CONCESSION APPLICATION

Waka Kotahi NZ Transport Agency
Homer Tunnel Avalanche & Rockfall Protection Structure and Associated Works

State Highway 94 and Fiordland National Park

3 JUNE 2022

Concession Application under Section 17O of the Conservation Act 1987 (Forms 1a, 3b, 7a and Easement)

To: Planning, Permissions & Land
Department of Conservation
PO BOX 5244
Dunedin 9058
Attention: Lisa Wheeler - Senior Permissions Advisor

From: Waka Kotahi NZ Transport Agency
PO Box 1479
Christchurch 8011
Attention: Gemma Kean – Senior Planner, Environmental Planning

Contact Person/Agent (Address for Service):

WSP
Christchurch Office
21 Moorhouse Avenue
Christchurch 8011
Attention: George Enersen

[redacted]
Email george.enersen@wsp.com

FORM 1a – Department of Conservation Contact Information Form

A. Applicant Details
Legal Status of Applicant
OTHER: Crown Entity – Waka Kotahi NZ Transport Agency

1. **Applicant Name (Individual)**
Phone/Email/Address:

Waka Kotahi NZ Transport Agency
PO Box 1479
Christchurch 8011
Attention: Gemma Kean – Senior Planner, Environmental Planning
Phone: [redacted]
E mail: gemma.kean@nzta.govt.nz

2. **Applicant Name (Other)**
Trading/NZBN/Office/Phone/Contact – refer A.1. above.
Website: Home | Waka Kotahi NZ Transport Agency (nzta.govt.nz)

B. Pre-Application Meeting
Have you had a pre-application meeting or spoke to someone at DOC?
YES
Date: 27/01/2022

Name of Doc Staff Member: Lisa Wheeler, Senior Permissions Advisor Dunedin Office +64 [redacted] (among other staff)

Name of Applicants Representative

Gemma Kean, Poutiaki Taiao | Environmental Planning, Christchurch
Phone: 64 3 740 4053 Mobile: [redacted]

C. Activity applied for:

FORM 1a – use of public conservation land for private/commercial facility/structure
FORM 3b – new permanent structure in Fiordland National Park.
FORM 7a – ‘other’
EASEMENT – new structure in FNP and longer-term use.

DESCRIPTION: to construct an avalanche and rockfall protection structure up to 80m long and ancillary works including excavation of material and bulk filling over the structure and the placement of rock rip rap for scour protection within and adjacent to State Highway 94 (SH94) and within Fiordland National Park (FNP).

Refer to Section 4 of the attached report for further detail.

The objectives of the proposed work are:

- To reduce the risk of avalanche and rockfall hazards to safety equipment required to operate the tunnel
- To reduce the risk to personnel servicing the safety equipment
- To reduce the ongoing risk to users of SH94
- To improve the resilience of SH94 at the Homer Tunnel eastern portal.

The proposed work is reasonably necessary for achieving these objectives for the reasons set out in the AEE.

D. Are you applying for anything else?
Are you submitting any other application forms in relation to this application?

YES

- Form 3b &
- Application for easement on public conservation land

E. Background experience of the applicant:

Waka Kotahi NZ Transport Agency is a Crown entity with its objective, functions, powers and responsibilities set out in the Land Transport Management Act 2003 and the Government Roading Powers Act 1989.

Waka Kotahi currently holds long-term concession PAC-40-18-14 for sites associated with maintenance of SH94, with the East Homer site being a gravel storage area. The Alpine Traffic Operations Centre (ATOC) or more commonly referred to as the ‘Chapel’ or ‘Green shed’ site is leased and activities licensed to Waka Kotahi by DOC under Concessions PAC14-80-40 and 52442-OTH.

The site has been actively managed by Waka Kotahi and its contractor Downer over the past 50 years, latterly under partnership as Milford Road Alliance.

F. Attachments

The following attachments are appended in support of this concession application:

Appendix A – Construction Drawings

Appendix B – Statutory Rules Assessment

Appendix C – Detailed Site Investigation

Appendix D – Lizard Assessment

Appendix E – Rock Wren Assessment

Appendix F – Heritage Assessment

Appendix G – Landscape and Visual Assessment + Visualisations

Appendix H – Accidental Discovery Protocols

Appendix I – Kea Protocols

Appendix J – Records of Consultation

Appendix K – Objectives and Policies Assessment

G. Checklist

APPLICATION CHECKLIST	ATTACHED
I have completed all sections of this applicant information form relevant to my application and understand that the form will be returned to me if it is incomplete.	√
I certify that the information provided in this applicant information form, and any attached additional forms is, to the best of my knowledge, true and correct.	√
I have completed the activity application form.	√
I have appropriately labelled all attachments and completed section F Attachments.	√
I will email permissions@doc.govt.nz my: • Completed applicant information form • Completed activity application form/s • Any other attachments.	√

H. Terms and conditions for credit account with DoC

HAVE YOU HELD AN ACCOUNT WITH THE DEPARTMENT OF CONSERVATION BEFORE?	YES / NO
Yes	√
~~No~~	
Under what name?	Waka Kotahi NZ Transport Agency

In ticking this checklist and placing your name below you are acknowledging that you have read and agreed to the terms and conditions for an account with the Department of Conservation

TERMS & CONDITIONS	TICK
I/We agree that the Department of Conservation can provide my/our details to the Department's Credit Checking Agency to enable it to conduct a full credit check.	√
I/We agree that any change which affects the trading address, legal entity, structure of management or control of the applicant's company (as detailed in this application) will be notified in writing to the Department of Conservation within 7 days of that change becoming effective.	√
I/We agree to notify the Department of Conservation of any disputed charges within 14 days of the date of the invoice.	√
I/We agree to fully pay the Department of Conservation for any invoice received on or before the due date.	√
I/We agree to pay all costs incurred (including interest, legal costs and debt recovery fees) to recover any money owing on this account.	√
I/We agree that the credit account provided by the Department of Conservation may be withdrawn by the Department of Conservation, if any terms and conditions (as above) of the credit account are not met.	√
I/We agree that the Department of Conservation can provide my details to the Department's Debt Collection Agency in the event of non-payment of payable fees.	√

FORM 3b – DOC Private/commercial facility/structures Form

A. Description of Activity

Refer Form 1a above and Section 3 and 4 of the attached report for description, location, area of public conservation land affected, proposed use and infrastructure changes.

Construction drawings are contained in Appendix A to the application report. Refer Form 1a.F above for list of attachments.

B. Alternative Sites Considered

Refer attached report (Section 7) for description of alternatives considered.

C. Larger Area

Refer Form 1a above, attached report (Sections 3 & 4) for descriptions and Appendix A for plans of the areas affected.

D. Exclusive Possession

Refer Form 1a above & attached report (Sections 3 & 4) for description of possession/ occupation areas.

E. Technical Specifications

Refer attached report and Appendix A for technical specifications/plans for the proposed activities.

F. Terms

Expiry – 2032

G. Bulk fuel storage

N/A – fuel storage under this application will be limited to temporary and mobile tanker associated with refuelling construction equipment.

H. Environmental Impact Assessment

Refer attached report for full AEE/EIA in Section 8.

I. Other

None.

FORM 7a – ‘Other’ Form

A. Description of Activity

Refer Form 1a above and Section 3 and 4 of the attached report for description, location, area of public conservation land affected, proposed use and infrastructure changes.

Construction drawings are contained in Appendix A to the application report. Refer Form 1a.F above for list of attachments.

B. Terms

Expiry – 2032

C. Bulk Fuel Storage

N/A – fuel storage under this application will be limited to temporary and mobile tanker associated with refuelling construction equipment.

D. Environmental Impact Assessment

Refer attached report for full AEE/EIA in Section 8.

E. Other

None.

Application for an Easement on Public Conservation Land

A. Applicant Details

Refer Form 1a above.

B. Variation of an existing easement concession

IS THIS APPLICATION VARYING AN EXISTING EASEMENT CONCESSION?	YES / NO
~~Yes~~	
No	√
~~Easement concession number you wish to vary~~	N/A

C. Pre-Application Meeting

Yes - Refer Form 3b above.

D. Location and Nature of the proposed easement concession

Refer Form 1a above for description and area of public conservation land affected.

Will your easement concession benefit other land?

Yes – State Highway 94.
Refer Form 1a above.
Site Plans & Construction Drawings are contained in Appendix A to the application report.
Refer Form 1a.F above for list of attachments.

E. Description of activity

Refer Form 1a above, Section 4 of the attached report and Appendix A for plans of the activities.

F. Permanent or temporary structures or facilities

Refer Form 1a above, Section 4 of the attached report and Appendix A for plans of the activities. Waka Kotahi will own and maintain the structure.

Alternatives are considered in Section 7 of the attached report.

G. Technical Specifications (for telecommunications).

Not applicable/no telecommunications facilities proposed.

H. Other DOC permissions

Refer Forms 1a and 3b and attached report and appendices for descriptions.

I. Duration (term of easement)

10 Years - Expiry 2032

J. Consultation undertaken

Yes – Refer Section 5 of the attached report

K. Consistency with DOC statutory plans

Yes– √

Refer Section 9 of the attached report for an assessment of the relevant statutory documents.

L. Effects Assessment

Yes – √

Refer Section 8 of the attached report.

M. Attachments

Yes – √

Refer Form 1a above for reference to attached report and list of Appendices.

N. Registration on a Record of Title

No– √

No RoT for site, SH94 or FNP gazette only.

O. Checklist

Yes – √

Refer Form 1a above and attached report and Appendices for relevant information.

P. Terms and Conditions for a credit account with DOC

Yes – √

Refer form 3b above for detail.

DECLARATION

Delegated Authority to make application on behalf Waka Kotahi NZ Transport Agency

SIGNED BY: [redacted]

NAME: Richard Shaw
Team Lead South – Poutiaki Taiao | Environmental Planning Transport Services

Pursuant to authority delegated by Waka Kotahi NZ Transport Agency

DATE: 13 June 2022

Applicant Details (for Further Costs):

Waka Kotahi NZ Transport Agency
PO Box 1479
Christchurch 8011
Attention:

ATTENTION: Gemma Kean – Senior Planner, Environmental Planner
Phone: +64 21 223 4053
E mail: gemma.kean@nzta.govt.nz

Consultant Details (Address for Service – Not for further costs)**:**

WSP
Christchurch Office
21 Moorhouse Avenue
Christchurch 8011
Attention: George Enersen

Ph 027 216 7815
Email george.enersen@wsp.com

Quality Review and Approval Record

Item	Name	Date
Prepared by:	George Enersen, WSP	18.05.2022
Reviewed by:	Steve Baker, WSP	19.05.2022
Approved by:	Waka Kotahi Poutiaki Taiao / Environmental Planning Team planner	13.06.2022

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1 INTRODUCTION

1.1 Overview

Waka Kotahi NZ Transport Agency (Waka Kotahi / the Applicant) are progressing safety and resilience improvements at the eastern portal of the Homer Tunnel. Situated on State Highway 94 (SH94) / Milford Road within the Fiordland National Park (FNP), Homer Tunnel provides a critical link to Milford Sound Piopiotahi. The key component of these works is the replacement of the existing avalanche and rockfall protection shelter at the eastern portal.

The existing avalanche and rockfall protection shelter ('protection structure' herein) is assessed as being in generally poor condition, exposed and susceptible to the ongoing risk of avalanche and rockfall damage and subsequent safety and resilience issues. In its current condition, the shelter structure is considered to provide little protection from rockfall or avalanche debris to road users or maintenance personal when compared to current standards, which is the primary purpose of the shelter.

The objectives of the proposed work are:

- To reduce the risk of avalanche and rockfall hazards to safety equipment required to operate the tunnel
- To reduce the risk to personnel servicing the safety equipment
- To reduce the ongoing risk to users of SH94
- To improve the resilience of SH94 at the Homer Tunnel eastern portal.

This will improve the resilience of SH94 / Milford Road from Te Anau to Milford Sound, particularly in the winter months.

The land required for the proposal is conservation land owned by the Crown and is managed by the Department of Conservation (DOC).

To enable the construction of the replacement protection structure and associated works Waka Kotahi seeks a concession from DOC for the construction of the protection structure where it is located outside the existing SH94 formed corridor and within FNP at the eastern portal of the Homer Tunnel.

The application also seeks to authorise associated works, including excavation of material from the adjoining area to fill beside and over the new avalanche structure, associated earthworks, the construction of rip rap scour protection and the removal of the existing protection shelter.

1.2 Purpose of Report

The purpose of this report and supporting documentation is to provide an Assessment of Effects on the Environment (AEE) in support of an application for a concession made by Waka Kotahi in accordance with the relevant provisions of the Conservation Act 1987 (the Conservation Act).

This report provides a description of the activity and an assessment of the actual and potential effects on the environment, as required by Part 3B of the Conservation Act. It covers matters that must be considered by DOC when deciding whether or not to grant concession, as sought by Waka Kotahi.

1.3 Background

Under the Land Transport Management Act (LTMA) 2003 the objective of Waka Kotahi is to "contribute to an effective, efficient, and safe land transport system in the public interest".

The objective of the project is to:

- Reduce the risk of avalanche and rockfall hazards to safety equipment required to operate the tunnel
- Reduce the risk to personnel servicing the safety equipment
- Reduce the ongoing risk to users of SH94
- Improve the resilience of SH94 at the Homer Tunnel eastern portal.

Safety of people is key to the functionality of SH94 / Milford Road and the operation of the Homer Tunnel. To improve the efficiency, safety and resilience of SH94 / Milford Road, Waka Kotahi are progressing safety and resilience improvements at the eastern portal of the Homer Tunnel which provides a critical tourist and economic link to Milford Sound Piopiotahi.

The key component of these improvement works is the replacement of the existing protection structure at the eastern portal which is required due to the current structure being in generally poor condition. While it is unlikely the current condition issues will impact on the structural integrity of the structure over the next 20 years, its structural form is considered to have limited robustness as an effective rockfall or avalanche protection structure when measured by current standards.

These improvement works are being undertaken by Waka Kotahi in three strategic phases for several reasons including engineering design timeframes, statutory approval timeframes and the need to maintain the ongoing operation of the tunnel. However, the most notable reason is due to the unique and dynamic environmental conditions relating to the avalanche season which restricts the construction window due to safety risks for workers and the ability to complete the entire project in a single construction season.

The three project phases include the following works:

- **Phase 1:** Relocation of the generators from adjacent to the Homer Tunnel to the Alpine Traffic Operation Centre (ATOC) concession area and trenching of cabling from the ATOC area back up toward a proposed new equipment building adjacent to the tunnel entrance (Approved under concession number 52442-OTH).
- **Phase 2:** Relocation of the existing equipment building from adjacent to the avalanche protection structure to further north where it will be buried within the talus slope (Concession application in process).
- **Phase 3:** Demolition of the existing protection structure and construction of a new protection structure and associated works (Subject of this concession).

In combination with the Phase 1 and Phase 2 works, the proposal to construct a new protection structure will enable Waka Kotahi to meet its statutory and project objective(s) for SH94 / Milford Road under the LTMA 2003 and work towards a Safer System approach for SH94 / Milford Road operations and emergency management. The proposal will also remove vertical clearance restrictions on the tunnel making the state highway network more effective and efficient.

The statutory approval requirements and status for Phase 1 and 2 have already been approved or are in process by Southland District Council and DOC. This application seeks a concession for the Phase 3 works only.

1.4 Location

The site is generally located within the formed road corridor and immediately adjacent to SH94 / Milford Road at the eastern portal of the Homer Tunnel (refer Figure 1-1) and being within the FNP administered by DOC.

Figure 1-1 Site Location (Source: NZTopoMap)

2 OTHER RMA ACTIVITIES AND LEGISLATION

2.1 Overview

The following statutory planning provisions have been considered when considering whether additional resource consents or statutory approvals under other regulations may be required for the proposal:

- Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (NESF)
- Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS)
- Environment Southland Regional Plans:
    - Operative Regional Water Plan
    - Proposed Southland Water and Land Plan
    - Operative Air Regional Plan
- Southland District Plan
- Heritage New Zealand Pouhere Taonga Act 2014

An assessment of these provisions where relevant to the proposal has been completed (Appendix B) with additional approvals being identified as required.

Resource consents are being sought from Environment Southland to construct erosion and scour protection structures within the bed of ephemeral watercourses and to modify (re-open) an existing ephemeral watercourse (RMA Section 13). A minor diversion of surface water during construction may also be required (RMA Section 14).

A Notice of Requirement is being lodged with Southland District Council (SDC) to alter the existing State Highway 94 roading designation.

These applications are being lodged simultaneously with this concession application. A copy of the application will also be provided to Te ao Marama at the time of lodgement.

3 DESCRIPTION OF ENVIRONMENT

3.1 Overview

The Homer Tunnel is located approximately 96km north of Te Anau on SH94 / Milford Road within a remote alpine environment forming part of the FNP and the South West New Zealand World Heritage Area, Te Wāhipounamu. The SH94 / Milford Road legal corridor does not align with the formed road corridor. However, the formed road corridor has been treated as being located outside of the FNP and is managed by Waka Kotahi.

SH94 / Milford Road between Te Anau and Milford Sound / Piopiotahi is one of the country's leading tourist routes, providing the only access by road to Milford Sound Piopiotahi, which is an internationally recognised tourist destination. The Homer Tunnel forms a critical part of the Milford Road infrastructure passing beneath the Homer Saddle (refer Figure 3-1). Construction of the tunnel began in 1935 and was officially completed in 1954 resulting in a 1,240m long and 7.3 m wide tunnel into Southland's Cleddau Valley[1].

The immediate environment is a largely undisturbed natural environment with the built environment being limited to SH94 / Milford Road infrastructure including the existing protection structure, associated equipment building and the Alpine Traffic Operations Centre (ATOC) area approximately 500m to the east of Homer Tunnel.

Figure 3-1 Homer Tunnel and surrounding environment

[1] https://www.engineeringnz.org/programmes/heritage/heritage-records/homer-tunnel/

3.2 Statutory Setting

Within the Fiordland National Park Management Plan (FNPMP) the site is identified as being within a ‘Frontcountry Visitor Setting’. The Milford Road forms a specific Frontcountry visitor setting – ‘Milford Road Frontcountry Visitor Setting’ – which is defined as 200 m either side of the SH94 centre line.

In comparison to other FNPMP settings, the Frontcountry Visitor settings are considered to usually have a substantial level of infrastructure and can include the following facilities: car parks, picnic and camping areas, toilets, water supplies, signs, interpretation panels, viewpoints, wharves, boat ramps, shelters, bridges and easy walking tracks.

The intention of the Milford Road Frontcountry visitor setting as outlined within the FNPMP is that it should continue to absorb the greater part of any increased use of FNP while it is recognised that further development within this setting may be desirable to effectively manage visitors and ensure a range of quality experiences are available.

Under the Operative Southland District Plan 2018 (SDP) the site is located within the Fiordland/Rakiura Zone. The wider Fiordland area and the application site is identified in the SDP Planning Map FRZ.1-6 as an Outstanding Natural Landscape (ONL).

SH94 / Milford Road is designated in Schedule 5.3 of the SDP as Designation D241: State Highway 94 for “State Highway Purposes”. There are no conditions attached to the designation. For the purposes of interpreting the location of the designation, SDC have determined that the designation follows the existing legal alignment (refer Figure 3-2). However, the formed alignment of SH94 / Milford Road does not follow the legal road alignment as shown in Figure 3-2. The formed road corridor is therefore not considered to be designated in the SDP, however for maintenance purposes it is understood existing use rights apply under the RMA and previous works have been undertaken on this basis.

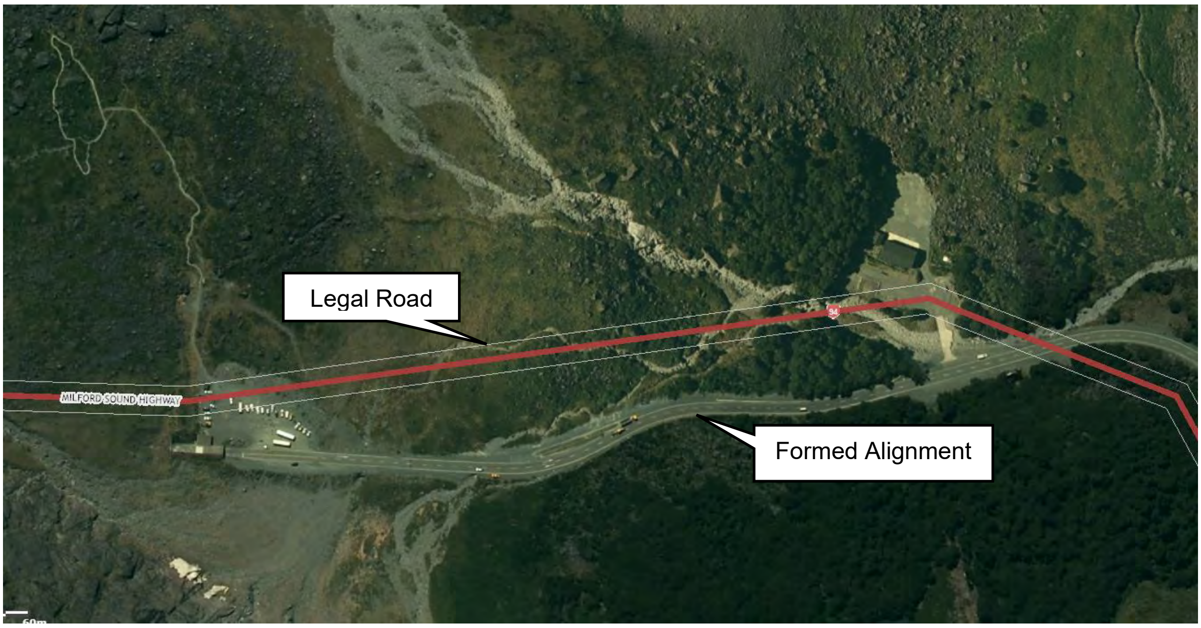

Figure 3-2 Legal Road Alignment (Source: GripMaps NZ)

3.3 Natural Environment

3.3.1 Overview

The surrounding environment comprises FNP being New Zealand's largest national park[2] covering approximately 1.2 million hectares of mountain, lake, fiord and rainforest environments. FNP is internationally recognised as part of the wider UNESCO World Heritage site: Te Wāhipounamu (Place of the Greenstone) and is characterised by steep sided valleys, extensive indigenous vegetation and high rainfall.

Located in the upper Hollyford Valley, adjacent to the Cockburn Incline formation to the south and the Darran Mountains to the north, the East Homer valley rises west towards the Homer Tunnel with SH94 / Milford Road comprising a series of climbing sweeping bends up to the Tunnel's eastern portal access, which sits beneath the Homer Saddle (Te Kōhaka-o-Te-Ruru).

The landform has been shaped by glaciation and brings with it several challenges to managing SH94 / Milford Road as it traverses through FNP, particularly in the alpine sections from the Divide through the Homer Tunnel and down into Milford Sound Piopiotahi.

The ephemeral west branch of the Hollyford River, Whakatipu Kā Tuka/Ōkare flows eastward from the site to the north branch confluence and outlet from the Gertrude Valley and from there down the Upper Hollyford Valley into the Lower Hollyford Valley approximately 13 km from the site.

Immediately to the south of the site surface water derived from rainfall and snowmelt sheds off the mountain slopes which feeds into a primary ephemeral watercourse which flows into the Hollyford River via a culvert beneath SH94 / Milford Road. The primary ephemeral channel has been blocked by talus debris and surface water flows have broken out of the primary channel resulting in two secondary ephemeral channels (refer Section 4-3).

3.3.2 Topography & Geology

The eastern portal to Homer Tunnel is located within an amphitheatre-like valley formed by glacial erosion at the head of the Hollyford Valley. The valley floor is surrounded on three sides by very steep slopes forming a large basin with near vertical cliff faces immediately south of the approach to the eastern portal of the tunnel. The exposed rock slopes above the eastern portal rise steeply (typically up to 60°) to between 450m and 800m above the road.

Immediately in front of the eastern portal tunnel entrance is a bouldery gravel fill which forms a pad up to 9m high by approximately 60m wide which comprises fill from tunnel excavation spoil material (closed car park area). The outer 10m extent of the pad is found to comprise silty bouldery gravel spoil, likely to have been placed during road widening activities between the eastern portal and the Hollyford Forks Bridge in the late 1980's (WSP, 2021).

Fill from the original tunnel excavation has also been used as an approximately 3m high road foundation, raising the current road alignment above the natural ground level.

The geology of the Fiordland region is home to the largest area of very strong crystalline rocks in New Zealand - plutonic rocks such as granite and diorite, and high grade metamorphic gneisses uplifted as a single block and subsequently are heavily glaciated[2]. Except for excavated tunnel spoil, the surrounding area comprises material that has been

[2] Fiordland National Park Management Plan 2007.

transported by glacial processes, fluvial processes and avalanche and rockfall activity from the surrounding steep mountainsides.

A bouldery gravel talus covers the valley floor on which SH94 / Milford Road crosses enroute to the eastern portal entrance and is considered natural ground (largely undisturbed) with buried boulders up to 20m in diameter. The tunnel spoil fill material sitting above the natural ground and forming the (closed) car park area is variable, and the bulk of the material is coarse gravel, cobbles and boulders.

3.3.3 Potentially Contaminated Soils

The site at the eastern portal to the Homer Tunnel has historically been built up using excavation material won from the Homer Tunnel construction, unknown source material and building rubble, and as such is considered to have potentially been subject to contamination and subsequently being a potential HAIL H or I site.

A Detailed Site Investigation (DSI) (refer Appendix C) has been completed to determine whether there has been any migration of hazardous substances in sufficient quantity that it could be a risk to human health or the environment to determine the applicability of HAIL H or I and subsequently the relevance of the NESCS.

Soil sampling results have identified no exceedances of the applicable soil contaminant standard (SCS) adopted for the site (recreational) being a conservative SCS for the proposal (construction works) and long-term use given restrictions on human access post development at the site. It is considered that the soils are highly unlikely to be a risk to human health.

In relation to ecological risk, the samples taken identified that soil contaminants are generally at or below background concentrations or below Eco-SGV[3] screening values adopted for the site based on the geological conditions. One sample exhibited marginally elevated copper and a further four samples were in excess of the zinc Eco-SGV. However, when taking into consideration background concentrations for the local geology, these levels are not considered to be outside the normal range for materials in the area, particularly in the case of zinc and as such are not considered to pose a risk to ecological receptors. In terms of the NESC, to qualify as a HAIL 'H' or 'I' a hazardous substance needs to be identified in a sufficient quantity that it could be a risk to human health or the environment. The DSI has identified that soils are below the SCS for the site and are highly unlikely to be a risk to human health while there are no contaminants considered to pose a risk to ecological receptors. The site is therefore not a HAIL and as such the NESCS does not apply.

3.3.4 Natural Hazards

SH94 / Milford Road and the immediately surrounding environment at the proposal site is subject to avalanche and rockfall hazards which can severely impact the road during avalanche season. Snowfields in the mountains above SH94 / Milford Road present a significant avalanche risk at the entrance to the eastern portal. Eight avalanche risk zones are identified above the eastern portal which cannot be seen from the road. The stretch of road at risk extends from the portal to near to the limit lines for the traffic lights on the eastern approach (refer Figure 3-3).

[3] Development of soil guideline values for the protection of ecological receptors (Eco-SGVs): Technical Document; Landcare Research/Manaaki Whenua 2016.

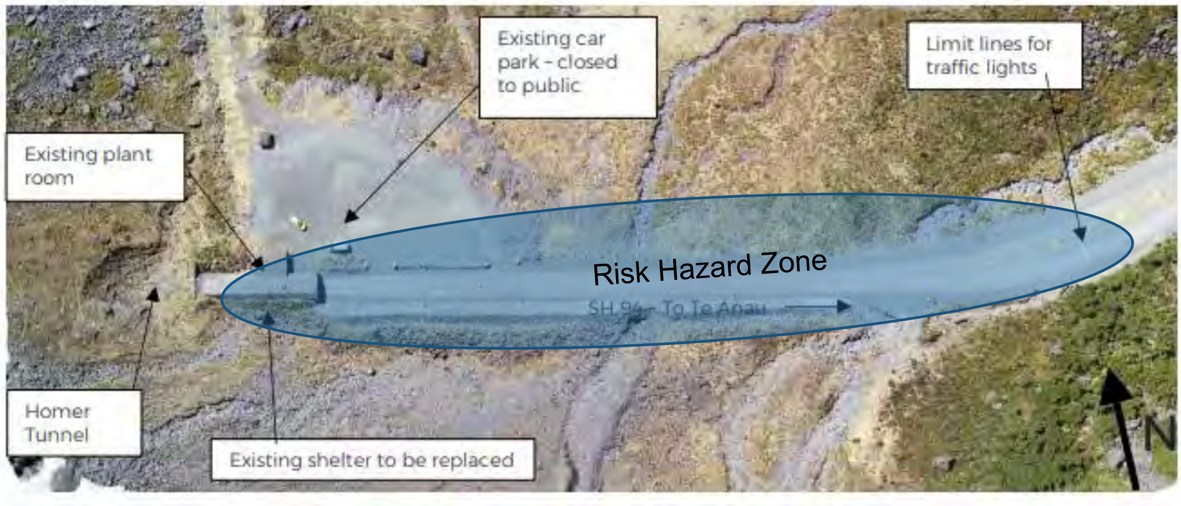

Figure 3-3 Avalanche and Rockfall Hazard Zone

The local avalanche season typically occurs between 1st May to 30th November, although there is potential for the season to have minor shifts dependent on the onset of winter conditions and snowfall volume.

The Milford Road Alliance (MRA) runs an avalanche control programme to safely operate the road during the avalanche season through monitoring the snowpack condition and the weather to predict risk levels and manage road user exposure. The MRA undertake active controls as necessary to artificially generate avalanches from the unstable snowpack. The programme also controls the risk exposure through restricting traffic within the avalanche hazard area and by closing the road when the avalanche risk is elevated.

In combination with the MRA controls, the existing protection structure provides some protection in the event of an avalanche during operation of the tunnel. Multiple events have resulted in the closure of SH94 / Milford Road due to avalanches with some events resulting in significant damage to the protection structure.

In addition to the natural hazard from avalanche, an increase in the frequency of rockfall has been observed at the site. Similar to avalanche risk, rockfall occurrence is inferred to be affected by seasonal weather conditions and during summer and autumn months the occurrence of rockfall is likely to be significantly lower than in spring or winter. However, rockfall risk is not able to be predicted or managed to the same degree as the avalanche risk and therefore requires an increased level of protection for road users. The existing protection structure provides limited protection from rockfall.

Multiple rockfall source areas have been identified along the Homer Saddle to the west of the site and along the mountain faces towards Mt Belle that mark the site's southern extents. It is considered rockfall typically affects sites within 100 – 200m from the toe of the slopes[4].

Due to the amphitheatre shaped cirque at the head of the valley, rockfall is generally directed towards central areas where the eastern portal, closed car park area and SH94 / Milford Road are situated. Subsequently and in combination with the avalanche risk, access to the immediately surrounding area has been restricted to service personnel only, with no public access through creating a no stopping section for vehicles and closing of the area, including the former carpark adjacent to the tunnel entrance to members of the public.

[4] Homer Tunnel Rockfall Risk Design Approach, WSP (2021)

The limit lines and traffic lights controlling access through to the tunnel have been moved east back down the road towards the ATOC where there is protection from stopped vehicles provided by the natural topography (refer Figure 3-3).

3.4 Ecological Values

3.4.1 Overview

The Fiordland region provides for a wide diversity of habitats supporting a variety of indigenous flora and fauna. The only indigenous mammals within FNP are the long-tailed bat and short-tailed bat while lizards are the only reptiles. The region is a stronghold for many of the less common of New Zealand’s endemic birds including the piwauwau (rock wren), a bird of alpine boulder fields and kea which are considered a taonga species to FNP.

Whio (blue duck) are also found in alpine environments, however they are a rapid river specialist with the nearest suitable habitat being the Lower Hollyford River.

Details of the flora and fauna relevant to the project area are discussed below.

3.4.2 Vegetation Communities

The indigenous vegetation community across the proposal footprint and surrounds was assessed onsite by Beale Consultants as part of the Phase 2 works. The vegetation is classified as mixed tussock grassland-scrub, being the dominant plant community in the sub-alpine and low alpine zones in the headwaters of the Hollyford River[5].

The mixed tussock grassland-scrub community in and surrounding the proposal footprint comprises patches of the snow tussock *Chionochloa pallens* subsp. cadens, blue tussock (*Poa colensoi*) and *Rytidosperma gracile* that occurs in association with scattered shrubs of *Veronica odora*, *Coprosma ciliata*., *Coprosma pseudocuneata*, *Olearia ilicifolia*, *Olearia nummularifolia*, *Coprosma serrulata* and inaka (*Dracophyllum longifolium*).

In places there is the distinctive large leaved mountain daisy (Celmisia semicordata Subsp. semicordata). Extensive patches of prickly shield fern (*Polystichum vesticum*) occur in the vicinity of the avalanche shelter along with several discrete stands of mountain lacebark (*Hoheria glabrata*). In places the rocky ground is covered in light green carpets of the moss *Racomitrium* spp. Many of the boulders and rocks in the site are extensively covered with foliose and crustose lichens.

Figure 3-4 indicates the typical vegetation and mixed rock cover on the talus slope to the immediate south of the existing avalanche shelter, being an area frequently impacted by avalanches during the avalanche season. During the onsite assessment no flora classified as threatened or at risk were observed in the project site or immediate surrounds.

[5] ‘Homer Tunnel Avalanche Shelter Improvement Works, proposed Plant Room Terrestrial Ecology Assessment’, Beale Consultants (November 2021)

Figure 3-4 Nature of vegetation cover

3.4.3 Herpetofauna

Two lizards species are recorded as being present in the Homer Tunnel area, being the Cascade gecko (Mokopirirakau “Cascades”; At-Risk, Declining) and Awakopaka skink (*Oligosoma awakopaka*; Data Deficient). Both species are reported as being present above 1000m towards the Homer Saddle, but neither is considered likely to be resident close to the highway[6]. Both species occupy rocky subalpine and low alpine scrub and alpine grasses/tussocks, including scree and boulder field edges.

A lizard assessment was therefore undertaken by Dr Tony Jewell of Lizard Expert NZ on February 19th, 2022. The site survey was conducted during excellent weather conditions with suitable (yet modified habitat) being present for indigenous lizards[7].

The identification of potentially suitable lizard habitat was limited to the northern part of the project area and these habitats formed the focus of the field survey which were searched twice over the day and intensively. The northern area comprised the artificial scree and talus edging of the car park and the revegetated construction zones around the portal where numerous rocks were present.

The site surveys did not identify the presence of any lizards or any sign of lizards (including droppings, sloughed skins, the rustle sound of an animal rapidly retreating etc.) across the proposed work area.

A copy of the lizard assessment results is provided in Appendix D.

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[6] Email correspondence: Carey Knox, Wildland Consultants - cited in ‘Homer Tunnel Avalanche Shelter Improvement Works, proposed Plant Room Terrestrial Ecology Assessment’, Beale Consultants (November 2021)
[7] Lizard Assessment of Homer Tunnel Eastern Portal (SH94), 24 March 2022.

3.4.4 Avifauna

The eastern entrance to the Homer Tunnel is a relatively well-known area for rock wrens due to its supporting alpine habitat. Rock wren numbers have been intensively monitored in the Homer-Gertrude area by DOC since 2011. The most up to date population assessment of rock wrens at the Homer-Gertrude Cirque is a 2018 estimate of 129 birds (Monks et al, 2021)[8].

Rock wrens are most common in areas where scree or rockfalls are interspersed with areas of stable low scrub, fellfield and cushioned vegetation (Heather & Robertson 2005)[8], being typical habitat at the application site. A site assessment of the proposal footprint was therefore undertaken by three Wildlife Management International Ltd (WMIL) ecologists over two days on the 5th and 6th April 2022 to assess the potential supporting habitat and prevalence of rock wren at the proposal site. A copy of the rock wren assessment is provided in Appendix E.

The proposal footprint was assessed to consist of extensively modified habitat (carpark, road, rock bunds to south side of the road). To the south of the road the proposal footprint encompasses a low angle scree slope which was characterised by small rocks and tussocks. To the north of the carpark the project footprint encompasses a modified slope of small rocks/gravel and shrubs.

No rock wrens were heard or seen within the project footprint and no evidence of nesting was observed through the adoption of a range of searching methods. An area approximately 200 – 300m beyond the proposal footprint to the north was also assessed, where rock wrens were detected, and rock wrens were also observed foraging approximately 100m from the proposal site. Two male wrens were also observed within 1m of the proposal footprint feeding amongst the boulders immediately north of the car park area, however rock wrens were not seen to use the carpark slope (characterised by bare gravel with occasional tussocks).

Consistent with the onsite assessments, territory mapping conducted by a DOC alpine ecologist[8] as part of a five-year study of the Homer Valley rock wren haven't identified rock wren nests within the site footprint for the proposal. Nests have however been located within 50m to the north of the footprint.

Although rock wrens were detected in small numbers, due to the time of year of the survey and given rock wrens are known to be cryptic, the number of rock wren observed during the site visit is considered to be the minimum number of work wren utilising the site.

Kea are also observed as being present across the site and surrounds at the eastern portal to the Homer Tunnel. Suitable breeding and foraging habitat exist in and around the project area in the form of beech forest, subalpine scrub, tussock grassland and herbfields[9]. Kea are also well documented as a curious bird and will therefore be attracted to foreign (construction worker) activity at the site.

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[8] Cited in Larcombe, S. 2022. East Homer Avalanche and Rock Fall Safety Project: Rock Wren (*Xenicus gilviventris*) Impact Assessment, April 2022. Unpublished Wildlife Management International Technical Report to WSP.

[9] http://www.nzbirdsonline.org.nz/species/kea - cited in 'Homer Tunnel Avalanche Shelter Improvement Works, proposed Plant Room Terrestrial Ecology Assessment', Beale Consultants (November 2021)

3.5 Built Environment

Due to avalanche risk being a common feature during the construction period of the Homer Tunnel and consequent loss of life to construction workers, a reinforced concrete shelter was constructed, extending out from the eastern tunnel portal to provide protection to workers.

In 1938 approximately 55m of avalanche shelter structure had been constructed, with the full structure being constructed to approximately 146m in 1940[10]. In 1945 up to approximately 115m of the reinforced concrete shelter was destroyed by avalanche, while in 1997, approximately a further 10m of the shelter was destroyed. The remnants of the original shelter are still visible beside the road.

The remaining 35m of protection structure is in poor condition and the structure has limited ability to provide adequate protection against avalanche and rockfall. While it is likely some time (20-30 years) before the structural integrity of the shelter will be compromised, the structural form is considered to have limited robustness as being an effective rock fall or avalanche structure when measured by current standards.

The shelter is also the most restrictive point in terms of vehicle height clearance (sign posted at 3.81m), compared with the remainder of the tunnel which can accommodate vehicles to the current legal limit of 4.3m. This constrains access, including responding to emergency events. Though the tunnel was constructed wide enough to enable two lanes of traffic, traffic lights are used to limit traffic to one direction at a time for safety reasons.

A secondary built-up site within the immediately surrounding environment associated with the operation and maintenance of the Homer Tunnel is the Alpine Traffic Operations Centre (ATOC) or more commonly referred to as the ‘Chapel’ or ‘Green shed’. The site is leased, and activities licensed to Waka Kotahi by DOC under Concessions PAC14-80-40 and 52442-OTH.

This site is located approximately 500m east of the Homer Tunnel and is built on a small plateau which provides for several existing buildings and will provide for a proposed new generator shed building (Phase 2 works). The purpose of the ATOC site is for the undertaking of operations and emergency management communications for Homer Tunnel. The site was originally established as a Ministry of Works storage area for SH94 / Milford Road and continues to be used for the same purposes by the MRA. No additional works are proposed at the ATOC site as part of this application.

The Homer Hut (New Zealand Alpine Club) is located approximately 1 km east of the site in the valley floor at the start of the track to the Gertrude Saddle.

3.6 Cultural, Heritage and Archaeological Values

3.6.1 Cultural

The site is situated within Atawhenua – Fiordland as defined within Te Tangi a Tauira Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan 2008.

The site is in the basin below Te Kōhaka-o-Te-Ruru/Homer Saddle and the traditional pathway along Ōkare/Hollyford River passes east of the site, near the Homer Hut and carpark.

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[10] Cited in ‘Homer Tunnel Enabling Works/Heritage Impact Assessment/Origin Consultants/August/2021/Version 1.0

3.6.2 Heritage

The Homer Tunnel is not listed in the SDP or included in the Heritage New Zealand List Rārangi Kōrero. However, the 'Homer Tunnel Portal Avalanche Damage, Milford Road' is listed in the FNPMP (Section 4.12 Table 3), as an actively managed historical site.

A 'heritage significance' assessment of the Tunnel was therefore undertaken by Origin Consultants (refer Appendix F). This assessment noted the Tunnel was constructed during a time of severe economic depression and was undertaken in recognition of the growing importance of tourism to New Zealand. It was considered a significant feat for a young country with a small population and revealed that the pioneering phase of the country was shifting towards one of settlement, leisure, and tourism.

The heritage significance assessment considers the Homer Tunnel shelter structure (despite being largely crushed in 1945) a notable and unique form of construction and contributes to the Tunnel's high technology, engineering and scientific value. Additionally, several plaques commemorating the lives of individuals lost during the construction of the Homer Tunnel are attached to the eastern elevation of the existing plant room.

The remaining portion of the protection structure and the commemorative plaques on the plant room are considered to have high significance with respect to heritage values.

3.6.3 Archaeological

Under the Heritage New Zealand Pouhere Taonga Act (HNZPTA) 2014 an archaeological site is defined as any place associated with pre-1900 human activity, where there is material evidence relating to the history of New Zealand. The Homer Tunnel was constructed post-1900 and therefore does not meet the definition of an archaeological site under the HNZPTA 2014.

The Homer Tunnel is however recorded on the New Zealand Archaeological Association's recording website, (NZAA) ArchSite as site D40/11. The site (D40/11) is referred to as the 'Homer Tunnel portal and portal avalanche debris' which is debris from the original 115m avalanche protection structure which was destroyed in 1945. This debris is visible on either side of the road alignment; however, the carparking area to the north of the Tunnel entrance is relatively clear of debris[Error! Bookmark not defined.].

The eastern portal area has been heavily modified during the construction of the tunnel and after the avalanche. Although the site is not associated with pre-1900 human presence, there is the potential for it to contain some materials and artefacts that relate to the 20th century use of the site.

A second site immediately north of the eastern tunnel portal (D40/20) is also recorded on the NZAA ArchSite as the 'Homer Tunnel workshops', being an area associated with the building of the Homer Tunnel. The site is also not considered to be associated with pre-1900 activity and is not proposed to be disturbed.

3.7 Recreational and Amenity Values

Fiordland's greatest attribute is that, to most people, the area is a wild untouched landscape which is enhanced by the vast remote mountainous and rugged terrain with significant and wide-ranging recreational and amenity values.

The Milford Road corridor is significant in that it provides access to the superlative scenery and recreational opportunities of FNP, whilst the road is an attraction in its own right.

Several recreational opportunities including climbing and tramping occur within the vicinity of the Homer Tunnel eastern portal. The Homer Saddle is an accessible short hike while the mountains on either side – Mt Talbot and Mount Moir – provide some of New Zealand's most classic and revered mountaineering and rock climbing, respectively. Historically access has been typically gained from near the eastern tunnel portal area until safety concerns have resulted in DOC closing off the connecting carpark area to public access. Access to the Homer Saddle is now encouraged along the Hollyford River beginning at the Homer Hut. However, Waka Kotahi understand from the Federated Mountain Clubs that recreationists often walk up the side of the state highway and through the carpark to access the Homer Saddle and surrounding areas.

The Milford Road itself is specified in the FNPMP as the 'Milford Road Frontcountry Visitor Setting' which is defined as 200m each side of the road centre line and is identified as much more than just an access route to Milford Sound / Piopiotahi. The road is considered a visitor attraction in its own right, passing through some of the most spectacular forest and alpine scenery in the country, if not the world. The road is a unique journey into the heart of FNP. Some of the most striking features of Te Wāhipounamu - South West New Zealand World Heritage Area are revealed along its route.

The main reasons people use the road are to undertake a scenic cruise on Milford Sound / Piopiotahi, for sight-seeing or for access to the more remote walking tracks in FNP. There are many opportunities for visitors to stop and discover the short walks or viewing sites along the way.

4 DESCRIPTION OF PROPOSAL

4.1 Overview

The proposal is to construct a new replacement protection structure to cover and protect the SH94 / Milford Road approach to the eastern portal and undertake associated works.

The replacement protection shelter will comprise a robust reinforced concrete portal framed roof structure which will be covered in site-won talus material to provide cushioning in the event of rockfall impact. An embankment will be constructed on the uphill side of the shelter to deflect avalanche flows over the shelter while the downhill side of the shelter will generally be open sided.

The replacement protection structure and associated works comprises the following elements:

- New structures being a protection structure and a mechanically stabilised earth (MSE) wall
- The placement of rock rip rap for erosion protection
- Excavation of the existing road and the car park area
- Vegetation disturbance

Each of these elements is detailed under relevant subheadings below along with construction details and mitigation proposed as part of the proposal.

4.2 New Structures

The new built structures proposed include a new protection structure that will have a maximum length of approximately 80m from the existing stone headwall of the tunnel portal. The length constructed is most likely to be in the order of 50 – 60m with the actual length to be constructed being contingent on the overall costs of construction which is subject to variable factors.

However, for the purpose of this application an 80m length of structure is being proposed.

Most of the shelter will be open sided on the downhill side (north face) formed with reinforced concrete columns at 4m centres. This is to avoid increasing the length of the enclosed tunnel structure and will minimise evacuation distances and allow smoke venting in the event of a fire in the tunnel (refer Figure 4-1 and Appendix A).

The only exception will be a short distance (nominally 10 m) at the transition to the existing tunnel portal, where the proposed shelter will be a closed structure as it needs to be completely buried to tie-in with the talus slope and to accommodate the new buried plant room (Phase 2 works).

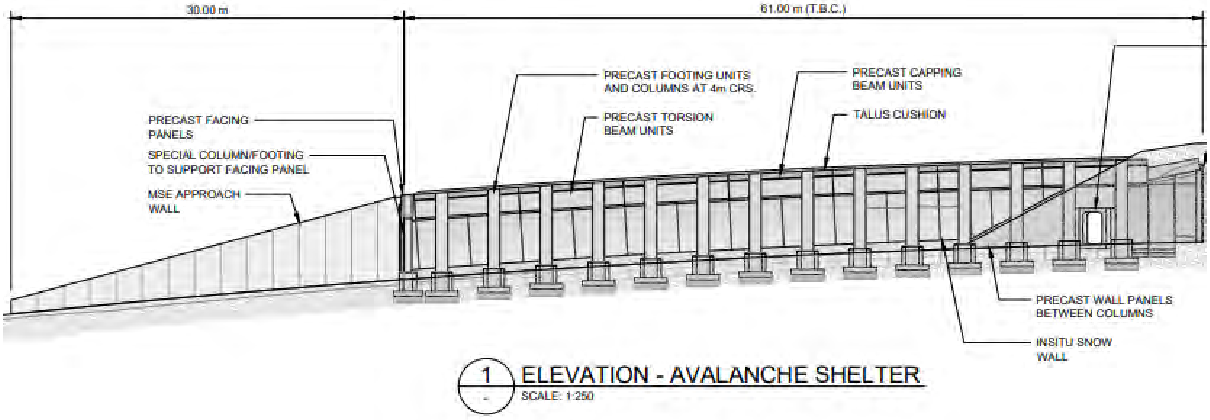


Figure 4-1 Side view of the structure showing open air sections

On the uphill side (south face) the structure will be closed sided formed by a reinforced concrete wall and having a roof comprising of precast beams which will be covered by an approximate 1m depth of talus material (refer Section 4.4).

The structure will have a sloped embankment running along its entire length, supported by a mechanically stabilised earth (MSE) wall to deflect avalanche flows over the top of the shelter (refer Figure 4-2). This design avoids the shelter presenting a wall-like obstruction in the path of an avalanche and seeks to avoid exposing the replacement structure to potentially massive loading.

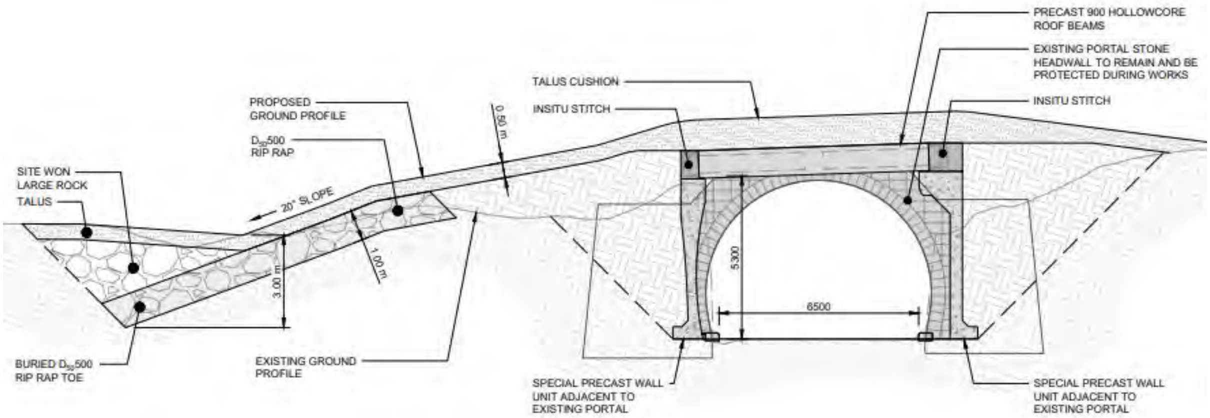


Figure 4-2 Cross section view (at the portal) indicating the sloped embankment

As noted above, the MSE wall will support the southern face of the sloped embankment and talus fill. The MSE wall will be constructed independently and separated from the shelter structure. A precast link slab will be provided to span the gap between the structure and the MSE wall to support the fill material above.

The purpose of the MSE wall is to withstand the impact of avalanches into the foreseeable future. This protective fill will include rock armouring in its lower extent (refer Section 4.3) and will be shaped and finished to appear similar to the adjoining talus slopes as it extends up onto the top of the shelter. An MSE approach wall is proposed to extend 30m outward from the structure on the uphill slope forming the approach to the protection structure along SH94 / Milford Road. The MSE wall will support the sloped embankment and talus fill beyond the avalanche structure extent.

The wall will have an approximate face height of 4m and effective retained height of 6m.

4.3 Rock Rip Rap

A rock rip rap apron will be constructed from the toe of the engineered fill embankment on the uphill side of the shelter to most of the way up the embankment (refer Figure 4-3). The purpose of the rip rap is to mitigate the risk of scouring of the constructed embankment under the action of avalanche flow loads, snowmelt and rainfall runoff scour from the steep mountain catchment immediately to the south.

Currently, snowmelt and rainfall runs off the steep rock slope into an ephemeral channel (primary channel) located at the toe of the slope at the interface with the talus apron/fan (refer Figure 4-4). There are two secondary ephemeral channels identified which have broken out from the primary channel which appears to be due to heavy blockage of the main channel by talus debris (refer Figure 4-4 and Figure 4-5).

The rip rap will be constructed across these two secondary ephemeral pathways which drain rainfall off the steep rock slope above. Rock sizing between 500 mm to 1000 mm is proposed to be used. The rock to be used for the rip rap will be sourced locally from within FNP as per the requirements of the FNPMP.

A source location for the rock and aggregate required for the project is still to be determined. If required, the necessary approvals will be applied for separately.

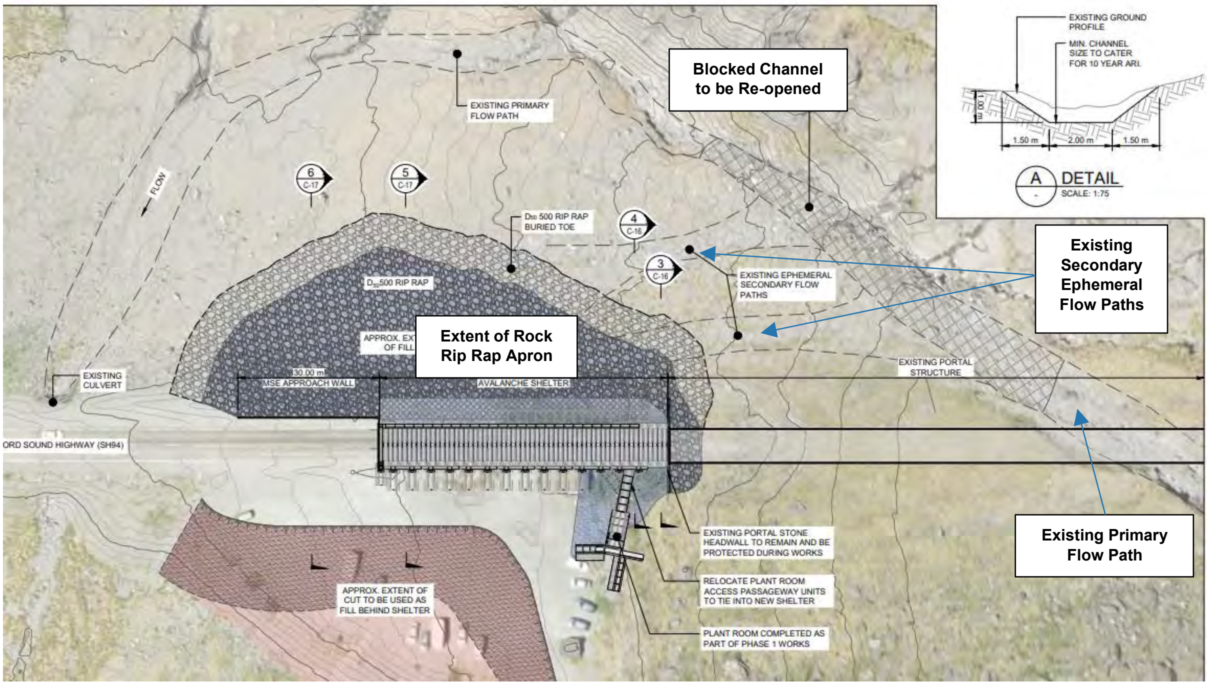


Figure 4-3 General arrangement plan showing rock rip rap apron and proposal to cut-off flow to secondary channels by clearing debris from primary channel, WSP 2022

To facilitate the construction of the rock rip rap across the two secondary ephemeral channels in dry conditions and avoid interference with the footprint of the proposed shelter embankment it is proposed to cut off the flow to the secondary channels during construction by reopening the former primary channel (refer Figure 4-3 & 4-5).

This will be achieved by digging out the talus debris to a minimum extent to accommodate a 10-year ARI flow. A 10-year ARI sizing for the channel is considered appropriate as the required purpose of the channel is only to perform flood mitigation risk during the construction phase (i.e., a few months) to ensure the construction footprint remains relatively dry.

This will need to be managed throughout the construction phase to prevent blockage and subsequent breakout into the secondary channels.

Following construction, no specific management of the primary or secondary channels is proposed. It is likely that talus debris will once again block the primary channel and water will break out into secondary channels. If this occurs, the new rip rap and embankment will direct water around its toe eventually finding its way back into the main channel prior to the culvert under SH94 / Milford Road.

However, due to the dynamic nature of the receiving environment (being subject to avalanche flow and rockfall) where the rock rip rap is proposed, the ongoing maintenance of the rock rip rap and embankment may be required. This application therefore seeks to approve the necessary works required to maintain the rock rip rap and embankment for the duration of the concession.

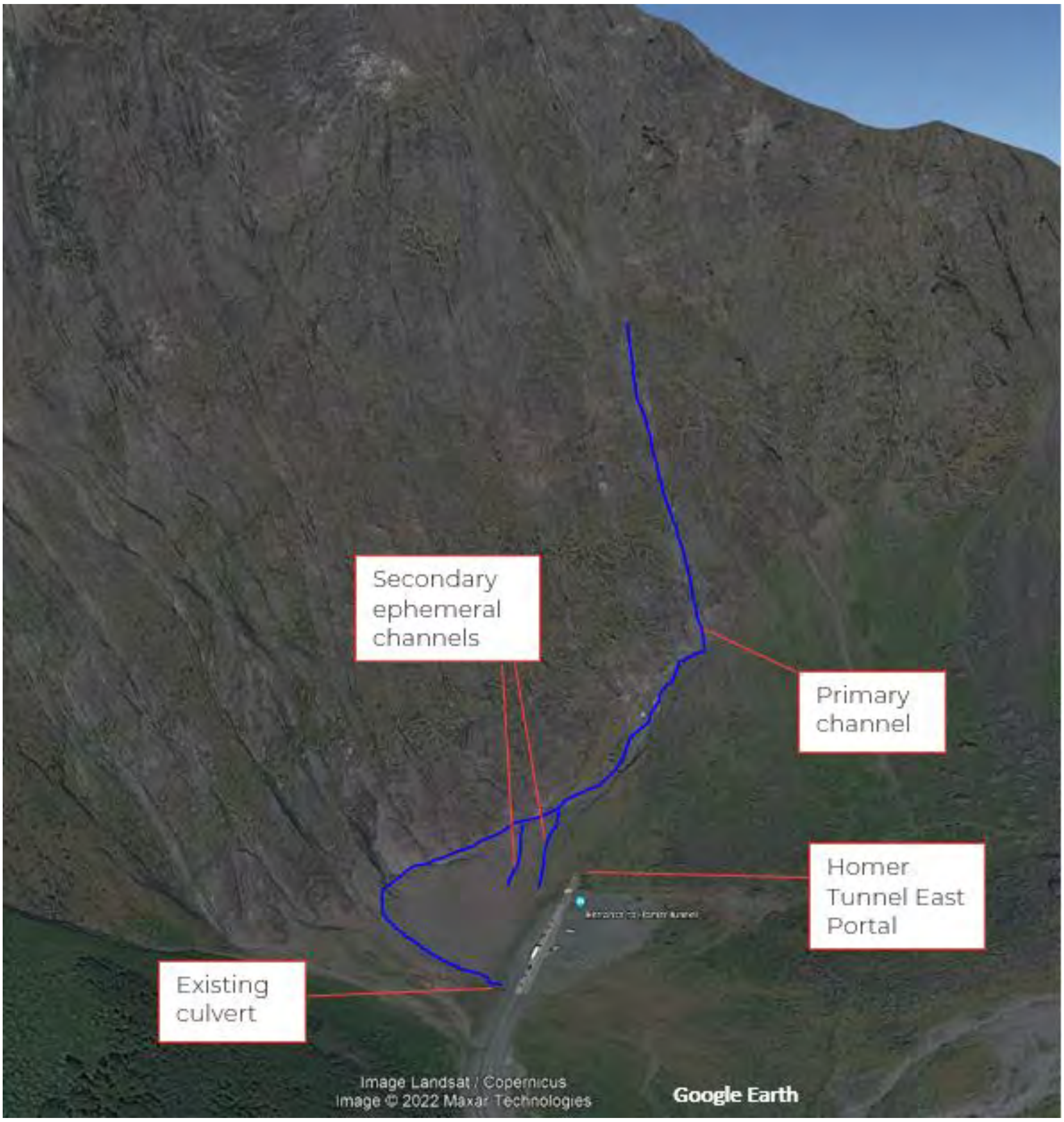


Figure 4-4 Google image of site showing primary and secondary channels at the East Homer Tunnel Portal site (Imagery date 2/13/2011)

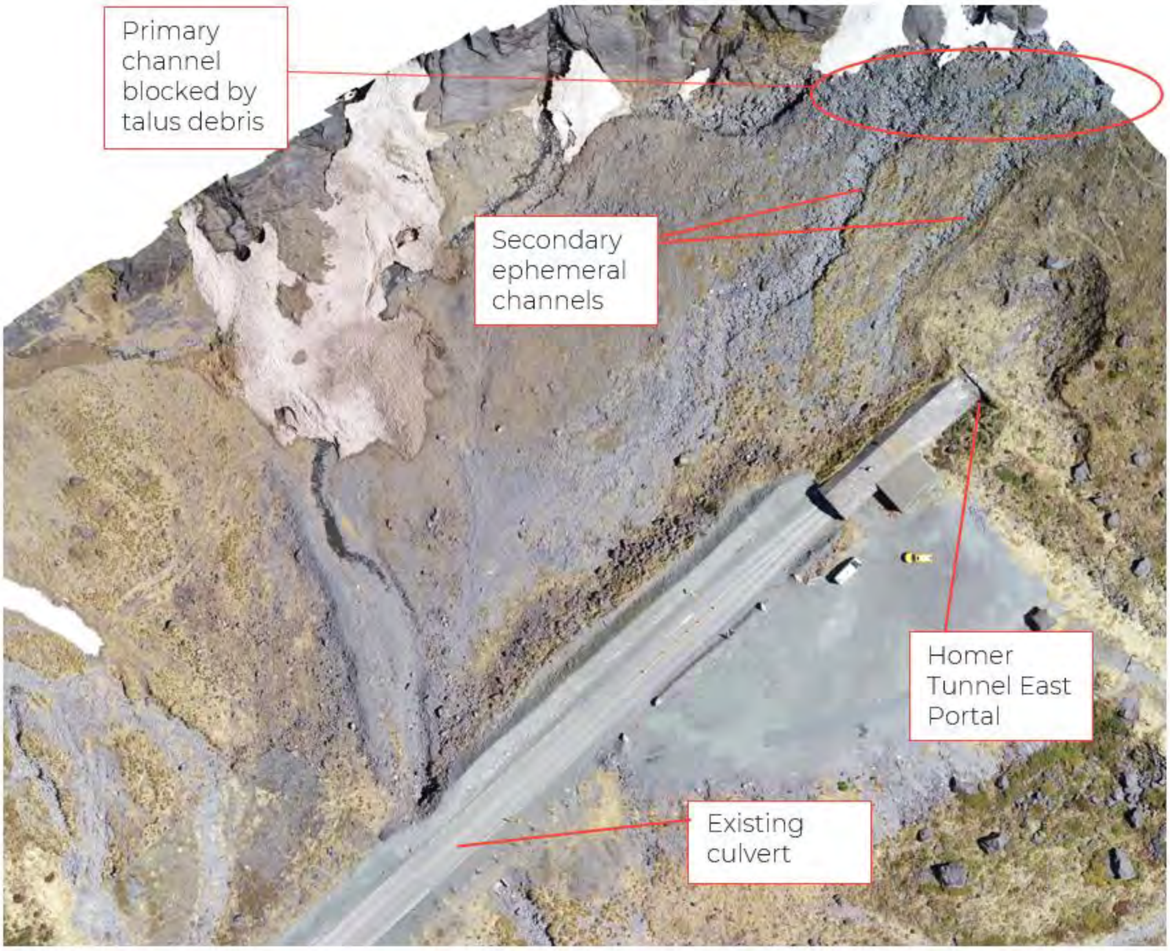


Figure 4-5 Drone survey imagery showing primary and secondary ephemeral channels, WSP 2021

4.4 Excavations and Filling

Excavations will be required to excavate out the existing road corridor to allow the construction of new foundations while the adjoining car park area is also proposed to be largely excavated. The fill material from the car park area is to be used as a source fill material for the embankment and for the top of the protection structure.

A minimum of 2.5 – 3m depth of excavation will be required across existing road foundation areas to remove unsuitable materials and to provide for a suitable foundation load bearing platform for construction of the protection shelter. Excavated material including potential buried concrete rubble from the historically collapsed protection shelter is proposed to be kept onsite and encapsulated within the embankment fill on the south side of the protection structure (refer Figure 4-5).

Concrete rubble will be placed deep within the proposed embankment and covered with general fill. This fill layer will be further protected from the risk of erosion and subsequent exposure from the rock rip rap amouring at the toe of the embankment as discussed in Section 4.3 and shown in Figure 4-5.

Once the precast units of the shelter structure have been installed, various grades of fill material will be placed along the southern flank and on top of the shelter structure. Most of this material will be sourced from the closed carpark fill area and its embankment which comprises tailings from the original construction of the Homer Tunnel.

Excavation of the carpark fill will largely return this area back to its near original natural form more cognisant of the valley floor contour that existed prior to the tunnel construction. This will assist with the blending of the replacement structure into the surrounding environment.

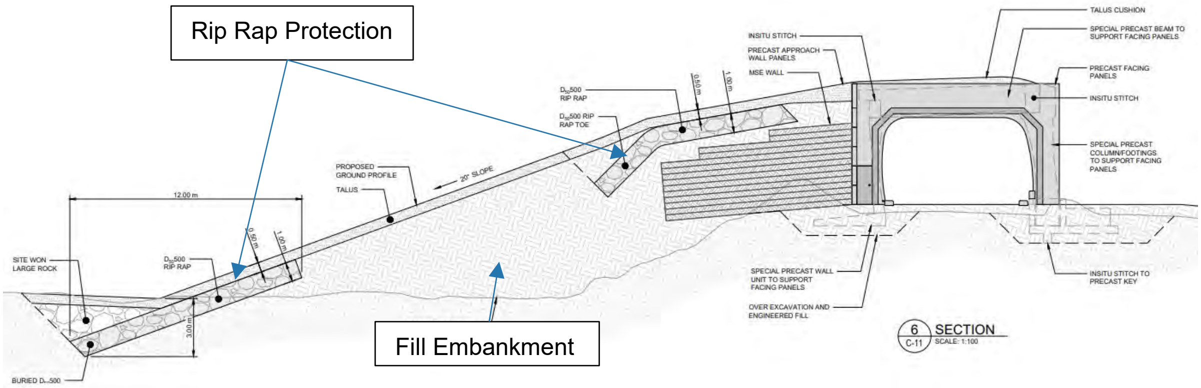


Figure 4-6 Fill Embankment on the Southern Flank of the Protection Structure

A final layer over the protection shelter will comprise a rock impact cushion which will be formed on top of the shelter from site won talus material with the placement of stockpiled rock and organic material to assist in renaturalisation. Excavated organic material may also comprise historically buried tree material. Depending on the condition of the tree material, it is likely this will be mulched and reused as organic material as part of re-naturalising the site.

Additional fill materials required for the works will be sourced locally from within the FNP. A source location for the rock and aggregate required for the project is still to be determined.

If required, the necessary approvals will be applied for separately.

4.5 Vegetation Disturbance

Vegetation disturbance requirements have been minimised as far as possible with majority of the proposal footprint having either previously been disturbed or not comprising any vegetated cover. The key vegetation clearance activities proposed under this concession application will occur on the northern fringes of the carpark embankment and immediately south of SH94 and the existing protection structure (refer blue outline within Figure 4-6).

A concession and resource consent application for the clearance of vegetation identified within the red outline being immediately adjacent to the north of the existing protection structure is currently in progress. Vegetation removed from across the project footprint in all work phases will be stockpiled in the immediately adjacent carpark area. At the conclusion of the disturbance works, the vegetation and organic material within the stockpiles will be respread across the excavated areas.

It is intended that this will assist in the naturalisation of the filled embankment and help visually 'tie' the built slope into its surroundings. Local rock will also be placed lichen side up, interspersed with clumps of replaced vegetation. Vegetation material from the 'front face' of the closed carpark fill will be placed on the excavated downhill batter of the site, working away from the road. This will assist in naturalising the excavated face and assist in mitigating the visual impact associated with the disturbance works to trampers and climbers moving up the valley.

Due to the harsh and challenging conditions associated with the subalpine environment and the proposal site being frequently subjected to avalanche flows which are likely to be prohibitive to the success of restorative planting, no intentional or formal planting is proposed as part of this project. Further detail on the landscape treatment proposed is provided in Section 7.1.1 ‘Avoidance, Mitigation and Remediation Measures’ of the Landscape and Visual Assessment prepared for the project (refer Appendix G).

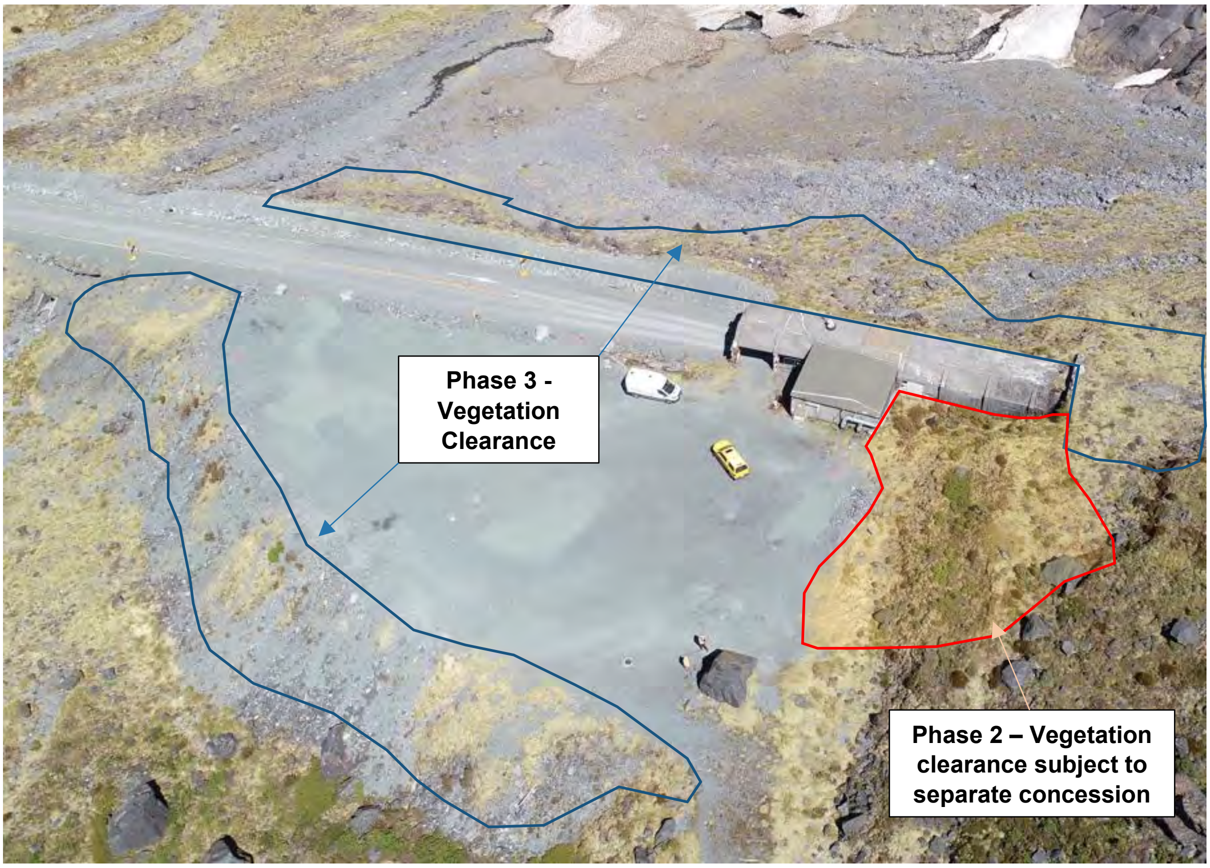


Figure 4-7 Proposed Vegetation Clearance Areas (blue outline)

4.6 Construction Matters

Due to avalanche risk, the construction window for the works is significantly reduced and will be largely limited to a 5-month period between December until the start of May.

Construction is proposed to take place following the avalanche season of 2023 (i.e., after 30th November 2023) and needs to be completed prior to the commencement of the avalanche season of 2024 (i.e., before 1st May 2024).

It may be possible that limited works can continue into the shoulder of the avalanche season being through May and June as a contingency depending on the risk exposure and the nature of the work.

This provides a challenging constraint on access and timeframes for construction. It is therefore proposed that the entire protection structure will be constructed using precast elements transported to site. This method will enable accelerated construction, while also ensuring the road and tunnel can remain open throughout the works.

General design principles are to provide self-supporting elements and simple stitch joints to avoid falsework and formwork requirements. Weights of elements are being designed to allow lifting from the south side using a modest size crane i.e., to reduce set up and minimise machinery movements on site.

Enabling / preparatory works including but not limited to the following will have been completed the previous year (2022/2023):

- new plant room construction (construction to be authorised as part of Phase 2)
- relocation of equipment from the existing plant room to either the new plant room or to another location
- stockpiling of suitable fill materials (sourced within FNP) at existing concession sites nearby to facilitate efficient and effective transport to the site during construction
- procure and fabricate all precast elements including walls, footings, columns, cap beams, main beams, and facia panels. Stockpile at appropriate site(s) to enable ease of transport to the construction site.

4.7 Mitigation and Proposed Conditions

4.7.1 Overview

The following subsections set out the mitigation that forms part of the proposal through either design elements or measures to be adopted by the contractors during construction. Also included is a set of proposed conditions.

4.7.2 Design Elements and Construction

The project design has incorporated several aspects that seek to reduce the adverse effects on landscape character and amenity values including:

- Having a compact form relative to the scale of the mountain basin landform
- Being partially covered in local talus material and the excavation of the existing car parking area which currently exists as a ‘false landscape feature’
- Treatments such as dark colour pigmentation utilised in exposed concrete so that it matches that of the existing concrete which is likely darker due to locally sourced material used. This is an important consideration given the precast nature of the construction elements
- The front façade is also proposed to incorporate cultural design elements imprinted within the concrete which will be finalised in consultation with mana whenua
- Confining signage on the entrance ‘façade’ to the minimum necessary for traffic safety
- No lighting visible beyond the road entrance to the shelter
- The location of the Project is relatively remote within a national park where it will not be overlooked by any permanent occupants or by people stopping at rest areas or the like. The exception being those recreationists accessing the Homer Saddle.
- The reuse of tailings material from the car park and site won talus will provide efficacy to the project through minimal haul distances for material and a resultant reduction of heavy haulage vehicles on the state highway within the FNP and the associated reduction to the enjoyment of the Milford Road Frontcountry visitor setting
- Rehabilitation including natural revegetation of the fill areas as disturbed talus slope with cleared vegetation

- Organic material across the site including tussocks and turf will be put aside and stockpiled to be reused during the reinstatement of the uplifted tussock and rock.

4.7.3 Erosion and Sediment Controls

During construction, excavations have the potential to give rise to the erosion of sediment and potential run off, particularly given the high volume of rainfall experienced in Fiordland.

While there are no flowing waterbodies immediately adjacent to the works area, there is potential for discharges to enter ephemeral waterways which are tributaries of the Hollyford River resulting in the mixing with surface flows downstream.

The discharge of stormwater and any sediment is however likely to have a minimal effect on water quality only, as excavations are occurring within exposed rock talus slope which means there is limited sediment to release.

Furthermore, given the significant rainfall volumes experienced in the receiving environment which consists of largely exposed rock and talus with minimal vegetation cover there is already a high level of natural runoff from exposed rock occurring.

Notwithstanding this, a general level of erosion and sediment controls will be implemented across the site during works.

The basic principles of good erosion and sediment control (ESC) practice are:

- Control of run-on water
- Separation of any ‘clean’ water from ‘dirty’ water
- Protecting the land surface from erosion
- Minimise sediment leaving the site.

An ESC Plan will be prepared and undertaken by the appointed contractor.

4.7.4 Discovery Protocols

The Ngāi Tahu ki Murihiku or Waka Kotahi archaeological accidental discovery protocol (ADP) will be adopted and initiated for any potential sites uncovered during excavation.

Discovery protocols will also apply in relation to the potential to uncover contaminated land. An unexpected contaminant discovery protocol is appended to this report in Appendix H.

4.7.5 Rock Wren and Kea Protocols

Measures informed by a suitably qualified and experienced practitioner (SQEP) in avian ecology for the management of kea and rock wren prior to and during the works will include but will not be limited to the following protocols:

- Engaging a SQEP in avifauna to undertake a rock wren survey across the site to assess the project area for potential nesting activity 1 - 5 days prior establishing works at the site.
- Mobilise machinery and construction workers once the site assessment confirms no presence of nesting activity, or if nesting activity is identified, a 20m no working zone will apply to such nests for up to 54 days or until chicks have fledged the nest.
- Ensuring that the working site remains ‘active’ post the avifauna survey to minimise the risk of nesting occurring post survey and avoiding reinstatement of the site until all works have been complete.
- Preventing the work site from being attractive to kea.
- Disguising or preventing access to any attractive items that are to remain on-site unattended.

- Implementing measures to deter kea from interacting with items at the work site.

A full set of protocols for the management of kea are attached in Appendix I.

Specific conditions relating to the management of potential rock wren nesting activity are proposed in Section 4.7.6 below.

4.7.6 Proposed Conditions

General

1. All filling and excavation work shall be carried out in accordance with an Erosion and Sediment Control Plan (ESCP). The ESCP shall include (but is not limited to):

    a. A site description, i.e. topography, vegetation, soils, etc;
    b. Details of proposed activities;
    c. A locality map;
    d. Drawings showing the site, type and location of sediment control measures, on-site catchment boundaries and off-site sources of runoff;
    e. Site laydown and stockpile location(s) and controls;
    f. A programme of works including a proposed timeframe and completion date;
    g. Emergency response and contingency management;
    h. Environmental monitoring and auditing, including frequency;

Rock Wren

2. To avoid the actual or potential risk of disturbing any potential southern rock wren nests, a bird nest survey is required to be undertaken by a SQEP in avifauna 1 - 5 days prior to disturbance works occurring at the site.

3. If nests are identified within 20m of construction activities during the survey required by Condition 2, construction works shall not occur within the 20m buffer for up to 54 days or until chicks have fledged from the nest.

Heritage

4. Prior to and during the demolition of the existing avalanche protection structure, the concession holder must systematically record all features of the structure to a Level 1 standard of recording as outlined within the Heritage New Zealand Pouhere Taonga (2018) ‘Archaeological Guidelines Series No. 1: Investigation and recording of buildings and standing structures.’

5. The concession holder must erect and maintain a digital/audio visual display at the Knobs Flat Centre for the purposes of displaying interpretive information on the history of the Homer Tunnel and construction. The interpretive material to be displayed shall be determined in consultation with the Department of Conservation and Iwi.

5 CONSULTATION

5.1 Overview

Waka Kotahi has been undertaking consultation with stakeholders and potentially affected parties in relation to the safety and resilience improvements proposed at the eastern portal of the Homer Tunnel since August 2021.

During the various consultation phases, Waka Kotahi acknowledged that it had committed to the decision to undertake avalanche and rock fall protection at the Homer Tunnel eastern portal. The key objective of the consultation was to therefore, share details of the project as designs were progressed, and to consult with stakeholders / potentially affected parties on decisions still to be finalised and to understand stakeholder expectations.

Key aspects of the consultation were:

- Informing of design details of the replacement avalanche shelter (i.e., façade shape/form, colour etc.) to gain feedback on design
- Providing opportunities for parties to raise concerns relating to the proposal
- Gathering feedback on appropriate mitigation measures, particularly from regulatory authorities to address environmental effects
- Assisting with obtaining necessary statutory approvals from SDC, DOC and Environment Southland.

5.2 Initial Consultation

Initial consultation was undertaken with several parties in late 2021 with the intention of introducing the project at a broad level, while also to gain feedback to inform the statutory approvals required to progress enabling works, namely for a new generator building, trenching activities, and the construction of a replacement equipment building adjacent to the tunnel.

A summary of the consultation undertaken is provided below:

- **August 2021**: Waka Kotahi undertook direct liaison with the Department of Conservation permissions staff and had ongoing discussion with respect to heritage matters for the wider project.
- **September 2021**: A workshop was held with Southland District Council and local iwi resource management consultancy Te Ao Marama Inc (TAMI) planning representatives.
- **October 2021**: A further preliminary meeting with the Milford Opportunities Project (MOP) group representatives was held.

5.3 Secondary Consultation

5.3.1 Overview

In early 2022 more specific consultation was undertaken in relation to the proposed replacement protection shelter itself. Consultation was undertaken at two levels recognising and tailoring the level of consultation required for different parties.

These stakeholder levels were identified as:

- **Key Stakeholders**: government agencies and territorial authorities administering local and regional statutory approval processes, immediately affected landowner (DOC) and site-specific identified statutory agencies (including iwi via TAMI)
- **Wider Stakeholders**: parties relevant to this proposal with national or regional scope and/or strategic representation, including representative groups and affected community organisations. These parties are those with a staked interest, either on the ground or in the use of SH94.

A summary of the consultation undertaken with each stakeholder group is summarised below.

5.3.2 Key Stakeholder Consultation

On 2nd February 2022 a letter and supporting information (landscape visualisations and engineering drawings) along with an invitation to attend a follow up workshop was sent to parties identified as key stakeholders including SDC, Environment Southland, DOC, TAMI and Heritage New Zealand.

A workshop was held with representatives from the above identified parties on 2nd March 2022 except for Heritage New Zealand and TAMI from whom a response was not received. A presentation of the project was provided to the attendees with multiple opportunities for questions and providing feedback. The workshop was a valuable source of information to understand stakeholder expectations. Feedback from the stakeholders indicated that the need for the project was generally understood with feedback being positive and stakeholders were generally supportive of the project.

A separate meeting was held with TAMI on 1st April 2022 due to the unavailability to attend the workshop. Feedback provided from TAMI was in general support of the project with several opportunities to include a cultural narrative being explored. A set of meeting minutes from the workshop was also provided to HNZ, with no further correspondence received.

Waka Kotahi intends to continue working with mana whenua either directly or via TAMI with respect to the incorporation of cultural design and storytelling elements of the project from a cultural perspective.

5.3.3 Wider Stakeholder Consultation

On 18th March 2022 a letter and supporting information (landscape visualisations and engineering drawings) was provided to a wider group of stakeholders including:

- Fiordland Community Board
- Bus and Coach Association New Zealand
- New Zealand Automobile Association
- New Zealand Heavy Haulage Association
- Federated Mountain Clubs
- Milford Sound Infrastructure
- Royal Forest and Bird Society
- Mountain Safety Council New Zealand
- Southland Fish and Game
- New Zealand Alpine Club

Follow up meetings were requested by and held with the chairperson of the Fiordland Community Board and the general manager of the New Zealand Alpine Club to further discuss the proposal.

Overall, general support has been expressed for the proposal with the main areas of concern being in relation to temporary closures of the SH94 / Milford Road during construction.

A record of the secondary consultation undertaken is provided in Appendix J.

Further consultation is proposed to be held with key tourism or other operators who rely on the SH94 / Milford Road at certain times of the day to conduct their respective operations.

These organisations will likely include but not be limited to the following land transport providers / tourism operators:

- NZ Heavy Haulage Association
- NZ Road Transport Association
- NZ Automobile Association
- Bus & Coach NZ
- Great South
- Real Journeys/Go Orange
- Southern Discoveries

The purpose of this consultation will be to better understand the most appropriate construction windows and potential delays in the context of operators relying on the state highway, so that the construction timeline can be finalised and to minimise interruptions to users of the state highway.

6 STATUTORY REQUIREMENTS

6.1 Conservation Act 1987 – Part 3B Concessions

The site is located within conservation land which is owned by the Crown and administered by DOC. The proposal site and proposed activities are therefore subject to the Conservation Act 1987.

Section 17O (2) of the Conservation Act states:

> *Except as provided in subsection (3) or subsection (4), no activity shall be carried out in a conservation area unless authorised by a concession.*

The proposal is not provided for in subsection (3) or (4) and therefore, a concession is required to undertake the proposal.

A concession is therefore sought for the proposal being an additional structure and associated works on and including an easement over conservation land managed by DOC in accordance with Section 17O of the Conservation Act.

The information that is required to be included within a concession application is set out in Section 17S of the Conservation Act. This report outlines those matters required to be covered by Section 17S of the Conservation Act. The information requirements set out within Section 17S as outlined in Table 5-1.

Section 8 below outlines how the activity is considered to be consistent with the relevant conservation management strategies and plans, as required by Section 17W of the Conservation Act.

Table 6-1 Conservation Act Section 17S Requirements

SECTION 17S CONTENTS OF APPLICATION		COMPLIES (Y/N – WHY)
CLAUSE	**DESCRIPTION**	**COMMENT**
(a)	*a description of the proposed activity:*	Refer Section 4 above.
(b)	*a description identifying the places where the proposed activity will be carried out (including the status of those places):*	Refer Section 3 and 4.
(c) (i)	*the potential effects of the proposed activity:*	Refer Section 7 below.
(c) (ii)	*any actions that the applicant proposes to take to avoid, remedy, or mitigate any adverse effects of the proposed activity:*	Refer Section 4.7
(d)	*details of the type of concession for which the applicant is applying:*	Refer Forms 1a, 3b & Easement Application, Sections
(e) (i)	*the proposed duration of the concession*	Expire: 2032
(e) (ii)	*the reasons for the proposed duration*	Enable works to occur and future land acquisition to take place.

(f)	*relevant information relating to the applicant, including any information relevant to the applicant's ability to carry out the proposed activity*	Refer Form 1a, and Section 1 above.
if the applicant applies for a lease, a licence granting an interest in land, or an easement,—		
(g) (i)	*reasons for the request; and*	Refer Section 1 and 4 above.
(g) (ii)	*sufficient information to satisfy the Minister that, in terms of section 17U, it is both lawful and appropriate to grant the lease, licence, or easement (as the case may be).*	Refer Sections 4, 7 & 8.

7 CONSIDERATION OF ALTERNATIVES

The Homer Tunnel forms a critical infrastructure component of SH94 / Milford Road providing the only connection between Te Anau and Milford Sound Piopiotahi via road. With the construction of the tunnel being completed in 1953 it signified a significant feat of construction for its era and denotes a significant interest in the land supporting the state highway alignment connecting to the tunnel.

As noted in Section 3 a form of protection structure is required at the eastern tunnel portal to provide a critical element of health and safety from avalanche and rockfall for the operation, maintenance and ongoing use of the tunnel.

The SH94 / Milford Road alignment and associated site for the protection structure is fixed and an alternative route or site for the structure would not be feasible. An assessment of effects on the environment has been undertaken (refer Section 8) and it is not considered the proposal will result in significant environmental effects.

The option of repairing and reusing the existing structure is not considered to be a feasible option for the following reasons:

- The poor condition of the existing shelter, including past avalanche/rockfall damage;
- The existing structure provides little current protection from rockfall or avalanche debris, which is its primary purpose;
- Over-cladding would involve construction of a much larger envelope to the shelter resulting in greater visual and heritage impacts; and
- The existing avalanche shelter is the lowest part of the tunnel and restricts the type of vehicles that can enter it (currently restricted to 3.8 m in height). The current legal vehicle clearance height requirement is 4.3m. Digging the floor of the tunnel down to provide extra headroom has been considered but has been deemed unworkable from an engineering perspective.

Furthermore, it is not an option for Waka Kotahi to not progress with the replacement of the protection structure as it is deemed required to meet Waka Kotahi's objective under the LTMA 2003.

8 ASSESSMENT OF ENVIRONMENTAL EFFECTS

8.1 Overview

Section 17S(c) of the Conservation Act requires the applicant to assess any actual or potential effects that the proposed works may have on the environment, and the ways in which any adverse effects may be avoided, remedied or mitigated.

This application seeks concession to construct a replacement avalanche structure and undertake associated construction works including earthworks and vegetation disturbance within FNP, adjacent to SH94 at the eastern portal of the Homer Tunnel. This assessment of environmental effects (AEE) provides an assessment of the actual and potential effects of the proposed works.

This AEE has been prepared in such detail that corresponds with the scale and significance of the effects that the activity may have on the environment. The actual and potential effects of the proposal are identified as follows:

- Positive Effects
- Effects on Ecological Values
- Effects on Natural Processes
- Landscape and Visual Effects
- Effects on Natural Character
- Effects on Cultural, Heritage and Archaeological Values
- Effects on Public Access and Recreational Values

These actual and potential effects are assessed under the relevant subheadings below.

8.2 Positive Effects

SH94 / Milford Road is considered regionally important infrastructure if not nationally significant and Waka Kotahi is responsible for managing it in a safe, effective, efficient and sustainable manner. The proposed works will ensure that Waka Kotahi can operate SH94 / Milford Road in a way which meets these objectives.

In terms of the definition of natural and physical resources in Section 2 of the RMA, the SH94 / Milford Road is a significant physical resource and as such, must be sustainably managed. The proposed works will provide for the sustainable management of this physical resource and is consistent with the purpose and principles of the RMA.

The proposal will improve the safety of SH94 / Milford Road through protecting users and maintenance operators from avalanches and rockfall into the future and will result in a corresponding increased resilience of the state highway network which provides the only linkage via road to Milford Sound from Te Anau. SH94 / Milford Road is a significant South Island tourist route, which also provides access to related service industries and a lucrative primary marine industry. Delays and disruption to motorists, freight movements, services, and tourism industries from avalanche or rockfall hazards present substantial risks to the Milford, Northern Southland and Lakes District economy and communities.

The resilience of this network connection will be significantly improved by the replacement protection structure which will better meet the intended purpose of the structure when measured by today’s standards. Tourism and other industry operators will have greater certainty because of the works. The reduced height restriction on access to the tunnel will also be removed through the proposal, resulting in an increase in access for higher vehicles, including in an emergency which is a positive for the health and wellbeing of the communities reliant on the tunnel for access.

Furthermore, 'Road to Zero' is the Government's road safety strategy with the vision of zero deaths and serious injuries on New Zealand roads by 2050 and which seeks to support a significant and sustained improvement in road safety outcomes. The proposed replacement protection structure is necessary for improved tunnel management and will support this traffic safety strategy as Waka Kotahi sets out to achieve the Road to Zero principles.

The proposal will therefore have significant positive effects in the long term on people and communities. Risk from avalanche and rockfall will be reduced and the experience for state highway users and maintenance workers will be improved, ensuring the tunnel continues to operate in an integrated manner and maintains connections to Milford for these people and communities.

8.3 Effects on Ecological Values

8.3.1 Overview

The proposed construction activities have the potential to adversely affect vegetation communities due to the need to undertake earthworks and vegetation removal. These disturbance activities subsequently have the potential to affect terrestrial fauna, the foraging grounds and habitat for avifauna, as well as directly impacting potential bird nesting areas.

8.3.2 Terrestrial Ecology

The extent of effects on the sub-alpine tussock grassland-scrub community is a correlation of the extent of disturbance or modification and the attributed ecological value of the vegetation. The majority of the area to be disturbed comprises of exposed talus, rock and formed road environment, and the extent of vegetation clearance will be minimal in the context of the wider environment. The areas to be disturbed have been minimised as far possible while enabling the works to be practicably undertaken. In addition, a large area of the proposal footprint has previously been subject to disturbance. Therefore, there is little to no vegetation cover present with vegetation cover being largely limited to the eastern talus slope below the carpark area and the immediate area adjoining the road/existing structure to the south.

It is considered that the ecological function and integrity of the tussock grassland-scrub community beyond the construction footprint will be maintained. As such, the minimal vegetation clearance that is required will have a less than minor effect.

With respect to herpetofauna, potential lizard habitat across the proposal footprint is assessed as being limited and identified as being restricted to the northern aspect of the proposal. A lizard assessment undertaken across the proposal footprint during excellent weather conditions did not identify any lizards or any sign of lizards.

Given the limited presence of suitable lizard habitat and the absence of lizards across the project footprint, the proposal is not considered to impact on lizards during works. Further, there will not be a loss of lizard habitat as a result of the proposal, but rather during the works there will be temporarily unavailability of potential lizard habitat which was identified in the northern aspect of the proposal.

8.3.3 Avian Ecology

Rock Wren

Recent site surveys undertaken by WMIL have assessed the proposal footprint as not being a suitable nesting area for rock wren. The area is also assessed as being largely unsuitable as a habitat due to its extensively modified state, with only low-quality foraging grounds being identified. The absence of rock wren nests within the proposal footprint is consistent with territory mapping undertaken by DOC[8] which identified the nearest nests being approximately 50m to the north of the site.

Notwithstanding the lack of observed rock wren nests within the site, rock wrens are confirmed as being regularly present within the immediately surrounding environment. On the basis of understood and monitored behavioral traits, rock wren appear not to re-use the same nest site or excavation as the previous year, while territories of first year birds often comprise suboptimal habitat (Higgins et al, 2001)[8], thus the potential for nesting within the proposal footprint cannot be ruled out.

Therefore, even with the absence of nesting areas being observed and the lack of desirable habitat, there is still potential for nesting to occur within the proposal footprint during the nesting and chick rearing season (October – February). Due to the construction window being constrained by the avalanche risk, the nesting and chick rearing season cannot be avoided.

In addition to the impacts on nesting activity, the immediate areas which comprise habitat and foraging grounds for rock wren will likely be subject to construction related impacts from machinery and vehicles including noise, vibration and dust that may displace rock wren from feeding within this area of the territory during the construction phase.

With respect to impacts on suitable foraging areas and potential habitats during the works, the scale of disturbance on these areas is proportionately small relative to the size of an average territory for a pair of rock wren. In the context of the proportionate proposal footprint disturbance to territory disturbance, the number of rock wrens likely impacted by this small and temporary unavailability of habitat is of one to two pairs of adult rock wren and their potential offspring (2 – 10 wren total). This compares to an estimated population of 129 rock wren at the Homer-Gertrude Cirque in 2018.

Mid to long term, the proposal has the potential to result in a net gain of rock wren habitat and foraging grounds through the removal of a non-natural feature in the landscape (carpark area) and the re naturalisation to a boulder field with the opportunity to support natural regrowth of tussock grasses.

