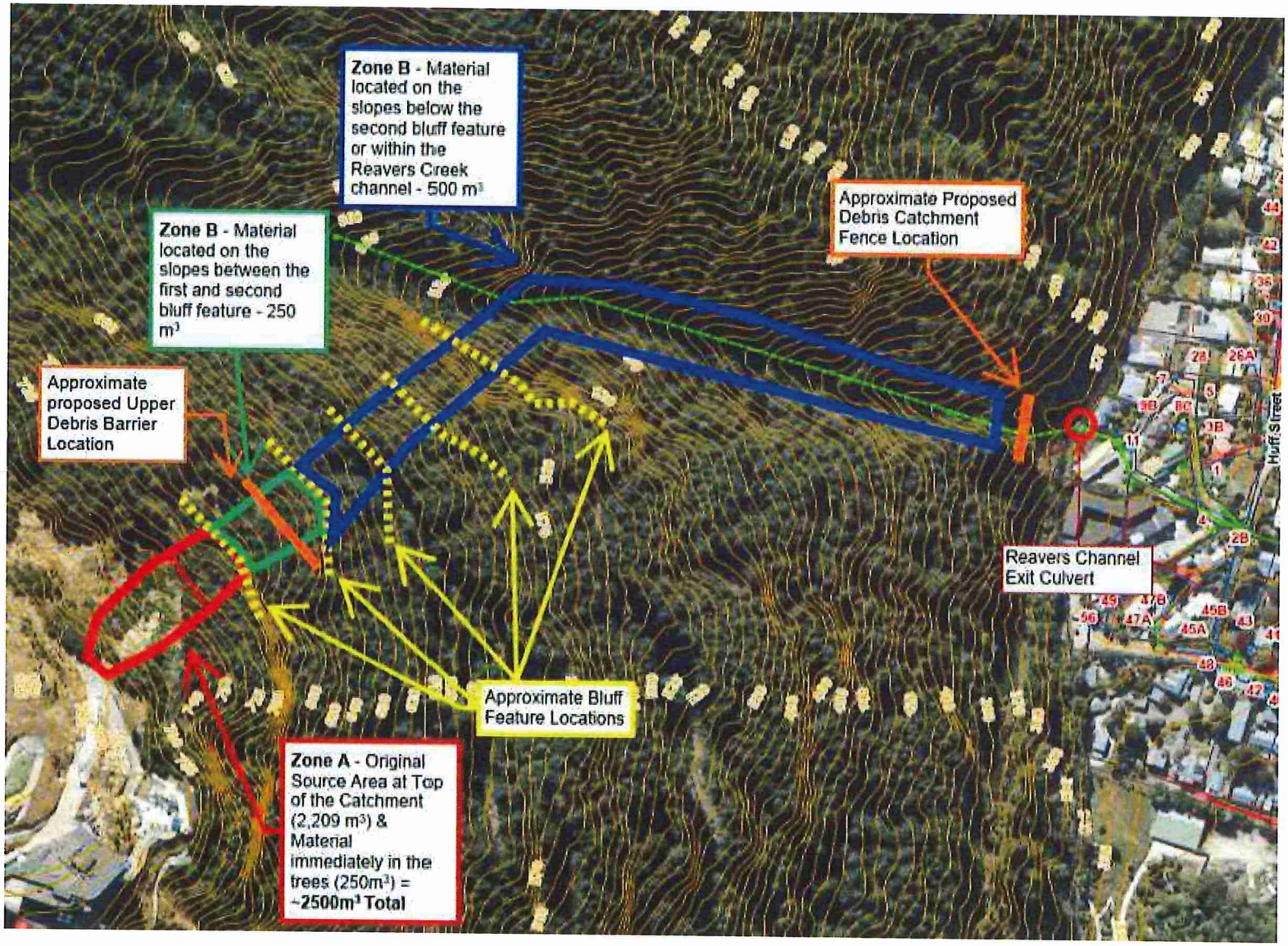
Note to person signing written approval