While no suitable nesting habitat has been identified during surveys undertaken at the site, the surveys were conducted outside of the nesting season and nesting has the potential to occur in the boulder fields within close proximity to the site (<50m).

To mitigate any potential effects from works impacting on possible nesting activity it is proposed that a SQEP in avifauna assesses the site 1 – 5 days prior to disturbance works occurring at the site. A condition to this effect is proposed in Appendix B.

If the site contains no nesting activity, disturbance across the footprint will commence and the area will remain active with machinery throughout the nesting season to ensure any potential establishment of possible rock wren nesting during the appropriate season is deterred. In the event that nesting activity is identified, construction activities within 20m of an active nest shall be avoided for up to 54 days or until chicks have fledged the nest.

Conditions to this effect have been proposed as mitigation in Section 4.7.6 and form part of this proposal.

On the basis of known limited habitat and foraging opportunity present across the site and mitigation proposed to address potential effects associated with nesting activity, the potential effects on rock wren will be less than minor.

Kea

Kea mainly nest within native forested areas and therefore are not expected to nest across the project footprint. Kea are however, innately curious and are attracted to people wherever they enter its mountain domain. Subsequently, in addition to the mitigating of potential construction impacts on kea, the establishment of kea protocols during construction to manage kea and their interaction with machinery and workers will be required.

Measures that will be employed during construction to manage potential effects on kea have been outlined within Section 4.7.5.

Based on the implementation of these measures which have been informed by a suitably qualified and experienced person in avifauna the potential adverse effect on kea is considered to be less than minor.

8.4 Effects on Natural Processes

The proposed works to cut-off surface flows to the secondary ephemeral channels within the proposal footprint through reopening the existing channel, and the permanent placement of rock rip rap across these secondary flow paths has the potential to adversely affect the natural functioning of surface flows in the immediate area.

Under existing conditions with the primary / existing channel blocked by talus material and debris, surface water flow down the secondary channels eventually flows back into the primary channel prior to passing through the culvert under SH94 / Milford Road. By reopening the existing channel, surface water will remain within the primary channel and will not affect the flow regime through the culvert under SH94 / Milford Road. The existing channel will be reopened to provide for a surface flow of 9.4 m^3/s being the 10-year annual recurrence interval (ARI)[11]. Surface flows will continue contributing to the Hollyford River from the immediate catchment largely unaffected.

In terms of the potential for an increase in sediment load as a result of the works, the bed material forming the primary and secondary channels comprises all talus material which has deposited naturally through the action of erosion and regular avalanche flows at the site. It is therefore considered that the disturbance of the bed material to reopen the main channel will cause no significant increase in sediment than would ordinarily be caused following disturbance from avalanches or other natural disturbance mechanisms.

Due to the dynamic nature of the environment at the site which is subject to the continuously changing natural processes of rockfall, avalanche, significant rainfall and snowmelt, it is likely that talus debris will again block the primary channel. As a result, it is likely that the flow of surface water will naturally adjust to these natural dynamic factors and again break out into secondary flow path channels. Subsequently, no permanent solution to maintain surface flows within the primary channel is proposed. Rather, under a scenario where surface flows break out of the primary channel, the rip rap toe of the new embankment will

[11] The 'Rational' method was used to predict flows at the site using historical rainfall intensity data obtained from the HIRDS V4 (High Intensity Rainfall System (niwa.co.nz)).

direct water around the toe and back into the main channel prior to the culvert under SH94 / Milford Road.

Based on the above assessment, the proposed re-opening of the existing primary channel to divert surface flows out of the secondary break out channels and the permanent placement of rock rip rap across these flow paths will have a less than minor effect on natural waterway processes.

8.5 Landscape and Visual Effects

8.5.1 Overview

The FNPMP recognises that the intention of the Milford Road Frontcountry visitor setting is to absorb any increased use of FNP, while acknowledging that further development within the Milford Road Frontcountry visitor settings may be desirable to effectively manage visitors and ensure a range of quality experiences is available to them.

An effective and fit for purpose protection structure is critical to ensuring visitors can continue to safely access FNP. Notwithstanding this, the proposal is located within an outstanding natural landscape and the potential adverse effects on landscape vistas and the unique Milford Road experience must be considered. A landscape and visual assessment (LVA) has been undertaken to assess the potential effect on the landscape at five different viewpoints (Appendix G).

At three of the five viewpoints (1, 2 and 5) there is potential for there to be an adverse effect while at the remaining two viewpoints (3 and 4) there is potential for there to be a near neutral effect. An assessment of these viewpoints is provided below. Visualisations have also been produced to illustrate the visual impact of the replacement shelter structure on the landscape (refer Appendix G).

The attached visualisations should be viewed in conjunction with the below assessment to assist the reader. The assessment and corresponding visualisations are based on a maximum extent of shelter structure being 80 m in length.

During the construction phase there is also the potential for there to be an impact on landscape values which have been considered.

8.5.2 Viewpoints 1, 2 and 5

Viewpoint 1 (refer Figure 8-1) is defined as the approach to the tunnel from the limit line traffic lights - approximately 200m from the existing shelter. This is the one point on the local section of road where traffic will be stationary due to tunnel operations (i.e., traffic signals) although viewshafts will be confined to those motorists ‘at the front of the queue’ and will therefore, be limited. At this viewpoint, only the upper portion of the existing protection structure and tunnel opening are visible due to the difference in elevation.

Due to the increased length of the proposed structure, the new structure will appear 45m (based on an 80m structure) closer to the viewer at this point and thus, the full extent of the replacement structure will be the most obvious change. Notwithstanding this, the degree of visual effect will be reduced by a combination of distance and the large scale of the enclosing alpine landscape, and the limited number of motorists stopped at this particular viewpoint who have a line of sight. Additionally, the use of colour, texture and pattern in the concrete of the entrance façade will assist in blending in with the landscape.

Figure 8-1 Viewpoint 1 - Existing Protection Structure Left & Proposed Protection Structure Right

Viewpoint 2 (refer Figure 8-2) is located between Viewpoint 1 and the tunnel portal, being the no stopping zone due to avalanche risk. At approximately 100m and closer, the full opening of the existing shelter and tunnel immediately beyond is not visible due to the rising nature of the road. The façade of the replacement shelter at this viewpoint will be obvious due to the longer structure reducing the proximity of sight as motorists traverse closer to the tunnel. The tapered section of retaining wall to the left of the entrance and the section ‘pillars’ within the open, and the northern internal wall of the shelter will also be obvious.

The bulk fill immediately south will also be a new element in the landscape, though this will be balanced out through removal of the old fill that forms the current closed carpark site north of the shelter. This change will also contribute to improving the natural character of the area (refer Section 8.5 below).

Similarly, to Viewpoint 1, the new structure will create a distinct change in the landscape as it extends beyond the existing avalanche shelter. However, given the closer proximity of Viewpoint 2, the adverse visual effects will be greater. There are however, several positive attributes that will contribute to the motorist’s overall view that act as mitigating factors to a visually larger structure. The experience of descending into a primeval void that is dark and long, carved out of native rock is not found anywhere else on the New Zealand highway network and is a highlight of travelling on the Milford Road, which is an experience in its own right. Further, the large scale of the enclosing alpine landscape, the viewer being in motion and therefore the short duration of the view all act to reduce the visual effects to an acceptable level at Viewpoint 2.

Figure 8-2 Viewpoint 2 - Existing Protection Structure Top & Proposed Protection Structure Bottom

Viewpoint 5 (refer Figure 8-3) is formed from the northwest aspect of the closed carpark from a point on the informal track leading up the Homer Saddle. The extent of the structure, its section pillars and openings that make up the northern wall of the shelter will be obvious.

In terms of visual effects, the 'long' view of the full potential 80m extent of the shelter along its northern wall will result in a high degree of effect when unmitigated, particularly given the proximity of view. Several factors however mitigate the visual effect from being obviously obtrusive to a level that will be acceptable.

With the restriction of public access adjoining the eastern tunnel portal, the viewing audience is anticipated to be small and limited to recreationists accessing the track above the tunnel portal to reach the Homer Saddle.

The northern façade has been designed as 'open' which will assist in breaking up the visual bulk of the shelter, while the use of sympathetic and local colour tones, texturing and patterns in the concrete of the beams and pillars will assist in absorbing the structure into the landscape while creating visual interest. Removal of the carpark 'plateau' area will also assist in re-naturalising the immediately surrounding topography. Furthermore, the openness of the shelter reflects the original shelter structure which is a positive in terms of heritage.

Figure 8-3 Viewpoint 5 - Existing Protection Structure Top & Proposed Protection Structure Bottom

Further, the structure will also be viewed in the context of the large scale of the enclosing alpine landscape as shown in the Drone View ‘before’ and ‘after’ images (Appendix G).

When compared to the existing structure, the proposal as seen from Viewpoints one, two and five when taking into consideration constraining elements to viewshafts, the positive attributes experienced by motorists traversing Milford Road, mitigating design elements and the context of the larger scale of the enclosing alpine landscape, the potential landscape and visual effect will be minor.

8.5.3 Viewpoints 3 and 4

Viewpoints 3 and 4 (refer Figure 8-4) are from entering the shelter toward the tunnel and exiting the shelter toward the Hollyford Valley respectively.

On entry into the shelter structure views of the Homer Saddle and the head of the Hollyford Valley will be transient as motorists descend into the tunnel with the north wall openings and pillars flicking past. On exiting the tunnel, the view will be transient as motorists are about to descend from the tunnel into the valley with a quick succession of openings and pillars flickering past with the vista seen as a succession of framed views.

The noticeable landscape change at Viewpoints 3 and 4 will be that the replacement shelter structure will increase the length of built structure that currently encloses the short tunnel entrance section of SH94 / Milford Road. If the structure was to be constructed to its maximum length of 80m, the increase in length of enclosed structure experienced by motorists would be approximately twice the existing length.

While the proposal will result in an extended duration of transient views when entering and exiting the tunnel, when comparing this change to the existing structure in the context of the overall experience of the surrounding environment, this minute change will result in a less than minor effect on landscape and visual effects.

Figure 8-4 Proposed Protection Structure at Viewpoint 3 Top & Viewpoint 4 Bottom

8.5.4 Construction Effects

Construction activities will require the removal of the residual 35m length of the existing protection structure which will be removed in stages. Once the existing structure has been removed, the construction of up to 60m of the replacement structure is likely to be initially achieved within the project budget. However, this could be up to a maximum length of 80m.

The construction phase of the replacement structure will include the re-naturalisation of the existing carpark fill area, construction of the new protection structure and placement of local fill material on the southern embankment of the shelter. The construction methods proposed will focus on maximising prefabrication to enable an accelerated construction window due to avalanche risk and to allow the road and tunnel to remain largely open throughout the works. These methods will generally include, excavation of the ground, placement of the precast concrete units and stitching, construction of the embankment on the uphill (south) side of the shelter and placement of a layer of fill material over the top of the shelter. At the conclusion of construction, the site will be reinstated as far as practicable with vegetation and organic material disturbed during the works to assist in with the rehabilitation of excavation activities on the landscape.

These construction methods and reduced construction timeframes will subsequently minimise the associated landscape and visual effects. The resultant adverse landscape and visual effects associated with construction activities will therefore be less than minor.

8.5.5 Summary of Effects

Though the proposal is for a longer structure, in context of the mitigating factors outlined above and that the proposal will consolidate the replacement structure with the existing built form of the Milford Road infrastructure, overall, the adverse landscape and visual effects will be minor. Localised landscape effects experienced during construction will be temporary in nature due to the reduced construction window and will largely be curtailed on completion of the works. The construction related effects will be managed and mitigated as far as practicable. Fully avoiding all construction related impacts is not fully possible and is an anticipated aspect of development.

8.6 Effects on Natural Character

The surrounding landscape is classified as an outstanding natural landscape and is seen as unique, having high levels of associated natural character and therefore demands a higher level of management of effects that are likely to be generated by any proposed change. In consideration of the potential effects on natural character, it must also be recognised that the immediate receiving environment falls within the Milford Road Frontcountry Visitor Setting.

While an integrated approach to managing the road and adjacent FNP is essential to ensure that any developments do not impact on the natural characteristics and values of FNP surrounding the road, the intention of the FNPMP is that this setting should continue to absorb the greater part of any increased use of FNP which provides important context when considering development. To a degree, the character of the immediate SH94 / Milford Road corridor is formed by a level of infrastructure / development.

The Milford Road forms a critical piece of infrastructure that enables the use and exploration of FNP, while use of the road itself provides a significant tourist experience and attraction in its own right. Natural hazards, particularly avalanches and landslips, strongly influence use patterns on the Milford Road. Safety of visitors using the road is an important consideration and it must be recognised that this proposal is paramount to ensuring and maintaining the safety of such users and the ongoing ability to fully appreciate FNP.

The proposal will result in a new structure approximately twice the length of the existing structure if the shelter is extended to the maximum length of 80m. In contrast, it is worth noting that historically the original structure was approximately 150m in length and would be present today if it hadn’t been destroyed by previous avalanches.

The structure has been designed to be sympathetic and fit within the character of the receiving environment while maintaining its intended purpose as a protection structure. The spreading of talus and stripped organic material from site excavations over top of the structure will assist in reducing the adverse effect of the large built structure on the surrounding natural character. Although a larger structure, it is considered that the backfilling of the structure will result in a more coherent structure within the adjoining natural landscape character compared with the existing plant room and avalanche shelter which are considered unkept and broken as they sit within the landscape.

Excavating out the closed carpark area will also remove an ‘artificial landform’ from the receiving environment being the plateau formed of tunnel construction tailings. This element is considered to be positive and will assist in returning to a more natural valley floor character immediately east of the tunnel portal. In turn this will assist in reducing the perceived footprint of the Milford Road infrastructure.

In the context of what is anticipated within the national park setting in combination with the critical importance of the Milford Road and the proposed design and associated mitigation measures, the actual and potential effects on natural character are considered to be minor.

8.7 Effects on Cultural, Heritage & Archaeological Values

8.7.1 Cultural

The proposed work area is a previously disturbed area associated with the original construction activities of the Homer Tunnel and the original avalanche protection structure dating back to the 1930’s. It is anticipated that the existing level of disturbance for roading activities, historical disturbance, and the existing physical site characteristics (minimal topsoil) minimises the potential for discovery of sites of cultural significance.

Iwi have been consulted with in relation to the project via Te Ao Marama Incorporated whom provide resource management liaison and representation for Rūnanga. Feedback provided during the consultation was generally positive with no notable issues with respect to cultural values being raised. Additionally, no nohoanga or other customary access rights over the river which could be affected by the works have been identified. Through consultation, opportunities to include cultural design elements into the new structure have been provided to Rūnanga. Waka Kotahi intends to continue working with mana whenua either directly or via TAMI with respect to the incorporation of cultural design and storytelling elements of the project from a cultural perspective.

Notwithstanding this, to ensure that any potential unknown cultural values are not impacted, the Ngāi Tahu ki Murihiku accidental discovery protocol (ADP) will be adopted and initiated for any potential sites uncovered during foundation construction activities.

8.7.2 Heritage

In relation to heritage values, an assessment[12] has been undertaken by Origin Consultants to inform the potential impacts on heritage values associated with the replacement of the existing protection structure (refer Appendix F). The assessment identifies that overall, the removal of the avalanche shelter and plant room will have a permanent moderate adverse impact on heritage values when unmitigated.

Several mitigation options are recommended including (in order of preference) relocating a section of the shelter offsite, reflecting the design of the existing shelter in the replacement shelter, or dismantling and burying a section of shelter for future use. Across all options it is recommended that structures and features be digitally recorded with improved interpretation of the Homer Tunnel with an offsite interpretive display.

In relation to the commemorative plaques, it is recommended that the plaques be relocated and mounted near the tunnel entrance at the existing traffic lights (preferred) or mounted in

[12] based on the criteria outlined in NZTA, “Historic heritage impact assessment guide for state highway projects,” (March 2015) which adopts the best practice guidance issued by Heritage New Zealand Pouhere Taonga

the new protection structure. It is proposed to relocate the plaques onto a wall of the new plantroom so that they maintain association with the existing site.

Relocation of a piece of the protection structure has been deemed not feasible as a suitable piece of land for a possible relocation site is not available. Placing a piece of the structure within Waka Kotahi owned land (road corridor) is not possible due to road safety requirements, while land outside the road corridor within FNP has also been discounted with DOC not preferring this option due to the potential ongoing maintenance and management liabilities.

Further, the associated costs of relocating a portion of the structure will be counterintuitive cost wise in terms of achieving the primary objective of the project (improving road safety and resilience). Relocation efforts of a piece of structure will more than likely result in a reduced constructed length of the replacement structure. In terms of burying a piece of the structure, it is highly unlikely that the shelter would be re-excavated at a later date nor relocated and therefore this mitigation option is therefore unlikely to be truly realised.

In adopting the other recommended options, the design of the proposed protection structure has deliberately incorporated elements and features of the original shelter design while largely maintaining the existing experience of the remote environment and minimal human impact upon it.

Namely, the design references the semi-octagonal shape of the existing avalanche shelter façade, increases the ceiling height to expose and better appreciate the aesthetic qualities of the stone façade of the Homer Tunnel portal, while the northern wall reinstates original features of the pre 1945 structure. During Phase 1 works, the stone façade will be reinforced to protect the façade ongoing and enable its increased visibility to be adapted which is a positive effect.

In addition to the positive effects on heritage values achieved within the design of the replacement protection structure, it is proposed that during demolition of the existing structure that all features are systematically recorded to a Level 1 standard of recording as outlined in the HNZPT (2018) 'Archaeological Guidelines Series No. 1: Investigation and recording of buildings and standing structures.' The recording of the structure is proposed to be incorporated into a digital interpretation of the construction of the Homer Tunnel and Milford Road to improve the story telling of Homer Tunnel.

Unmitigated the removal of the existing protection structure is deemed to have moderate and permanent adverse effects on heritage values. Replacement of the protection structure is however necessary due to the condition issues of the current structure and the vulnerability posed to the resilience of SH94 / Milford Road. Based on the adoption of several of the recommended mitigation options through the sympathetic design of the replacement protection structure and incorporation of the original protection structure features, combined with undertaking a standing record of the residual structure to be used for interpretive purposes, and relocation of the plaques onto the new plant room the adverse effects on heritage values as a result of the proposal are assessed as being minor.

8.7.3 Archaeology

With respect to archaeological values, while the site is not known to be associated with pre-1900 human activity, an ADP will also be adopted to ensure that there are no effects on archaeology.

8.8 Effects on Public Access and Recreational Values

The Homer Saddle sits immediately above the project area which is accessible for trampers via the Homer Nature Walkway which was previously accessible via the carpark area at the eastern portal of the tunnel. Public access through this area is now restricted due to rockfall and avalanche hazard with the carpark area being closed off and DOC closing access from here to the Homer Nature Walkway. Trampers accessing the Homer Saddle should now make their way along the Hollyford River from the Homer Hut to access the saddle track.

During construction access along SH94 for pedestrians will remain fully restricted for health and safety reasons associated with an active construction site. While some walkers, trampers and climbers may still walk along SH94 / Milford Road up to the eastern portal to access the Homer Nature Walkway, with this area being closed by DOC, it is not considered prudent to be assessing potential effects associated with negligent activity.

Access alongside the Hollyford River to the Homer Saddle will remain unimpeded during the work and ensure that the associated recreational values can be maintained during construction. The Homer Hut and Gertrude Valley Track area and access will not be affected by the proposed works. Waka Kotahi intends to provide ongoing communication with stakeholders and will provide notification to the New Zealand Alpine Club to pass on relevant information regarding construction timeframes to their members. With respect to the landscape values appreciated by persons undertaking recreational activity within the immediate environment, these effects have been considered in Section 8.4 and assessed as minor.

Due to the carpark area being closed and access from adjacent to the eastern portal to the Homer Nature Walkway being restricted by DOC, construction activity within this immediate area will not impact on public access and recreational values. The Homer Saddle will remain accessible via the Hollyford River from the Homer Hut, being the accepted route and will be unimpeded by the proposal. Subsequently there will be no effect on public access and recreational values.

8.9 Effects Conclusion

Overall, it is assessed that the actual and potential effects on ecological values, natural processes, natural character, and cultural values will be less than minor, while there will be no effect on archaeological values or on public access and recreational values. The proposal will result in minor effects on landscape and visual effects and heritage values.

Once constructed, the proposal will however result in significant positive effects with respect to safety and resilience of SH94 / Milford Road and those economies and the general public that rely on the state highway network.

9 STATUTORY ASSESSMENT

9.1 Overview

The application must be considered in accordance with Section 17U of the Conservation Act 1987 which outlines those matters to be considered by the Minister when processing an application for a concession.

Section 17U Matters to be considered by Minister states:

(1) In considering any application for a concession, the Minister shall have regard to the following matters:
- *(a) the nature of the activity and the type of structure or facility (if any) proposed to be constructed:*
- *(b) the effects of the activity, structure, or facility:*
- *(c) any measures that can reasonably and practicably be undertaken to avoid, remedy, or mitigate any adverse effects of the activity:*
- *(d) any information received by the Minister under sections 17S, 17SD, and 17SE:*
- *(e) any relevant environmental impact assessment, including any audit or review:*
- *(f) any relevant oral or written submissions received as a result of any relevant public notice issued under section 49:*
- *(g) any relevant information which may be withheld from any person in accordance with the Official Information Act 1982 or the Privacy Act 2020.*

(2) The Minister may decline any application if the Minister considers that—

- *(a) the information available is insufficient or inadequate to enable him or her to assess the effects (including the effects of any proposed methods to avoid, remedy, or mitigate the adverse effects) of any activity, structure, or facility; or*
- *(b) there are no adequate methods or no reasonable methods for remedying, avoiding, or mitigating the adverse effects of the activity, structure, or facility.*

(3) The Minister shall not grant an application for a concession if the proposed activity is contrary to the provisions of this Act or the purposes for which the land concerned is held.

(4) The Minister shall not grant any application for a concession to build a structure or facility, or to extend or add to an existing structure or facility, where he or she is satisfied that the activity—

- *(a) could reasonably be undertaken in another location that—*
  - *(i) is outside the conservation area to which the application relates; or*
  - *(ii) is in another conservation area or in another part of the conservation area to which the application relates, where the potential adverse effects would be significantly less; or*
- *(b) could reasonably use an existing structure or facility or the existing structure or facility without the addition.*

(5) The Minister may grant a lease or a licence (other than a profit à prendre) granting an interest in land only if—

(a) the lease or licence relates to 1 or more fixed structures and facilities (which structures and facilities do not include any track or road except where the track or road is an integral part of a larger facility); and

(b) in any case where the application includes an area or areas around the structure or facility, —

(i) either –

(A) it is necessary for the purposes of safety or security of the site, structure, or facility to include any area or areas (including any security fence) around the structure or facility; or

(B) it is necessary to include any clearly defined area or areas that are an integral part of the activity on the land; and

(ii) the grant of a lease or licence granting an interest in land is essential to enable the activity to be carried on.

(6) No lease may be granted unless the applicant satisfies the Minister that exclusive possession is necessary for—

(a) the protection of public safety; or

(b) the protection of the physical security of the activity concerned; or

(c) the competent operation of the activity concerned.

(7) For the purposes of subsection (6), the competent operation of an activity includes the necessity for the activity to achieve adequate investment and maintenance.

(8) Nothing in this Act or any other Act requires the Minister to grant any concession if he or she considers that the grant of a concession is inappropriate in the circumstances of the particular application having regard to the matters set out in this section.

The matters set out within subsections (1) – (8) of Section 17U of the Act have been addressed within Sections 4 and 7 of this report. DOC may therefore consider granting of this concession application.

Additional matters in relation to Subsection (3) are outlined below in Section 8.2.

9.2 Applicable Management Documents

9.2.1 Overview

Fiordland National Park is identified as part of Te Wāhipounamu Southwest New Zealand World Heritage Area. The Department of Conservation manages the World Heritage Area on behalf of the New Zealand Government under the National Parks Act 1980 and Conservation Act 1987 (amongst others).

Management documents such as Conservation Management Strategies and National Park Management Plans set out the measures required to achieve the specific care of the National Park. The Southland Murihiku Conservation Management Strategy 2016 and the Fiordland National Park Management Plan 2007 are therefore considered to contain provisions (objectives and policies), relevant to this application.

Also considered below in respect of the Iwi values and liaison with respect to the proposed development is the Te Tangi Au Tauira – the Cry of the People: Kāi Tahu Ki Southland Natural Resource Management Plan 2005.

9.2.2 Southland Murihiku Conservation Management Strategy

The Southland Murihiku Conservation Management Strategy (CMS) was approved in 2016. It is the statutory document implementing general policies and establishes objectives for the integrated management of natural and historic resources within the conservation areas of Southland, including Fiordland National Park, though the latter has its own plan.

Part 1 of the CMS contains the documents vision, objectives and milestones that apply to all public conservation lands, waters and resources in Southland Murihiku.

Parts 2 and 3 contain more specific policies and objectives. Part Two – Places identifies Fiordland Te Rua-o-te-moko including FNP amongst further significant areas of conservation land, with further recognition as part of Te Wāhipounamu – South West New Zealand World Heritage Area. Part Three contains specific policy requirements for Southland Murihiku.

The following sections are identified as being relevant to this proposal:

- Section 1.4 - Treaty partnership intentions with Ngāi Tahu as tangata whenua of Southland Murihiku.
- Section 1.5 – Natural heritage, history, recreation, public engagement and conservation national and regional conservation objectives
- Section 2.2 – Specific provisions for Fiordland Te Rua-o-te-moko Place
- Section 3.10 – Specific provisions for Structures and Utilities

An assessment of the proposal against the relevant objectives and policies from those sections identified above has been undertaken and is provided in Appendix K. As per the assessment, the proposal is consistent with these objectives and policies.

9.2.3 Fiordland National Park Management Plan 2007

The Fiordland National Park Management Plan (FNPMP) 2007 is a statutory document and provides for the management of Fiordland National Park (FNP) in accordance with the General Policy for National Parks 2005 and the National Parks Act 1980. The FNPMP provides detailed objectives and policies for the effective management of FNP.

The FNPMP is broken into six separate parts. The following parts are most relevant to this proposal:

- Part Two – Treaty of Waitangi Relationships
  - Section 2.1 Giving Effect to the Treaty of Waitangi
- Part Four – Biodiversity, Landscapes, and Historical Management
  - Section 4.3 Preservation of Indigenous Species and Habitats
  - Section 4.12.3 Further Recognition of Heritage Values
- Part Five – Visitor Management
  - Section 5.3.9 Front Country Visitor Settings
  - Section 5.3.9.2 Milford Road
  - Section 5.7 Roading, Vehicle Use and Other Transport Options
- Part Six – Management of Natural Resources
  - Section 6.15 Access and Utilities

An assessment of the proposal against the relevant objectives and policies from those sections identified above has been undertaken and is provided in Appendix K. As per the assessment, the proposal is consistent with these objectives and policies.

9.2.4 Te Tangi Au Tauira – the Cry of the People: Kāi Tahu Ki Southland Natural Resource Management Plan 2005

Te Tangi Au Tauira is the iwi management plan for Murihiku (Southland) and is a relevant consideration with respect to iwi values. Section 3.3 Te Atawhenua – Fiordland and 3.3.5 Fiordland Future Development is relevant in this instance.

An assessment of the applicable provisions of the Te Tangi Au Tauira iwi management plan has been undertaken in Appendix K. As per the assessment, the proposal is consistent with the relevant sections of Te Tangi Au Tauira.

10 NOTIFICATION

Notification of an application lies at the discretion of the Minister. Section 17SC of the Conservation Act determines the process for determining public notification of concession applications made under Section 17O of the Act.

In this case, the adverse effects of the proposal will be less than minor on ecological values, natural processes, natural character, and cultural values, while the landscape and visual effects and effects on heritage values will be minor. There will be no effect on archaeological values or on public access and recreational values while the proposal will give rise to significant positive effects.

The applicant does not request public notification and will undertake and attempt to provide any information sought (s17SD/s17SE).

11 CONCLUSION

Pursuant to Section 17S and 17O of the Conservation Act Waka Kotahi applies for a concession from the Department of Conservation for the use of conservation land to progress safety and resilience improvements at the eastern portal of the Homer Tunnel, being the construction of a replacement avalanche and rockfall protection shelter and associated works.

While the site is located within an outstanding natural landscape, the Milford Road is classified as a Frontcountry visitor setting being one of six defined settings within the Fiordland National Park (FNP). The intention of this setting is that it should continue to absorb the greater part of any increased use of FNP while it is recognised that further development within this setting may be desirable to effectively manage visitors and ensure a range of quality experiences are available.

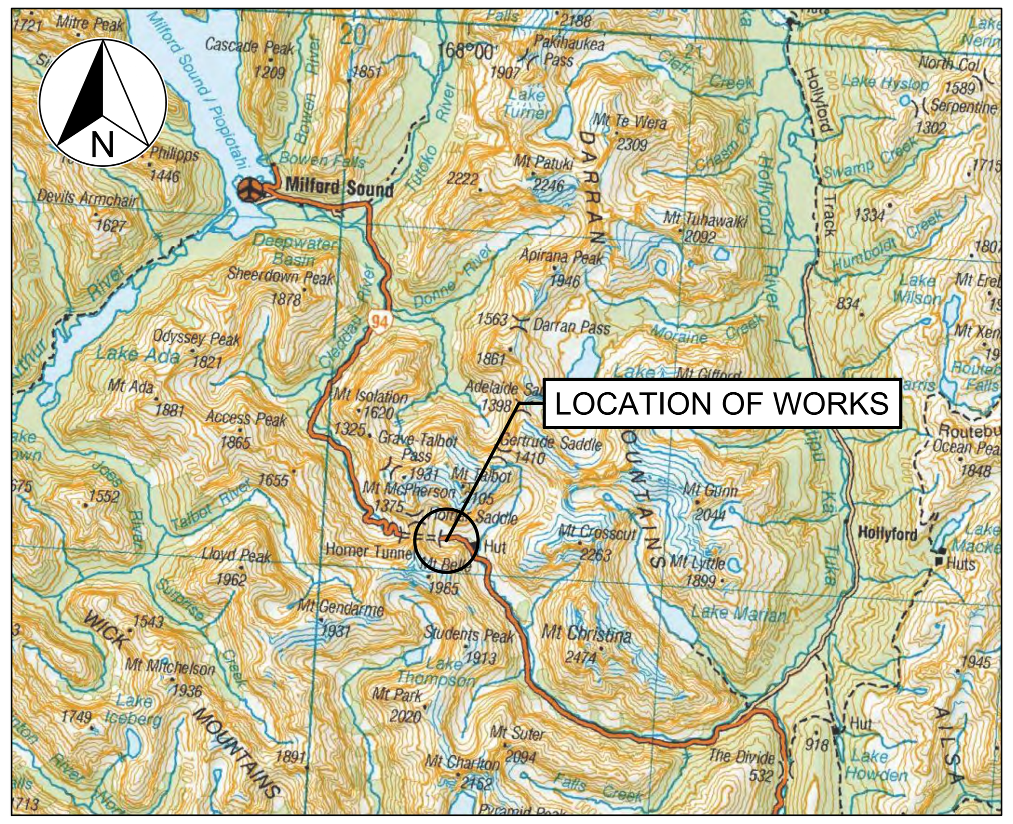
An effective and fit for purpose protection structure is critical to ensuring visitors can continue to safely access FNP's offering. Due to the purpose of the proposed infrastructure, there are no alternative sites.

The proposal will result in significant positive effects with respect to safety and resilience of SH94 / Milford Road and those industries and the general public that rely on the state highway network. The assessment of potential and actual effects with respect to ecological values, natural processes, natural character and cultural values are less than minor while there will be no effect on archaeological values or on public access and recreational values. The proposal will have minor effects on landscape and visual effects and heritage values.

In accordance with Section 17W of the Conservation Act the proposal is consistent with the objectives and policies of the Southland Murihiku Conservation Management Strategy 2016 and the Fiordland National Park Management Plan 2007 being the applicable management documents that set out the measures required to achieve the specific care of the National Park. Further, in relation to iwi values the proposal is consistent with the Kāi Tahu Ki Southland Natural Resource Management Plan 2005.

Based on the above, it is therefore considered that the granting of this concession application will not be contrary to the provisions of the Conservation Act or the purposes for which the land concerned is held.

Appendix A
Construction Drawings



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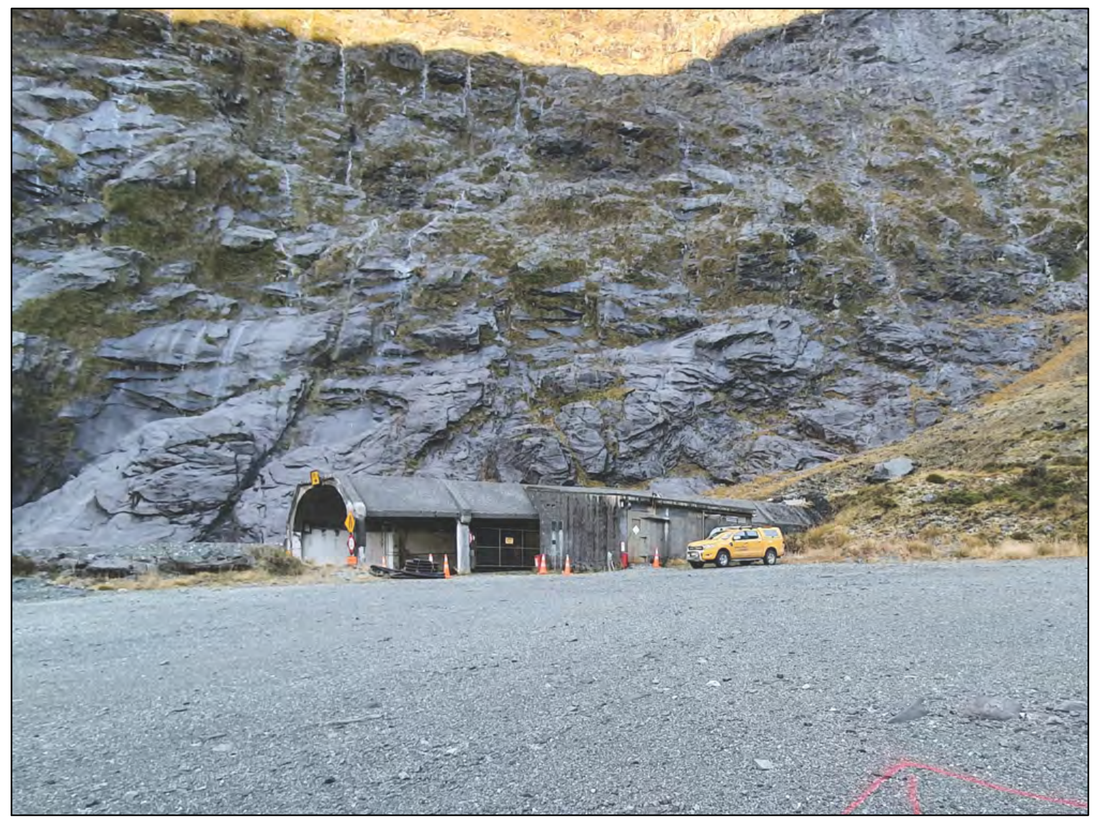
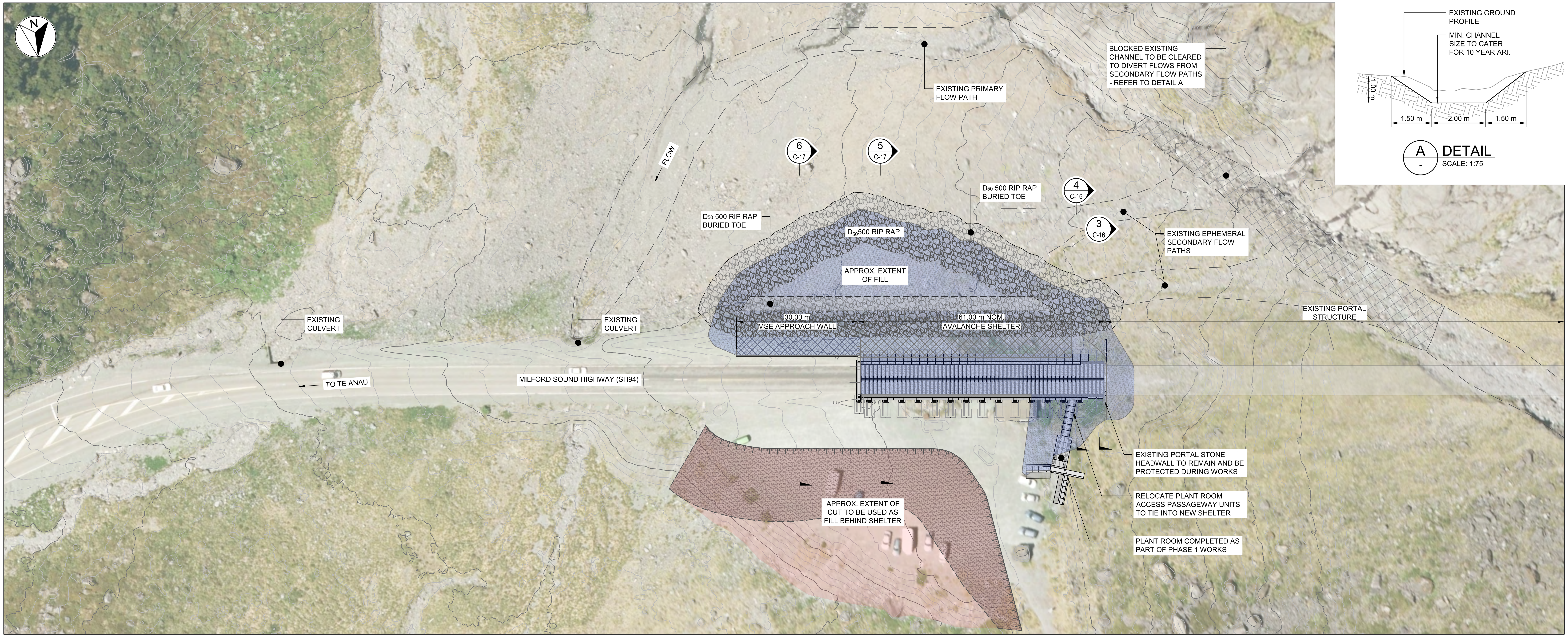


EXISTING AVALANCHE SHELTER

EXISTING AVALANCHE SHELTER AND PLANT ROOM

EXISTING PORTAL STONE HEADWALL



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REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR CONSENT	M.C.	2022-05-20

WAKA KOTAHI NZ TRANSPORT AGENCY

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CIVIL

SCALES: AS SHOWN @ A1
ORIGINAL SIZE: A1

DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
T. BERRYMAN	-	2022-05-20

FOR INFORMATION

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
GENERAL ARRANGEMENT
SITE PLAN

WSP PROJECT NO. (SUB-PROJECT): 6-DK546.00
SHEET NO.: C-11
REVISION: A

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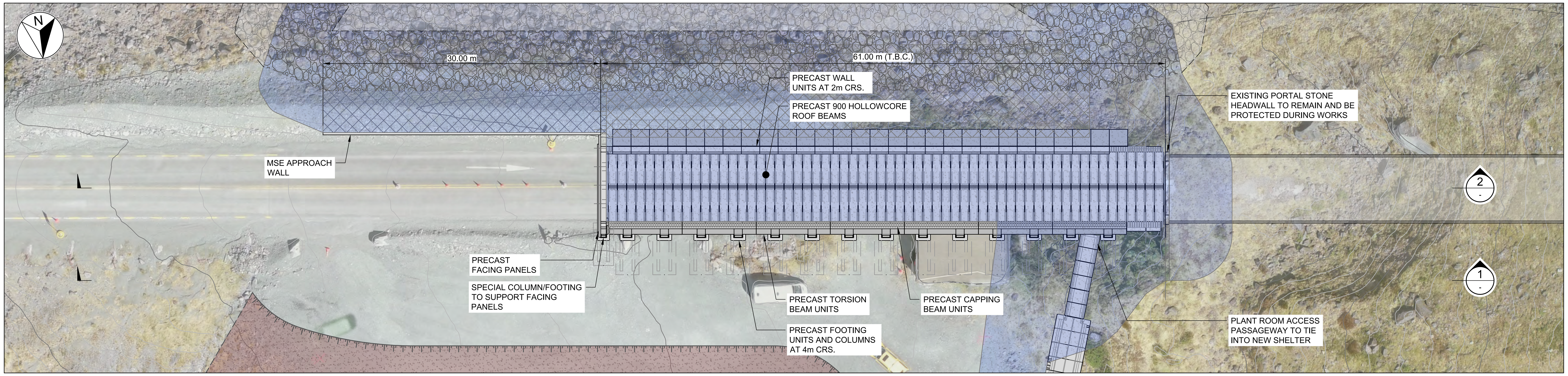

PLAN - AVALANCHE SHELTER

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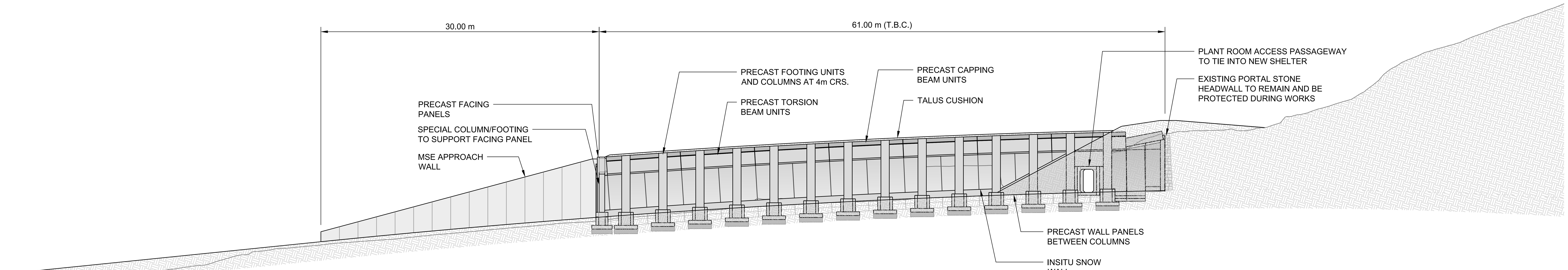

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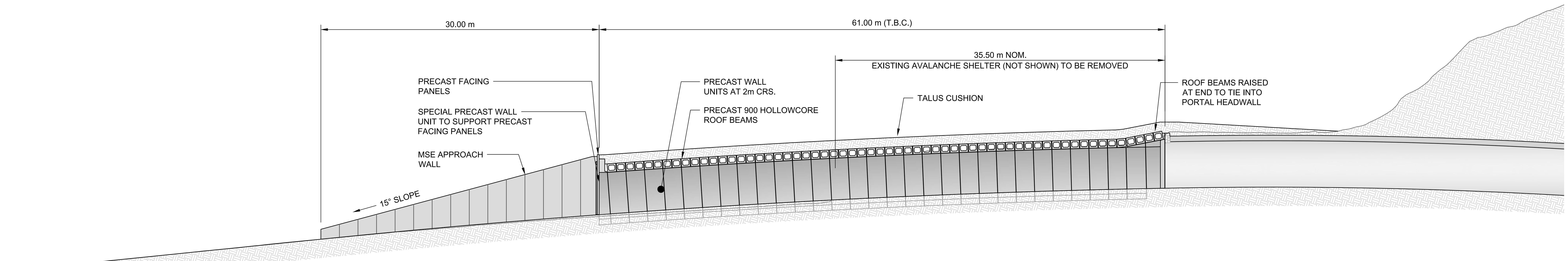

2 LONGSECTION - AVALANCHE SHELTER

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REVISION	AMENDMENT	APPROVED	DATE
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SCALES: AS SHOWN @ A1
ORIGINAL SIZE: A1
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APPROVED: M. COWAN
DRAWING VERIFIED: T. BERRYMAN
DESIGN VERIFIED: -
APPROVED DATE: 2022-05-20

FOR INFORMATION

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
GENERAL ARRANGEMENT
STRUCTURE - PLAN AND ELEVATION

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SHEET NO.: C-12
REVISION: A

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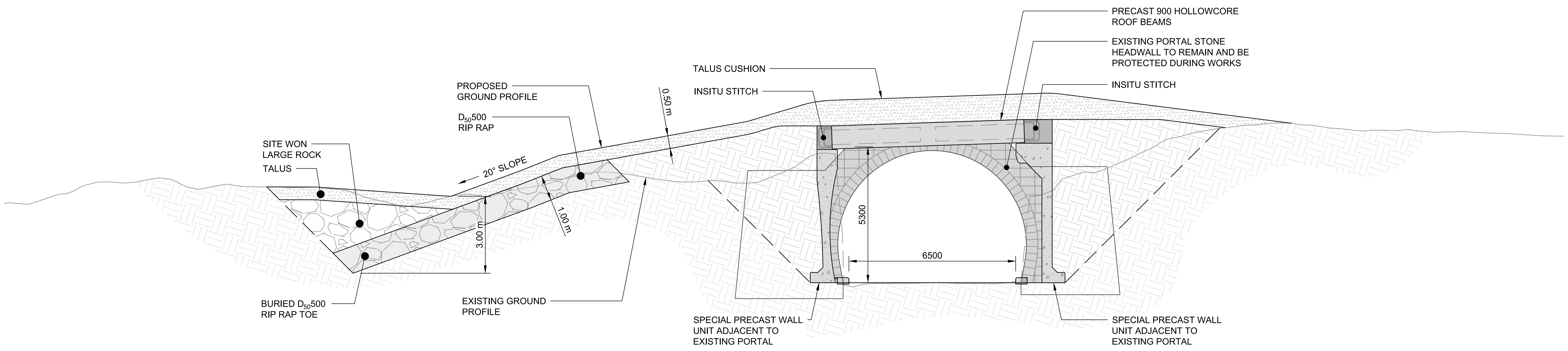

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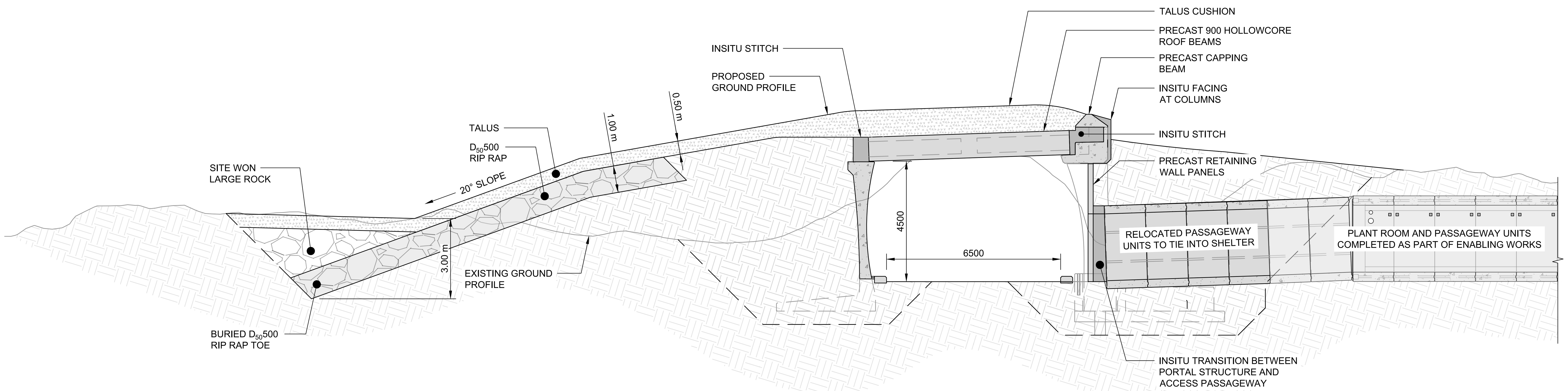

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REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR CONSENT	M.C.	2022-05-20

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SCALES		ORIGINAL SIZE
AS SHOWN @ A1		A1
DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
T. BERRYMAN	-	2022-05-20

FOR INFORMATION

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
GENERAL ARRANGEMENT
TYPICAL SECTIONS

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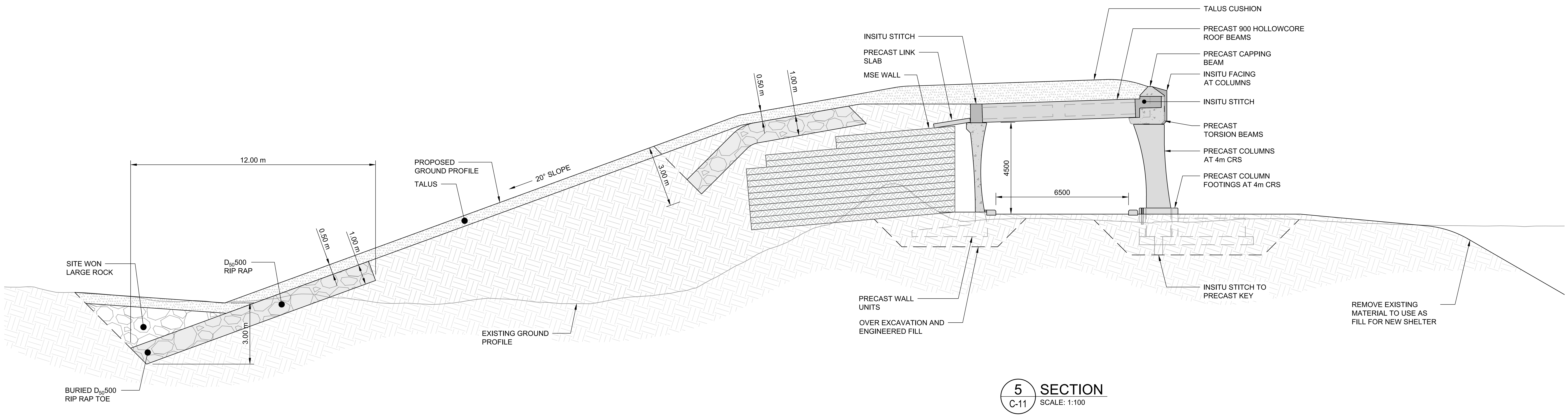
6-DK546.00	C-16	A



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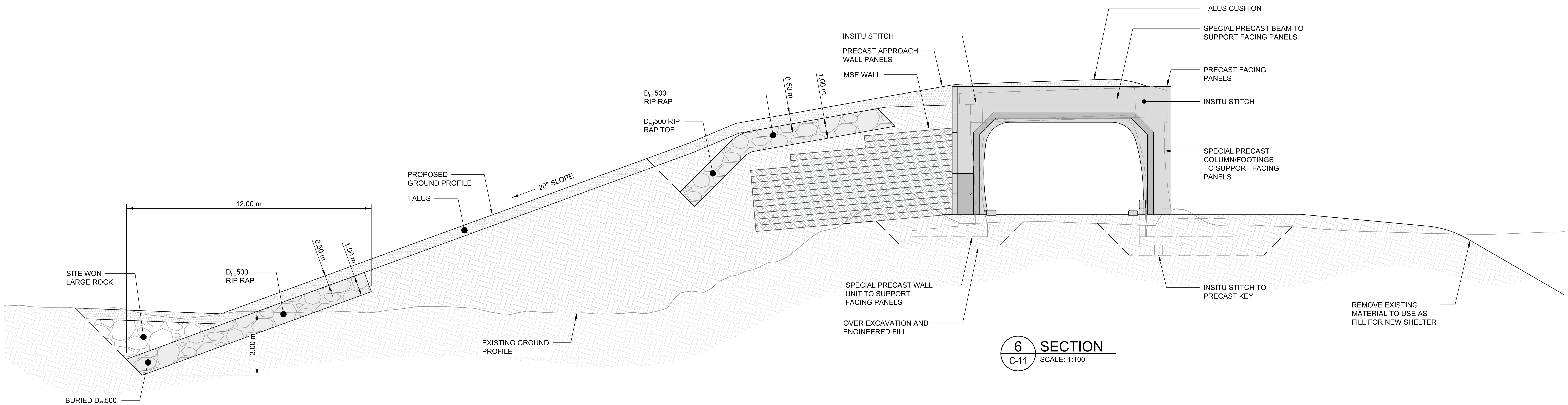

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REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR CONSENT	M.C.	2022-05-20

WAKA KOTAHI NZ TRANSPORT AGENCY

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SCALES: AS SHOWN @ A1
ORIGINAL SIZE: A1
DRAWN: J. MACDONALD
DESIGNED: P. ROUTLEDGE
APPROVED: M. COWAN
DRAWING VERIFIED: T. BERRYMAN
DESIGN VERIFIED: -
APPROVED DATE: 2022-05-20

FOR INFORMATION

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
GENERAL ARRANGEMENT
TYPICAL SECTIONS

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Appendix B
Statutory Rules Assessment

Resource Management Act 1991 (RMA) Activity Classification Assessment – Homer Tunnel Avalanche Protection Shelter

Revision 1: 03/05/2022

Description of Proposal

Waka Kotahi NZ Transport Agency (Waka Kotahi / the Applicant) are proposing to construct a replacement avalanche and rockfall protection structure and associated works at the eastern portal to Homer Tunnel (the Project). The replacement avalanche and rockfall protection structure comprises several key elements including:

- An approximate 80m long protection shelter structure
- A 30m long mechanically stabilised earth (MSE) retaining wall
- The placement of rock rip rap for erosion protection south of the protection shelter
- Excavation of bulk fill from the car park area to be backfilled over the shelter

National Rules

National Resource Management Regulations have also been assessed with respect to the potential for contaminants in soil (NESCS) and consideration of the potential for reclamation of a river (NESF).

Regional Rules

The placement of rock rip rap for erosion protection south of the protection shelter will occur within ephemeral waterways which are tributaries of the Upper Hollyford River and requires consideration against rules within the Operative Regional Water Plan for Southland as well as the Proposed Southland Water and Land Plan (*Decisions version, 1 March 2021). Also considered is the Regional Air Plan 2016 with respect to the discharge of construction related dust. The key aspects considered in this rule assessment are as follows:

- Disturbance, placement of erosion and sediment control structures and realignment of waterways (Section 13)
- Diversions of waterways (Section 14)
- Discharge of stormwater (Section 15)
- Discharge of dust to air (Section 15)

District Rules

The rules in the Southland District Plan relating to the Fiordland/Rakiura Zone and the district wide biodiversity section are considered.

Key Assumptions

The following assumptions have been made when assessing the proposal against relevant regional rules:

- No upgrading or replacement to any existing culverts will be required
- No taking of water is required for construction and any water required will be trucked to site

Table Function:

Acronyms and definitions for terms used is at the end of the table. The Far Right 'Activity Classification' Column: **Black Bold Text** = no consent required as permitted or already consented, **Red Bold Text** = when resource consent is required, as not permitted nor already consented. Underlined Text = definition provided within the table notes at the end of the table.

Activity	RMA Section	Regulation / Plan Name	Regulation, Rule or Chapter #	Comment / Assessment	Likely Activity Classification
National Environmental Standards (administered by SDC)					
Disturbing contaminated soil	s9(1)	NESCS	Reg 7/ 9	The NESCS apply to 'a piece of land' where an activity or industry described in the HAIL is being undertaken on it. A preliminary site investigation (PSI) identified that the existing car park area in front of the Homer Tunnel has been built up from material won from the excavation of the Homer Tunnel and also demolition rubble from the historic avalanche shelter. There is potential for hazardous substances to be buried within this demolition rubble. A site walkover also found large amounts of scrap metal and some building rubble in an adjacent site, therefore there has been potential migration of any hazardous materials onto the site.	Not Applicable

Activity	RMA Section	Regulation / Plan Name	Regulation, Rule or Chapter #	Comment / Assessment	Likely Activity Classification
				To understand the potential risk of migrated contaminants and the applicability of HAIL 'H', a detailed site investigation (DSI) was undertaken. The results show no exceedances of human health and soils are generally at background levels. There are hydrocarbons reported slightly above reporting limits and therefore above background however these are minor and likely related to the use of the site as a carpark i.e., oil leaks/diesel spills from cars. In order for HAIL 'H' to apply, land must be considered to have been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment. On the basis of the sampling results the contaminants identified are not of a sufficient quantity that it could be a risk to human health or the environment HAIL 'H' therefore does not apply and the proposed works are not occurring on a "piece of land" as such the NESCS does not apply.	
National Environmental Standards (administered by Regional Council)					
Reclamation of a river	s9(1) & s13	NESF	Regulation 57	The reclamation of the bed of any river is a discretionary activity under the NESF. The placement of the proposed erosion and scour protection within ephemeral waterways immediately south of the avalanche protection structure is not considered to be a reclamation as the works are not considered to form dry land. Furthermore, the construction of natural hazard protection is excluded from the definition.	Not Applicable
Regional Requirements					
Erosion control structures	s13	RWPS	Rule 30	Rock Rip Rap is proposed to be placed to the south of the new protection structure for scour and erosion protection from surface water flows and to prevent the new structure from avalanche loading. The footprint of the rip rap will extend across two defined ephemeral waterways which form tributaries of the Upper Hollyford River. Rule 30 of the operative plan provides for the placement or reconstruction and any associated bed disturbance of rock rip rap, on, under or over the bed of any river, modified watercourse, stream as a permitted activity subject to conditions. Condition (i) requires that the work cannot be in a national park. The works are located within Fiordland National Park and therefore Rule 30 cannot be complied with. Therefore, resource consent is required.	Discretionary Activity
	s13	PSWLP	Rule 61	Rock Rip Rap is proposed to be placed to the south of the new protection structure for scour and erosion protection from surface water flows and to prevent the new structure from avalanche loading. The footprint of the rip rap will extend across two defined ephemeral waterways which form tributaries of the Upper Hollyford River. Rule 61(a) of the proposed plan provides for the placement or reconstruction of rock rip rap, gabion baskets or anchored or layered trees in, on, under or over the bed of a lake, river or modified watercourse and any associated bed disturbance and discharge resulting from the carrying out of the activity as a permitted activity subject to conditions. Condition (i) requires that the work cannot be in a national park. The works are located within Fiordland National Park and therefore Rule 61 cannot be complied with. Therefore, resource consent is required.	Discretionary Activity
Channel realignment (Dry Cut)	s13	RWPS	Rule 40	The excavation and disturbance of the bed of two defined ephemeral waterways which form tributaries of the Upper Hollyford River will be required for the purpose of temporary realigning these waterways during construction. The excavation or disturbance of the bed of any river, modified watercourse, stream or lake for the purpose of making a dry cut requires resource consent as a restricted discretionary activity.	Restricted Discretionary Activity
		PSWLP	Rule 71	Except as provided for elsewhere in the PSWLP, the excavation or disturbance of the bed of a river or modified watercourse for the purpose of realigning, widening or deepening any channel within the bed is a discretionary activity.	Discretionary Activity

Activity	RMA Section	Regulation / Plan Name	Regulation, Rule or Chapter #	Comment / Assessment	Likely Activity Classification
				It is proposed to deepen and widen an existing ephemeral channel at the toe of the mountain slopes to the south of the proposed avalanche and rockfall protection structure to ensure that water shedding from the mountainous catchment above remains away from the worksite during construction.	
Diversion of ephemeral streams	s14	RWPS	Rule 20	Minor diversions of surface water will likely be required temporarily during construction to enable the placement of rip rap erosion protection and a dry working zone. Notwithstanding any other rule in this Plan, the diversion of water within a river or lake bed is a permitted activity subject to conditions of Rule 20. Condition (a)(i) requires the minor diversion to be associated with a permitted activity under Rules 24 to 46 or for the purposes of habitat creation, restoration and enhancement [...]. The proposed diversion will be associated with an activity requiring resource consent under Rule 40 and will not be for the purposes of habitat creation, restoration and enhancement and therefore Rule 20 does not apply. The activity is therefore classified under Rule 18 (d)(iii) as a restricted discretionary activity.	Restricted Discretionary Activity
		PSWLP	Rule 51	Minor diversions of surface water will likely be required temporarily during construction to enable the placement of rip rap erosion protection and a dry working zone. Despite any other rule within the PSWLP, the diversion of water within a river is provided for as a permitted activity subject to conditions. Key conditions require that: • the diversion is for the purposes of undertaking a permitted activity under Rules 55 to 79 • the diversion is carried out completely within the riverbed (i.e. no water is diverted outside of the river or lake bed); • the water is returned to its original course after completion of the activity, no later than one month after the diversion occurs; If water is present in the two ephemeral waterways, the diversion of surface water will be required. The diversion will not be associated with a permitted activity under Rules 55 to 79, nor will it be carried out completely within the bed of the riverbed, while the diversion will be in place for longer than one month. The temporary diversion will therefore require resource consent.	Discretionary Activity
Discharge of dust	s15	ORAP	Rule 5.5.3	Any discharges of contaminants into air from the following industrial or trade premises are permitted activities, provided that the criteria which follow the list are met. The criteria applicable to this proposal includes: 10. any gravel extraction processes operating at 100 tonnes or less in any hour. The excavations across the project footprint including talus material and the car parking area will not exceed 100 tonnes in any hour.	Permitted
Earthworks	9(3)	SDP	FRZ.1/FRZ.3	Rule FRZ.1 – 2(1) provides for earthworks as a permitted activity provided that earthworks that (a) in any 12 month period do not exceed… 200m3…; (b) (i) are greater than 20m from a waterbody that do not alter the existing ground level by more than 5m in depth or 2m in height; (ii) within 20 m of a waterbody that do not alter the existing ground level by more than 2 m in depth or height; … and: (i) shall not be undertaken at an elevation greater than 700m amsl… (ii) shall not be undertaken on slopes of more than 20°; (iv) shall not be undertaken within 5 metres of any water body. Earthworks associated with the proposal will exceed 200m³, will alter the height of existing ground by more than 2 m in height within 20 m of an ephemeral waterbody, occur on a slope greater than 20°, will be undertaken at an elevation greater than 700m amsl and will occur within 5 m of ephemeral waterbodies. Pursuant to Rule RZ.3(6) any activity that does not meet the permitted activity criteria of FRZ.1 is a discretionary activity.	Discretionary Activity

Activity	RMA Section	Regulation / Plan Name	Regulation, Rule or Chapter #	Comment / Assessment	Likely Activity Classification
Replacement Avalanche and Rockfall Protection Structure			FRZ.1/FRZ.3	Rule FRZ.1 (3) provides that any activity or work of the Crown within the National Park or Public Conservation Land that is consistent with the relevant Conservation Management Strategy or National Park Management Plan and will not have a significant adverse effect beyond the boundary is a permitted activity subject to meeting the general standards are met. The 'Crown' is inferred to be the Department of Conservation and therefore this rule does not apply.	Not Applicable
			FRZ.4	Any activity that is not listed as a Permitted, Controlled or Discretionary Activity is a Non-Complying Activity. There is no rule providing for the replacement infrastructure proposed.	Non-Complying
Vegetation clearance			BIO.1/BIO.3	Rule BIO.1(3) provides for the clearance, modification or removal of indigenous vegetation where it is associated with the operation, maintenance, minor upgrading, repair or removal of any existing regionally significant infrastructure or existing renewable electricity facilities as a permitted activity. The proposal will constitute more than 'minor upgrading' of existing regionally significant infrastructure and therefore won't meet the requirements of the rule. There is no other relevant rule that provides for the activity. The clearance, modification or removal of indigenous vegetation which is not provided for under Rule BIO.1 or Rule BIO.2 is a Discretionary Activity.	Discretionary Activity

Table Notes

Acronyms

DSI – Detailed Site Investigation
HAIL – Hazardous Activities and Industries List
NESCS – National Environmental Standard for Managing and Assessing and Managing Contaminants in Soil to Protect Human Health 2011
NESF - Resource Management (National Environmental Standards for Freshwater) Regulations 2020
ORAP – Operative Regional Air Plan
PSWLP – Proposed Southland Water and Land Plan (*Decisions version, 1 March 2021)
PSI – Preliminary Site Investigation
RWPS – Regional Water Plan for Southland
SCS – Soil Contaminant Standard in the NESCS
SDP – Southland District Plan

Definitions

Natural State Waters – means waters within areas defined as National Park managed under the National Parks Act 1980; [...]
Stormwater – Surface water runoff subsequent to participation
Industrial or Trade Premises – [...] (c) Any other premises form which a contaminant is discharged in connection with any industrial or trade process
Industrial or Trade Process - Includes every part of a process from the receipt of raw material to the dispatch or use in another process or disposal of any product or waste material, and any intervening storage of the raw material, partly processed matter, or product.
Reclamation – means the manmade formation of permanent dry land by the positioning of material into or onto any part of a waterbody, bed of a lake or river or the coastal marine area, and:
(a) includes the construction of any causeway; but (b) excludes the construction of natural hazard protection structures such as seawalls, breakwaters or groynes except where the purpose of those structures is to form dry land.

Appendix C
Detailed Site Investigation

Project Number: 6-DK546.00

Homer Tunnel Shelter Extension, Milford Road

Preliminary and Detailed Site Investigation

27 May 2022

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Revision	Details
1	Draft for client comments
2	Final for issue

Executive Summary

WSP New Zealand Limited (WSP herein) have been engaged by Waka Kotahi (the client) to provide engineering services for the design of an avalanche shelter at the eastern portal of the Homer Tunnel (the site), on State Highway 94 (SH94) near Milford Sound. As part of the development, WSP has undertaken a preliminary and detailed site investigation to determine the risks to human health and the environment as part of the proposed site works. The site is located within Fiordland National Park.

The site is currently the eastern Portal to the Homer Tunnel and has historically been built up using excavation material won from the Homer Tunnel, unknown source material and building rubble, and as such is considered to have potentially undergone HAIL activities. Therefore, a PSI/DSI is required for assessment of the risks to human health and the environment associated with ground disturbance.

A review of historical imagery and council records indicates that the material has been present on the site since the construction of the tunnel in the 1930's. The Environment Southland HAIL database indicates that there have been potential, although not yet investigated, HAIL activities on site.

Based on site visit observations, anecdotal evidence from current landowners, council records and a review of historic aerial imagery, the site has potentially been subject to HAIL activities, namely:

- H: Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment;
- I: Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment

Detailed Site Investigation Works

To achieve the objectives of the DSI portion of this report, a judgemental sampling pattern was adopted across the carparking area of the site only, where ground disturbance of HAIL land is proposed. A total of 7 locations were sampled. These were taken within both near surface soils and test pits at locations where potential contaminants may be present.

Samples were analysed for a suite of heavy metals and hydrocarbons (TPH/BTEX PAH), as well as a single asbestos sample.

Subsurface Conditions

Soil type was generally consistent across the sampled locations on site. Some of the fill material contained organics (tree remnants, TP01) and building debris was found in TP02-TP05. Soils generally comprised dry sandy gravel or gravelly sand which was bluish grey. No groundwater was found within any of the locations investigated.

Results

Human health exceedances were not reported in any of the samples analysed. These samples were compared with a parks/recreation end use. No asbestos was present in samples tested. Exceedances of background concentrations were recorded for hydrocarbons in 2 of the 13 samples.

One sample exhibited marginally elevated copper and a further four samples were in excess of the zinc Eco-SGV. Taking into consideration background concentrations for the local geology however, these levels are not considered to be outside the normal range for materials in the area, particularly in the case of zinc and as such are not considered to pose a risk to ecological receptors.

Development Proposals

It is proposed to construct a new avalanche shelter from the existing eastern portal of the tunnel. This will involve demolition of the existing portal and construction of a new avalanche shelter that extends further than the existing structure. As part of the works, an earth bund is to be constructed on the southern side of the road using materials sourced from the present-day carparking area. This material is to be used as bulk fill and encapsulated with locally won Talus material.

NESCS Considerations

Potential HAIL activities were investigated on the car parking area of the site. No HAIL activities were found to have occurred or be occurring on other areas of the site. As potential HAIL has occurred within the car parking area of the site a detailed site investigation has been completed on this area for ground disturbance. It is considered highly unlikely that there would be a risk to human health associated with works on other areas of the site.

Intrusive investigations within car parking area of the site have found only organic hydrocarbon contaminants in slight excess of background concentrations in isolated areas. The NESCS does not apply to the site as soil contaminants are not present in sufficient quantity to present a risk to human health or the environment.

Soil Disposal

Soils are suitable for re-use on site. Materials may be re-worked for deposition on the southern side of the road as part of the portal extension works. Any materials not used within the earthworks on the southern part of the site may be retained within the northern PoL (car park).

Although not recommended, should soil disposal to an off-site source need to occur this would be as Managed fill as soils were found to contain metals in excess of Class A landfill criteria. Further analysis of soil samples for toxicity characteristic leaching testing (TCLP) prior to disposal may need to be undertaken in order to determine their suitability.

Individual landfill facilities have their own consented acceptance criteria for waste materials and should be approached with the laboratory results appended to determine suitability for acceptance should off-site disposal be considered necessary.

Disposal of materials to landfill is not considered to be a cost effective or sustainable option based on soil chemistry, geographical location and ecological risk.

Recommendations

Based on the findings of this investigation WSP recommends that:

Based on the findings of this investigation WSP recommends that:

- Should any ground conditions be encountered across the site which are not anticipated from the findings of this report a SQEP should be consulted in order to reassess the risks to human health;
- Disturbance of the car parking area should include an unexpected contaminant discovery protocol as part of the general site management plan;
- This DSI report is submitted to the consenting authority as part of any resource consent application; and
- The report is submitted to the regional authority for updating of the HAIL database.

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F: Laboratory CoC, Results and Soil Data Tables
G: Accidental Discovery Procedure

Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for Waka Kotahi ('**Client**') in relation to a Detailed Site Investigation Report ('**Purpose**') and in accordance with the extension dated 11/05/2022 to the contract NZTA3948 Homer Tunnel Avalanche Shelter Pre-Implementation and Implementation. The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

In preparing the Report, WSP has relied upon data, surveys, analyses, designs, plans and other information ('**Client Data'**) provided by or on behalf of the Client. Except as otherwise stated in the Report, WSP has not verified the accuracy or completeness of the Client Data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this Report are based in whole or part on the Client Data, those conclusions are contingent upon the accuracy and completeness of the Client Data. WSP will not be liable in relation to incorrect conclusions or findings in the Report should any Client Data be incorrect or have been concealed, withheld, misrepresented, or otherwise not fully disclosed to WSP.

1 Introduction

WSP New Zealand Limited (WSP herein) have been engaged by Waka Kotahi (the client) to provide engineering services for the design of an avalanche shelter at the eastern portal of the Homer Tunnel (the site), on State Highway 94 (SH94) near Milford Sound. As part of the development, WSP has undertaken a preliminary and detailed site investigation to determine the risks to human health and the environment as part of the proposed site works. The site is located within Fiordland National Park.

It is understood that it is proposed to construct a new concrete avalanche shelter at the portal, extending an additional 60m approximately from the present-day structure. Relocation of ancillary structures is also proposed. As part of these works, material from the existing carpark on the north side of SH94 is to be moved to the south side to construct an earth bund to protect the new avalanche structure, with there being a potential for material excavated from the northern part of the site to be stored and screened at a nearby site prior to it being placed back on the southern side.

The site is currently identified on the Environment Southland (ES) contaminated sites register as being verified HAIL, however, it is not classified and no further information is provided. The MfE Hazardous Activities and Industries List (HAIL) document is a compilation of activities and industries that are considered likely to cause land contamination resulting from hazardous substances use, storage or disposal. The HAIL is intended to identify most situations in New Zealand where hazardous substances could cause, and in many cases, have, caused land contamination that has the potential to be harmful to human health. In order to determine the presence or absence of soil contamination on and near to the proposed development area WSP undertook a Preliminary Site Investigation (PSI) and Detailed Site Investigation (DSI).

Preparation of a PSI and DSI under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) Regulation (2011) will provide information as to whether soil contamination from current and historical activities onsite is likely to be present at levels that could adversely impact human health. In addition soil contamination information can determine whether there is likely to be any adverse environmental impacts associated with the disturbance of potentially contaminated soils on site.

1.1 Objective

The objective of this investigation was to characterise the contamination risk to human health and the environment during and following any potential future soil disturbance works on the site. The conclusions of this investigation may be used in support of obtaining consent under the NESCS and to meet any requirements from Environment Southland.

To achieve the objectives, the following scope was undertaken:

- Review publicly available historic aerial photographs of the site and surrounding areas;
- Review local geological and hydrogeological conditions through publicly available sources;
- Review of relevant previous reports for the site;
- Undertaking a site walkover to assess the current site conditions;
- Collection of soil samples across the site from test pits excavated for environmental sampling;
- Analysis of soils from varying lithologies and depths for contaminants of concern;
- Comparison of the soil analysis results with applicable background and standard risk values; and
- Preparation of this PSI/DSI report detailing contaminates, risks identified, soil analysis results and consenting requirements.

This report has been reviewed by a Suitably Qualified and Experienced Practitioner (SQEP), as per the NESCS Regulations 2011.

2 Site Location and Setting

The Homer Tunnel is located approximately 96km north of Te Anau on State Highway 94 (SH94), Milford Road, and connects the Milford Sound with Te Anau (Figure 1). The Tunnel passes beneath the Homer Saddle (1375 mRL) and is 1280m long. The Eastern portal is at an elevation of 918mRL.

The area is in a remote alpine environment located within the Fiordland National Park and the South-West New Zealand World Heritage Area, Te Wāhipounamu.

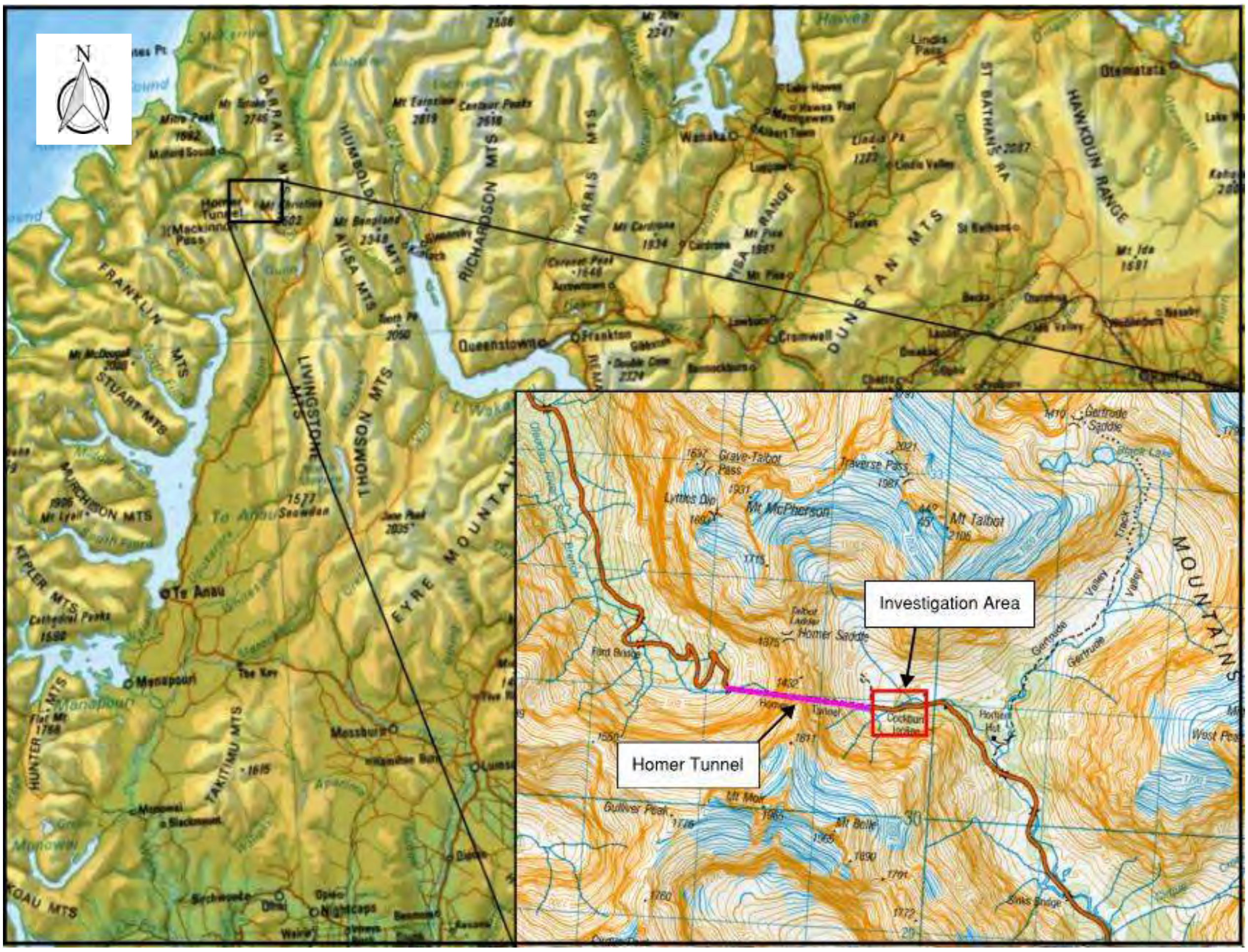


Figure 1: Location map of the Homer Tunnel and eastern portal investigation area

The site comprises approximately 10,000m^2 and comprises the carpark to the north of SH94 at the portal entrance, as well as the road and proposed fill area on the southern side. The site is bordered by steep rock valley walls to the south and west, and the valley floor to the east and north.

The site identification details are provided in Table 1 and the site layout is presented in Figure 2.

Table 1: Summary of site details

Site Address	Homer Tunnel Eastern Portal, SH94, Fiordland
Approximate Site Area (m^2)	10,000m^2
Proposed Site Use	Roadway and associated curtilage
NESCS Permitted Activity threshold volumes: 1) Total site disturbance, and 2) Yearly off-site movement of soil based on the approximate total site area	 500m^3 100m^3

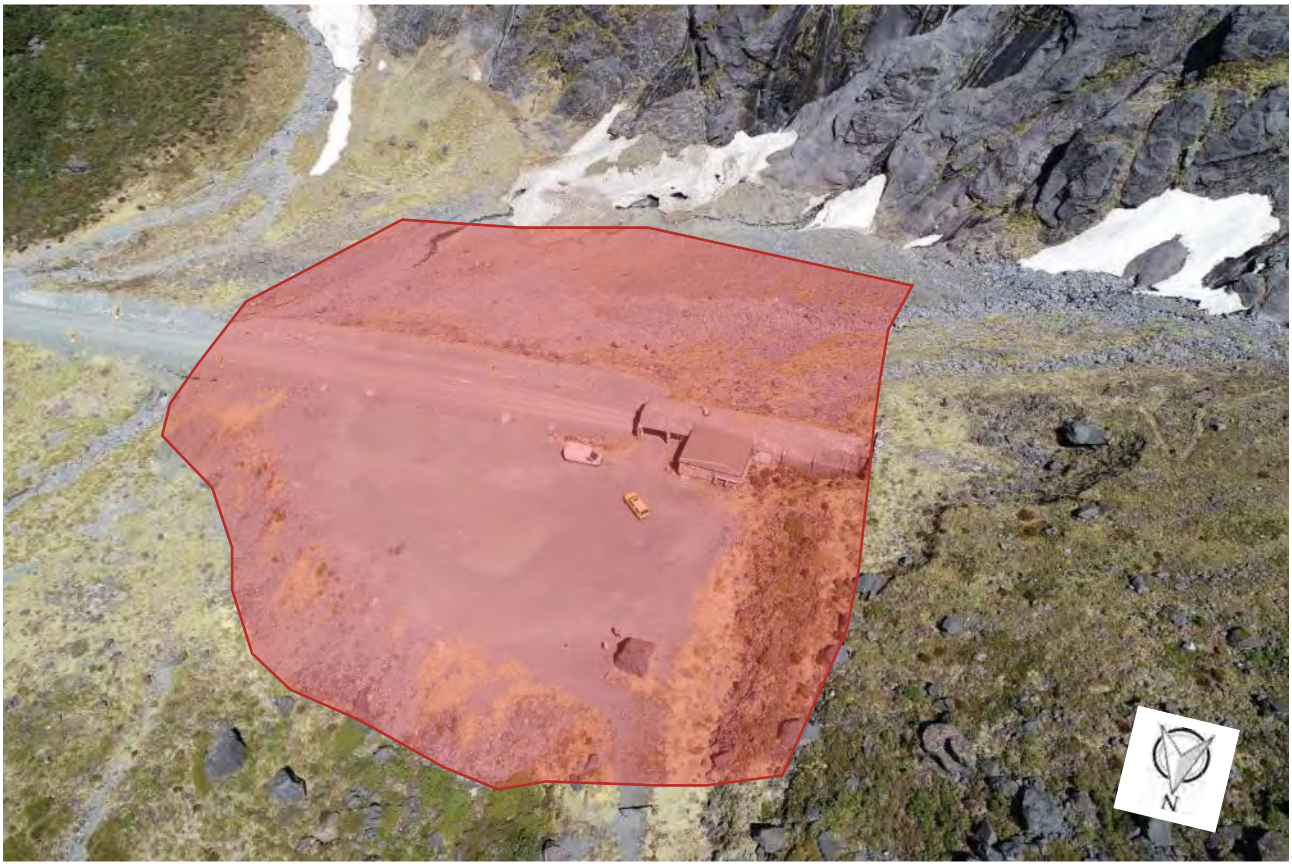


Figure 2: Approximate Site Layout.

2.1 Geology and Hydrogeology

The site is located within the Darran Complex which forms a narrow belt of igneous intrusive rocks that extends from Lake McKerrow in the north to Lake Te Anau in the south.

Igneous intrusive rocks (plutonic origin) dominate the geology of the Fiordland area and typically include gabbro and diorite within the Darran complex. Emplacement was followed by significant uplift in the order of 18km (with near equivalent amounts of erosion).

The dominant rock type at the Homer Tunnel is an un-weathered biotite leucogabbro. This is dissected by south-west oriented intrusive pegmatite veins and diorite dykes which reflect past tectonic stresses. Hydrothermal veins within these volcanic rocks have introduced minerals of varying geochemistry, which have subsequently been eroded and weathered.

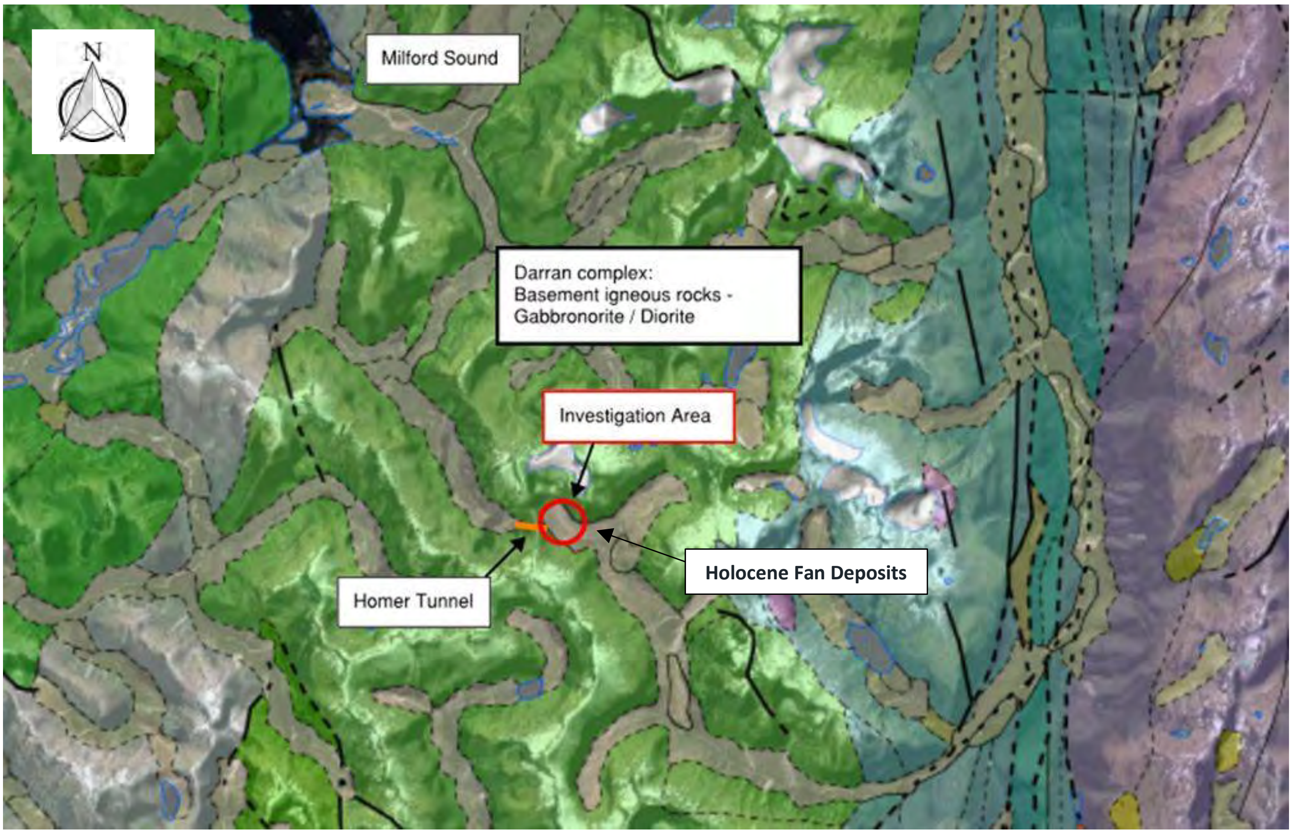


Figure 3: Geological Map of the area (GNS Geological Webmap extract)

The Institute of Geological and Nuclear Sciences Geological Web Map indicates that much of the site is situated on Holocene fan deposits comprising angular boulders, gravel, sand and silt. These include debris flow and avalanche deposits, refer to Figure 3.

Our site inspection found that much of the carpark area on the northern side of the road comprises fill, most likely sourced from the excavation of the Homer Tunnel, demolition material from the original portal destroyed by an avalanche and road scrapings such as asphalt from road clearance following avalanche or debris flow and/or remnants from renewals.

2.1.1 Topography and Surface Water Drainage

The site lies at the head of a glaciated valley and is at an elevation of approximately 920m above mean sea level. The valley walls are generally bare of vegetation due to extreme annual rainfall, which effectively washes away topsoil before it is able to be vegetated and repeated snow avalanches which occur regularly during the winter and shoulder seasons. Where not within avalanche paths, the valley floor contains low native scrub, with protected gullies containing dense mature forest.

The carpark and road on site are generally level and slope gently towards the east. There is a steep drop off at the boundary of the carpark where no fill has been placed. Natural material is present at the base of the slope. The area to the south of the road lies approximately 5m lower in elevation, and slopes towards the north-east.

Heavy and persistent rainfall is a characteristic of the area. Water generated from this rainfall drains into two main rivers in the area, the Cleddau in the west and the Hollyford in the east. Several small tributaries have carved through the talus debris slopes at the head of the Hollyford Valley on either side of the SH94 approach to the eastern tunnel portal. At the times of particularly heavy rainfall the whole valley can become saturated, and water will flow down randomly via flow paths to the valley floor.

2.1.2 Hydrogeology

The site is not located near to any defined aquifer, and as such is not subject to groundwater abstraction, however, is located within a National Park and both ground and surface water is therefore considered to be sensitive with respect to environmental considerations.

3 Site Condition and Surrounding Environment

3.1 Site Inspection

A site walkover was completed on 29 March 2022. Photographs taken as part of the site walkover and investigation are presented in Appendix A.

The southern part of the site comprises a gentle sloping base of a debris fan which is characterised by debris flow material consisting of boulders, cobbles and coarse gravel. SH94 intersects the site running in an east-west direction and is slightly elevated above the southern section.

Immediately on the northern side of SH94 the remnants of an historic avalanche shelter can be seen buried within the existing fill material. This material appears to consist of concrete reinforced with steel. There is an existing avalanche shelter which extends approximately 40m from the portal of the Homer Tunnel. Ancillary structures are present on the northern side of the tunnel which include a generator room.

The northern side of SH94 is generally level with the road and has historically been used as a gravel carpark. The site has been built up using material won from the excavation of the Homer Tunnel, approximately 8-10m and the northern boundary slopes steeply, approximately 40° to the valley floor below.

4 Proposed Development

The proposed avalanche shelter will replace the existing concrete portal at the eastern entrance to the Homer Tunnel and will extend eastwards along the existing road alignment. The length of the shelter is not currently established.

The new avalanche shelter will be constructed using pre-cast concrete units to form an open sided tunnel structure. The structure will then be capped by a rock rip rap layer and earth embankment sloping down to the south enabling future avalanche and rockfall to pass over the structure.

The road geometry, both vertical and horizontal is not subject to change. However, substantial earthworks will be required to improve the subgrade to support foundation loads and enable the construction of the shelter embankment. The shelter is currently proposed to be supported on shallow isolated and spread footings. A reinforced earth structure, independent of the shelter, is proposed to the south of the shelter to retain the proposed slopes.

An indicative sketch showing the current shelter option is presented below.

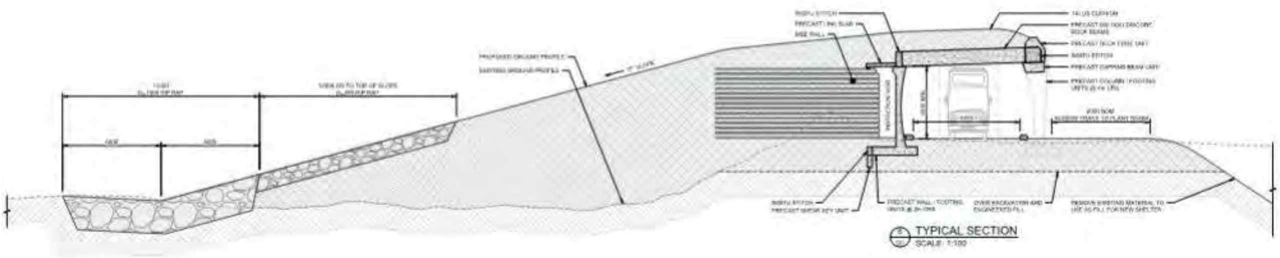


Figure 4:Preliminary design sketch of the proposed avalanche shelter

5 Site History

5.1 Historical Aerial Photographs

Historical aerial mapping and photographs were sourced from Retrolens (an online historical image resource) and Google Earth. Four suitable aerial photographs were available for the site area, from 1938 to 2003. Additional drone photographs taken in 2021 have been used. A summary of observations is provided in Table 2 and copies of the aerial photographs reviewed are provided in Appendix B.

Table 2: Summary of historical aerial photographs

YEAR	Site and Surroundings Description
1938	The tunnel is under construction. There is an historic road that is no longer present to the north of the site. There are some associated buildings along the road believed to have been used by workers on the tunnel construction. The present day carparking area and road does not exist.
1967	The site has significantly changed and generally appears in its present day state. The existing carpark is present, and the buildings associated with the construction of the tunnel have been demolished. The remnants of the avalanche shelter demolished in the 1940's can be seen on the northern boundary of the road.
1983	The site remains largely unchanged. There is further vegetation growth in some areas.
2003	The site is in its present day state. Additional material has been added to the carparking area increasing the area.
2021	No significant changes from 2003.

5.1.1 Heritage

This site is known to potentially have significant heritage value, therefore heritage values should be considered separate to this report.

5.2 Council Records

5.2.1 Environment Southland database

A search of the Environment Southland online HAIL database indicates that the existing property is a listed HAIL site. No further information is provided and no previous investigation has been undertaken on the site.

5.3 Summary of Site History and Areas of Concern

Construction of the Homer Tunnel began in the 1930's and spanned more than twenty years, finally being completed in 1954. The tunnel was constructed from the Hollyford side due to access issues from the Milford side.

During the construction of the tunnel various buildings and workings were present on or adjacent to the site being investigated. Spoil materials and debris from the tunnel construction were deposited at the eastern portal as fill for the new carriageway alignment and towards the north of the portal where it formed a levelled laydown pad during construction. The buildings used at the time of construction have subsequently demolished, and the exact locations where the building material was deposited is unknown. There is potential for contaminants of concern to have been present in these buildings, most notably heavy metals in the construction material.

Explosives (TNT) were most likely used to blast rock materials during the construction of the tunnel. Remnant unexploded ordnance are however highly unlikely to be present within the materials deposited in sufficient quantity to pose a risk to human health or pose an issue to construction activity (risk to construction workers). Taking into consideration the time since the tunnel was constructed, significant degradation of any remnant TNT would have occurred and more likely than not dispersed into the surrounding environment.

As part of the construction process, an avalanche shelter was installed on the eastern portal entrance to protect road users from the elements during the (up to) nine months of the year where snow is present above the road. Shortly after its construction however part of the portal was destroyed by an avalanche and had to be removed.

The historic photographs show that a large amount of fill has been placed onsite. Demolition rubble from the historic avalanche shelter has been used to make up a portion of this fill. There is potential for contaminants of concern to have been within this material as the exact source is not known.

During the site walkover, the adjacent site to the north was found to contain large amounts of scrap metal and some building rubble, therefore there may have been potential for migration of any hazardous contaminants to the site.

Based on site visit observations, anecdotal evidence from current landowners, council records and a review of historic aerial imagery, there is potential for HAIL activities to have occurred onsite. Our observations show that these activities have been limited to the carparking area. No HAIL activities are noted to have or be occurring on other areas of the site.

As such HAIL categories H: Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment, and I: Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment should be investigated as they may apply to the site.

6 Conceptual Site Model

Using the identified potential HAIL activities or industries a site-specific conceptual site model can be developed. A conceptual site model relates to the assessment of contamination arising from the previous and current land uses, both on and off the site that may impact on development proposals. This is achieved by detailing the nature and extent of contamination, the potential migration pathways and to identify potential receptors to the extent possible based on information gathered from the desk study and site visit. Data gaps and uncertainties are identified during the preparation of the conceptual model, which assists in designing a more detailed investigation.

Based on the site history the following conceptual site model (CSM) was produced. The CSM is used to support the decision-making process for contaminated land management. The five basic activities associated with developing a conceptual site model are:

- Identification of potential contaminants.
- Identification and characterisation of the source(s) of contamination.
- Delineation of potential migration pathways through environmental media, such as groundwater, surface water, soils sediment, biota, air, service lines.
- Identification and characterisation of potential receptors (human, ecological or building infrastructure).
- Determination of the limits of the study area or system boundaries.

Data gaps and uncertainties are identified during the preparation of the conceptual site model, which assists in designing any detailed investigation that may follow.

For there to be an effect on receptors there must be a contamination source and a mechanism (pathway) for contamination to affect human health or the environment (receptor).

The desk-based information on the site has enabled the development of a conceptual site model as shown in Table 3.

A possible pollutant linkage between the contaminant source and receptor is defined as one that has the potential to represent unacceptable risks to human health or the environment.

Table 3: Conceptual Site Model

Likely sources of impact	Potential historical and current day sources were identified: • Importation of unknown fill material • Historic building rubble • The use of site as a carparking area
Potentially impacted media	Impacts are likely to be limited to shallow soils (the upper several metres). Shallow groundwater or nearby surface water features may also be impacted.
Contaminants of concern	The potential contaminants of concern comprise: • Heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc) • Hydrocarbons (PAH/TPH and BTEX chemicals)
Migration pathways	Potential migration pathways for the contaminants of concern comprise: • airborne migration of dust, vapour or fibres • surface runoff containing impacted soil or dissolved contaminants • infiltration of contaminants in soil
Potential exposure pathways	Potential exposure pathways comprise: • inhalation of dust, vapours or fibres • ingestion or dermal contact with impacted soil, including surface soils including during excavation work • ingestion or dermal contact with impacted surface water or extracted groundwater
Potential sensitive receptors	Identified sensitive receptors comprise: • workers and visitors at the site during the proposed site works; • users of the site following redevelopment; • environmental receptors on or near to the site (flora and fauna)

7 Preliminary Site Investigation Findings

The conceptual site model developed following assessment of the desk-based findings and a site walkover indicates that there are potential HAIL activities which may have impacted the carparking (northern) section of the site. These activities may have potentially contaminated soils on the site either through deposition direct into the soils or due to migration through near surface soils and, as a consequence, be present in concentrations which are considered to be a risk to human health.

Further assessment of these risks within the area has therefore been undertaken in the form of detailed site investigation to determine contaminant concentrations associated with identified activities and their locations. These are covered in the following sections.

8 Data Quality Objectives

Systematic planning is critical to successful implementation of an environmental assessment and is used to define the type, quantity and quality of data needed to inform decisions. The United States Environmental Protection Agency (US EPA) has defined a process for establishing data quality objectives (DQOs), which has been referenced in the MfE CLMG No. 5.

DQOs ensure that:

- The study objectives are set.
- Appropriate types of data are collected (based on contemporary land use and chemicals of concern).
- The Tolerance levels are set for potential decision-making errors.

The DQO process is a seven-step iterative planning approach. The outputs of the DQO process are qualitative and quantitative statements which are developed in the first six steps. They define the purpose of the data collection effort, clarify what the data should represent to satisfy this purpose and specify that performance requirements for the quality of information to be obtained from the data. The output from the first six steps is then used in the seventh step to develop the data collection design the meets all performance criteria and other design requirements and constraint. The DQO process adopted for the DSI is outlined in Appendix C.

Detailed site investigations were completed on the carpark area of the site only. This area was determined to require investigation as there was potential for HAIL activity to have occurred. As such further assessment of contaminant levels within the carpark only were considered to be appropriate for the purposes of this investigation.

9 Detailed Site Investigation

9.1 Sampling Design and Rationale

The MfE CLMG No. 5 outlines the three types of sampling patterns commonly used for site investigations, comprising judgemental, systematic and stratified sampling.

To achieve the objectives of the DSI works, a judgemental sampling pattern was adopted across the proposed carparking site. Judgement was based upon site observations, access constraints, and historical information from the PSI.

A total of 7 locations were sampled at the site with multiple samples taken from varying depths and lithologies at some of the locations. There were 22 samples taken in total. These were taken both within test pits and at surface level across the site to give a representation of the contamination levels in the soil. The locations of samples are detailed on the Test Pit Location Plan in Appendix D.

TP04 1.5m and 1.7m below ground level are a duplicate sample for QA/QC purposes. An internal lab duplicate was also completed on TP05 0.1m.

9.2 Fieldwork

The intrusive investigation works were undertaken at the site on 12 April 2022.

A 13 Tonne excavator was present onsite to dig four test pits, and samples were collected from both the surface soils at the pit locations and at stratified depths throughout the pits.

Surface conditions were logged, and soil samples were placed in laboratory supplied jars. Leaving minimal headspace and closed using Teflon-coated lids.

Samples were stored on ice in a sealed cooler and transported to the laboratory under chain of custody. Dedicated disposable nitrile gloves were worn for each sampling episode and all non-dedicated equipment was decontaminated between sampling locations to minimise the potential or cross contamination.

9.3 Laboratory Analysis

Selected soil samples were submitted to Analytica Laboratories (Analytica) for analysis of determined contaminants of concern at the site. Soil samples were selected for analysis based on a combination of sample depth and observations. The testing included 8 heavy metals (8HM) (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), PAH/TPH BTEX chemicals and a single asbestos sample of a sample of fibrous material.

Analytica are accredited by International Accreditation New Zealand (IANZ) for the analytical suites requested. A summary of the samples taken, soil conditions and analysis completed is given in Table 4:

Table 4: Summary of samples

Sample Number	Depth m bgl	Sample description	Analysis scheduled
TP01	0.1	Sandy GRAVEL	8HM, THP/PAH, BTEX
TP01	0.5	Sandy GRAVEL	HM8
TP01	1.0	Sandy GRAVEL	HM8
TP01	1.5	Sandy GRAVEL	8HM, THP/PAH, BTEX
TP01	2.5	Sandy GRAVEL	HM8
TP02	0.1	Gravelly SAND	8HM, THP/PAH, BTEX
TP02	0.5	Sandy GRAVEL	8HM, THP/PAH, BTEX
TP02	1.0	GRAVEL with some sand	HM8
TP02	2.0	GRAVEL with some sand	HM8
TP02	3.0	GRAVEL with some sand	HM8
TP03	0.2	GRAVEL with some sand	8HM, THP/PAH, BTEX
TP03	0.3	GRAVEL with some sand	8HM, THP/PAH, BTEX
TP03	0.5	GRAVEL with some sand	HM8
TP03	1.5	Gravelly SAND	HM8
TP03-ASB	1.5	Fibre Bundle	Asbestos
TP04	0.2	GRAVEL with some sand	8HM, THP/PAH, BTEX
TP04	0.5	GRAVEL with some sand	8HM, THP/PAH, BTEX
TP04	1.5	GRAVEL with some sand	8HM, THP/PAH, BTEX
TP04	1.7	GRAVEL with some sand	8HM, THP/PAH, BTEX
TP05	0.1	Sandy GRAVEL	8HM, THP/PAH, BTEX
TP05	1.0	GRAVEL with some sand	HM8
Base 01	Surface	SAND	8HM, THP/PAH, BTEX
Base 02	Surface	SAND	HM8
Asphalt 01	0.5	Buried Asphalt	PAH/TPH/BTEX

10 Basis for Guideline Values

10.1 Soil Contaminant Standards for the Protection of Human Health

The MfE 2011, Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (the MfE (2011) Methodology') Sets out a risk-based derivation methodology for health-based standards to apply to soil contaminants in New Zealand under the Resource Management Act 1991.

The MfE (2011) Methodology provides a suite of numerical criteria for priority contaminants that are legally binding as gazetted under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health ('the NESCS'). These numerical criteria applied as screening criteria (Tier 1 criteria), as conservative clean-up targets, to inform on site management actions, or to trigger further investigation with a Tier 2 assessment. The MfE (2011) Methodology utilises standardised receptors and exposure parameters to calculate soil contaminant standards (SCSs) for the following five generic land-use scenarios:

- Rural residential (guidelines for lifestyle block 0%. 10% and 25% produce scenarios).
- Residential (guidelines for 0%, 10% and 25% produce scenarios).
- High-density residential.
- Recreational.
- Commercial/industrial outdoor worker (unpaved).

With respect to assessment under the NESCS, the assessment criteria for this investigation have been based on analysis of the proposed land use as a parks/recreation site. As the site development comprises construction of a portal with associated earthworks and no human access is likely following redevelopment, we consider that this exposure scenario is conservative and appropriate, and no further adjustment of the soil contaminant (SCS) as set out in the NESCS is necessary in this instance. As no guidelines for petroleum hydrocarbons are available for recreation areas, a conservative application of residential end use has been applied.

10.1.1 Other Soil Guidelines

Where there is no appropriate soil contaminant standard for the contaminant, the MfE (2003; revised 2011) Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values provides the following hierarchy to determine the order in which guidelines values in reference documents should be used in a contaminated site assessment.

1. New Zealand documents that derive risk-based guideline values.
2. Rest-of-the-world documents that derive risk-based guideline values.
3. New Zealand documents that derive threshold values.
4. Rest-of-the-world documents that derive threshold values.

The estimated upper limit of background concentrations for trace elements (arsenic, cadmium, chromium, copper, mercury, lead, nickel and zinc) have been adopted for assessment against NESCS applicability in this report. Specific attention to local geology has been applied for this report as local background concentration have the potential to be elevated due to natural processes.

The specific contaminant standards adopted for soils are outlined within the laboratory results summary in Tables 5 – 7 respectively.

10.2 Soil Contaminant Standards for the Protection of the Environment

There are currently no gazetted soil contaminant standards for ecological protection within New Zealand, however Manaaki Whenua/ Landcare Research[1] have published documents which have derived Eco-SGVs taking into consideration international publications and local research.

This report presents a methodology for deriving soil guideline values (Eco-SGVs) for eleven contaminants that are protective of microbial processes, plants, soil invertebrates, wildlife and livestock in New Zealand. These include heavy metals, PAH, TPH and DDT. Values are for use as a screening tool which indicates whether soil contaminants are likely to have an adverse impact on the local environment.

As part of the development process of Eco-SGVs, local background concentrations for numerous soil and rock types have also been published and are used in an 'added risk' approach. The *availability* of the background concentrations of a contaminant is therefore considered to be zero or sufficiently close that it makes no practical difference. Therefore should soil contaminants exceed the Eco-SGV but not local background, these are not considered likely to pose a risk to local environmental receptors.

Local background concentrations for the site are based on site soils being derived from local intrusive volcanic rocks (Gabbro and Tonalite) and are used for assessment purposes within this report.

10.3 Disposal Options

No offsite disposal of soil is anticipated as part of the proposed site works. Screening of soils to remove organic tree debris along with any reinforced concrete may be required with the screened material

In addition to assessing the human health risks associated with the development and end use of the site, a high-level assessment of off-site disposal options for any excess spoil generated during site redevelopment works has been conducted. Dependant on the contamination condition of the spoil, offsite disposal options range from disposal to cleanfill sites (lowest cost) through managed fill sites to licensed hazardous waste landfills (highest cost).

As disposal to a cleanfill site is likely to represent the most cost-effective off-site disposal option, the soil results have been compared to the WasteMINZ definition of 'Clean Fill' Material within the publication entitled: *Technical Guidelines for Disposal to Land* (WasteMINZ 2018):

> *"Clean Fill Material Virgin excavated natural materials (VENM) such as clay, soil and rock that are free of:*
>
> - *combustible, putrescible, degradable or leachable components;*
> - *hazardous substances or materials (such as municipal solid waste) likely to create leachate by means of biological breakdown;*
> - *products or materials derived from hazardous waste treatment, stabilisation or disposal practices;*
> - *materials such as medical and veterinary waste, asbestos, or radioactive substances that may present a risk to human health if excavated;*
> - *contaminated soil and other contaminated materials; and*
> - *liquid waste.*

[1] Development of soil guideline values for the protection of ecological receptors (Eco-SGVs): Technical Document; Landcare Research/Manaaki Whenua 2016

> *When discharged to the environment, clean fill material will not have a detectable effect relative to the background."*

Any soils which contain contaminant concentrations in excess of the cleanfill criteria are considered to be Controlled Fill or Managed Fill[2]. Controlled Fill is described as

'predominantly clean fill material that may also contain inert construction and demolition materials and soils from sites that may have contaminant concentrations in excess of local background concentrations, but with specified maximum total concentrations that will not restrict future land use.'

With Managed Fill described as:

> *'Predominantly clean fill material and controlled fill material that may also contain material with contaminant concentrations in excess of controlled fill limits where site specific management controls are in place to manage discharges to the environment.'*

For assessment of possible disposal options, results have been compared against the cleanfill definition (through the use of background concentrations) and acceptance criteria for Class A and B landfills. Individual landfill facilities will have their own specific criteria for acceptance which are based around these definitions and criteria.

[2] Technical Guidelines for Disposal to Land: WasteMINZ 2018

11 Results

11.1 Subsurface Conditions

Soils encountered within the test pits were relatively consistent across the site. Discussions with onsite personnel, as well as observations made during the test pitting show that the material is generally a gravelly sand or sandy gravel fill from local sources. Some historic building demolition rubble was found, including concrete from the historic avalanche shelter and some organic material (tree debris and timber). No groundwater was found within any of the locations investigated. No evidence of unexploded ordnance was encountered in either the geotechnical or contaminated land ground investigations.

Logs of the soils encountered within the test pits are presented in Appendix E.

Historic asphalt was found buried within TP02. The origin of this material is unknown, however is likely to be derived from road scrapings. A sample of this material was taken to test for the presence of coal tar and labelled Asphalt 01. In addition, a fibrous bundle of material was found within TP03 at 1.5m bgl. A sample of the material was taken for asbestos presence/absence testing.

11.2 Analytical Results

Tables 5 - 7 provide detailed tables with comparison against relevant guideline values for the assessment of human health. Full laboratory reports (including chain of custody) are provided in Appendix F.

None of the analysed heavy metal contaminants were encountered at concentrations in excess of human health criteria.

Table 5: Summary of Heavy Metals Results

Soil Analytical Results - Heavy Metals			Heavy metals							
			Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		Reporting Limit	0.125	0.005	0.125	0.075	0.25	0.025	0.05	0.05
Human health criteria[1]										
Park/Recreation			80	400	2700	>10000	880	1800	1200[2]	30000[2]
Background concentrations[3]										
Landcare Research:										
Predicted background concentration (Tonalite/Gabbro)			5.23	0.36	31.5	129.4	20.68	-	16.95	143.3
Waste Disposal[4]										
Burnside Landfill Acceptance - Total Concentration			100	20	400	400	400	4	200	800
Class A			100	20	100	100	100	4	200	200
Class B			10	2	10	10	10	0.4	20	20
Sample Location	Depth of sample (m begl)	Date Collected								
TP01	0.1	12-Apr-22	2.1	0.041	37.2	92.8	10.2	0.092	16.9	50.6
TP01	0.5		0.64	0.035	39.9	103	3.3	0.03	10.8	19.7
TP01	1		1	0.028	39.1	109	3.5	0.14	10.5	23.3
TP01	1.5		0.81	0.034	34.2	105	5.85	0.087	9.64	23.7
TP01	2.5		0.39	0.016	38.9	107	2	0.043	9.22	12.8
TP02	0.1		2.5	0.052	47.1	61	3.6	<0.025	37.3	47.3
TP02	0.5		1.4	0.023	35.1	110	3.7	<0.025	13.6	31.6
TP02	1		1.3	0.036	34.5	84.8	9.58	0.095	13.7	44.6
TP02	2		1.3	0.048	36.5	79.9	8.56	0.048	13.9	61
TP02	3		1.4	0.033	41.1	76.6	7.41	0.029	15.1	43.4
TP03	0.2		0.65	0.022	38.9	92.4	2.7	<0.025	11.1	23.8
TP03	0.3		0.84	0.033	35.2	102	6.23	<0.025	12.1	32.3
TP03	0.5		2.5	0.041	38.2	57.4	5.14	<0.025	28.1	47.5
TP03	1.5		1.4	0.043	37.9	93.3	7.8	0.093	15.1	43.9
TP04	0.2		0.64	0.03	38.3	137	2	<0.025	10.5	17.7
TP04	0.5		0.69	0.025	36.7	116	2.8	<0.025	10.2	20.8
TP04	1.5		1.1	0.028	32	84.2	3.5	<0.025	13.6	24.7
TP04	1.7		1.1	0.028	35.5	91.4	4.6	<0.025	12.6	25.8
TP05	0.1		2.1	0.047	39.7	89.3	6.9	0.034	32.4	46
TP05	1		0.4	0.013	26.7	67.3	5.19	<0.025	10.7	17.7
Base 01	Surface		1.8	0.018	29.3	110	2.3	<0.025	33.4	29.9
Base 02	Surface		1.9	0.034	29.9	63.5	2.6	<0.025	30.7	42.9

[1] National Environmental Standard for Assessing and Managing Contaminants to Protect Human Health (MfE, 2011) Park/Recreational land use

[2] NEPM (2011) National Enviornment Protection (Assessment of Site Contamination) Measure - Schedule B1, Table 1A(1), Recreational C

[3] Landcare Research/ Manaaki Whenua (2016) Development of Soil Guideline Values for the Protection of Ecological Receptors (Eco-SGVs) - Appendix A: Background concentrations

[4] MfE (2004) Module 2 – Hazardous Waste Guidelines: Landfill Waste Acceptance Criteria and Landfill Classification; Appendix A Total Concentration for Leachability Limits for Class A and Class B Landfills

Above Human health

Above Background

Above Waste Disposal Criteria - Class A

Above Waste Disposal Criteria - Class B

NL - No limit

- No data

Table 6: Summary of Hydrocarbon Analysis Results

Soil Analytical Results - Hydrocarbons			BTEX				TPH				PAH		
			Benzene	Toulene	Ethylbenzene	Total Xylenes	C7-C9	C10-C14	C15-C36	C7-C36 (total)	Naphthalene	Pyrene	Benzo(a)pyrene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		PQL	0.05	0.1	0.05	0.1	10	15	25	50	0.01	0.02	0.01
Human health criteria[2]													
Residential			**1.1**	**68**	**53**	**48**	**120**	**470**	**NA**	**-**	**58**	**NA**	**0.27**
Waste Disposal[4]													
Burnside Landfill Acceptance - Total Cor			10	2000	1000	2000	-	-	-	-	200	-	300
Class A			10	2000	1000	2000	-	-	-	-	200	-	300
Class B			*1*	*200*	*100*	*200*	-	-	-	-	*20*	-	*30*
Sample Location	Depth of sample (m begl)	Date Collected											
TP01	0.1	12-Apr-22	<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	0.079	0.14
TP01	1.5		<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	<0.020	0.021
TP02	0.1		<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	<0.020	<0.010
TP02	0.5		<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	<0.020	<0.010
TP03	0.2		<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	<0.020	<0.010
TP03	0.3		<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	<0.020	<0.010
TP04	0.2		<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	<0.020	<0.010
TP04	0.5		<0.050	<0.10	<0.050	<0.10	<10	<15	25	<50	<0.010	<0.020	<0.010
TP04	1.5		<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	<0.020	<0.010
TP04	1.7		<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	<0.020	<0.010
TP05	0.1		<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	<0.020	<0.010
Base 01	Surface		<0.050	<0.10	<0.050	<0.10	<10	<15	<25	<50	<0.010	<0.020	<0.010
Asphalt 01	Surface		<0.050	<0.10	<0.050	<0.10	<10	<15	1,247	1,247	0.02	0.17	0.053

[1] National Environmental Standard for Assessing and Managing Contaminants to Protect Human Health (MfE, 2011) Residential use

[2] Mfe (2011) guidelines for Assessing and managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Module 4 - Tier 1 Soil Screening Criteria Table 4.11 sand profile <1m

[4] MfE (2004) Module 2 - Hazardous Waste Guidelines: Landfill Waste Acceptance Criteria and Landfill Classification; Appendix A Total Concentration for Leachability Limits for Class A and Class B Landfills

Above Human health

Above Background

Above Waste Disposal Criteria - Class A

Above Waste Disposal Criteria - Class B

NL - No limit

- No data

Table 7: Summary of Analytical results and comparison to Eco-SGVs

Soil Analytical Results - Heavy Metals & Organic contaminants			Heavy Metals								Organics				
			Arsenic	Cadmium	Chromium (VI)	Copper	Lead	Mercury	Nickel	Zinc	Fluoranthene	Benzo(a)pyrene	TPH: C6 - C10	TPH: C10 - C16	TPH: C17 - C36
Limit of Reporting (LOR)		mg/kg	0.125	0.005	0.125	0.075	0.25	0.025	0.05	0.05	<0.02	<0.01	<10	<15	<25
Background Concentrations[1]		Tonalite/Gabbro	5.23	0.36	**31.5**	**129.4**	20.68	-	16.95	143.3	-	-	-	-	-
NZRB [1]		Eco-SGV	8	1.5	100	120[2]	55	-	-	45[3]	7.6	2.8	66	45	na
Sample Name	Depth (m bgl)	Sampling Date	mg/kg												
TP01	0.1	12/04/2022	2.1	0.041	**37.2**	92.8	10.2	0.092	16.9	50.6	0.068	0.14	<10	<15	<25
TP01	0.5		0.64	0.035	**39.9**	103	3.3	0.03	10.8	19.7					
TP01	1		1	0.028	**39.1**	109	3.5	0.14	10.5	23.3					
TP01	1.5		0.81	0.034	**34.2**	105	5.85	0.087	9.64	23.7	<0.02	0.021	<10	<15	<25
TP01	2.5		0.39	0.016	**38.9**	107	2	0.043	9.22	12.8					
TP02	0.1		2.5	0.052	**47.1**	61	3.6	<0.025	37.3	47.3	<0.02	<0.01	<10	<15	<25
TP02	0.5		1.4	0.023	**35.1**	110	3.7	<0.025	13.6	31.6	<0.02	<0.01	<10	<15	<25
TP02	1.0		1.3	0.036	**34.5**	84.8	9.58	0.095	13.7	44.6					
TP02	2.0		1.3	0.048	**36.5**	79.9	8.56	0.048	13.9	61					
TP02	3.0		1.4	0.033	**41.1**	76.6	7.41	0.029	15.1	43.4					
TP03	0.2		0.65	0.022	**38.9**	92.4	2.7	<0.025	11.1	23.8	<0.02	<0.01	<10	<15	<25
TP03	0.3		0.84	0.033	**35.2**	102	6.23	<0.025	12.1	32.3					
TP03	0.5		2.5	0.041	**38.2**	57.4	5.14	<0.025	28.1	47.5					
TP03	1.5		1.4	0.043	**37.9**	93.3	7.8	0.093	15.1	43.9					
TP04	0.2		0.64	0.03	**38.3**	**137**	2	<0.025	10.5	17.7	<0.02	<0.01	<10	<15	<25
TP04	0.5		0.69	0.025	**36.7**	116	2.8	<0.025	10.2	20.8	<0.02	<0.01	<10	<15	25
TP04	1.5		1.1	0.028	**32**	84.2	3.5	<0.025	13.6	24.7	<0.02	<0.01	<10	<15	<25
TP04	1.7		1.1	0.028	**35.5**	91.4	4.6	<0.025	12.6	25.8	<0.02	<0.01	<10	<15	<25
TP05	0.1		2.1	0.047	**39.7**	89.3	6.9	0.034	32.4	46	<0.02	<0.01	<10	<15	<25
TP05	1.0		0.4	0.013	26.7	67.3	5.19	<0.025	10.7	17.7					
Base 01	Surface		1.8	0.018	29.3	110	2.3	<0.025	33.4	29.9					
Base 02	Surface		1.9	0.034	29.9	63.5	2.6	<0.025	30.7	42.9					
Asphalt 01											0.032	0.053	<10	<15	1247

Key:

Exceedance of background concentration

Exceedance of recommended Eco-SGV for toxicants in soil

Notes:

1. New Zealand Risk Based Guidelines: Development of Soil Guideline Values for the Protection of Ecological Receptors (Eco-SGVs) Landcare Research 2016 - Areas of ecological significance: Target Value
2. Based on local background concentrations relevant to the site
3. Based on Aged Zinc in tolerant soils * Background levels need to be taken into consideration in assessment

na - not available

12 Quality assessment and Quality Control

The field and laboratory quality assurance and quality control (QA/QC) program as was based on data quality indicators (DQIs) chosen to assess the suitability of the dataset. These are discussed in the following sections.

12.1 Field Quality Program

Table 7 summarises the field quality program for the DSI.

Table 8: Field Quality Programme

Environmental consultant	The environmental consultant maintains Quality Assurance Systems certified to AS/NZS ISO 9001:2000.
Procedures	All work was conducted in accordance with relevant statutory health, safety and environmental (HSE) sampling guidelines, as well as standard company HSE and environmental field procedures. Standard field sampling sheets were used. Details recorded included WSP staff and contractors present, time on/off-site, weather conditions, calibration records and other observations relevant to the works.
Sampling	Collection of samples was undertaken by appropriately qualified and experienced personnel following WSP standard field procedures which are based on industry accepted standard practice. Chain of custody was used to ensure the integrity of samples from collection to receipt by the laboratory.
Equipment decontamination	Undertaken after each sampling episode where equipment used was not dedicated. Field sampling procedures conformed to WSP QA/QC protocols to prevent cross contamination, preserve sample integrity, and allow for collection of a suitable data set from which to make technically sound and justifiable decisions with data of satisfactory usability.
Transportation	Samples were stored in chilled coolers on-site and during transport by the field scientist to the laboratory. Chain of custody forms were completed on-site and sent with the samples. Chain of custody forms are presented with laboratory reports in Appendix F, and include the sampler's name, date of sampling, sample matrix, sample containers and preservation used, and analysis requested. The laboratory confirmed receipt of the samples and specified the condition on delivery and the scheduled analyses. Laboratory sample receipt documentation indicated that appropriate holding times were met for the primary laboratory and intra-laboratory duplicates.
Reporting	Report generally complies with the MfE CLMG No. 1.

12.2 Laboratory Quality Program

Table 8 summarises the laboratory quality program for the DSI.

Table 9: Laboratory Quality Programme

Holding times	Samples were transported to the primary laboratory, and all primary samples were extracted and analysed within the holding times for the analyses requested.
Methods	Analysis was carried out by laboratories with IANZ certification for the required analyses. Methods used by the laboratories were consistent with MfE CLMG No. 5.
Reporting Limits	Detection limits were sufficient to enable comparison against the appropriate guidelines

13 QA/QC Data Evaluation

13.1 Consistency

Consistent and repeatable sampling techniques and methods were utilised. The same samplers and methodology were used for all sampling locations. The sampling was in general accordance with the sampling and analysis procedures and as per standard industry procedures.

Each sample was analysed using identical methods for each analyte and laboratory practical quantitation limits (PQLs) were consistent over each laboratory batch. Duplicate samples were within acceptable variation criteria.

13.2 Completeness

All critical samples were analysed for the contaminants of concern identified at the site. Appropriate methods and PQLs were adopted for the investigation. All sample documentation was completed appropriately and sample holding times were complied with.

13.3 Summary

WSP considers that the sample collection, documentation, handling, storage and transportation procedures utilised are of an acceptable standard and the analytical results provided by the laboratories are deemed reliable and complete, therefore the data are considered fit for purpose.

It is considered that the QA/QC procedures and results were acceptable and that the conclusions of the report have not been significantly affected by the sampling or analytical procedures.

14 Discussion and Site Characteristics

14.1 Analytical Results

14.1.1 Human Health Criteria

No human health exceedances for heavy metals, TPH/PAH and BTEX for a parks/recreation end use were reported for any of the samples taken. Asbestos was not detected.

The sample Asphalt 01 was shown both through field screening using the 'tea and coffee test' and through hydrocarbon analysis at Analytica lab that it did not contain any coal tar. It was however found to contain diesel range hydrocarbons and PAHs in excess of their respective LOR. There is a potential for more buried asphalt material to be encountered throughout the fill materials on site.

14.1.2 Environmental Discharge Criteria

Natural background levels are not readily available for the local geology of the site. The Manaaki Whenua/Landcare Research paper for Eco-SGVs however has provided background soil concentrations for varying rock and soil types for use in determining assessment criteria. Observations made during the visit indicate that the site is surrounded by Gabbro and other intrusive rocks.

The site comprises fill material sourced from this rock and the local surrounding valley floor materials. The predicted background concentrations reported are considered unreliable for the Gabbro and Tonalite rock due to a low sample size of 2. However, taking into consideration background levels for rock types nearby, the results are generally at or below these levels. Copper and Chromium shows slight elevations above these reported levels, however based on local geological conditions and the geochemistry of minerals within these rock types, the levels are considered to be within background levels.

Although not in excess of soil guideline values for human health, diesel range hydrocarbons above their limit of reporting (LOR) were detected in one sample, with PAHs present marginally in excess of their LOR within two of the twelve samples (both TP01). As these contaminants are not considered to occur naturally, they are therefore considered to be above background.

These elevated occurrences of hydrocarbons are generally limited to the top 500mm of soil and may be attributable to hot spot spillages from vehicles parked on site. They are not considered to be representative of the general soil conditions across the site.

14.1.3 Waste Disposal

It is not anticipated that there will be any requirement for offsite disposal of soil as part of the ongoing site works. Any soils not disturbed and moved to the southern site area as part of the earthworks process can be retained on the northern car park area.

Although not required, should some disposal need to occur, any near soils which are disposed to an off-site source should be considered to be managed fill as copper concentrations indicate exceedances for the Class A Landfill criteria in nine of the samples analysed.

Should offsite disposal to a Landfill be required, toxic characteristic leaching procedure (TCLP) testing may be required prior to acceptance by an appropriate landfill facility.

14.1.4 Ecological Risk

As the site is located within Fjordland National Park, an assessment of potential risks to ecological receptors has also been undertaken. Eco-SGV criteria derived by Manaaki Whenua/Landcare Research has been utilised as a screening level to determine whether soils are likely to pose a risk to fauna and flora and therefore whether further, more detailed assessment of the risks is warranted.

One sample exhibited marginally elevated copper and a further four samples were in excess of the zinc Eco-SGV. Taking into consideration background concentrations for the local geology however, these levels are not considered to be outside the normal range for materials in the area, particularly in the case of zinc and as such are not considered to pose a risk to ecological receptors.

14.2 Consenting Requirements

Based on the results of the DSI finding heavy metals within their natural background levels and marginal isolated organic hydrocarbons slightly above background levels, the NES-CS does not apply to the site as contaminants are not present in sufficient quantity that they are considered a risk to human health or the environment.

15 Conclusion and Recommendations

A preliminary and detailed site investigation was undertaken on the Homer tunnel shelter extension site. Historical, anecdotal and public records sources showed potential HAIL activities have been undertaken on the present-day carparking area. This area was investigated to define whether a 'piece of land' applies to the area. Material from the carparking area is proposed to be disturbed and moved on site to create a bund adjacent to the southern side of the road and new portal. This material will be encapsulated by natural talus material from the surrounding area.

A soil sampling investigation was carried out at the area on 12 April 2021 in order to determine the chemical characteristics of near surface soils within the car park area. An assessment of the risks to human health associated with potential contaminants of concern was required in order to satisfy the NESCS and local body council requirements for earthworks and ground disturbance as well as to enable a high level ecological risk assessment to be undertaken.

NESCS assessment

Soil analysis results from the investigation works indicate that contaminants of concern (organic hydrocarbons) were present only marginally in excess of local background concentrations in highly localised areas. They did not exceed their applicable standard.

The NESCS does not apply to the site as contaminants of concern are not present in sufficient quantity to present a risk to human health or the environment. An NESCS consent will therefore not be required for the works on site.

Ecological Risks

Soil contaminants are at or below background concentrations or below Eco-SGV screening values. The risk to ecological receptors from soil disturbance on site is therefore considered to be low.

Disposal and re-use of excess soils

Soils are suitable for re-use on site. Materials may be re-worked for deposition on the southern side of the road as part of the portal extension works. Any materials not used within the earthworks on the southern part of the site may be retained within the northern PoL (car park).

Although not recommended, should disposal to an off-site source need to occur this would be as Managed fill as soils were found to contain metals in excess of Class A landfill criteria. Further analysis of soil samples for toxicity characteristic leaching testing (TCLP) prior to disposal may need to be undertaken in order to determine their suitability.

Individual landfill facilities have their own consented acceptance criteria for waste materials and should be approached with the laboratory results appended to determine suitability for acceptance should off-site disposal be considered necessary.

Disposal of materials to landfill is not considered to be a cost effective or sustainable option based on soil chemistry, geographical location and ecological risk.

15.1 Safety in Design

Safety in Design (SID) considers the safety of those who are involved in the construction of, maintenance of, cleaning of, repair of and demolition of a structure, or anything that has been constructed.

As part of the assessment of this site we have taken reasonably practicable steps to assess the potential for hazards associated with potentially contaminated land to exist. We have, through the development of a conceptual site model and selected site sampling, assessed the qualitative level of risk posed to human health and have made various recommendations to address the plausible risks.

Where identified, this report indicates hazards and risks to health and safety associated with contaminated land which must be communicated to the design team, the client and associated stakeholders as required by the Health and Safety at Work Act 2015. Risks include potential exposure to contaminated soils through ingestion or dermal contact.

Soil contaminants are not considered to pose a risk to human health, however due to the homogeneous nature of fill materials, any disturbance of the car park area should be undertaken with unexpected discovery protocols as part of the general site management plan. An unexpected contaminant discovery protocol is appended to this report in Appendix G.

15.2 Recommendations

Based on the findings of this investigation WSP recommends that:

- Should any ground conditions be encountered across the site which are not anticipated from the findings of this report a SQEP should be consulted in order to reassess the risks to human health;
- Disturbance of the car parking area should include an unexpected contaminant discovery protocol as part of the general site management plan;
- This DSI report is submitted to the consenting authority as part of any resource consent application; and
- The report is submitted to the regional authority for updating of the HAIL database.

16 References

GNS Geology Webmap (accessed May 2021) https://maps.gns.cri.nz/

Health and Safety at Work Act 2015.

MfE, 2001 (revised 2011). Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand.

MfE, 2003 (revised 2011). Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values.

MfE, 2004 (revised 2011). Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils.

MfE, 2011. Hazardous Activities and Industries List (HAIL).

MfE, 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health.

MfE, 2012. User's Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.

Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

WasteMINZ, Technical Guidelines for Disposal to Land (2018)

17 SQEP Certification of Report

National Environmental Standard for assessing and managing contaminants in soil to protect human health

DETAILED SITE INVESTIGATION CERTIFYING STATEMENT

I, Lisa Bond, of WSP New Zealand Ltd certify that:

1. this detailed site investigation has been completed to the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human health) Regulations 2011 (the NESCS) because it has been:
   a. done by a suitably qualified and experienced practitioner, and
   b. done in accordance with the current edition of *Contaminated land management guidelines No 5 – Site investigation and analysis of soils,* and
   c. reported on in accordance with the current edition of *Contaminated land management guidelines No 1 – Reporting on contaminated sites in New Zealand, and*
   d. This report is certified by a suitably qualified and experienced practitioner.
2. This detailed site investigation concludes that:

   Soil contamination on parts of the site does not exceed the applicable standard in Regulation 7 of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations.

Evidence of the qualifications and experience of the suitably qualified and experienced practitioners who have done this investigation and certified this report are available on request from WSP.

Signed and dated: ......[redacted].......13/05/2022.

Appendix A
Site Photographs

	PHOTOGRAPHIC LOG

Client Name	Site Location	Project No.
Waka Kotahi	Homer Tunnel Avalanche Shelter	6-DK546.00

Photo No.	Date
1	12 April 2022

Description

A general overview of the car parking area on the north side of the road.

Photo No.	Date
2	12 April 2022

Description

TP01

	PHOTOGRAPHIC LOG	
Client Name Waka Kotahi	**Site Location** Homer Tunnel Avalanche Shelter	**Project No.** 6-DK546.00

Photo No.	Date
3	12 April 2022

Description

TP01 and a general example of the material underlying the site.

Photo No.	Date
4	12 April 2022

Description

TP02, asphalt can be seen within the side wall of the pit that has been historically buried.

	PHOTOGRAPHIC LOG	
Client Name Waka Kotahi	**Site Location** Homer Tunnel Avalanche Shelter	**Project No.** 6-DK546.00

Photo No.	**Date**
5	12 April 2022

Description

TP03, showing remnants of the destroyed avalanche shelter.

Photo No.	**Date**
6	12 April 2022

Description

TP04

PHOTOGRAPHIC LOG		
Client Name Waka Kotahi	**Site Location** Homer Tunnel Avalanche Shelter	**Project No.** 6-DK546.00

Photo No.	Date
7	12 April 2022

Description

The south side of the portal.

Photo No.	Date
8	12 April 2022

Description

The existing portal structure proposed to be demolished.

Appendix B
Historical Imagery

1938

Approximate Site Location

Approximate Site Location

1983

Approximate Site Location

2003

Approximate Site Location

2021

N

Approximate Site Location

2021

Approximate Site Location

Appendix C
Data Quality Objectives

Table DQO1 DQO process

STEP	DESCRIPTION	OUTCOMES
1	State the problem	Based on our understanding of the project, the following “problem” has been identified: The site has been used historically for a land use which is indicative of an increased risk of contamination. The client has an obligation under the Health and Safety at Work Act to identify risks to workers and contractors working on the site. One such risk is the risk of exposure to contaminants and therefore in order to properly understand the level of risk and how best to manage it further investigations of the soil contaminant conditions is required. The site is to be redeveloped and will require soil disturbance. Some soil excess may be generated as a result of the works and may need to be disposed of either on or off-site. Contaminant characteristics of the soil need to be understood in order to identify appropriate disposal locations for the soil excess. The soil disturbance works trigger the Resource Management (National Environmental Standard for Assessment and Management of Contaminated Soils to Protect Human Health) Regulations. Soil contaminant conditions must be understood in order to determine consenting requirements and risks to human health. The site is located within a National Park and risks to the environment associated with ground disturbance need to be understood.
2	Identify the decisions/goal of the investigation	The decisions to be made based on the results of the investigation are as follows: — Is the site investigation design sufficiently robust to meet the requirements of Contaminated Land Management Guideline No. 5, Site Investigation and Analysis of Soil? — Have all the contaminants of concern been identified? — Are the data gaps at the site clear? — Are there contaminant risks which need to be managed during the works? — Are there contaminant risks that need to be managed on completion of the works? — What controls are needed to manage the contaminant risks during and on completion of the works? — Where can the soil excess be disposed of? — What consents and permits are triggered by the presence of contamination? — What is the cost of managing contamination risks and what impact will this have on the overall works budget.

STEP	DESCRIPTION	OUTCOMES
3	Identify the inputs to the decision	The inputs required to make the above decisions are as follows: — Background data on site history and materials used in the construction of the site and associated plant — Observation data including presence of odours and discolouration of the soil — Geological data — Concentrations of contaminants of concern in soil — Site assessment criteria for soil — Distribution of identified soil contamination (if any)
4	Define the study boundaries/constraints on data	The boundaries of the investigation have been identified as follows: — Spatial boundaries: the spatial boundary of the investigation area is defined as the geographical extent of the proposed works, as shown on the test location plan and the depth of exploration. — Temporal boundaries: the date of the project inception (TBC) to the completion of the field work under the proposed investigation.
5	Develop a decision rule *The purpose of this step is to define the parameters of interest, specify the action levels, and combine the outputs of the previous DQO steps into an 'if…then…' decision rule that defines the conditions that would cause the decision maker to choose alternatives actions.*	If concentrations exceed the adopted assessment criteria, then: — Consent will be sought — Controls will be implemented to manage contaminant risks during and on completion of works — Soil excess will be disposed of at a facility that is licenced to accept this type of waste. — Requirements for further assessment, remedial and/or management options will be considered.
6	Specify limits on decision errors	The acceptable limits on decision errors to be applied in the investigation and the manner of addressing possible decision errors have been developed based on the data quality indicators (DQIs) of precision, accuracy, representativeness, comparability and completeness and are presented in Tables DQO2 and DQO3.
7	Optimise the design for obtaining data *The purpose of this step is to identify a resource effective data collection design for generating data that satisfies the DQOs.*	This assessment has been designed considering the information obtained during the desktop review of information undertaken by WSP (2022) and presented in this report. The data collection design that is expected to satisfy the DQOs is described in detail in Section 9 (sampling design and rationale). It is based on the principles set out in CLMG No. 5 and the details of the proposed works. To ensure the design satisfies the DQOs, DQIs (for accuracy, comparability, completeness, precision and reproducibility) have been established to set acceptance limits on field methodologies and laboratory data collected. Further detail has on DQI has been provided below.

DQIs for sampling techniques and laboratory analysis of collected soil samples define the acceptable level of error required for this assessment. The adopted field methodologies and data obtained have been assessed by reference to DQIs as follows:

— Precision: a quantitative measure of the variability (or reproducibility) of data.

— Accuracy: a quantitative measure of the closeness of reported data to the true value.

- Representativeness: the confidence (expressed qualitatively) that data is representative of each media present on the site.
- Comparability: a qualitative parameter expressing the confidence with which one data set can be compared with another.
- Completeness: a measure of the amount of useable data (expressed as a percentage) from a data collection activity.

A summary of the field and laboratory DQIs for the validation assessment are provided in Tables DQO2 and DQO3.

Table DQO2 DQIs for field techniques

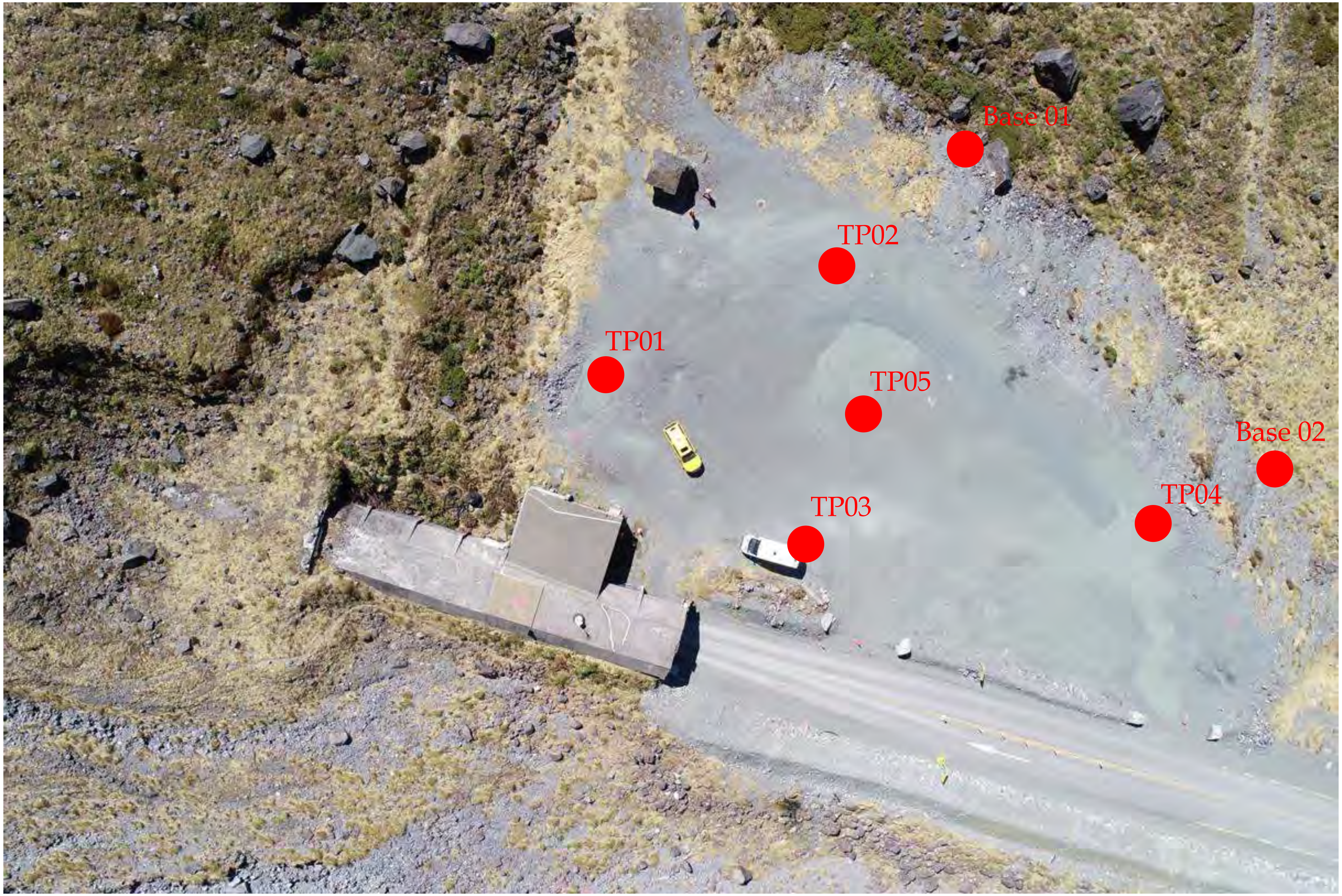
DQI
Precision
Standard operating procedures (SOPs) appropriate and complied with
Collection of intra-laboratory and inter-laboratory duplicates as necessary
Accuracy
WSP SOPs appropriate and complied with
Representativeness
Appropriate media samples
Sample design appropriate to identify potential sources
Comparability
Same SOPs used on each occasion
Experienced sampler
Climatic conditions (temperature, rainfall, wind)
Same type of samples collected
Completeness
SOPs appropriate and complied with
All required samples collected

Table DQO3 DQIs for laboratory

DQI	ACCEPTABLE LIMITS
Precision	
International Accreditation New Zealand (IANZ) certified laboratory	IANZ accreditation for analyses performed
Accuracy	
Analysis of laboratory matrix spikes, laboratory control samples and surrogate recoveries	70-130% inorganics/metals 60-140% organics 10-40% semi-volatile organic compounds

DQI	ACCEPTABLE LIMITS
Representativeness	
All required samples analysed	As per Section 9
Comparability	
Sample analytical methods used (including clean-up)	As per MfE CLMG No. 5
Same units	Justify/quantify if different
Same laboratories	Justify/quantify if different
Sample PQLs	Less than nominated criteria
Completeness	
All critical samples analysed	As per Section 9
All required analytes analysed	As per Section 9
Appropriate methods and PQLs	As per MfE CLMG No. 5
Sample documentation complete	
Sample holding times complied with	

Appendix D
Test Pit Location Plan



wsp

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New Zealand
Tel: 03 440 2400

Project: Homer Tunnel Avalanche Shelter
Project No.: 6-DK546.00

Sample Location Plan – Environmental Test Pits

Appendix E
Test Pit Logs

Test Pit No. TP01

Project:	Homer Tunnel East Portal Shelter Extension	*Coordinates:*	1203438 E 5030938 N
Client:	Waka Kotahi	*Ref. Grid:*	NZTM
Project No.:	6-DK546.00	*R.L.:*	Not established
Location:	East Portal, Homer Tunnel, SH94		

GEOLOGY	DEPTH (m)	DESCRIPTION	GRAPHIC LOG	WATER LEVEL	R.L. (m)	DEPTH (m)	SOIL TESTS: SCALA PENETROMETER (Blows per mm) 0 2 4 6 8 10 12 14 16 18 20	SHEAR STRENGTH (kPa)	OTHER TESTS	SAMPLES
Made Ground: Fill	0–1.3	Sandy GRAVEL with cobbles; greyish brown. Loose to medium dense; dry; clast supported; sand is medium to coarse; angular to subangular, fine to coarse, gabbro and diorite gravel; angular to subangular gabbro and diorite cobbles. (FILL)								
	1.3–2.1	Sandy GRAVEL with cobbles and boulders; brownish grey. Loose to medium dense; dry; clast supported; sand is medium to coarse; angular to subangular, fine to coarse gabbro and diorite gravel; angular to subangular gabbro and diorite cobbles; angular to subangular. (FILL)								
	2.1–3	Sandy GRAVEL with cobbles; greyish brown. Loose to medium dense; dry; clast supported; sand is medium to coarse; angular to subangular, fine to coarse gabbro and diorite gravel; angular to subangular gabbro and diorite cobbles. (FILL)								
	3	END OF PIT AT 3m - Target Depth Reached								

Notes:
No Groundwater Present

Test Methods:
Determination of the Penetration Resistance of a Soil, NZS 4402 Test 6.5.2:1988
Guideline for Hand Held Shear Vane Test, NZ Geotechnical Soc., 2001

Date Tested: 12/04/2022
Excavator: TD150
Tested by: JL
Checked by: MS

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Test Pit No. TP01

Project:	Homer Tunnel East Portal Shelter Extension	*Coordinates:*	1203438 E 5030938 N
Client:	Waka Kotahi	*Ref. Grid:*	NZTM
Project No.:	6-DK546.00	*R.L.:*	Not established
Location:	East Portal, Homer Tunnel, SH94		

PIT PHOTOGRAPH

Notes:
No Groundwater Present

Test Methods:
Determination of the Penetration Resistance of a Soil, NZS 4402 Test 6.5.2:1988
Guideline for Hand Held Shear Vane Test, NZ Geotechnical Soc., 2001

Date Tested:	12/04/2022
Excavator:	TD150
Tested by:	JL
Checked by:	MS

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Test Pit No. TP02

Project: Homer Tunnel East Portal Shelter Extension
Client: Waka Kotahi
Project No.: 6-DK546.00
Location: East Portal, Homer Tunnel, SH94
Coordinates: 1203468 E 5030936 N
Ref. Grid: NZTM
R.L.: Not established

GEOLOGY	DEPTH (m)	DESCRIPTION	GRAPHIC LOG	WATER LEVEL	R.L. (m)	DEPTH (m)	SCALA PENETROMETER (Blows per mm) 0 2 4 6 8 10 12 14 16 18 20	SHEAR STRENGTH (kPa)	OTHER TESTS	SAMPLES
Made Ground: Fill	0–1	Sandy GRAVEL with cobbles; greyish brown. Loose to medium dense; dry; clast supported; sand is medium to coarse; angular to subangular, fine to coarse, gabbro and diorite gravel; angular to subangular gabbro and diorite cobbles. (FILL) Asphalt mixed in with material.								
Made Ground: Fill	1–3	Sandy GRAVEL with some silt and cobbles and small boulders; light grey. Loose to medium dense; dry; clast supported; sand is medium to coarse; angular, medium to coarse gabbro gravel; angular gabbro cobbles and boulders < 300mm diameter. (FILL) Some wood and pipe material noted at 2.8 to 3.0m depth.								
	3	END OF PIT AT 3m - Target Depth Reached								

Notes:
No Groundwater Present

Test Methods:
Determination of the Penetration Resistance of a Soil, NZS 4402 Test 6.5.2:1988
Guideline for Hand Held Shear Vane Test, NZ Geotechnical Soc., 2001

Date Tested: 12/04/2022
Excavator: TD150
Tested by: JL
Checked by: MS

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Test Pit No. TP02

Project:	Homer Tunnel East Portal Shelter Extension	*Coordinates:*	1203468 E 5030936 N
Client:	Waka Kotahi	*Ref. Grid:*	NZTM
Project No.:	6-DK546.00	*R.L.:*	Not established
Location:	East Portal, Homer Tunnel, SH94		

PIT PHOTOGRAPH

Notes:
No Groundwater Present

Test Methods:
Determination of the Penetration Resistance of a Soil, NZS 4402 Test 6.5.2:1988
Guideline for Hand Held Shear Vane Test, NZ Geotechnical Soc., 2001

Date Tested:	12/04/2022
Excavator:	TD150
Tested by:	JL
Checked by:	MS

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Test Pit No. TP03

Project:	Homer Tunnel East Portal Shelter Extension	*Coordinates:*	1203499 E 5030935 N
Client:	Waka Kotahi	*Ref. Grid:*	NZTM
Project No.:	6-DK546.00	*R.L.:*	Not established
Location:	East Portal, Homer Tunnel, SH94		

GEOLOGY	DEPTH (m)	DESCRIPTION	GRAPHIC LOG	WATER LEVEL	R.L. (m)	DEPTH (m)	SOIL TESTS: SCALA PENETROMETER (Blows per mm) 0 2 4 6 8 10 12 14 16 18 20	SHEAR STRENGTH (kPa)	OTHER TESTS	SAMPLES
Made Ground: Fill	0.0–0.5	GRAVEL with some silt and sand; brown. Loose to medium dense; dry; sand is medium to coarse; angular, medium to coarse gabbro gravel. (FILL)								
	0.5–1.0	Fine to coarse GRAVEL with some sand; brown and grey. Loose to medium dense; dry. Sand is fine to coarse; gravel is fine to coarse; angular to subrounded. (FILL) Concrete debris with metal rebar present.								
	1.0–1.7	Gravelly SAND with some silt and wood; grey. Medium dense; dry. Sand is fine to coarse; gravel is fine to coarse, angular to subrounded. (FILL) Large boulder >1m present at 1.6m bgl.								
	1.7	END OF PIT AT 1.7m - Unstable pit wall(s)								

Notes:
No Groundwater Present

Test Methods:
Determination of the Penetration Resistance of a Soil, NZS 4402 Test 6.5.2:1988
Guideline for Hand Held Shear Vane Test, NZ Geotechnical Soc., 2001

Date Tested: 12/04/2022
Excavator: TD150
Tested by: JL
Checked by: MS

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Test Pit No. TP03

Project:	Homer Tunnel East Portal Shelter Extension	*Coordinates:*	1203499 E 5030935 N
Client:	Waka Kotahi	*Ref. Grid:*	NZTM
Project No.:	6-DK546.00	*R.L.:*	Not established
Location:	East Portal, Homer Tunnel, SH94		

PIT PHOTOGRAPH

Notes:
No Groundwater Present

Test Methods:
Determination of the Penetration Resistance of a Soil, NZS 4402 Test 6.5.2:1988
Guideline for Hand Held Shear Vane Test, NZ Geotechnical Soc., 2001

Date Tested:	12/04/2022
Excavator:	TD150
Tested by:	JL
Checked by:	MS

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Test Pit No. TP04

Project:	Homer Tunnel East Portal Shelter Extension	*Coordinates:*	1203467 E 5030936 N
Client:	Waka Kotahi	*Ref. Grid:*	NZTM
Project No.:	6-DK546.00	*R.L.:*	Not established
Location:	East Portal, Homer Tunnel, SH94		

GEOLOGY	DEPTH (m)	DESCRIPTION	GRAPHIC LOG	WATER LEVEL	R.L. (m)	DEPTH (m)	SOIL TESTS: SCALA PENETROMETER (Blows per mm) 0 2 4 6 8 10 12 14 16 18 20	SHEAR STRENGTH (kPa)	OTHER TESTS	SAMPLES
Made Ground: Fill		GRAVEL with some silt and sand; grey. Loose to medium dense; dry; sand is medium to coarse; angular, medium to coarse gabbro gravel. (MADE GROUND: FILL)								
		GRAVEL with some silt and sand, minor wood; reddish brown. Loose to medium dense; dry; sand is medium to coarse; angular, medium to coarse gabbro gravel. (MADE GROUND: FILL)								
	1	GRAVEL with some silt and sand; grey. Loose to medium dense; dry; sand is medium to coarse; angular, medium to coarse gabbro gravel. (MADE GROUND: FILL). Comprised approximately 40% concrete debris.				1				
	2	END OF PIT AT 1.7m - Unable to Advance Auger - Hole Obstructed				2				
	3					3				
	4					4				

Notes:
No Groundwater Present

Test Methods:
Determination of the Penetration Resistance of a Soil, NZS 4402 Test 6.5.2:1988
Guideline for Hand Held Shear Vane Test, NZ Geotechnical Soc., 2001

Date Tested:	12/04/2022
Excavator:	TD150
Tested by:	JL
Checked by:	MS

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Test Pit No. TP04

Project:	Homer Tunnel East Portal Shelter Extension	*Coordinates:*	1203467 E 5030936 N
Client:	Waka Kotahi	*Ref. Grid:*	NZTM
Project No.:	6-DK546.00	*R.L.:*	Not established
Location:	East Portal, Homer Tunnel, SH94		

PIT PHOTOGRAPH

Notes:
No Groundwater Present

Test Methods:
Determination of the Penetration Resistance of a Soil, NZS 4402 Test 6.5.2:1988
Guideline for Hand Held Shear Vane Test, NZ Geotechnical Soc., 2001

Date Tested:	12/04/2022
Excavator:	TD150
Tested by:	JL
Checked by:	MS

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Test Pit No. TP05

Project: Homer Tunnel East Portal Shelter Extension
Client: Waka Kotahi
Project No.: 6-DK546.00
Location: East Portal, Homer Tunnel, SH94

Coordinates: 1203462 E 5030937 N
Ref. Grid: NZTM
R.L.: Not established

GEOLOGY	DEPTH (m)	DESCRIPTION	GRAPHIC LOG	WATER LEVEL	R.L. (m)	DEPTH (m)	SOIL TESTS: SCALA PENETROMETER (Blows per mm) 0 2 4 6 8 10 12 14 16 18 20	SOIL TESTS: SHEAR STRENGTH (kPa)	SOIL TESTS: OTHER TESTS	SOIL TESTS: SAMPLES
Made Ground: Fill		Sandy GRAVEL with cobbles; greyish brown. Loose to medium dense; dry; clast supported; sand is medium to coarse; angular to subangular, fine to coarse, gabbro and diorite gravel; angular to subangular gabbro and diorite cobbles. (FILL)								
		GRAVEL with some silt and sand; brown. Loose to medium dense; dry; sand is medium to coarse; angular, medium to coarse gabbro gravel. (MADE GROUND: FILL)								
	1	END OF PIT AT 1m - Unable to Advance Auger - Hole Obstructed				1				
	2					2				
	3					3				
	4					4				

Notes:
No Groundwater Present

Test Methods:
Determination of the Penetration Resistance of a Soil, NZS 4402 Test 6.5.2:1988
Guideline for Hand Held Shear Vane Test, NZ Geotechnical Soc., 2001

Date Tested: 12/04/2022
Excavator: TD150
Tested by: JL
Checked by: MS

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Test Pit No. TP05

Project:	Homer Tunnel East Portal Shelter Extension	*Coordinates:*	1203462 E 5030937 N
Client:	Waka Kotahi	*Ref. Grid:*	NZTM
Project No.:	6-DK546.00	*R.L.:*	Not established
Location:	East Portal, Homer Tunnel, SH94		

PIT PHOTOGRAPH

Notes:
No Groundwater Present

Test Methods:
Determination of the Penetration Resistance of a Soil, NZS 4402 Test 6.5.2:1988
Guideline for Hand Held Shear Vane Test, NZ Geotechnical Soc., 2001

Date Tested:	12/04/2022
Excavator:	TD150
Tested by:	JL
Checked by:	MS

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Appendix F
Laboratory CoC and Results

ENVIRONMENTAL TESTING:

CHAIN OF CUSTODY

ANALYTICA LABORATORIES

CLIENT INFORMATION	
Client	WSP
Address	Level 1, 34 Grant Road, Queenstown
Project Leader	Josh L
Project ID	6-DK546.00
Site	Homer Tunnel.
Sampler	Josh L
Phone	027 208 0636
Email	josh.lamond@wsp.com
Invoice Email	~~[illegible]@wsp.com~~ NZ.AP@wsp.com

Lab ID (Lab use only) 22-14982 Registered By FH Date Registered 21/04/22

22-14982

CLIENT REQUESTS (Please Tick)

Routine	✓	Priority		Urgent		ESDAT		QC Report		Drinking Water	

TESTS REQUESTED — Analysis Requests/Suites [Enter Test Code Below]

#	Sample ID	Depth	Sampling Date	Time	Matrix (Please Circle)	HM8	PAH/TPH/BTEX	Hold			Sample Comments (ie: extra test requests, high odour, bulk material)
1	TP01	0.1	12.4.22		S - CW - SW - WW	✓	✓				
2	TP01	0.5	"		S - CW - SW - WW	✓					
3	TP01	1.0	"		S - CW - SW - WW	✓					
4	TP01	1.5	"		S - CW - SW - WW	✓	✓				
5	TP01	2.5	"		S - CW - SW - WW	✓					
6	TP02	0.1	"		S - CW - SW - WW	✓	✓				
7	TP02	0.5	"		S - CW - SW - WW	✓	✓				
8	TP02	1.0	"		S - CW - SW - WW	✓					
9	TP02	2.0	"		S - CW - SW - WW	✓					
10	TP02	3.0	"		S - CW - SW - WW	✓					
11	TP03	0.2	"		S - CW - SW - WW	✓	✓				
12	TP03	0.3	"		S - CW - SW - WW	✓	✓				
13	TP03	0.5	"		S - CW - SW - WW	✓					
14	TP03	1.5	"		S - CW - SW - WW	✓					
15	TP04	0.2	"		S - CW - SW - WW	✓	✓				
16	TP04	0.5	"		S - CW - SW - WW	✓	✓				
17	TP04	1.5	"		S - CW - SW - WW	✓	✓				
18	TP04	1.7	"		S - CW - SW - WW	✓	✓				
19	TP05	0.1	"		S - CW - SW - WW	✓	✓				

Matrix Key	S (Solids)	CW (Clean Water)	SW (Saline Water)	WW (Waste Water)
	All soils, sediment, sludge	Potable, Ground, Bore, Surface, Fresh	Sea Water, Geothermal	Effluent, Trade Waste, Leachate

Sender Name	Josh Lamond.	Received by (Lab Staff)		Courier company		Courier #			
Date Sent	13.4.22	Time sent	4:00 am : pm	Date Received		Time Received	am : pm	Seal Status		Sample Chilled	

Page 1 of 2

Samples transferred to:	Auckland	
	Hamilton	✓
Date: 19.4.22	Wellington	
	Christchurch	
Initials: EK	Dunedin	

*Asbestos sample kept in Dunedin

ENVIRONMENTAL TESTING:

CHAIN OF CUSTODY

ANALYTICA LABORATORIES

CLIENT INFORMATION		Lab ID (Lab use only)		Registered By		Date Registered	
Client	WSP						
Address	Level 1, 34 Grant Road, Queenstown						
Project Leader	Josh L						
Project ID	6-DK546.00						
Site	Homer Tunnel						
Sampler	Josh L						
Phone	027 208 0636						
Email	josh.lamond@wsp.com						
Invoice Email	nzap@wsp.com						

CLIENT REQUESTS (Please Tick)												
Routine	✓	Priority		Urgent		ESDAT		QC Report		Drinking Water		

TESTS REQUESTED

		Sample ID	Depth	Sampling Date	Time	Matrix (Please Circle)	HM8	PAH/TPH/BTEX	ASB Bulk.	Hold.		Sample Comments (ie: extra test requests, high odour, bulk material)
0	1	TP05	1.0	12-4-22		S - CW - SW - WW	✓					
	2	Base 01	-	"		S - CW - SW - WW	✓	✓				
2	3	Base 02	-	"		S - CW - SW - WW	✓					
	4	Asphalt 01	-	"		S - CW - SW - WW		✓				
4	5	DOC 01	-	"		S - CW - SW - WW	✓					
	6	DOC 02	-	"		S - CW - SW - WW	✓					
6	7	DOC 03	-	"		S - CW - SW - WW				✓		
7	8	DOC 04	-	"		S - CW - SW - WW				✓		
	9	TP01-AS	2.0	"		S - CW - SW - WW				✓		
	10	TP02-AS	2.0	"		S - CW - SW - WW				✓		
	11	TP03-AS	1.5	"		S - CW - SW - WW				✓		
	12	TP04-AS	~~[illegible]~~ 0.2	"		S - CW - SW - WW				✓		
	13	TP03-ASB	1.5	"		S - CW - SW - WW			✓			BULK.
	14					S - CW - SW - WW						
	15					S - CW - SW - WW						
	16					S - CW - SW - WW						
	17					S - CW - SW - WW						
	18					S - CW - SW - WW						
	19					S - CW - SW - WW						

Matrix Key	S (Solids)	CW (Clean Water)	SW (Saline Water)	WW (Waste Water)
	All soils, sediment, sludge	Potable, Ground, Bore, Surface, Fresh	Sea Water, Geothermal	Effluent, Trade Waste, Leachate

Sender Name	Josh L.		Received by (Lab Staff)		Courier company		Courier #			
Date Sent	13-4-22	Time sent	4:00 am : pm	Date Received		Time Received	am : pm	Seal Status		Sample Chilled

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Certificate of Analysis

WSP
Level 1, 34 Grant Road
Queenstown

Attention: Josh Lamond
Phone: 027 208 0636
Email: josh.lamond@wsp.com

Lab Reference: 22-14982
Submitted by: Josh L
Date Received: 21/04/2022
Testing Initiated: 21/04/2022
Date Completed: 29/04/2022
Order Number:
Reference: 6-DK546.00

Sampling Site: Homer Tunnel

Report Comments

Samples were collected by yourselves (or your agent) and analysed as received at Analytica Laboratories. Samples were in acceptable condition unless otherwise noted on this report.
Specific testing dates are available on request.

Heavy Metals in Soil

		Client Sample ID	TP01 0.1	TP01 0.5	TP01 1.0	TP01 1.5	TP01 2.5
		Date Sampled	12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-1	22-14982-2	22-14982-3	22-14982-4	22-14982-5
Arsenic	mg/kg dry wt	*0.125*	2.1	0.64	1.0	0.81	0.39
Cadmium	mg/kg dry wt	*0.005*	0.041	0.035	0.028	0.034	0.016
Chromium	mg/kg dry wt	*0.125*	37.2	39.9	39.1	34.2	38.9
Copper	mg/kg dry wt	*0.075*	92.8	103	109	105	107
Lead	mg/kg dry wt	*0.25*	10.2	3.3	3.5	5.85	2.0
Mercury	mg/kg dry wt	*0.025*	0.092	0.030	0.14	0.087	0.043
Nickel	mg/kg dry wt	*0.05*	16.9	10.8	10.5	9.64	9.22
Zinc	mg/kg dry wt	*0.05*	50.6	19.7	23.3	23.7	12.8

Heavy Metals in Soil

		Client Sample ID	TP02 0.1	TP02 0.5	TP02 1.0	TP02 2.0	TP02 3.0
		Date Sampled	12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-6	22-14982-7	22-14982-8	22-14982-9	22-14982-10
Arsenic	mg/kg dry wt	*0.125*	2.5	1.4	1.3	1.3	1.4
Cadmium	mg/kg dry wt	*0.005*	0.052	0.023	0.036	0.048	0.033
Chromium	mg/kg dry wt	*0.125*	47.1	35.1	34.5	36.5	41.1
Copper	mg/kg dry wt	*0.075*	61.0	110	84.8	79.9	76.6
Lead	mg/kg dry wt	*0.25*	3.6	3.7	9.58	8.56	7.41
Mercury	mg/kg dry wt	*0.025*	<0.025	<0.025	0.095	0.048	0.029
Nickel	mg/kg dry wt	*0.05*	37.3	13.6	13.7	13.9	15.1
Zinc	mg/kg dry wt	*0.05*	47.3	31.6	44.6	61.0	43.4

Heavy Metals in Soil

Client Sample ID			TP03 0.2	TP03 0.3	TP03 0.5	TP03 1.5	TP04 0.2
Date Sampled			12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-11	22-14982-12	22-14982-13	22-14982-14	22-14982-15
Arsenic	mg/kg dry wt	*0.125*	0.65	0.84	2.5	1.4	0.64
Cadmium	mg/kg dry wt	*0.005*	0.022	0.033	0.041	0.043	0.030
Chromium	mg/kg dry wt	*0.125*	38.9	35.2	38.2	37.9	38.3
Copper	mg/kg dry wt	*0.075*	92.4	102	57.4	93.3	137
Lead	mg/kg dry wt	*0.25*	2.7	6.23	5.14	7.80	2.0
Mercury	mg/kg dry wt	*0.025*	<0.025	<0.025	<0.025	0.093	<0.025
Nickel	mg/kg dry wt	*0.05*	11.1	12.1	28.1	15.1	10.5
Zinc	mg/kg dry wt	*0.05*	23.8	32.3	47.5	43.9	17.7

Heavy Metals in Soil

Client Sample ID			TP04 0.5	TP04 1.5	TP04 1.7	TP05 0.1	TP05 1.0
Date Sampled			12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-16	22-14982-17	22-14982-18	22-14982-19	22-14982-20
Arsenic	mg/kg dry wt	*0.125*	0.69	1.1	1.1	2.1	0.40
Cadmium	mg/kg dry wt	*0.005*	0.025	0.028	0.028	0.047	0.013
Chromium	mg/kg dry wt	*0.125*	36.7	32.0	35.5	39.7	26.7
Copper	mg/kg dry wt	*0.075*	116	84.2	91.4	89.3	67.3
Lead	mg/kg dry wt	*0.25*	2.8	3.5	4.6	6.90	5.19
Mercury	mg/kg dry wt	*0.025*	<0.025	<0.025	<0.025	0.034	<0.025
Nickel	mg/kg dry wt	*0.05*	10.2	13.6	12.6	32.4	10.7
Zinc	mg/kg dry wt	*0.05*	20.8	24.7	25.8	46.0	17.7

Heavy Metals in Soil

Client Sample ID			Base 01	Base 02
Date Sampled			12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-21	22-14982-22
Arsenic	mg/kg dry wt	*0.125*	1.8	1.9
Cadmium	mg/kg dry wt	*0.005*	0.018	0.034
Chromium	mg/kg dry wt	*0.125*	29.3	29.9
Copper	mg/kg dry wt	*0.075*	110	63.5
Lead	mg/kg dry wt	*0.25*	2.3	2.6
Mercury	mg/kg dry wt	*0.025*	<0.025	<0.025
Nickel	mg/kg dry wt	*0.05*	33.4	30.7
Zinc	mg/kg dry wt	*0.05*	29.9	42.9

Polycyclic Aromatic Hydrocarbons - Soil

Client Sample ID			TP01 0.1	TP01 1.5	TP02 0.1	TP02 0.5	TP03 0.2
Date Sampled			12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-1	22-14982-4	22-14982-6	22-14982-7	22-14982-11
1-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
2-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Benz[a]anthracene	mg/kg dry wt	*0.02*	0.083	<0.020	<0.020	<0.020	<0.020

Polycyclic Aromatic Hydrocarbons - Soil

Client Sample ID			TP01 0.1	TP01 1.5	TP02 0.1	TP02 0.5	TP03 0.2
Date Sampled			12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Benzo[a]pyrene	mg/kg dry wt	*0.01*	0.14	0.021	<0.010	<0.010	<0.010
Benzo[b]&[j] fluoranthene	mg/kg dry wt	*0.02*	0.16	0.021	<0.020	<0.020	<0.020
Benzo[g,h,i]perylene	mg/kg dry wt	*0.02*	0.079	<0.020	<0.020	<0.020	<0.020
Benzo[k]fluoranthene	mg/kg dry wt	*0.01*	0.057	<0.010	<0.010	<0.010	<0.010
Chrysene	mg/kg dry wt	*0.01*	0.10	0.013	<0.010	<0.010	<0.010
Dibenz(a,h)anthracene	mg/kg dry wt	*0.01*	0.018	<0.010	<0.010	<0.010	<0.010
Fluoranthene	mg/kg dry wt	*0.02*	0.068	<0.020	<0.020	<0.020	<0.020
Fluorene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-cd)pyrene	mg/kg dry wt	*0.01*	0.076	0.011	<0.010	<0.010	<0.010
Naphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Phenanthrene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Pyrene	mg/kg dry wt	*0.02*	0.079	<0.020	<0.020	<0.020	<0.020
Benzo[a]pyrene TEQ (LOR)	mg/kg dry wt	*0.03*	0.20	0.040	0.030	0.030	0.030
Benzo[a]pyrene TEQ (Zero)	mg/kg dry wt	*0.01*	0.20	0.020	<0.010	<0.010	<0.010
Anthracene-d10 (Surrogate)	%	*1*	79	78	78	77	78

Polycyclic Aromatic Hydrocarbons - Soil

Client Sample ID			TP03 0.3	TP04 0.2	TP04 0.5	TP04 1.5	TP04 1.7
Date Sampled			12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-12	22-14982-15	22-14982-16	22-14982-17	22-14982-18
1-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
2-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Benz[a]anthracene	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo[a]pyrene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo[b]&[j] fluoranthene	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo[g,h,i]perylene	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo[k]fluoranthene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Dibenz(a,h)anthracene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020	<0.020
Fluorene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-cd)pyrene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Naphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Phenanthrene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Pyrene	mg/kg dry wt	*0.02*	<0.020	<0.020	<0.020	<0.020	<0.020
Benzo[a]pyrene TEQ (LOR)	mg/kg dry wt	*0.03*	0.030	0.030	0.030	0.030	0.030
Benzo[a]pyrene TEQ (Zero)	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene-d10 (Surrogate)	%	*1*	78	78	77	78	78

Polycyclic Aromatic Hydrocarbons - Soil

		Client Sample ID	TP05 0.1	Base 01	Asphalt 01
		Date Sampled	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-19	22-14982-21	22-14982-23
1-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.076
2-Methylnaphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.060
Acenaphthene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.019
Acenaphthylene	mg/kg dry wt	*0.01*	<0.010	<0.010	<0.010
Anthracene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.19
Benz[a]anthracene	mg/kg dry wt	*0.02*	<0.020	<0.020	0.21
Benzo[a]pyrene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.053
Benzo[b]&[j] fluoranthene	mg/kg dry wt	*0.02*	<0.020	<0.020	0.083
Benzo[g,h,i]perylene	mg/kg dry wt	*0.02*	<0.020	<0.020	0.076
Benzo[k]fluoranthene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.022
Chrysene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.38
Dibenz(a,h)anthracene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.019
Fluoranthene	mg/kg dry wt	*0.02*	<0.020	<0.020	0.032
Fluorene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.026
Indeno(1,2,3-cd)pyrene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.026
Naphthalene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.020
Phenanthrene	mg/kg dry wt	*0.01*	<0.010	<0.010	0.21
Pyrene	mg/kg dry wt	*0.02*	<0.020	<0.020	0.17
Benzo[a]pyrene TEQ (LOR)	mg/kg dry wt	*0.03*	0.030	0.030	0.11
Benzo[a]pyrene TEQ (Zero)	mg/kg dry wt	*0.01*	<0.010	<0.010	0.11
Anthracene-d10 (Surrogate)	%	*1*	78	77	79

Total Petroleum Hydrocarbons - Soil

		Client Sample ID	TP01 0.1	TP01 1.5	TP02 0.1	TP02 0.5	TP03 0.2
		Date Sampled	12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-1	22-14982-4	22-14982-6	22-14982-7	22-14982-11
C7-C9	mg/kg dry wt	*10*	<10	<10	<10	<10	<10
C10-C14	mg/kg dry wt	*15*	<15	<15	<15	<15	<15
C15-C36	mg/kg dry wt	*25*	<25	<25	<25	<25	<25
C7-C36 (Total)	mg/kg dry wt	*50*	<50	<50	<50	<50	<50

Total Petroleum Hydrocarbons - Soil

		Client Sample ID	TP03 0.3	TP04 0.2	TP04 0.5	TP04 1.5	TP04 1.7
		Date Sampled	12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-12	22-14982-15	22-14982-16	22-14982-17	22-14982-18
C7-C9	mg/kg dry wt	*10*	<10	<10	<10	<10	<10
C10-C14	mg/kg dry wt	*15*	<15	<15	<15	<15	<15
C15-C36	mg/kg dry wt	*25*	<25	<25	25	<25	<25
C7-C36 (Total)	mg/kg dry wt	*50*	<50	<50	<50	<50	<50

Total Petroleum Hydrocarbons - Soil

Client Sample ID			TP05 0.1	Base 01	Asphalt 01
Date Sampled			12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-19	22-14982-21	22-14982-23
C7-C9	mg/kg dry wt	*10*	<10	<10	<10
C10-C14	mg/kg dry wt	*15*	<15	<15	<15
C15-C36	mg/kg dry wt	*25*	<25	<25	1,247
C7-C36 (Total)	mg/kg dry wt	*50*	<50	<50	1,247

BTEX in Soil

Client Sample ID			TP01 0.1	TP01 1.5	TP02 0.1	TP02 0.5	TP03 0.2
Date Sampled			12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-1	22-14982-4	22-14982-6	22-14982-7	22-14982-11
Benzene	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050	<0.050	<0.050
Toluene	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
Ethylbenzene	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050	<0.050	<0.050
m,p-Xylene	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050	<0.050	<0.050
Toluene-d8 (Surrogate)	%	*1*	92	92	92	94	93
p-Bromofluorobenzene (Surrogate)	%	*1*	92	93	91	90	89

BTEX in Soil

Client Sample ID			TP03 0.3	TP04 0.2	TP04 0.5	TP04 1.5	TP04 1.7
Date Sampled			12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-12	22-14982-15	22-14982-16	22-14982-17	22-14982-18
Benzene	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050	<0.050	<0.050
Toluene	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
Ethylbenzene	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050	<0.050	<0.050
m,p-Xylene	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050	<0.050	<0.050
Toluene-d8 (Surrogate)	%	*1*	93	95	94	94	95
p-Bromofluorobenzene (Surrogate)	%	*1*	90	91	88	90	88

BTEX in Soil

Client Sample ID			TP05 0.1	Base 01	Asphalt 01
Date Sampled			12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-19	22-14982-21	22-14982-23
Benzene	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050
Toluene	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10
Ethylbenzene	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050
m,p-Xylene	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10
o-Xylene	mg/kg dry wt	*0.05*	<0.050	<0.050	<0.050
Toluene-d8 (Surrogate)	%	*1*	95	94	95
p-Bromofluorobenzene (Surrogate)	%	*1*	89	86	87

Moisture Content

Client Sample ID			TP01 0.1	TP01 1.5	TP02 0.1	TP02 0.5	TP03 0.2
Date Sampled			12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-1	22-14982-4	22-14982-6	22-14982-7	22-14982-11
Moisture Content	%	*1*	8	15	10	11	4

Moisture Content

Client Sample ID			TP03 0.3	TP04 0.2	TP04 0.5	TP04 1.5	TP04 1.7
Date Sampled			12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-12	22-14982-15	22-14982-16	22-14982-17	22-14982-18
Moisture Content	%	*1*	8	14	18	16	12

Moisture Content

Client Sample ID			TP05 0.1	Base 01	Asphalt 01
Date Sampled			12/04/2022	12/04/2022	12/04/2022
Analyte	Unit	*Reporting Limit*	22-14982-19	22-14982-21	22-14982-23
Moisture Content	%	*1*	5	5	3

Method Summary

Elements in Soil Samples dried and passed through a 2 mm sieve followed by acid digestion and analysis by ICP-MS. In accordance with in-house procedure based on US EPA method 200.8.

PAH in Soil Solvent extraction, silica cleanup, followed by GC-MS analysis.
Benzo[a]pyrene TEQ (LOR): The most conservative TEQ estimate, where a result is reported as less than the limit of reporting (LOR) the LOR value is used to calculate the TEQ for that PAH.
Benzo[a]pyrene TEQ (Zero): The least conservative TEQ estimate, PAHs reported as less than the limit of reporting (LOR) are not included in the TEQ calculation.
Benzo[a]pyrene toxic equivalence (TEQ) is calculated according to *'Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health'*. Ministry for the Environment. 2011. (In accordance with in-house procedure).

TPH in Soil Solvent extraction, silica cleanup, followed by GC-FID analysis. (C7-C36). (In accordance with in-house procedure based on US EPA 8015).

VOC in Soil Methanol extraction in accordance with US-EPA 5030A, analysis via GCMS with headspace sample introduction. (In-house procedure based on US EPA Method 5021).

Moisture Moisture content is determined gravimetrically by drying at 103 °C.

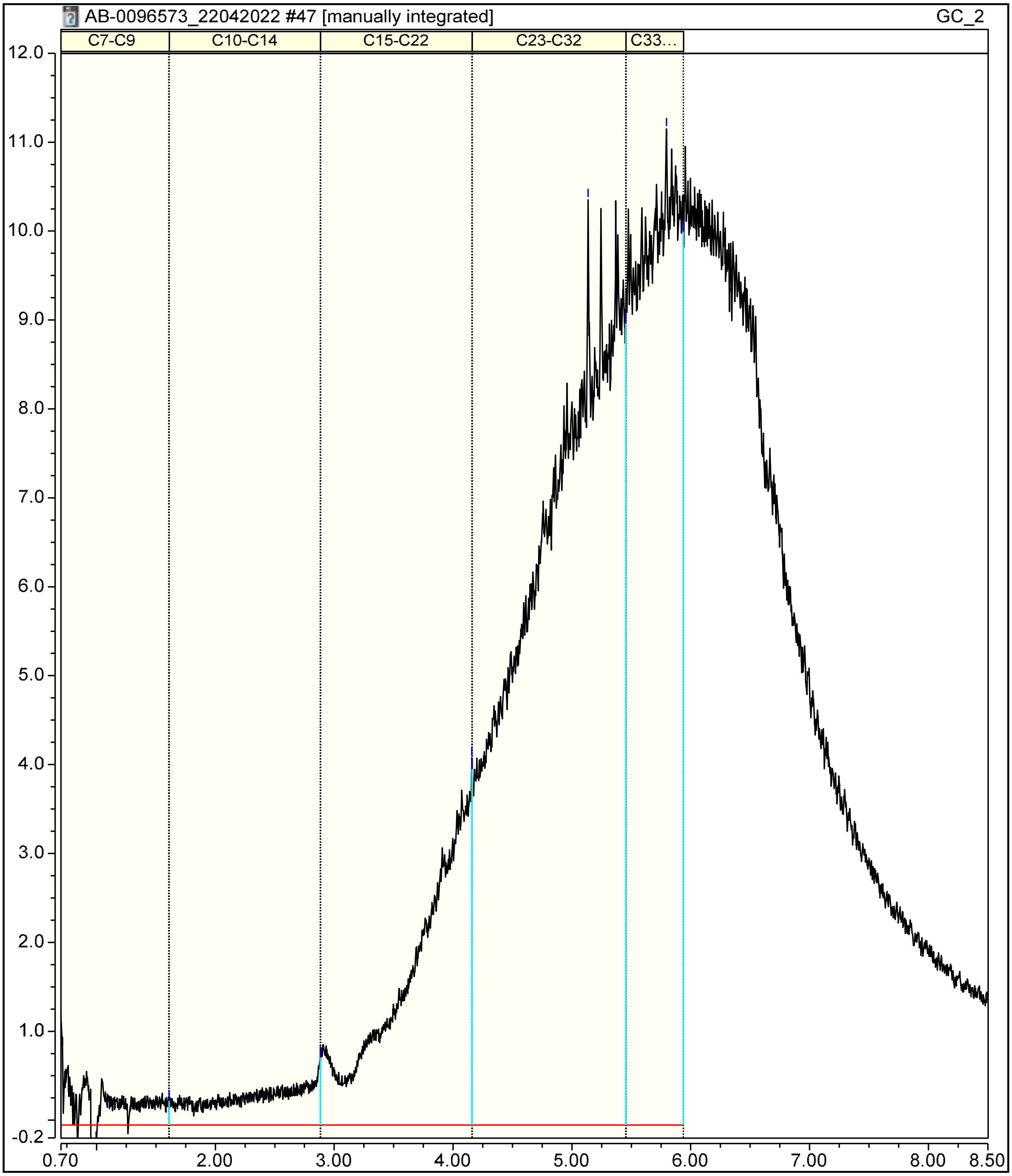
[redacted]
Sharelle Frank, B.Sc. (Tech)
Technologist

[redacted]
Terry Cooney, Ph.D.
Signatory

Rong Zhang
Technician

Chromatogram

22-14982-23



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Certificate of Analysis

WSP Queenstown
Level 1, 34 Grant Road
Queenstown
Attention: Josh Lamond
Phone: 027 208 0636
Email: josh.lamond@wsp.com

Lab Reference: 22-14645
Submitted by: Josh L
Date Received: 19/04/2022
Testing Initiated: 19/04/2022
Date Completed: 19/04/2022
Order Number:
Reference: 6-DK546.00

Sampling Site: Homer Tunnel
Description of Work: Bulk/Soil - Homer Tunnel

Report Comments

Samples were collected by yourselves (or your agent) and analysed as received at Analytica Laboratories. Samples were in acceptable condition unless otherwise noted on this report.
Specific testing dates are available on request.

Asbestos Fibres in Bulk (Qualitative)

Sample Details

Laboratory ID	Client Sample ID	Sample Location	Sample Description	Date Sampled	Date Analysed
22-14645-5	TP03 - ASB	1.5	Bulk Materials (76 x 40 x 2 mm)	12/04/2022	19/04/2022

Information in the above table supplied by the client: Client Sample ID, Sample Location, Date Sampled.

Analysis Results

Laboratory ID	Client Sample ID	Sample Layers	Fibre Types	Asbestos (Present / Absent)
22-14645-5	TP03 - ASB	L1 - Surface Debris L2 - Fibrous Material	Organic Fibres Asbestos NOT Detected.	Absent

Information in the above table supplied by the client: Client Sample ID.

Asbestos Fibres in Bulk (Qualitative) Approver:

Emma Kirk, NZCS.
Dunedin Lab Coordinator

Method Summary

Asbestos Fibres in Bulk Materials (Qualitative)	Sample analysis was performed using polarised light microscopy with dispersion staining in accordance with the guidelines of AS4964-2004 Method for the qualitative identification of asbestos in bulk samples. Note 1: The reporting limit for this analysis is 0.1g/kg (0.01%) by application of polarised light microscopy, dispersion staining and trace analysis techniques. Note 2: If mineral fibres of unknown type are detected, by PLM and dispersion staining, these may or may not be asbestos fibres. To confirm the identity of this fibre, another independent analytical technique such as XRD analysis is advised. Note 3: The laboratory does not take responsibility for the sampling procedure or accuracy of sample location description.

Appendix G
Accidental Discovery Protocol

Accidental Discovery Protocol

Contaminated sites may have isolated hotspots of gross contamination that may not have been identified during site investigations and may be uncovered during soil disturbance Those onsite should be trained to identify evidence of potential contamination. including:

- Unexpected visual cues (buried refuse, metal objects, building materials or asbestos waste or fibres, soil or water staining/bleaching or discolouration). This protocol does not cover buried concrete material within the carpark area discovered during the site investigation as this is known to have come from the historic avalanche shelter.
- Strong odours (fuel, sulphurous, rotting vegetation or sewage).
- Oily liquids or 'rainbow effect' films on groundwater.

If encountered, The Primary Contractor will implement the following procedures:

- Cease all work within a 5 m radius, make the work area safe and restrict access to all workers until instructed by the HSO or approved delegate.
- Switch off heat/ignition sources and isolate, contain or absorb any contaminant discharge.
- Advise the SQEP.
- The SQEP, in consultation with the Primary Contractor, will assess the site. If the assessment concludes confirmation of contamination is required, the following actions will be implemented:
    - Control the site: install temporary fencing, temporary cover, silt traps and bunding as required around the area of potential contamination.
    - If safe to do so, small volumes of material may be transferred into covered leak-proof skips/tanks to minimise contaminated discharges.
    - If safe to do, larger volumes will be bunded and secured.
    - Collection of potentially contaminated soil/refuse/water for independent analysis.
    - Submission of samples for laboratory analysis by SQEP.
- The SQEP will assess the results of the laboratory analysis against the relevant human health and environmental discharge criteria as appropriate and/or required by consent conditions.
- Grossly contaminated soil, spoil, refuse material or water that requires off-site disposal will be collected by appropriately licensed hazardous waste handlers and disposed of at facilities consented to accept the material.
- The Primary Contractor will record the details of the discovery, corrective actions taken and final disposal carrier and route in a register of additional contaminated material discovered.

wsp.com/nz

Appendix D
Lizard Assessment

LizardExpertNZ

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www.lizardexpertnz.co.nz Web
P.O. Box 54 Port Chalmers, 9050 Address

WSP New Zealand
12 Moorhouse
Addington
Christchurch 8011

Attn: Greig Larcombe
cc: Sarah Hamilton

24th March 2022

LIZARD ASSESSMENT OF HOMER TUNNEL EASTERN PORTAL (SH94)

Dear Greig,

As you are aware, Tony Jewell has successfully completed a lizard assessment of the proposed works areas, Homer Tunnel, February 19th, 2022. The area surveyed is shown in Figure 1 and takes in the new avalanche shelter and plant room. No lizards or their sign were detected, despite excellent prevailing weather conditions during the survey, and suitable (yet modified) habitat being present for indigenous lizards.

Survey Methods

Potentially suitable lizard habitat was limited to the northern part of the survey area and these habitats formed the focus of the field survey, and were searched intensively, twice. Initially (before it became reliably sunny) suitable habitat was surveyed by lifting rocks in search of lizards resting/sheltering beneath. These habitats were then surveyed again, by scanning for emergent sun-basking lizards. Habitats surveyed over the northern part of the search area included artificial scree and talus edging the car park, and revegetated construction zones around the portal; here numerous loose rocks were present.

The remaining parts of the search area were unsuitable as lizard habitat, for example, the carpark area, road, and disturbed gravels, the latter showing evidence of recent inundation. These areas were, however, quickly searched in case lizards happened to be present in more isolated and disturbed parts of the survey area. A buffer area of 10-20 m outside the survey area (Figure 1) was also surveyed.

Weather conditions prior to the survey were rainy and cloudy, but from 12:30 pm, when the survey commenced, cloud began breaking up and temperatures warmed to 11-15 °C and became sunnier. By 3:00 pm when the survey had been completed, the air temperature had begun to noticeably fall, and the wind increased. Overall, conditions within most of the survey period were considered by Tony Jewell to be excellent for lizard emergence and activity.

All lizard habitat survey and disturbance was carried out under Wildlife Act Authority 35130-FAU issued to Mandy Tocher for work on public conservation land. Wildlife Act Authority 35130-FAU allows for delegation of lizard handling/disturbance to suitably qualified field staff, such as Tony Jewell, a well-known herpetologist in New Zealand.

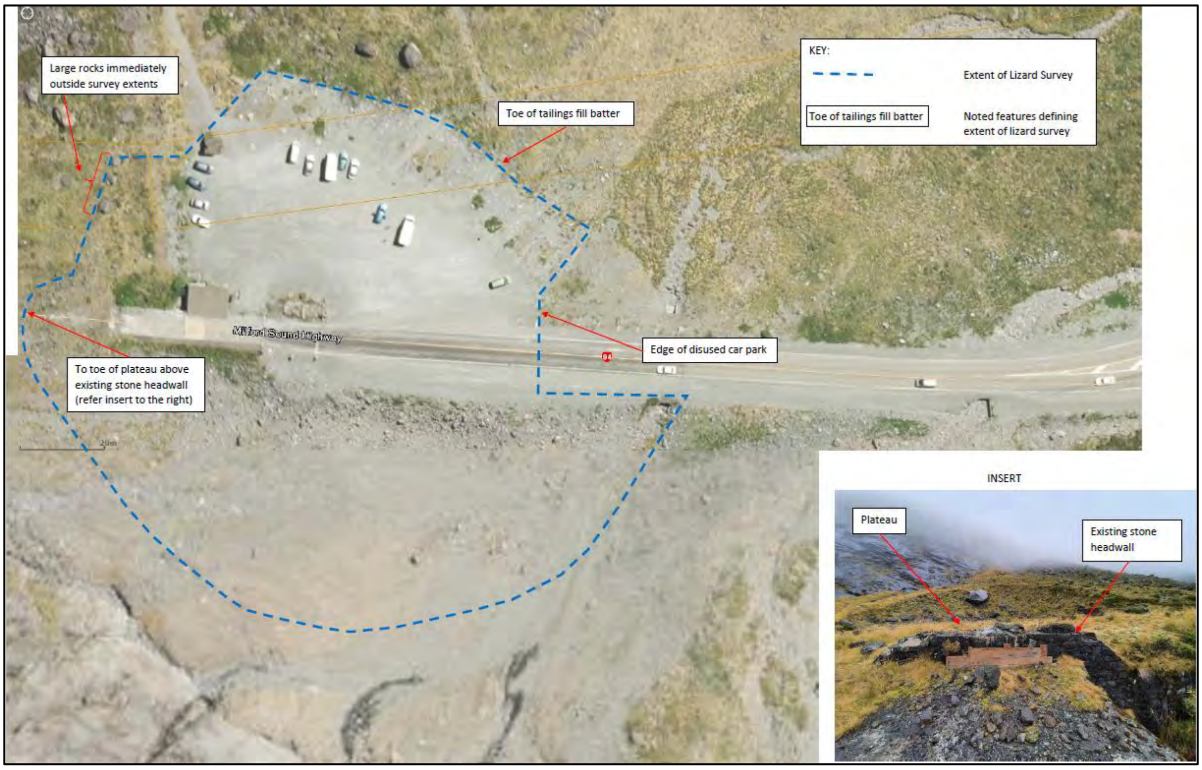

Figure 1: Location of the lizard survey area (within blue dotted line), Homer Tunnel (eastern portal). An area of 10-20 m outside this area was also searched.