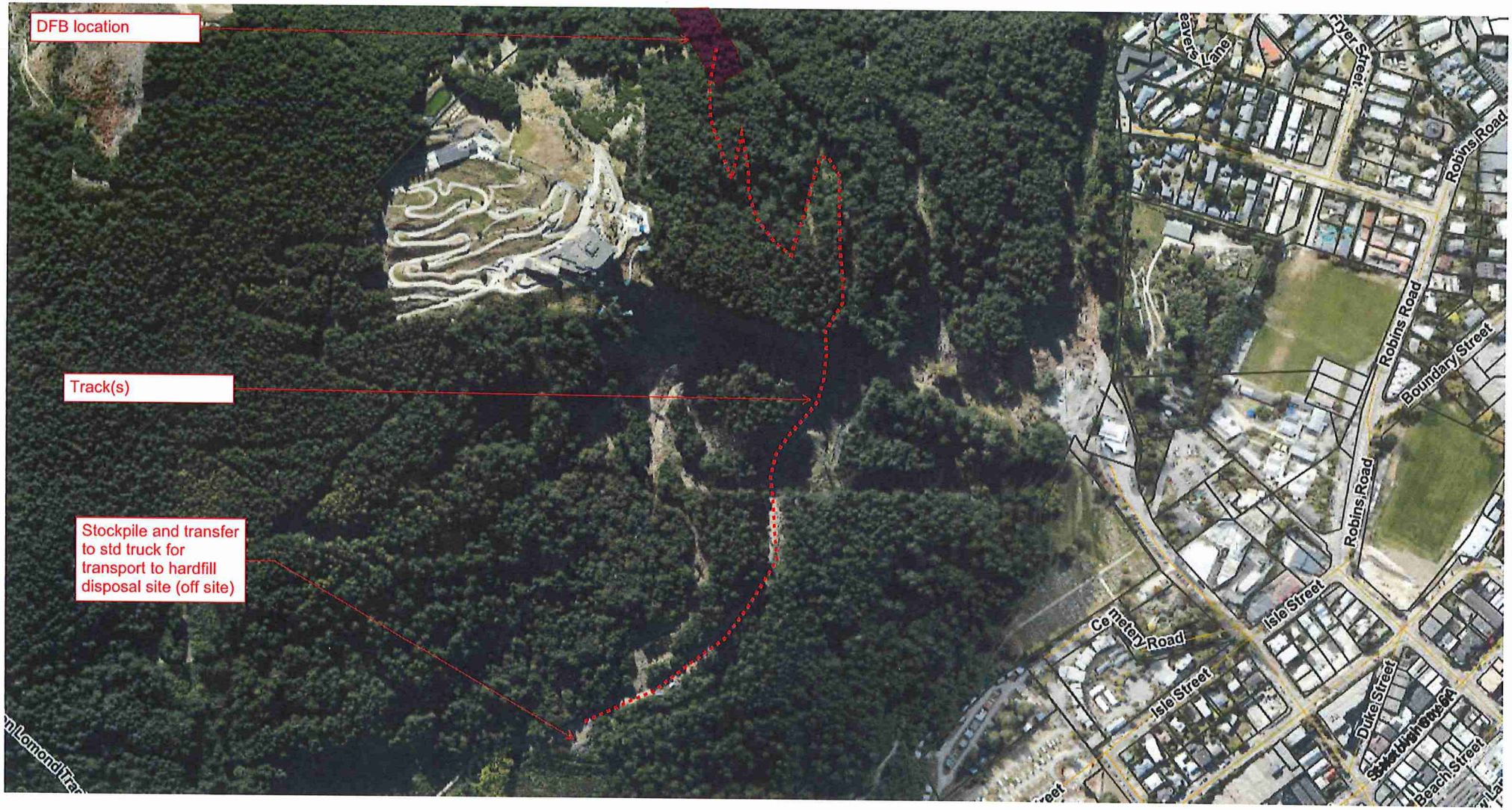
Conditional written approvals cannot be accepted.

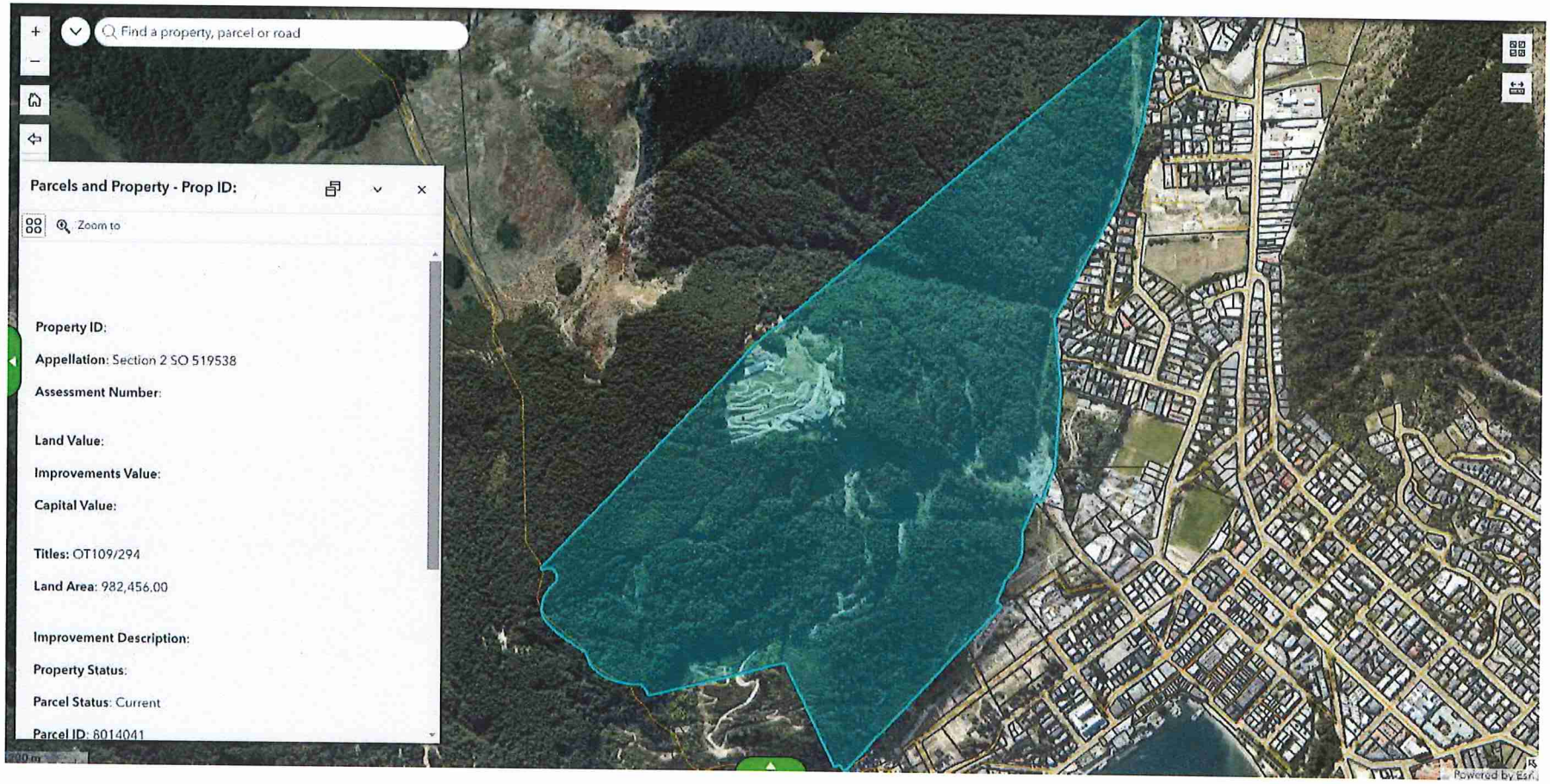
There is no obligation to sign this form, and no reasons need to be given.