Results

The entire survey area comprised of modified habitat, despite areas of vegetation regrowth giving a superficial appearance of being undisturbed. As noted above, no lizards or signs of lizards (including droppings, sloughed skins, the rustle sound of an animal rapidly retreating etc.) were encountered both over the search area or within a 10-20 m buffer area outside the search area (Figure 1).

Habitat modification over the search area was evidenced by both the lack of lizards, and by the depauperate invertebrate fauna present. With the exception of flighted invertebrate species such as moths, no native slugs (only exotic ones) and no weta or grasshoppers were detected even though they are known to be present close by.

Conclusions

No lizards were detected over the search area, or surrounding areas, despite suitable weather for lizard activity being experienced during the survey. Habitat over the search area was modified, evidenced by the lack of lizards, and commonly encountered invertebrate species.

Based on the lizard assessment, I am confident that there will be no adverse effects of the planned construction works for the new avalanche shelter and plant room on indigenous lizard values. Moreover, I can confirm that a Wildlife Act permit from DoC is not required to carry out planned works.

Dr Mandy Tocher

[redacted]

Herpetologist, LizardExpertNZ

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Appendix E
Rock Wren Impact Assessment

EAST HOMER AVALANCHE AND ROCK FALL SAFETY PROJECT

Rock Wren (*Xenicus gilviventris*) Impact Assessment, April 2022

WMIL Wildlife Management International

TOITŪ CARBON ZERO ISO 14064-1 ORGANISATION

East Homer Avalanche and Rock Fall Safety Project: Rock Wren (*Xenicus gilviventris*) Impact Assessment, April 2022.

Sara Larcombe

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This report was prepared by Wildlife Management International Limited for WSP as fulfilment of the contract Homer Tunnel-PF-LE-405-ACENZ dated 25 March 2022.

23 May 2022

Version History:

Version	Date	Author	Reason for change
1	24 April 2022	WMIL: Larcombe, S.	WMIL First Draft
2	23 May 2022	WMIL: Larcombe, S.	Response to client feedback

Citation:

This report should be cited as:

Larcombe, S. 2022. East Homer Avalanche and Rock Fall Safety Project: Rock Wren (*Xenicus gilviventris*) Impact Assessment, April 2022. Unpublished Wildlife Management International Technical Report to WSP.

Cover image: View of Homer Tunnel project site from the west. © Sara Larcombe, WMIL.

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EXECUTIVE SUMMARY

This report has been prepared as part of the environmental impact assessment of the proposed avalanche protection work and building upgrades at the eastern end of the Homer Tunnel due to be undertaken in a two-phase operation by Waka Kotahi/NZ Transport Agency. The pīwauwa/rock wren (*Xenicus gilviventris*), New Zealand's only truly alpine bird, is known to inhabit this site. This report describes the use of the site and surrounding area by rock wrens, outlines the potential impacts of the planned building works, and provides recommendations for minimizing the impacts to rock wrens.

Wildlife Management International Ltd. visited the site in early April 2022. Habitat within the Phase 1 project footprint consisted of tussock and shrubs interspersed with small rocks partially covered by vegetation and/or soil with few large boulders, very few crevices and no areas of open boulderfield. The majority of the Phase 2 project footprint consisted of extensively modified habitat (carpark, road, rocks piled up along south side of road), low-angle scree slope and a modified slope of small rocks/gravel and shrubs.

The Phase 1 and 2 areas were surveyed for evidence of rock wren nesting and activity as well as listening for calls. No rock wrens were heard or seen within the project footprint, and no evidence of nesting was found.

Five rock wrens were detected outside the project footprint (three seen and a further two heard calling). Two rock wrens were also observed foraging approximately within 100 m from the project site.

The size of the total area of suitable foraging habitat being impacted by the project footprint represents a small fraction of a territory for a pair of rock wren. The number of rock wrens likely to be impacted by this small loss of habitat is 2-4 adult rock wren (1-2 breeding pairs) and their potential offspring (2-10 birds in total). It is unlikely that rock wrens will nest inside the building site footprint; however nests may be located in boulderfields at close proximity to the site.

Some habitat loss will be temporary (during the two-year building phase) before vegetation is replaced. A very minor amount of habitat loss will be permanent, as structures will exist in areas that were previously rock wren habitat. To mitigate the loss of rock wren foraging habitat caused by the building upgrades, disused sites in the immediate area could be re-vegetated.

Effective stoat suppression is known to facilitate greater nesting success for rock wrens. A network of stoat traps is present in the Homer Valley. This trapping programme is due for a review, to identify if improvements could be made to reverse the decline of rock wrens in this area. A contribution to funding to support this review could be made, so as to offset the small amount of habitat loss caused by the building works.

It is recommended that a subsequent site assessment should be conducted in spring (between mid-October and mid-November) when rock wren pairs are actively nesting and defending territories, to determine the locations of any nests at close proximity to the building site.

*East Homer Avalanche and Rock Fall Safety Project: Rock Wren (*Xenicus gilviventris*) Impact Assessment April 2022*

1. INTRODUCTION

Rock wrens (*Xenicus gilviventris*), also known as pīwauwau, mātuitui, and tuke, are New Zealand's only truly alpine bird, and are remarkably well-adapted for life above the bush line. They are a small (14-20 g) passerine, capable of only short bursts of flight. Much of their time is spent hopping between boulders and darting in and out of rock crevices, searching for food and nesting materials. They are largely insectivorous, but also feed on seeds, berries, and nectar (Heather & Robertson 2005, Higgins et al. 2001, O'Donnell et al. 2011, Gaze 2013).

Rock wrens occur in areas of low alpine and subalpine shrubland, herb fields, scree slopes, boulder fields and rocky bluffs (Michelsen-Heath 1989). They are sexually monogamous, and form pair-bonds which last between breeding seasons. Each pair will maintain a territory year-round, with territories ranging in size from c. 0.6 – 4.2 hectares (Michelsen-Heath 1989). They are thought to enter a state of torpor or possibly hibernation over winter (Child 1978, Mcnab et al. 2020). Records indicate that rock wrens live for at least five years (Michelsen-Heath 1989).

Rock wrens have a fragmented distribution in mountainous areas along the western side of the South Island. Populations to the south of Aoraki/Mt Cook are known to be genetically separated from populations to the north (Verry et al. 2019, Weston et al. 2016). The southern populations, recently grouped as the subspecies *Xenicus gilviventris rineyi*, are classed as Nationally Endangered under the New Zealand Threat Classification System (Robertson et al. 2021).

Rock wrens are cavity-nesters, nesting in crevices on the ground among talus slopes and boulder fields, or digging burrows into the earth (Michelson-Heath 1989, Weston et al. 2018). Nests are well-constructed cups, consisting of woven strands of vegetation heavily insulated with feathers. Clutches of 1-5 eggs are laid from mid-October through to mid-November, with replacement clutches laid as late as the end of December. Both sexes share incubation and chick raising. Incubation averages 18-22 days, and chicks are brooded for 21-26 days. Juveniles disperse from their parents' territory 2-4 weeks after fledging, typically establishing their own territory within 500m (Higgins et al. 2001, Michelsen-Heath 1989).

Rock wrens are increasingly rare, due largely to nest predation by stoats (*Mustela erminea*) as well as mice (*Mus musculus*) (Michelsen-Heath & Gaze 2007, Gaze 2013, O'Donnell et al. 2017). Stoats readily obtain eggs or chicks from the nest, and adult birds are sometimes taken. In areas where stoats are effectively controlled through ground-based trapping or aerial 1080 treatments, rock wren survival rates are much higher than in areas with no stoat control (Edge Hill & Reid 2017, Little et al. 2017).

This work was undertaken as part of environmental impact assessment for the State Highway 94 (SH94) Homer Tunnel Avalanche Shelter project due to be completed by Waka Kotahi/NZ Transport Agency. Wildlife Management International Ltd. (WMIL) was contracted to complete an assessment of the possible impacts of the construction on rock wren. This work was undertaken in April 2022.

2. SCOPE OF ASSESSMENT

The scope of the rock wren impact assessment includes:

- a description of the availability of rock wren habitat and foraging areas outside of the project footprint in the wider surrounds,
- a description of the nesting behaviour of rock wrens in the context of the project site,

- an assessment of how prevalent rock wren are at the site, and characterisation of what they utilise the site for,
- quantification of numbers of rock wren observed within project footprint using data collected during onsite survey, and a comparison with likely rock wren population in the wider catchment, and
- comments on the likely effects on rock wren given the scale of likely disturbance from the project and in the context of the potential wider environment.

3. EAST HOMER SITE CHARACTERISTICS

The Homer-Gertrude Cirque (44° 45' S, 168° 0' E) is a vertical sided U-shaped valley in the Darran Mountains, immediately adjacent to the eastern entrance of the Homer Tunnel. This area is well-known as a relatively accessible site to view rock wrens, due to its alpine habitat, proximity to SH94, and easily accessible walking tracks.

Rock wrens are commonest in areas where screes or rockfalls are interspersed with areas of stable areas of low scrub, fellfield and cushion vegetation (Heather & Robertson 2005), which is typical habitat at this site.

4. ROCK WREN SITE USE AND NESTING BEHAVIOURS

Rock wren numbers have been intensively monitored in the Homer-Gertrude area by Department of Conservation (DOC) researchers since at least 2011. In 2012, monitoring showed that rock wren numbers were in rapid decline due to high levels of nest predation by stoats (Weston et al. 2018). In response to this finding, a line of stoat traps (37 double-set DOC200 traps at 200 m spacing) was extended into the alpine areas of both the Homer and Gertrude Valleys in 2013, and serviced regularly by a volunteer group (Weston et al. 2018). This trapping network provides protection from stoats across an area of approximately 200 ha of rock wren habitat (Edge Hill & Reid 2017, Weston et al. 2018). In the 2014 season following expansion of the trapping network, a significant increase in nesting success of rock wrens at the Homer and Gertrude site was observed (Monks et al 2021). From 2013 to 2016, the rock wren population at the Homer-Gertrude cirque increased steadily (Monks et al. 2021). Territory mapping estimates concluded that this area contained a total population of 135 birds during the fledging period in 2016, compared to just 34 in 2013 (Monks et al. 2021). However, the population in this area appears to have been in decline from 2016 to 2021 (K. Weston, DOC, pers. comm.). The existing trap network is in need of a review, to determine if it meets current best-practice standards for effectively suppressing stoats.

In Fiordland, rock wren nests are typically found close to large patches of vegetation, and are constructed as holes in ground with a slope greater than 20°; usually in an elevated bluff or bank, or within cracks or vegetated ledges on rock faces and large free-standing boulders (Higgins et al. 2001, Michelsen-Heath 1989, Weston et al. 2018). In 2011 rock wren nests monitored in the Homer-Gertrude Valley were sited primarily in extensive boulder fields and talus slopes interspersed with subalpine scrub and patchy *Chionochloa* grasslands between 700 and 1100 m a.s.l. (Little et al. 2017). Pairs monitored over two consecutive seasons at another site in Fiordland National Park were observed to build nests in sites very similar to those they had built in previously and within 50 m of previous nests. However, they did not re-use the same nest site as the previous year, or the excavation from the previous year (Higgins et al. 2001).

In Fiordland, rock wren territories are typically between 0.6 and 4.2 ha in size, with the average size being 1.4ha (Michelsen-Heath 1989). Most territories have 20-30% of the area covered with bush, scrub, or dense prostrate vegetation for feeding, and varying areas of scree or rockfall, and they often seem to contain a source of water (Michelsen-Heath 1989). Smaller territories, of 1-2 ha, can have up to 80% vegetative cover, whereas in large territories, up to 10 ha, vegetation is typically sparser (Michelsen-Heath 1989). Territories of first-year birds often comprise suboptimal habitat, and can be comparatively large, with birds required to cover greater distances to feed (Higgins et al. 2001).

5. ASSESSING ROCK WREN NUMBERS

Rock wrens are a cryptic species. Their colouration enables them to vanish into their surrounding landscape, and their small size and agility means that they can quickly dart between rocks or under bushes. They frequently use the sub-terranean space between boulders to forage or shelter (Monks et al. 2021).

A five-year study conducted by Monks et al. (2021) investigating the effectiveness of a variety of rock wren census techniques found that during the nesting and chick-rearing phases (October to February) rock wrens were more consistently detectable, whereas during the post-fledging phase (March onwards), crypsis increased and census techniques were much less reliable. The proportion of birds detected in surveys in the post-fledging period was lower than in both the nesting and fledging periods, due to fledglings becoming independent and dispersing throughout the landscape. No studies have been produced detailing rock wren numbers or habitat use in the autumn and winter months, presumably as observations are increasingly infrequent as winter approaches. Some authors posit that rock wrens enter a state of torpor or even hibernation during these months (Child 1978, Mcnab & Weston 2020).

The increased crypsis later in the season suggests that population assessments should occur prior to dispersal of fledglings, between spring and late summer (Monks et al. 2021).

The most up-to-date population assessment of rock wrens at the Homer-Gertrude Cirque is a 2018 estimate of 129 birds (Monks et al. 2021).

6. EAST HOMER SITE VISIT

A site visit was conducted on 5 and 6 April 2022 by three WMIL ecologists.

The footprint of Phase 1 is approximately 600m^2 in size, and approximately half of this area is suitable rock wren foraging habitat. Habitat within the project footprint of Phase 1 consisted of tussock and shrubs interspersed with small rocks (<50 cm diameter) partially covered by vegetation and/or soil. Five larger boulders (>1 m diameter) were found within the project footprint. There were very few crevices within these large boulders, and no areas of open boulderfield (see Figure 1 for aerial imagery and Appendix 1 for site photographs).

The majority of the project footprint of Phase 2 consisted of extensively modified habitat (carpark, road, rocks piled up along south side of road). To the south of the road the project footprint encompassed a low-angle scree slope which was characterized by small rocks and tussocks. To the north of the carpark the project footprint encompassed a modified slope of small rocks/gravel and shrubs (Figure 1, Appendix 1).

The weather on 5 April 2022 consisted of persistent drizzly rain and occasional heavier showers, with light winds. Cloud cover was 100%. The temperature was mild. The field team arrived at the site at 11.30 am. One hour was spent searching the site (Phase 1 and Phase 2 footprints: three person-hours). Observers examined rock crevices for evidence of rock wren nesting, scanned the area for rock wren activity, and listened for any calls. Observers walked repeatedly through the site in an attempt to flush any rock wren present, and observed the site from vantage points which allowed for a view of the entire footprint. No rock wrens were heard or seen within the project footprint, and no evidence of nesting was found.

From 1 pm until 2 pm a search was conducted outside the project footprint, through the extensive boulderfields which characterize the sides of the valley approximately 200-300 m to the north. Five rock wrens were detected during this search period; three were seen and a further two were heard calling. Two of the rock wrens were observed foraging approximately 100 m from the project site.

On 6 April the weather was much more conducive to searching for rock wren. Cloud cover was 50%, precipitation was nil, and the sun reached the valley floor. Winds were light and the temperature was mild. The project footprint was monitored for rock wren between 09.45 am and 10:45 am. Observers walked the extent of the site footprint to flush any wren present, and investigated under boulders for evidence of nesting. Again observers scanned the project footprint from suitable vantage points.

At 09.50 am one rock wren was observed at approximately 100 m north of the Phase 1 site project footprint, foraging amongst the boulderfield.

At 10.30 am two male rock wrens were observed feeding amongst the boulders alongside the nature trail immediately north of the project footprint. They moved through the boulderfield and shrubs to the gully immediately adjacent to the edge of the carpark slope (Phase 2 footprint margin) and were observed to spend 5 minutes foraging amongst the boulders and shrubs. They were not seen to use the carpark slope (characterized by bare gravel with occasional tussocks) but were feeding immediately adjacent to its lower edge, within approx. 1m of the project footprint margin (Figure 1).

Between 10:45 and 11:45 am a further three rock wrens were observed outside the project footprint, approximately 200 m to the north along the nature trail.

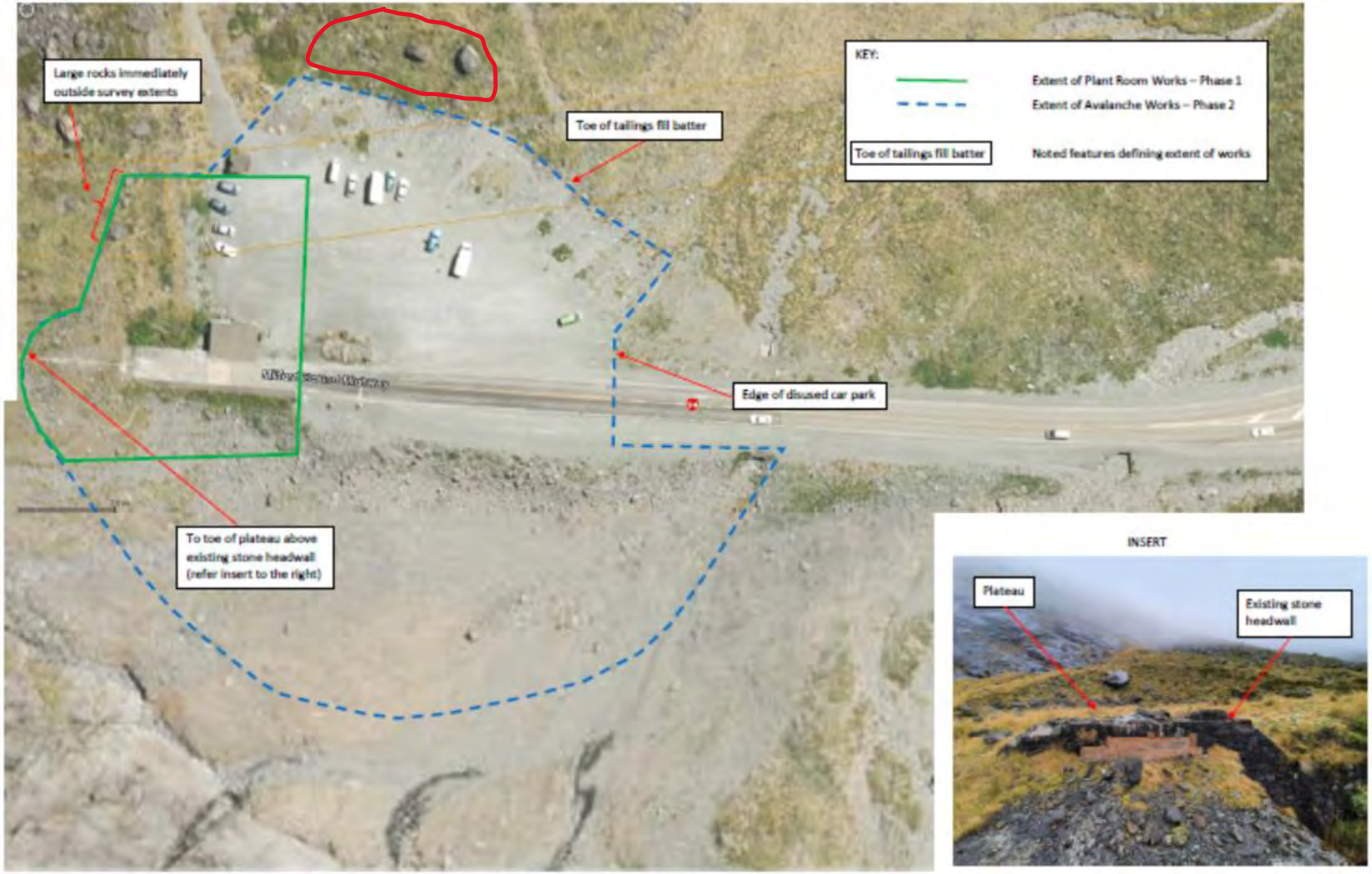

Figure 1. <u>Aerial view of Phase 1 (green solid line) and Phase 2 (blue dashed line) boundaries. Location of rock wren observation shown as red circle. Courtesy of Greig Larcombe (WSP), red circle added by author.</u>

7. DISCUSSION

The weather on the first day of the site visit was not conducive to conducting a thorough rock wren survey. Rainy conditions likely contributed to rock wrens spending time foraging under boulders and amongst vegetation or roosting somewhere sheltered, rather than being detectable on the surface. The consistent rainfall reduced visibility, and the sound of the rain drops and the stream flowing reduced the likelihood of the observers being able to hear any rock wren calls.

The weather on the second day of the site visit was much more suitable for rock wren detection. Observers were able to identify rock wrens much more readily by call alone, and were more likely to be able to spot rock wrens hopping around once they had pinpointed the direction that the calls were coming from.

Although rock wrens were detected during the site visit, it is reasonable to assume that not all rock wren present at the site and adjacent area were detected due to the time of year at which the site visit was conducted. Rock wrens are known to be cryptic, and crypsis increases in the post-fledging period from late March onwards (Monks et al. 2021). The numbers of rock wren observed during the site visit should therefore be treated as minimum numbers of rock wren utilizing this area.

The footprint of Phase 1 of the developments encompasses some habitat which may be suitable foraging ground for rock wrens. Plant species such as *Coprosma* and *Gaultheria* which rock wrens are known to feed from were observed within this area. No suitable nesting sites were observed in this area. Phase 1 encompasses an area of approximately 600m^2 of vegetated slopes interspersed with large boulders, as well as extensively modified areas (car park, road, tunnel roof). As rock wrens typically have a territory size of around 1.4 ha (14000 m^2) with a minimum size of 0.6ha (6000m^2), this 600m^2 site represents at most 1/10th of a rock wren pair's territory, or smaller fractions of several territories.

The footprint of Phase 2 is mostly extensively modified habitat (carpark, road, rocky bank south of road) and rocky river flats. No suitable nesting sites were observed in this area, and only low-quality foraging grounds were found. This footprint is largely unsuitable habitat for rock wren. However, two rock wrens were observed foraging immediately adjacent to the sloping bank that forms the northern edge of the carpark (Figure 1). This area is likely to be impacted by the building process (noise, vibrations, dust etc.). Rock wrens therefore may be displaced from feeding in this portion of their territory during the building process. Again, the size of the area that may be impacted by the building activities is proportionately small relative to the size of an average rock wren territory.

Rock wren territory mapping was conducted as part of a five-year study of the Homer Valley rock wren population by DOC alpine ecologist Kerry Weston. This territory mapping shows that the building site footprint consistently overlaps or borders the territories of one or two rock wren pairs (Dr. K. Weston, DOC, pers. comm.; Appendix 2). No rock wren nests were found within the building site footprint during this study. The nearest nests have been located within 50 m to the north of the footprint (Appendix 2).

8. CONCLUSIONS AND RECOMMENDATIONS

The size of the total area of suitable foraging habitat being impacted by the building site represents a small fraction of the territory of a pair of rock wren. The amount of rock wrens likely to be impacted by this small loss of habitat is one to two pairs of adult rock wren (two to four adult birds) and their potential offspring (two to ten rock wren total). It is unlikely that rock wrens will nest inside the building site footprint; however nests may be located in boulderfields at close proximity (<50 m) to the site.

Some habitat loss will be temporary (during the two-year building phase) before vegetation is replaced once construction work is completed. A very minor amount of habitat loss will be permanent, as structures will exist in areas that were previously rock wren habitat. To mitigate the loss of rock wren foraging habitat caused by the building upgrades, disused sites in the immediate area could be re-vegetated. The site of the current carpark is suitable for this, as it is adjacent to known rock wren foraging habitat and historically would have been covered with similar vegetation.

Effective stoat suppression is known to facilitate greater nesting success for rock wrens. The trapping programme in the Homer Valley is in need of a review, to determine if improvements could be made, so as to reverse the decline of rock wrens in this area. To offset the small amount of habitat loss caused by the building works, a financial contribution could be made towards the evaluation of stoat suppression efforts in the Homer Valley.

A subsequent site assessment should be conducted in spring (between mid-October and mid-November) when rock wren pairs are actively nesting and defending territories, to determine the locations of any nests at close proximity to the building site. If nests are located within 20 m of the building activities, construction work in this immediate area should be halted until chicks have fledged from the nest.

9. ACKNOWLEDGMENTS

Thanks go to Dan Burgin and Elizabeth (Biz) Bell for accompanying me on the site visit, persisting in the hunt for birds despite the rain, and sharing in the joy of watching rock wrens bobbing about amongst the boulderfields.

Thanks also to Kirsty Youldon at Downer for facilitating our visit to the site.

Many thanks to Dr. Kerry Weston, DOC alpine ecologist, for sharing her knowledge and data.

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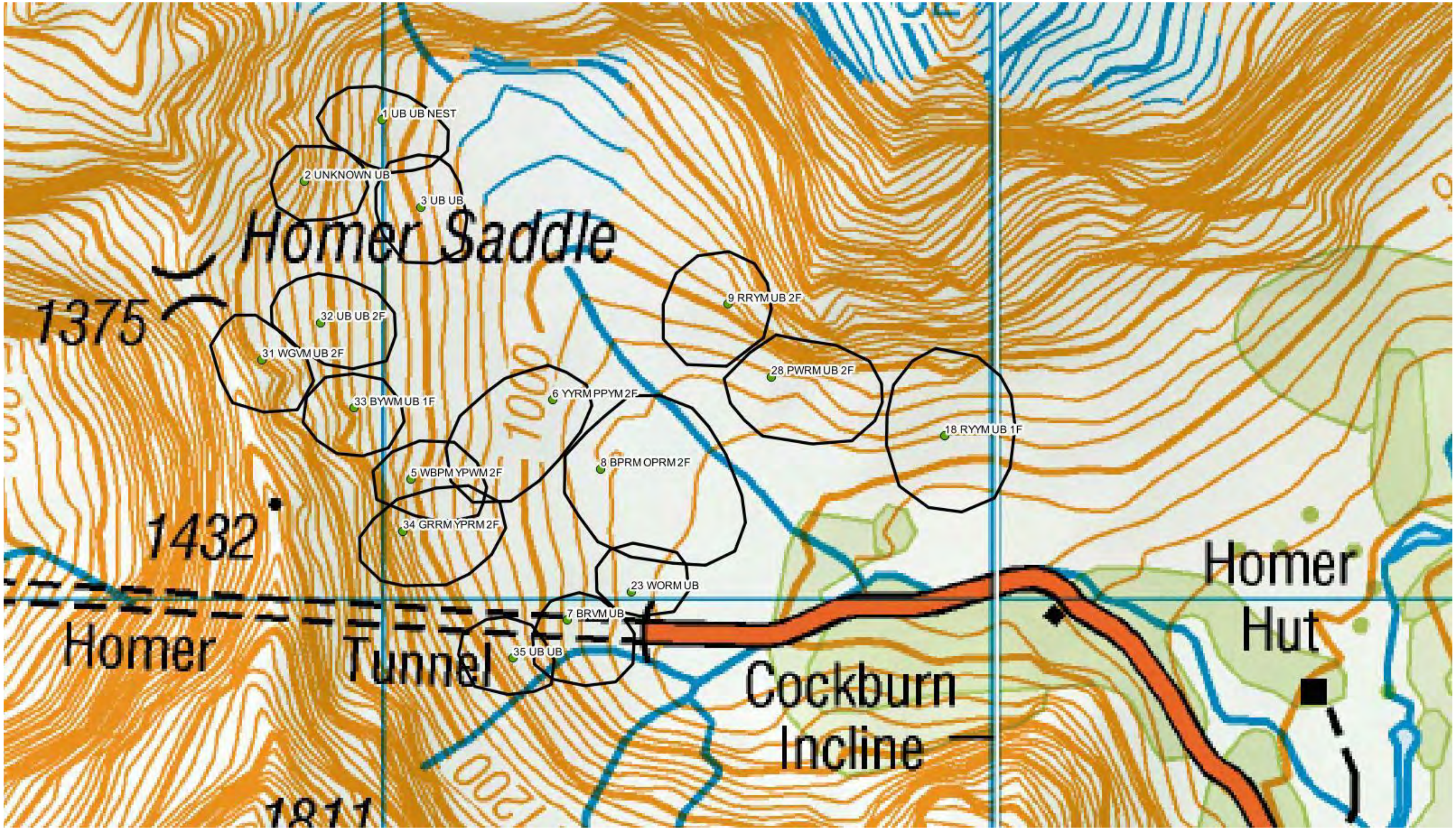
11. APPENDIX 1: SITE PHOTOGRAPHS

Photo 1. View of the footprints of Phases 1 and 2 SH94 Homer Tunnel Avalanche Shelter Project from the west. The approximate margins of Phase 1 are shown by the solid green line and Phase 2 by the dashed blue line.

Photo 2. Northern aspect of Phase 1 SH94 Homer Tunnel Avalanche Shelter Project footprint (foreground) showing potential rock wren (Xenicus gilviventris) foraging habitat. The green line approximates the footprint margin.

Photo 3. Northern boundary of Phase 2 SH94 Homer Tunnel Avalanche Shelter Project (blue dashed line). Two rock wren (*Xenicus gilviventris*) were observed foraging in the area circled in red.

12. APPENDIX 2: ROCK WREN TERRITORY MAPS



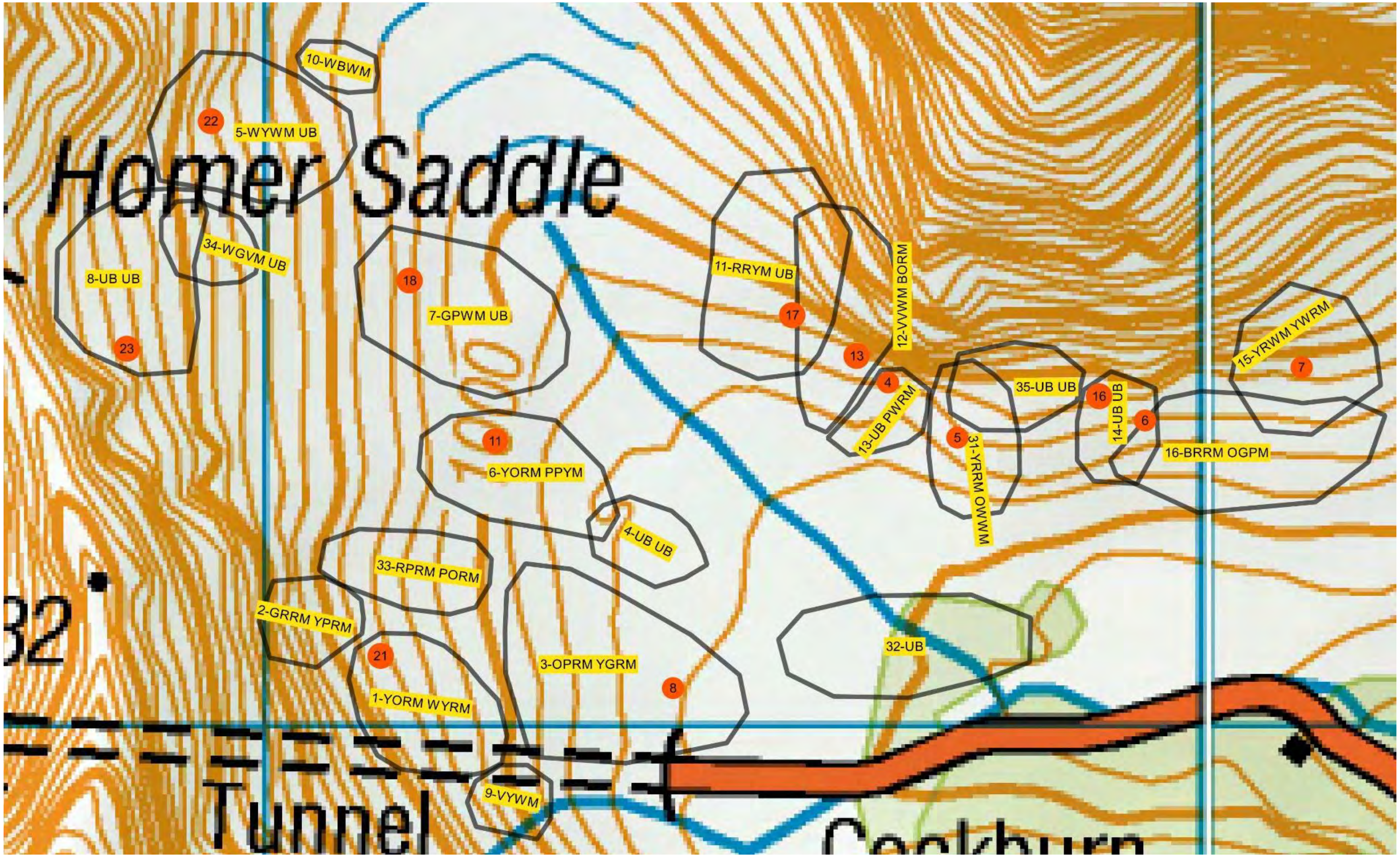


Figure 3. Rock wren (*Xenicus gilviventris*) breeding territories at Homer Valley in 2016-2017 (black circles). Nest locations are shown as orange dots. Courtesy of Dr. Kerry Weston, DOC.

Appendix F
Heritage Assessment

HOMER TUNNEL EASTERN PORTAL, MILFORD ROAD

Heritage Assessment
September 2022

Origin
CONSULTANTS

Heritage Assessment for the Homer Tunnel Eastern Portal

Commissioned by Waka Kotahi New Zealand Transport Agency

Prepared by Jeremy Moyle, Lucy Travis, Robin Miller, and Benjamin Teele

Origin Consultants Ltd

8 September 2022

Cover: Homer Tunnel in the 1930s, Kete Christchurch PH13-050.

Ownership & Disclaimer

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Executive Summary

This heritage assessment has been prepared for Waka Kotahi New Zealand Transport Agency (Waka Kotahi) as part of their proposed resilience improvement works at the eastern portal of the Homer Tunnel. It is intended to support concession applications to the Department of Conservation (DOC) for the proposed works. It collates and supplements three previous heritage impact assessments prepared by Origin Consultants.[1] The Homer Tunnel is a significant heritage site. Most of the site is located on land administered by DOC.

It is based upon research provided from a variety of archival sources and reports. These included historic documents and publications and more recent reports provided by Waka Kotahi that relate to the proposed resilience improvement works. The key constraints and limitations include the lack of a recent site visit, the reliance on past heritage assessments, and the preliminary state of some proposed designs.

Discussions about the formation of a Milford Road began as early as 1878, and some early construction attempts were made during the late 19th century. Work resumed on the project during the 1930s and the homer tunnel was constructed between 1935 and 1953. The project required a large amount of labour and resource, and camps and workshops were built near the eastern portal entrance. The progress of construction was often impacted by avalanches and rockfall. In an attempt to withstand these hazards, a concrete drill shed was constructed in 1936 (today the tunnel's plant room) and an avalanche shelter was constructed between 1938 and 1940. Approximately 115m of this latter structure was destroyed by an avalanche in 1945. An additional 10m was destroyed by another avalanche in 1997. The deposition of tunnel spoil, construction refuse, and the remains of the destroyed avalanche shelter created a fill terrace adjacent to the eastern portal. This was expanded with a new deposit of fill at some point between 1983 and 2003.

Today the eastern portal site includes a variety of notable features, including: the remaining section of the avalanche shelter, the attached plant room and commemorative, the stone façade of the tunnel portal, debris from the destroyed sections of avalanche shelter, the fill terrace formed from construction spoil and other material, talus/fill embankments on either side of the tunnel portal, and the site of the former construction workshop to the north.

There are several pieces of legislation as well as management and recognition documentation that influence DOC's interest in the heritage fabric associated with the Homer Tunnel. These include the Conservation Act 1987, the National Parks Act 1980 and Fiordland National Park Management Plan 2007 (which includes the Homer Tunnel Portal Avalanche Damage as an actively managed historic site in the park), the Homer Tunnel Portal and Ruins Conservation Plan 1993, ArchSite site recording scheme, Land Transport Management Act 2003, Resource Management Act 1991 along with district and regional plans, Heritage New Zealand Pouhere Taonga Act 2014, and the Homer Tunnel Conservation Plan.

The Homer Tunnel, as a whole, is assessed as having: high technology, engineering, and scientific value; high contextual and group value; high historic value; moderate architectural value; moderate rarity and representative value; moderate integrity value; moderate vulnerability value; and moderate cultural value. Within this general assessment of heritage value, specific features relevant to the proposed works are assessed as having varying levels of significance. High significance: Surviving remnant of reinforced concrete avalanche shelter, eastern portal plant room, commemorative brass plaques (eastern elevation of the plant room), stone portal façade, and homer tunnel workshops archaeological site (D40/20). Moderate significance: Visible avalanche shelter debris. Low significance: Refuse and fill associated with tunnel construction scattered around the eastern portal.

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[1] Lucy Travis and Robin Miller, *Homer Tunnel Eastern Shelter Alterations: Heritage Impact Assessment and Advice* (Unpublished report for Waka Kotahi, 2021); Lucy Travis and Robin Miller, *Homer Tunnel Resilience Improvements, Phase 1: Heritage Comments* (Unpublished report for Waka Kotahi, 2021); Lucy Travis and Robin Miller, *Homer Tunnel Resilience Improvements, Phase 2: Heritage Comments* (Unpublished report for Waka Kotahi, 2022).

The proposed resilience works are planned in three phases. Phase 1 has already been completed and involved trenching and cabling alongside and across the Milford Road to allow the temporary relocation of the generators from adjacent to the Homer Tunnel to the Green Shed operations and emergency management site.

Phase 2 includes: new equipment building excavations and placement beneath replaced rubble alongside the Homer Tunnel; the temporary removal of the avalanche shelter debris pile; exploratory excavation; and rock pinning the stone façade of tunnel portal. These works are assessed as generally having a less than minor effect on the tunnel's heritage values. A variety of monitoring and recording recommendations are made to manage the potential for Phase 2 excavations to affect archaeological material. A conservation methodology has been prepared to manage the stone façade rock pinning.

Phase 3 includes: works involve the removal of the existing avalanche shelter and plant room; the relocation of commemorative plaques to the new equipment building; the construction of a new avalanche shelter; and the reinstatement of the avalanche debris pile removed during Phase 2. The removal of the avalanche shelter and associated items is considered to have an overall moderate adverse (permanent) impact on the heritage values of the Homer Tunnel. The quarrying of the fill terrace is only expected to have a less than minor adverse effect on the site's heritage values. Replacement is not the preferred approach from a heritage perspective, but the in-situ retention of the shelter and associated features is unfeasible due to: the poor condition of the existing shelter, the lack of existing protection from rockfall/avalanche, the inability to over-clad the existing feature, the low height of the structure, the need to shift former avalanche shelter debris to make way for new construction. The proposed new structure is a c. 50-80m long concrete structure, with an open north elevation (similar to the existing shelter design). Various alternative options were considered to mitigate the adverse effects of the Phase 3 work, but most were ultimately considered unfeasible given the extreme situation and requirements of the site. The design of the new shelter is assessed as providing some mitigation for the adverse effects of the historic shelter removal. This design incorporated advice provided by Origin Consultants. Recommendations are made for the relocation of the commemorative plaques, the recording of the existing avalanche shelter and associated structures, and the development of some form of interpretive package. A variety of archaeological monitoring and recording recommendations are made to manage the potential for Phase 3 excavations to affect archaeological material. The requirement to reinstate the debris pile is also reiterated.

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Introduction

This heritage assessment has been prepared for Waka Kotahi New Zealand Transport Agency (Waka Kotahi) as part of their proposed resilience improvement works at the eastern portal of the Homer Tunnel. It is intended to support and supplement concession applications to the Department of Conservation (DOC) for the proposed works. The Homer Tunnel is a significant heritage site. Most of the site is located on land administered by DOC.

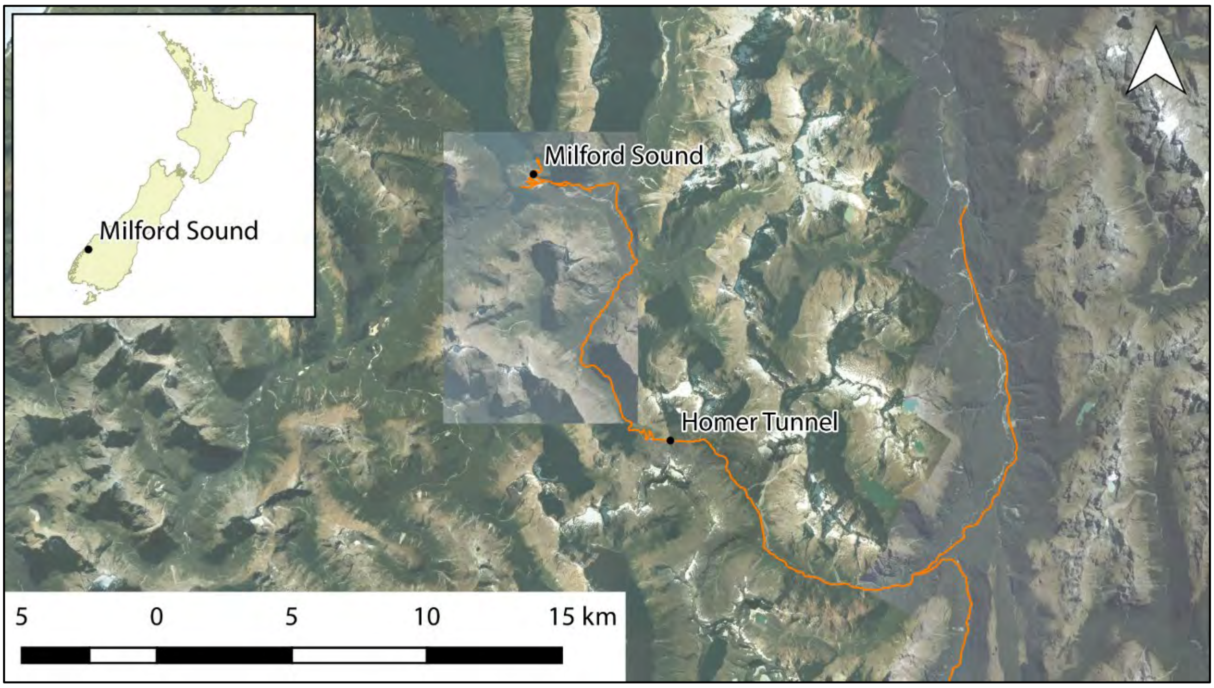

Figure 1. Location of the Homer Tunnel. Roads are shown in orange.

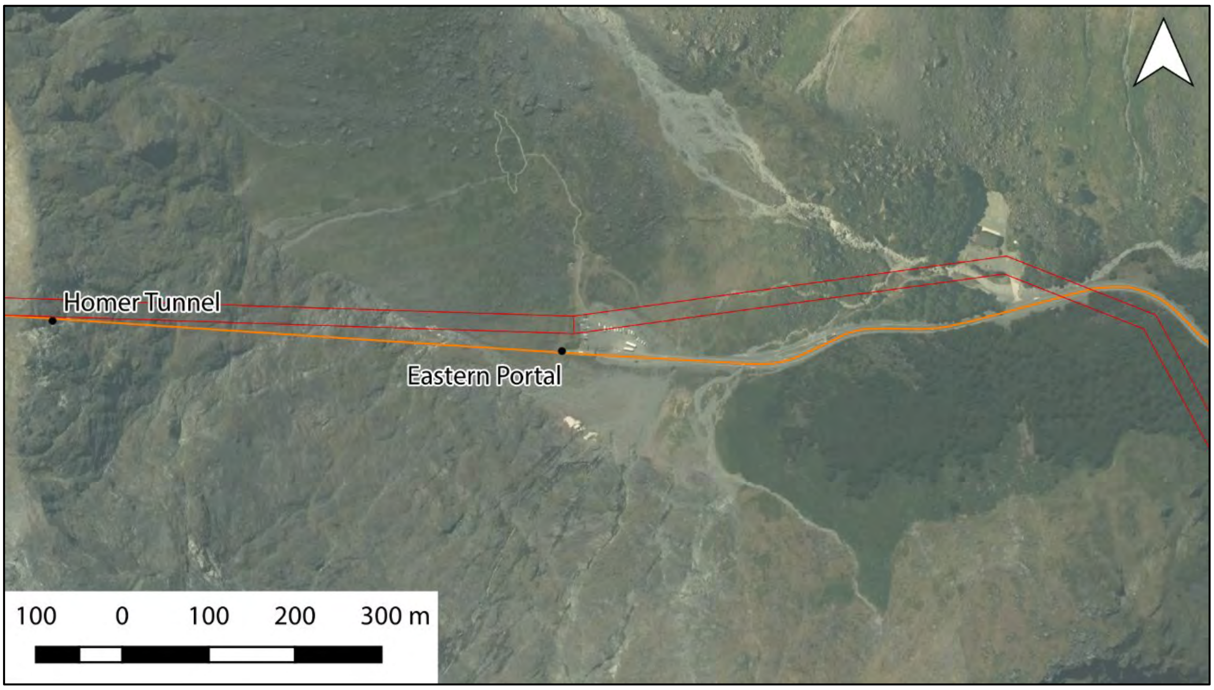

Figure 2. Eastern portal site. Note that the highway alignment (orange) does not follow the road reserve (red).

The purpose of this assessment is to:

- Collate and supplement previous heritage assessments produced for different phases of the resilience improvement works.[2]
- Outline the site's history, current situation, and heritage values.
- Identify how the site will be affected by the proposed works.
- Outline how efforts to mitigate adverse effects have been incorporated into the designs.
- Provide recommendations for the mitigation and management of any effects to the site's heritage during the proposed works.

[2] Travis and Miller, *Homer Tunnel Eastern Shelter Alterations: Heritage Impact Assessment and Advice*; Travis and Miller, *Homer Tunnel Resilience Improvements, Phase 1: Heritage Comments*; Travis and Miller, *Homer Tunnel Resilience Improvements, Phase 2: Heritage Comments*.

Methodology

This report collates and supplement several previous reports prepared by Origin Consultants for the Homer Tunnel and the proposed works. These include: [3]

- *The Homer Tunnel, Milford Sound-Te Anau Road, Fiordland National Park Conservation Plan (Draft)* [4]
- *Homer Tunnel Eastern Shelter Alterations: Heritage Impact Assessment and Advice*[5]
- *Homer Tunnel Resilience Improvements, Phase 1: Heritage Comments*[6]
- *Homer Tunnel Resilience Improvements, Phase 2: Heritage Comments*[7]

The content of this assessment and the reports it collates is based upon research provided from a variety of archival sources and reports. The principal sources have been:

- Digital archives, including PapersPast and Archives New Zealand.
- Reports and drawings held by Waka Kotahi and the Department of Conservation.[8]
- Online photographic archives, including Te Papa and the Alexander Turnbull Library; and
- Modern aerial photographs (via Google Maps, Google Earth, and LINZ Data Service).

The site visit that primarily informs this this assessment was undertaken in 2019 by Ben Teele and Robin Miller as part of the preparation of the Homer Tunnel Conservation Plan. This site visit included the tunnel and its surrounds; locations inspected on foot at this time included:

- The eastern portal site, including the approach along the road, the talus embankments to the south and west of the portal, and the southern half of the fill terrace.
- The tunnel interior.
- The western portal site, including the approach along road and the surrounding area immediately around the western tunnel entrance.
- Other sites associated with the tunnel and its construction, including: the workshop site, to the north of the eastern portal; the Homer Camp, close to the current Alpine Traffic Operation Centre (ATOC) concession area; and the Marian camp at the Hollyford turnoff.

An additional site visit was made in April 2022 by Jaime Grant of Origin consultants for archaeological monitoring during the now completed Phase 1 work.

Constraints and Limitations

The key constraints and limitations on this assessment are considered to be as follows:

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[3] Note: The phasing nomenclature was changed for these works. At the time these reports were completed Phase 1 referred to the new equipment building etc. (now Phase 2) and Phase 2 was the new avalanche shelter etc. (now Phase 3).
[4] Robin Miller, Benjamin Teele, and Jeremy Moyle, *Homer Tunnel, Milford Sound to Te Anau Road, Fiordland National Park: Conservation Plan (Draft)* (Unpublished report for Waka Kotahi, 2020).
[5] Travis and Miller, *Homer Tunnel Eastern Shelter Alterations: Heritage Impact Assessment and Advice*.
[6] Travis and Miller, *Homer Tunnel Resilience Improvements, Phase 1: Heritage Comments*.
[7] Travis and Miller, *Homer Tunnel Resilience Improvements, Phase 2: Heritage Comments*.
[8] Department of Conservation, *Fiordland National Park Management Plan* (Invercargill: Department of Conservation, 2007); Ken Bradley and Jo MacPherson, *Homer Tunnel Portal and Ruins Conservation Plan* (Unpublished report for Department of Conservation, 1993); John Lamond, *Homer Tunnel Shelter Extension, Milford Road: Preliminary and Detailed Site Investigation* (Unpublished report for Waka Kotahi, 2022); Waka Kotahi, *Concession Applications: Soil & Vegetation Disturbance for Trenching and Investigations, Cables and Reinforcement for Replacement Equipment Building, East Homer Tunnel, SH94 and Fiordland National Park* (Unpublished report for Department of Conservation, 2021); Warrick Hamilton, *Homer Tunnel East Portal Shelter Extension: Geotechnical Factual Report* (Unpublished report for Waka Kotahi, 2021); Warrick Hamilton, *Homer Tunnel Avalanche Shelter: Geotechnical Interpretive Report* (Unpublished report for Waka Kotahi, 2022); T. Berryman and J. Jennings, *Homer Tunnel - SH94 RP 240 / 0.00 - Resilience Improvements - Phase 1* (Unpublished drawings for Waka Kotahi, 2021); J. MacDonald and P. Routledge, *Homer Tunnel - SH94 RP 240 / 0.00 - Resilience Improvements - Phase 1* (Unpublished drawings for Waka Kotahi, 2022).

- No site visit was undertaken specifically for this assessment. It has relied on information provided from previous site visits that were undertaken to inform separate documents.
- It relies heavily on the adaptation of previous commentary on the heritage features around the eastern portal area.

Background

Site History

The Māori history of Fiordland extends back to the earliest settlers of Te Wai Pounamu, the Waitaha. Legend describes the physical formation and shaping of the South Island centred around the sinking of Te Waka Aoraki. Aoraki and his brothers were thrown from the waka and turned into stone, becoming the highest peaks of the Southern Alps. The fiords of the region represent the raised sides of the wrecked waka, which were hacked away in an effort to make it habitable by humans.[9] According to legend Te Kōhaka-o-Te-Ruru (Homer Saddle) was formed by Ruru, who took over from Tu-te-Raikiwhananoa, and cut the South Island coastline with his huge axe. In his inexperience, he tackled the base first, and created a square rock face.[10]

Kākāpō and koko-takiwai attracted Ngāti Mamoe and Ngāi Tahu to Fiordland. Koko-takiwai was an easily shaped, softer pounamu and was sought after for making hei-tiki. In addition to kākāpō, the area also offered many other mahinga kai. As such, there were two principal trails to the Milford Sound. The inland route is now followed by the Milford Track, over Omanui (McKinnon Pass), down the Waitawai (Clinton River) to the head of Lake Te Anau. From there, pounamu and resources would be transported by raft to the head of the Waiau River. The other trail was from Martins Bay, up the Hollyford Valley, and over into the Routeburn Valley to a pounamu source at the head of Lake Wakatipu. The sea was also utilised to travel to Fiordland, and there were numerous tauranga waka along the coast.[11]

From early European settlement, the Fiordland continued to be a significant source of resources into twentieth century. Initially the area was used by whalers and sealers, and later was recognised for its tourism potential. By 1878, several attempts had been made to locate a track from Queenstown through to the Milford Sound, including by WH Homer and George Barber who scouted a route from Te Anau and over the Darren Ranges into the Cleddau Valley in 1888.[12] In 1890, the Government became interested in an overland connection to the Milford Sound and prison labourers were sent to begin constructing a road towards Lake Te Anau, via Homer Saddle. However, this programme only lasted until 1892.[13]

Following the failure of the Government's prisoner programme, little further action was taken to find a viable route until 1908. An expedition was launched by the Tourism Department to locate an overland track. The party left from the Milford side, and explored each branch of the Cleddau Valley. They suggested a tunnel of 4,000 yards on a descending grade to the Cleddau Valley and a road cut into a ledge zig-zagging down the face of Homer's Saddle.[14] The tunnel concept was presented to the Minister for Tourism (Hon T Mackenzie) in 1912.[15]

Following the outbreak of the First World War, any further consideration of the route was put on hold. In 1922, as part of a project to create jobs during the depression, the Government decided to extend the highway beyond the Te Anau hotel, up the Eglinton Valley. These works began in 1929/1930.[16] By 1933, New Zealand was still deeply in economic depression, and the Public Works Department doubled the number of men working on the road through Eglinton Valley. In late 1933, a Public Works Department survey party explored

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[9] Department of Conservation, "Fiordland National Park Management Plan," June 2007.
[10] Te Rūnanga o Ngā Tahu, "Kawarau and Te Wai-o-Koroiko," Retrieved 24 May 2019, from http://www.kahurumanu.co.nz/atlas.
[11] Department of Conservation, "Fiordland National Park Management Plan," June 2007.
[12] *Southland Times*, "From Milford to Wakatip," 12 February 1889.
[13] *Lyttelton Times*, "Westland," 18 December 1890.
[14] *Otago Witness*, "The Wakatipu Milford Connection: To the Editor," 15 January 1908.
[15] *Lake Wakatip Mail*, "A Big Undertaking," 16 April 1912.
[16] *Evening Post*, "By Motor to Milford," 10 April 1931; Jack Ede, *Mountain Men of Milford* (Christchurch: The Caxton Press, 1988).

the valley to find the most practical route for the proposed tunnel and to estimate the probable costs.[17] These investigations found that the best route would be through the Homer Saddle. By June 1934, the engineers selected where the tunnel would be pierced, providing the shortest route to cut through the range.[18]

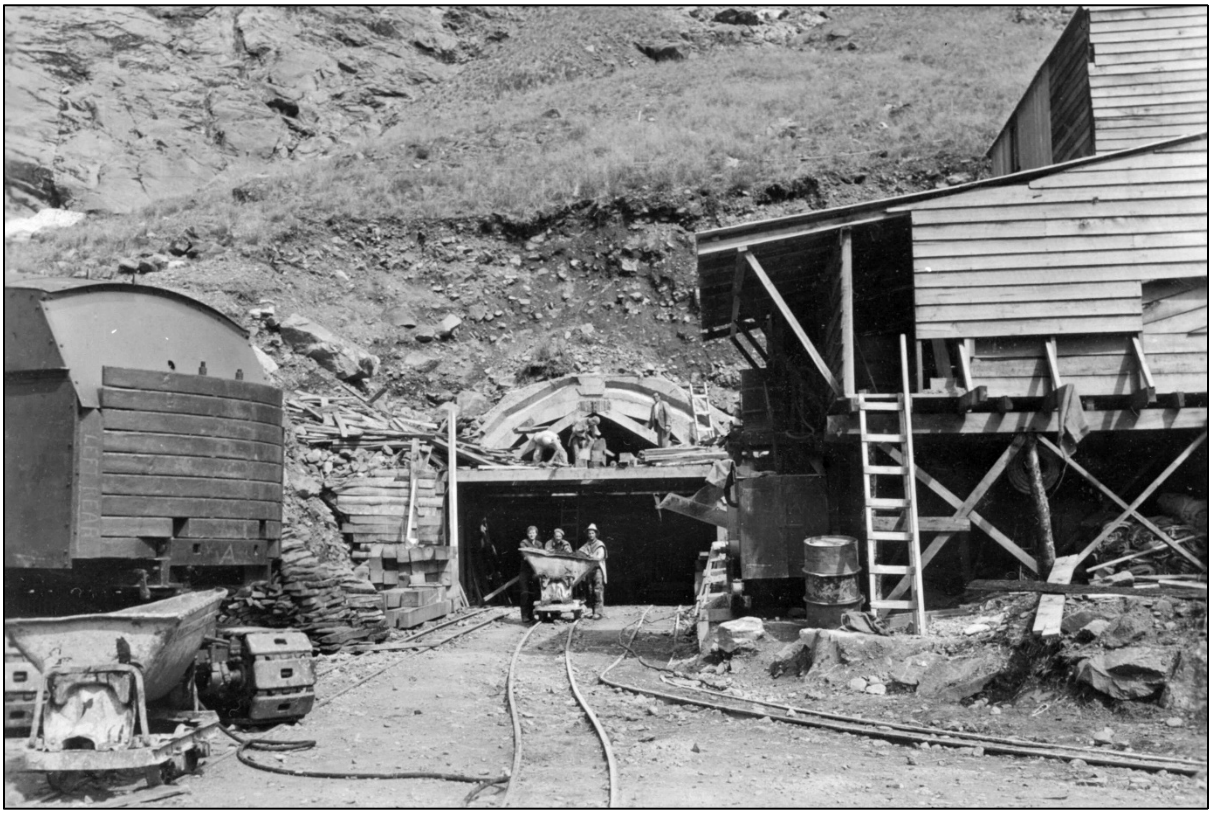

Figure 3. Constructing the eastern tunnel portal in 1936.[19]

Work began in July 1935 on the eastern side of the Homer Saddle. This initially involved cutting through loose scree on the saddle by hand. This loose rock was removed by September, and drilling began at the start of 1936.[20] By March, a fully equipped workshop was built, compressors were erected, a blacksmith's shop, explosives magazine, and appurtenant buildings including accommodation, water supply, and telephone lines were all constructed.[21] The eastern portal arch was completed in the same year.[22]

An avalanche struck the eastern entrance in July 1936, killing Percy Leigh Overton, injuring seven others, and destroying multiple buildings.[23] Construction continued to be slowed by heavy snowfall and avalanches through winter.[24] By May 1937, 470ft of the tunnel had been excavated. Another avalanche struck, killing two and injuring three.[25] Work was suspended until Downer & Company won the contract to take over and complete the works.[26]

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[17] AF Downer, Tunnelling in New Zealand (1861-1978). Transactions of the New Zealand Institution of Engineers Incorporated: Civil Engineering Section. Vol 7, Issue 1 (March 1980).
[18] *New Zealand Herald*, "Forming Tourist Road," 2 June 1934.
[19] Alexander Turnbull Library.
[20] *New Zealand Herald*, "Milford Road Tunnel," 3 August 1935 and 14 September 1935; *Stratford Evening Post*, "Big Traffic Tunnel," 15 January 1936.
[21] Public Works Statement (By Hon R Semple, Minister of Public Works), *Appendix to the Journals of the House of Representatives*, 1936 Session I, D-01.
[22] *Otago Daily Times*, "The Homer Tunnel," 7 April 1938.
[23] *Stratford Evening Post*, "Avalanche Brings Death Crashing Down Mountain," 7 July 1936; "Frantic Dash," 8 July 1936.
[24] *Evening Post*, "Eglinton Valley," 2 January 1937.
[25] *New Zealand Herlad*, "Snow Tragedy," 5 May 1937.
[26] *Otago Daily Times*, "Mr Semple and the Homer Tunnel," 26 November 1937.

By April 1938, around 180ft of avalanche protection had been constructed on the eastern approach.[27] The full 480ft was completed on the eastern side in May 1940.[28] A concrete drill shed was erected north of the eastern portal by March 1939.[29] The heading tunnel was cut through to the western side of Homer's Saddle in early February 1940 and enlarged by ring boring.[30] Progress towards the completion of the tunnel was then impacted by the outbreak of the Second World War with works completely ceasing in April 1942.[31]

In September 1945, 300ft (115m) of the original eastern portal avalanche protection was destroyed by an avalanche (Figure 4).[32] A substantial amount of the debris has subsequently formed part of road alignments and widening. This debris remains within the legal road corridor and other parts have been incorporated into the road surface itself. A small section of the avalanche protection was placed above ground, immediately adjacent to the eastern tunnel entrance.

Works recommenced in January 1951, but stopped over winter due to the risk of avalanche.[33] The tunnel was completed at the end of 1953, and opened to the public in the summer of 1954.[34]

More recently there have been some additional modifications to the avalanche shelter and the shelter debris remaining from the 1945 avalanche. Historic photographs suggest that the debris remained generally untouched between at least 1967 and 1983 (Figure 6-Figure 7). In 1997, a further 10m (approx.) of avalanche protection was destroyed during an avalanche. By 2003 a large area of shelter debris had been cleared and/or buried to provide additional access to the enlarged carpark to the north of the eastern portal (Figure 8). Recent geotechnical testing has shown that the carpark was enlarged using a sandy gravel fill to supplement the fill terrace created by the tunnel construction spoil and refuse.

Figure 4. View of collapsed eastern portal avalanche protection, 14 January 1946.[35]

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[27] *Otago Daily Times*, "The Homer Tunnel," 7 April 1938.
[28] *Otago Daily Times*, "News of the Day," 16 April 1941; Public Works Statement (By Hon HT Armstrong, Minister of Public Works), *Appendix to the Journals of the House of Representatives*, 1941 Session I, D-01.
[29] Archives New Zealand.
[30] *Press*, "Work on Homer Tunnel," 27 September 1940.
[31] *Otago Daily Times*, "Slowing Down," 11 April 1940; "Homer Tunnel," 22 September 1945.
[32] DU White, *The Homer Tunnel*, 10 May 1947.
[33] *Otago Daily Times*, "The Homer Tunnel," 16 October 1950; "Completion Decided," 4 September 1950.
[34] Ede, *Mountain Men of Milfold*.
[35] Archives New Zealand.

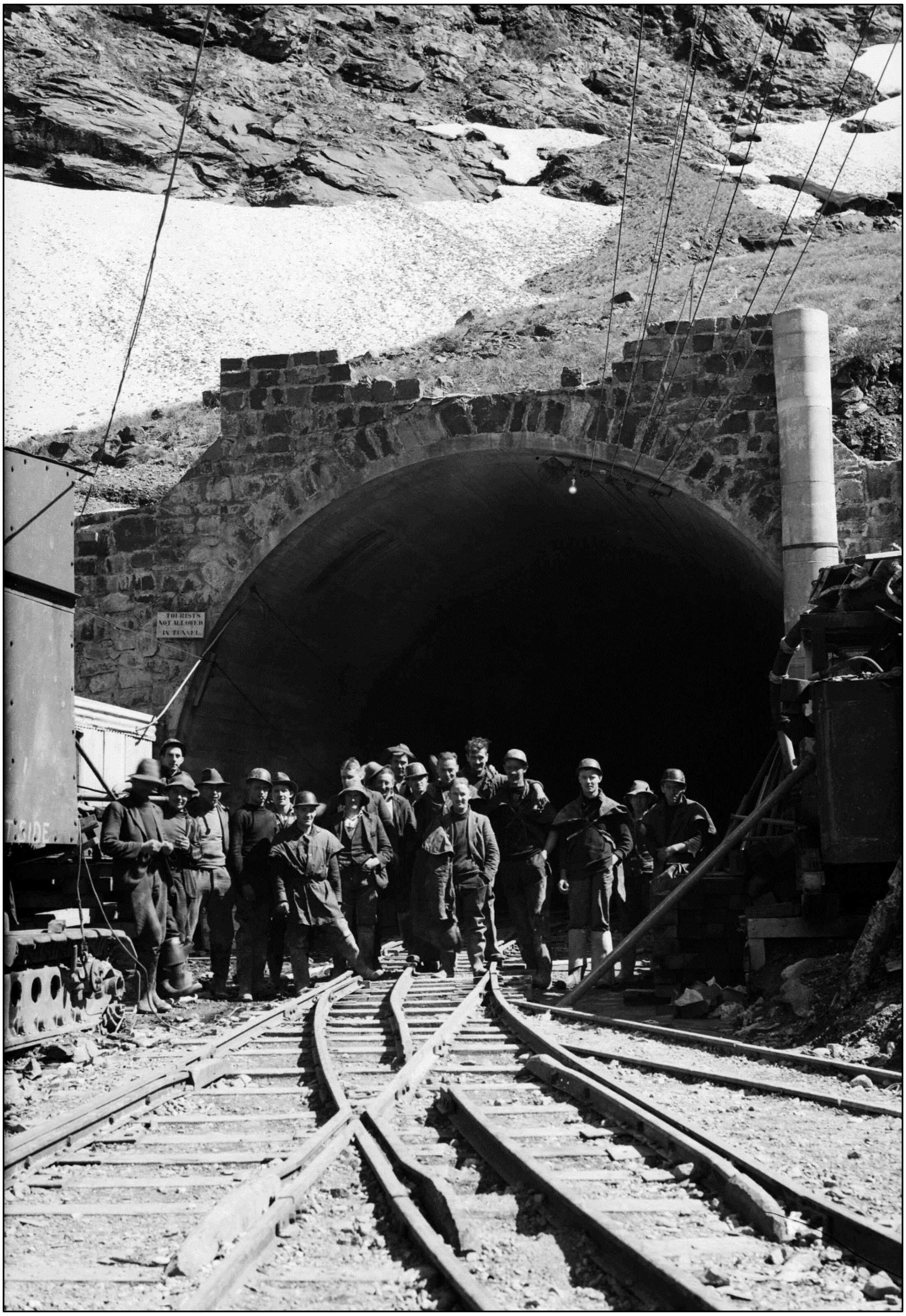

Figure 5. Completion of the eastern tunnel portal in 1936 (some stonemasonry work was still outstanding to the stone façade parapet).[36]

[36] Alexander Turnbull Library.

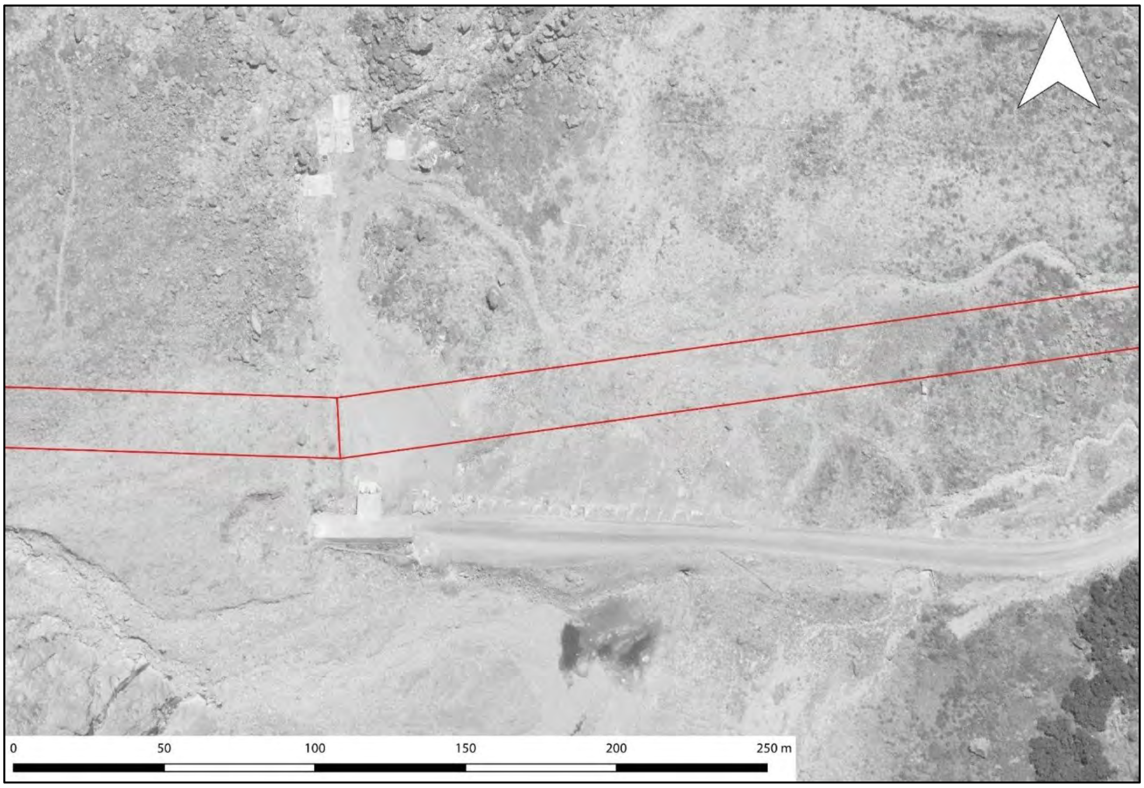

Figure 6. 1967.[37]

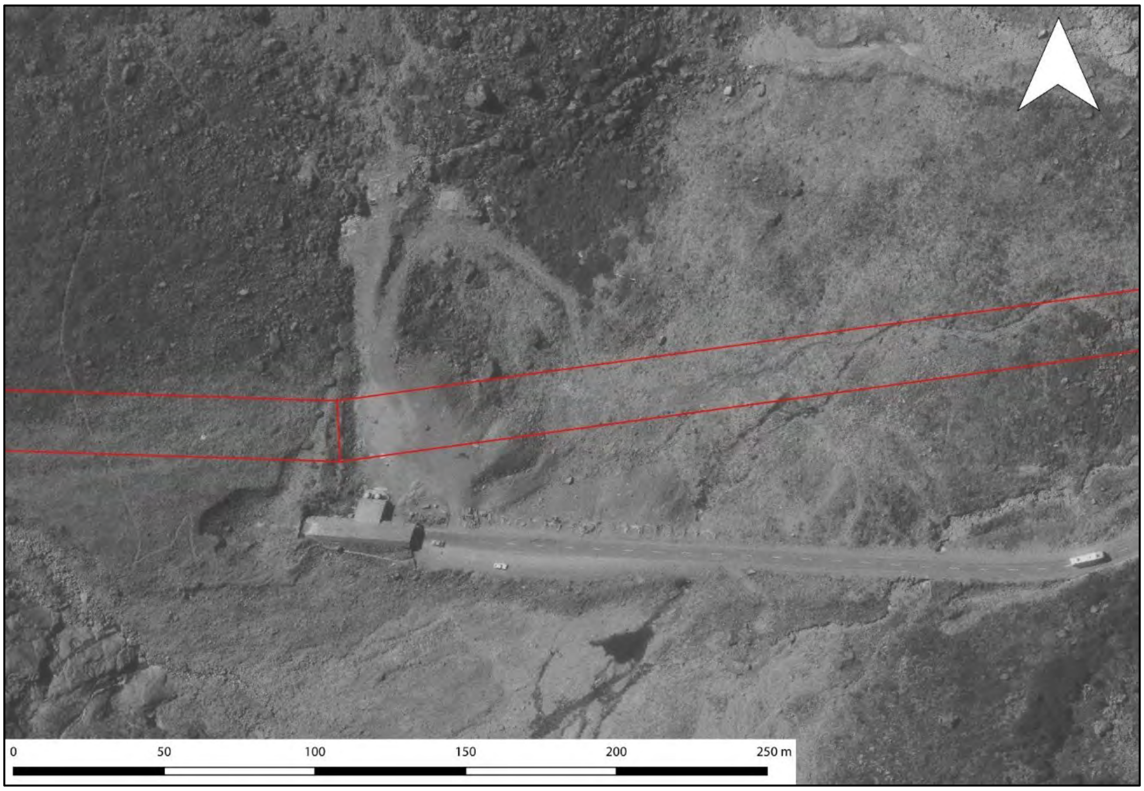

Figure 7. 1983.[38]

[37] Retrolens.
[38] Retrolens.

Figure 8. 2003.[39]

Current Eastern Portal Site

There are a variety of notable features that are currently present around the eastern portal of the Homer Tunnel (Figure 9). These include:

A. Remaining extent of the reinforced concrete avalanche shelter (Figure 10).
B. Plant room attached to the avalanche shelter close to the tunnel entrance (Figure 10). Commemorative plaques are attached to the east elevation of this building.
C. Stone façade of tunnel portal (Figure 12).
D. A pile of avalanche shelter debris close to the tunnel entrance (Figure 10).
E. Fill terrace and roadside embankment incorporating some avalanche shelter debris and refuse from tunnel construction (Figure 14-Figure 15).
F. Talus/fill embankments possibly containing refuse from tunnel construction.
G. Construction workshop site area.

Aside from the avalanche shelter debris and the extant tunnel structures, a site walk over in 2019 by Ben Teele did not identify any visible archaeological material within the immediate area of the eastern portal. There are visible concrete foundations and concentrated deposits of construction refuse around the construction workshop site area (G).

Recent geotechnical and environmental investigations into the fill terrace by WSP provide some insight into the type of material that makes up this feature. Several test pits were excavated across the fill terrace to depths of 1.6m to 3m.[40] These revealed that most of the terrace was primarily composed of angular gravels and cobbles, presumably spoil from the tunnel excavation. Occasional refuse deposits of material like unidentified

[39] Retrolens.
[40] Lamond, *Homer Tunnel Shelter Extension, Milford Road: Preliminary and Detailed Site Investigation*; Hamilton, *Homer Tunnel East Portal Shelter Extension: Geotechnical Factual Report*.

timber and metal fragments are present in this fill. Some concentrated deposits of reinforced concrete are also present, and this is interpreted to be redeposited avalanche shelter debris. No other deposits of concentrated cultural material were identified in the test pit reports. The north-east margin of the terrace is mainly comprised of recent silty sand and gravel fill. (c.f. Figure 7 and Figure 8). These results, along with the history of land modification near the eastern portal, suggests that most avalanche shelter debris and refuse material will be extremely disturbed.

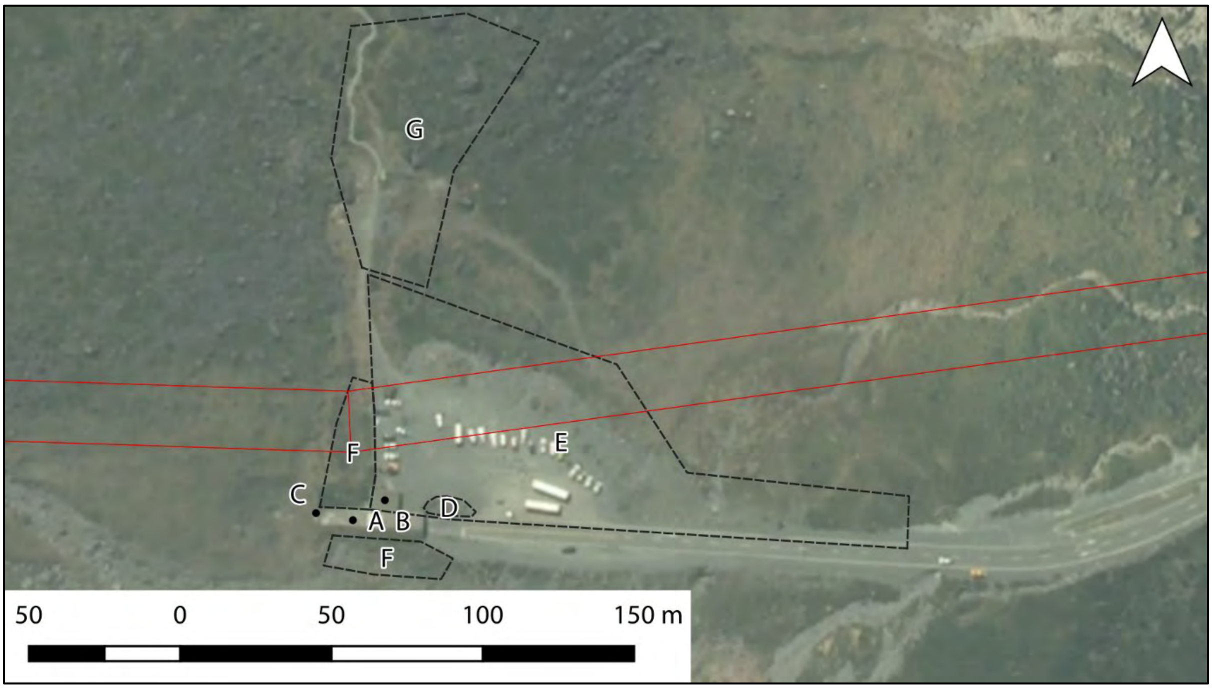

Figure 9. Eastern portal site features and approximate extents.

Figure 10. Remaining avalanche shelter and adjacent debris pile.

Figure 11. Avalanche debris pile, with the plant room visible behind.[41]

Figure 12. Section of the eastern portal stone façade.[42]

[41] ArchSite.
[42] WSP.

Figure 13. Area to the south of the avalanche shelter.

Figure 14. View towards the tunnel, showing some of the avalanche debris along the roadside.[43]

[43] ArchSite.

Figure 15. View east along the road, across part of the fill terrace.[44]

Figure 16. Foundation pads at the workshop site, looking back towards the tunnel portal. The avalanche shelter and plant room are visible at the top left corner.[45]

[44] WSP.
[45] ArchSite.

Figure 17. Refuse pile making up part of the construction workshop site.[46]

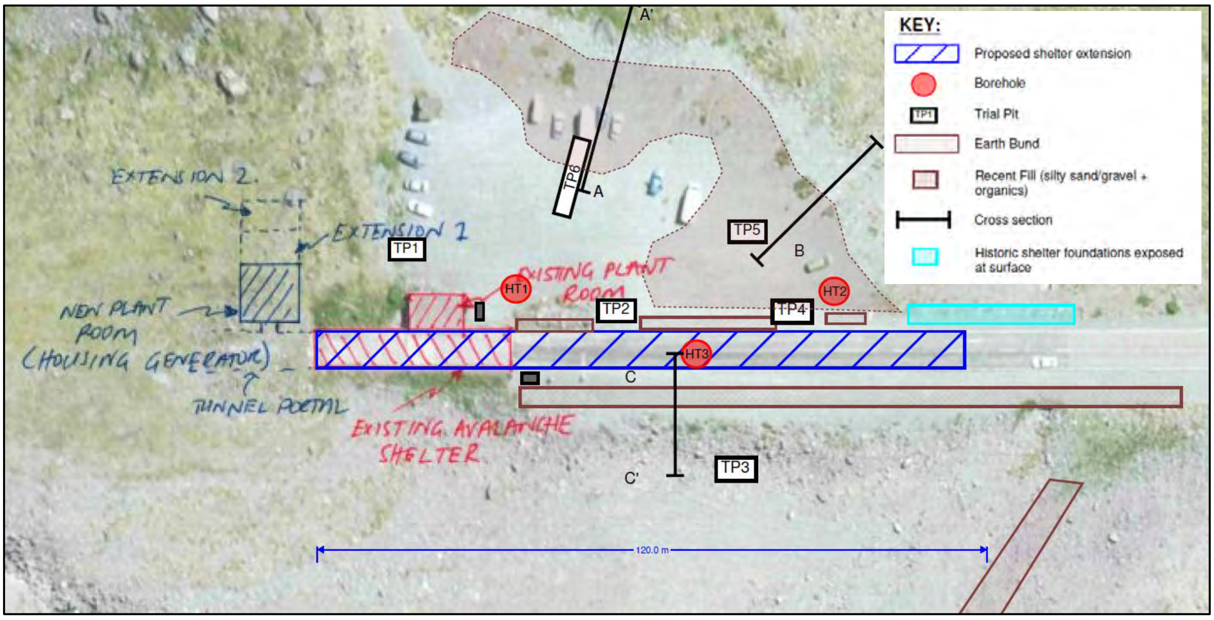

Figure 18. Geotechnical test pit locations.[47]

[46] ArchSite.
[47] Hamilton, *Homer Tunnel East Portal Shelter Extension: Geotechnical Factual Report*.

Regulatory Framework and Previous Heritage Recognition

There are several pieces of legislation as well as management and recognition documentation that influence DOC's interest in the heritage fabric associated with the Homer Tunnel. The additional regulatory framework relevant to Homer Tunnel heritage is outlined in previous heritage impact assessments and the Homer Tunnel Conservation Plan recently prepared by Origin Consultants.

Conservation Act 1987

The Conservation Act 1987 established DOC. The purpose of the act is to promote the conservation of New Zealand's natural and historic resources. Section 6(a) states that one function of the department is to manage historic resources. Section 6(e) notes that the use of historic resources for tourism is not inconsistent with their conservation.

An additional role of DOC is to administer the National Parks Act 1980.

National Parks Act 1980 and Fiordland National Park Management Plan 2007

The National Parks Act 1980 determines the structure for the control and management of national parks in New Zealand and determines the broad principles by which the parks are to be managed. The Department of Conservation is directed to administer and manage all national parks. As part of this responsibility, the Act requires that a Park Management Plan is prepared for each park.

Fiordland National Park Management Plan 2007 has been prepared – in accordance with the National Parks Act – to express DOC's overall management intentions for Fiordland National Park. The Plan provides for the management of historic resources within the Fiordland National Park. Specifically, the Plan identifies 35 historic places within the Park that have been selected for active management by DOC. This includes the *Homer Tunnel Portal Avalanche Damage* on the Milford Road. DOC has assessed the site as being of local importance.[48]

Homer Tunnel Portal and Ruins Conservation Plan 1993

A brief conservation plan for this site was prepared by DOC in 1993.[49] This is a separate document to Homer Tunnel Conservation Plan that has been prepared more recently by Origin Consultants.[50]

The historically significant fabric at the site was identified as consisting of:

- The avalanche shelter debris left following the destruction of most of the structure in 1945; this consists of "the smaller pile near the tunnel portal and the larger collection some 100m back along the road."
- "The extant piece of portal [avalanche shelter], a reinforced concrete structure, [extending] from the edge of the rock face out for some 50 meters."

This fabric was identified as having the following significance:

- **Social/historic significance** – The Homer Tunnel Portal Ruins are a very obvious reminder of the inexorable power of nature and, as a result, the huge challenge that was involved in the building of the Milford Road. Much of the work on the tunnel, and the road, was done by unemployed men whose labour was often used instead of machinery and who lived in considerable danger from avalanches during winter months. The ruins, the tunnel and the road itself are a memorial to the effort of those men.

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[48] Department of Conservation, *Fiordland National Park Management Plan*.
[49] Bradley and MacPherson, *Homer Tunnel Portal and Ruins Conservation Plan*.
[50] Miller, Teele, and Moyle, *Homer Tunnel, Milford Sound to Te Anau Road, Fiordland National Park: Conservation Plan (Draft)*.

- **Physical Significance** – The Homer Tunnel is the only road tunnel through the main divide and the only tunnel in an avalanche prone area. This presented a unique problem for New Zealand, and to secure the safety of the men working on the tunnel an extension of the portal was constructed. Although these are very common overseas it is almost certainly the only one ever built in New Zealand. The design of the structure was not unique either but it was very strong - certainly it was very well reinforced - and the best option available at the time. A still extant section of the portal remains at the entrance to the tunnel.
- **Aesthetic Significance** - The Homer Tunnel is one of the highlights on the Milford Road. From Te Anau the road enters a tunnel cut in the side of a dramatic mountain landscape. For the visitor the portal debris is a vivid if perhaps not pretty reminder of the awesome power of avalanches.

The conservation plan proposes no intervention to the ruins or the remaining section of the avalanche shelter and suggests that the shelter is conserved in its present state.

It is notable that the conservation plan covers the extant avalanche shelter and its ruins, while the Fiordland National Park Management Plan only cites the *Homer Tunnel Portal Avalanche Damage* as the actively managed historic place.

ArchSite

Reference to the New Zealand Archaeological Association's (NZAA) site recording scheme, ArchSite, indicates that two sites have been recorded at the eastern portal of the Homer Tunnel (Figure 19 and Table 1). D40/11 was recorded by DOC in 1993 in conjunction with the preparation of the Homer Tunnel Portal and Ruins Conservation Plan. D40/20 was recorded in 2021 by Matt Schmidt of DOC.

Both sites are post-1900 and are not protected by the archaeological provisions of the HNZPT Act 2014.

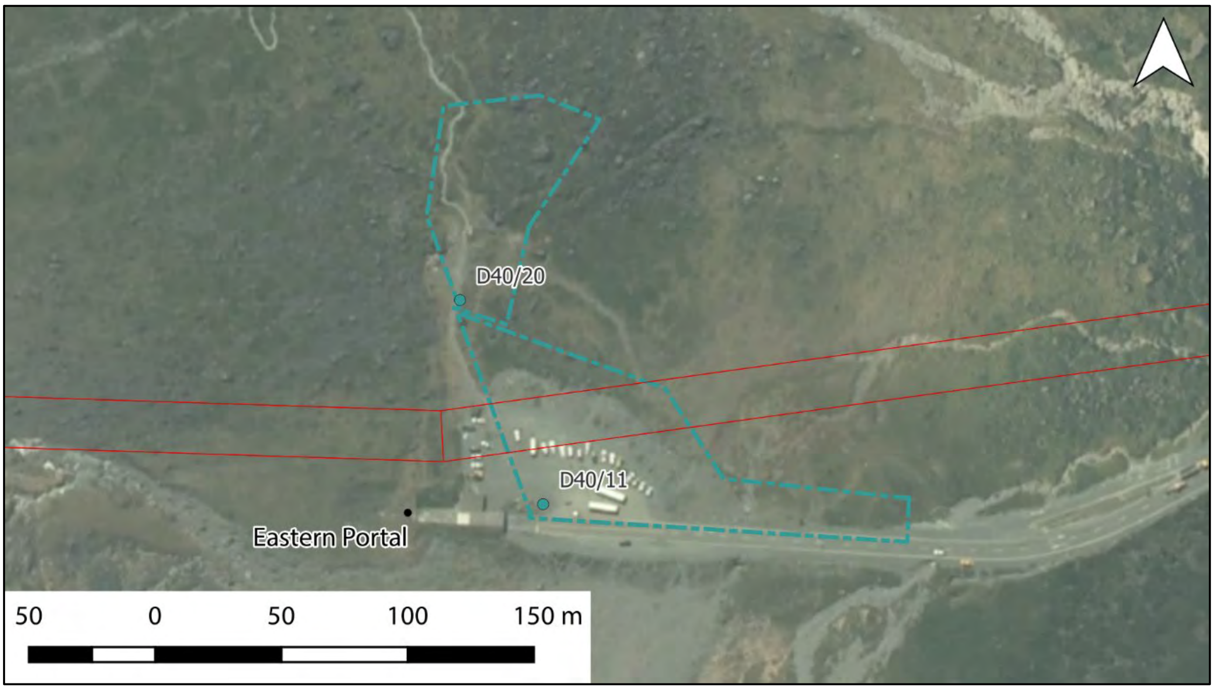

Figure 19. Locations of recorded sites and site extents.[51]

[51] ArchSite.

Table 1. Table of recorded sites.

Site Number	Site Name	Site Type	Details
D40/11	Homer Tunnel Portal and Portal Avalanche Debris	Transport/ communication	Remnant concrete portal structure (avalanche shelter) and associated remains left following its partial destruction by avalanches in 1945 and 1997.
D40/20	Homer Tunnel Workshops	Industrial	Remains of workshop sites, bricks and artefacts, refuse pile from tunnel construction.

Land Transport Management Act 2003

The Land Transport Management Act 2003 requires Waka Kotahi to "exhibit a sense of social and environmental responsibility" (section 96).

Resource Management Act 1991

The protection of historic heritage from inappropriate subdivision, use, and development is identified as a matter of national importance in section 6(f). Historic heritage is defined as those natural and physical resources that contribute to an understanding and appreciation of New Zealand's history and cultures, derived from archaeological, architectural, cultural, historic, scientific, or technological qualities.

'Historic Heritage' includes:

- Historic sites, structures, places, and areas.
- Archaeological sites.
- Sites of significance to Māori, including Wāhi Tapu, Wāhi Tapu Areas, and Wāhi Tūpuna.
- Surroundings associated with the natural and physical resources.

These categories are not mutually exclusive, and some archaeological sites may include above ground structures or may also be places that are of significance to Māori.

Heritage New Zealand Pouhere Taonga Act 2014

Heritage New Zealand Pouhere Taonga (HNZPT) administers the HNZPTA 2014. The HNZPTA 2014 contains a consent process for any work affecting archaeological sites (archaeological authority). An archaeological site is defined as:

a) any place in New Zealand, including any building or structure (or part of a building or structure), that—
    i) was associated with human activity that occurred before 1900 or is the site of the wreck of any vessel where the wreck occurred before 1900; and
    ii) provides or may provide, through investigation by archaeological methods, evidence relating to the history of New Zealand; and
b) includes a site for which a declaration is made under section 43(1).

The site does not meet the definition of an archaeological site under the HNZPTA 2014 as all works associated with the construction of the Milford Road and the Homer Tunnel started in 1929, and there is no evidence of human presence at the site prior to 1900.

District and Regional Plans

The Resource Management Act 1991 (RMA 1991) requires city, district, and regional councils to manage the use, development, and protection of natural and physical resources in a way that provides for the wellbeing of today's communities while safeguarding the options of future generations. The Southland District Council

District Plan recognises that the district has a wealth of historic heritage, encompassing archaeological, architectural, cultural, historic, scientific, and technological qualities. Items of historic heritage value within the district are listed in a schedule to the District Plan. The Homer Tunnel is not included in this list.

The Otago Regional Council and Environment Southland have produced the Otago Southland Regional Land Transport Plans 2021-2031. This plan is the primary document guiding integrated land transport planning and investment within the Otago and Southland regions and identifies that Waka Kotahi has approved funding for works to be carried out on the Homer Tunnel.

Homer Tunnel Conservation Plan

The Homer Tunnel Conservation Plan prepared by Origin Consultants anticipated future alterations to the portals and avalanche protection shelters.[52] The following policies are considered relevant to the development of the eastern portal entrance and approach:

D.4.7 Crushed portion of avalanche protection

<u>Policy</u>: The remaining above ground portion of the crushed section of avalanche protection at the eastern portal entrance should be relocated out of the road corridor and have an information board provided to explain its significance.

D.4.8 Reuse of 'Drill Shed'

<u>Policy</u>: Consideration should be given to adaptive re-use of the original 'Drill Shed' building on the eastern portal when its use as a service centre is discontinued.

D.4.9 Removal of redundant services and signage

<u>Policy</u>: Any services which are assessed as obsolete or modern signage which is superseded should be removed. New service provisions should be discrete within the tunnel.

D.4.14 Modifications to the tunnel

<u>Policy</u>: Alteration and modification of those items with high and medium significance shall not be permitted, without substantial justification by way of a heritage impact assessment and appropriate mitigation measures.

D.4.15 Modifications to the setting of the tunnel

<u>Policy</u>: The tunnel, portals, and their wider environment/setting should be protected from alterations and development that are unsympathetic to the heritage values of the site. This includes negative impacts on the prominent view shafts of the tunnel from both directions.

D.4.18 Demolition of portals

<u>Policy</u>: If the structural condition of the avalanche portals is such that it is the only option to demolish them and replace them with new structures, guidance should be taken from ICOMOS New Zealand Charter 2010… from a heritage conservation point of view under the guidance of Clause 17 of the ICOMOS charter (see D1.1 above), the most preferred 'degree of intervention' scenarios are either 'reconstruction' or 'adaptation.'

[52] Miller, Teele, and Moyle, *Homer Tunnel, Milford Sound to Te Anau Road, Fiordland National Park: Conservation Plan (Draft)*.

Assessment of Heritage Values

While there are many aspects to the concept of 'heritage significance,' the following significance assessment has been based on the criteria outlined in NZTA, "Historic heritage impact assessment guide for state highway projects," (March 2015) which adopts the best practice guidance issued by HNZPT.[53] This assessment considered the Homer Tunnel site as a whole that includes a variety of features (e.g., the tunnel cut, the tunnel portal façade, and the existing avalanche shelter).

In general, Origin Consultants regard the Homer Tunnel site to have:

- **High technology, engineering, and scientific value** – The significance of the Homer Tunnel lies in the organisational challenge of surveying the remote valleys, blocked by a mountain range, and then bringing in men and supplies to build a road and tunnel across the valleys and through the mountain. The subsequent challenge of cutting through solid rock in an inhospitable climate was duly met by engineers. When completed, the tunnel was the longest road tunnel in New Zealand, and one of the highest in the world. The construction of a reinforced concrete avalanche protection for the portal is likely the only example of such a feature being built in New Zealand.[54] While a large portion of the protection did not survive beyond 1945, it was still a notable form of construction to protect the tunnel entrances. The destruction of a substantial portion is reflective of the immense power of the avalanches that struck, rather than a failure in technological or constructional expertise.
- **High contextual and group value** – The Homer Tunnel forms the core of a cluster of sites associated with the construction of the Milford Road. These additional sites include the workers' camps, hydroelectric generation along the river, and the road itself. As a small structure, the Tunnel has a dramatic setting, dwarfed by the Homer Saddle and surrounding valleys and ranges. This setting contributes to its high contextual value.
- **High historic value** – The Tunnel was constructed during a time of severe economic depression and was undertaken in recognition of the growing importance of tourism to New Zealand. It was a project of large magnitude, which was subsequently eclipsed by the impressiveness of the surrounding landscape. It was a significant feat for a young country with a small population and revealed that the pioneering phase of the country was shifting towards one of settlement and leisure. The construction of the Tunnel was also associated with many notable surveyors, engineers, politicians, and site workers.
- **Moderate architectural value** – The architectural values of the Tunnel are limited, as the tunnel itself is rudimentary in form. Being cut through hard rock, linings and architectural designs were limited. The few architectural elements that can be found relate to the stone façade to the eastern portal and, while not originally intended to be an architectural feature, the semi-octagonal form of the avalanche protection.
- **Moderate rarity and representative value** – When constructed, the Tunnel was the longest and highest tunnel in New Zealand at that time. It was built with the full-face and drift method, whereas other roading tunnels were cut through softer rock and used the heading and bench method. In comparison to other roading tunnels constructed at a similar time, the Homer Tunnel was built purely for tourism purposes, rather than to link infrastructure.
- **Moderate integrity value** – The Tunnel has had little modification, with minor additions and services and altering the road surface. It retains significant features from its time of construction, including the eastern portal stone façade.
- **Moderate vulnerability value** – Large portions of the original avalanche protection at the eastern portal have been destroyed, indicating its vulnerability in its alpine environment. It is recognised that

[53] Accessed at: https://www.nzta.govt.nz/assets/resources/guide-to-assessing-cultural-heritage-effects/docs/historic-heritage-impact-assessment-guide-2015.pdf

[54] Alongside the portal at the western end of the tunnel, though this was built to a different design.

improvements are necessary to improve the safety of the Tunnel and its avalanche/rock fall protection.

- **Moderate cultural value** – The Tunnel was held in high public esteem, catching the imagination of the wider nation during a time New Zealand developed its own, unique identity, separate from that of the British Empire. The Milford Sound was heralded as one of the most scenic places on earth for the tourist. For a government department to undertake a large roading and tunnel project (costing more than $60 million in today's currency) with relatively little discord indicates how the scenic value of this part of the country was appreciated by New Zealanders.

Within this general assessment of heritage value, specific features relevant to the proposed works are assessed as having the following significance:

- **High significance** – Surviving remnant of reinforced concrete avalanche shelter, eastern portal plant room, commemorative brass plaques (eastern elevation of the plant room), stone portal façade, and homer tunnel workshops archaeological site (D40/20). These features are all major elements of the homer tunnel site and contribute directly to its technology/engineering/scientific, architectural, and integrity heritage values.
- **Moderate significance** – Visible avalanche shelter debris. This feature is important to the site's vulnerability heritage value.
- **Low significance** – Refuse and fill associated with tunnel construction scattered around the eastern portal. As an element of the tunnel's setting, this material is only peripheral to the core site features (tunnel, stone portal façade, etc.). However, it still contributes to the site's contextual/group value as well as its technology/engineering/scientific value.

Proposed Works and Assessment of Effects

The proposed works at the Homer Tunnel Eastern Portal have been programmed for three phases. A set of current designs are included in Appendix A.

Phase 1 – Preliminary Enabling Works

This work has already been completed under concession number 52442-OTH. It included:

- Cable trenching to allow the relocation of the generators from adjacent to the Homer Tunnel to the Alpine Traffic Operation Centre (ATOC) concession area. A new shed was also constructed at ATOC.

Cable Trenching

Trenching and cabling was required to allow the relocation of the generators from adjacent to the Homer Tunnel to the Green Shed operations and emergency management site in the Alpine Tunnel Operation Centre (ATOC) concession area located 500m east of the Tunnel portal along SH94 (Figure 22).

The required trenching and cabling are described in the Waka Kotahi Resource Consent and Concession Applications as follows:

> The length of trenching for replacement cable placement is 100m from SH94 through the modified carpark to the new equipment building and into the Tunnel. Trenching will be up to 1.2m deep and 1.8m wide. The trenching will reconnect the power source for the Tunnel (generators) that are to be relocated to the Green Shed operations and emergency management 500m east of the Tunnel along SH94.[55]

An archaeological record of the site's stratigraphy was made during this work. Jaime Grant from Origin Consultants visited in April 2022 and recorded the profile exposed in the trench crossing the roadway closest to the tunnel portal (Figure 22).

Figure 20. Trenching across the road during the Phase 1 work, looking east.

The first layer is the current road surface (20-30mm), followed by the mix of gravel and loose stones for about 47-500mm, no archaeological material was discovered in this layer. The third layer is the older road surface about 2cm thick then followed by about 50mm of gravel and loose stones, this layer contained a few elongated metal fragments that may have been the remains of either drill bits or reinforcing bars from the former avalanche shelter. The fourth layer and the base of the trench was made of concrete and is likely the remains of the previous structure. Approximately 100mm of concrete was exposed. The excavation also

[55] Waka Kotahi, *Concession Applications: Soil & Vegetation Disturbance for Trenching and Investigations, Cables and Reinforcement for Replacement Equipment Building, East Homer Tunnel, SH94 and Fiordland National Park*.

exposed an empty cavity within the concrete structure, presumably a product of a portion of the former avalanche shelter that was not fully crushed.

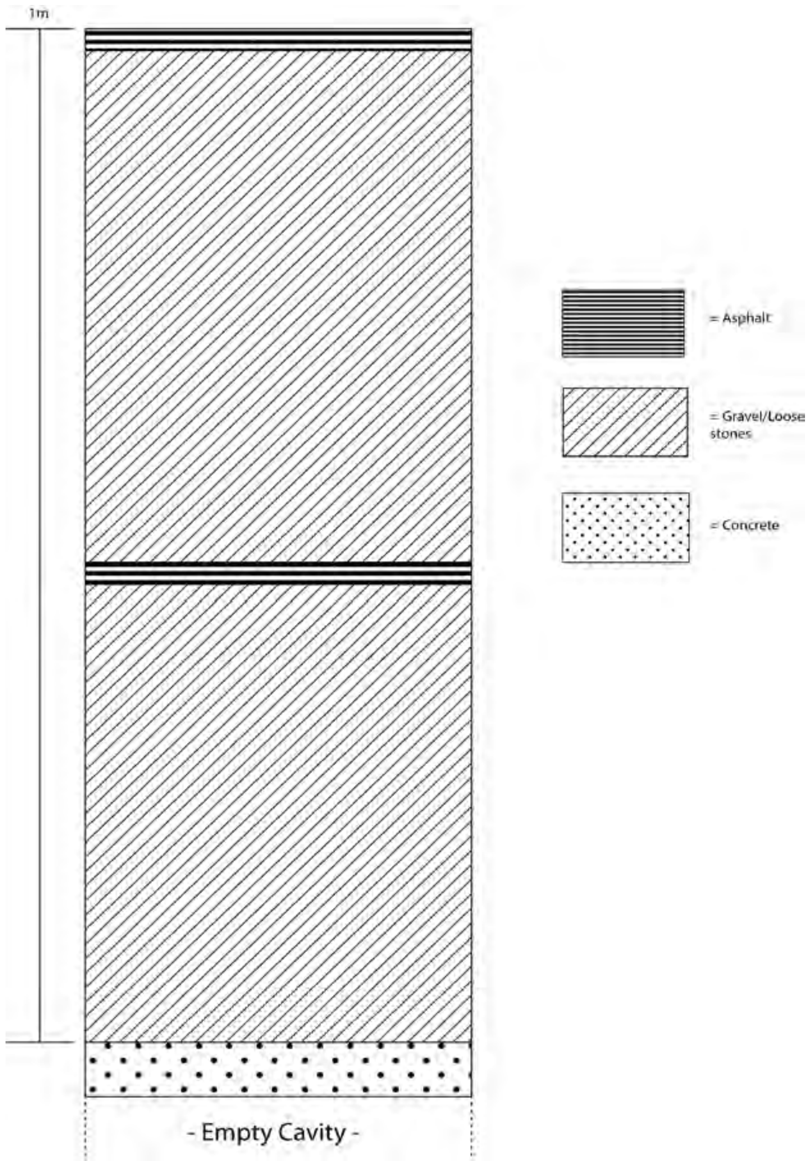

Figure 21. Idealised profile of the stratigraphy encountered during trenching across the road.

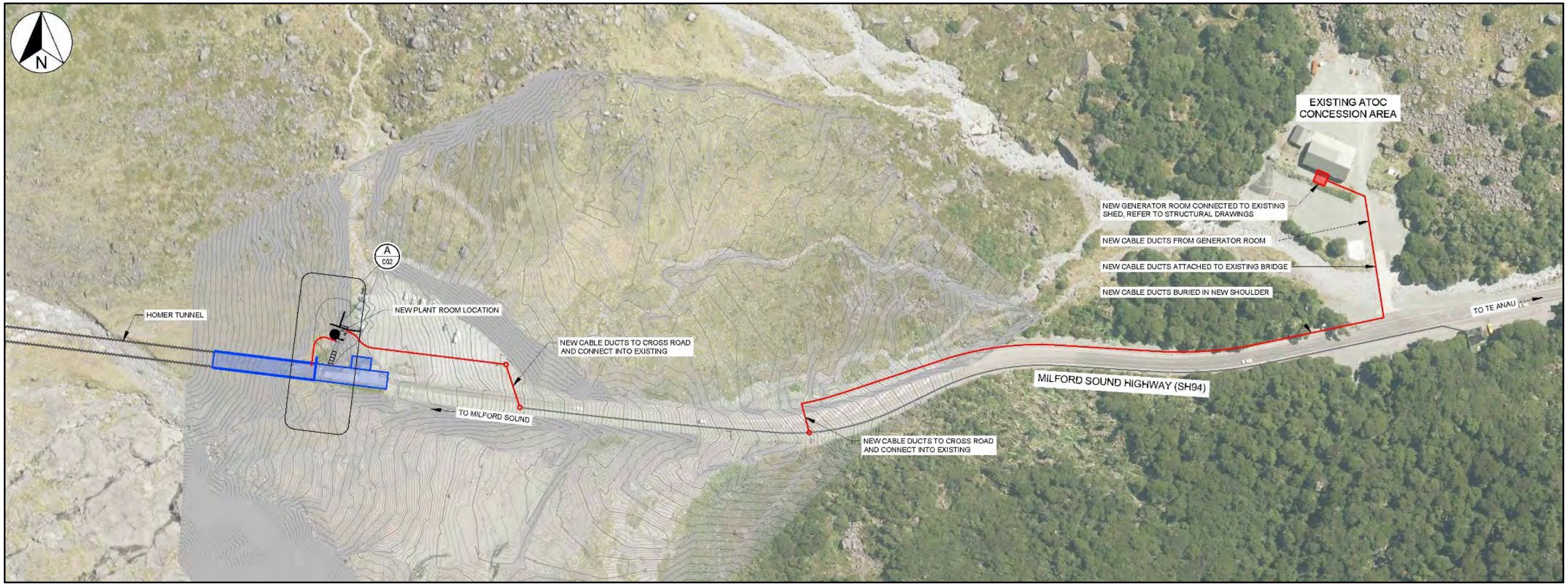

Figure 22. Route of cable trenching from the New Equipment Room to the Existing ATOC area (not to scale).[56]

[56] WSP.

Phase 2 – Additional Enabling Works

This work will include:

- New equipment building excavations and placement beneath rubble alongside the Homer Tunnel.
- Exploratory excavation.
- Rock pinning the stone façade of tunnel portal.

During the design process, Waka Kotahi have consulted with Origin Consultants about the suitability of the proposed work from a heritage perspective. From this, alternative options for the Phase 2 work have either been already incorporated into designs or were not considered necessary due to proposals having a less than minor effect

New Equipment Building

The new equipment building is described by Waka Kotahi as follows:

> A new equipment building is proposed on the north side of the Homer Tunnel eastern entry/exit and existing Plant Room attached to the Tunnel.
>
> The new building is proposed to be 9.15m long, by 3.7m wide, and up to 3.2m high. It will be constructed of connecting pre-cast concrete units.
>
> The new building will be connected to the Homer Tunnel by a pre-cast concrete corridor of 11.5m in length, 2.22m wide, and up to 3.2m high. A temporary further 5m long by 2m wide corridor is proposed to connect the existing and new equipment buildings to the Tunnel until such time as all necessary systems and services are shifted to the new equipment building.
>
> Three wing-wall protection structures will be placed at the north and west sides of the new building, to form retaining walls against the talus slope. The 14.5m-long north-facing wing-wall with a sloped outer (east) edge up to 4.5m in height will extend up to 5m west past the equipment building and will be up to 7.5m in length across the face of the new equipment building and up to 3.5m in height. The wing walls will be pre-cast exposed coloured concrete panels, made to appear similar to the surrounding material and slope colours.
>
> The new equipment building and connected corridors will be largely covered back over with removed, stored and replaced talus material, with retained vegetated talus used to re-naturalise the slope and provide additional avalanche and rock fall protection for the new structures.[57]

As noted in the final paragraph, the new equipment building will be excavated into the talus/fill embankment to the north of the existing avalanche shelter (F in Figure 9), and the excavated material redeposited over much of the building following construction. The design of the proposed structure is outlined in Figure 23 to Figure 27.

The eastern portal entrance is dwarfed by the Homer Saddle, and this view from the approach acts as a reminder of the technological and engineering feat of carving this Tunnel through isolated and rugged terrain. The viewshaft from the east of the tunnel is also aesthetically important and adds to the setting of the Tunnel.

The setting of the Tunnel is maintained by the proposed design of the new equipment shed, built into the slope to the north of the tunnel entrance. The external entrances to the new equipment building are secluded and are not highly visible from the eastern approach. The design of the wing walls incorporates recessive colours, which are in keeping with the natural elements of the surrounding landscape. The building, and connecting corridors, will be largely covered back over with removed, stored, and replaced talus material and vegetation. This design will assist in maintaining the small-scale appearance of the tunnel entrance.

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[57] Waka Kotahi, *Concession Applications: Soil & Vegetation Disturbance for Trenching and Investigations, Cables and Reinforcement for Replacement Equipment Building, East Homer Tunnel, SH94 and Fiordland National Park*.

During a transitional period, a temporary corridor will be constructed to connect the existing and new equipment buildings. This corridor is located to the rear of the existing equipment building, so will also be secluded from view when approaching the Tunnel. Any adverse effects associated with this corridor will be temporary.

Excavation during building construction may disturb archaeological material related to the 20th century tunnel construction. Previous test pitting in the area has suggested that any archaeological material is most likely to be unidentified timber, metal, and concrete refuse fragments randomly mixed into tunnel spoil. This material is not expected to add much to the archaeological understanding of the site. As such, the disturbance of this material will have little effect on the heritage values of the site, especially if it is redeposited over the new building when construction has completed.

Figure 23. Site of the proposed New Equipment Building.

Assessment Summary

The proposed equipment building will have a less than minor adverse effect on the Homer Tunnel's heritage value.

Alternative Options

The original equipment building design was considered suitable from a heritage perspective and no alternative options were recommended.

Recommendations

- NZTA should engage an archaeologist to oversee the earthworks.
- Stand over archaeological monitoring is not recommended given the low heritage value of the archaeological material that may be affected.
- Prior to any works commencing, earthworks contractors should be briefed by the archaeologist about the possibility of encountering archaeological material, how to identify possible archaeological material during works, contractors' responsibilities with regard to notification of the discovery of archaeological evidence.
- During earthworks, contractors should provide the archaeologist with weekly updates on excavation progress, any possible archaeological material encountered, and representative photographs.
- If a significant archaeological discovery is made during earthworks (e.g., intact mining machinery, human remains, buried in-situ structures), then a standard Accidental Discovery Protocol should be followed (Waka Kotahi Minimum Standard P45, or equivalent, Appendix B).
- Following earthworks, site D40/11 should be updated to provide a record of the site works and any archaeological discoveries.

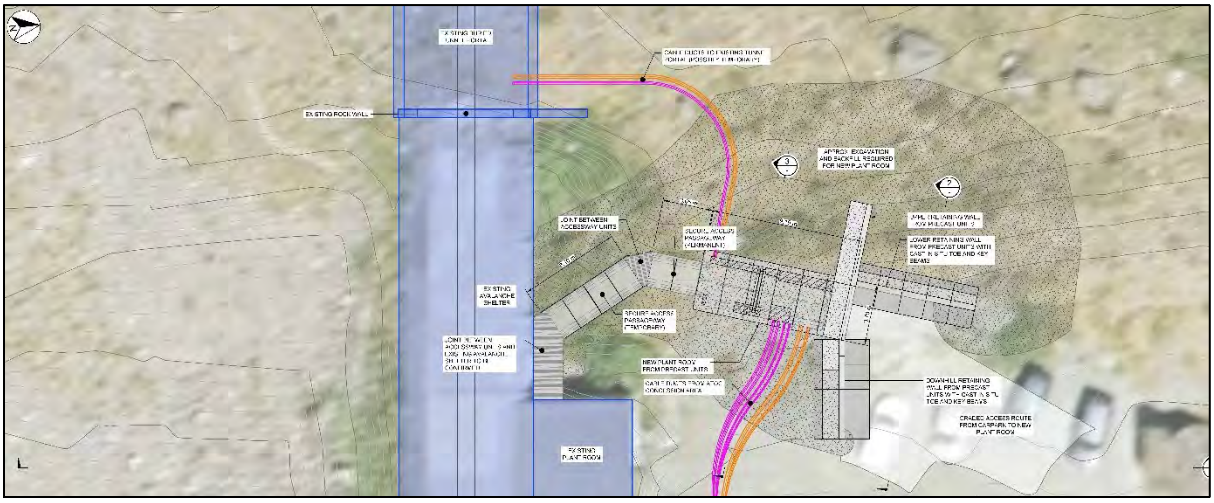

Figure 24. Design drawing of Equipment Building showing proposed plan layout (not to scale).[58]

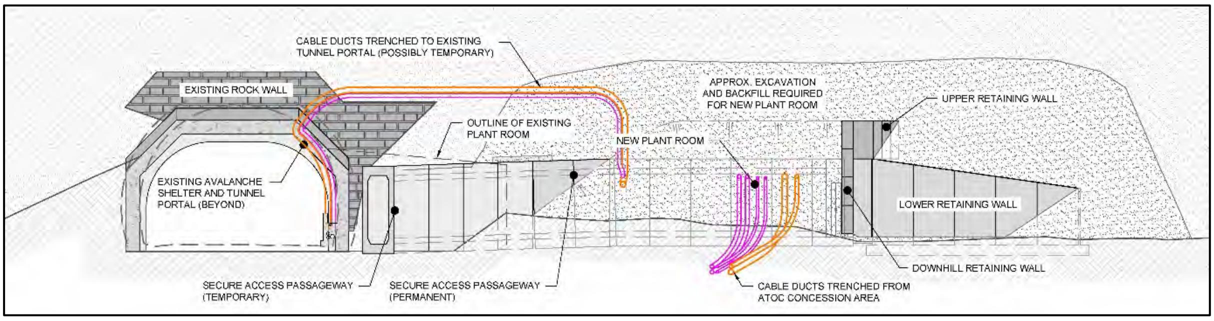

Figure 25. Design drawing of Equipment Building showing proposed east elevation (not to scale).[59]

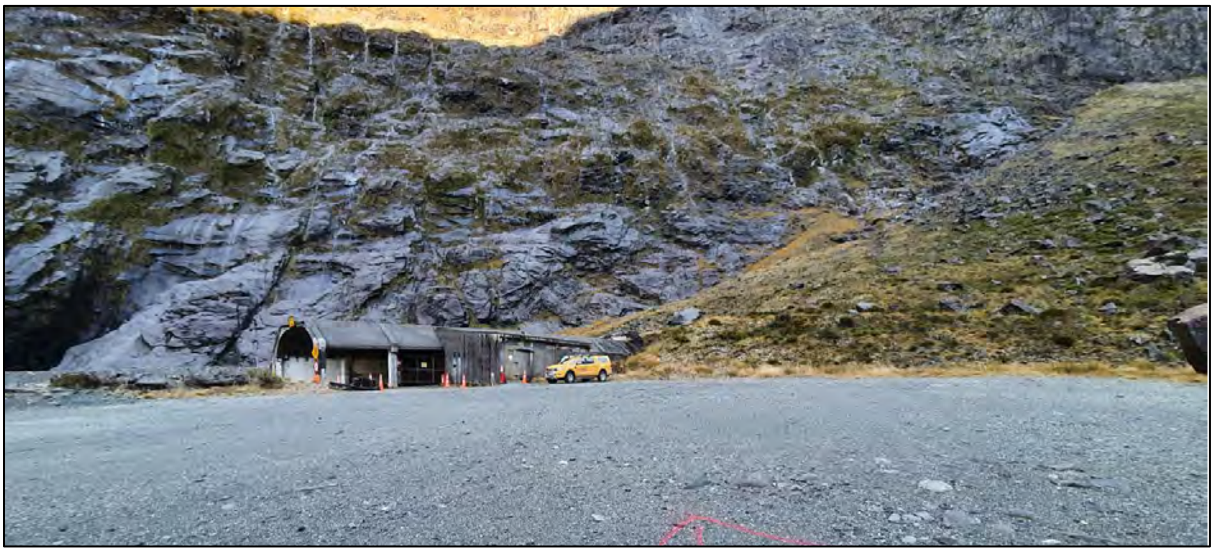

Figure 26. Equipment Building site at present.

[58] WSP.
[59] WSP.

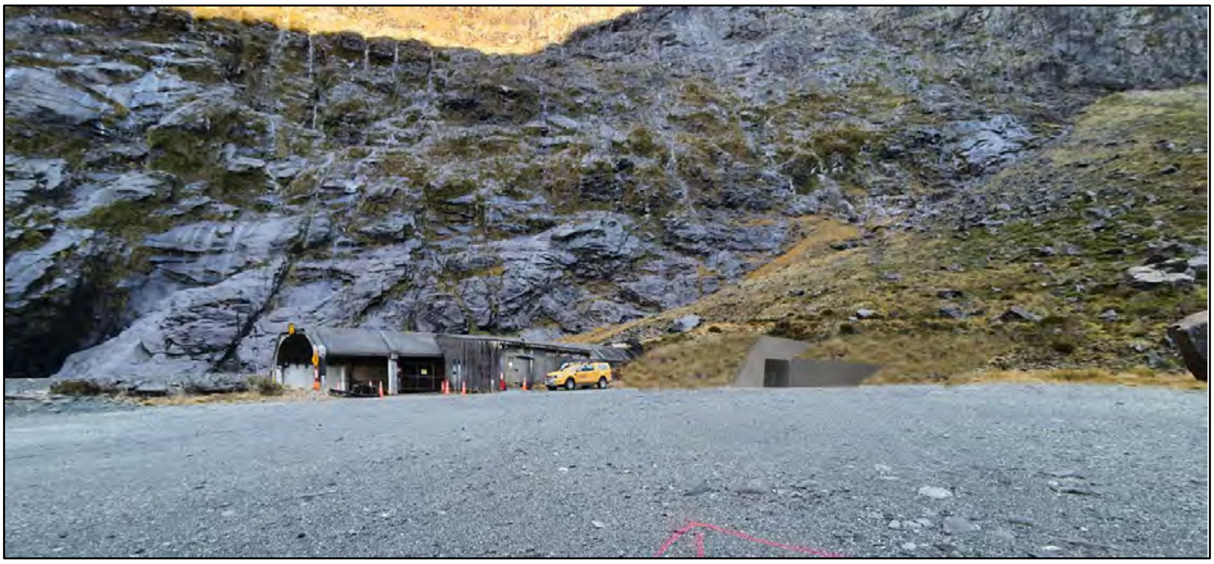

Figure 27. Equipment Building site with render of completed structure.

Exploratory Excavation

Exploratory excavation will be carried out to the north of SH94. These earthworks will involve six investigation pits in the car parking area of approximately 9m long by 3m wide by 2m deep (Figure 28, red areas). The purpose of these investigations is to inform the next stage of the works to the tunnel (Phase 3) with regard to:

- The nature of the ground in the vicinity of the shelter for engineering purposes.
- Establishing the existence and extent of avalanche shelter remains at this site.

There is also the option to expand these excavations to a larger, aprox.600m^2 area (black hatched area, Figure 28) to full investigate any ground conditions or avalanche shelter that might be encountered.

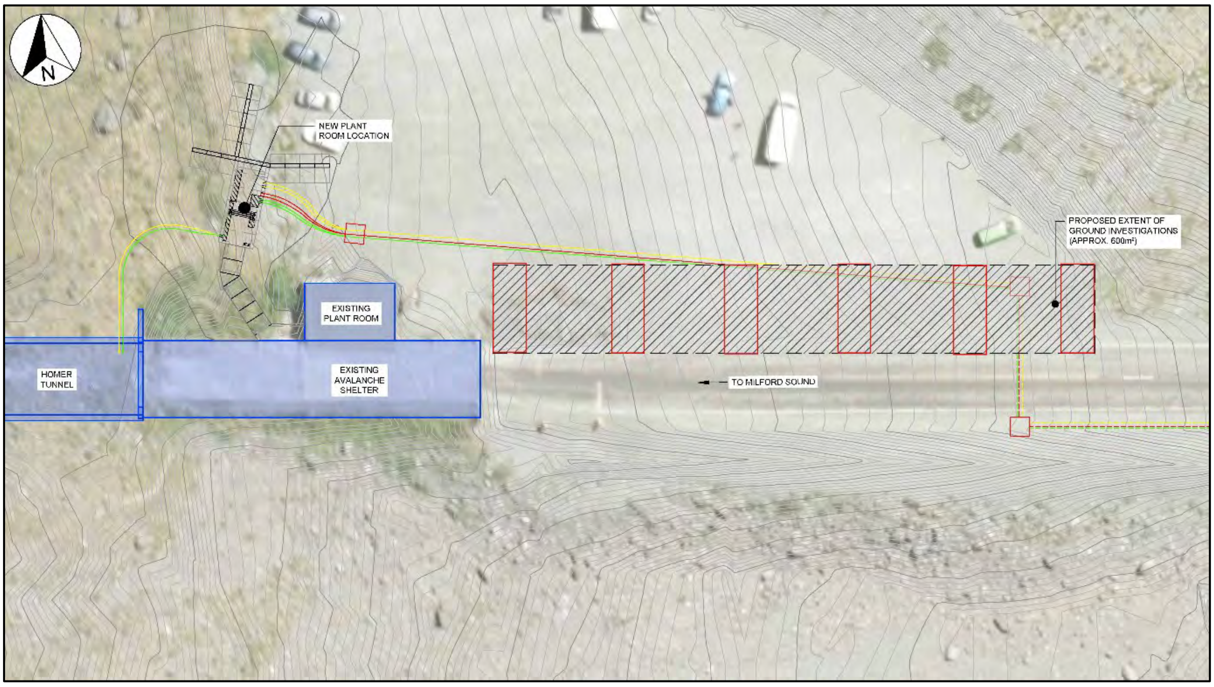

Figure 28. Design drawing showing the proposed exploratory excavation area (hatched in black, not to scale).[60]

[60] WSP.

The debris pile forms part of the Homer Tunnel Portal Avalanche Damage site. This is a historic site that is actively managed by DOC as part of the Fiordland National Park Management Plan. The short conservation plan prepared by DOC for this site does not recommend that the debris be modified.[61] However, despite this previous conservation guidance, the proposed movement and redeposition of the debris should not have any effect on the site's historic significance as identified in the DOC conservation plan. While leaving the debris in situ would be preferable, the redeposited material – visible from within the new open-sided avalanche shelter – will still function as "a vivid if perhaps not pretty reminder of the awesome power of avalanches" and a reminder of "the huge challenge that was involved in the building of the Milford Road."[62]

Buried remains of the former shelter will also likely be affected. It may also affect a limited amount of miscellaneous refuse deposits associated with tunnel construction.

<u>Assessment Summary</u>

The proposed exploratory excavation will have a less than minor adverse effect on the Homer Tunnel's heritage value.

<u>Alternative Options</u>

The proposal to remove and reinstate the debris pile during works was developed following consultation with DOC as a way to help preserve some of the site's heritage values. The exploratory excavation was also identified as an opportunity to actively monitor excavation to identify and record any archaeological material.

<u>Recommendations</u>

- The debris pile should be relocated to the north of its current site for storage prior to the exploratory works beginning in Phase 2 (see Figure 29). This site has been confirmed with NZTA as the best relocation site as it will be clear of the areas required for plant etc. in the Phase 2 and 3 works. The relocated pile should be marked and isolated on site to prevent any contractors inadvertently affecting it during project works. The debris pile should be reinstated following the completion of the new shelter in Phase 3 (see Figure 42 below).
- NZTA should engage an archaeologist to oversee the earthworks.
- The archaeologist should be on site to monitor the excavation and record any archaeological material encountered.
- Following earthworks, site D40/11 should be updated to provide a record of the site works and any archaeological discoveries.

[61] Bradley and MacPherson, *Homer Tunnel Portal and Ruins Conservation Plan*.
[62] Bradley and MacPherson.

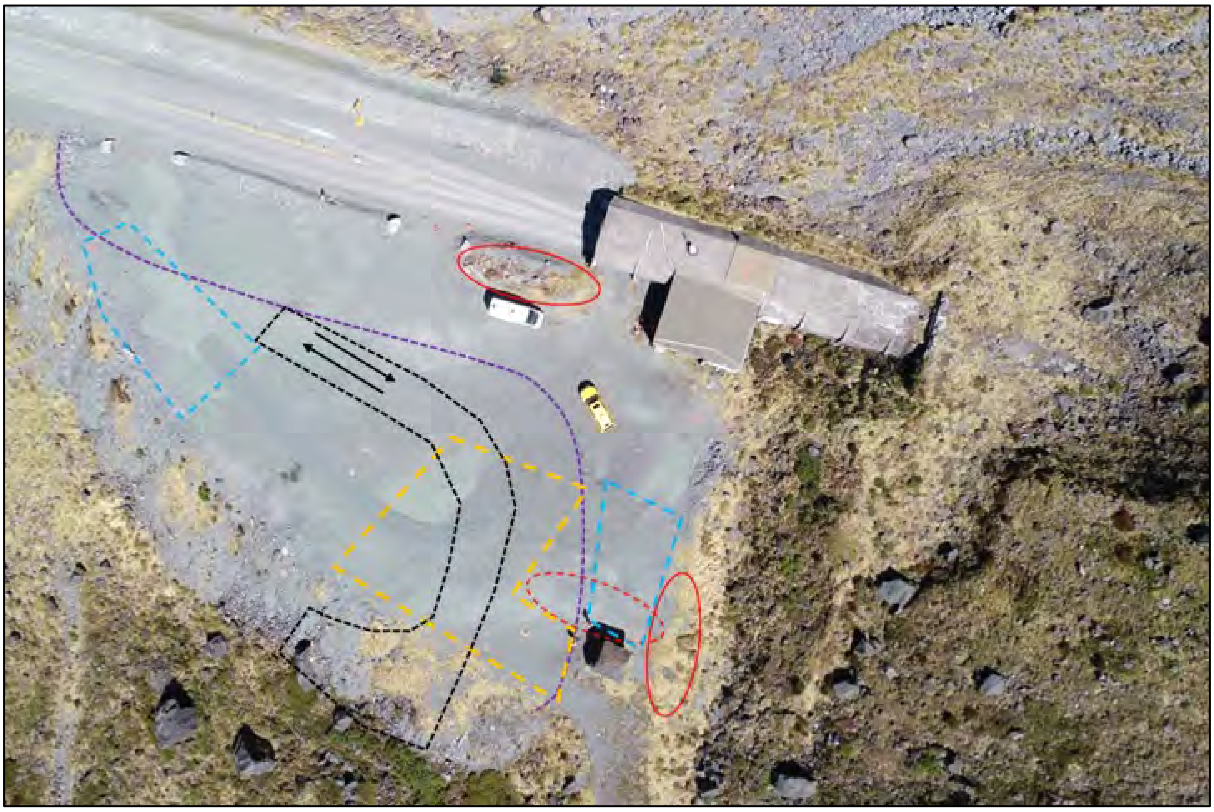

Figure 29. Location of the existing debris pile and the proposed temporary relocation site (outlined in solid red). The other dashed lines indicate areas/boundaries of areas affected by work during Phase 2 and 3.[63]

Tunnel Portal Façade Rock Pinning

The proposed rock wall reinforcement is described by Waka Kotahi as follows:

> To ensure that earthworks for the new equipment building do not cause damage to the original eastern portal rock wall, and to protect it from further deterioration, Waka Kotahi proposes to reinforce the stacked rock wall by pinning it back into the slope during the excavation activities.
>
> Pinning the rock face will involve small steel plates affixed to the front east facing wall, with a capped pin inserted through the plate and rock wall and anchored into the slope behind the wall.[64]

Pattress plates are a traditional method of restraining/securing unreinforced masonry of heritage buildings and structures; typically, they are used in infrastructure retaining walls and abutments, as well as in agricultural and commercial buildings. Their installation will have the beneficial effect of providing added stability to the façade during the proposed works and for the future. Provided they are darkly coloured, the proposed plate design is expected to have a limited visual impact and blend into the surrounding masonry.

There is the potential to significantly damage the stonework during pattress plate installation and a conservation methodology has been developed to avoid this issue. This involves:

- Careful exploratory excavation and drilling to establish the full extent and nature of the wall prior to the main works beginning
- The use of contractors experienced in working with historic stone masonry
- Repointing sections of stonework as necessary
- Siting anchors through larger rocks to avoid the risk of fracturing/shattering.

[63] NZTA.
[64] Waka Kotahi, *Concession Applications: Soil & Vegetation Disturbance for Trenching and Investigations, Cables and Reinforcement for Replacement Equipment Building, East Homer Tunnel, SH94 and Fiordland National Park*.

- Ongoing consultation between heritage specialist and a heritage engineer and contractors on site as work proceeds.

For more details, the *Stone Façade, Homer Tunnel, Heritage Conservation Methodology* is included as Appendix B.

Excavation with this work may disturb archaeological material related to the 20th century excavation. Previous test pitting in the area has suggested that any archaeological material is most likely to be unidentified timber, metal, and concrete refuse fragments randomly mixed into tunnel spoil. As such, the disturbance of this material will have little effect on the heritage values of the site.

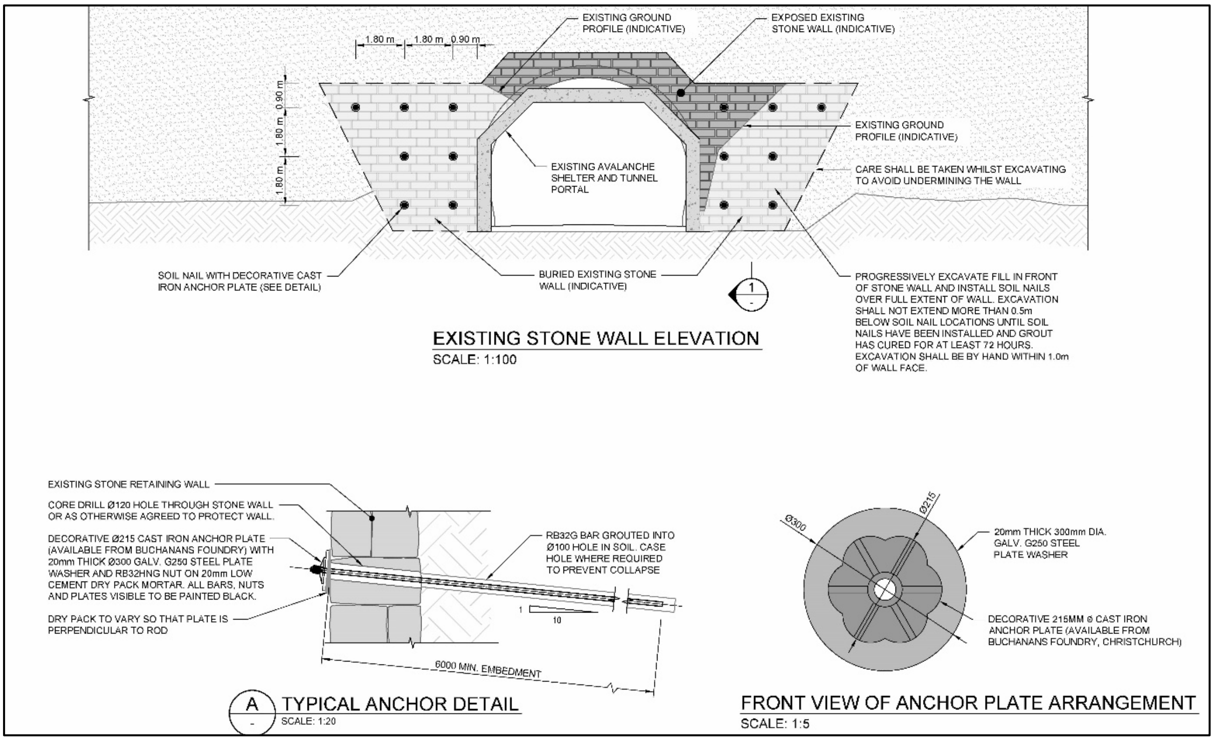

Figure 30. Design drawing showing the proposed rock pinning (not to scale).[65]

Assessment Summary

Provided the conservation methodology is followed, the proposed work is assessed as having a less than minor adverse effect on the Homer Tunnel's heritage value.

Alternative Options

Following initial concerns from DOC about the proposed rock pinning around the Eastern Portal, Origin has prepared a conservation methodology to ensure that the stone wall is not damaged by the work (see Appendix B).

Recommendations

- The conservation methodology should be followed.
- NZTA should engage an archaeologist to oversee the earthworks.
- Stand over archaeological monitoring is not recommended given the low heritage value of the archaeological material that may be affected.

[65] WSP.

- During earthworks, contractors should provide the archaeologist with weekly updates on excavation progress, any possible archaeological material encountered, and representative photographs.
- If a significant archaeological discovery is made during earthworks (e.g., intact mining machinery, human remains, buried in-situ structures), then a standard Accidental Discovery Protocol should be followed (Waka Kotahi Minimum Standard P45, or equivalent). DOC should also be notified of any significant discoveries.
- Prior to any works commencing, earthworks contractors should be briefed by the archaeologist about the possibility of encountering archaeological material, how to identify possible archaeological material during works, contractors' responsibilities with regard to notification of the discovery of archaeological evidence.
- Following earthworks, site D40/11 should be updated to provide a record of the site works and any archaeological discoveries.

Phase 3 – Avalanche Shelter Replacement

This work will involve:

- Removal of the existing avalanche shelter and plant room.
- New structures being a protection structure and a mechanically stabilised earth (MSE) wall
- Excavation of the existing road and the car park area
- The placement of rock rip rap for erosion protection
- Vegetation disturbance

The first three work elements are discussed below as these are directly relevant to the site's heritage values.

Removal of the Avalanche Shelter

Alterations are now necessary to improve the resilience of avalanche protection at the eastern entrance to the Homer Tunnel. Currently, the avalanche shelter and plant room are exposed and susceptible to rockfall and avalanche damage. This will also involve the relocation of the commemorative plaques on the plant room and the adjacent avalanche shelter debris pile.

This is not the preferred heritage outcome, and there has been extensive discussions between NZTA and Origin Consultants about options for retaining the existing shelter. Ultimately, it has been determined that the in-situ retention of the shelter and associated features is unfeasible for several reasons:

- The poor condition of the existing shelter, including past avalanche/rockfall damage.
- The existing structure provides little current protection from rockfall or avalanche debris. The engineering requirements of the site – to be able to manage both avalanche and seismic risk – are extreme and the existing shelter is not considered fit for purpose.
- Over-cladding (building around the existing shelter) would involve construction of a much larger envelope to the shelter obscuring it from view.
- The existing avalanche shelter is the lowest part of the tunnel and restricts the type of vehicles that can enter it (currently restricted to 3.8 m in height). The current legal vehicle clearance height requirement is 4.3m. Digging the floor of the tunnel down to provide extra headroom has been considered but has been deemed unworkable from an engineering perspective. [66]
- The avalanche debris pile needs to be shifted to accommodate the new shelter construction. The extreme foundation requirements of the new structure mean that it is not possible to work around the pile in its existing location.

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[66] Memo from Gemma Kean, Waka Kotahi to Andrew Barsby, Heritage New Zealand, 7 May 2021, "Homer Tunnel Avalanche Shelter upgrade"; Email from Gemma Kean, Waka Kotahi to Robin Miller, Origin Consultants and Andrew Barsby, Heritage New Zealand, 18 May 2021, "State Highway 94, Homer Tunnel avalanche protection works."

Assessment

The removal of the avalanche shelter and associated items is considered to have an overall moderate adverse (permanent) impact on the heritage values of the Homer Tunnel.

Alternative Options

Given the adverse effect of the shelter's removal a variety of mitigating options were considered for the various heritage items that will be affected by the proposed works. These are outlined in in the sections below. Possible options in the overview tables (Table 2-Table 5) are rated out of 5, with a rating of 5 representing a positive heritage outcome.

Plaques

In the first instance, the plaques should be relocated to a site near the eastern entrance to the Tunnel, for example, the plaques could be mounted near the existing traffic lights (preferred) or mounted in the new avalanche shelter or plant room. A location near the Tunnel entrance retains a strong relationship with the Tunnel and connection to those who died with the place. Improving the visibility and appreciation of the plaques will also improve their commemorative value.

Alternatively, the plaques could be relocated to a nearby site that is related to the construction of the Tunnel – for example, the site of The Forks workers' camp at Gertrude Node or Homer Camp, where Hulse and Overton lived during the construction of the Homer Tunnel. Getrude Node is preferred due to its proximity to the Tunnel entrance.

The plaques should be relocated in a way that retains their heritage significance and association with the construction of the Tunnel, for example, mounted on a piece of the avalanche shelter/plant room concrete. At all sites the placement of the plaques will need to be carefully planned: the plaques need to be visible, accessible (for viewing and maintenance), and not appear out of context.

In summary, the plaques should be relocated to an appropriate nearby setting, with increased visibility and where they can be appreciated. They could be relocated with a piece of the avalanche shelter/plant room for mounting. There is potential for the plaques to lose their context/significance the more remote from the Tunnel they become.

Ultimately, it was decided that relocating the plaques on to the new equipment was the most appropriate option that was the best way to balance heritage, health and safety, and feasibility considerations.

Table 2. Overview of options for managing the plaques.

Options	Pros	Cons	Rating
Relocate and mount near the Tunnel entrance at the existing traffic lights.	Retains strong relationship and connection with Tunnel due to proximity; Commemorative value due to increased visibility at existing stopping point (but likely to only be seen by road users at the head of the queue); Improved accessibility for maintenance.	Potential safety issues for people stopping and getting out of their cars.	5
Mount in the new avalanche shelter/plant room.	Location retains strong relationship with Tunnel and connection of the plaque to those who died with the place is retained.	Reduced visibility (in comparison to other sites) as tunnel users would pass by at 30-60km/h; Vulnerable to exhaust emissions and access may be difficult for maintenance	4

Options	Pros	Cons	Rating
		in Tunnel; plaques would not be publicly visible if mounted on the plant room.	
Relocate with avalanche shelter and mount at The Forks/Gertrude Node as part of interpretative display.	Retain significant features of the Homer Tunnel (long term); Improved access and appreciation of aspect of the Homer Tunnel's history and positive impact of heritage values of the Tunnel and the events, people, and places associated with the construction (long term); Retains relationship with the Tunnel due to the connection with those who died (Hulse lived at The Forks); Potential to incorporate other elements of the avalanche shelter into a stopping area with story boards to improve interpretation of the Tunnel; Increased accessibility for maintenance.	Would need interpretative aid to increase visibility (e.g., tourists are directed to the area as a feature of the Milford Road journey) and to ensure connection with Tunnel is maintained; Maintenance of the structure would be required to prevent adverse effects on heritage values (long term); Support to relocate elements of the Tunnel has not been forthcoming from stakeholders.	4
Relocate with avalanche shelter to a site other than Gertrude Node as part of interpretative display.	Retain significant features of the Homer Tunnel (long term); Improved access and appreciation of aspect of the Homer Tunnel's history and positive impact of heritage values of the Tunnel and the events, people, and places associated with the construction (long term).	Less relationship with the Tunnel; Would need interpretative aid to increase visibility (e.g., tourists are directed to the area as a feature of the Milford Road journey) and to ensure connection with Tunnel is maintained; Maintenance of the structure would be required to prevent adverse effects on heritage values (long term); Support to relocate elements of the Tunnel has not been forthcoming from stakeholders.	3
Relocate alone and mount at The Forks/Gertrude Node or Homer Camp site without interpretation.	Retains some relationship with the Tunnel due to connection with those who died (Hulse lived at The Forks and Overton lived at Homer Camp); Increased accessibility for maintenance.	Less relationship with the Tunnel; Placement, mounting, and display would need consideration to ensure connection with the Tunnel is maintained; Would need interpretative aid to increase visibility (e.g., tourists are directed to the area as a feature of the Milford Road journey); Support to relocate elements of	2

Options	Pros	Cons	Rating
		the Tunnel has not been forthcoming from stakeholders.	
Record the structures and features.	Detailed record of the plaques, avalanche shelter and the portal (long term); Digital recording will enable the potential for future interpretative use.	None from a heritage perspective.	5
Improve the interpretation of the Homer Tunnel (and Milford Road) with interpretative physical or digital display.	Increased recognition and appreciation of the heritage values and significance of the Homer Tunnel and construction of SH94 (long term); Enhances public understanding of tangible and intangible values.	None from a heritage perspective.	5

Avalanche Shelter

Relocate a shelter section: The avalanche shelter has significance as likely the only example of such a feature being built in New Zealand, and adds to the high technology, engineering, and scientific value of the Tunnel. Alongside the portal stone wall façade, it is one of the only architectural features of the Tunnel. The adverse impacts of the removal of the avalanche shelter would be mitigated by retaining and relocating a section of the shelter, which could be visited by tourists travelling along the Milford-Te Anau Highway (SH94). While the relocation of a section of the shelter has potential to be a mitigating measure against the adverse effect of removing the shelter, its relocation also risks taking it out of context, leaving it disconnected and undervalued – The proposed relocation site must provide a setting and association compatible with the heritage value of the avalanche shelter.

Relocation – Visitor Experience and Opportunities: In accordance with best practice, the relocated shelter would need to serve a useful purpose. Given that the use of the avalanche shelter is integral to its heritage significance, a similar use should be maintained, for example, it could be utilised as a shelter for tourists stopping along SH94. Any adaptation required should not dominate the shelter's original form. The relocated shelter could also accommodate a physical installation providing information on the history and construction of the Homer Tunnel, highlight the meaning of the commemorative plaques, and highlight the connection of the site and its relationship to the construction of the Tunnel.

Maintenance Requirements: A lapse in protecting the structure would likely have an adverse impact on the avalanche shelter's heritage values. As such, ongoing maintenance would be required. Maintenance requirements could include:[67]

- Preventing vandalism and protecting the structure from deterioration.
- Periodic cleaning to remove road dust, bird guano, and organic growths.
- Removal of any rubbish left by visitors.

Further maintenance costs may be reduced by careful siting of the shelter section, i.e., in a position where it gets good light and natural drying and is away from trees or vegetation that might drop leaves, etc on it.

[67] Origin Consultants is not a maintenance or structural expert. As such, any comments on maintenance are limited to general consideration of condition.

Vandalism might also be reduced by locating the shelter section in clear sight and by applying anti-graffiti treatment following cleaning.

Relocation Methods: Waka Kotahi has advised that it is not possible to relocate a full section of the avalanche shelter in one piece. A section of the shelter would need to be cut for transportation and restitched, with the leading bay being the most likely section. Each section would then need to be restitched. The stitching will be visible, approximately 200mm wide. There are two options to cut the shelter section for relocation – into six or three.

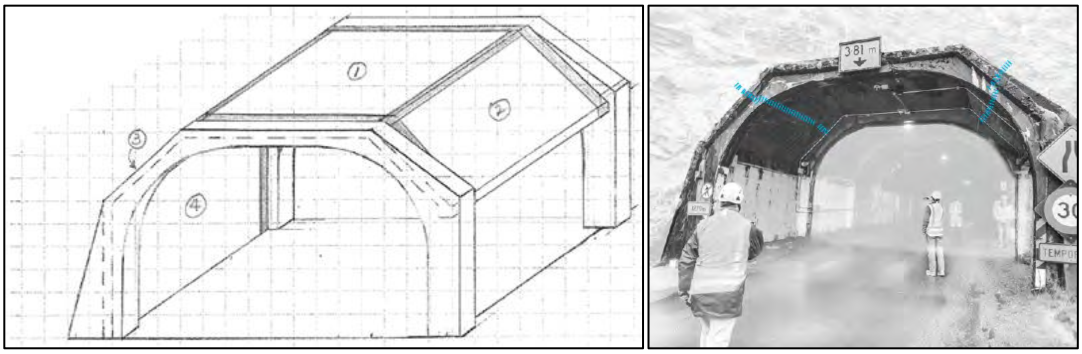

Figure 31. Relocation methodology and cut/stitching locations.

Any alteration should be kept to the minimum necessary and substantially reversible, with little or no adverse effect on the heritage significance of the shelter. Cutting the shelter into six pieces is more compatible with the original form of the shelter and would have less visual impact on the shelter, thereby maintaining more of its original form.

Relocation Sites: As part of this assessment, five sites were identified along SH94 that could be utilised as part of the proposed works (see Appendix D). These sites were assessed against the following criteria to consider the suitability of each:

- Compatibility/association – whether the site provides a setting compatible with the heritage value of the avalanche shelter, for example, is (directly or indirectly) associated with the construction of the Homer Tunnel and SH94 or is in close proximity to the Tunnel.
- Viability – whether the shelter would be appropriately preserved and maintained in each location, as Waka Kotahi has advised that DOC is unable to take over the care and maintenance of a section of the shelter.
- Visitor experience and purpose – whether the site would contribute to a positive visitor experience, for example, support interpretation (e.g., accommodate a physical installation and/or connect the site and history of the construction of the Homer Tunnel and SH94), and (in accordance with heritage best practice) whether the relocated shelter would serve a useful purpose at the location.
- Impact on heritage values – whether the proposed location would have a beneficial or negative impact on the heritage significance of the Homer Tunnel.

Two suitable sites, that have ties to the construction of the Homer Tunnel, were identified:

- Gertrude Node – which has a close association with the Homer Tunnel, due to the proximity and as the location of "The Forks" which formed a base for the early exploration of routes for SH94 and residential houses for Homer Tunnel engineers and overseers (including Donald Hulse); provides an existing carpark/stopping point on SH94; shelter could be utilised as a shelter/hub for tourists walking in the Gertrude Valley.
- Knob's Flat – which has some association with the construction of the Homer Tunnel as a workers' camp site for the construction of SH94; provides an existing carpark/facilities and popular stopping point on SH94; shelter could be used as a shelter/hub for tourists. This has been identified as the preferred site by NZTA.

The relocation of a section of the avalanche shelter would act to mitigate some of the adverse effects by retaining some of the shelter's heritage significance, where relocated to an appropriate location (for example, the Gertrude Node or Knob's Flat). It also provides an opportunity to improve the interpretation of the Homer Tunnel's heritage values and appreciation of the significance of the site. However, both preferred sites are located on DOC land. Waka Kotahi have advised that DOC does not have the resources to take over the care and maintenance of a section of the shelter.

Dismantle and Bury a Section of the Shelter: Where relocation is not possible, the next best option is to dismantle and bury a section of the shelter. A section of the shelter could be dismantled as outlined under 'Relocation Methods' above, 'flat-packed,' protected, and buried. Waka Kotahi has advised that a section of the shelter could be buried as part of the fill on the southern side of the new shelter.[68]

As in 1945, when the avalanche shelter was crushed and buried under the new road alignment, the remaining portions of the avalanche shelter could form part of the new infrastructure. Origin Consultants has been involved in other projects where archaeological features have been buried. Along SH88, stone revetments were covered in geotechnical cloth and buried to preserve these features.

Where relocation is not possible, an alternative option is to dismantle and bury a section of the avalanche shelter to enable its future re-use.

Status Under the Fiordland National Park Management Plan: The shelter is also possibly part of the Homer Tunnel Portal Avalanche Damage, one of 35 actively managed heritage sites identified in the Fiordland National Park Management Plan. The extent of this site is somewhat ambiguous. The management plan entry only refers to the avalanche damage (i.e., the debris left over from the previous destruction of parts of historic avalanche shelter). However, the short conservation plan prepared for the site in 1993 also includes the remaining section of avalanche shelter as part of the site. It is unclear what protection is provided by the site's status in the Fiordland National Park Management Plan.

Feasibility Issues Shelter Dismantling or Relocation: Ultimately, however, nether relocation nor dismantlement were determined to be feasible options for addressing the adverse effects of losing the shelter.

No suitable land parcel is available for relocation. Placing a piece of the structure within Waka Kotahi owned land (road corridor) is not possible due to road safety requirements, while land outside the road corridor within the national park has also been discounted with DOC not preferring this option due to the potential ongoing maintenance and management liabilities.

Additionally, the associated costs of relocating a portion of the structure will be counterintuitive cost wise in terms of achieving the primary objective of the project (improving road safety and resilience). Relocation efforts of a piece of structure will more than likely result in a reduced constructed length of the replacement structure. In terms of burying a piece of the structure, it is highly unlikely that the shelter would be re-excavated at a later date nor relocated and therefore this mitigation option is therefore unlikely to be truly realised.

Table 3. Overview of options for managing the existing shelter.

Options	Pros	Cons	Rating
Relocate a section of the avalanche shelter to Gertrude Node (preferred) or Knob's Flat and utilise as part of	Original feature (and associated heritage significance) of the Homer Tunnel retained (long-term); Improved access and appreciation of aspect of the	Maintenance would be required to prevent adverse effects on heritage values (long term); Potential to impact heritage significance/archaeology at proposed site – Exact chosen site should ensure existing and archaeology present	4

[68] Email from Chris Collins, Waka Kotahi to Robin Miller, Origin Consultants, 24 March 2022.

Options	Pros	Cons	Rating
interpretative display.	Homer Tunnel's history and positive impact of heritage values of the Tunnel and the events, people, and places associated with the construction (long term).	is not damaged or destroyed; Support to relocate elements of the Tunnel has not been forthcoming from stakeholders.	
Reflect the design of the shelter in the replacement shelter.	Design mitigates some of the adverse impacts on the Tunnel's heritage values associated with the removal of the avalanche shelter (long-term); Moderate beneficial impact on vulnerability of the Homer Tunnel (long term) and ongoing use.	Minor alteration to the existing setting (long term).	4
Dismantle and bury a section of the avalanche shelter to allow for future re-use.	Original feature of the Homer Tunnel retained and could be excavated in future and relocated/used (long-term).	Loss of visibility of original feature (short or long term); Potential for damage (long term); Potential for location of burial to be lost.	2
Demolish the remaining section of the shelter	None from a heritage perspective.	Loss of original feature of Tunnel and significant effect on heritage values of the Tunnel (long term).	0

Recording Features

Recording is an essential part of investigating and understanding the heritage significance of a place. It also provides a record of a building or structure that can be used by future researchers. This is particularly important where demolition or destruction of heritage fabric is proposed. The collected data must be thorough, accurate, accessible, and reusable.

Recording is applicable where a building or structure or part of a building or structure is to be demolished, or where a building is to be relocated without intent to reinstate and preserve it elsewhere or a structure or part of a structure is to be relocated or otherwise significantly modified.

Although the structures are not pre-1900 in origin, the HNZPT (2018) 'Archaeological Guidelines Series No. 1: Investigation and recording of buildings and standing structures' (AGS1) provide a recognised standard for the recording of buildings that are archaeological sites. A level I recording as outlined in this document will provide a comprehensive record of the shelter structure before it is demolished.

The removal of the avalanche shelter also provides an opportunity to record the stone wall façade of the eastern portal entrance.

Systematic recording of the avalanche shelter and plaques should be carried out prior to the removal of the shelter, and the removal of the shelter provides an opportunity to obtain a detailed recording of the portal. This recording should be carried out to an HNZPT (2018) 'Archaeological Guidelines Series No. 1: Investigation and recording of buildings and standing structures' Level I standard (or equivalent). A digital recording is recommended and will enable the potential for future interpretative use, for example, in an app relating to the history of the Milford Road.

Table 4. Overview of the recording option.

Option	Pros	Cons	Rating
Record the structures and features	Detailed record of the plaques, avalanche shelter and the portal (long term); Digital recording will enable the potential for future interpretative use.	None from a heritage perspective.	5

Improving the Interpretation of the Milford Road

The Homer Tunnel is highly significant as a heritage site of the Milford Road, and the wider Milford Road contains further sites that have an important historic connection with the construction of the Tunnel and SH94. Despite this significance, at this stage, there is little widely accessible information about the construction of the Tunnel and road.

Interpretation of heritage sites actively enhances public understanding of tangible and intangible values, which may not be readily perceived – Highlighting the story of the construction of the Homer Tunnel and SH94 provides an opportunity to increase public awareness of the Homer Tunnel as a nationally significant industrial structure. This could be carried out via a physical installation or by utilising digital technology.

Digital Technology: There are many examples of the interpretation of significant heritage features being supported by digital technology, from the use of apps, augmented reality, to QR Codes to collect more information about an object, location, or site. In New Zealand, the St Paul's Cathedral in Dunedin offers a virtual tour of the Cathedral, recorded before a fire which damaged the roof in August 2020, and the Great Hikes app highlights environmental and historical features to hikers on the Milford Track.

Table 5. Overview of the improvement of historic interpretation information.

Option	Pros	Cons	Rating
Improve the interpretation of the Homer Tunnel (and Milford Road) with interpretative physical or digital display.	Increased recognition and appreciation of the heritage values and significance of the Homer Tunnel and construction of SH94 (long term); Enhances public understanding of tangible and intangible values.	None from a heritage perspective.	5

Physical Installation: Five potential sites were considered for a physical installation on the construction of the Milford Road and Homer Tunnel (Appendix D). At these sites, a physical installation (for example, an information kiosk) could be constructed to support the interpretation of the heritage significance the Homer Tunnel and Milford Road.

These sites have been assessed against the following criteria:

- Compatibility/association – whether the site provides a setting compatible with the heritage values of the Homer Tunnel, for example, is (directly or indirectly) associated with the construction of the Homer Tunnel and SH94 or is in close proximity to the Tunnel.
- Visitor experience – whether the site is frequented by visitors; would contribute to a positive visitor experience; and could accommodate an installation connecting the site and history of the construction of the Homer Tunnel and SH94.

Table 6. Possible sites for interpretive installations.

Site	Compatibility/Association[69]	Visitor Experience
Gertrude Node	Site location has a close association with the Homer Tunnel, due to proximity and as the location of "The Forks," which formed a base for the early exploration of routes for SH94 and residential houses for Homer Tunnel engineers and overseers (including Donald Hulse). ✓✓✓	Existing carpark and stopping point on SH94 for tourists walking in the Gertrude Valley; closely linked to the construction of SH94 and the Homer Tunnel; close proximity to the Homer Tunnel entrance. ✓✓
Lone Tree	Site has some association with the Homer Tunnel, due to proximity but is not known to be a workers' camp site. ✓	Existing stopping point on SH94 with no facilities. ✓
Monkey Creek	Site has some association with the Homer Tunnel, due to proximity and as a location of a workers' camp for the construction of bridges along SH94. ✓✓	Existing carpark and popular stopping point on SH94 with no facilities. ✓✓
Knob's Flat	Site has some association with the Homer Tunnel as the location of a workers' camp site for the construction of SH94 (occupied by PWD workers). ✓✓	Existing carpark and popular stopping point on SH94 with facilities and private accommodation; linked to the construction of SH94; better potential to tie into SH94 sites as situated at the start of tourist's journey to the Milford Sound. ✓✓✓
Te Anau	Site location has little association with the Homer Tunnel and its construction. ✓	Potential for installation to be located at the Fiordland National Park Visitor Centre, which is visited by tourists and Milford Track hikers. ✓✓

<u>Recommendations</u>

- Remove the plaques from their existing location and reinstate on an exterior wall of the new plant room. The exact location of the plaques on the new building should be confirmed in consultation with a DOC heritage advisor.
- Systematically record all features to a Level 1 standard as outlined in the HNZPT (2018) 'Archaeological Guidelines Series No. 1: Investigation and recording of buildings and standing structures.' The avalanche shelter, plant room, and plaques should be recorded prior to their removal, and the stone wall façade at the eastern portal entrance should be recorded after the removal.
- Develop an interpretive package, either digital or physical (or both), in consultation with a DOC heritage advisor. If a physical interpretive site is required, this should be established at Knobs Flat.

[69] Research into each site from John Hall-Jones, *Milford Sound: An Illustrated History of the Sound, the Track, and the Road* (Craig Printing Co, Invercargill: 2000); Harold J Anderson, *Men of the Milford Road* (Craig Printing Co, Invercargill, 1985).

New Avalanche Shelter

The new avalanche shelter will be a *circa* 80-60m long structure extending out from the existing Tunnel Portal Façade (Figure 32-Figure 33). At the façade, the shelter roof will flare upwards to fully reveal the original stone-faced portal (Figure 33-Figure 34). The shelter will be constructed using precast concrete components with a fill embankment covering the southern elevation and roof. Much of this fill is planned to be excavated from the existing fill terrace (Figure 32). The northern elevation of the shelter will be open, similar to the existing shelter design. A series of substantial footings are planned either side of the shelter to accommodate potential avalanche forces (Figure 35-Figure 36). The eastern entrance portal of the new shelter has been designed to evoke the form of the original avalanche shelter (Figure 36).

In response to the adverse effect of the historic shelter's removal, the new shelter design and earthworks plans incorporated feedback from Origin Consultants. These are outlined in the overview tables (Table 7-Table 8) are rated out of 5, with a rating of 5 representing a positive heritage outcome.

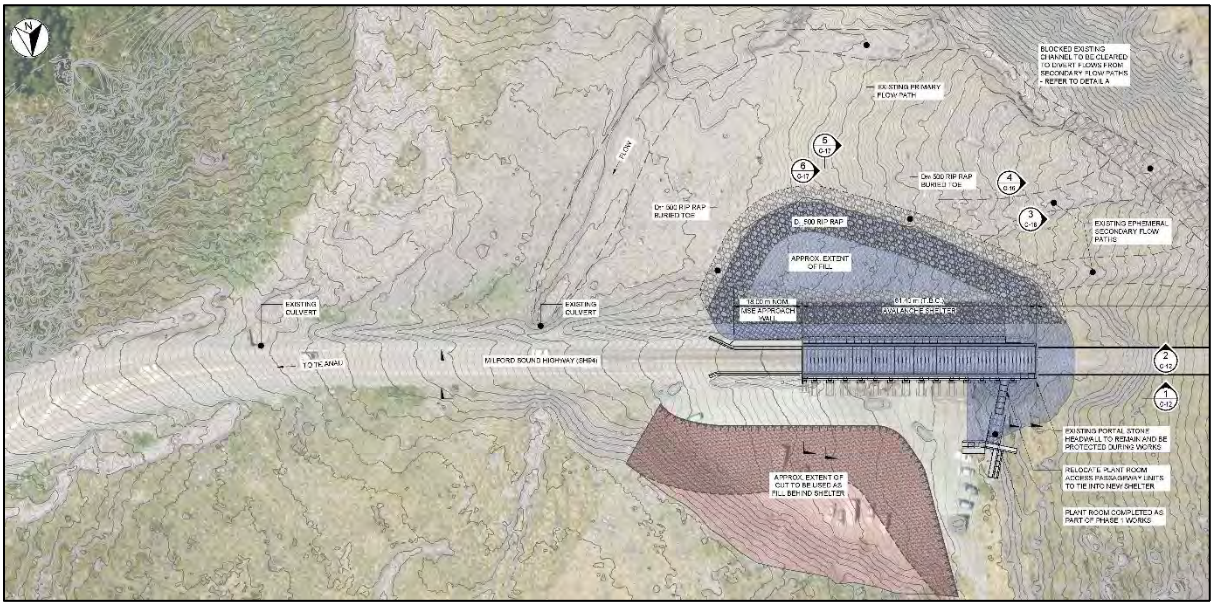

Figure 32. Design drawing showing the proposed new avalanche shelter. The red area indicates the proposed fill excavation site and blue indicates where the material will be deposited (not to scale).[70]

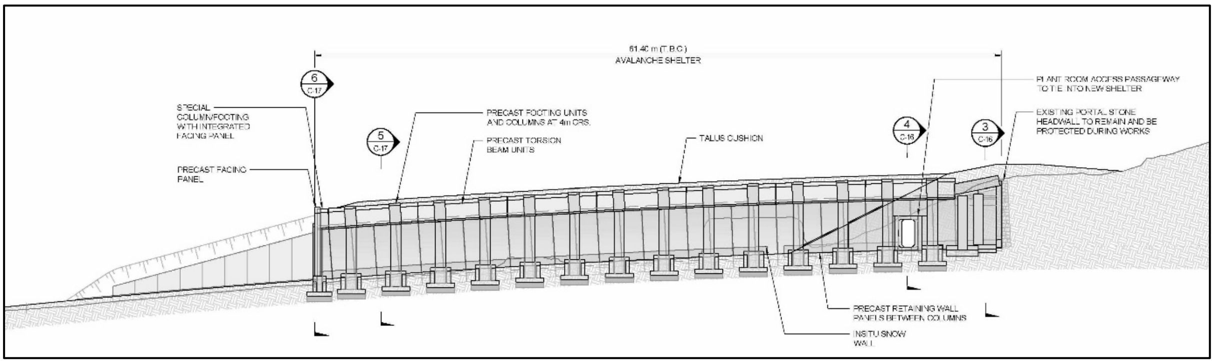

Figure 33. Design drawing showing the north elevation of the proposed avalanche shelter (not to scale).[71]

[70] WSP.
[71] WSP.

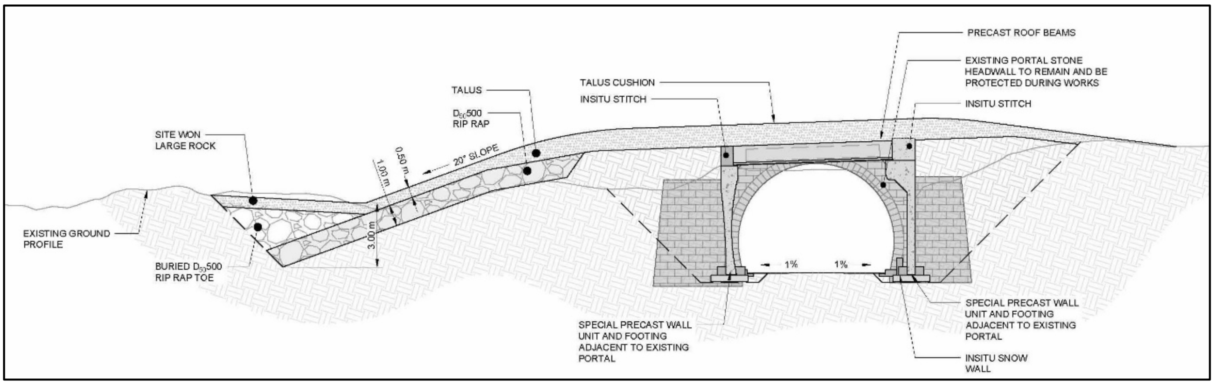

Figure 34. Section drawing showing the stone tunnel portal façade visible at the western end of the new avalanche shelter (not to scale).[72]

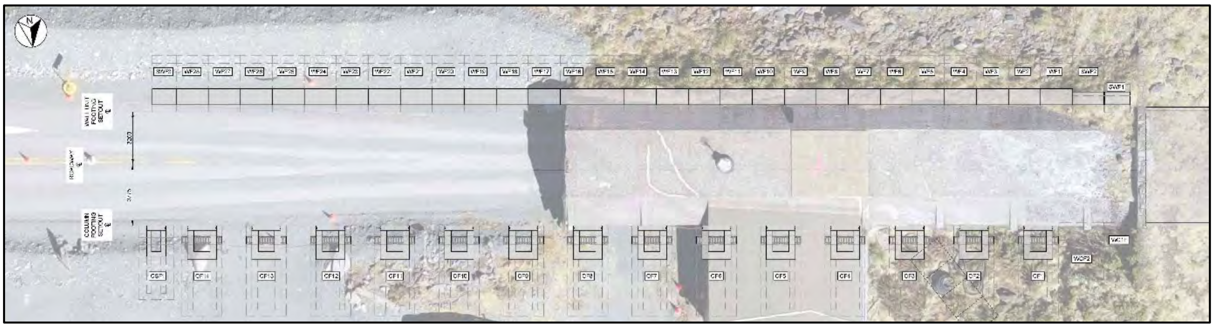

Figure 35. Design drawing showing the substantial footings along the northern edge of the shelter (at the bottom of image, not to scale).[73]

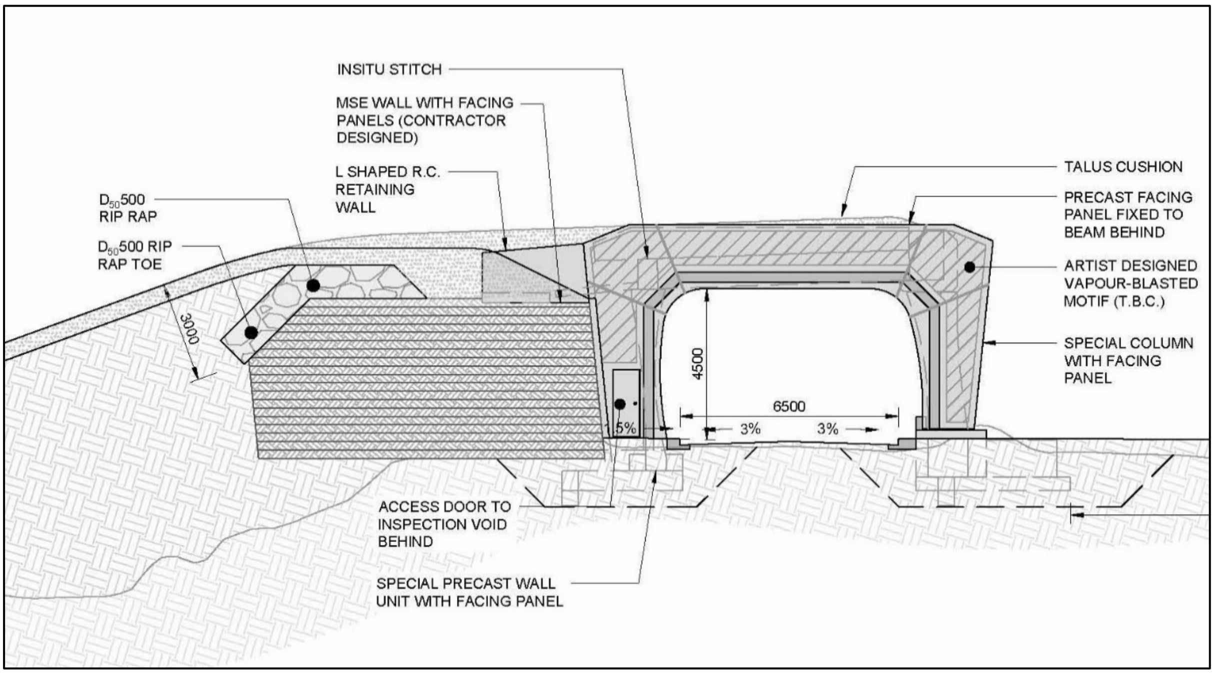

Figure 36. East elevation showing the extent of the foundation footings and the portal design evoking the form of the original avalanche shelter.[74]

72 WSP.
73 WSP.
74 WSP.

Figure 37. The existing site.

Figure 38. Conceptual render of the site following the new shelter construction.[75]

[75] WSP.

Figure 39. The existing site and a conceptual render of the new shelter and equipment room.[76]

Figure 40. Conceptual render showing the exposed tunnel portal within the new shelter.[77]

Heritage Design Inputs

The proposed design references the architectural features of the historic avalanche shelter (Figure 41) – it has a semi-octagonal shape at the mouth of the shelter and this has been referenced in the façade of the proposed design. The new shelter also retains the modular form of the existing shelter, with an open north side, reinstating a feature of the pre-1945 avalanche shelter and enhancing the 'sense of place' and visitor

[76] WSP.
[77] WSP.

experience. The shelter is to be constructed in concrete; a material that will recede into the natural elements of the surrounding landscape.

While the shape of the façade is not fully carried through into the body of the avalanche shelter, it is referenced in the interior design of the tunnel – The northern columns and southern wall are curved to reference the shape of the existing shelter and stone portal façade. Internally, the shelter has a quadrangular shape, with a shallow mono-pitch to the roof. This will cut across horizontally above the circular tunnel entrance and stone façade, but this effect is mitigated by the roof rising where it meets the stone façade, to reveal more of the portal structure. The avalanche shelter and stone façade will remain free-standing, with 100mm separation between the façade/headwall of the tunnel and the new avalanche shelter. As above, the interior concrete colours are recessive and in keeping with the natural elements of the surrounding landscape.

Currently, the eastern portal entrance is dwarfed by the Homer Saddle (Figure 37-Figure 38). This view from the approach is aesthetically important, adds to the setting of the Tunnel, and acts as a reminder of the technological and engineering feat of carving this tunnel in isolated and rugged terrain.

While the shelter will increase in length (to better protect the road from avalanche and rockfall), it will be covered with talus material and vegetation. As such, the proposed portal entrance retains a small-scale appearance in the context of the wider landscape. Similarly to the new plant room, the avalanche shelter and wing wall design incorporates recessive colours, in keeping with the natural landscape. The view from the approach is maintained with the proposed design, with only a small change due to the required length of the proposed shelter. The entrance to the Tunnel remains small-scale, functional, and insignificant within the vast landscape.

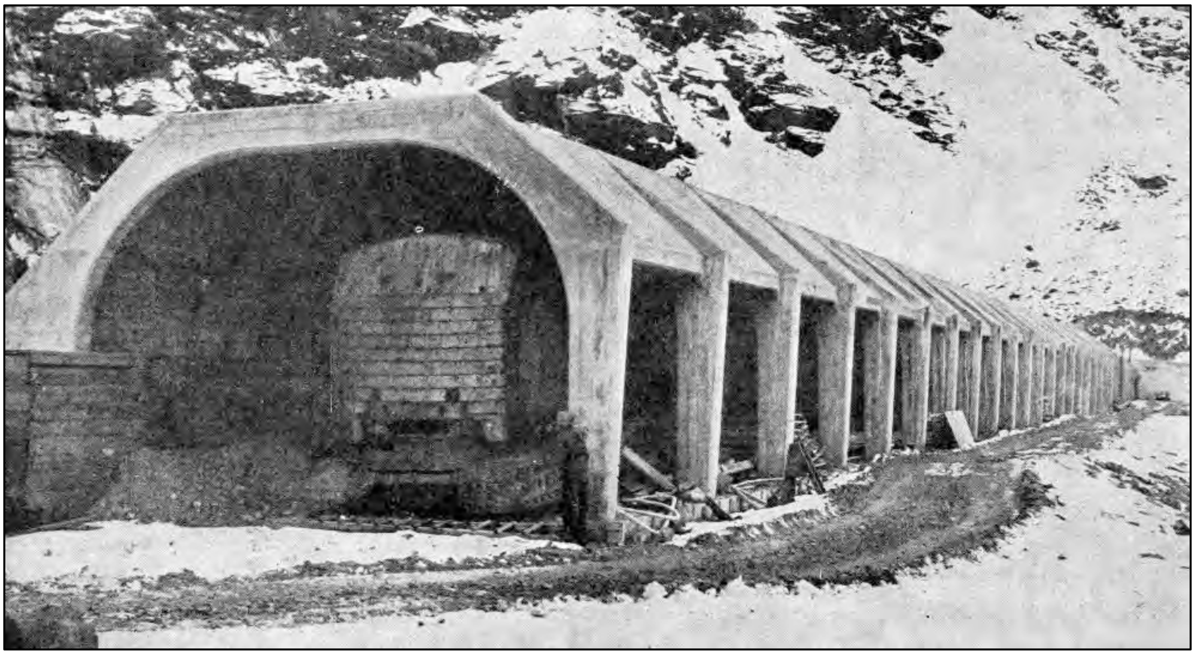

Figure 41. Photograph from July 1940 showing the original extent and design of the eastern avalanche protection.[78]

Finally, the design of the new avalanche shelter will improve the visibility of the portal stone façade. The roof of the new shelter rises where it meets the stone wall, enabling more of the stone façade to be visible to tunnel users.

[78] Auckland Council, AWNS 19400717.

Table 7. Overview of heritage design input.

Options	Pros	Cons	Rating
Reflect the design of the shelter in the replacement shelter.	Design mitigates some of the adverse impacts on the Tunnel's heritage values associated with the removal of the avalanche shelter (long-term); Moderate beneficial impact on vulnerability of the Homer Tunnel (long term) and ongoing use.	Minor alteration to the existing setting (long term).	4
Design the new shelter to improve the visibility of the stone façade.	Increased visibility and enhancement of visual and aesthetic values (long term).	None from a heritage perspective	5

Earthworks Management

It is proposed that the existing fill terrace adjacent to the eastern portal is excavated to provide the necessary fill for covering the southern side of the new shelter. This methodology has been proposed as the preferred approach from an ecological as well a health and safety perspective. Using the on-site fill will:

- Achieve the DOC preference for sourcing fill material from within the park. There are biosecurity concerns associated with bringing in fill from an outside source.
- Contribute towards the ecological rehabilitation of the eastern portal site.
- Remove the current carparking area that has been closed because of the health and safety risks associated with avalanche and rockfall around the eastern portal.

The previous geotechnical testing at the site indicates that much of the fill to be removed consists of the silty sand and gravel material that was deposited at the site at some point after 1983 (c.f., Figure 7, Figure 18, and Figure 32).

Table 8. Overview of earthworks management.

Options	Pros	Cons	Rating
Put in place an archaeological monitoring regime and accidental discovery protocol prior to terrace excavation to manage any potential archaeological material.	Ensures that any archaeological material present within the fill will be able be appropriately recorded if encountered by earthworks.	Archaeological material will still be disturbed by terrace excavation.	4

Excavation may also affect a limited amount of buried remains of the former avalanche shelter and miscellaneous refuse deposits associated with tunnel construction. It will not affect the visible avalanche shelter debris that partially makes up the 'significant fabric' of the Homer Tunnel Portal Avalanche Damage actively managed DOC historic site. This material will have been already removed from the site during the Phase 2 work. It should be reinstated following the completion of Phase 3 work. Some form of archaeological monitoring/recording should be undertaken during works to manage any historic material that might be encountered.

There will also be localised earthworks both sides of the road for the shelter foundations (see Figure 35) that may also affect buried remains.

Assessment Summary

The foundation excavations and excavation of the fill terrace are only expected to have a less than minor adverse effect on the site's heritage values. The new avalanche shelter itself will have no adverse effects on the Homer Tunnel's heritage value. Given that the design new shelter both evokes the appearance of the original avalanche shelter and better exposes the tunnel portal façade, it is assessed as providing some mitigation for the adverse effect of the historic shelter removal.

Alternative Options

No alternative options are proposed. Heritage design advice and construction management proposals from Origin Consultants were adopted by Waka Kotahi.

Recommendations

- NZTA should engage an archaeologist to oversee the earthworks.
- Stand over archaeological monitoring is not recommended given the low heritage value of the archaeological material that may be affected.
- Prior to any works commencing, earthworks contractors should be briefed by the archaeologist about the possibility of encountering archaeological material, how to identify possible archaeological material during works, contractors' responsibilities with regard to notification of the discovery of archaeological evidence.
- During earthworks, contractors should provide the archaeologist with weekly updates on excavation progress, any possible archaeological material encountered, and representative photographs.
- If a significant archaeological discovery is made during earthworks (e.g., intact mining machinery, human remains, buried in-situ structures), then a standard Accidental Discovery Protocol should be followed (Waka Kotahi Minimum Standard P45, or equivalent, Appendix B).
- Following earthworks, site D40/11 should be updated to provide a record of the site works and any archaeological discoveries.
- Following the completion of the Phase 3 works, the avalanche shelter debris pile removed during Phase 2 should be reinstated to the site shown in Figure 42.

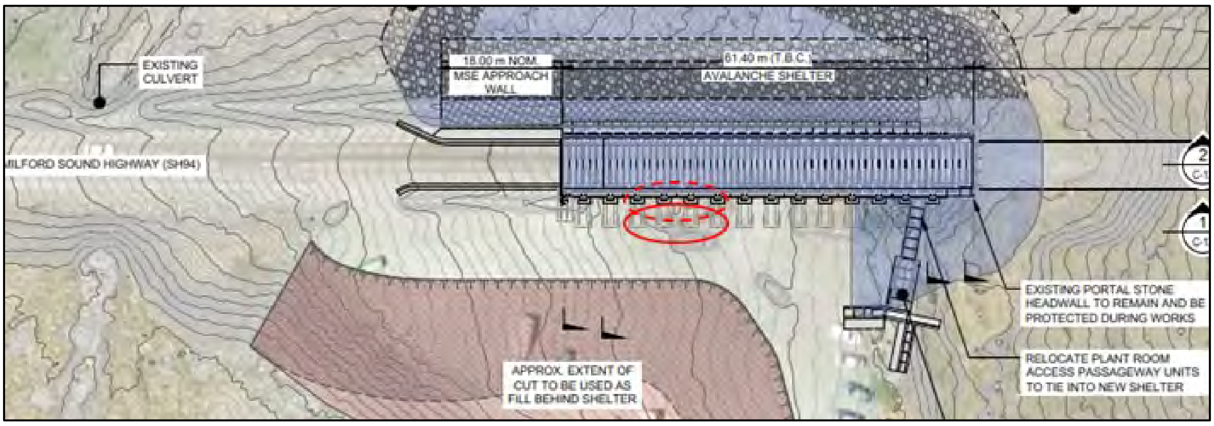

Figure 42. Site for debris relocation marked by the solid red oval. The dashed line indicates the original site of the debris prior to construction.[79]

[79] WSP.