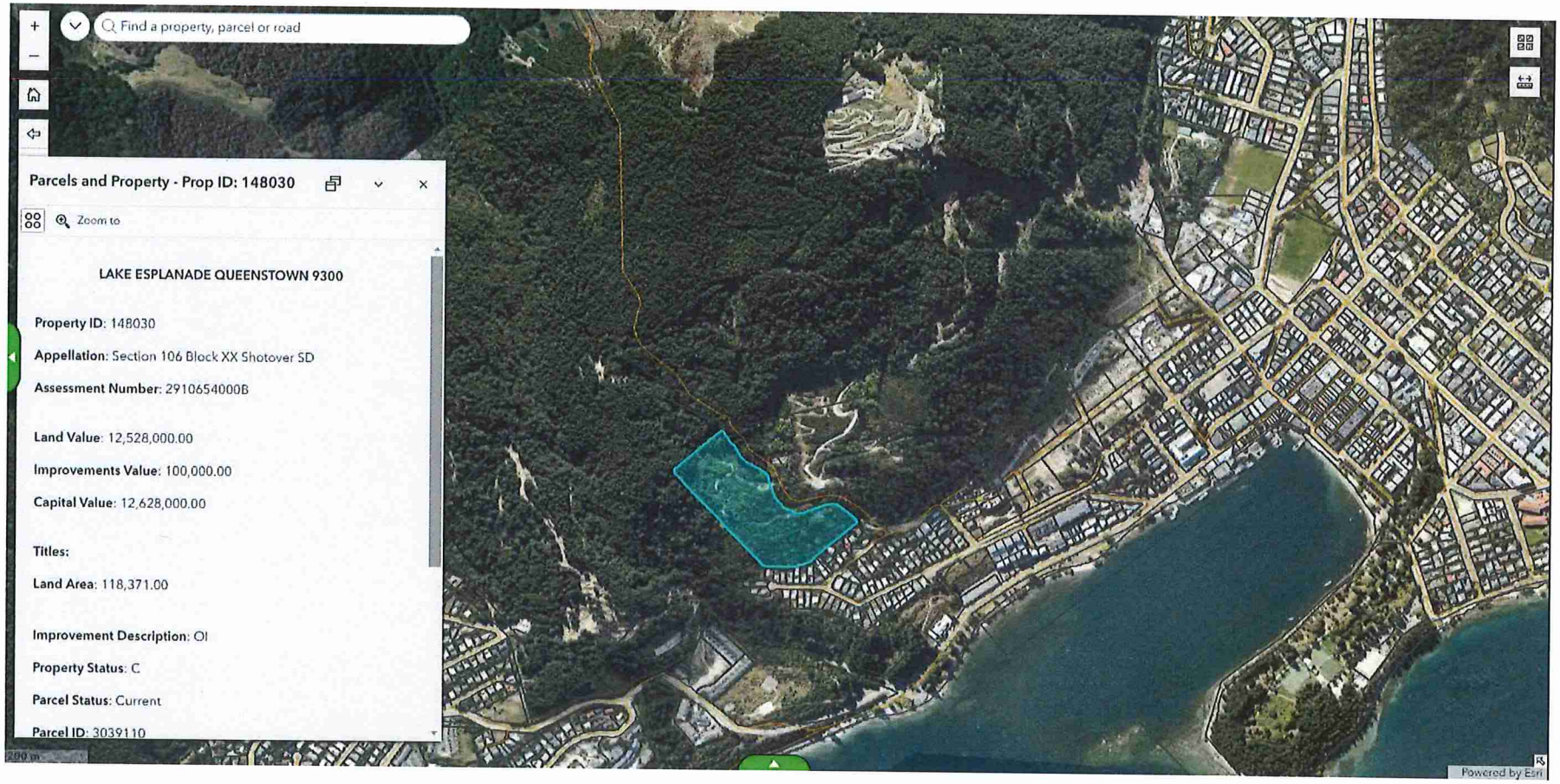
If this form is not signed, the application may be notified with an opportunity for submissions.

If signing on behalf of a trust or company, please provide additional written evidence that you have signing authority.


Zone B - Material located on the slopes below the second bluff feature or within the Reavers Creek channel - 500 m³
Zone B - Material located on the slopes between the first and second bluff feature - 250 m³
Approximate Proposed Debris Catchment Fence Location
Approximate proposed Upper Debris Barrier Location
Reavers Channel Exit Culvert
Approximate Bluff Feature Locations
Zone A - Original Source Area at Top of the Catchment (2,209 m³) & Material immediately in the trees (250m³) = ~2500m³ Total
Huff's Creek


DFB location
Track(s)
Stockpile and transfer to std truck for transport to hardfill disposal site (off site)
Robins Road
Boundary Street
Isle Street
Cemetery Road
Duke Street
Beach Street


Find a property, parcel or road
Parcels and Property - Prop ID:
Zoom to
Property ID:
Appellation: Section 2 SO 519538
Assessment Number:
Land Value:
Improvements Value:
Capital Value:
Titles: OT109/294
Land Area: 982,456.00
Improvement Description:
Property Status:
Parcel Status: Current
Parcel ID: 8014041
Powered by Esri


Find a property, parcel or road
Parcels and Property - Prop ID: 148030
Zoom to
LAKE ESPLANADE QUEENSTOWN 9300
Property ID: 148030
Appellation: Section 106 Block XX Shotover SD
Assessment Number: 2910654000B
Land Value: 12,528,000.00
Improvements Value: 100,000.00
Capital Value: 12,628,000.00
Titles:
Land Area: 118,371.00
Improvement Description: OI
Property Status: C
Parcel Status: Current
Parcel ID: 3039110
Powered by Esri