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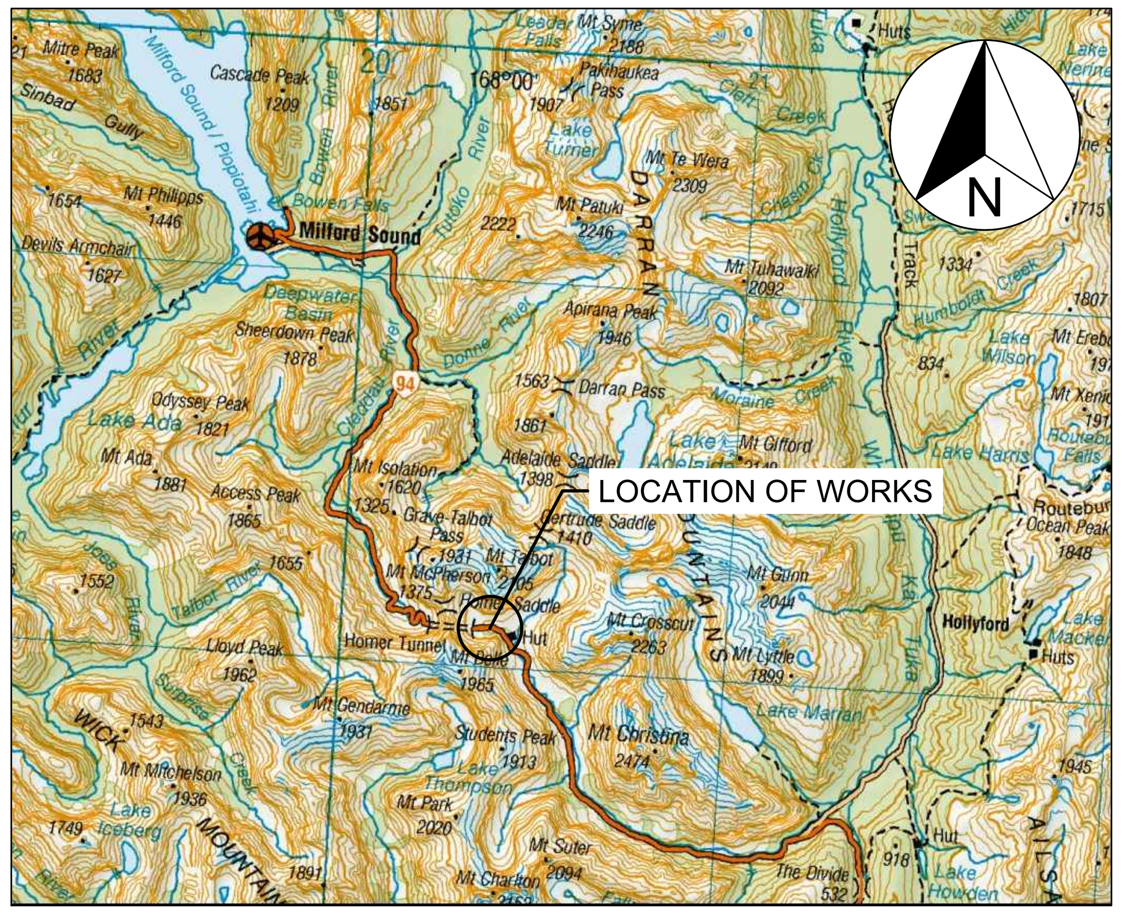
Appendix A – Proposed Designs

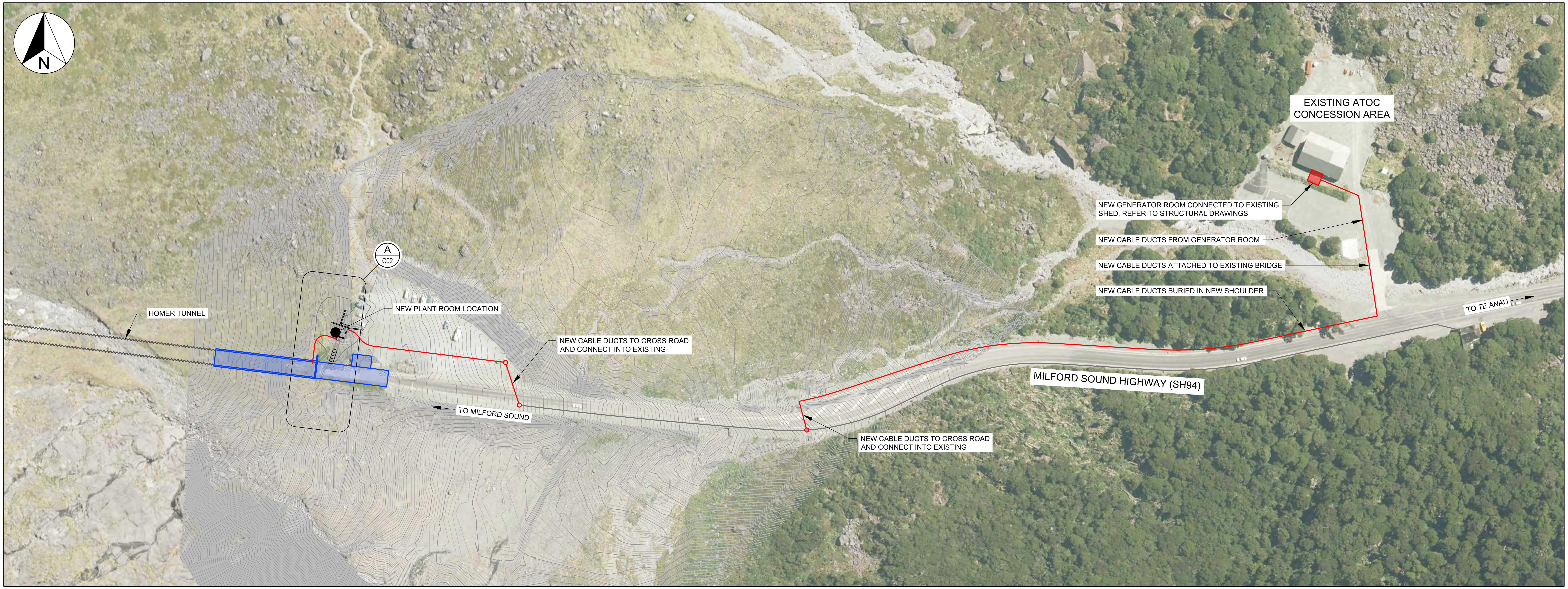


LOCATION PLAN

EASTERN TUNNEL PARKING AREA

EXISTING AVALANCHE SHELTER AND GENERATOR ROOM

PROPOSED GENERATOR BUILDING LOCATION



SITE PLAN
SCALE: 1:1000

1:1000@ A1 / 1:2000@ A3 — 0 10 20 30 40 50 60 70 80 90 100 m

REVISION	AMENDMENT	APPROVED	DATE
A	PRELIMINARY DESIGN	GL	2.09.2021

WAKA KOTAHI NZ TRANSPORT AGENCY

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New Zealand

CIVIL

SCALES: AS SHOWN
ORIGINAL SIZE: A1
DRAWN: T. BERRYMAN
DESIGNED: J. JENNINGS
APPROVED: G. LARCOMBE
DRAWING VERIFIED: J. JENNINGS
DESIGN VERIFIED: M. COWAN
APPROVED DATE: 2.09.2021

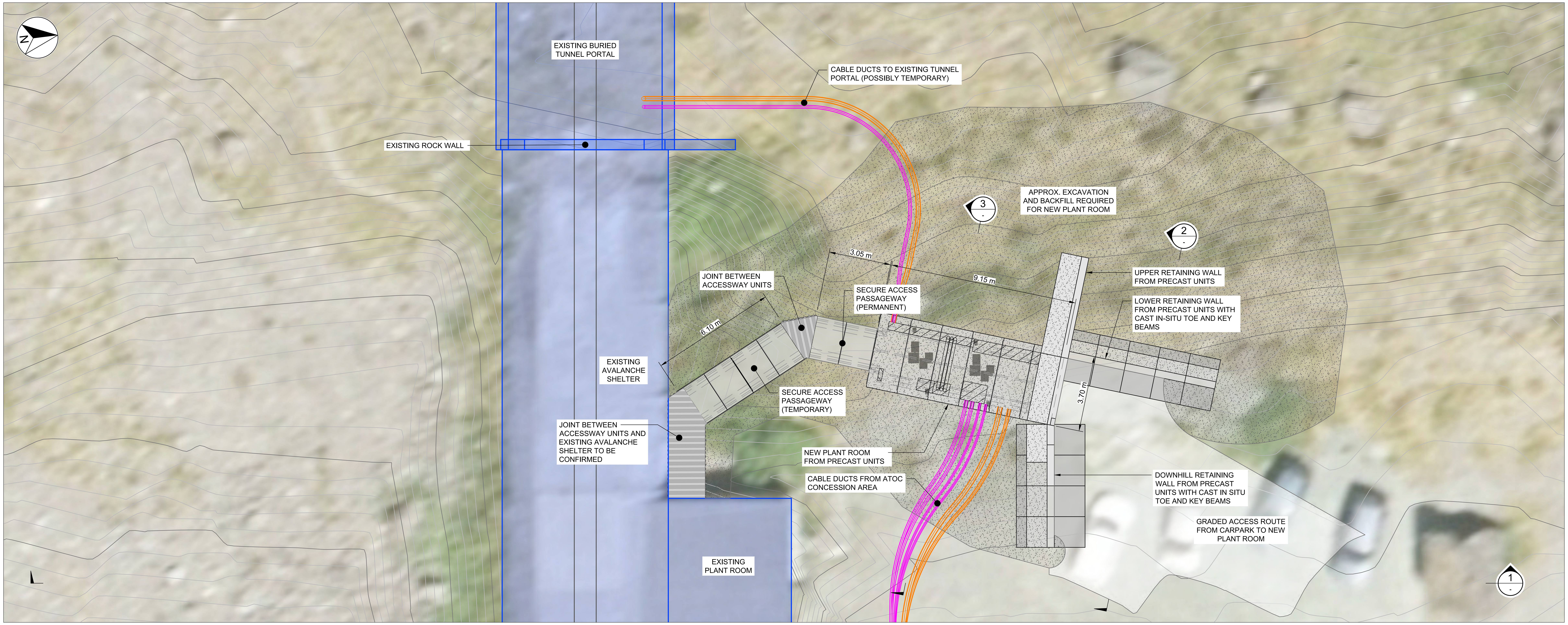
PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 1

TITLE
SITE PLAN

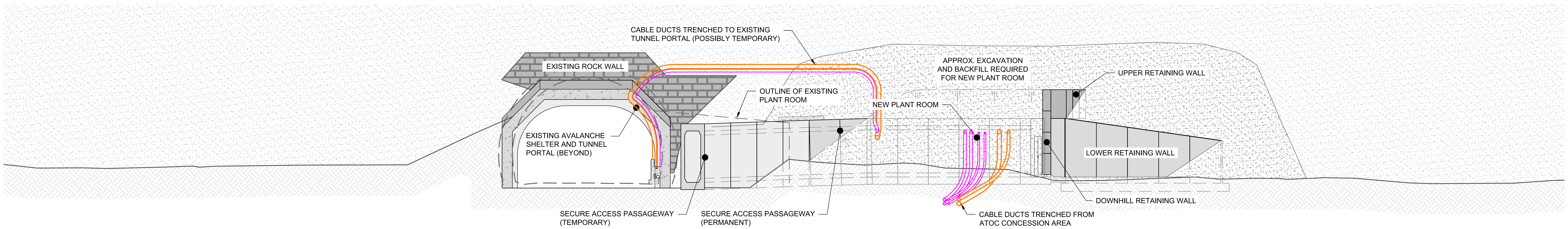
WSP PROJECT NO. (SUB-PROJECT): 6-DC734.00 (001)
SHEET NO.: C01
REVISION: A

Original sheet size A1 (841x594) Plot Date 2021-09-02 at 2:58:36 PM U:\ProjectsNZ\6d\6-DC734.00 SH94 Homer Tunnel Fire Life Safety\Home\014 Enabling Works\Drawings\6-DC734.00_001 HOMER TUNNEL IMPROVEMENTS - PHASE 1.dwg C01 - SITE PLAN



PLAN - NEW PLANT ROOM AND ACCESSWAY

SCALE: 1:100



1 SECTION - NEW PLANT ROOM AND ACCESSWAY

SCALE: 1:100

1:100@ A1
1:200@ A3 0 1 2 3 4 5 6 7 8 9 10 m

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR CONSENT	M.C.	2021-11-03

WAKA KOTAHI NZ TRANSPORT AGENCY

wsp
Christchurch Office
+64 3 363 5400
PO Box 1482
Christchurch 8140
New Zealand

CIVIL

SCALES: 1:50
ORIGINAL SIZE: A1

DRAWN	DESIGNED	APPROVED
J. MACDONALD	J. JENNINGS	M. COWAN
DRAWING VERIFIED	**DESIGN VERIFIED**	**APPROVED DATE**
B. MCHAFFIE	B. MCHAFFIE	2021-11-03

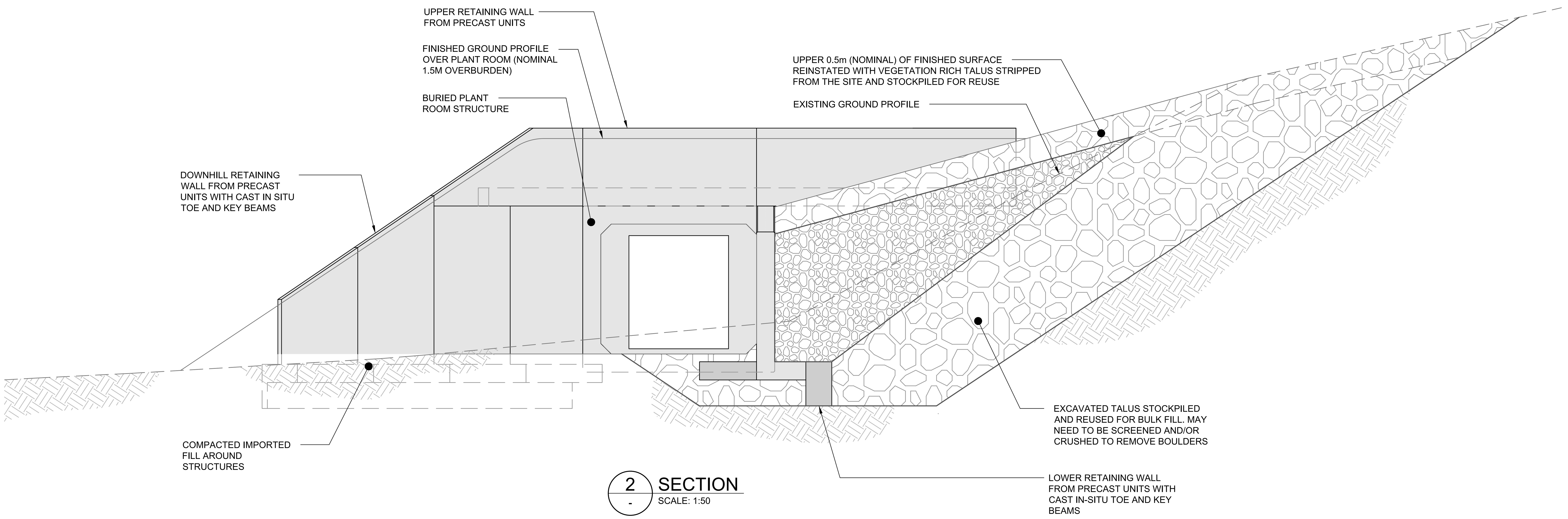
FOR CONSENT

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 1

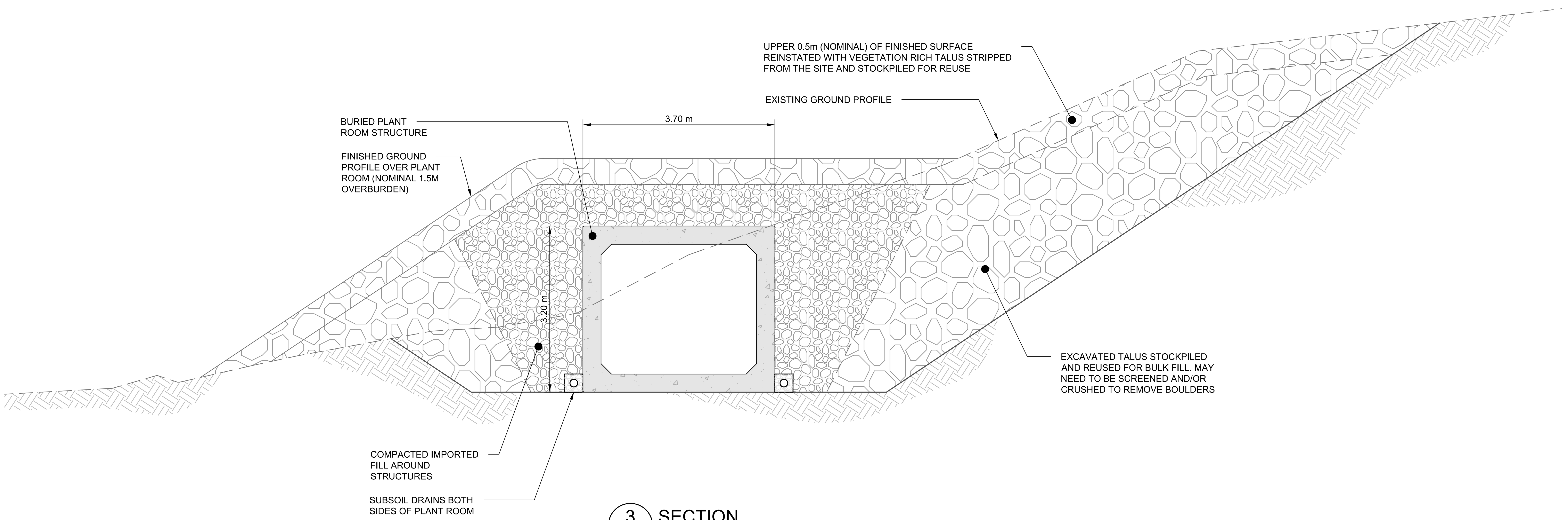
TITLE
PROPOSED PLANT ROOM AND ACCESSWAY
PLAN

WSP PROJECT NO. (SUB-PROJECT): 6-DC734.00 (003)
SHEET NO.: C01
REVISION: A

Original sheet size A1 (841x594) Plot Date 2021-11-03 at 9:37:50 AM \\corp.pbwan.net\ANZ\ProjectsNZ\6d\6-DC734.00 SH94 Homer Tunnel Fire Life Safety\Home\014 Enabling Works\Drawings\6-DC734.00_003-C01-C02(A).dwg C01



2 SECTION
-
SCALE: 1:50



3 SECTION
-
SCALE: 1:50

1:50@ A1
1:100@ A3
0 1 2 3 4 5 m

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR CONSENT	M.C.	2021-11-03

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Christchurch 8140
New Zealand

CIVIL

SCALES: 1:50
ORIGINAL SIZE: A1

DRAWN	DESIGNED	APPROVED
J. MACDONALD	J. JENNINGS	M. COWAN
DRAWING VERIFIED	**DESIGN VERIFIED**	**APPROVED DATE**
B. MCHAFFIE	B. MCHAFFIE	2021-11-03

FOR CONSENT

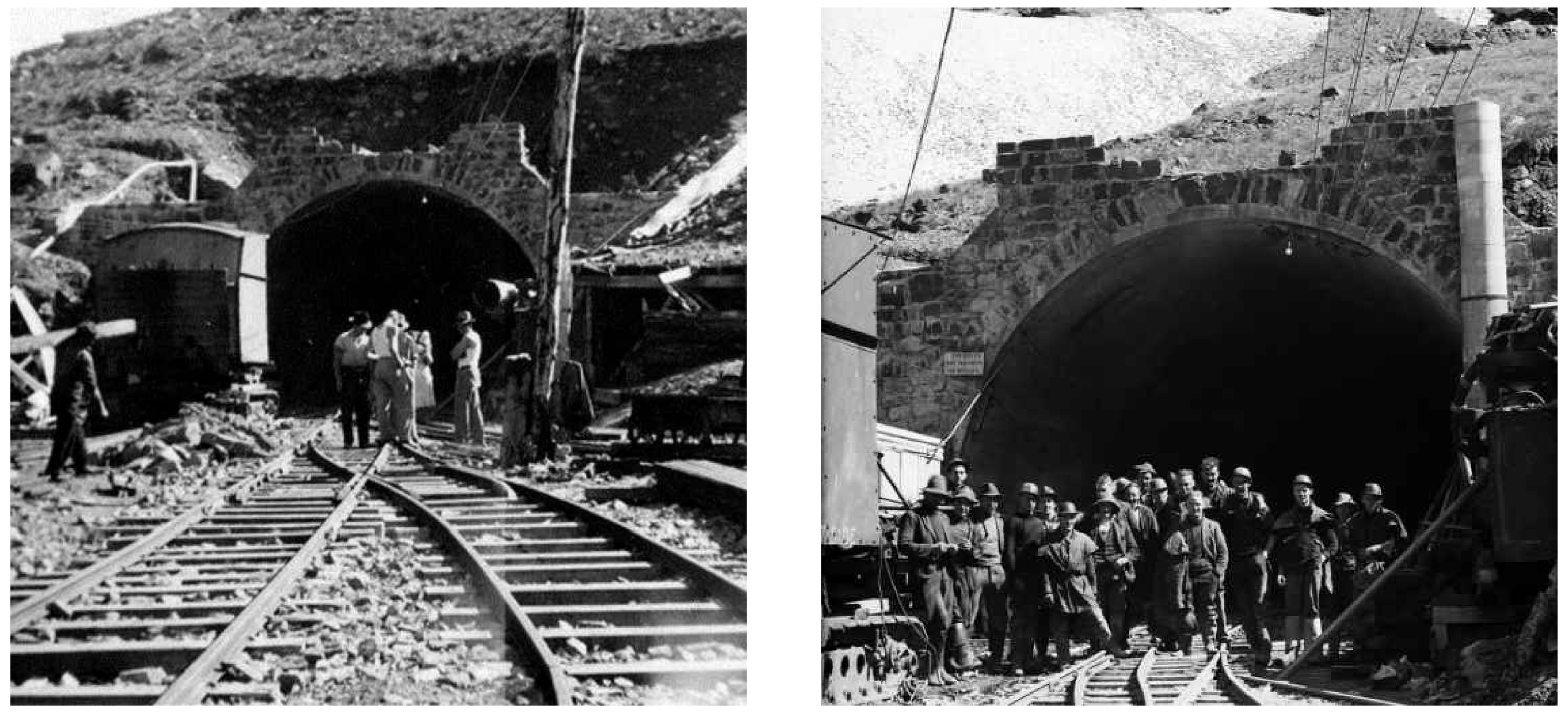
PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 1

TITLE
PROPOSED PLANT ROOM AND ACCESSWAY
SECTIONS

WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DC734.00 (003)	C02	A

Original sheet size A1 (841x594) Plot Date 2021-11-03 at 9:37:51 AM \\corp.pbwan.net\ANZ\ProjectsNZ\6d\6-DC734.00 SH94 Homer Tunnel Fire Life Safety\Home\014 Enabling Works\Drawings\6-DC734.00_003-C01-C02(A).dwg C02

CURRENT WALL PHOTO



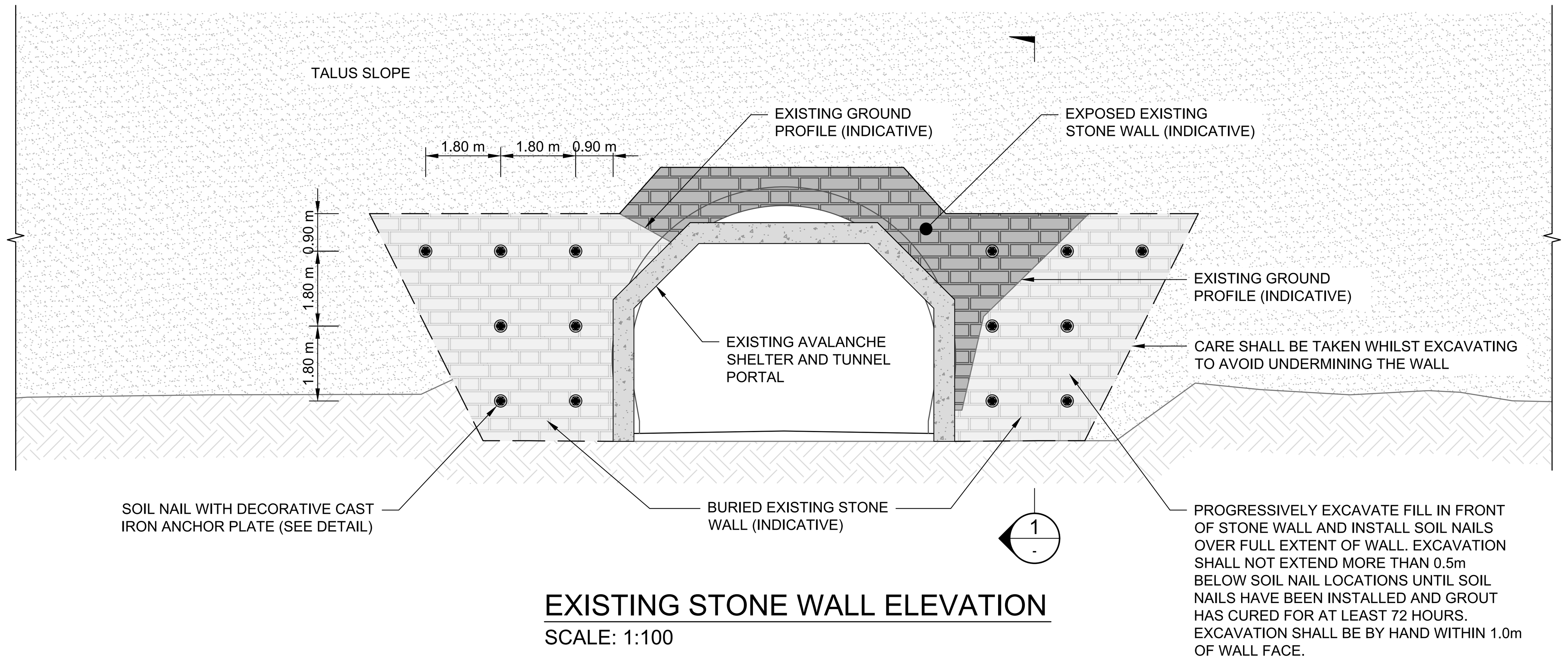
HISTORIC WALL PHOTOS

SOIL NAIL NOTES:

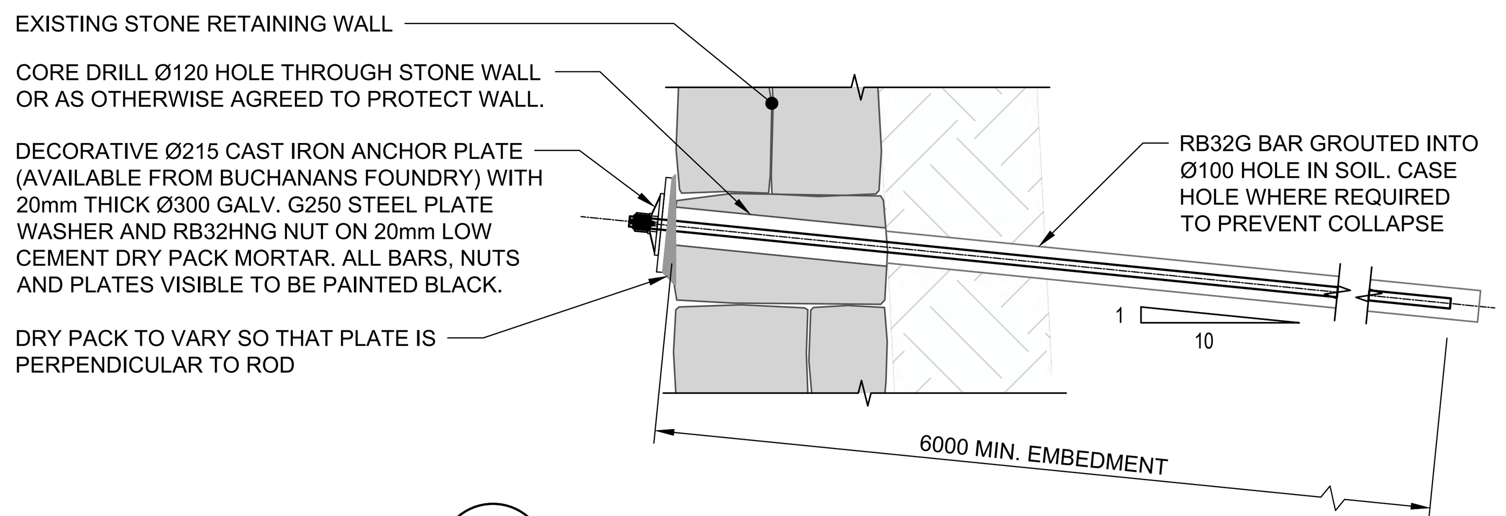
1. THE PROPOSED ANCHOR SYSTEM FOR STABILISING THE EXISTING WALL CONSISTS OF DRILLED AND GROUTED REIDBAR SOIL NAILS (GROUND ANCHORS).
2. DRILLED HOLES FOR SOIL NAILS SHALL BE CASED WHERE REQUIRED TO PREVENT HOLE COLLAPSE.
3. THE SOIL NAILS ARE TO BE INSTALLED TO DEVELOP THE ULTIMATE DEPENDABLE CAPACITIES OUTLINED BELOW FOR PROOF LOADING REQUIREMENTS.
4. PROOF LOADING SHALL BE UNDERTAKEN ON INSTALLED ANCHORS TO THE FOLLOWING LOADS:
   - 30KN FOR THE UPPER SOIL NAILS;
   - 100KN FOR THE CENTRAL CENTRAL SOIL NAILS; AND
   - 165KN FOR THE LOWER SOIL NAILS.
4. TESTING SHALL BE UNDERTAKEN AS DESCRIBED IN THE PROJECT SPECIFICATION.

EXCAVATION NOTES:

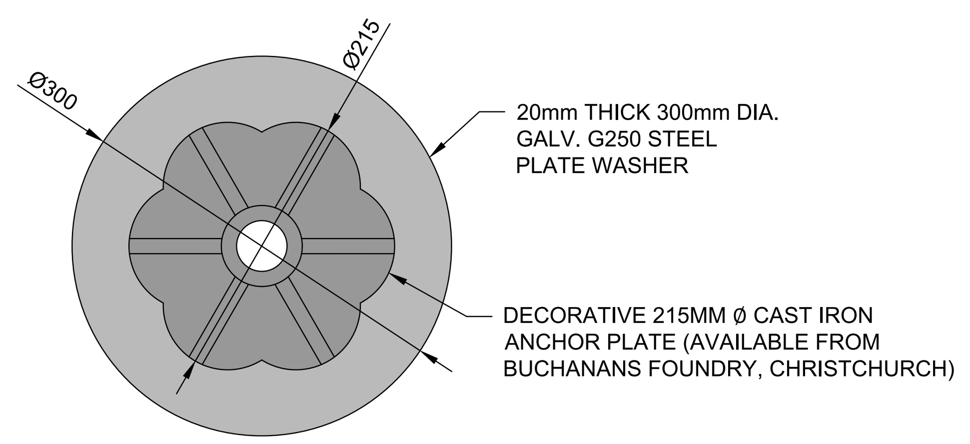
1. EXCAVATION SHALL BE UNDERTAKEN TO DETERMINE THE EXTENTS OF THE EXISTING STONE WALL.
2. EXCAVATION SHALL BE CAREFULLY PROGRESSED TO ENSURE THE EXISTING WALL IS NOT DAMAGED OR DESTABILISED.
3. SOIL NAILS SHALL BE INSTALLED AS EXCAVATION PROGRESSES. THE EXTENT OF EXCAVATION BELOW A ROW OF SOIL NAILS SHALL BE LIMITED TO THE ABSOLUTE MINIMUM REQUIRED FOR INSTALLATION (NOMINALLY 0.5m) UNTIL THE SOIL NAILS ARE FULLY INSTALLED AND THE GROUT HAS CURED FOR AT LEAST 72 HOURS.
4. MECHANICAL EXCAVATION MAY BE USED UP TO WITHIN 1.0m OF THE WALL FACE. EXCAVATION WITHIN 1.0m OF THE WALL FACE SHALL BE UNDERTAKEN WITH NON-POWERED HAND TOOLS.
5. CARE SHALL BE TAKEN TO NOT UNDERMINE THE WALL.



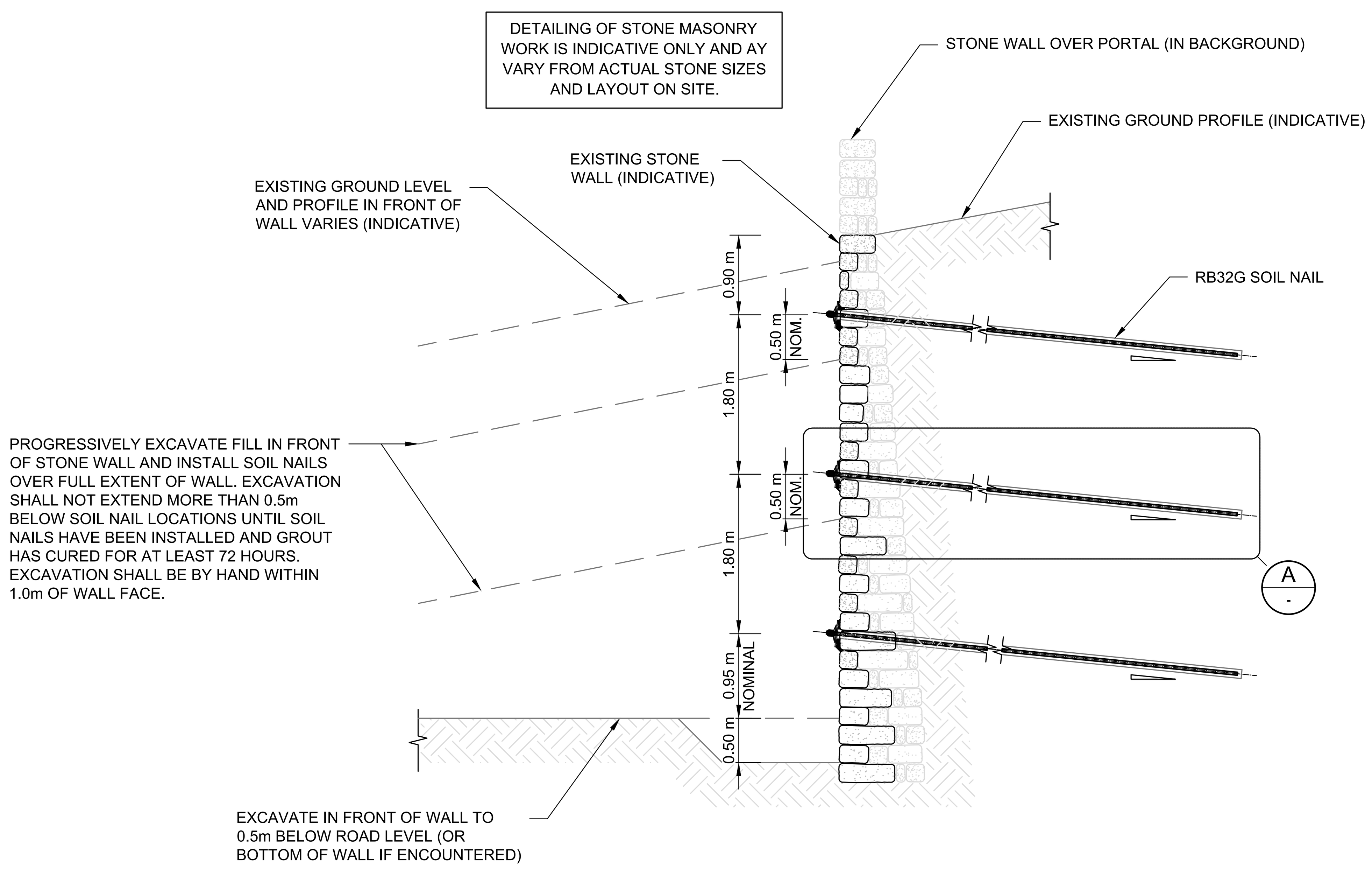
EXISTING STONE WALL ELEVATION
SCALE: 1:100



A - TYPICAL ANCHOR DETAIL
SCALE: 1:20



FRONT VIEW OF ANCHOR PLATE ARRANGEMENT
SCALE: 1:5



1 - SECTION THROUGH STONE WALL
SCALE: 1:50

1:50@ A1 1:100@ A3 — 0 1000 2000 3000 4000 5000 mm

1:20@ A1 1:40@ A3 — 0 200 400 600 800 1000 1200 1400 1600 1800 2000 mm

1:5@ A1 1:10@ A3 — 0 50 100 150 200 250 300 350 400 450 500 mm

REVISION	AMENDMENT	APPROVED	DATE
A	PRELIMINARY DESIGN		

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CIVIL

SCALES: AS SHOWN — ORIGINAL SIZE: A1

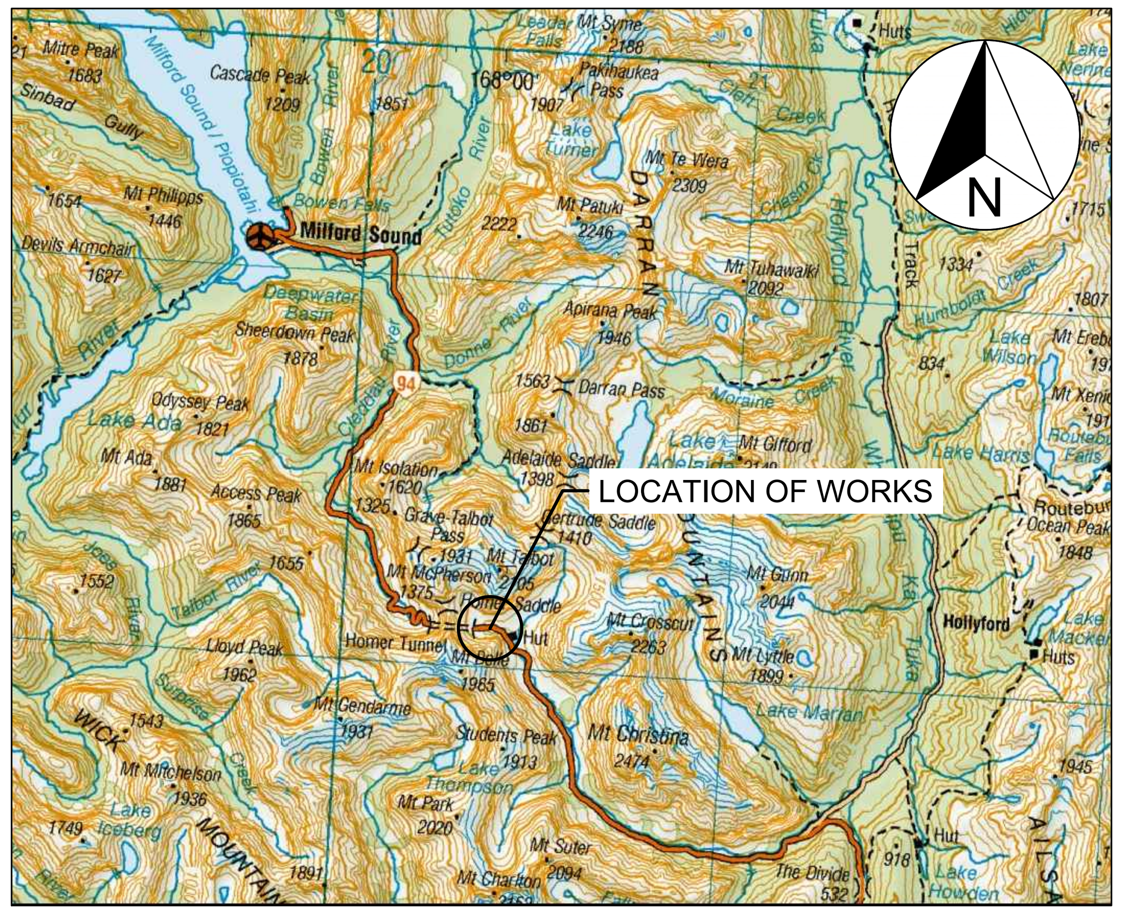
DRAWN	DESIGNED	APPROVED
T. BERRYMAN	B. McHAFFIE	G. LARCOMBE
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
J. JENNINGS	J. JENNINGS	

PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 1

TITLE
EXISTING PORTAL
MASONRY HEADWALL STRENGTHENING

WSP PROJECT NO. (SUB-PROJECT): 6-DC734.00 (001) — SHEET NO.: C11 — REVISION: A

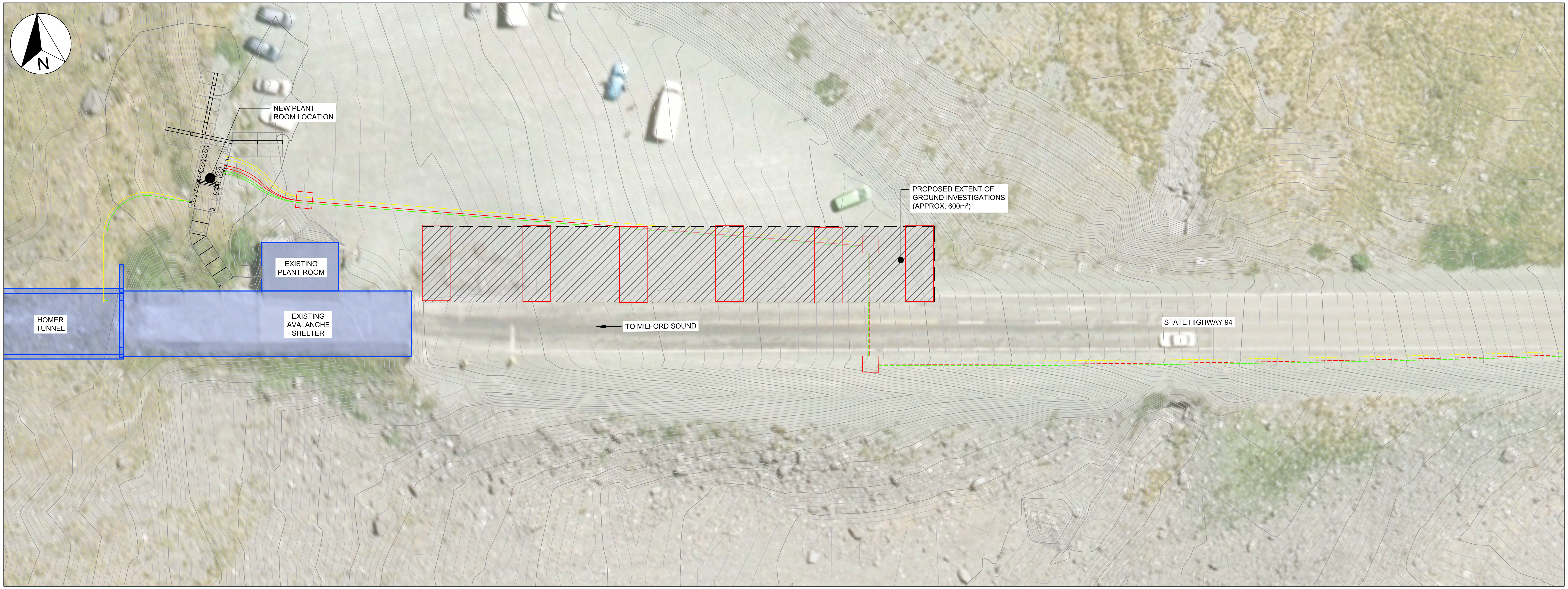


LOCATION PLAN

EASTERN TUNNEL PARKING AREA

EXISTING AVALANCHE SHELTER AND GENERATOR ROOM

PROPOSED GENERATOR BUILDING LOCATION



SITE PLAN

SCALE: 1:250

1:250@ A1
1:500@ A3
0 4 8 12 16 20 24 m

300 mm 200 100 50 10 mm 0

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR CONSENT	G.L.	2021-11-18

WAKA KOTAHI
NZ TRANSPORT AGENCY

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Christchurch 8140
New Zealand

CIVIL

SCALES		ORIGINAL SIZE
AS SHOWN		A1
DRAWN	DESIGNED	APPROVED
T. BERRYMAN	J. JENNINGS	G. LARCOMBE
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
J. JENNINGS	B. McHAFFIE	2021-11-18

FOR CONSENT

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 1

TITLE
SITE PLAN
PROPOSED EXTENT OF GROUND INVESTIGATIONS

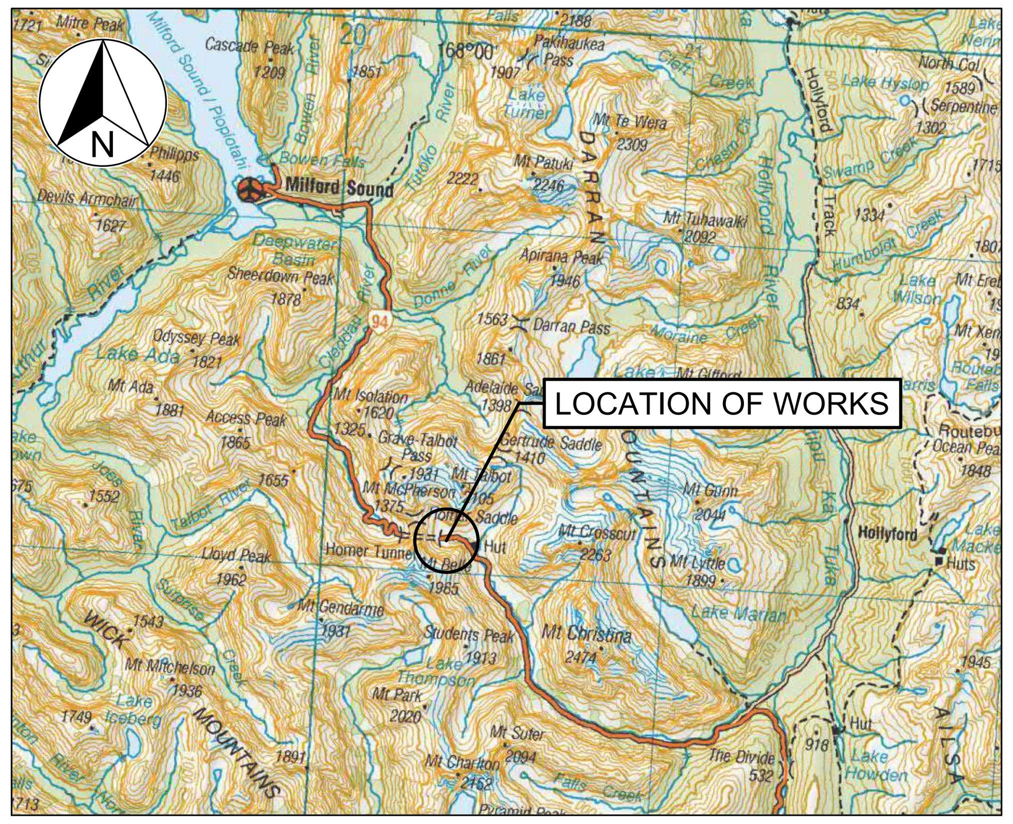
WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DC734.00 (004)	C02	A

Original sheet size A1 (841x594) Plot Date 2021-11-18 at 1:02:11 PM \\corp.pbwan.net\ANZ\ProjectsNZ\6d\6-DC734.00 SH94 Homer Tunnel Fire Life Safety\Home\014 Enabling Works\Drawings\6-DC734.00_004-C01(A).dwg C02 - SITE PLAN

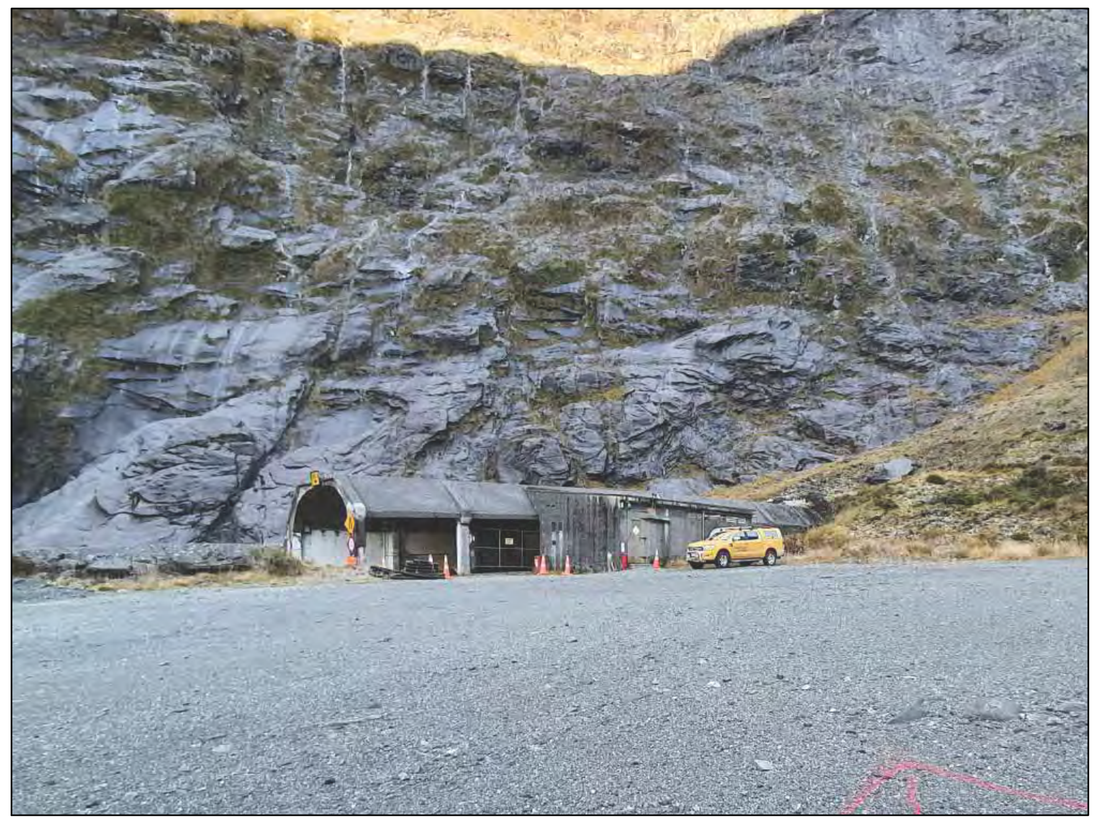
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

CIVIL
PRELIMINARY

Project No: 6-DK546.00
Date: 2022-08-26



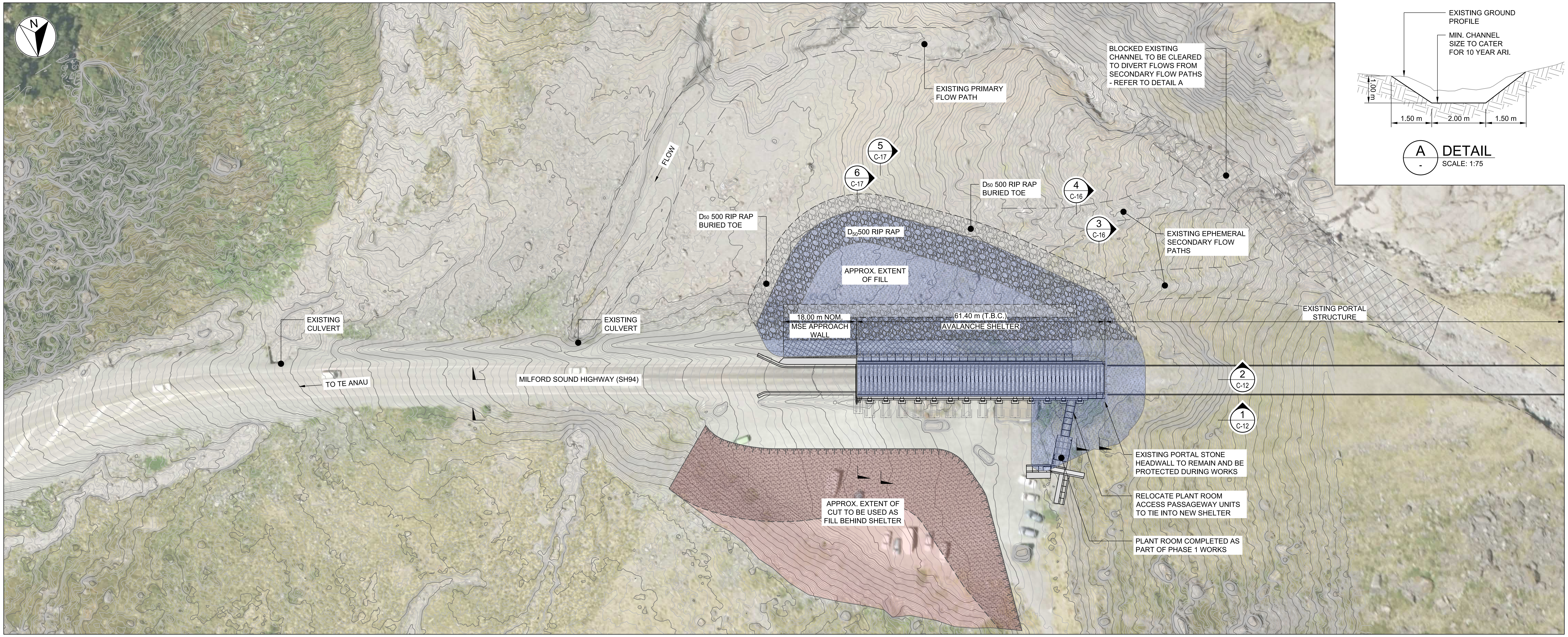
LOCATION PLAN



EXISTING AVALANCHE SHELTER

EXISTING AVALANCHE SHELTER AND PLANT ROOM

EXISTING PORTAL STONE HEADWALL



A DETAIL
SCALE: 1:75

SITE PLAN
SCALE: 1:500

1:500@ A1
1:1000@ A3
0 5 10 15 20 25 30 35 40 45 50 m

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR CONSENT	M.C.	2022-05-20
B	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

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wsp
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New Zealand

CIVIL

SCALES: AS SHOWN @ A1
ORIGINAL SIZE: A1

DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	**DESIGN VERIFIED**	**APPROVED DATE**
T. BERRYMAN	B. MCHAFFIE	2022-08-26

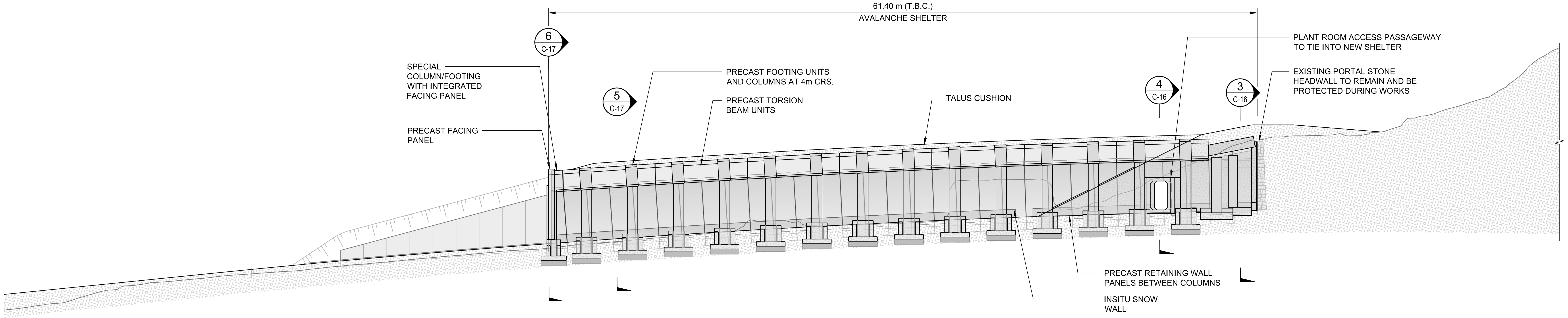
PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

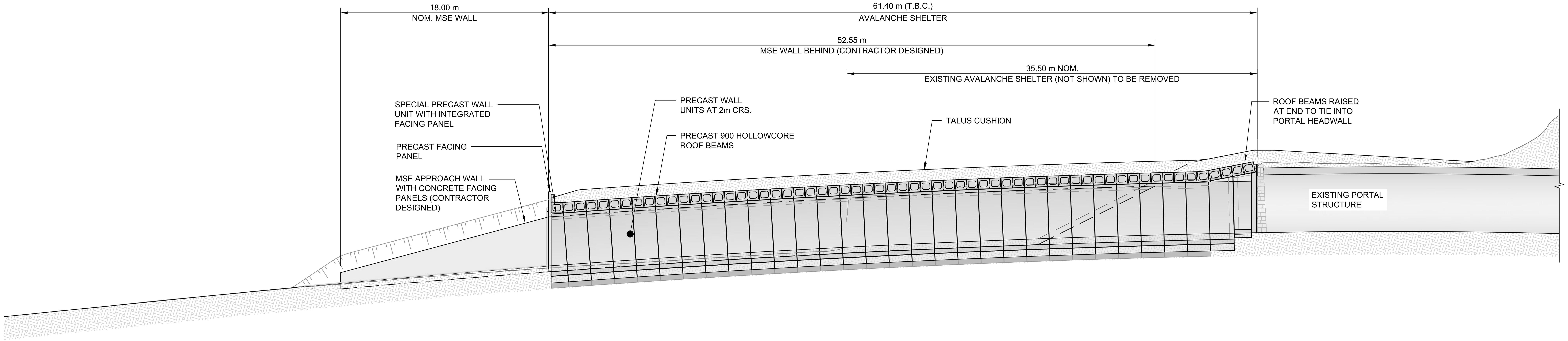
TITLE
GENERAL ARRANGEMENT
SITE PLAN

WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DK546.00	C-11	B

Original sheet size A1 (841x594) Plot Date 2022-08-23 at 3:51:19 PM \\corp.pbwan.net\ANZ\ProjectsNZ\6d\6-DK546.00 Homer Tunnel Avalanche Shelter Pre-imp &\Home\07_Drawings\CAD\6-DK546.00_C11-C20.dwg C-11



1 -
ELEVATION - AVALANCHE SHELTER
SCALE: 1:200



2 -
LONGSECTION - AVALANCHE SHELTER
SCALE: 1:200

1:250@ A1
1:500@ A3
0 4 8 12 16 20 24 m

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR CONSENT	M.C.	2022-05-20
B	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

WAKA KOTAHI
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Christchurch 8140
New Zealand

CIVIL

SCALES		ORIGINAL SIZE
AS SHOWN @ A1		A1
DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
T. BERRYMAN	B. MCHAFFIE	2022-08-26

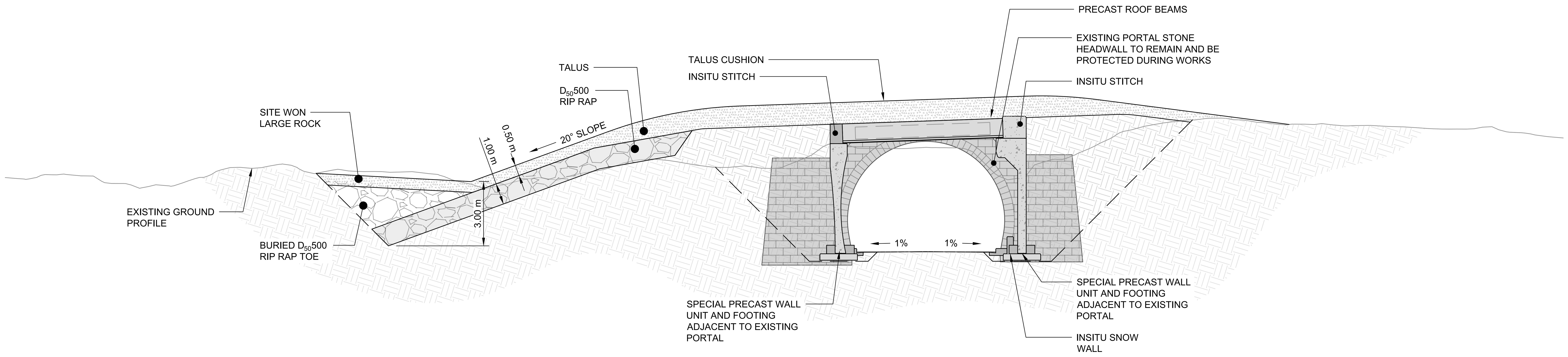
PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

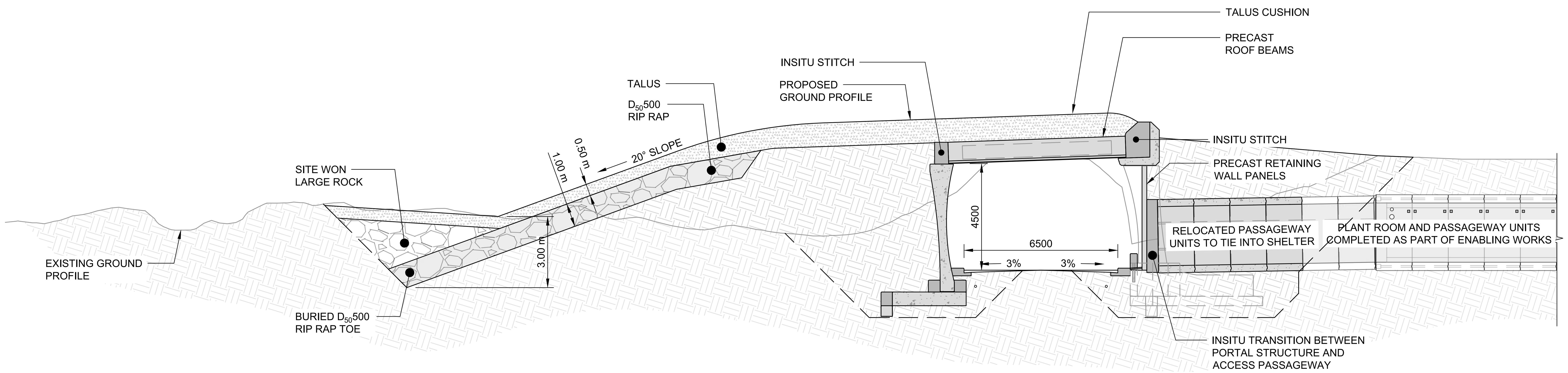
TITLE
GENERAL ARRANGEMENT
ELEVATIONS

WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DK546.00	C-12	B

Original sheet size A1 (841x594) Plot Date 2022-08-23 at 3:51:33 PM \\corp.pbwan.net\ANZ\ProjectsNZ\6d\6-DK546.00 Homer Tunnel Avalanche Shelter Pre-imp &\Home\07_Drawings\CAD\6-DK546.00_C11-C20.dwg C-12



3 SECTION
C-11 SCALE: 1:100



4 SECTION
C-11 SCALE: 1:100

1:100 @ A1
1:200 @ A3 0 2000 4000 6000 8000 10000 mm

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR CONSENT	M.C.	2022-05-20
B	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

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SCALES		ORIGINAL SIZE
AS SHOWN @ A1		A1
DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
T. BERRYMAN	B. MCHAFFIE	2022-08-26

PRELIMINARY

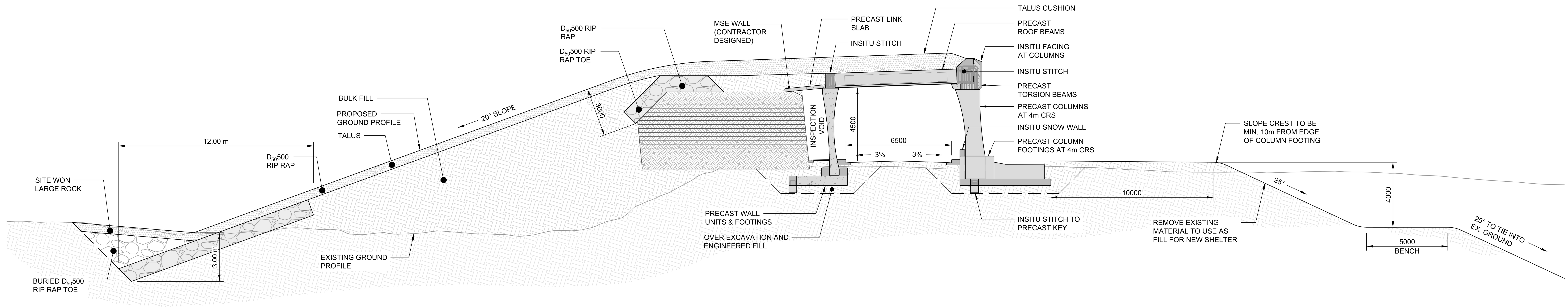
PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
GENERAL ARRANGEMENT
TYPICAL SECTIONS

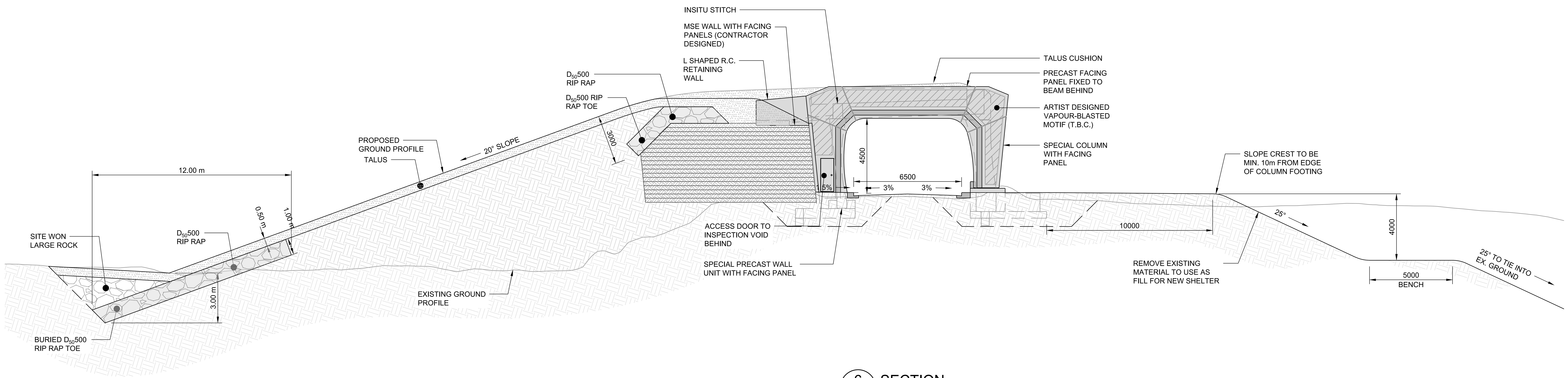
WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DK546.00	C-16	B

Original sheet size A1 (841x594) Plot Date 2022-08-23 at 3:51:40 PM \\corp.pbwan.net\ANZ\ProjectsNZ\6d\6-DK546.00 Homer Tunnel Avalanche Shelter Pre-imp &\Home\07_Drawings\CAD\6-DK546.00_C11-C20.dwg C-16

300 mm
200
100
50
10 mm
0



5 C-11 SECTION
SCALE: 1:125



6 C-11 SECTION
SCALE: 1:100

1:100@ A1 1:200@ A3 0 2000 4000 6000 8000 10000 mm

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR CONSENT	M.C.	2022-05-20
B	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

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New Zealand

CIVIL

SCALES: AS SHOWN @ A1
ORIGINAL SIZE: A1

DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
T. BERRYMAN	B. MCHAFFIE	2022-08-26

PRELIMINARY

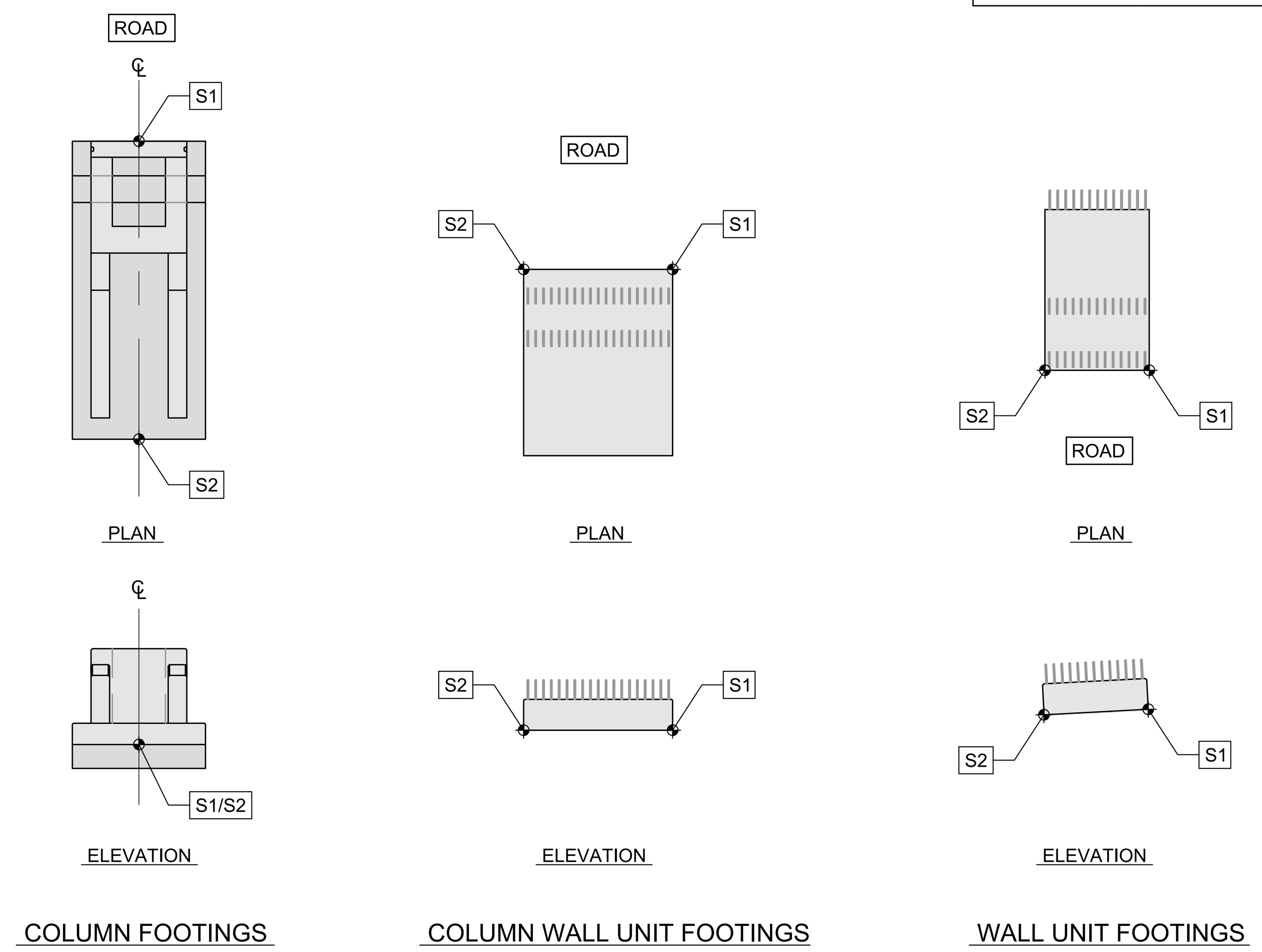
PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
GENERAL ARRANGEMENT
TYPICAL SECTIONS

WSP PROJECT NO. (SUB-PROJECT): 6-DK546.00
SHEET NO.: C-17
REVISION: B

PLAN
SCALE: 1:100

NOTE: SHELTER STRUCTURE ABOVE FOOTING LEVEL OMITTED FOR CLARITY



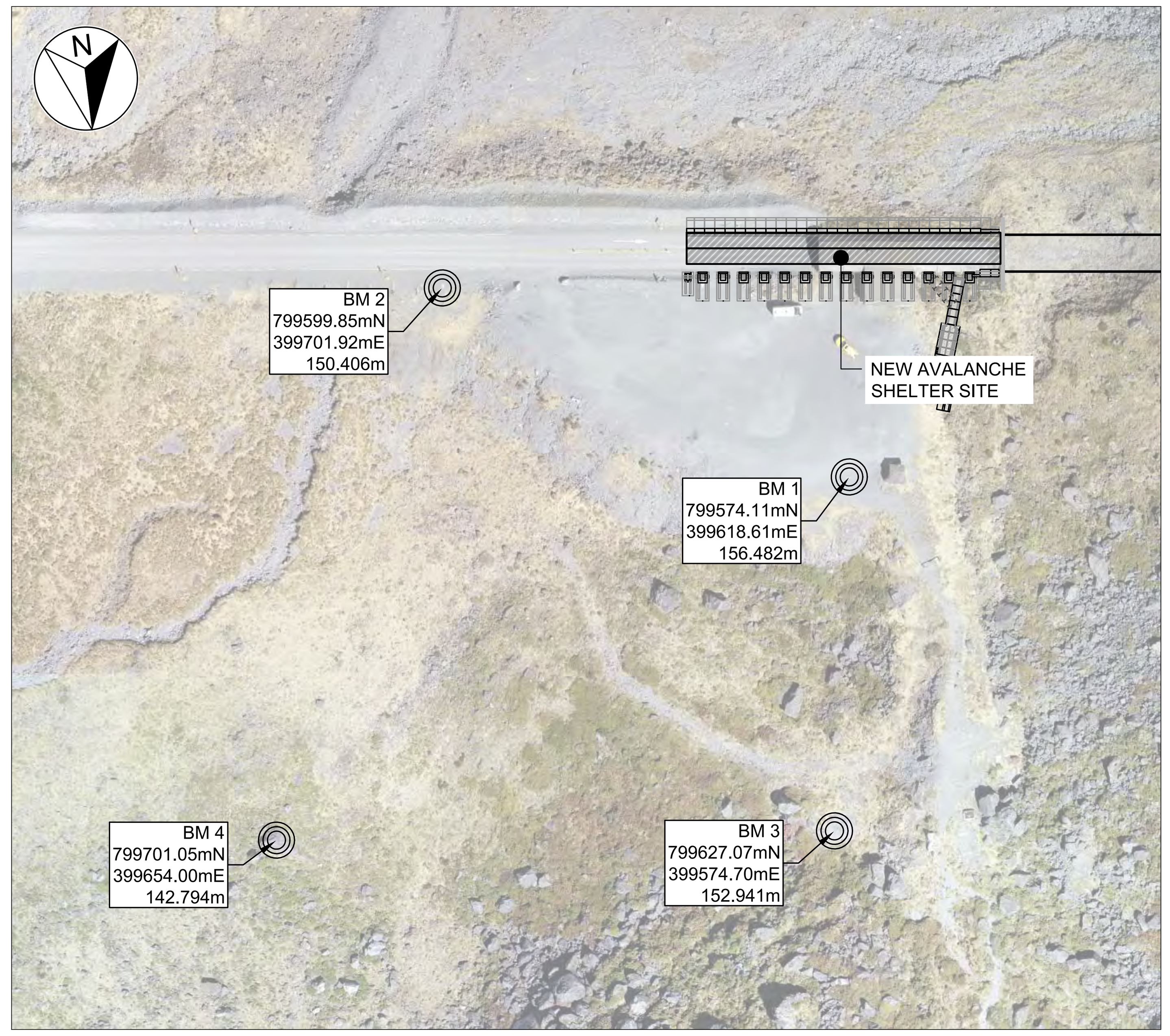
FOUNDATION ELEMENTS - TYPICAL SETOUT LOCATIONS
SCALE: 1:150

SETOUT NOTES:

1. SETOUT COORDINATES GIVEN ARE NOT IN RELATION TO ANY SURVEY PROJECTION OR HEIGHT DATUM.
2. COORDINATES GIVEN ARE IN RELATION TO SURVEY MARKS AS LOCATED ON PLAN.
3. WALL UNITS ARE FOUNDED ON A VERTICAL CURVE WHILE COLUMN FOOTING UNITS ARE FOUNDED ON A HORIZONTAL PLANE.
4. ACCURATE SETOUT OF THE COLUMN FOOTINGS IS CRITICAL IN ORDER TO LAND THE PRECAST TORSION BEAMS.

Coordinate Schedule

Northing	Easting	Level	Description
799574.11	399618.61	156.482	BM 1
799599.85	399701.92	150.406	BM 2
799627.07	399574.70	152.941	BM 3
799701.05	399654.00	142.794	BM 4



SURVEY MARK LOCATION PLAN
SCALE: 1:1000

1:100 @ A1
1:200 @ A3
0 2000 4000 6000 8000 10000 mm

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

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New Zealand

CIVIL

SCALES: AS SHOWN @ A1
ORIGINAL SIZE: A1
DRAWN: J. MACDONALD
DESIGNED: P. ROUTLEDGE
APPROVED: M. COWAN
DRAWING VERIFIED: P. ROUTLEDGE
DESIGN VERIFIED: B. MCHAFFIE
APPROVED DATE: 2022-08-26

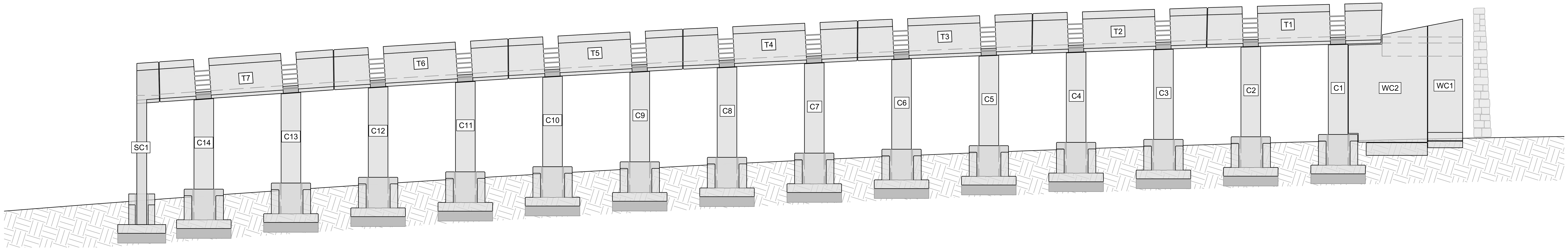
PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

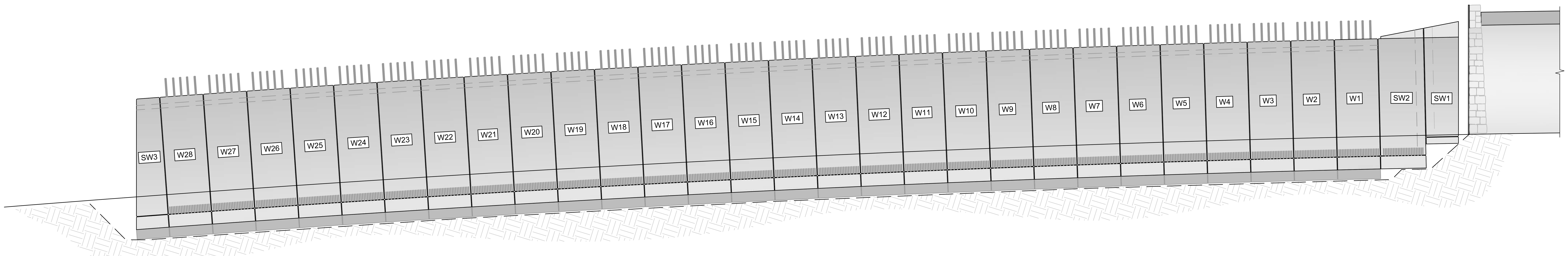
TITLE
SETOUT
PRECAST FOUNDATION ELEMENTS - PLAN

WSP PROJECT NO. (SUB-PROJECT): 6-DK546.00
SHEET NO.: C-31
REVISION: A

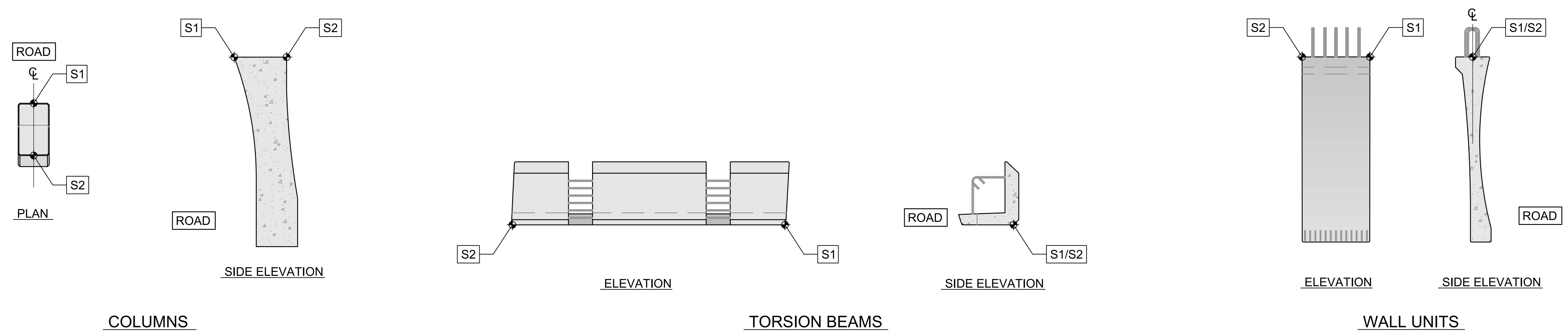
Original sheet size A1 (841x594) Plot Date 2022-08-23 at 3:39:52 PM \\corp.pbwan.net\ANZ\ProjectsNZ\6d\6-DK546.00 Homer Tunnel Avalanche Shelter Pre-imp &\Home\07_Drawings\CAD\6-DK546.00_C31-C40.dwg C-31



ELEVATION - COLUMN, WALL UNIT AND TORSION BEAM INSTALLATION
SCALE: 1:100



ELEVATION - WALL UNIT INSTALLATION
SCALE: 1:100



PRECAST ELEMENTS - TYPICAL SETOUT LOCATIONS
SCALE: 1:150

1:100@ A1
1:200@ A3
0 2000 4000 6000 8000 10000 mm

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

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New Zealand

CIVIL

SCALES		ORIGINAL SIZE
AS SHOWN @ A1		A1
DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
P. ROUTLEDGE	B. MCHAFFIE	2022-08-26

PRELIMINARY

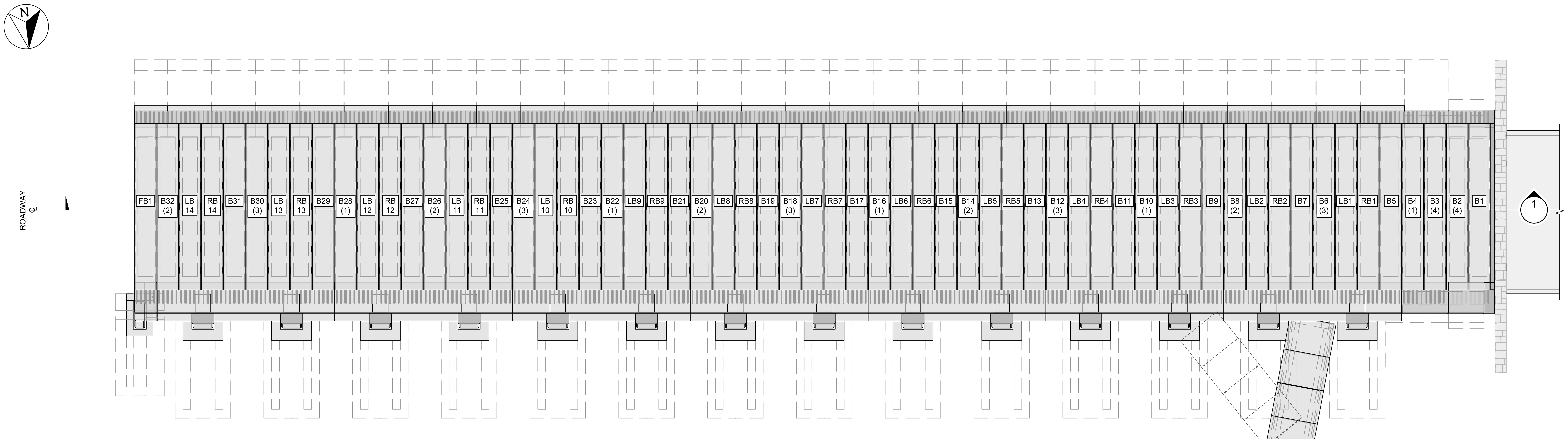
PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
SETOUT
COLUMNS & WALL UNIT - ELEVATIONS

WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DK546.00	C-32	A

NOTES:

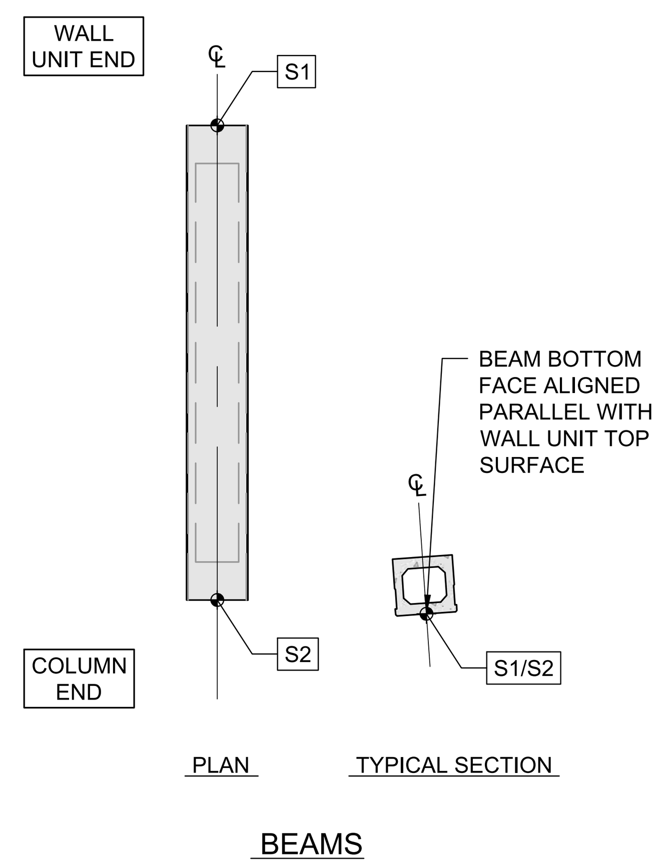
1.



PLAN - PRECAST BEAM SETOUT

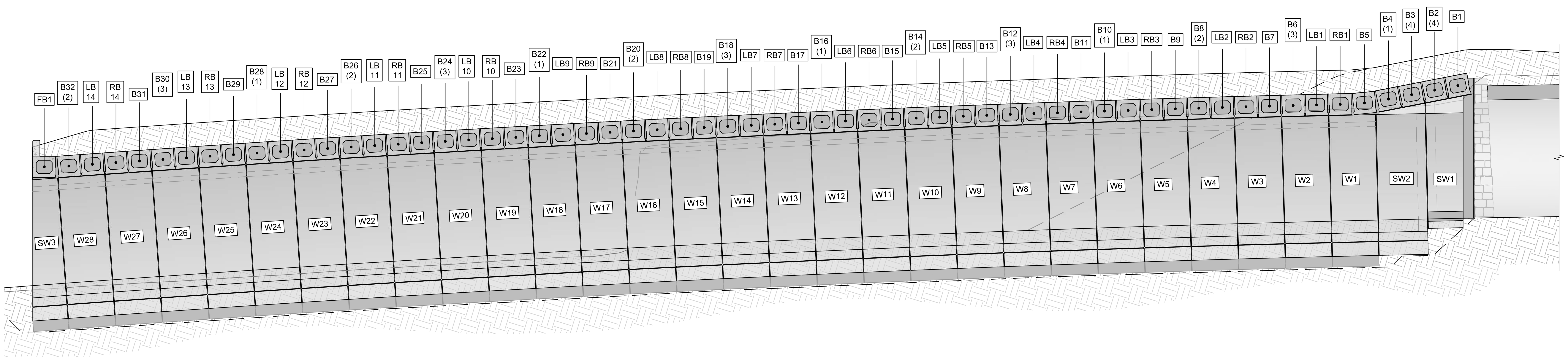
SCALE: 1:100

NOTE: NUMBERS IN BRACKETS (#) INDICATE REQUIRED SERVICE DUCT LAYOUT - REFER TO SHEET C-177 FOR TYPICAL SERVICE DUCT LAYOUTS



TYPICAL SETOUT LOCATIONS

SCALE: 1:100



1 ELEVATION - PRECAST BEAM SETOUT

SCALE: 1:100

1:100 @ A1
1:200 @ A3 0 2000 4000 6000 8000 10000 mm

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

WAKA KOTAHI NZ TRANSPORT AGENCY

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CIVIL

SCALES		ORIGINAL SIZE
AS SHOWN @ A1		A1
DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
P. ROUTLEDGE	B. MCHAFFIE	2022-08-26

PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
SETOUT
BEAMS - PLAN & ELEVATION

WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DK546.00	C-33	A

Original sheet size A1 (841x594) Plot Date 2022-08-23 at 3:40:24 PM \\corp.pbwan.net\ANZ\ProjectsNZ\6d\6-DK546.00 Homer Tunnel Avalanche Shelter Pre-imp &\Home\07_Drawings\CAD\6-DK546.00_C31-C40.dwg C-33

WALL FOOTING SETOUT

ELEMENT	SETOUT POINT	NORTHING	EASTING	LEVEL
WF1	S1			
	S2			
WF2	S1			
	S2			
WF3	S1			
	S2			
WF4	S1			
	S2			
WF5	S1			
	S2			
WF6	S1			
	S2			
WF7	S1			
	S2			
WF8	S1			
	S2			
WF9	S1			
	S2			
WF10	S1			
	S2			
WF11	S1			
	S2			
WF12	S1			
	S2			
WF13	S1			
	S2			
WF14	S1			
	S2			
WF15	S1			
	S2			
WF16	S1			
	S2			
WF17	S1			
	S2			
WF18	S1			
	S2			
WF19	S1			
	S2			
WF20	S1			
	S2			
WF21	S1			
	S2			
WF22	S1			
	S2			
WF23	S1			
	S2			
WF24	S1			
	S2			
WF25	S1			
	S2			
WF26	S1			
	S2			
WF27	S1			
	S2			
WF28	S1			
	S2			
SWF1	S1			
	S2			
SWF2	S1			
	S2			
SWF3	S1			
	S2			

COLUMN FOOTING SETOUT

ELEMENT	SETOUT POINT	NORTHING	EASTING	LEVEL
CF1	S1	399627.887	799528.901	156.214
	S2	399624.136	799533.059	156.214
CF2	S1	399630.855	799531.578	156.108
	S2	399627.103	799535.736	156.108
CF3	S1	399633.822	799534.256	155.987
	S2	399630.071	799538.413	155.987
CF4	S1	399636.789	799536.933	155.852
	S2	399633.038	799541.090	155.852
CF5	S1	399639.756	799539.609	155.703
	S2	399636.004	799543.767	155.703
CF6	S1	399642.722	799542.286	155.539
	S2	399638.970	799546.443	155.539
CF7	S1	399645.687	799544.962	155.361
	S2	399641.936	799549.119	155.361
CF8	S1	399648.653	799547.637	155.169
	S2	399644.901	799551.795	155.169
CF9	S1	399651.617	799550.312	154.963
	S2	399647.866	799554.470	154.963
CF10	S1	399654.581	799552.986	154.742
	S2	399650.830	799557.144	154.742
CF11	S1	399657.545	799555.660	154.507
	S2	399653.793	799559.818	154.507
CF12	S1	399660.508	799558.334	154.257
	S2	399656.756	799562.491	154.257
CF13	S1	399663.470	799561.006	153.993
	S2	399659.718	799565.164	153.993
CF14	S1	399666.431	799563.678	153.715
	S2	399662.680	799567.836	153.715
CSF1	S1	399668.540	799565.581	153.496
	S2	399665.459	799568.997	153.496
WC1F	S1			
	S2			
WC2F	S1			
	S2			

WALL UNIT SETOUT

ELEMENT	SETOUT POINT	NORTHING	EASTING	LEVEL
W1	S1			
	S2			
W2	S1			
	S2			
W3	S1			
	S2			
W4	S1			
	S2			
W5	S1			
	S2			
W6	S1			
	S2			
W7	S1			
	S2			
W8	S1			
	S2			
W9	S1			
	S2			
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	S2			
W11	S1			
	S2			
W12	S1			
	S2			
W13	S1			
	S2			
W14	S1			
	S2			
W15	S1			
	S2			
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	S2			
W25	S1			
	S2			
W26	S1			
	S2			
W27	S1			
	S2			
W28	S1			
	S2			
SW1	S1			
	S2			
SW2	S1			
	S2			
SW3	S1			
	S2			

COLUMN SETOUT

ELEMENT	SETOUT POINT	NORTHING	EASTING	LEVEL
C1	S1	399628.082	799528.686	162.119
	S2	399627.063	799529.814	162.119
C2	S1	399631.049	799531.363	162.013
	S2	399630.031	799532.492	162.013
C3	S1	399634.016	799534.040	161.892
	S2	399632.998	799535.169	161.892
C4	S1	399636.983	799536.717	161.757
	S2	399635.965	799537.846	161.757
C5	S1	399639.950	799539.394	161.608
	S2	399638.932	799540.523	161.608
C6	S1	399642.916	799542.070	161.444
	S2	399641.898	799543.199	161.444
C7	S1	399645.882	799544.746	161.266
	S2	399644.863	799545.875	161.266
C8	S1	399648.847	799547.422	161.074
	S2	399647.829	799548.550	161.074
C9	S1	399651.811	799550.097	160.868
	S2	399650.793	799551.225	160.868
C10	S1	399654.776	799552.771	160.647
	S2	399653.757	799553.900	160.647
C11	S1	399657.739	799555.445	160.412
	S2	399656.721	799556.574	160.412
C12	S1	399660.702	799558.118	160.162
	S2	399659.684	799559.247	160.162
C13	S1	399663.664	799560.791	159.898
	S2	399662.646	799561.920	159.898
C14	S1	399666.625	799563.463	159.620
	S2	399665.607	799564.592	159.620
SC1	S1			
	S2			

TORSION BEAM SETOUT

ELEMENT	SETOUT POINT	NORTHING	EASTING	LEVEL
T1	S1			
	S2			
T2	S1			
	S2			
T3	S1			
	S2			
T4	S1			
	S2			
T5	S1			
	S2			
T6	S1			
	S2			
T7	S1			
	S2			

BEAM SETOUT

ELEMENT	SETOUT POINT	NORTHING	EASTING	LEVEL
B1	S1			
	S2			
B2	S1			
	S2			
B3	S1			
	S2			
B4	S1			
	S2			
B5	S1			
	S2			
B6	S1			
	S2			
B7	S1			
	S2			
B8	S1			
	S2			
B9	S1			
	S2			
B10	S1			
	S2			
B11	S1			
	S2			
B12	S1			
	S2			
B13	S1			
	S2			
B14	S1			
	S2			
B15	S1			
	S2			
B16	S1			
	S2			
B17	S1			
	S2			
B18	S1			
	S2			
B19	S1			
	S2			
B20	S1			
	S2			
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	S2			
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B25	S1			
	S2			
B26	S1			
	S2			
B27	S1			
	S2			
B28	S1			
	S2			
B29	S1			
	S2			
B30	S1			
	S2			
B31	S1			
	S2			
LB1	S1			
	S2			
LB2	S1			
	S2			
LB3	S1			
	S2			
LB4	S1			
	S2			
LB5	S1			
	S2			
LB6	S1			
	S2			
LB7	S1			
	S2			
LB8	S1			
	S2			
LB9	S1			
	S2			

LB10	S1			
	S2			
LB11	S1			
	S2			
LB12	S1			
	S2			
LB13	S1			
	S2			
LB14	S1			
	S2			
RB1	S1			
	S2			
RB2	S1			
	S2			
RB3	S1			
	S2			
RB4	S1			
	S2			
RB5	S1			
	S2			
RB6	S1			
	S2			
RB7	S1			
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RB9	S1			
	S2			
RB10	S1			
	S2			
RB11	S1			
	S2			
RB12	S1			
	S2			
RB13	S1			
	S2			
RB14	S1			
	S2			
FB1	S1			
	S2			

1:100@ A1 1:200@ A3 0 2000 4000 6000 8000 10000 mm

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

WAKA KOTAHI NZ TRANSPORT AGENCY

wsp
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CIVIL

SCALES: AS SHOWN @ A1
ORIGINAL SIZE: A1

DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
P. ROUTLEDGE	B. MCHAFFIE	2022-08-26

PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
SETOUT
SETOUT TABLES

WSP PROJECT NO. (SUB-PROJECT): 6-DK546.00
SHEET NO.: C-34
REVISION: A

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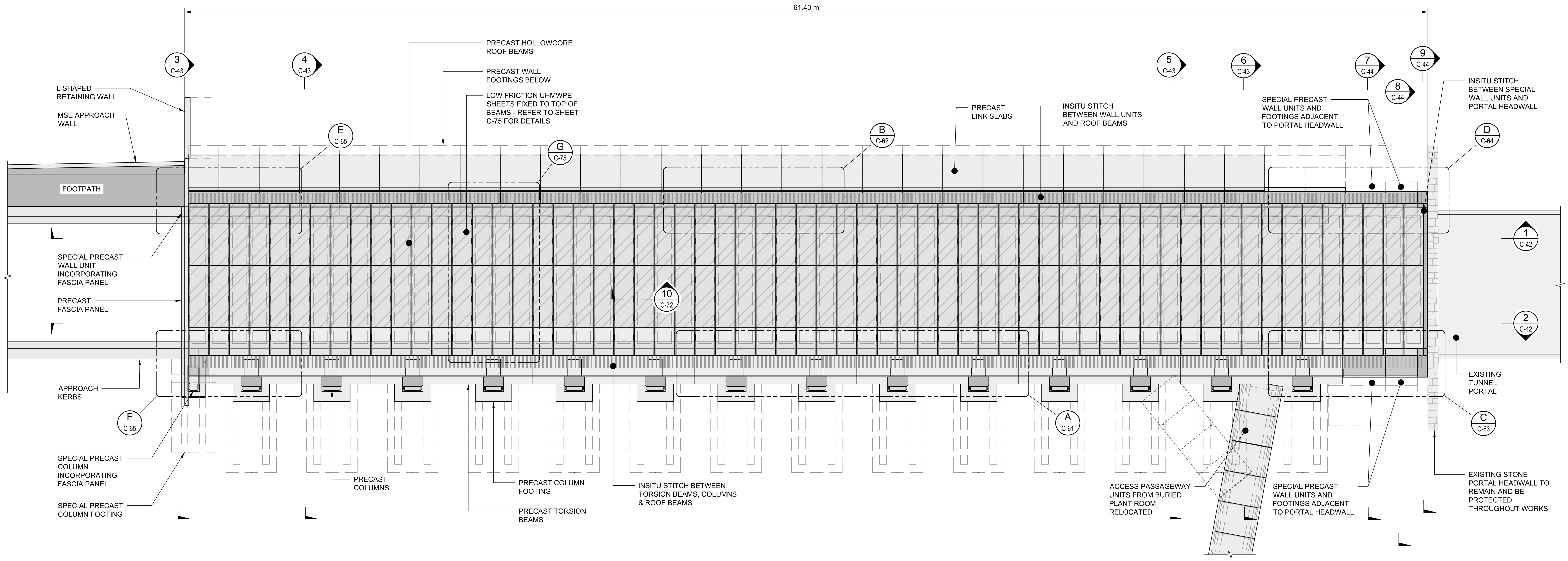

PLAN - SHELTER STRUCTURE

SCALE: 1:100

300 mm
200
100
50
0 10 mm

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

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CIVIL

SCALES		ORIGINAL SIZE
AS SHOWN @ A1		A1
DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
P. ROUTLEDGE	B. MCHAFFIE	2022-08-26

PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
INSITU CONNECTION DETAILS
PLAN - SHELTER STRUCTURE

WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DK546.00	C-41	A

NOTES:

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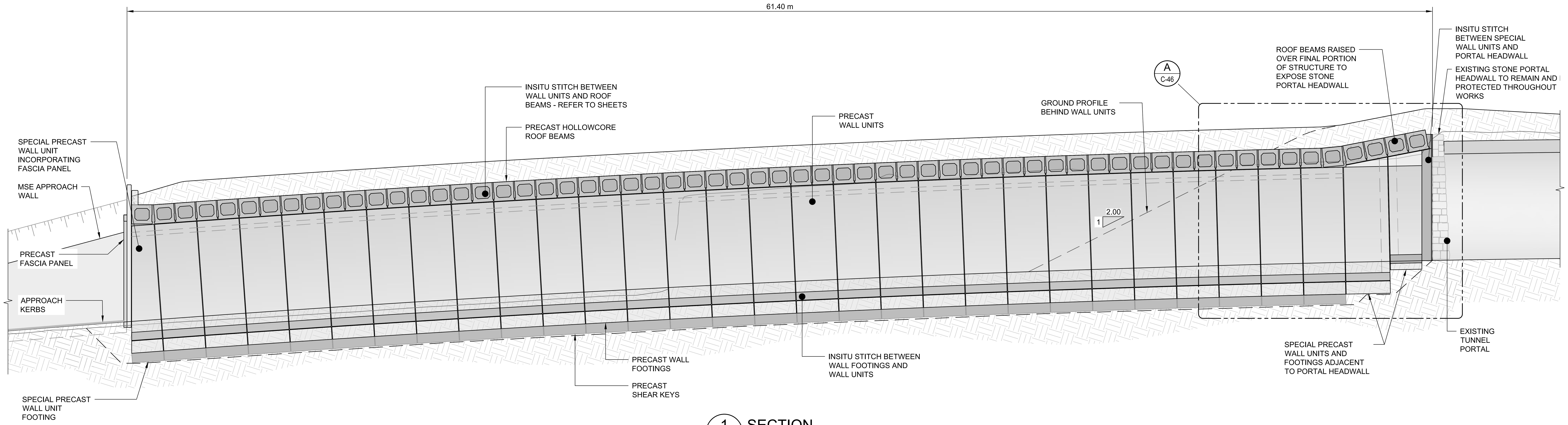

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C-41
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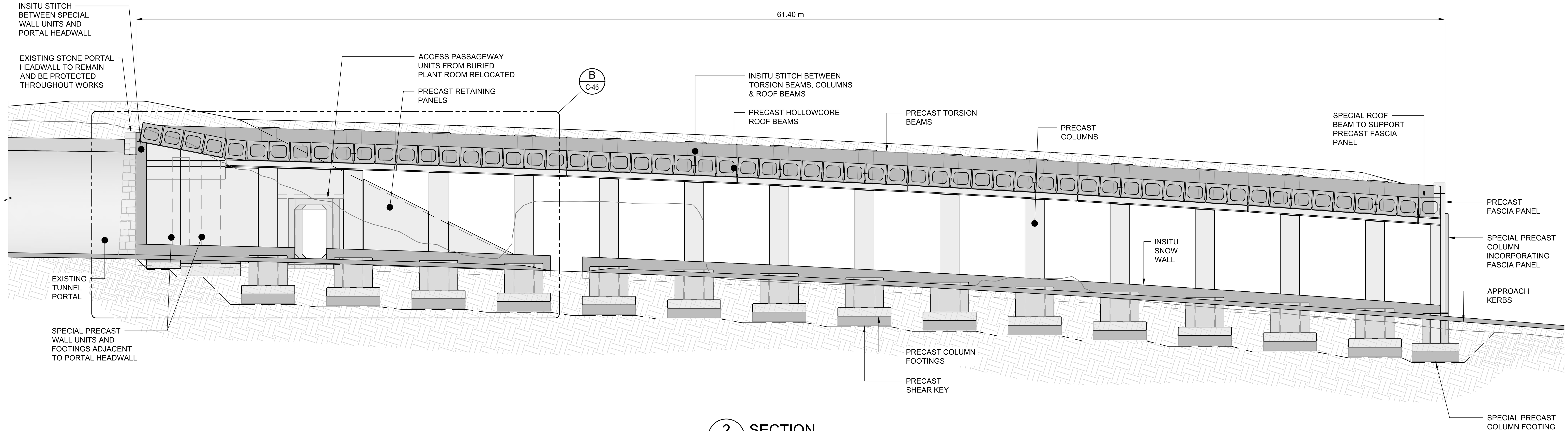

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C-41
SCALE: 1:100

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

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New Zealand

CIVIL

SCALES: AS SHOWN @ A1
ORIGINAL SIZE: A1

DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	**DESIGN VERIFIED**	**APPROVED DATE**
P. ROUTLEDGE	B. MCHAFFIE	2022-08-26

PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
INSITU CONNECTION DETAILS
LONGSECTIONS - SHELTER STRUCTURE

WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DK546.00	C-42	A

Original sheet size A1 (841x594) Plot Date 2022-08-23 at 3:40:45 PM \\corp.pbwan.net\ANZ\ProjectsNZ\6d\6-DK546.00 Homer Tunnel Avalanche Shelter Pre-imp &\Home\07_Drawings\CAD\6-DK546.00_C41-C45.dwg C-42

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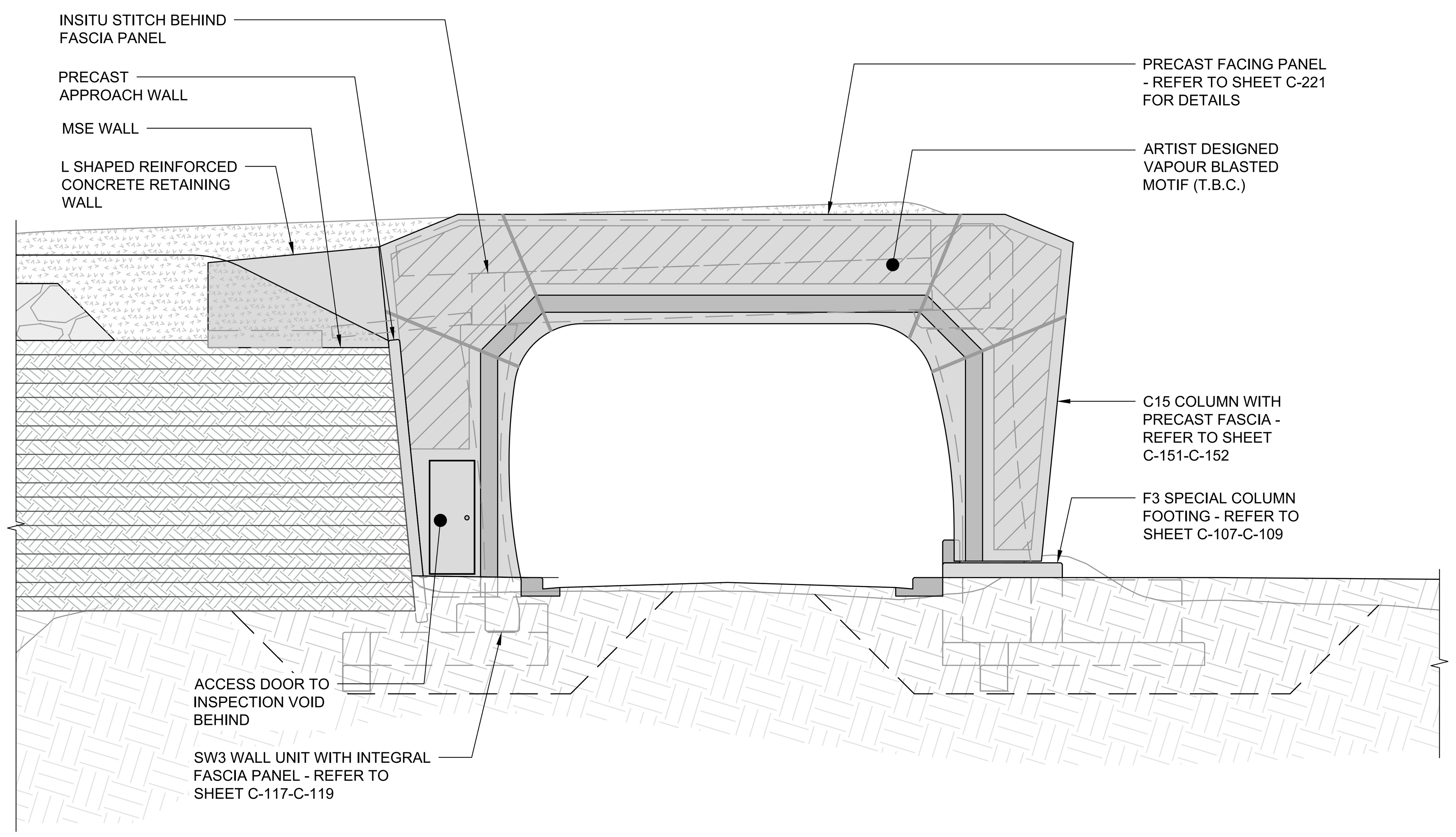
1.



3 C-41 SECTION
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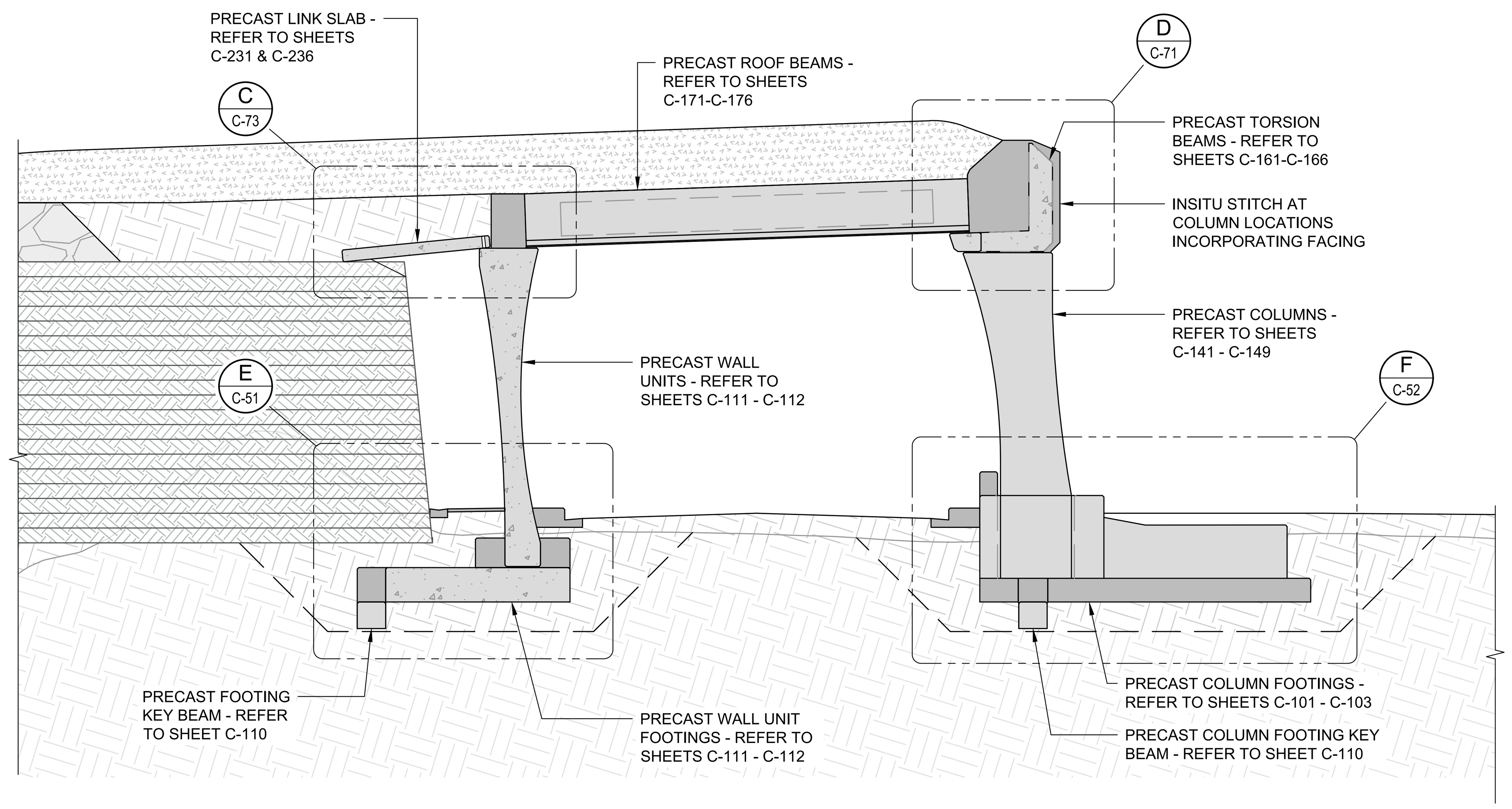
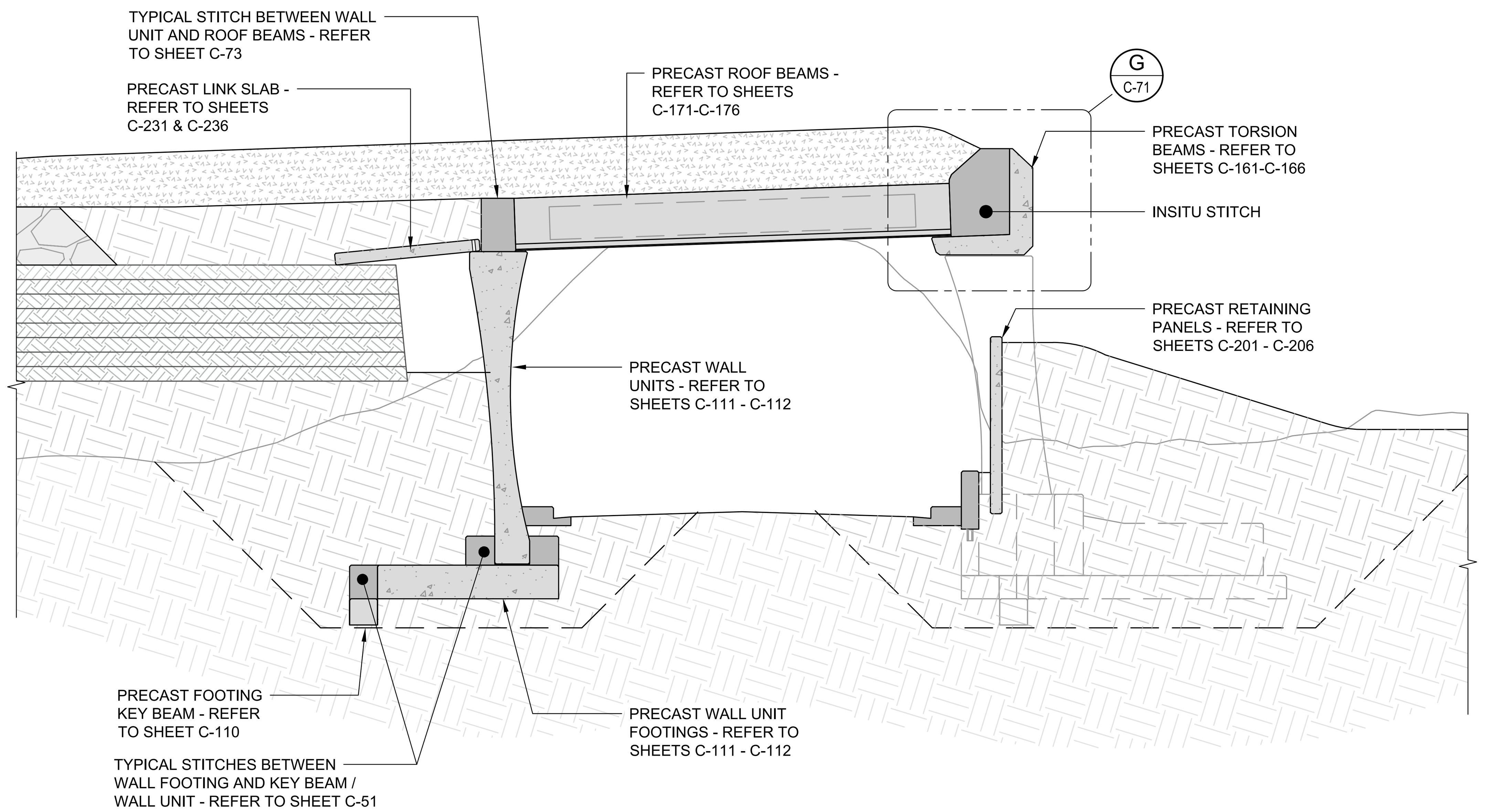
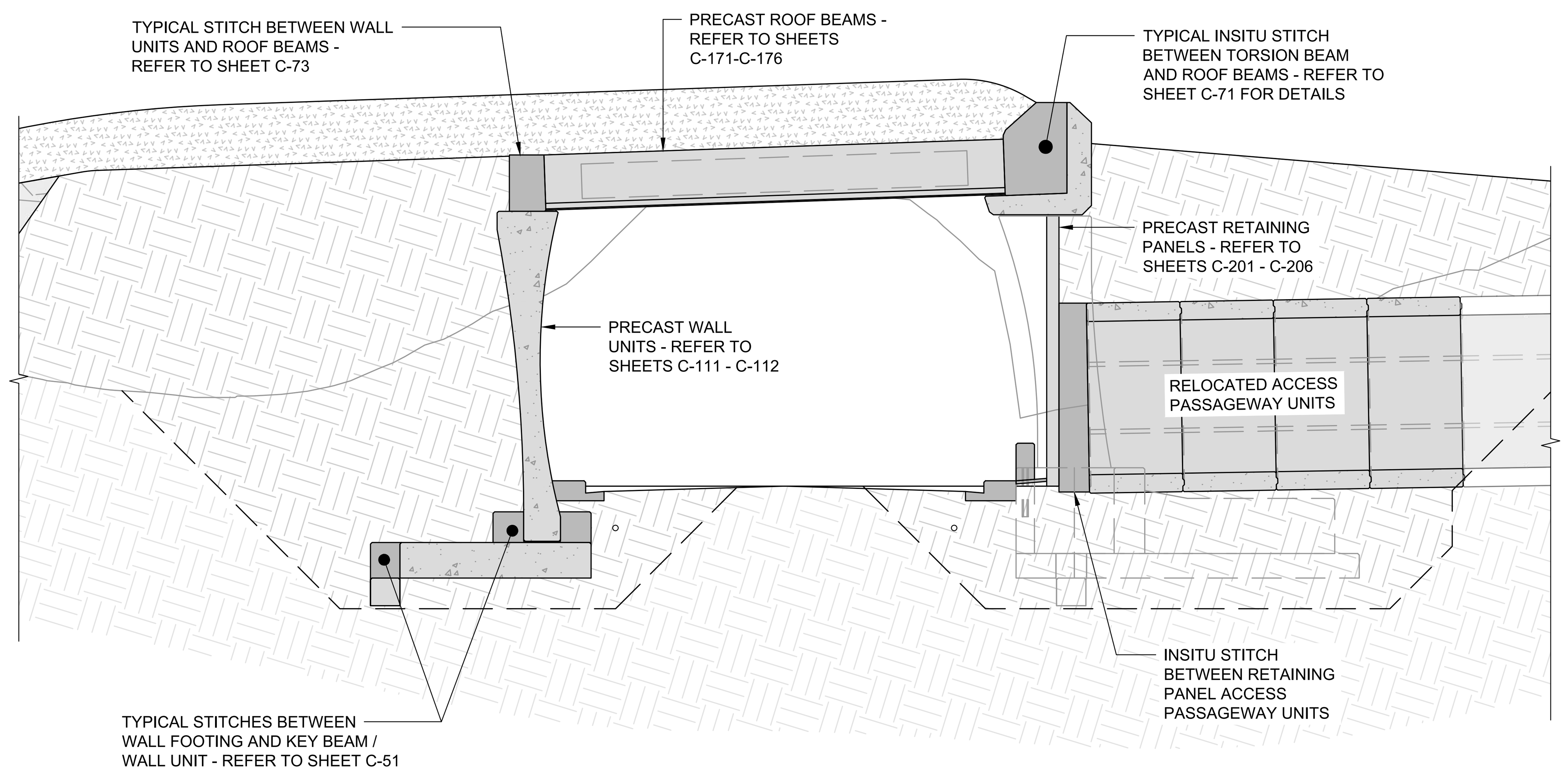


4 C-41 SECTION
SCALE: 1:75



5 C-41 SECTION
SCALE: 1:75



6 C-41 SECTION
SCALE: 1:75

300 mm
200
100
50
10 mm
0

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

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CIVIL

SCALES		ORIGINAL SIZE
AS SHOWN @ A1		A1
DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
P. ROUTLEDGE	B. MCHAFFIE	2022-08-26

PRELIMINARY

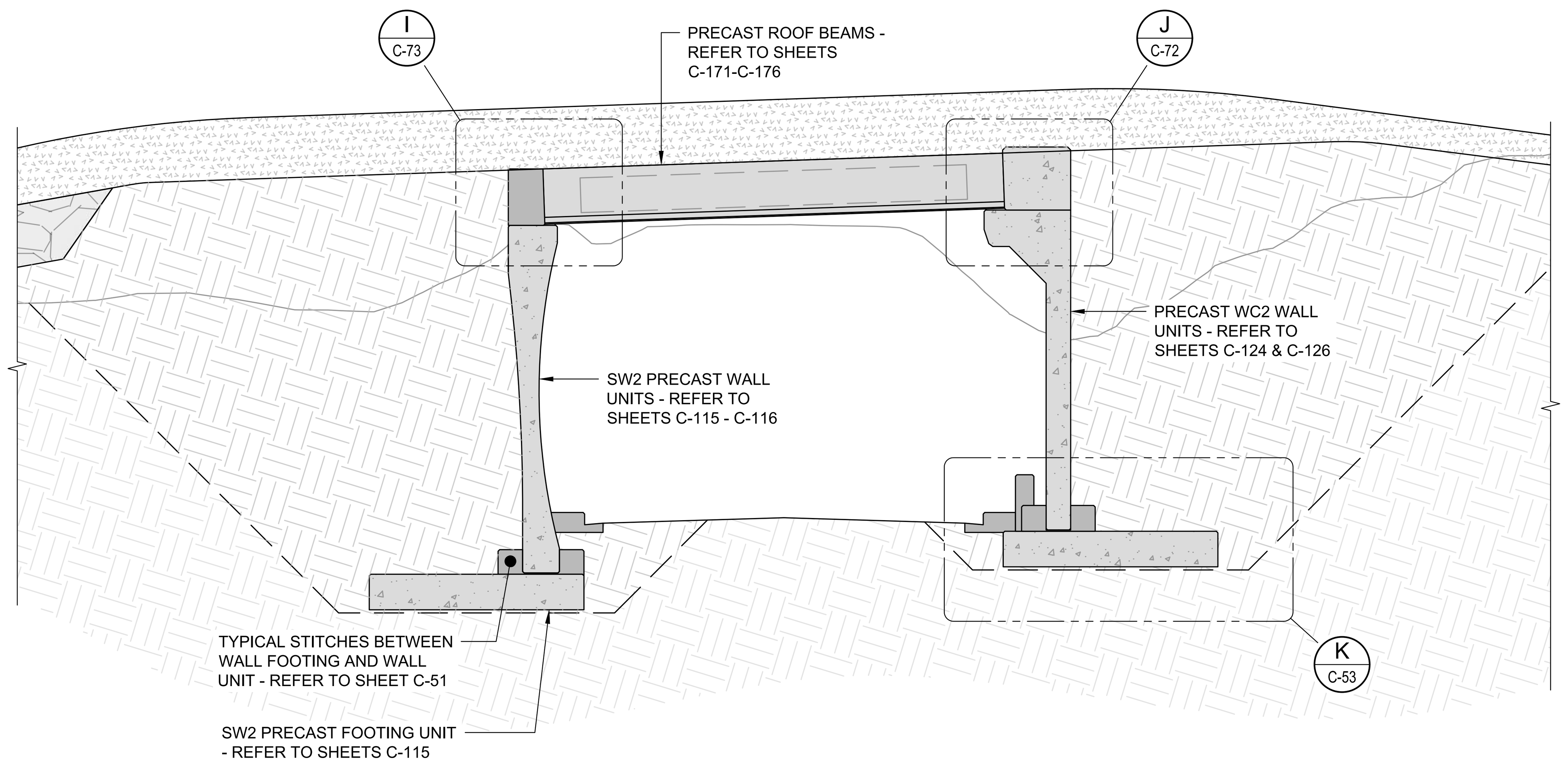
PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
INSITU CONNECTION DETAILS
TYPICAL SECTIONS - SHELTER STRUCTURE

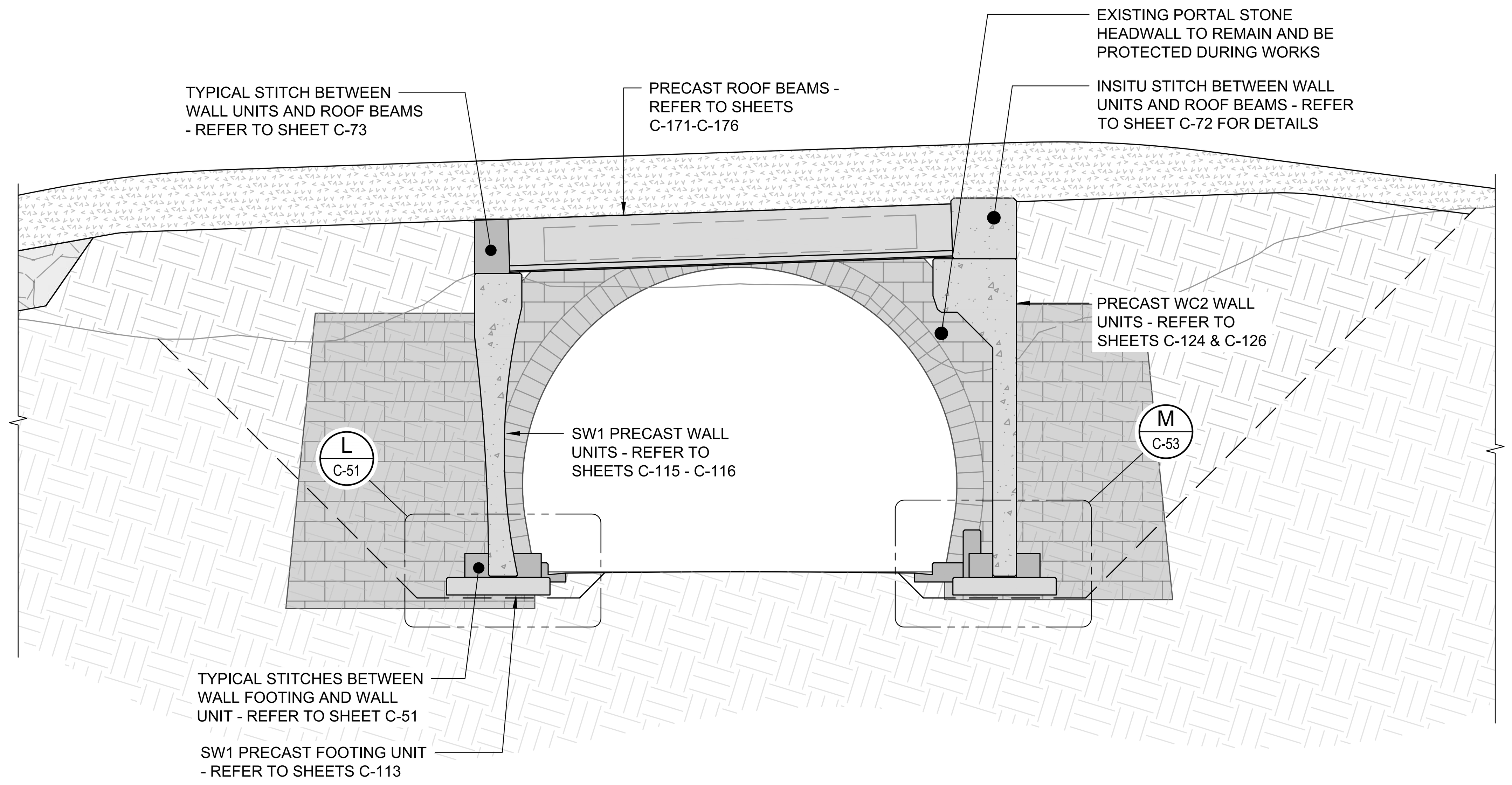
WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DK546.00	C-43	A

NOTES:

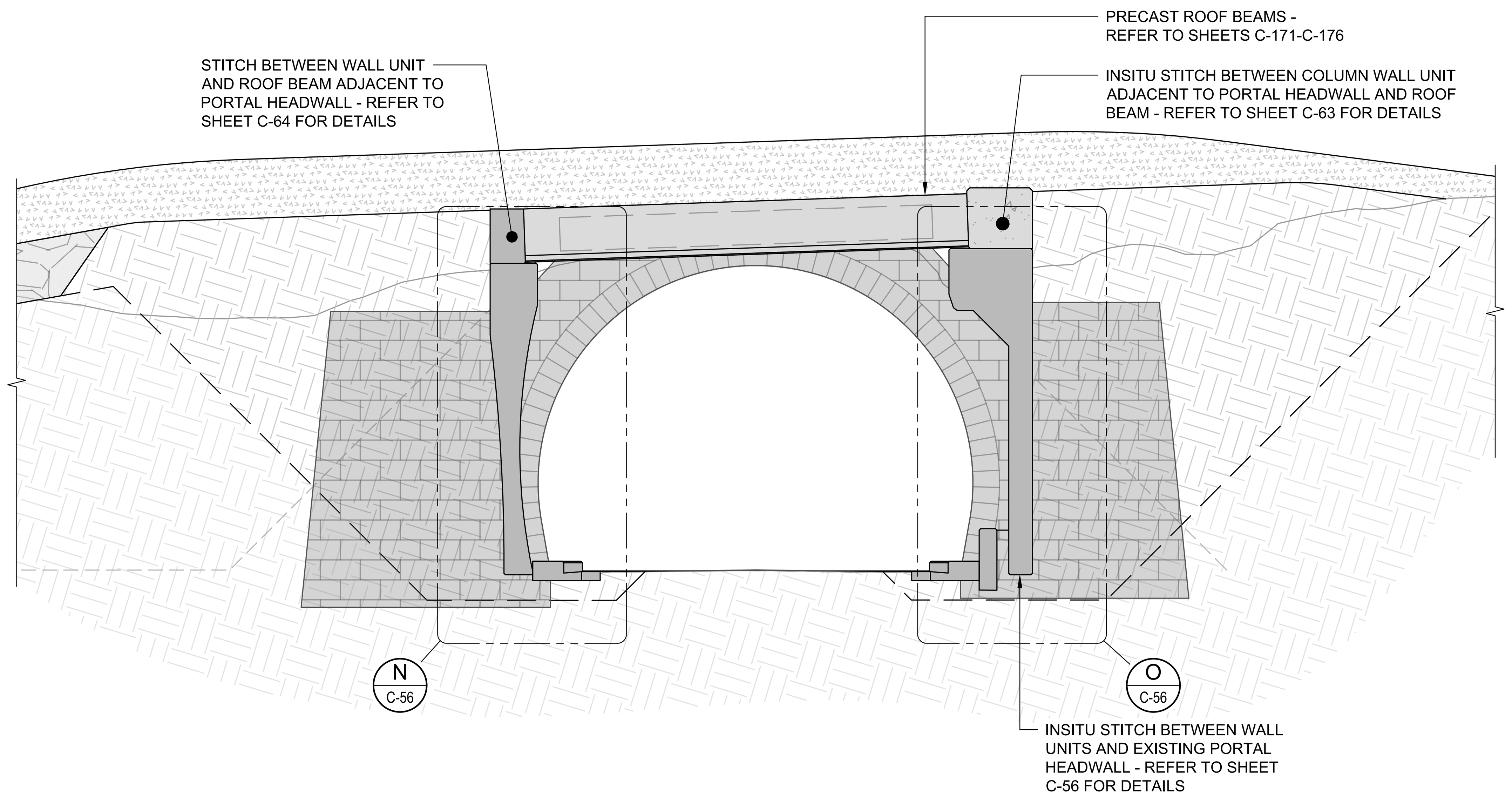
1.



7 SECTION
C-41
SCALE: 1:75



8 SECTION
C-41
SCALE: 1:75



9 SECTION
C-41
SCALE: 1:75

0 10 mm 50 100 200 300 mm

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

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New Zealand

CIVIL

SCALES		ORIGINAL SIZE
AS SHOWN @ A1		A1
DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
P. ROUTLEDGE	B. MCHAFFIE	2022-08-26

PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
INSITU CONNECTION DETAILS
TYPICAL SECTIONS - SHELTER STRUCTURE

WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
6-DK546.00	C-44	A

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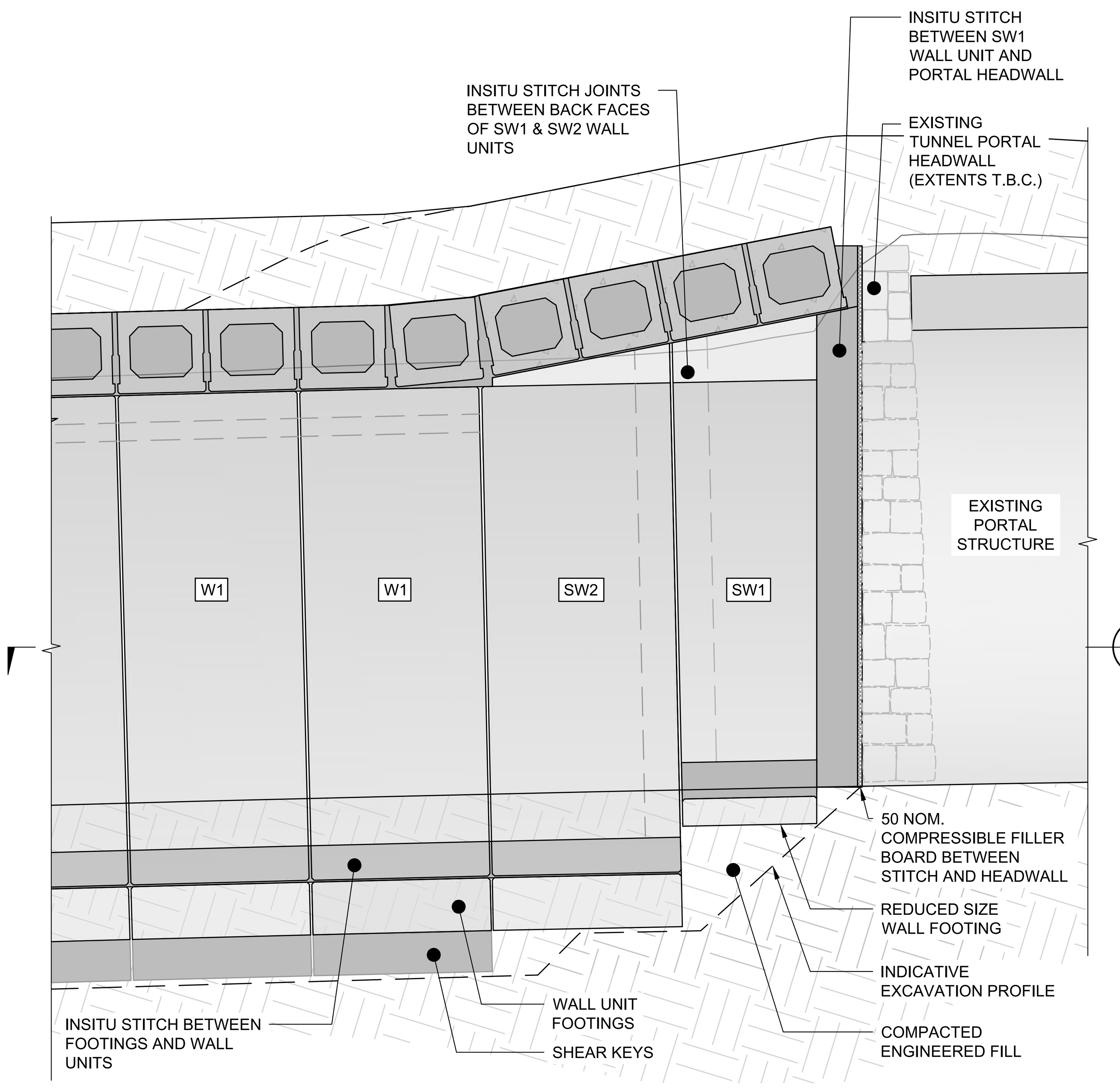
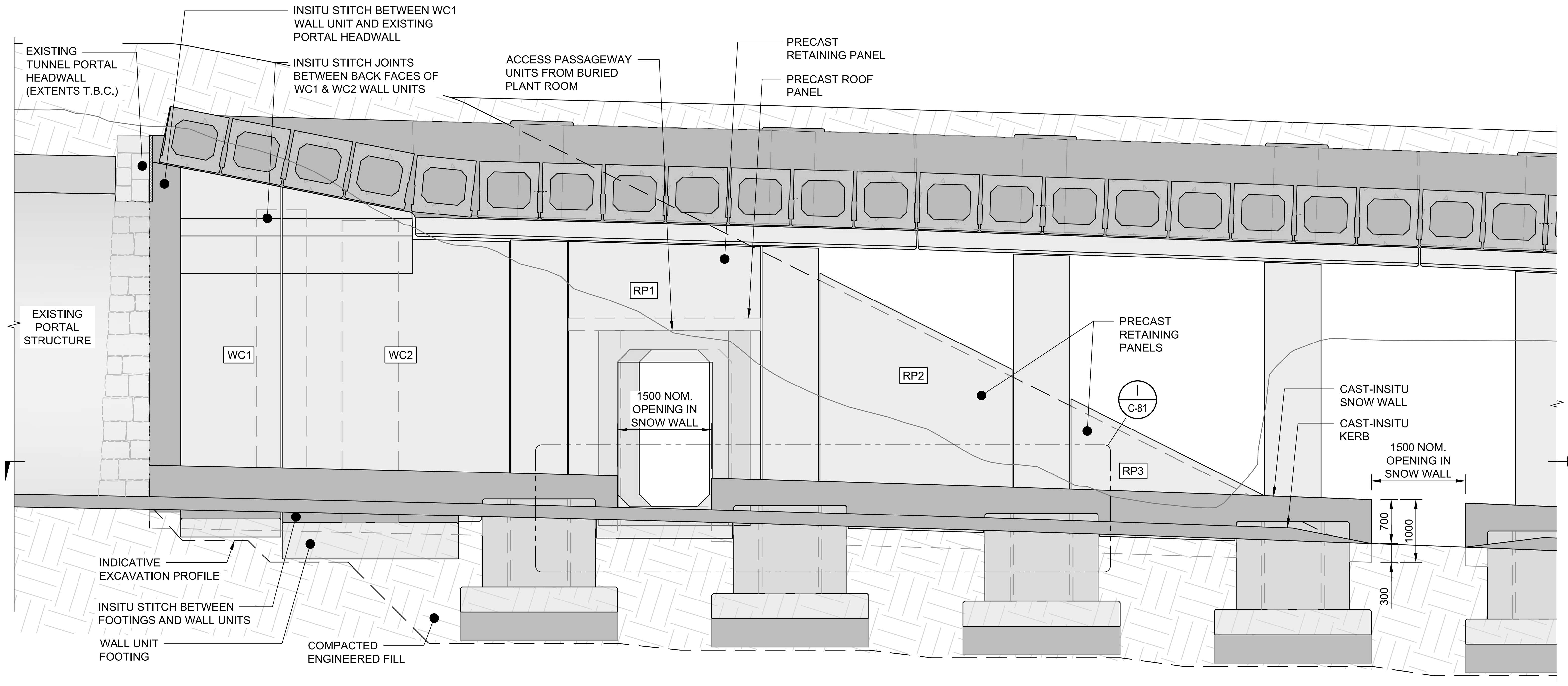
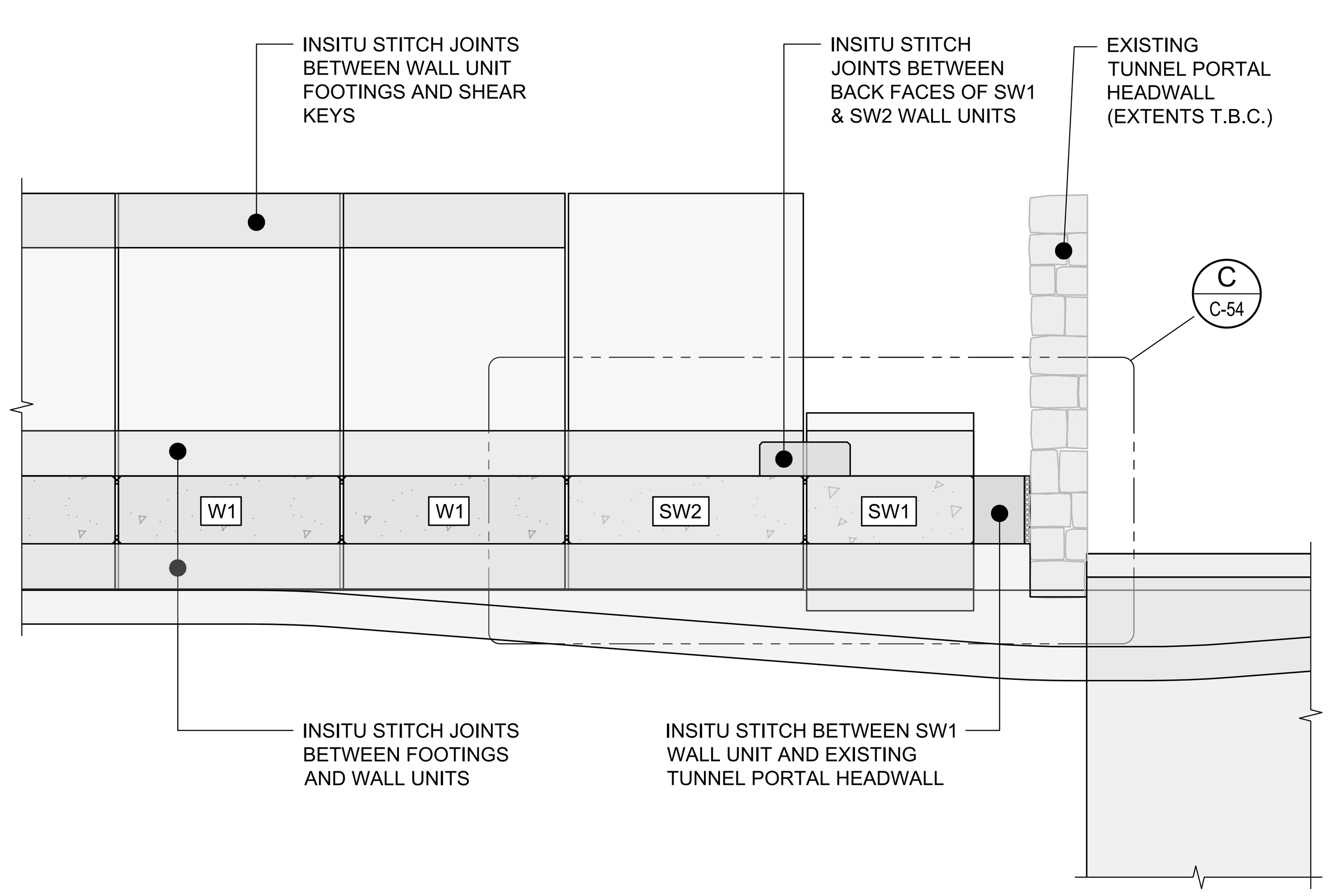


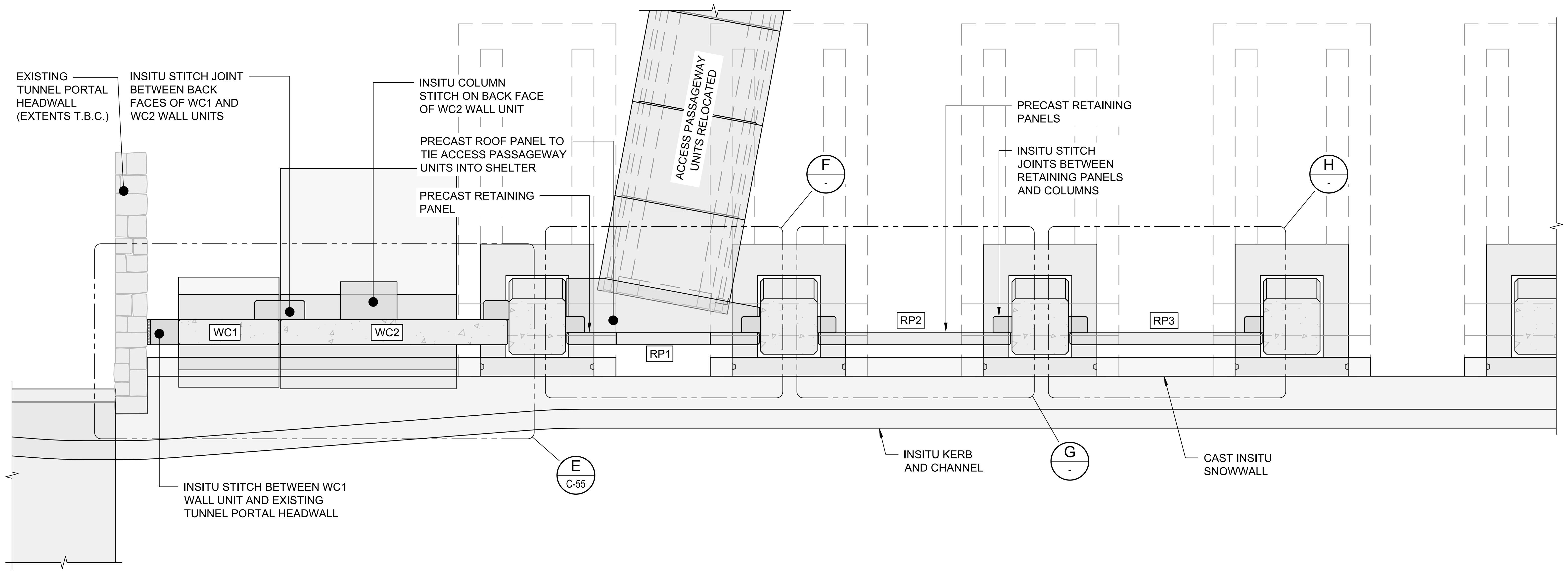
A DETAIL
C-42
SCALE: 1:50



B DETAIL
C-42
SCALE: 1:50



2 SECTION
-
SCALE: 1:50



1 SECTION
-
SCALE: 1:50

REVISION	AMENDMENT	APPROVED	DATE
A	ISSUED FOR PEER REVIEW	M.C.	2022-08-26

WAKA KOTAHI NZ TRANSPORT AGENCY

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CIVIL

SCALES: AS SHOWN @ A1
ORIGINAL SIZE: A1

DRAWN	DESIGNED	APPROVED
J. MACDONALD	P. ROUTLEDGE	M. COWAN
DRAWING VERIFIED	**DESIGN VERIFIED**	**APPROVED DATE**
P. ROUTLEDGE	B. MCHAFFIE	2022-08-26

PRELIMINARY

PROJECT
WAKA KOTAHI (NZ TRANSPORT AGENCY)
HOMER TUNNEL - SH94 RP 240 / 0.00
RESILIENCE IMPROVEMENTS - PHASE 2

TITLE
INSITU CONNECTION DETAILS
SHELTER STRUCTURE ADJACENT TO PORTAL

WSP PROJECT NO. (SUB-PROJECT): 6-DK546.00
SHEET NO.: C-46
REVISION: A

Original sheet size A1 (841x594) Plot Date 2022-08-23 at 3:41:11 PM \\corp.pbwan.net\ANZ\ProjectsNZ\6d\6-DK546.00 Homer Tunnel Avalanche Shelter Pre-imp &\Home\07_Drawings\CAD\6-DK546.00_C46-C47.dwg C-46

Appendix B – Accidental Discovery Protocol

Minimum Standard P45 –
Accidental Archaeological Discovery Specification

1 Purpose

This specification sets out the standard procedure that the Transport Agency representative and Contractors will follow in the event that an archaeological site, kōiwi/human remains or taonga (Māori artefacts) are accidentally discovered during investigation, construction and/or maintenance of the State Highway network and associated works.

This minimum standard P45 does not apply when an archaeological authority has been issued by Heritage New Zealand Pouhere Taonga (HNZPT). Refer instead to the authority, which will set out the archaeological requirements specific to that area of the project.

P45 replaces the earlier standard Z/22. P45 reflects the minimum requirements of the Transport Agency in accordance with statutory obligations under the Heritage New Zealand Pouhere Taonga Act 2014 and the Protected Objects Act 1975.

The procedures contained in P45 are also designed to recognise and provide for the protection of cultural and historic heritage and the special relationship of Māori in regard to their land, water, sites, wahi tapu and other taonga.

Drivers for the revision include the Heritage New Zealand Pouhere Taonga Act 2014, (which replaced the Historic Places Act 1993) and revised guidelines released by HNZPT for the handling of kōiwi/human remains.

An assessment of effects on archaeological values should be completed during the earliest stages of Transport Agency project planning. Transport Agency has guidelines for such an assessment (*Assessing historic heritage impacts guide for state highway projects*).

The decision to either proceed with an accidental archaeological discovery using specification P45 for earthworks on any project or to apply for an archaeological authority must be informed by a project archaeologist in conjunction with HNZPT.

The specification can be referenced in Resource Management Act approvals as a condition of designation or consent.

To reflect an existing agreement with Te Runanga o Ngai Tahu, where Māori archaeological sites, artifacts or kōiwi are found within the **Canterbury and West Coast** regions, the *Accidental Discovery Protocol (2003)* (Attachment 1) agreed between Te Runanga o Ngai Tahu and Heritage New Zealand applies. P45 will apply to other (non- Māori) sites.

In the **Auckland** region, works must also comply with the Accidental Discovery Rule E12.6 in the Auckland Unitary Plan. This rule has some additional triggers and requirements not included in P45. In particular attention is drawn to the parts of the rule that apply to Protected New Zealand Objects as defined in the Protected Objects Act 1975 (including any fossil or sub-fossil), evidence of contaminated land and lava caves.

2 General procedures following the accidental discovery of possible archaeological sites, kōiwi/human remains or taonga

1. **Immediately** following the discovery of material that could be an archaeological site, kōiwi/human remains and/or taonga, the Contractor will cease all work within a minimum of 20m of any part of the discovery and immediately advise the Transport Agency representative of the discovery.

2. If it is unclear whether the find is an archaeological site, kōiwi/human remains and/or taonga, the Transport Agency representative should consult a qualified archaeologist to confirm its origin.
3. The Transport Agency representative shall notify the following people of the discovery:

   - The New Zealand Police, if any kōiwi/human remains are uncovered
     To be satisfied that the remains are not a missing person or part of a crime scene. This is also a requirement of the Coroners Act 1988.

   - Project Archaeologist
   - If a project archaeologist is not nominated in the contract documents, a qualified archaeologist will be appointed by the Transport Agency representative to ensure all archaeological sites, kōiwi/human remains and taonga are dealt with appropriately and to support liaison with key parties, including clarifying with HNZPT whether an authority is required;

   - The Regional Archaeologist at HNZPT

   - Appropriate iwi group(s) or kaitiaki representative(s)
     In most situations these relationships will have been established during project planning. However, note that statutory acknowledgement areas establish obligations on the Crown to work with iwi under specific Accords. Advice on the appropriate iwi group(s) is available through the relevant Transport Agency statutory planner responsible for consents and approvals.

   - Auckland Council, if the discovery is made in the Auckland region
     This is to ensure compliance with the accidental discovery rule in the Unitary Plan.

4. The Transport Agency representative shall require the Contractor to secure the discovery area, ensuring the area (and any object(s) contained within) remains undisturbed and meets health and safety requirements.

   Note: 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 HNZPT irrespective of whether the works are permitted or a consent has been issued under the Resource Management Act 1991.

5. The Transport Agency representative shall ensure that either themselves or the Contractor, as appropriate, are available to meet and guide the Project Archaeologist, New Zealand Police, HNZPT Regional Archaeologist, the appropriate iwi group(s), and (in the Auckland region) the Council to the discovery area. The Contractor and Transport Agency representative will assist with any reasonable requests any of these people may make.
6. The Transport Agency representative shall ensure that no information is released to the media except as authorised by the Transport Agency, in consultation with HNZPT, Police and the appropriate iwi group(s).
7. Further assessment of the site by the Project Archaeologist may be required. If the discovery area contains an archaeological site which cannot be avoided, an application for an archaeological authority must be made to HNZPT in accordance with the Heritage New Zealand Pouhere Taonga Act 2014. All requirements in relation to an archaeological authority will be instructed by the Transport Agency representative as a variation to the contract.
8. The Project Archaeologist and Transport Agency representative shall ensure that any possible archaeological sites, kōiwi/human remains or taonga are protected until as much information as practicable is obtained and a decision is made regarding their appropriate management.
9. When the archaeological authority has been granted, the Transport Agency representative will inform the Contractor when HNZPT have authorised that work in the discovery area can recommence. The Contractor must not recommence work until all statutory and cultural requirements have been met, including the mandatory stand-down period associated with an authority.
10. The Transport Agency representative shall ensure the Contractor undertakes all subsequent works in accordance with the conditions of this authority.
11. In the Auckland region, where it has been determined that no authority is required (for example in the case of kōiwi, or post-1900 archaeological remains), the Transport Agency representative will seek confirmation from the Council that there are no additional statutory requirements under the Unitary Plan.

3 Further procedures in the event that kōiwi/human remains are discovered

1. The discovery of kōiwi/human remains, whether of Māori or non-Māori origin, needs to be handled with respect and sensitivity. Decisions on the next steps should not be unduly rushed.

2. The New Zealand Police are involved in all cases of kōiwi/human remains discovery. Their primary role is to undertake a formal identification of the remains and to determine if they relate to a missing person or if a crime has been committed.

3. HNZPT Regional Archaeologists will (if necessary and where possible) visit a site following the notification of the discovery of kōiwi/human remains. HNZPT staff can assist in formal identification of the remains as human if required, and whether they are associated with an archaeological site and therefore require an archaeological authority before works can proceed. They will also work with the Transport Agency representative, iwi and Police to identify appropriate processes.

4. Iwi, hapu and whānau also play an important role as kaitiaki in the care and management of kōiwi following discovery.

5. As soon as practicable after the Transport Agency representative has given notice to the New Zealand Police through the local police station, the Project Archaeologist, HNZPT regional archaeologist, appropriate iwi group(s), and (in the Auckland region) the Council that kōiwi/human remains have been discovered, the Transport Agency representative shall invite these parties to meet to discuss the next steps.

6. If the remains are of Māori derivation there are a number of sensitive issues to work through including: any cultural ceremonies; the possibility for the remains to stay where they are; if a disinterment license is required from the local Public Health Unit; what protocols will be followed for the removal of the remains if in situ preservation is not possible; the final location of the remains; the level of recording and extent of any further scientific analysis; and who will remove the remains.

7. The Transport Agency representative, in consultation with iwi representatives, shall make the necessary arrangements for any cultural ceremonies as soon as practicable.

8. Once these ceremonies are completed, the Transport Agency representative shall arrange for the Project Archaeologist, in consultation with the New Zealand Police, HNZPT Regional Archaeologist, and the appropriate iwi group(s), to proceed as agreed with potential recording, further analysis, in situ retention or exhumation in a manner to meet professional standards and the New Zealand Archaeological Association code of ethics.

9. If the remains are of non-Māori derivation it will need to be established: whether any descendants can be traced; whether a disinterment license is required from the local Public Health Unit; where remains will be reburied; and what level of recording and scientific analysis should be undertaken.

10. The Project Archaeologist will record details of the kōiwi/human remains, the site of discovery, and any other relevant facts, and these records will be made available to the New Zealand Police, HNZPT, and the appropriate iwi group(s) or other descendants.

11. An archaeological authority may be required from HNZPT before work affecting the site can recommence, particularly if the remains are identified as human and within an archaeological context.

4 Custody of taonga (excluding kōiwi/human remains) or material found at an archaeological site

1. The Project Archaeologist will have initial control of, and responsibility for, all material contained in the discovery area.
2. The Transport Agency representative shall ensure no objects are removed from the site until it has been determined, in consultation between the Project Archaeologist and the appropriate iwi group(s), whether it is associated with an archaeological site and/or the object is taonga (be it taonga tūturu as defined in the Protected Objects Act 1975 or otherwise).
3. If the object is of Māori origin the Project Archaeologist will record the object and its context, and, if it is a taonga tūturu, will also notify the Ministry for Culture and Heritage of the finding as required under the Protected Objects Act 1975.
4. Where statutory acknowledgement areas exist, following Treaty Settlement, the Accords between the Crown and iwi may oblige the Transport Agency to directly notify those iwi of taonga tūturu finds and to transfer these finds for temporary custodianship to these iwi, until ownership is determined. If this situation arises, the Māori Land Court makes the final determination on ownership of all taonga tūturu.
5. If the object is a taonga and less than 50 years old (i.e. not taonga tūturu), the Transport Agency representative shall invite the appropriate iwi group(s) to remove the taonga from the site.
6. If the object is European in origin the Project Archaeologist shall deliver any such object to the Transport Agency representative.

5 Recommencement of Works

1. The Project Archaeologist will have initial control of, and responsibility for, all material contained in the discovery area.

Situation	Recommencement Procedure
Item is identified as taonga tūturu.	Ministry for Culture and Heritage approval required.
An archaeological authority is required.	Works may recommence once the archaeological authority is granted, the 15 working day appeal period has expired and any other pre-start conditions are met. Adherence to site specific protocols with relevant iwi groups. A site blessing should be considered.
Human remains, no archaeological authority required.	Police approval required prior to recommencement. Adherence to site specific protocols with relevant iwi groups. A site blessing should be considered.
No archaeological authority required.	Confirmation from either Heritage New Zealand or project archaeologist and where relevant, local authority that no further consents or approvals are required. Adherence to site specific protocols with relevant iwi groups. A site blessing should be considered.

Appendix C – Stone Façade, Homer Tunnel, Heritage Conservation Methodology

STONE FAÇADE, HOMER TUNNEL
HERITAGE CONSERVATION METHODOLOGY FOR STRENGTHENING

TO:	Waka Kotahi NZ Transport Agency c/o Chris Collins – Chris.Collins@nzta.govt.nz cc Gemma Kean - Gemma.Kean@nzta.govt.nz cc Michael Cowan - michael.cowan@wsp.com
PROJECT NAME:	Homer Tunnel, East Avalanche Shelter Replacement Project
ORIGIN PROJECT #:	584a
DATE OF INSPECTION:	26 August 2022

INTRODUCTION
This methodology has been prepared for the purposes of the concession application to the Department of Conservation for Resilience Improvements to the Tunnel. It follows recent discussions with Dr. M. Schmidt of the Department of Conservation as to how it is proposed resilience works to the stone façade will be undertaken to minimise the effects on the heritage significance of the façade.

The methodology below is supplemental to the information in the associated engineering design drawings. It refers to the heritage conservation aspects of the proposed work and does not override the engineering design and specifications.

For the purposes of the proposed works, the 'heritage engineer' will be Michael Cowan, supported by Jeremy Jennings, both of WSP and the 'heritage specialist' will be Robin Miller, supported by Jeremy Moyle, both of Origin Consultants Ltd.

ASSOCIATED ENGINEERING DESIGN DRAWINGS
Refer to WSP: 6-DC734.00 (001)/Sheet C11/Rev 1

HERITAGE CONSERVATION METHODOLOGY
Any repair or alteration work undertaken to the stone masonry, including any core drilling and ground anchor works, must be undertaken by a specialist drilling and heritage stonemasonry contractors through Downer. These contractors will need to demonstrate proven heritage experience. Wainwright & Co, heritage stonemasons, of Dunedin, McMillan Drilling of Christchurch or another specialist heritage drilling company may be considered suitable. However, whichever contractors are proposed by Downer, they will be subject to the prior approval in writing of the heritage specialist and heritage engineer.

The following heritage conservation measures shall be read in conjunction with the existing 'Excavation Notes' on the drawing:

<u>Note 1.</u>
The measurements and photographs shall also be reported to the heritage specialist, who will review the results with the heritage engineer.

Note 2.
The initial investigation and excavation work at the top of the masonry headwall/façade should also establish the extent of concrete behind the stone masonry.

During these works, both the heritage specialist and heritage engineer, or their delegated site representatives, shall attend site providing observation and recording.

Pre-drilling of smaller exploratory cores into the wall should be undertaken to provide information relating to the wall depth and composition.

During the hold point, the heritage engineer and heritage specialist will review the results of the initial excavations and exploratory cores. The hold point review will consider whether there is a need for the soil nails or whether the extent of concrete and the bond of the stonework to the concrete provides sufficient resilience already. On the basis of the soil nails being required, the review will determine the final design of the soil nails, their size and their exact locations. It should ensure the minimum number of anchors are installed and consider whether smaller diameter drill holes can be used.

Note 3.
As the stepped excavations proceed, the heritage engineer and specialist will review the need, if any, for repointing or grouting of the stonework. If required, any new pointing must match the existing in terms of binder type and aggregate, pointing style and visual appearance.

If deemed necessary by the heritage specialist and heritage engineer for the stability of the wall, repointing must be carried out as stepped excavations proceed in order that the condition of the stonework is improved concurrently with the façade being exposed. Otherwise, any more minor masonry repairs may be coordinated to be carried out on completion of the stabilisation works.

Should repointing works be necessary, this work must be undertaken by a specialist heritage stonemason, who must prepare a repointing sample(s) for approval by the heritage specialist before repointing works proceed.

New Note 8.
The final positioning of the anchors should target larger rocks (stone blocks) for coring through so that the potential for fracturing / shattering small stones is removed.

New Note 9.
A geotextile membrane shall be laid between the façade and the new fill during backfilling.

Robin Miller
Director
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Appendix D – Milford Road/SH94 Sites[80]

[80] From Travis and Miller, *Homer Tunnel Resilience Improvements, Phase 2: Heritage Comments*.

Appendix 2 – Milford Road/SH94 Sites

Sites	Compatibility/Association	Visitor Experience
Gertrude Node An existing carpark which provides access to tracks in the Gertrude Valley, located approx. 430m from the Homer Tunnel eastern portal. Located within Fiordland National Park (DOC).	Site location has a close association with the Homer Tunnel, due to proximity; Location of "The Forks," which formed a base for the early exploration of routes for SH94 and residential houses for Homer Tunnel engineers and overseers (including Donald Hulse). ✓✓✓	Existing carpark/stopping point on SH94; provide public shelter/hub for tourists walking in the Gertrude Valley; linked to the construction of SH94 and the Homer Tunnel; close proximity to the Homer Tunnel entrance. ✓✓✓
Lone Tree (Lyttels Farm) Located approx. 4.7km from the Homer Tunnel eastern portal. Located within Fiordland National Park (DOC).	Site has some association with the Homer Tunnel, due to proximity but is not known to be a workers' camp site. ✓	Existing stopping point on SH94; provide shelter for tourists stopping along SH94. ✓✓
Monkey Creek An existing carpark located approx. 5km from the Homer Tunnel eastern portal, that provides a popular stopping point for tourists travelling along SH94. Located within Fiordland National Park (DOC).	Site has some association with the Homer Tunnel, due to proximity and as a location of a workers' camp for the construction of bridges along SH94. ✓✓	Existing carpark/stopping point on SH94; location linked to the construction of SH94; provide shelter for tourists stopping along SH94. ✓✓
Knob's Flat An existing toilet facility and stopping point for tourists/tours, with private accommodation, located approx. 37km from the Homer Tunnel eastern portal. Located within Fiordland National Park (DOC).	Site has some association with the Homer Tunnel as the location of a workers' camp site for the construction of SH94 (occupied by PWD workers). ✓✓	Existing carpark/popular stopping point on SH94; linked to the construction of SH94. ✓✓✓
Te Anau Approx. 100km from the Homer Tunnel eastern portal. The Fiordland National Park Visitor Centre, or similar, could provide a location for the relocated shelter.	Site location has little association with the Homer Tunnel and its construction. ✓	Potential for installation aligned with road safety. ✓

Appendix G
Landscape and Visual Assessment + Visualisations

SH94 Homer Tunnel Replacement Avalanche Shelter

Waka Kotahi NZ Transport Agency

Landscape and Visual Assessment

wsp

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1 Executive Summary

With regard to the proposed SH94 Homer Tunnel Replacement Avalanche Shelter Project, this landscape and visual assessment is based on the SH94 Homer Tunnel Structure Options Report[1]. The options report and its supporting plans, elevations and photos show the location and extent of the individual components of the Project. This base information, along with a full range of other relevant environmental information, is included in the Project's Assessment of Environmental Effects.

The Project is located at eastern portal of the Homer Tunnel in the Upper Hollyford Valley within Southland District. The tunnel and its associated road access are in a remote alpine environment within the Fiordland National Park and the South West New Zealand World Heritage Area, Te Wāhipounamu. Avalanches can seriously affect the road during avalanche season.

The whole of Fiordland is identified in the operative Southland District Plan as an Outstanding Natural Landscape, within which the Homer Tunnel is a significant landmark on the road to the Milford Sound/Piopiotahi. The tunnel and its eastern portal have notable heritage aspects and the immediate area is a distinctive ecological habitat that is frequently impacted upon by snow avalanche and rockfall.

Construction of the Project will require the removal of the residual 35 m length of the existing avalanche shelter; a remanent of the approximately 150 m long avalanche shelter built in the early 1940s. Much of this original shelter was destroyed by avalanche not long after the tunnel was opened. The proposed avalanche shelter will potentially extend approximately 40 m to 80 m out from the actual portal of the tunnel. The extension will have a form that replicates the north facing, open sided nature of the existing shelter. Its structural longevity will be assured by a mass fill on its southern flank that, along with the shelter itself, will withstand the impact of future avalanches and rockfall.

The full 80 m length of the proposed replacement avalanche shelter is the uppermost extent likely to be constructed as part of this project and its construction may be staged over time. In the initial construction phase, it is expected a built length of 40 m to 60 m will be achieved. The minimum extent envisaged is to replace the shelter back to at least the truncated extent of the existing shelter. This is to avoid any increased exposure to avalanche and rockfall, while providing a strengthened, long-term structure.

The following landscape mitigation measures will be built into the Project from the outset and include:

- Keeping the size and extent of the shelter to the minimum size necessary to fulfil its purpose.
- The use of a simple, functional form for the shelter.
- The use of colour, texture and patterns in the exposed concrete work.
- The excavation and naturalisation of the 'closed carpark' fill area.
- The placement of local fill material on the southern flank of the shelter.
- The rehabilitation including natural revegetation of the fill areas as disturbed talus slope.

The immediately adjacent area of fill that was created when the tunnel was built will be excavated and utilised as part of the mass fill. The removal of this 'closed carpark' fill area and its subsequent rehabilitation will also be a positive remediation measure.

[1] *East Homer Avalanche Shelter: Structure Options Report*, prepared for Waka Kotahi by WSP, December 2021.

The landscape and visual assessment has considered the potential landscape and visual effects of the Project with the replacement shelter built to its full nominal 80 m length. In landscape terms, this is seen as the ‘worst case’ scenario with lesser lengths of staged construction of the shelter having diminished effects.

Potential visual effects have been considered relative to a number of local viewpoints; refer to the visual simulations at Attachment 1. In terms of whether the effects are adverse, neutral or positive, for the three viewpoints where the view is towards the Project – Viewpoints 1, 2 and 5 – the visual effects would be adverse. This is primarily due to the addition of further built structure into these views. The two viewpoints – Viewpoint 3 and 4 – where the view is outwards from within the Project, the visual effects could be considered positive, given that the view consists of a series of framed vistas. However, given the degree of new built structure within these particular views, the effect is considered to be neutral.

The proposed landscape mitigation measure and, in particular, the removal and rehabilitation of the extensive fill area adjacent to the tunnel portal, will reduce any adverse effects of the Project on natural character.

While there are heritage aspects to the existing shelter and its connected plant room, as an assemblage of structures have reached the end of their service life and are no longer fit for purpose in providing necessary protection from rockfall and avalanche debris. Once removed and the proposed shelter is built with its associated mitigation and remediation measures established, any adverse effects on natural character will be ‘Low’.

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2 Introduction

2.1 Purpose of Document

WSP has been commissioned by Waka Kotahi NZ Transport Agency (Waka Kotahi) to prepare a Landscape and Visual Assessment (LVA) to assess the landscape effects[2] and visual effects[3] of a proposed avalanche shelter located at the eastern portal of the State Highway 94 (SH94) Homer Tunnel, Upper Hollyford Valley, Fiordland National Park.

Waka Kotahi is proposing to increase the security of SH94, Milford Road, for vehicles approaching the eastern portal of the Homer Tunnel. The current avalanche shelter no longer fit for purpose having reached the end of its lifespan, and there is a concern as to how much protection the shelter provides.

An options assessment *"Homer Tunnel Avalanche Shelter Preliminary Options Assessment*[4]*"* outlined several options for remediation/retrofit and/or replacement of the avalanche shelter with replacement of the avalanche shelter being preferred. This has now been refined via the draft *"East Homer Avalanche Shelter: Structure Options Report*[5]*"*, December 2021.

The purpose of this report is to identify the landscape, visual amenity and natural character values of the Project Area and identify the potential effects of the construction and operation of the Project on those values.

An LVA is required to ascertain any potential effects of the Project on landscape character[6] (landscape effects) and amenity (visual effects) which may affect landscape values[7]. Effects may be positive, neutral or adverse.

This report includes a discussion on the:

- Existing landscape context.
- Description of the Project, along with modifications to the landscape and mitigation and remediation measures proposed to lessen any potential adverse landscape and visual effects
- Statutory planning aspects.
- Methodological approach used in rating the effects.
- Landscape and visual effects.
- Natural character effects.
- Cumulative effects.
- Conclusion.

The LVA is to be read in association with the Assessment of Environmental Effects (AEE) that provides greater detail on the background, and specifics of the Project, including from other technical experts. The AEE provides a description of the key issues at the site.

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[2] 'Landscape' effects concern physical changes to the setting which may or may not be seen but are otherwise understood to exist. A landscape effect is a consequence of a change in a landscapes character and value/s.

[3] 'Visual' effects are a subset of landscape effects. Visual effects are consequences of change on landscape values as experienced in views and are one tool to help understand landscape effects. Other senses contribute to amenity values such as sound and smell, however the visual is typically pre-eminent for most people.

[4] *Homer Tunnel Avalanche Shelter Preliminary Options Assessment; prepared for Waka Kotahi by WSP, April 2021*

[5] As per Footnote 1

[6] Landscape 'character' includes the physical, associative and perceptual dimensions.

[7] Landscape 'Value' is the relative regard (quality, meaning, importance, merit, worth) with which a landscape is held. Values may be physical, associative and perceptual.

Regarding landscape effects relevant to planning matters, the assessment component of this LVA is in accordance with relevant provisions of Part 2 and the Fourth Schedule of the Resource Management Act 1991 (RMA).

2.2 Project Objectives

Waka Kotahi is seeking to address the avalanche shelter safety and condition concerns, provide improved resilience and serviceability for avalanche protection whilst accommodating potential future improvements and consideration of the effect on the historical values.

The objectives of the replacement avalanche shelter project are to:

- Improve the security of SH94 at the eastern portal of the Homer Tunnel.
- Cater for future extensions to the shelter without compromising the design of the initial sections.
- Minimise the visual and environmental effects.

2.3 Background Information

As noted in the Project's draft Structure Options Report:

Waka Kotahi are progressing safety and resilience improvements at the Homer Tunnel situated on SH94 Milford Road which provides an important tourist link to Milford Sound Piopiotahi. A main component of these works is the replacement of the existing avalanche shelter at the eastern end of the Homer Tunnel.

The Homer Tunnel construction began in 1935 but works were suspended from 1942 to 1950, and for most years when the tunnel was being built work was also suspended over the winter months. The tunnel was officially opened to traffic in 1954. The Eastern Portal and approach road for the tunnel are located within the runout zone at the base of the East Homer avalanche track. After three deaths of construction staff in 1936 and 1937 by avalanches, the existing semi-octagonal shaped avalanche shelter was constructed and completed in 1941 to give some protection while work continued in the tunnel. The original length of avalanche shelter constructed was 146 m, but during the spring of 1945, a 90 m section of the shelter was destroyed by an avalanche and was never replaced. A further 10 m was lost in 1997. The remnants of the original shelter are still visible beside the road.

The remaining portion of the avalanche shelter is in appreciably poor condition and the structure has limited ability to provide adequate protection against avalanche and rockfall due to its construction and condition. The shelter is also most restrictive in terms of vehicle height clearance (sign posted at 3.81 m) compared with the remainder of the tunnel, which could accommodate vehicles to the current legal limit of 4.3 m if it weren't for limitations of the existing shelter. This constrains access, including responding to emergency events.

The replacement of the eastern avalanche shelter addresses these factors. The intent is to develop a design that replaces and extends the shelter as far along the road to the east as the current budget will allow, retaining the ability to extend the structure in the future to ultimately protect the full length of hazard from the East Homer avalanche track.

Tourists on day trips to Milford Sound are the primary users of the tunnel. Pre-Covid 19, approximately 45% of visitors to Milford Sound travelled on coaches, with a growing number travelling in rental cars and campervans. Traffic flow through the tunnel is predominantly tidal and is controlled by traffic lights; morning bound for Milford Sound and afternoon eastbound on the return trip.

As part of the natural events in the vicinity of the Homer Tunnel, an increase in the frequency of rockfalls has been noted. This has led to the area around the tunnel being restricted to the public by generating a no stopping section for vehicles and the area also closed to pedestrians. The Department of Conservation (DOC) has also closed this area to walkers, trampers and climbers.

The rockfall risk is not able to be predicted or managed to the same degree as the avalanche risk and therefore to increase the level of protection to road users the proposed replacement avalanche shelter needs to provide protection from both avalanche and rock fall.

3 Landscape Description

3.1 Landscape Context

The project area is in a remote alpine environment within the Fiordland National Park and the South West New Zealand World Heritage Area, Te Wāhipounamu.

Fiordland National Park (the Park or FNP) covers an area of 12,500 km^2 and is New Zealand's largest national park. It is characterised by steep sided valleys, extensive indigenous vegetation and high rainfall. The geology has been shaped by glaciation and brings with it a number of challenges to managing SH94 as it traverses through the park, particularly in the alpine sections from the Divide through the Tunnel, and into Milford Sound Piopiotahi via the Homer Tunnel.

Located in the Upper Hollyford Valley, adjacent to the Cockburn Incline formation to the south and the Darran Mountains to the north, the East Homer valley rises west towards the Homer Tunnel with SH94 comprising a series of climbing sweeping bends up to the Tunnel's eastern portal access which sits beneath the Homer Saddle (Te Kōhaka-o-Te-Ruru).

The ephemeral west branch of the Hollyford River Whakatipu Kā Tuka/Ōkare is located east of the site and only flows during and after rainfall events or during snow melt. It drains eastward from the site to the north branch confluence and outlet from the Gertrude Valley and from there down the Upper Hollyford Valley into the Lower Hollyford Valley approximately 13 km from the site.

The New Zealand Alpine Club's Homer Hut is located 1 km east of the site in the valley floor at the start of the track to the Gertrude Saddle.

The Fiordland National Park Management Plan[8] at 4.2 Assessment of Values and Places; 4.2.1 Landform states that:

"Assessed at a landscape level, Fiordland National Park is in excellent condition, essentially still in its natural state except for the very small areas where development has occurred. The long Fiordland coastline is unique in New Zealand because the landscape has not been greatly modified by agriculture, fire, or other such human impacts.

The landform has been created by the uplift of hard plutonic rocks such as granite and diorite, which have been subsequently carved into their present shape by successive periods of heavy glaciation.

Most erosion since the last glaciation period has been by way of rock falls and slips. Effects are local and minor so that the glacial landforms are usually well preserved, other than where rivers have cut deep narrow gorges into the valley floors.

[8] Fiordland National Park Management Plan, Department of Conservation, June 2007

Snow avalanches can occur throughout the alpine areas of Fiordland National Park mainly during the winter and spring. Major avalanche zones exist in the high Darran Mountains. Monitoring of snowfields for avalanche hazard is undertaken along SH94, and to a lesser extent on the Milford and Routeburn tracks. Artificial release of avalanches is carried out when necessary to avoid harm to visitors or facilities."

Relatively recent sedimentary deposits are present at the base of slopes and in the valley floors which were formed by past glaciation and include postglacial alluvium, till, rockfall and avalanche debris. Also present are talus (debris fans and scree slopes) that progress downslope into valley alluvium deposits. These sediments comprise eroded volcanic and metamorphic rock types.

Further at 4.2.2 Vegetation - Significant Features of the park's management plan:

"Important in the subalpine zone are species of dracophyllum, hebe, olearia and coprosma species. Also found are three podocarps: snow tōtara, pink pine and mountain toatoa; most other subalpine plants are woody members of the daisy family and tussock grasses. Tussock grasses of the genus Chionochloa dominate the alpine zone. Common herbs include alpine daisies (Celmisia), native carrots, buttercups, spear grasses and many other species."

These descriptions of landform and vegetation are directly applicable to the immediate area of the eastern portal of the Homer Tunnel and accord with observations made when visiting the site on 7 October 2021[9].

The terrestrial ecology of the avalanche shelter area is further defined in the Project's ecology assessment[10]. This assessment describes the subalpine nature of the area and notes the effect of past avalanches on the local habitat.

As noted in the Project's heritage assessment[11]:

The Homer Tunnel is a significant landmark on the road to the Milford Sound/Piopiotahi. It forms a crucial link on the Milford Road, providing the only road access to the Milford Sound.

The eastern portal tunnel entrance is composed of a semi-circular concrete arch, with a construction date of 1936/1937. It has a bonded course stone façade with a parapet to the external face.

The eastern portal (on the Te Anau side) avalanche shelter is constructed in reinforced concrete and is semi-octagonal in section. It was constructed from 1938 to 1941 and truncated following avalanches in 1945 and 1996. The avalanche shelter is in poor condition, with cracks (exceeding 10mm) throughout the roof and walls. While the shelter has previously been repaired, ongoing events continue to further damage the existing shelter, exposing reinforcing and increasing the risk to the public. The shelter has a residual service life in the order of 20 years; it is in poor condition and has limited structural robustness.

There is a small concrete building attached to the northern side of the eastern portal. This was originally built as a shed for drill sharpening and replaced an earlier timber building

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[9] David McKenzie and Meg Back, Landscape Architects, WSP were accompanied by Graham Clarke, Asset Manager, Milford Road Alliance.

[10] Homer Tunnel Avalanche Shelter Improvement Works: Proposed Plant Room – Terrestrial Ecology Assessment (draft). Beale Consultants, October 2021

[11] Homer Tunnel Eastern Shelter Alterations, Milford Sound – Te Anau Road: Heritage Impact Assessment & Advice. Origin Consultants, August 2021

destroyed in an avalanche in 1945. It is now used as a plant room. This building is located within an area of high rockfall and known avalanche paths and is the building that is proposed to be replaced.

3.2 General Site Description

Also, from the draft Structures Option Report:

The Homer Tunnel is in a remote alpine section of Fiordland National Park approximately 100 km north of Te Anau (one and a half hours drive) on SH94 and is the only road access to Milford Sound.

SH94 is an alpine highway and parts of the highway are subject to avalanches. Avalanches can seriously affect the road during avalanche season. The avalanche area covers 17 km starting at Falls Creek, above Hollyford Road junction (91 km north of Te Anau) and ending at the Chasm on the Milford Sound side of the Homer Tunnel.

When the ancient glaciers retreated from the Fiordland valleys, they left a terrain with near- vertical walls and large, steep snow basins which provide an almost perfect landscape for avalanches. Snowfall, wind and temperature changes create complex layering within the start zone snowpack. When the layers weaken, avalanches can be triggered by gravity, new snow, rain, or deliberately cleared in a managed way by active control.

The avalanches start high up in the mountains in snow that cannot be seen from the Milford Road itself. The Milford Road Alliance runs an avalanche control programme to safely operate the road during the avalanche season[12] *through monitoring the snowpack condition and the weather to predict risk levels and manage road user exposure. They undertake active controls as necessary to artificially generate avalanches from the unstable snowpack. The programme also controls the avalanche hazard risk exposure by not allowing traffic to stop within the avalanche hazard area and by closing the road when the avalanche risk starts elevating.*

The stretch of road in the hazard zone of the East Homer avalanche track extends from the tunnel portal to near to the limit lines for the traffic lights on the eastern approach (see Figure 3-1)

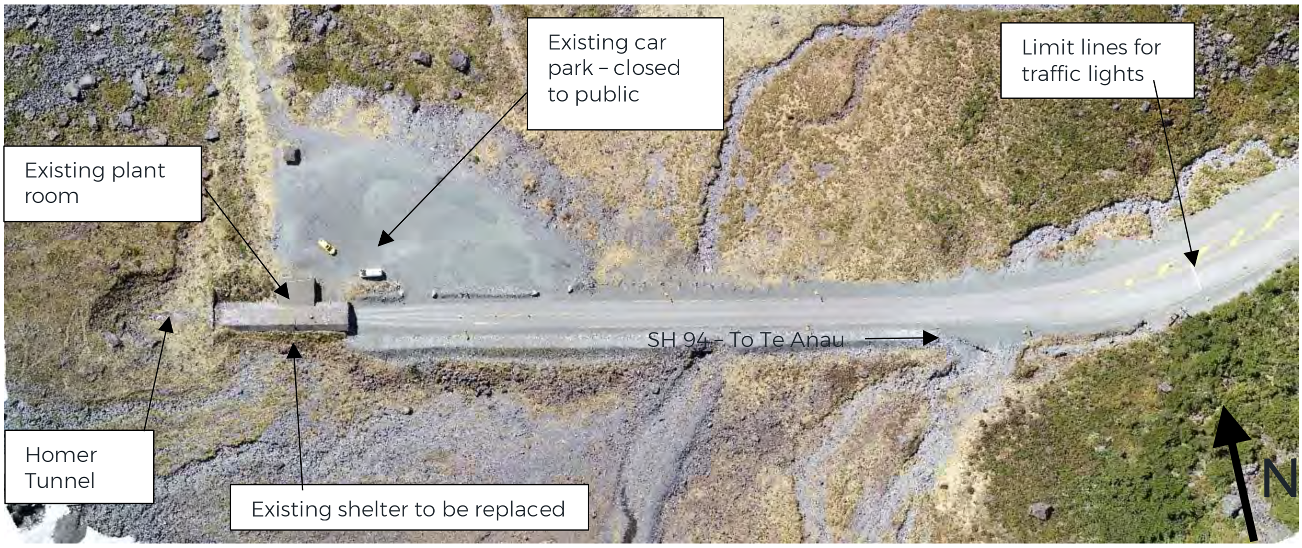


Figure 3-1: Plan showing eastern approach to Homer Tunnel

[12] The local avalanche season generally extends from 1st May to 30th November, a 7-month period.

It is noted that the east entrance to the Homer Tunnel comprises three distinct structural sections as shown in Figure 3-2:

- The semi-hexagonal RC shelter, which is the visible portion of the 'tunnel' and is to be replaced by this project.
- The circular concrete arch portal traversing through the talus slope to the rock interface, which is hidden within the talus slope.
- The exposed rock tunnel, which penetrates through the Homer Saddle to the Cleddau Valley.

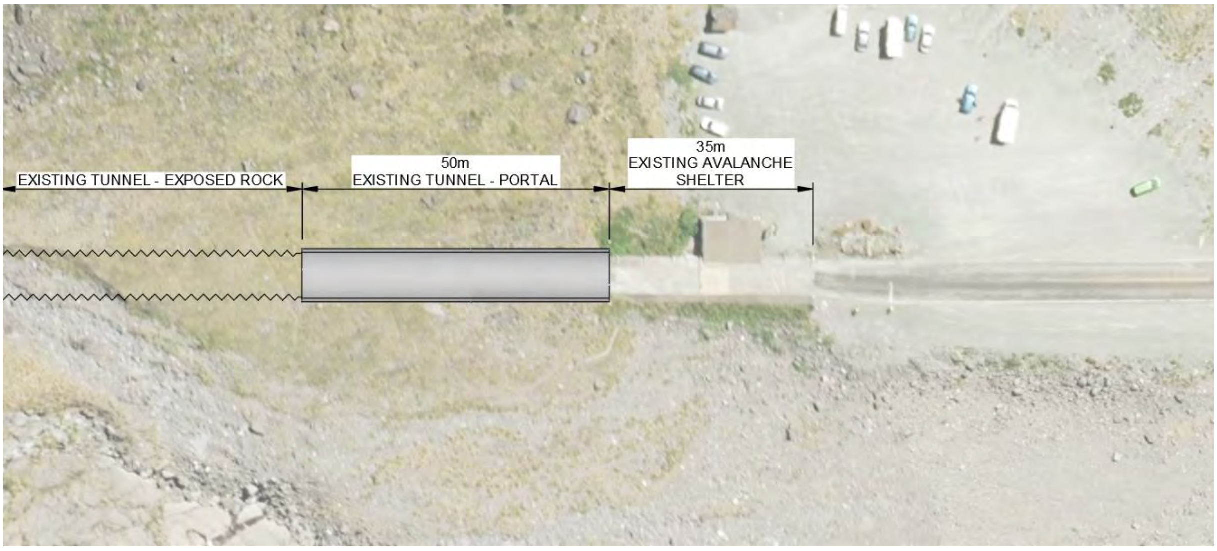


Figure 3-2: Plan showing the layout at the eastern end of the tunnel

General site photos are presented in Figure 3- through 3-7.

Due to avalanche risk, construction activity at the eastern end of the Homer Tunnel is limited to a 5 month period between the avalanche seasons each year, which typically extend from the beginning of December until start of May. The commencement of the avalanche season is dependent on the onset of winter conditions and snowfall. May and June are shoulder months where construction activities may be manageable depending on risk exposure. This provides a challenging constraint on access for construction. To maximise the construction window for the replacement avalanche shelter, enabling work is currently proposed for Dec 2022 – May 2023 period with the replacement avalanche shelter constructed in Dec 2023 – May 2024 period. The enabling works includes relocating the plant room and all of its contents. These works are covered by separate assessments, consents and concessions.

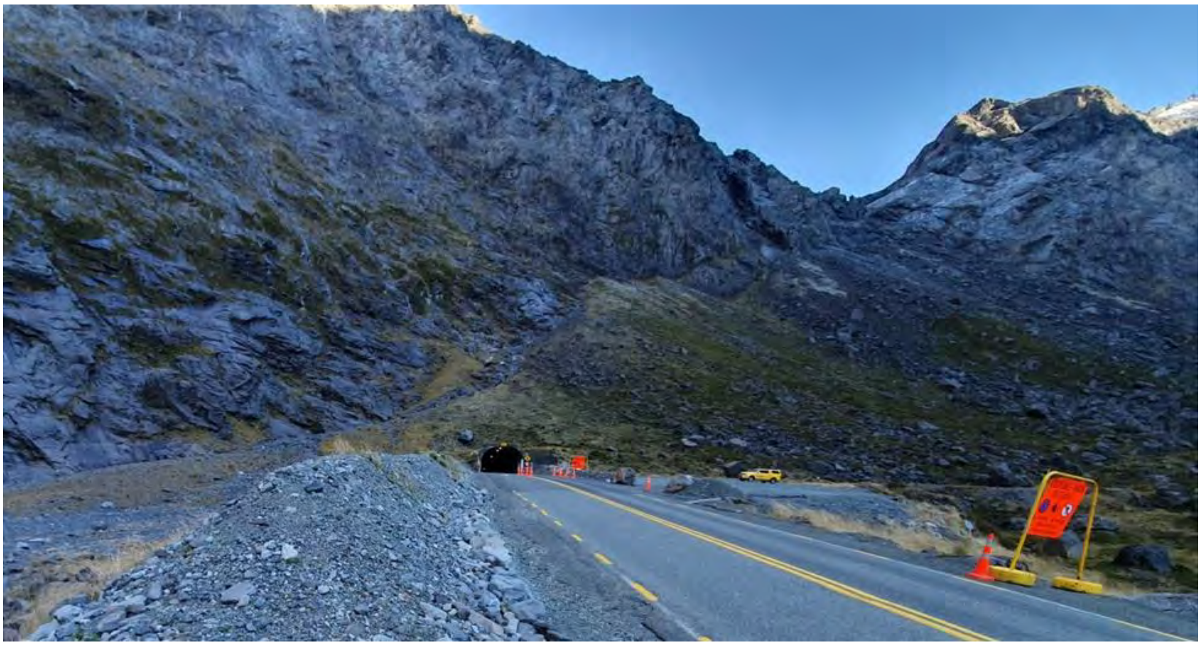


Figure 3-3: Approaching the eastern portal and the existing avalanche shelter, with the dark coloured concrete, existing plant room immediately to the right of the tunnel entrance. There are earth bunds either side of the carriageway. On the left side, the bund provides rockfall protection and the bund on the right side prevents access to the now-closed car park

Figure 3-4: View of existing avalanche shelter entrance

Figure 3-5: Existing avalanche shelter, plant room and talus slope viewed from car park

Figure 3-6: Existing avalanche shelter and plant room viewed from talus slope above

Figure 3-7: Existing avalanche shelter viewed from above existing plant room looking towards stone-faced wingwall at portal entrance

4 Description of the Project

4.1 Design Options

A number of design options are discussed at Section 2 of the draft Structures Options Report.

Fundamentally, all options have a sloped embankment on the uphill side to deflect avalanche flows over the top of the shelter, which avoids the shelter presenting a wall-like obstruction in the path of an avalanche avoiding exposure to potentially massive loading.

To avoid increasing the length of the tunnel and adversely affecting the ventilation within the existing tunnel, the proposed shelter needs to generally have open sides. However, for a short distance (nominally 10 m) at the transition to the existing tunnel portal, the proposed shelter needs to be compatible and connect to the new plant room and will need to be completely buried. Therefore, different structural options are required for these two distinct parts of the proposed shelter, namely:

- The transition structure – used near the existing portal
- The primary structure – used for most of the length of the shelter

4.2 Description of the Proposed Structure

The recommended options for the various components of the structure are:

- Transition structure: Reinforced concrete (RC) portal frame – fully buried; ref Fig 4-1.
- Primary structure: RC portal frame with structurally independent MSE wall; ref Fig 4-2.
- Primary Structure: entrance façade showing approach MSE wall; ref Fig 4-3.
- Roof structure: Hollowcore beams; ref Fig 4-4 and 4-5.
- Angle of roof and embankment: Steeper embankment with shallow sloping roof; ref Fig 4-.

The replacement avalanche shelter will potentially extend approximately 80 m from the existing portal stone headwall; being the uppermost extent likely constructed as part of this project. Its construction is likely to be staged over time. In the initial construction phase, it is likely a built length of 40 m to 60 m will be achieved. The minimum extent is to build the replacement shelter back to at least the truncated extent of the existing shelter. This is to avoid any increased exposure to avalanche and rockfall, while providing a strengthened, long-term structure.

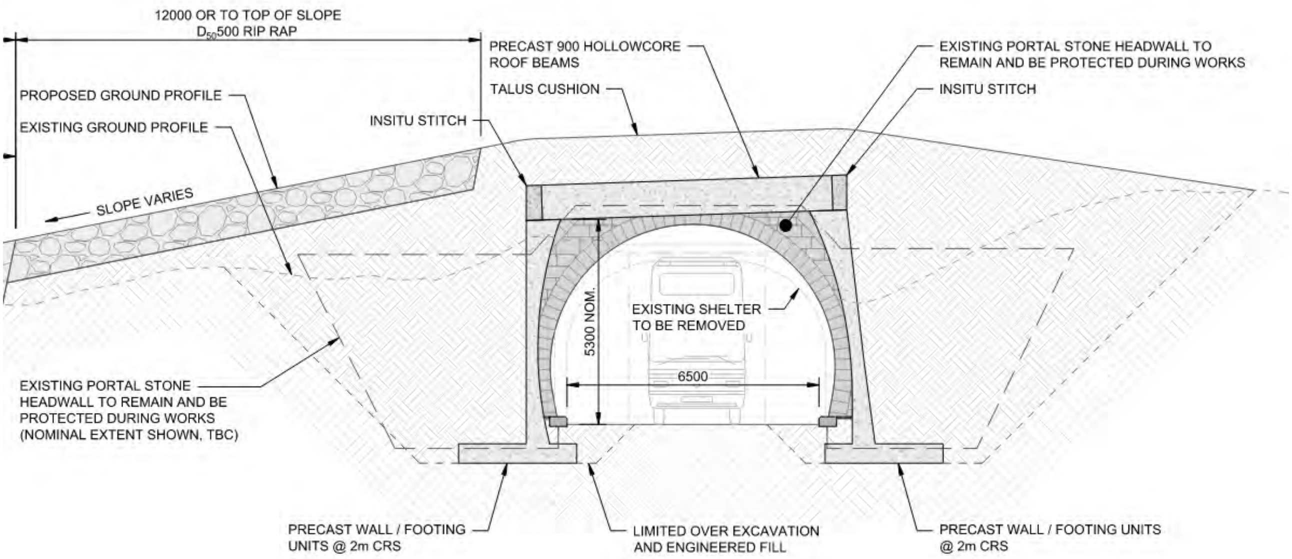


Figure 4-1: Typical section through RC portal frame

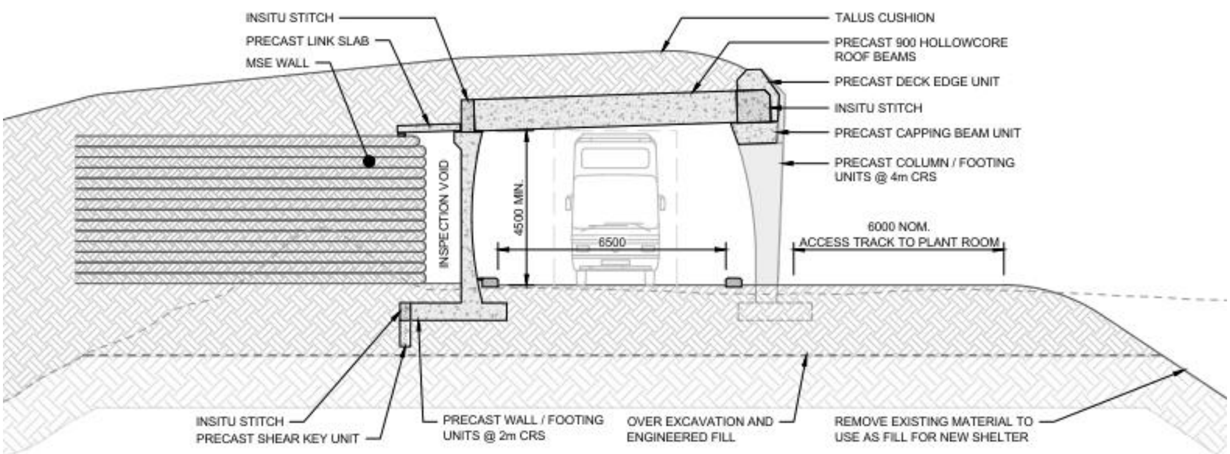


Figure 4-2: Typical section through RC portal frame with structurally independent MSE wall

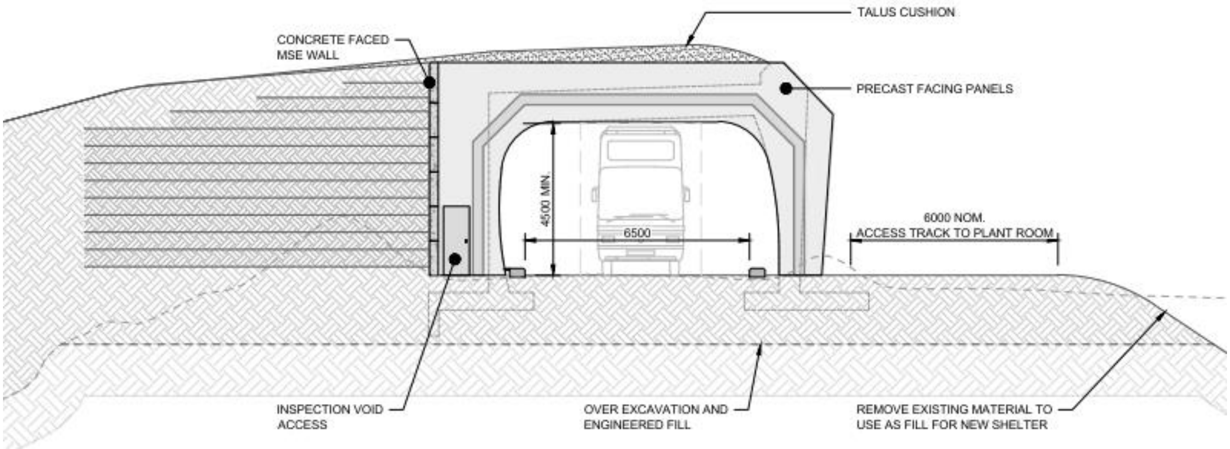


Figure 4-3: Section at entrance façade showing approach MSE wall.

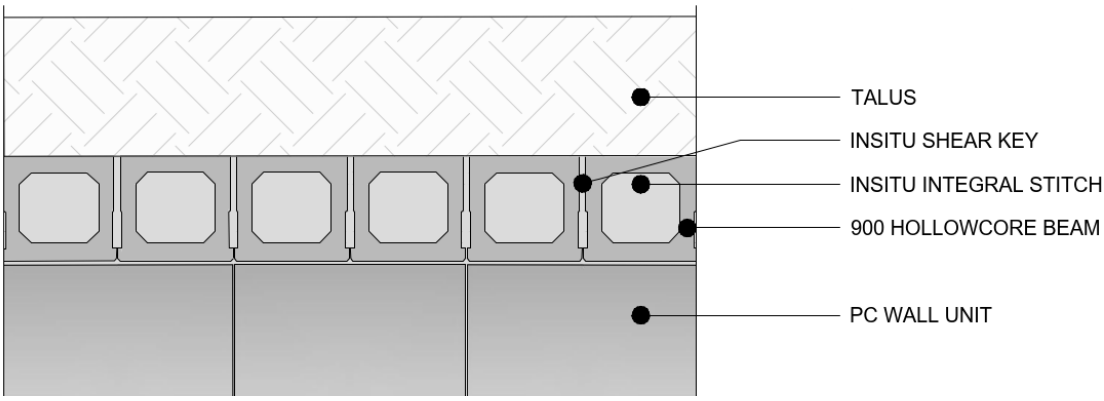


Figure 4-41: Hollowcore beams (roof) buried under talus fill

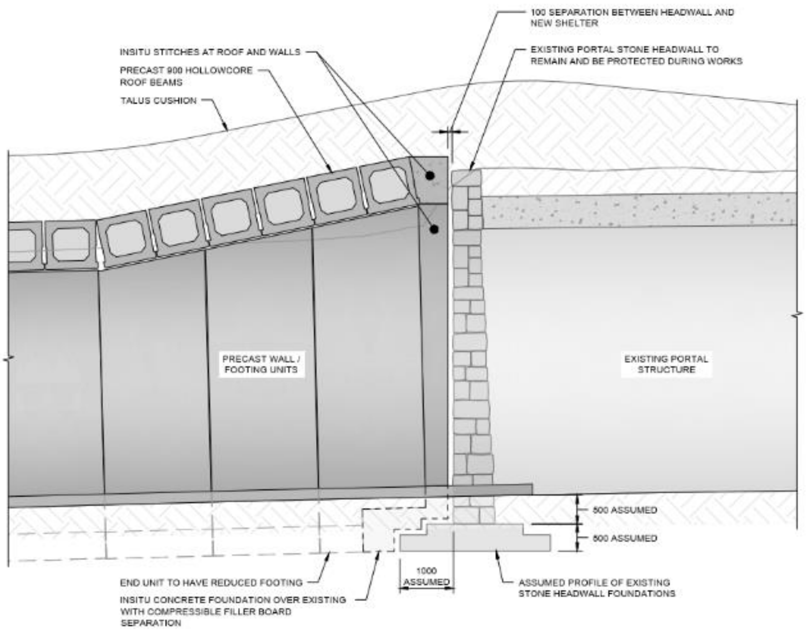


Figure 4-5: RC Portal Frame to Existing Portal Tie-In

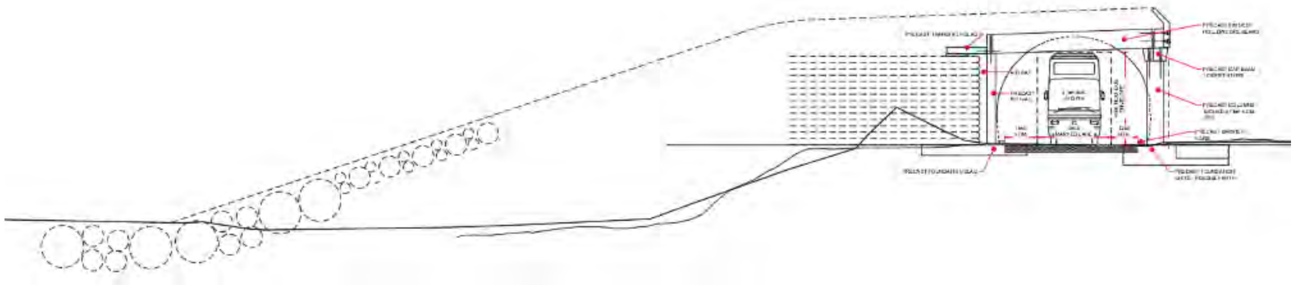


Figure 465: Steeper embankment with shallow slope roof

The construction methods will focus on maximising prefabrication to enable accelerated construction and to allow the road and tunnel to remain open throughout the works.

Construction will generally include excavation of the ground, placement of precast units, construction of an embankment on the uphill side of the shelter and placement of a layer of fill material over the top of the shelter.

It is proposed to use precast concrete which will achieve a minimum 100-year design life. Steel columns could be considered as an alternative to precast columns, but they would of large proportions to provide the required bending capacity and robustness against impact. Also, they would need to be fabricated in weathering steel to avoid the need to maintain the coating in this difficult access and wet environment.

Special controlled fill will be used for the MSE wall construction. This may need to be imported from outside of the national park or an appropriate source within the park will need to be identified also allowing for possible processing (grading and possible crushing).

Rock rip rap will be provided at the toe of the embankment on the uphill side of the shelter to mitigate the risk of scouring under the action of avalanche flow loads and, less significantly, water flow from drainage off the talus slope and rock face. The rip rap will be sourced from within the national park.

General fill material for construction of the embankment is intended to be salvaged and reused from the tunnel tailings currently forming the car park area adjacent to the existing shelter. The top layer and rock impact cushion on top of the shelter will be formed from site won talus material. The excavated area would be re-contoured to a simple, non-eroding slope similar to that which existed before the tunnel was constructed.

The layer of talus material over the roof to provide cushioning will also act to naturalise the earthen embankment. The ‘cushion’ layer is required to resist avalanche scouring as multiple avalanches per season will result in frequent disturbance of the cushioning material. Using the natural site won talus material as the cushion will mean that it can be reinstated readily by redistributing the talus. However, this will also mean that the revegetation of the embankment, either by planting or natural seeding, will be very limited.

Stormwater will percolate through the talus cushion material on the roof. A loose laid waterproof membrane with a puncture resistant protection blanket will be provided to prevent water leaking through the roof. The fall on the roof will convey water across the roof to the embankment fill through which the water will drain away. There is likely to also be seepage through the MSE wall. Runoff from the embankment will be directed along the toe of the embankment slope into the existing drainage paths beyond the shelter.

The shelter will be constructed from precast reinforced concrete sections with F4 formed finishes to visible elements. Special feature formwork, surface finishes and/or coloured concrete or aggregate may be used on large concrete surfaces and are considered as part of the landscape mitigation measures.

4.3 Permanent Modifications to the Landscape

Constructing the replacement avalanche shelter will require the removal of the existing sections of avalanche shelter back to the handlaid stone wall of the actual tunnel portal, along with the existing plant room. The latter will be replaced as part of the enabling works prior to the replacement avalanche shelter being constructed. Once the precast units of the replacement avalanche shelter have been installed, various grades of fill material will be placed along the southern flank and onto the top of the shelter structure. Some of this material will be sourced from the closed carpark fill area and its embankment. This excavated area will then be shaped to more closely replicate the pre-existing natural landform prior to the tunnel been built.

The entrance 'façade' of the shelter and its supporting piers and the open voids on its northern flank will be visible to motorists travelling into the tunnel; the piers and voids will also be visible to motorists exiting the tunnel towards the Hollyford Valley. These features will also be visible from a distance to trampers and climbers heading to and from the Homer Saddle.

4.4 Temporary Modifications to the Landscape

There will be a localised, temporary landscape effects during the construction phase, most of which will be curtailed when the shelter has been completed' and the disturbed surface is rehabilitated and revegetated.

4.5 Reduction of Potential Adverse Effects

The replacement avalanche shelter needs to be robust and designed to be capable of resisting loading from, in part, being buried in the talus slope forming an 'extension' of the slope along its southern 'flank', to resist rockfall impact and inundation by avalanche debris.

Aspects of the Project that reduce adverse effects on landscape character and amenity values include:

- Having a compact form relative to the scale of the mountain basin landform.
- Being partially covered in local talus material.
- Treatments such as dark colour pigmentation utilised so that exposed concrete has an appearance that is sympathetic to the environment.
- Confining signage on the entrance 'façade' to the minimum necessary for traffic safety.
- No lighting visible beyond the road entrance to the shelter.
- The location of the Project is relatively remote within a national park where it will not be overlooked by any permanent occupants or by people stopping at rest areas or the like.

5 Statutory Planning Aspects

The following section is not a formal statutory assessment. This is contained in the Project's AEE. However, an understanding of the statutory framework assists with assessing the landscape and visual effects of the Project.

The site is located within the Fiordland/Rakiura Zone of the Operative Southland District Plan 2018 (the District Plan). The whole of Fiordland is identified in the District Plan Map FRZ.1-6 as an Outstanding Natural Landscape (ONL); refer Figure 5-1.

It is situated within Atawhenua – Fiordland as defined within Te Tangi a Tauira Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan 2008.

The site is in the basin below Te Kōhaka-o-Te-Ruru/Homer Saddle and the traditional pathway along Ōkare/Hollyford River passes east of the site, near the Homer Hut and carpark.

There is one recorded archaeological site within the vicinity (D40/11 – Homer Tunnel portal and portal avalanche debris) which is shown as being located near the Homer Tunnel eastern portal.

Figure 5-1: Extract from SDC District Plan Map FRZ.1-6

6 Methodology

The methodology for assessment is based on the NZILA Landscape Assessment Guidelines[13] and utilises information obtained from both desk top study and site / site context investigation through field study.

The desktop study information has been utilised to help describe the Project, site, and contextual landscape and evaluate the key issues and potential landscape effects of the Project, including positive effects.

A site visit was undertaken on 7 October 2021 to examine the landscape character and values of the broader context and site. During fieldwork, the degree of visibility of the site and Project was confirmed, following earlier desktop study. A photographic record was taken at the time.

[13] New Zealand Institute of Landscape Architects Te Tangi a te Manu – Aotearoa New Zealand Landscape Assessment Guidelines, Final Draft, April 2021.

The outcomes of the site visit served to fine-tune the extent of the receiving environment and determine the locations of any potentially affected parties.

The statutory matters are addressed in **Section 5** of the LVA.

A seven-point scale of effects[14] has been used in this LVA when assessing the potential adverse landscape effects arising from the Project. This effects scale ranges between: 'Very Low' to 'Low' to 'Moderate to Low' to 'Moderate' to 'Moderate to High' to 'High' to 'Very High'. It is generally understood that 'less than minor' effects are equivalent to the 'Very Low' and 'Low' effects ratings (**Appendix 1**).

Mitigation measures are discussed in **Section 4.5** and **Section 8** of the LVA.

7 Potential Landscape and Visual Amenity Issues

In general, the proposed replacement avalanche shelter will be a new built element within a large scale, contained alpine landscape. The existing built or artificial elements are limited to the SH94 road formation leading up to the Homer Tunnel for approximately 300 m from where the road rises from the local bush line and the existing sections of avalanche shelter at the tunnel portal. Existing, but not so obvious is the area of fill material that was excavated when the road tunnel was formed and on which the closed carpark is now located.

The proposed shelter will have a noticeable physical 'footprint' and is therefore likely to be visible and bring about a distinct change to the local landscape. However, being visible does not necessarily equate to an adverse landscape or visual effect. Even if it is adverse, it may be anticipated or expected and therefore not inappropriate in terms of overall balanced and sustainable management.

In terms of potential visual effects, these will relate to how much of the proposed shelter can be seen and from where. With the Homer Tunnel carpark closed to public use, the main 'viewing audience' is confined to SH94 and traffic travelling upslope towards the tunnel. A smaller potential viewing audience to the north will be trampers or climbers accessing the somewhat informal track up to the Homer Saddle. As previously noted, DOC has closed the area close to tunnel to pedestrians, but the informal track can be accessed via the creek bed further to the north.

The traffic lights that control the one-way flow of vehicles through the tunnel are located approximately 200 m east of the tunnel portal and will be approximately 120 m from the front 'façade' at the entrance to the replacement avalanche shelter. This is the one location where vehicles will be stationary and motorists at the front of the queue may potentially see the entrance to the shelter and possibly part of its northern flank.

As SH94 ascends towards the tunnel, the entrance façade and the internal structure of the avalanche shelter will become clearly visible. These aspects are described more fully in Section 8.

7.1.1 Avoidance, Mitigation and Remediation Measures

The following measures will be built into the Project from the outset and include:

- Keeping the size and extent of the shelter to the minimum size necessary to fulfil its purpose.
- The use of a simple, functional form for the shelter.
- The use of colour, texture and pattern in the exposed concrete work.
- The excavation and removal of the 'carpark' fill area.
- The placement of local fill material on the southern flank of the shelter.

[14] As per the above.

- The rehabilitation including natural revegetation of the fill areas as disturbed talus slope.

In excavating the south-facing talus slope when dismantling the existing sections of avalanche shelter, it is intended to disturb as little as possible of the area upslope and down slope of the footprint of the proposed mass fill. Larger rocks on the surface of the slope that is current lying against the south wall of existing shelter will be uplifted and placed aside with their lichen-cover kept exposed. Any areas or clumps of vegetation will also be uplifted intact and placed aside, where and when it is possible to do so. The same approach will be taken when excavating the front slope of the closed carpark fill area.

Figure 7-1 is typical of the vegetation and mixed rock cover on the talus slope to the immediate south of the existing avalanche shelter, an area that is frequently impacted by avalanches during the avalanche season. This area has naturally revegetated since the original construction of the tunnel. The localised presence of vegetation along the embankment on the flank of the existing shelter is likely attributable to snow drift accumulation during the winter months providing protection to the scouring effects of subsequent avalanches. This is not the case relative to the more expansive valley floor to the east away from the shelter, which is also impacted by surface water runoff. Figure 3.1 also shows this difference of vegetation cover in an aerial view.

Figure 7-1: Existing vegetation and both lichen-covered rocks and fresh rocks and gravel avalanche and waterborne debris on south side of the existing avalanche shelter.

The excavated talus, rock and plant material will be stockpiled in the immediate area. After the replacement avalanche shelter has been built, it will subsequently be placed on the upper surface of the placed mass fill, starting from the 'front slope' that faces the road and then working along and up onto the top of the newly constructed shelter. The local rock will be placed lichen side up, interspersed with clumps of replaced vegetation. Graded rock armouring placed over the lower portion and on the toe of the fill slope as a fundamental component to the replacement shelter's avalanche protection.

The uplifted vegetation to be used in this direct transfer method will be screened/protected from the sun and the wind and frequently watered to maintain its viability while in temporary storage on site. Should the uplifted clumps of vegetation not survive this process, they will still constitute organic material being returned to the slope, much in the same way smashed vegetation within avalanche debris is the starting point for the regrowth of the subalpine vegetation.

As can be seen in Figures 3-4 to 3-7, the concrete of the existing avalanche shelter is weathered and quite dark in colour; presumably as the aggregate for the concrete was won from locally occurring rock and gravels. As the sections of the replacement avalanche shelter will be pre-cast at a site outside the national park, all the exposed concrete work will be pigmented to an equivalent dark colour.

On the southern flank of the replacement avalanche shelter, local talus material and uplifted vegetation will be specifically placed on the end slope facing the road to help visually 'tie' this built slope into its surroundings.

Similarly, uplifted talus, rock and plant material from the 'front face' of the closed carpark fill will be placed on the new, downhill batter of the excavated area, working away from the road. This is with the intent that this placed material will be more visually evident on the road approach and in the latter case, to trampers and climbers moving up the valley.

In regard to the height of the retaining walls, such as that which forms the outer end of the shelter's MSE wall and the entrance façade of the shelter, New Zealand Building Code F4 (safety from falling) does not apply as:

- Barriers would be incompatible with the intended use of the area.
- While there is to be no public access to the immediate area, some maintenance access would be anticipated but the hazard can be controlled operationally.
- There is no need to access the areas above the walls and the entrance facade, whether for operation or maintenance.
- The tops of the walls are generally not accessible as the rocky talus material makes climbing the slope difficult, i.e., the slope forms a natural barrier.
- Any barrier would be subject to damage from rockfall and avalanche and would require repair, inspection and maintenance access to an area where access would not normally be needed.
- The general area presents similar natural hazards.

In terms of the use of colour, texture and pattern as part of the surfacing and finish to the Project's concrete work, some initial concepts have been included in the visual simulations at Attachment 1. These will be developed more fully with the Project's stakeholders as design input is developed.

In relation to texture, it has been concluded that this is going to be provided. This comes at an expense and the priority is to provide protection by maximising the extent of the shelter within the available budget rather than on embellishments unless this has some important context. The priority area where there could be some visual benefit is applying some treatment to the shelter entrance façade, which is a more dominant element.

8 Assessment of Landscape and Visual Effects

The following assessment is based upon:

- A site visit on 7 October 2021 to gain a fresh understanding of the receiving environment[15].
- Observation of the current extent of the existing avalanche shelter at the eastern portal of the tunnel and that of the temporary avalanche shelter at the western portal of the tunnel.
- An understanding of the Project and the likely visual effects of creating the replacement avalanche shelter.
- Experience gained in defining and implementing appropriate measures to address these types of effects. This relates to railway tunnel rockfall shelters and their integration with the local landscape as part of the recent North Canterbury Transport Infrastructure Recovery project.

The description and discussion in previous sections about setting, site, planning context and proposed activities forms the baseline discussion to this assessment.

8.1 Project Visibility

The existing, remaining sections of the Homer Tunnel's east portal avalanche shelter are visible from SH94 over a relatively short distance of approximately 300 m when driving towards the tunnel from the east. Traffic currently stops on a 20-minute cycle at a set of traffic lights at the edge of the avalanche 'safe zone' approximately 200 m east of the tunnel. The traffic then proceeds up an incline through a no-stopping zone onto a level section of road through the existing sections of avalanche shelter and then descends into the tunnel.

As noted at Section 2.3, no parking is allowed on the immediate road edge or within the former carpark to the immediate north of the tunnel entrance. DOC has also closed the immediate area to walkers, trampers and climbers. However, it is understood that people do still walk along the road edge to access a somewhat informal track that leads from the corner of the closed carpark across the toe of the adjacent debris fan and then up to the Homer Saddle. These walkers will have a direct view of the existing avalanche shelter.

8.1.1 Viewpoint Selection

In order to understand the extent of the alpine landscape within which the eastern portal of the Homer Tunnel is located and the potential extent and scale of the replacement avalanche shelter, an aerial overview – Drone View: Before and After - is provided at **Attachment 1**.

Relative to the likely common views of the proposed shelter, viewpoints have been selected in order of closing proximity to the Project:

1. Approach from Traffic Lights
2. Approach to Tunnel
3. Entering Shelter toward Tunnel
4. Exiting Shelter toward Hollyford Valley and
5. Shelter as seen from the north

[15] The author of this LVA has visited the area many times in the past, tramping and climbing in the area and also providing input to various projects along SH94 and at Milford Sound.

The location of these five viewpoints is shown at Appendix 1: Viewpoint Locations. The reasoning behind considering a particular view and the specific discussion regarding the visibility of the various aspects of the Project is provided in Section 8.3 relative to the particular viewpoints.

8.2 Visual Simulations

Visual simulations[16] have been produced to illustrate the likely extent of the potential landscape and visual effects of the replacement avalanche shelter.

The fact that parts of the shelter will be visible and will change aspects of the character of the existing landscape does not necessarily mean that these effects will be inappropriate or unacceptable. The visibility, scale, nature and duration of the effect, the visual complexity and scale of the existing landscape, the visual sensitivity of the viewer and the size of the viewing audience; all influence the degree of the Project's potential landscape and visual effects. Visual sensitivity is a measure of how critically changes to a landscape will be regarded and this depends upon a range of viewer preferences and view characteristics.

The assessment that follows provides an objective description of the degree of change from the status quo that a viewer will experience from each particular viewpoint and what the degree of effects is likely to be following the construction of the Project. It is also noted that the full potential length of the replacement avalanche shelter at 80 m has been portrayed in the visual simulations. This is a 'worst case' or conservative view as it is most likely that a shelter length of no more that 60 m and possibly only the existing length of 35 m will be built in the first instance.

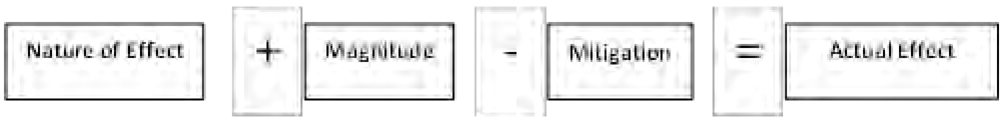
8.3 Landscape and Visual Effects relative to Specific Viewpoints

What has been used to define a potential visual effect ranking is a combination of the extent to which the Project is a focus, the extent to which the Project has changed the landscape, along with the duration of the view and the effects of distance.

Based on the environmental and design information available, the nature of the potential effect is described. It is noted that change is not an effect per se. By way of example, it is not the quantity of the earthworks that is relevant, rather the effect of the earthworks on (say) visual amenity values or on the natural character of a stream.

An evaluation of the magnitude of the effect is then provided. Magnitude is influenced by variables[17], for example the dimensions of the Project, distance from a viewpoint, and the effects of intervening landform or vegetation. A relative scale is used to rank magnitude and reasons provided to justify the ranking. The following 7-point scale based on the current NZILA LVA Guidelines is utilised. **Appendix 1** outlines these rankings in descending order.

The mitigation component that is factored into the above actual effects 'equation' is a combination of the Project's mitigation measures previously outlined in Section 6.1.7 and known effectiveness of previous 'landscape' rehabilitation conditions.



[16] The visual simulations have been produced relative to NZILA Best Practice Guide 'Visual Simulations BPG 10.2.

[17] In other words, an assessment of magnitude can be thought of as an assessment of variables.

In this assessment, the focus is on long term effects of the Project; being the 'Actual Effect'. Mention is made of a number of short-term effects that will appear during construction and then cease after the construction phase. Once the Project is completed, the initial effects; being 'Nature of Effect' and its 'Magnitude' will be reduced via the proposed landscape mitigation measures – 'Mitigation', resulting in the 'Actual Effect'.

8.3.1 Viewpoint 1 – Approach from Traffic Lights

Refer to the images at Attachment 1: Viewpoint 1 – Approach to Traffic Lights.

The 'Existing Situation' photo for Viewpoint 1 was taken from the limit line at the traffic lights on the approach to the Homer Tunnel when driving the Hollyford Valley section of SH94. As the road continues to rise towards the tunnel from this viewpoint and then flattens off, only the upper portion of the existing avalanche shelter and its associated tunnel opening is visible from this point. This is the one point on the local section of road where traffic may be stationary and the motorist that will see this particular view will be limited to those 'at the front of the queue'. Due to the avalanche risk, from this point through the tunnel motorists are not allowed to stop. The distance from the traffic lights to the existing avalanche shelter is approximately 200 m.

In this view it is also possible to see a linear bund of rubble on the left or south side of the road that has been placed to provide a degree of rockfall protection to the road and to exclude the potential of traffic pulling over and stopping. Somewhat less distinct is a rubble bund that is closer to the tunnel on the right or north side of the road that is a barrier to traffic potentially entering the now-closed carpark area. Extending out to the right is the outer slope of the closed carpark of which the grey colour of debris or rubble that has been spilled over the slope is visible.

In the 'Project Completed' image, the entrance façade of the replacement avalanche shelter is clearly visible, along with the section of retaining wall tapering down to the ground on the left side of the entrance. The mass fill on the south flank of the shelter is visible to the immediate left of the shelter. An aspect of the northern, open face of the shelter is slightly visible on the right side of the entrance and the rehabilitated talus slope that will cover the new plant room extends out to its east-facing entrance retaining wall on the right.

The closed carpark area, which sits on the original cut material that was excavated from the tunnel will be partially excavated to form the proposed shelter's mass fill. Once excavated, this area will be shaped to replicate the scalloped depression that pre-existed the tunnel. Originally, this area would have been talus slope spilling down into the valley. The road formation (elevated causeway) is built from tunnel spoil. The proposed excavation will primarily just remove the wide expanse of the carpark area which is not a nature feature as can be seen in the cover photo of Attachment 1.

A vehicle access track will be maintained parallel to the open, northern face of the replacement avalanche shelter to the entrance of the new plant room. The extent and form of this rehabilitated area is shown more clearly in the 'After' image of the Drone View.

The entrance to the replacement avalanche shelter at is maximum length of 80 m, will be approximately 45 m closer at 155 - 160 m to Viewpoint 1. The landscape change includes the addition of a new structure that is just over twice as long as the existing shelter. The mass fill on its southern flank will be a new element in the landscape, though this will be balanced by the removal of the old fill site on which the closed carpark was located.

In terms of visual effects, the full extent of the replacement avalanche shelter entrance opening and its enclosing façade and associated retaining wall will be the most obvious change. However, the degree of visual effect will be reduced by distance and the large scale of the enclosing alpine landscape, the limited number of motorists actually stopped at this particular viewpoint and the use of colour, texture and pattern in the concrete of the entrance façade.

The potential to rationalise the need for and amount of traffic safety signage will be considered during the detailed design of the Project. The type and placement of such signage will be an important consideration with defining the texture, patterning and/or profiling of the entrance façade.

The degree of landscape and visual effects will be 'Low' from this viewpoint.

8.3.2 Viewpoint 2 – Approach to Tunnel

Refer to the images at Attachment 1: Viewpoint 2 – Approach to Tunnel.

The 'Existing Situation' photo for Viewpoint 2 was taken from a moving vehicle approximately halfway between the traffic lights and the entrance to the existing avalanche shelter. On approaching the entrance to the existing avalanche shelter from 100 m and closer, the semi-hexagonal outer form of the shelter structure becomes clear, though at the distance from this viewpoint, the full opening of the shelter and the tunnel immediately beyond is not visible as the road continues to rise and then 'drops' into the tunnel. The rubble bunds on both sides of the road are obvious, as is the traffic safety-related signage at the opening. The existing weathered concrete plant room can also be seen to the immediate right of the shelter. Immediately above and behind the shelter, the concave shaped cut face where the local talus slope was excavated during the construction of the tunnel in the 1930s to 1940s can be seen. This cut face has an established surface that is very similar to the adjoining undisturbed talus slope; it is only its form that differentiates it.

In the 'Project Completed' image, the entrance façade of the replacement avalanche shelter is directly in front of the motorist and because of its proximity, its form and bulk and the pending descent into the tunnel, the proposed shelter will be obvious. At this proximity, the tapered section of retaining wall to the left of the entrance and the section 'pillars' within the open, northern internal wall of the shelter will be obvious. The play of light through the openings between the pillars relative to time of day and the weather conditions will also be noticeable.

The mass fill on the south flank of the shelter is directly visible to the immediate left of the shelter. To the right, the rehabilitated talus slope covering the new plant room and its entrance retaining walls will be visible, as will the maintenance vehicle access track that leads to the plant room. On the immediate right is the excavated and re-contoured area where the closed carpark was located.

As with the Viewpoint 1 discussion, the placement of a new roading-related structure will create a distinct change in the landscape as it replaces and extends the existing avalanche shelter. The other noticeable landscape change will be the build-up of the mass fill on the southern flank of the shelter balanced by the 'digging-out' of the old fill that forms the carpark site on the shelter's northern flank. The shaping of the mass fill on the southern flank will also mirror the natural tapering talus slope behind and above the shelter.

In terms of visual effects, the approaching view of the full extent of the replacement avalanche shelter entrance opening, its enclosing façade and associated retaining wall and the series of 'open windows' along its northern wall will be the most obvious change. Given the close proximity of Viewpoint 2 to the shelter structure, the degree of adverse visual effects will be high, given that its entrance opening and façade will be a focus for the approaching motorist. However, this will be countered by the positive effects of the motorist's anticipation of the descent into the tunnel, a rare and highly memorable travel experience. The experience of descending into a primeval void that is dark and long, carved out of native rock is not found anywhere else on the New Zealand highway network and is a highlight of travelling on the Milford Road. The large scale of the enclosing alpine landscape, the viewer being in motion and therefore the short duration of the view, the use of colour, texture and pattern in the concrete of the entrance façade and adjoining, north wall 'pillars'; all act to reduce the visual effects to an acceptable degree relative to Viewpoint 2.

The degree of landscape and visual effects will be 'Moderate-Low' from this viewpoint.

8.3.3 Viewpoint 3 - Entering Shelter toward Tunnel

Refer to the images at Attachment 1: Viewpoint 3 – Entering Shelter toward Tunnel.

Figure 8-1 approximates the 'Existing Situation' photo for Viewpoint 3 and is somewhat dated in that there are no longer traffic lights at the entrance to the existing avalanche shelter nor are vehicles allowed to park close to the tunnel. However, the structure remains as shown in this photo with two openings in the north wall of the shelter. Beyond this into what the public would consider 'the mouth of the tunnel', the shelter is enclosed on both sides.

Figure 8-1: Homer Tunnel existing avalanche shelter road entrance

The 'Project Completed' image for Viewpoint 3 is based on a computer model of what would be seen driving through and looking out through the openings in the north wall of the replacement avalanche shelter towards the Homer Saddle and the head of the Hollyford Valley. These openings are the inner seven of a potential total of sixteen in the north wall of the proposed shelter. This will be a transient view as the motorist is about to descend into the tunnel with the openings and their pillars flicking past.

Relative to Viewpoint 3, the noticeable landscape change will be that the replacement avalanche shelter will increase the length of built structure that currently encloses the short 'tunnel entrance' section of SH94 by approximately twice its length if the shelter is extended to 80 m. The visual effect comprises a northern view from the road to the wider landscape seen through a succession of openings or 'windows'.

The degree of landscape and visual effects will be 'Low' from this viewpoint.

8.3.4 Viewpoint 4 - Exiting Shelter toward Hollyford Valley

Refer to the images at Appendix 1: Viewpoint 4 – Exiting Shelter toward Hollyford Valley.

Figure 8-2 approximates the 'Existing Situation' photo for Viewpoint 4 and shows the view from within the inner section of the existing avalanche shelter looking out to the short, flat section of SH94 that is the eastern approach to the tunnel with the Hollyford Valley visible beyond. On the immediate left there is a small opening in the shelter wall containing ducting, followed by two sections of solid wall that relate to the existing plant room followed two openings in the north wall of the shelter. The latter allows for glimpses of the Upper Hollyford Valley as the motorists exit the tunnel.

Figure 8-2: Homer Tunnel existing avalanche shelter road entrance as seen from within the shelter.

The 'Project Completed' image for Viewpoint 4 is also based on a computer model of what would be seen looking out through the final opening in the north wall of the replacement avalanche shelter and the shelter entrance towards the Hollyford Valley. This will be a transient view as the motorist is about to descend from the tunnel into the valley with a quick succession of openings and pillars flicking past.

Relative to Viewpoint 4 as with Viewpoint 3, the noticeable landscape change will be that the replacement avalanche shelter increases the length of built structure that encloses the short 'tunnel entrance' section of SH94 by approximately twice its current length. The visual effect will, again, include a northern view from the road with the vista seen as a succession of framed views. As with the existing shelter, the proposed shelter's road entrance/exit frames the view to a portion of the Hollyford Valley and the western flank of Mt Crosscut as the motorist ascends the eastern portal section of the tunnel and descends into the valley. In this case, the tapered retaining wall immediately to the right of the tunnel exit will be visible, but as it is tapered down to the ground, it will not impede the view to right or south to the Cockburn Incline, being steep lower slopes of Mt Belle on the right or south.

The degree of landscape and visual effects will be 'Low' from this viewpoint.

8.3.5 Viewpoint 5 – Shelter from the north

Refer to the images at Appendix 1: Viewpoint 5 – Shelter from the north.

The 'Existing Situation' photo for Viewpoint 5 was taken from the northwest 'corner' of the closed carpark from a point on the informal track that leads up to the Homer Saddle at the head of the Hollyford Valley. While the public is no longer allowed to park in the carpark adjoining the eastern tunnel portal, it is expected that trampers and climbers can and will access this track to reach the saddle and the peaks to either side. However, the number of people doing this is expected to be relatively low.

The traffic lights on SH94 are visible in the bottom left corner of the photo with a steady climb from that point up to the entrance of the existing avalanche shelter in the middle right of the photo. The rubble bund on the south or left side of the road can be seen extending from a short distance upslope of the traffic lights through to the start of the shelter. The lower section of bunding can also be seen on the near or right side of the road. Closer to the shelter, the near bund includes concrete and reinforcing debris from the original, crushed section of avalanche shelter that extended to the far corner of the 'carpark' fill in this photo (Adjacent to the small, black car in this photo).

Seven sections of the existing shelter are visible with tunnel end of the 35 m long shelter obscured by the talus slope at the right of the photo. The existing flat roofed plant room sits in front of and beside the avalanche shelter, with the closed carpark forming the expansive foreground to this photo.

In the 'Project Completed' image, the entrance façade of the replacement avalanche shelter extends along SH94 for approximately 80 m out from the tunnel headwall, which is obscured by the rehabilitated talus slope and new plant room entrance and retaining walls at the right edge of the photo. The length of the existing shelter equates to the seven sections of the proposed shelter in the middle right of the image; three of these sections are partially to almost completely obscured by the 'plant room' talus slope. The replacement avalanche shelter then extends for another eleven sections to its entrance façade.

The tapered section of retaining wall to the left of the entrance is visible through the three 'openings' in the north wall/face of the shelter nearest the entrance. The internal MSE wall is in shade in this image but will be visible through the remaining openings. The precast capping beam connects all of the shelter sections and with the top deck edge unit contains the placed fill on the 'roof' of the shelter that provided rockfall protection to the shelter structure. The mass fill on the south side of the shelter is not visible from this viewpoint.

The extent of the replacement avalanche shelter, its section pillars and openings that make up the northern wall of the shelter will be obvious. The proposed shelter being up to 60 % longer than the existing shelter will create a noticeable change to the landscape relative to this viewpoint.

The maintenance vehicle access track that leads to the plant room will skirt in front of the north side of the proposed shelter with the excavated and re-contoured area where the closed carpark was located opened up in the left foreground of this view.

As with the Viewpoints 1 and 2 discussions, the placement of a new roading-related structure will create a distinct change in the landscape as it replaces and extends the existing avalanche shelter. The other noticeable landscape change will be the 'digging-out' of the old fill, carpark site on the shelter's northern flank.

In terms of visual effects, the 'long' view of the full potential 80 m extent of the replacement avalanche shelter and the series of 'open windows' along its northern wall will be the most obvious change. Given the close proximity of Viewpoint 5 to the shelter structure, the degree of visual effect will be adverse 'High'. However, there are a number of factors that act together to reduce the overall visual effects to adverse 'Low' relative to Viewpoint 5. These include:

- The likely small size of the viewing audience, especially given that DOC has excluded people from the tunnel portal area.
- The large scale of the enclosing alpine landscape as shown in the Drone View 'before' and 'after' images.
- The inclusion of multiple 'openings' in the shelter's northern 'wall' that break up the visual 'bulk' of the shelter.
- The use of colour, texture and pattern in the concrete of the shelter's north wall beams and pillars.
- The removal of the closed carpark fill and naturalisation of the excavated area.

The degree of landscape and visual effects will be 'Low' from this viewpoint.

8.4 Summary of Landscape and Visual Effects

The following summarises the potential landscape and visual effects of the replacement avalanche shelter relative to the specific viewpoints.

This assessment, relative to the various viewpoints that have been considered, provides an objective description of the degree of change to the status quo that a viewer will experience from each particular viewpoint, rather than whether the change represents an adverse or a positive effect. However, this can be inferred from the NZILA scale of effects table used for each viewpoint.

The fact that a component of the Project will be visible and will change aspects of the character of the existing landscape does not necessarily mean that its effects will be adverse, inappropriate or unacceptable. Its visibility, the scale, nature and duration of the effect, the visual complexity and scale of the existing landscape, the visual sensitivity of the viewer and the size of the viewing audience influence the significance of the Project's effects. Visual sensitivity is a measure of how critically changes to a landscape will be regarded and this depends upon a range of viewer preferences and view characteristics.

In regard to the five viewpoints discussed at section 8.3, Table 1 summarises the level of potential visual effect for each.

Table 1: Ranking of Effect relative to Specific Viewpoints

Viewpoint	Location	Visual Effect
1	Approach from Traffic Lights	Low - adverse
2	Approach to Tunnel	Moderate-Low - adverse
3	Entering Shelter toward Tunnel	Low - neutral
4	Exiting Shelter toward Hollyford Valley	Low - neutral
5	Shelter as seen from the north	Low - adverse

In terms of whether the effects are adverse or positive, for the three viewpoints where the view is towards the Project – Viewpoints 1, 2 and 5 – the visual effects would be adverse. This is primarily due to the addition of further built structure into these views. The two viewpoints – Viewpoint 3 and 4 – where the view is outwards from within the Project, the visual effects could be considered positive, given that the view consists of a series of framed vistas. However, given the degree of new built structure within these particular views, the effect is considered to be neutral.

9 Natural Character Effects

Any potential effects of the Project on natural character needs to consider whether the effects are adverse or not and what degree the effects are. It also needs to be noted how this relates to the planning context; in this case, the Fiordland/Rakiura Zone and its status as an ONL.

The broad landscape context of the Upper Hollyford Valley is described in Section 3 Landscape Description of this LVA and more specifically relative to the replacement avalanche shelter at Section 3.2.

The Project will increase the extent of built structure within the enclosed alpine landscape of the Upper Hollyford Valley by approximately twice in length over that of the existing shelter, if the proposed shelter is extended to 80 m. Other ancillary infrastructure is already in place, such as the approach section of SH94 from the traffic lights to the avalanche shelter or has been consented, such as the new plant room. The latter will have been installed prior to the construction of the replacement avalanche shelter.

The Project will be located within a national park which demands a higher level of management of effects that are likely to be generated by any proposed changes. The SDC District gives effect to the landscape quality having 'Outstanding Natural Landscape' status. The landscape setting that the proposed changes would fall within is unique and has very high levels of natural character.

Pertinent to the national park setting is whether the Project is appropriate (or not). The Project will introduce several modifications to the area, which among other things will include a new avalanche shelter; a large structure that will be up to approximately 80 m long. However, the proposed shelter is likely to no more than 40 m in the first instance and possibly no longer than the existing shelter. This will replace the existing avalanche shelter, which is now approximately 35 m long, but historically was around 150 m long.

It will also disrupt the natural processes of snow avalanche and rockfall, but that is its purpose and safety function. The intent of the structure is to provide improved safety relative to avalanche and rockfall, increased operational resilience from a modern designed structure and buried plant room housing essential equipment that supports the safe operation of the tunnel, plus reduced height restriction for access, including in an emergency.

The Project includes a mass fill along the southern flank of the proposed shelter that will be of a bulk and form to withstand the impact of avalanches into the foreseeable future. This protective fill will include rock armouring in its lower extent and will be shaped and finished to appear similar to the adjoining talus slopes as it extends up onto the top of the shelter. In doing so, the mass fill will blend the Project into the local landform.

A large portion of the bulk fill for the mass fill will be excavated from the closed carpark area. While this is efficient in terms of minimal haul distance, it also provides the opportunity to remove an artificial 'landform' from the immediate area of the tunnel's eastern portal. The excavation will be to an extent and shape that replicates what existed in this site prior to the construction of the tunnel. Once excavation is completed, its surface will be scarified and strippings and other organic material that was uplifted and stored at the start of excavation, will be spread across the site to start the natural rehabilitation process. This will go some way towards reducing any adverse effects of the structure on natural character.

While there are heritage aspects to the existing shelter and its connected plant room, as an assemblage of structures they are broken and unkempt. Once removed and the proposed shelter is built with its associated mitigation and remediation measures established, any adverse effects on natural character will be 'Low'.

10 Cumulative Effects Assessment

Given that the proposed replacement avalanche shelter is a singular entity that replaces and extends an existing avalanche shelter, there will be no cumulative landscape effects.

11 Conclusion

The landscape and visual assessment has considered the potential landscape and visual effects of the Project from to a number of local viewpoints and relative to the replacement avalanche shelter being built a nominal length of 80 m.

In terms of whether the effects are adverse or positive, for the three viewpoints where the view is towards the Project – Viewpoints 1, 2 and 5 – the visual effects would be adverse. This is primarily due to the addition of further built structure into these views. The two viewpoints – Viewpoint 3 and 4 – where the view is outwards from within the Project, the visual effects could be considered positive, given that the view consists of a series of framed vistas. However, given the degree of new built structure within these particular views, the effect is considered to be neutral.

The proposed landscape mitigation measure and, in particular, the removal and rehabilitation of the extensive fill area adjacent to the tunnel portal, will reduce any adverse effects of the Project on natural character.

While there are heritage aspects to the existing shelter and its connected plant room, as an assemblage of structures they are broken and unkempt. Once removed and the proposed shelter is built with its associated mitigation and remediation measures established, any adverse effects on natural character will be 'Low'.

Appendix 1: Seven Point Scale of Effects

From New Zealand Institute of Landscape Architects *Te Tangi a te Manu – Aotearoa New Zealand Landscape Assessment Guidelines*, April 2021. The definitions evolved from NZILA national workshop discussions prior to the publication of the guidelines.

The following seven-point scale is used to describe effects:

- Very High: Total loss to the key attributes of the receiving and permitted baseline environment and/or visual context amounting to a complete change of landscape character

- High: Major change to the characteristics or key attributes of the receiving and permitted baseline environment and/or visual context within which it is seen; and/or a major effect on the perceived amenity derived from it.

- Moderate-High: A moderate to high level of effect on the character or key attributes of the receiving and permitted baseline environment and/or the visual context within which it is seen; and/or have a moderate-high level of effect on the perceived amenity derived from it.

- Moderate: A moderate level of effect on the character or key attributes of the receiving and permitted baseline environment and/or the visual context within which it is seen; and/or have a moderate level of effect on the perceived amenity derived from it. *(Oxford English Dictionary Definition: Moderate: adjective-average in amount, intensity or degree)*.

- Moderate-Low: A moderate to low level of effect on the character or key attributes of the receiving and permitted baseline environment and/or the visual context within which it is seen; and/or have a moderate to low level of effect on the perceived amenity derived from it.

    - Low: A low level of effect on the character or key attributes of the receiving and permitted baseline environment and/or the visual context within which it is seen; and/or have a low level of effect on the perceived amenity derived from it. *(Oxford English Dictionary Definition: Low: adjective-below average in amount, extent, or intensity)*.

- Very Low: Very low or no modification to key elements/features/characteristics of the receiving and permitted baseline environment or available views, i.e. approximating a 'no-change' situation.

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SH 94 Homer Tunnel Avalanche Shelter | LVA
ATTACHMENTS

WAKA KOTAHI
NZ TRANSPORT AGENCY

ATTACHMENT 1 | VIEWPOINT LOCATIONS

SH 94 HOMER TUNNEL AVALANCHE SHELTER | LVA

DATE: August 2022 | PROJECT NUMBER: 6-DK546.00

ATTACHMENT 1 | DRONE VIEW | BEFORE

SH 94 HOMER TUNNEL AVALANCHE SHELTER | LVA
DATE: August 2022 | PROJECT NUMBER: 6-DK546.00

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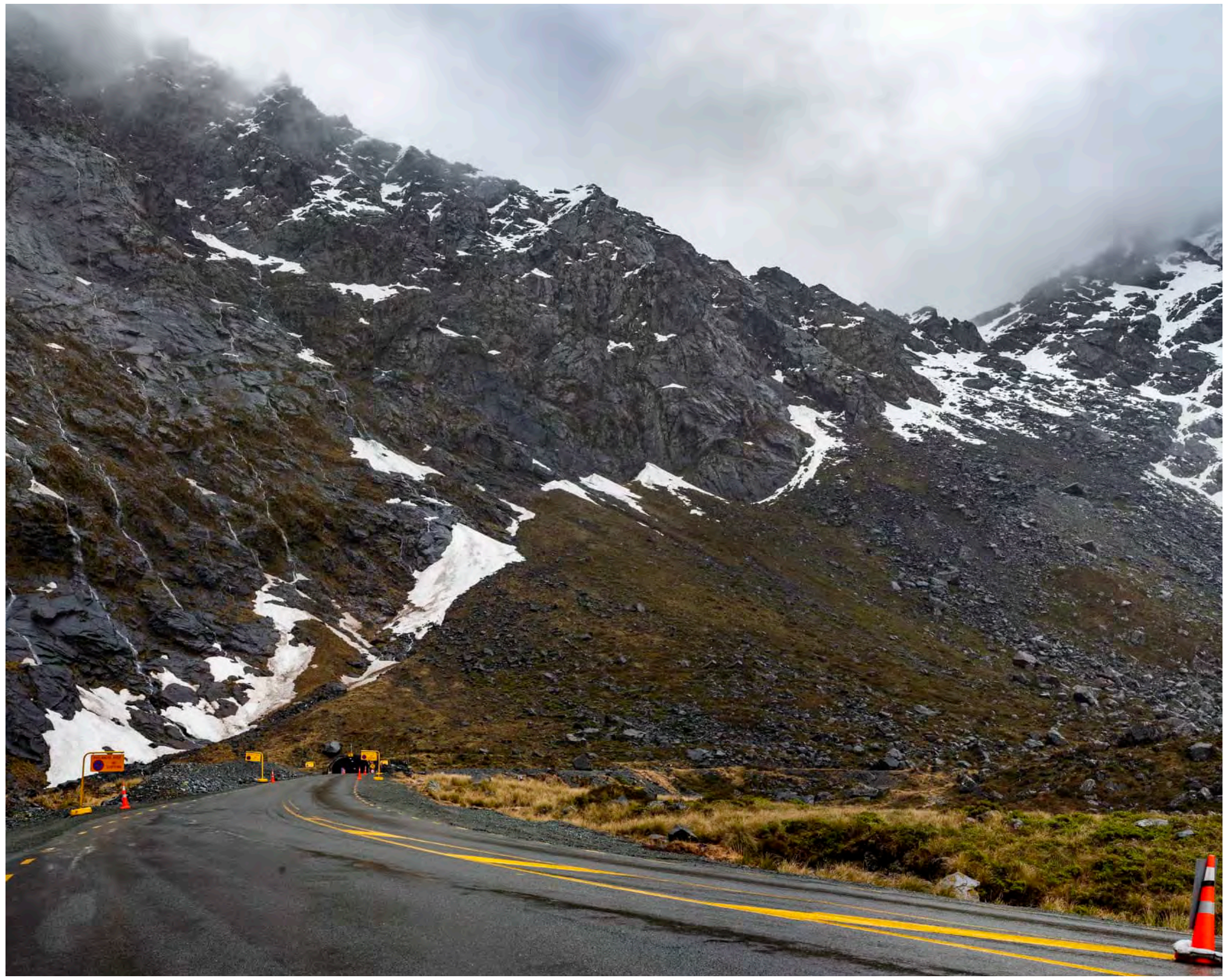
ATTACHMENT 1 | DRONE VIEW | AFTER

SH 94 HOMER TUNNEL AVALANCHE SHELTER | LVA

DATE: August 2022 | PROJECT NUMBER: 6-DK546.00

wsp



EXISTING SITUATION

PROJECT COMPLETED

EXISTING SITUATION

PROJECT COMPLETED

ATTACHMENT 1 | VIEWPOINT 2 | APPROACH TO TUNNEL

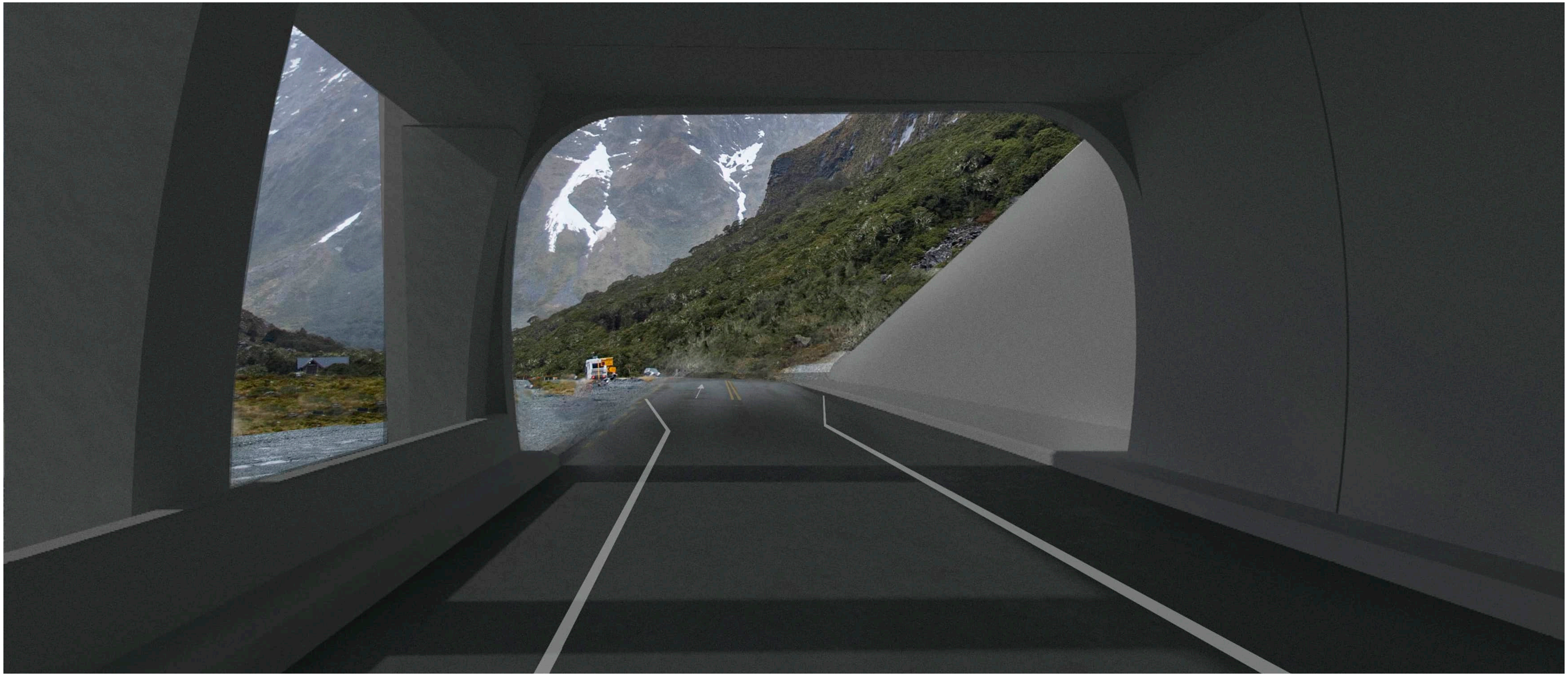
SH 94 HOMER TUNNEL AVALANCHE SHELTER | LVA
DATE: August 2022 | PROJECT NUMBER: 6-DK546.00

PROJECT COMPLETED

ATTACHMENT 1 | VIEWPOINT 3 | ENTERING SHELTER TOWARD TUNNEL

SH 94 HOMER TUNNEL AVALANCHE SHELTER | LVA
DATE: August 2022 | PROJECT NUMBER: 6-DK546.00

wsp



PROJECT COMPLETED

ATTACHMENT 1 |VIEWPOINT 4 | EXITING SHELTER TOWARD HOLLYFORD VALLEY

SH 94 HOMER TUNNEL AVALANCHE SHELTER | LVA

DATE: August 2022 | PROJECT NUMBER: 6-DK546.00

EXISTING SITUATION

PROJECT COMPLETED

ATTACHMENT 1 | VIEWPOINT 5 | SHELTER FROM THE NORTH

SH 94 HOMER TUNNEL AVALANCHE SHELTER | LVA
DATE: August 2022 | PROJECT NUMBER: 6-DK546.00

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Appendix H
Accidental Discovery Protocols

Minimum Standard P45 –
Accidental Archaeological Discovery Specification

1 Purpose

This specification sets out the standard procedure that the Transport Agency representative and Contractors will follow in the event that an archaeological site, kōiwi/human remains or taonga (Māori artefacts) are accidentally discovered during investigation, construction and/or maintenance of the State Highway network and associated works.

This minimum standard P45 does not apply when an archaeological authority has been issued by Heritage New Zealand Pouhere Taonga (HNZPT). Refer instead to the authority, which will set out the archaeological requirements specific to that area of the project.

P45 replaces the earlier standard Z/22. P45 reflects the minimum requirements of the Transport Agency in accordance with statutory obligations under the Heritage New Zealand Pouhere Taonga Act 2014 and the Protected Objects Act 1975.

The procedures contained in P45 are also designed to recognise and provide for the protection of cultural and historic heritage and the special relationship of Māori in regard to their land, water, sites, wahi tapu and other taonga.

Drivers for the revision include the Heritage New Zealand Pouhere Taonga Act 2014, (which replaced the Historic Places Act 1993) and revised guidelines released by HNZPT for the handling of kōiwi/human remains.

An assessment of effects on archaeological values should be completed during the earliest stages of Transport Agency project planning. Transport Agency has guidelines for such an assessment (*Assessing historic heritage impacts guide for state highway projects*).

The decision to either proceed with an accidental archaeological discovery using specification P45 for earthworks on any project or to apply for an archaeological authority must be informed by a project archaeologist in conjunction with HNZPT.

The specification can be referenced in Resource Management Act approvals as a condition of designation or consent.

To reflect an existing agreement with Te Runanga o Ngai Tahu, where Māori archaeological sites, artifacts or kōiwi are found within the **Canterbury and West Coast** regions, the *Accidental Discovery Protocol (2003)* (Attachment 1) agreed between Te Runanga o Ngai Tahu and Heritage New Zealand applies. P45 will apply to other (non- Māori) sites.

In the **Auckland** region, works must also comply with the Accidental Discovery Rule E12.6 in the Auckland Unitary Plan. This rule has some additional triggers and requirements not included in P45. In particular attention is drawn to the parts of the rule that apply to Protected New Zealand Objects as defined in the Protected Objects Act 1975 (including any fossil or sub-fossil), evidence of contaminated land and lava caves.

2 General procedures following the accidental discovery of possible archaeological sites, kōiwi/human remains or taonga

1. **Immediately** following the discovery of material that could be an archaeological site, kōiwi/human remains and/or taonga, the Contractor will cease all work within a minimum of 20m of any part of the discovery and immediately advise the Transport Agency representative of the discovery.

2. If it is unclear whether the find is an archaeological site, kōiwi/human remains and/or taonga, the Transport Agency representative should consult a qualified archaeologist to confirm its origin.

3. The Transport Agency representative shall notify the following people of the discovery:

   - The New Zealand Police, if any kōiwi/human remains are uncovered
     To be satisfied that the remains are not a missing person or part of a crime scene. This is also a requirement of the Coroners Act 1988.

   - Project Archaeologist
   - If a project archaeologist is not nominated in the contract documents, a qualified archaeologist will be appointed by the Transport Agency representative to ensure all archaeological sites, kōiwi/human remains and taonga are dealt with appropriately and to support liaison with key parties, including clarifying with HNZPT whether an authority is required;

   - The Regional Archaeologist at HNZPT

   - Appropriate iwi group(s) or kaitiaki representative(s)
     In most situations these relationships will have been established during project planning. However, note that statutory acknowledgement areas establish obligations on the Crown to work with iwi under specific Accords. Advice on the appropriate iwi group(s) is available through the relevant Transport Agency statutory planner responsible for consents and approvals.

   - Auckland Council, if the discovery is made in the Auckland region
     This is to ensure compliance with the accidental discovery rule in the Unitary Plan.

4. The Transport Agency representative shall require the Contractor to secure the discovery area, ensuring the area (and any object(s) contained within) remains undisturbed and meets health and safety requirements.

   Note: 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 HNZPT irrespective of whether the works are permitted or a consent has been issued under the Resource Management Act 1991.

5. The Transport Agency representative shall ensure that either themselves or the Contractor, as appropriate, are available to meet and guide the Project Archaeologist, New Zealand Police, HNZPT Regional Archaeologist, the appropriate iwi group(s), and (in the Auckland region) the Council to the discovery area. The Contractor and Transport Agency representative will assist with any reasonable requests any of these people may make.

6. The Transport Agency representative shall ensure that no information is released to the media except as authorised by the Transport Agency, in consultation with HNZPT, Police and the appropriate iwi group(s).

7. Further assessment of the site by the Project Archaeologist may be required. If the discovery area contains an archaeological site which cannot be avoided, an application for an archaeological authority must be made to HNZPT in accordance with the Heritage New Zealand Pouhere Taonga Act 2014. All requirements in relation to an archaeological authority will be instructed by the Transport Agency representative as a variation to the contract.

8. The Project Archaeologist and Transport Agency representative shall ensure that any possible archaeological sites, kōiwi/human remains or taonga are protected until as much information as practicable is obtained and a decision is made regarding their appropriate management.

9. When the archaeological authority has been granted, the Transport Agency representative will inform the Contractor when HNZPT have authorised that work in the discovery area can recommence. The Contractor must not recommence work until all statutory and cultural requirements have been met, including the mandatory stand-down period associated with an authority.

10. The Transport Agency representative shall ensure the Contractor undertakes all subsequent works in accordance with the conditions of this authority.

11. In the Auckland region, where it has been determined that no authority is required (for example in the case of kōiwi, or post-1900 archaeological remains), the Transport Agency representative will seek confirmation from the Council that there are no additional statutory requirements under the Unitary Plan.

3 Further procedures in the event that kōiwi/human remains are discovered

1. The discovery of kōiwi/human remains, whether of Māori or non-Māori origin, needs to be handled with respect and sensitivity. Decisions on the next steps should not be unduly rushed.
2. The New Zealand Police are involved in all cases of kōiwi/human remains discovery. Their primary role is to undertake a formal identification of the remains and to determine if they relate to a missing person or if a crime has been committed.
3. HNZPT Regional Archaeologists will (if necessary and where possible) visit a site following the notification of the discovery of kōiwi/human remains. HNZPT staff can assist in formal identification of the remains as human if required, and whether they are associated with an archaeological site and therefore require an archaeological authority before works can proceed. They will also work with the Transport Agency representative, iwi and Police to identify appropriate processes.
4. Iwi, hapu and whānau also play an important role as kaitiaki in the care and management of kōiwi following discovery.
5. As soon as practicable after the Transport Agency representative has given notice to the New Zealand Police through the local police station, the Project Archaeologist, HNZPT regional archaeologist, appropriate iwi group(s), and (in the Auckland region) the Council that kōiwi/human remains have been discovered, the Transport Agency representative shall invite these parties to meet to discuss the next steps.
6. If the remains are of Māori derivation there are a number of sensitive issues to work through including: any cultural ceremonies; the possibility for the remains to stay where they are; if a disinterment license is required from the local Public Health Unit; what protocols will be followed for the removal of the remains if in situ preservation is not possible; the final location of the remains; the level of recording and extent of any further scientific analysis; and who will remove the remains.
7. The Transport Agency representative, in consultation with iwi representatives, shall make the necessary arrangements for any cultural ceremonies as soon as practicable.
8. Once these ceremonies are completed, the Transport Agency representative shall arrange for the Project Archaeologist, in consultation with the New Zealand Police, HNZPT Regional Archaeologist, and the appropriate iwi group(s), to proceed as agreed with potential recording, further analysis, in situ retention or exhumation in a manner to meet professional standards and the New Zealand Archaeological Association code of ethics.
9. If the remains are of non-Māori derivation it will need to be established: whether any descendants can be traced; whether a disinterment license is required from the local Public Health Unit; where remains will be reburied; and what level of recording and scientific analysis should be undertaken.

10. The Project Archaeologist will record details of the kōiwi/human remains, the site of discovery, and any other relevant facts, and these records will be made available to the New Zealand Police, HNZPT, and the appropriate iwi group(s) or other descendants.

11. An archaeological authority may be required from HNZPT before work affecting the site can recommence, particularly if the remains are identified as human and within an archaeological context.

4 Custody of taonga (excluding kōiwi/human remains) or material found at an archaeological site

1. The Project Archaeologist will have initial control of, and responsibility for, all material contained in the discovery area.
2. The Transport Agency representative shall ensure no objects are removed from the site until it has been determined, in consultation between the Project Archaeologist and the appropriate iwi group(s), whether it is associated with an archaeological site and/or the object is taonga (be it taonga tūturu as defined in the Protected Objects Act 1975 or otherwise).
3. If the object is of Māori origin the Project Archaeologist will record the object and its context, and, if it is a taonga tūturu, will also notify the Ministry for Culture and Heritage of the finding as required under the Protected Objects Act 1975.
4. Where statutory acknowledgement areas exist, following Treaty Settlement, the Accords between the Crown and iwi may oblige the Transport Agency to directly notify those iwi of taonga tūturu finds and to transfer these finds for temporary custodianship to these iwi, until ownership is determined. If this situation arises, the Māori Land Court makes the final determination on ownership of all taonga tūturu.
5. If the object is a taonga and less than 50 years old (i.e. not taonga tūturu), the Transport Agency representative shall invite the appropriate iwi group(s) to remove the taonga from the site.
6. If the object is European in origin the Project Archaeologist shall deliver any such object to the Transport Agency representative.

5 Recommencement of Works

1. The Project Archaeologist will have initial control of, and responsibility for, all material contained in the discovery area.

Situation	Recommencement Procedure
Item is identified as taonga tūturu.	Ministry for Culture and Heritage approval required.
An archaeological authority is required.	Works may recommence once the archaeological authority is granted, the 15 working day appeal period has expired and any other pre-start conditions are met. Adherence to site specific protocols with relevant iwi groups. A site blessing should be considered.
Human remains, no archaeological authority required.	Police approval required prior to recommencement. Adherence to site specific protocols with relevant iwi groups. A site blessing should be considered.
No archaeological authority required.	Confirmation from either Heritage New Zealand or project archaeologist and where relevant, local authority that no further consents or approvals are required. Adherence to site specific protocols with relevant iwi groups. A site blessing should be considered.

Attachment 1: Accidental Discovery Protocol (2003) Canterbury/West Coast (Maori Discoveries)

Te Runanga o NGAI TAHU

TRANSIT NEW ZEALAND

Accidental Discovery Protocol
for Transit New Zealand Regions 11 (Canterbury) and 12 (West Coast)

This protocol recognises the importance of archaeological sites to both New Zealand, as set out in the *Historic Places Act* 1993, and to Ngāi Tahu, who consider that the study and analysis of such sites furthers the academic understanding of their tupuna and their world. Through scientific study, the Tribe learns more about their tupuna, and therefore, learns more about themselves. It also recognises the importance of maintaining the safety and efficiency of the State highway network to the community and the need to promote this work while minimising delays, which have both safety and cost implications, when works are being undertaken.

In the event of an "accidental discovery" of archaeological matter, including human remains, the following steps shall be taken:

1. All work within 100m [1] of the site[2] will cease immediately.
2. The plant operator will shut down all construction equipment and activity and advise the construction supervisor for the project site[3].
3. The construction supervisor will take immediate steps to secure the site to ensure the archaeological matter remains undisturbed and the site is safe in terms of health and safety requirements. Work may continue outside of the site area.

   (Note: Should further sites be found outside the 100m protection zone around the original discovery then Transit will adopt a precautionary approach and halt all work on the project site until consultation with the NZ Historic Places Trust (the Trust) and kaitiaki Papatipu Rūnanga has occurred. Transit will only qualify this approach when the project site is very large, eg the 10 km length of the proposed southern motorway. Where work may be being undertaken up to a kilometre or more apart then work will only halt in that part of the project site where the discoveries have occurred.)
4. The site construction supervisor will notify the consultant who in turn will contact the Project Manager at Transit New Zealand. In the event of the Project Manager being unavailable the matter will be reported to the Regional Manager.
5. Transit New Zealand will ensure that the matter is reported to the Regional Archaeologist at the Trust, the kaitiaki Papatipu Rūnanga and to any required statutory agencies[4] if this has not already occurred.
6. Transit New Zealand will ensure that a qualified archaeologist is appointed to ensure all archaeological matter is dealt with appropriately.
7. In the event that the accidentally discovered material is confirmed as being archaeological, under the terms of the *Historic Places Act*, then Transit shall ensure that

[1] This is consistent with the NZAA site protection requirements.
[2] The immediate area or location where the material, artefacts or human remains (without being exclusive) have been discovered.
[3] The project site is the area of the total project as defined in the Transit New Zealand contract documents.
[4] For example, the New Zealand Police in the event that human remains are found.

an archaeological assessment is carried out by the archaeologist, and if appropriate, an archaeological authority is obtained from the Trust before work resumes.

8. In the event of the material being of Maori origin Transit will ensure that the kaitiaki Papatipu Rūnanga is contacted in order that appropriate cultural processes are implemented to remedy or mitigate any damage to the site.

9. Any and all visits to the project site must be cleared by Transit New Zealand who will obtain and maintain a list of authorised personnel and advise the consultant and contractor accordingly. Under law, Transit is charged with the overall safe management of the site, including the health and safety of all persons visiting the site. To meet this requirement and also to protect the integrity of the accidental discovery, Transit considers it important that all visits to the project site are recorded, cleared and visitors inducted into the site.

10. Transit will ensure that representatives of the consultant and the contractor, as appropriate, shall be available to meet and guide representatives of the Trust and kaitiaki Papatipu Rūnanga , and any other party with statutory responsibilities, to the site.

11. Works in the site area shall not recommence until authorised by Transit New Zealand after consultation with the Trust, kaitiaki Papatipu Rūnanga, the NZ Police (and any other authority with statutory responsibility) to ensure that all statutory and cultural requirements have been met.

12. All parties will work towards work recommencing in the shortest possible timeframe while ensuring that any archaeological sites discovered are protected until as much information as practicable is gained and a decision regarding their appropriate management is made, including obtaining an archaeological authority if necessary. Appropriate management could include recording or removal of archaeological material.

13. Although Transit is bound to uphold the requirements of the *Antiquities Act*, it recognises the relationship between Ngāi Tahu Whanui, including its kaitiaki Papatipu Rūnanga , and any Maori artefacts that may be discovered.

[redacted]	[redacted]	[redacted]
Mark Solomon Kaiwhakahaere **Te Rūnanga o Ngāi Tahu**	Robin Odams Regional Manager **Transit New Zealand**	Bruce Albiston General Manager, Southern Region **New Zealand Historic Places Trust**
Date: 13 August 2003	**Date:** 6 August 2003	**Date:** 18 August 2003

Appendix I
Kea Protocols

PROTOCOLS FOR WORKING IN KEA AREAS AT & AROUND SH94

Kea (*Nestor notabilis*) are highly intelligent and curious birds. They may be attracted to anything new in their environment, and are well-known for their persistence in investigating man-made objects as both a potential source of food, and a source of entertainment.

The planned works at the east portal of the Homer Tunnel will involve new objects being present in an environment that is readily accessible to and frequently visited by kea. It is likely that kea will investigate these new objects.

Kea are nationally endangered (Robertson et al. 2021), and protected under the Wildlife Act. To minimize any human-kea interactions that may be detrimental to both the progress at the work site, and the livelihood of the kea, we recommend that the following protocols are adhered to.

Key protocols for minimizing kea interactions, in order of priority:

1. Prevent the work site from being attractive to kea.
    - Limit the attractiveness of work materials and machinery prior to their arrival on-site where possible. This includes the use of pre-cast materials for construction.
    - Do not interact with kea. This includes yelling at, "shooing", and imitating kea.
    - Do not feed kea. If birds are not actively fed, they will eventually get bored or hungry and move on.
    - Ensure that food scraps are not disposed of at the work site.
2. Disguise or prevent access to any attractive items that are to remain on-site unattended.
    - This especially includes soft or chewable materials, and shiny or brightly-coloured objects. Items can be disguised or made unattainable by being covered with tarpaulins or netting.
    - "Kea-proof" new plant arriving at site by protecting seals and protrusions, and removing removable parts, as far as reasonably practicable.
    - Close doors and windows of site buildings, plant and equipment, and where available put covers on machinery when not in use.
    - Do not leave loose clothing, boots, packs, food, and brightly coloured objects unattended. Where possible provide secured storage on site for these items.
    - Conduct daily end-of-day site walkovers to ensure no loose construction items or equipment remain on site. Items that may be of interest to kea which cannot be removed shall be appropriately covered or stored.
3. Deter kea from interacting with items at the work site.
    - Have a 'kea-kit' (including covers/tarpaulins/netting to exclude birds from particular areas of the work site that may be of interest) on hand.
    - If kea are showing interest in a particular item and the item cannot be removed, disguise or make unattainable by covering with tarpaulins or netting. Alternatively, a coating of cinnamon or garlic paste can be used to deter kea from chewing on items (Kea Conservation Trust 2018).
    - The use of a temporary electric poultry fence may be employed to deter persistent kea (Kea Conservation Trust 2015).
    - Any potentially hazardous construction materials are to be securely stored on site at all times when not in use.

Follow-up:

When operating plant or machinery, where there is potential risk to kea, the contractor is to stop work until this situation is appropriately mitigated.

Advise the Site Manager of any kea disruptions, and where necessary engage a suitably qualified "kea wrangler" to assist in problematic bird management. Contractor to confirm if 'kea wrangler' role has been appointed. Further measures shall be informed by a suitably qualified and experienced practitioner (SQEP) in avian ecology for the management of kea.

The Contractor’s Site Manager shall be further briefed by the SQEP in the ‘day to day’ management of kea.

The Department of Conservation (DoC) are also to be informed of any problematic kea including the presence of any downy chicks. The Contractor is to establish a contact with a local Ranger at the DoC Visitor Centre in Te Anau.

It is an offence to handle threatened wildlife. Kea are not to be removed from the work site. Where a kea is suspected to be injured or unwell, the contractor shall contact DoC to remove the kea from site.

Notes on kea breeding:

1. Building works are timed to avoid the kea nesting period of July to January (Heather & Robertson 2005).
2. The work site footprint does not contain suitable habitat for a kea nest site, so it is highly unlikely that nesting will occur on-site or in the immediate vicinity of the work site.
3. Any suspected kea breeding behaviour or the presence of downy chicks must be reported to Site Manager for advice on how to proceed.

Sources of information:

Kea Conservation Trust (KCT) website

Author’s personal experience both trying to attract and deter kea

For further advice, the Contractor could also engage directly with the KCT kea conflicts advisor to assist in further developing protocols to address specific issues on site. However, it is the contractor’s responsibility to ensure that any advice or action taken does not conflict any statutory requirement including under the Wildlife Act.

References:

Heather, B.D. & Robertson, H.A. 2005. *The Field Guide to the Birds of New Zealand*. Penguin Books, Auckland.

Kea Conservation Trust 2015. General info – kea proofing your home. https://www.keaconservation.co.nz/wp-content/uploads/2016/09/General-info-kea-proofing-your-home.pdf

Kea Conservation Trust 2018. Kea Guidelines for Plantation Forestry. https://www.keaconservation.co.nz/wp-content/uploads/2018/08/Final-Kea-Guidelines-at-5-May-PP.pdf

Robertson, H.A.; Baird, K.; Elliott, G.; Hitchmough, R.; McArthur, N.; Makan, T.; Miskelly, C.; O’Donnell, C.; Sagar, P.; Scofield, P.; Taylor, G. & Michel, P. 2021. Conservation status of birds in Aotearoa New Zealand, 2021. *New Zealand Threat Classification Series 36*. Department of Conservation, Wellington.

Signature:

[redacted]

Sara Larcombe

WMIL Ecologist

5 September 2022

Appendix J
Records of Consultation

<u>Meeting Minutes – State Highway 94/Homer Tunnel Avalanche and Rockfall Safety Improvements Stakeholder Workshop*</u>

Date: 02 March 2022

Attendees:

Attendee and Role	Organisation
Chris Collins, Project Manager	Waka Kotahi NZ Transport Agency
Gemma Kean, Senior Planner	Waka Kotahi NZ Transport Agency
George Enersen, Senior Planner	WSP
Steve Baker, Principal Planner	WSP
Michael Cowan, Technical Director Bridges and Civil Structures	WSP
Lisa Wheeler, Senior Permissions Advisor	Department of Conservation
Antonia Croft, Community Ranger (Te Anau)	Department of Conservation
Matt Schmidt, Senior Heritage Advisor	Department of Conservation
George Gericke, Consents Officer	Environment Southland
Tracy Excell, Resource Management Planner	Southland District Council

*To be read in conjunction with the ppt presented by Waka Kotahi

<u>Comments from DOC</u>

- General agreement from all parties that it was good to see that the stonework from the tunnel portal is being exposed through the new avalanche shelter design and that the octagonal entranceway shape has been retained/reflected through the new shelter design.
- Questions regarding the required fill either side of the avalanche shelter as fill is anticipated to come from the location where there is known avalanche shelter debris. If the debris is not going to be used as fill then it should be retained in-situ to demonstrate the story about what materials were left following destruction of the former sections of the avalanche shelter.
- The site does not have to be cleaned up completely – rather debris can be left in situ (more beyond the initial shelter length) as this reflects the environment and engineering feat.
- Question on whether there will be enough room left to provide walking access to the former causeway which provides access to an old workers camp on the northern side – confirmed this will be retained.
- Advised that rock wren were present when DOC visited the site to record heritage features – near to the workers camp.
- View that it was ok for the plaques to be left on-site even though they wouldn't be viewed by visitors they would be visible for anyone accessing the site for maintenance/operations purposes i.e workers. So long as the story is told elsewhere. DOC to think more about this and provide advice.
- Need to consider any ongoing maintenance requirements – to discuss further with DOC once the heritage assessment being undertaken by Origin on behalf of Waka Kotahi is completed.
- Rock wren and kea breeding season is July-January: Note that this eats into the planned construction timeframes (Nov-Jan). Overlapping months – look at whether a management plan can adequately address potential effects. **Note – look at the 3-lane project SDC consent.**
- Lizard survey completed with no lizard findings. Rock wren and Kea survey/management plans being worked on during March.
- DSI/ materials/rock fill, will the excavated material from the carpark be suitable for the proposed development? Hollyford site may be possible but will add costs for transport.
- Need details on volume/type of fill: engineered fill? Also look at the Gertrude fill site. Rock source likely the key challenge due to potential shortage within the FNP.

- Importance of communicating to visitors e.g. Federated Mountain Clubs (FMC), NZ Alpine Club (NZAC) and Milford Sound Tourism (MST) about the construction season as aligns with peak season for access and likely a double down on visitor numbers coming out of Covid restriction periods. Note that previous comms from others were very well received so look into this approach.
- Knobs Flat and Cascade Creek and visitor centre at Te Anau were identified as possible sites for storytelling as largest population stop prior to the Homer Tunnel. One idea was using a flat screen and relocating the plaques + providing safety information. The MRA/NZTA had an old screen at the Knobs Flat site – discuss with the MRA and MST as they manage the site.
- Opportunity for a joint information sharing location, history of the tunnel, environmental significance and ecological species in the area and the health and safety risks – could be used to influence behaviour of tourists also?
- Another option was the vintage machinery museum in Te Anau – potential to relocate some of the shelter etc. here? – option to consider.
- If the shelter is to be moved suggested that a corrugated iron shelter over the top for protection – though unlikely that the concrete shelter needs to be protected as still in a condition that can last for future, rather cracks etc. would need to be filled in. Consider future maintenance.
- If more than a screen is proposed at Knobs Flat then a conversation with MST will be required.
- Questions regarding construction staging: Site offices to be located at the ATOC. Precast elements to be held off-site (Lone Tree) and then brought onto site for construction. Fill material from the site will be stockpiled on site. Concession in the carpark space for construction, consider long term requirements and access in the future – matters to consider for Stage 3 concession. Further work to be undertaken on potential staging areas.
- David Griffin (property contact, DOC) working through property requirements already w Waka Kotahi.
- Questions around limiting access during works – was noted that considerable consideration being given by the design team with respect to minimising disruption and within tight timeframes. Tunnel operation to be maintained, aim to open during tidal flows for peak movements and then likely lengthy closures during the middle of day.

Environment Southland

- Things to consider for consenting: works in proximity to waterways – check any ephemeral streams etc.
- For stockpiling/material excavation – water requirements – runoff/erosion sediment control.
- Consent requirements for gravel abstraction – to be checked.
- Any water abstraction required? Any minor water diversions? Potential for temporary diversions during works and long term associated with the toe to protect for ongoing erosion.
- Contaminated land re-use (Permitted Activity under Rule 46) – ensure the PA standards are met or will be a consent req.

Southland District Council

- NOR for alteration to designation (check this is SDCs understanding and not considered a new designation).
- Likely to be publicly notified.
- Things to include in the application:
  - Landscape assessment
  - Geotechincal report
  - Biodiversity/ecological assessment (and any management plans required)
  - Archaelogical/heritage assessment
- Note these will be peer reviewed.
- Comment from ES regarding contaminated land/hazards will be required.
- Stormwater/sediment runoff comments from ES also.
- Interpretation panels etc. within the Nat Park are limited to 1.5m2 as a Permitted Activity/within Nat Park Plan – so likely to need separate consent from SDC, also anything illuminated likely non-complying.

- Offsetting requirement is only triggered if the effects assessment demonstrates that the effects will be more than minor and cannot be mitigated.
- Timeframe: May lodgement for a November start is ok as long as all the necessary information is provided upfront. Both ES and SDC agree on timeframe.

<u>Meeting Minutes – State Highway 94/Homer Tunnel Avalanche and Rockfall Safety Improvements – New Zealand Alpine Club 29/03/2022</u>

Attendees:

Attendee and Role	Organisation
Chris Collins, Project Manager	Waka Kotahi NZ Transport Agency
Gemma Kean, Senior Planner	Waka Kotahi NZ Transport Agency
George Enersen, Senior Planner	WSP
Greig Larcombe, Senior Engineer	WSP
Karen Leacock, General Manager	General Manager New Zealand Alpine Club (NZAC)

Presentation of the wider project to Karen Leacock - NZAC

<u>Summary of Discussion:</u>

Chris

- A broad overview of the project was provided via PowerPoint including tunnel construction history, purpose of the structure, current condition and the proposed design elements of new plant room and shelter + enabling work as Karen had acknowledged having limited knowledge about the project.
- Noted the proposal could consist of 50m – 80m avalanche structure length which is dependent on how far project funding will go. Estimated 75m will be constructed. Design of structure enables extension into the future should funding become available.
- Works occurring over three distinct phases and construction seasons due to several factors including –
    - Design phase information and consenting requirements
    - Limited construction season window due to avalanche risk – therefore staged approach enables least disruption to highway operations and mitigates health and safety risk during construction
- First phase of work underway now – trenching of cabling and generator relocation, plant room construction occurring in the 2022/2023 window (concession currently publicly notified on DOC website) and avalanche shelter construction occurring within the 2023/2024 window
- Design of the structure has a 6.5m width. Lane width for 100km/hr road is 3.5m so there is the ability to maintain a working lane through most of the time
- Most works will be precast elements so can be assembled on site (i.e., like Lego) rather than pouring of concrete etc. to complete construction within a limited timeframe and to minimise disruption

Karen:

- Acknowledged the structure was a large structure but had a clear understanding of the purpose of the works and was aware of the avalanche and rock fall risk to the environment.
- Queried how the project will impact traffic and the access to climbing areas for members during construction
- Also questioned access within the existing car park area and in and around the site during construction and whether this would be restricted to the public

Chris:

- Yes, access restricted. Tunnel area and car park will be closed off to access during construction for health and safety requirements.
- Noted that it’s understood there is an alternative access route up the river closer to the ATOC centre for climbers to still access beyond the construction area.

- Communications around access closures and alternative routes will be provided to NZAC in advance of any closures.

Gemma:

- Noted that NZAC were complimentary of the communications made in relation to a recently completed project (rock scaling works) in the area and queried whether NZAC would be happy if Waka Kotahi replicated those communications for these works.

Karen:

- Agreed that previous project communications were good, and that early circulation would be appreciated.
- Monthly newsletter goes out on second fortnight but has flexibility – has a reach of 2500 people and noted other channels would be better forms for communicating to wider NZAC members
- Facebook and website have a greater reach with Facebook having up to reach of 10,000 people
- NZAC member group Approx 4000 people
- Noted that the Aotearoa Climbing Access Trust (ACAT) is another good communications channel that can be used to circulate project communications – General Manager Edwin Sheppard the best contact – contact directly around construction closures etc.

Gemma / Chris:

- Noted that WSP has confirmed that the gravel requirements for the project at this stage are sufficient and unlikely to need the gravel proposed to be extracted by the NZAC
- Understand that NZAC was talking to the Milford Road Alliance regarding the extraction of material

Karen:

- Unsure on the conversations with MRA as works/conversations were likely had prior to involvement – but noted that she was required/tasked with obtaining the necessary consents
- Timing of works not confirmed but a reduced channel capacity and potential of flood risk to Homer Hut meant that gravel extraction is required above and below the 'pebble'
- Noted that gravel availability there if needed in the future

Chris:

- Provided detail around proposed construction phases and timeframes and noted that rock wren surveys were being undertaken across the project footprint

Karen:

- Noted that NZAC in partnership with DOC undertake trapping projects up the Gertrude and Bowen Valleys – and that she would communicate with the facilitator of the trapping programme in relation to the project
- Noted that the immediately surrounding environment is a very popular climbing area and recently had their biggest season to date.

END

<u>Meeting Minutes – State Highway 94/Homer Tunnel Avalanche and Rockfall Safety Improvements – Fiordland Community Board 28/03/2022</u>

Attendees:

Attendee and Role	Organisation
Chris Collins, Project Manager	Waka Kotahi NZ Transport Agency
Gemma Kean, Senior Planner	Waka Kotahi NZ Transport Agency
George Enersen, Senior Planner	WSP
Sarah Greaney, Community Board Chairperson	Fiordland Community Board

Presentation of the wider project to Sarah Greaney – Fiordland Community Board.

<u>Summary of Discussion:</u>

Chris:

- Chris Collins provided a broad overview of the project via PowerPoint including tunnel construction history, purpose of the structure, current condition and the proposed design elements of new plant room and shelter + enabling works.
- Noted the proposal could consist of 35m – 80m avalanche structure length which is dependent on how far project funding will go. Estimated 50 to 75m will be constructed. Design of structure enables extension into the future should funding become available.
- Works occurring over three distinct phases and construction seasons due to several factors including –
  - o Design phase information and consenting requirements
  - o Limited construction season window due to avalanche risk – therefore staged approach enables least disruption to highway operations and mitigates health and safety risk during construction
- First phase of work underway now – trenching of cabling and generator relocation, plant room construction occurring in the 2022/2023 window (concession currently publicly notified on DOC website) and avalanche shelter construction occurring within the 2023/2024 window
- Design of the structure has a 6.5m width. Lane width for 100km/hr road is 3.5m so there is the ability to maintain a working lane through most of the time
- Most works will be precast so can be assembled on site (i.e., like Lego) rather than pouring of concrete etc. to complete construction within a limited timeframe and to minimise disruption

Sarah:

- Biggest concerns are regional recovery post covid environment where three tourism seasons impacted + recovery from impacts of local flooding
- Understanding on traffic impacts and subsequent effects to tourism operators is of critical importance
- Questioned whether works will be undertaken during key holiday periods and noted that most works cease during this period
- Keeping disruption to minimum will be of upmost importance
- Any communications that come out about the project need to have explicit details and be very early on to ensure no surprises and unnecessary stressors on tourism operators

Chris:

- Some works in the 22/23 season may disrupt the road operations – likely those works required to break through the side wall of the portal to connect the proposed plant room
- Delays during the day will likely be minimal (10 - 15 min windows)
- Works can be undertaken in the evening/nights during summer months i.e., light until 9.30/10pm i.e., lifting of beams into place
- Working in dark not feasible as presents health and safety risks to workers from rockfall as cannot be sighted by spotters.

- Works to be undertaken in a systematic way to ensure most disruptive works can be undertaken outside of peak traffic flows (i.e., morning and evening peaks)
- Some works such as tying the new avalanche structure to the existing tunnel portal will be unable to avoid delays/temporary closure of the road to enable works to be undertaken safely
- Christmas will be the main holiday period, and it is likely works will continue through this period due to already limited construction window and to minimise any ongoing delays – ultimately it will be up to the contractor.
    - To mitigate delays during this holiday period, the works could be strategically limited to works that minimise road closures/delays (i.e., could be works occurring outside the road corridor such as construction of the MSE wall)
- Getting detailed and early communications out regarding construction timing and methodology is difficult due to not having a contractor engaged nor having the required statutory approvals in place – timeline for consenting noted to Sarah (lodgement May 2022 – up to 9 months processing)

Gemma:

- Q - Asked whether it would be helpful / the right process to provide updates to design and project information via Sarah to assist in reducing community concern relating to the construction

Sarah:

- Sarah noted yes and that communications need to go to wider tourism operators – and be clear on timeframes and impacts of works
- Parties must include
    - Visit Fiordland as the Regional Tourism Organisation (RTO)
    - Great South – as they oversee the RTO
    - Fiordland Business Association
- Sarah noted she can provide details of parties not already held by Waka Kotahi

Chris:

- Q - Asked whether the project team should present to the Community Board and whether the media attended community board meetings.

Sarah:

- The community board is meeting in three weeks (13 April) and Sarah will provide an overview of the project and information shared with her today to determine whether a specific presentation to the community board will be desired.
- Media can attend some community board meetings but not always.
- Sarah queried whether any information was sensitive and if it could be shared with wider public – Chris confirmed no – information fine for wider circulation
- Noted that communications should be explicit on programme of works and how Waka Kotahi will be mitigating effects/disruptions on the community.

Meeting Minutes – State Highway 94/Homer Tunnel Avalanche and Rockfall Safety Improvements – Te Ao Marama Inc 01/04/2022

Attendees:

Attendee and Role	Organisation
Chris Collins, Project Manager	Waka Kotahi NZ Transport Agency
Gemma Kean, Senior Planner	Waka Kotahi NZ Transport Agency
George Enersen, Senior Planner	WSP
Stevie-Rae Blair, Kaitohutohu Taiao	Te Ao Marama Inc – consultant service for local Rūnanga

Purpose to provide a recap of the Homer Tunnel project and progress made to date to Stevie-Rae – Te Ao Marama Inc.

Summary of Discussion:

Chris

- A broad overview of the project and update was provided including a presentation of and discussion on the landscape visualisations of the proposed new plant room and avalanche shelter.
- Noted that consent to Southland District Council (SDC) and concession application to Department of Conservation (DOC) for the plant room already in process with the concession being publicly notified.
- Noted that 80 m shelter extent was shown in the visuals, but the proposal will only result in the construction of 50m – 80m avalanche structure length which is dependent on how far project funding will go.
- Estimated 75m will be constructed. Design of structure enables extension into the future should funding become available.
- Most works will be precast elements so can be assembled on site (i.e., like Lego) rather than pouring of concrete etc. to complete construction within a limited timeframe and to minimise disruption.

Gemma / George:

- Noted that a Notice of Requirement application to alter the existing designation to SDC and a further concession application to DOC will be lodged for the project in May 2022.
- Regional resource consent requirements still being determined based on design information. Most likely required in relation to rip rap and erosion control structures being required within ephemeral channels to the immediate southwest of the proposed avalanche protection structure.
- Regional resource consents will be discussed with Stevie-Rae again at a later date.

Gemma:

- Raised that last time a discussion on the project was held there was a concept of relocating a section of the existing avalanche shelter to an alternative site to maintain and showcase associated heritage value. Noted that this concept is now likely to be discontinued due to ongoing maintenance and upkeep concerns raised from DOC.
- Opportunities to integrate into Milford Opportunities Project unlikely due to the timeframes of the Homer Tunnel project being much further advanced.
- Waka Kotahi's heritage consultant is currently preparing a report to advise on suitable alternatives which is likely to revolve more around the story telling aspect of the tunnel's construction.

- Knobs Flat has been identified as a potential site for story telling as it has some existing infrastructure (facilities such as a toilet and a resting area). Likely that an electronic display be incorporated into infrastructure at this location.
- Questioned whether iwi would be interested in expanding the story telling opportunity to include the cultural history and values associated with the site

Stevie-Rae:

- Understands the project purpose and need for it to be undertaken.
- Noted that it is great to have the opportunity to be involved with shared storytelling, but that its likely Rūnanga might already be having conversations with the Department (DOC) as Rūnanga leads the DOC side of things and that Stevie-Rae as a TAMI representative largely manages RMA conversation.
- Stevie-Rae noted that she would feedback this information/opportunity to the Rūnanga and that it is likely the Rūnanga will manage the story telling aspects directly.
- Noted that iwi unlikely to submit on the district or concession applications but are interested in the regional consenting requirements.

Gemma:

- Noted that it is unlikely the story telling opportunities have been had between DOC and the Rūnanga due to the options consideration still being at a very early stage and therefore that conversation is likely yet to be held.

Gemma / Chris:

- Discussed opportunities to include artwork within the concrete façade of the proposed avalanche structure – noting the Kaikōura rebuild project as a recent example
- Noted that the front facing façade would always be the front façade even if in the future the structure were to be extended out further. The façade would be relocated so any artist impression can be retained.
- Aim to keep the octagonal appearance to the entry of the structure to replicate heritage value and if possible, emphasis this further.
- Artwork can be a negative or positive detail into the concrete so easy to retrofit if required but noted a negative detail can be achieved within the precast concrete mouldings
- Noted the retaining wall to the south of the immediate entrance would likely be covered up in the future if the structure were to ever be extended. Therefore, for the purposes of design consideration, this might not be the best place for art elements

Stevie-Rae

- Noted she had been across some similar work done by Aukaha
- Certainly sees the incorporation of artist work as a great opportunity – but one for the Rūnanga to make decisions on and provide /decide on the design of any artwork
- Noted that a kōrero behind the artwork design could also feed into the storytelling elements at the Knobs Flat site
- Stevie confirmed she would take the landscape visuals of the proposed structure to present to Runanga and get feedback on artwork ideas.
- Noted that feedback likely in a couple of weeks

Discussion had on rock sourcing:

- George/Chris - Questioned whether any issues from a cultural perspective with respect to sourcing rock from the western side of the Homer Saddle (i.e., other side of the tunnel) from an existing DOC quarry?

- Chris noted-
  - that rock sources east of the tunnel have largely been exhausted from repair projects associated with recent flooding events.
  - to his knowledge the Milford Road Alliance haven't sourced rock west of the tunnel before for use in the east. Want to seek clarity that there are no issues from a cultural perspective like there are for the mixing of water from different catchments
- Stevie - noted no issues that she was aware of with regards to rock source but can double check with the Rūnanga. Questioned what had happened in past/why not previously done?
- Chris – have had conversations with the tunnel operations manager and believes it is likely just because that's what has happened in the past and that rock is usually just sourced as close to project areas as possible and unlikely been a requirement to bring rock through the tunnel.

END.

Appendix K
Objectives and Policy Assessment

Table 1 Southland Murihiku Conservation Management Strategy

PART ONE – SOUTHLAND MURIHIKU WIDE	
Objective / Policy	**Assessment**
Policy 1.4.2.13 *Work with Ngāi Tahu to review and implement decision-making processes for authorisation applications, to maximise opportunities for the involvement of Ngāi Tahu and ensure provision is made for Ngāi Tahu rights and values.*	Waka Kotahi have consulted with local iwi resource management consultancy Te Ao Marama Inc (TAMI) representatives on the Homer Tunnel improvements project since September 2021 with the most recent meeting held in April 2022. Consultation was undertaken for the purpose of better understanding cultural values within the surrounding environment and how the project may impact on such values. During consultation with iwi representatives TAMI, several opportunities were also explored with respect to how the project could include a cultural narrative. Waka Kotahi intends to continue working with mana whenua either directly or via TAMI with respect to the incorporation of cultural design and storytelling elements of the project from a cultural perspective. A record of consultation is provided in Appendix J of the AEE.
Policy 1.5.2.3 *Profile any historic Icon sites and the selected actively conserved historic places listed in Appendix 10, through quality interpretation, both on- and off-site, to enable visitors to identify with historic sites and their stories.* **Policy 1.5.2.4** *Prioritise for protection and conservation the actively conserved historic places listed in Appendix 10 on the basis of their historical, cultural and physical significance, their value to Ngāi Tahu and the community, and their conservation requirements*	The Homer Tunnel portal avalanche damage is listed in Appendix 10 as a tourism and recreational heritage topic with local significance. Waka Kotahi commissioned Origin Consultants to undertake a 'heritage significance' assessment of the Tunnel to fully understand the heritage values associated with the existing protection structure which concludes that the Homer Tunnel shelter structure (despite being largely crushed in 1945) is a notable and unique form of construction and contributes to the Tunnel's high technology, engineering and scientific value. Additionally, several plaques commemorating the lives of individuals lost during the construction of the Homer Tunnel are attached to the east elevation of the existing plant room. The remaining portion of the protection structure and the commemorative plaques on the plant room are considered to have high significance with respect to heritage values. Several options to mitigate the adverse effects of removing the structure have been recommended by Origin Consultants including relocating a section of the shelter offsite, reflecting the design of the existing shelter in the replacement shelter, or dismantling and burying a section of shelter for future use. The recommendation to relocate a piece of the structure is not proposed to be adopted due to feasibility issues associated with land availability and costs as set out within the AEE. Burying part of the structure is also not proposed as it is unlikely that the heritage values will be realised in the future as it is likely the structure will remain buried. In adopting the other recommended options, the design of the proposed protection structure has deliberately incorporated elements and features of the original shelter design as set out in the AEE while largely maintaining the existing experience of the remote environment and minimal human impact upon it. The proposed protection shelter also seeks to integrate the heritage fabric of the stone façade to ensure that its values can be visible and appreciated. It is also proposed that all features of the existing structure are systematically recorded to a Level 1 standard of recording as outlined in the HNZPT (2018) 'Archaeological Guidelines Series No. 1: Investigation and recording of buildings and standing structures' prior to and during demolition. The recording of the structure is proposed to be incorporated into a digital interpretation of the construction of the Homer Tunnel and Milford Road to improve the story telling of Homer Tunnel. Commemorative plaques currently located on the plant room will be relocated onto the new plant room to maintain a meaningful connection of the commemoration to the site. The proposal is not inconsistent with Policies 1.5.2.3 and 1.5.2.4.
Policy 1.5.2.5 *Understand the expectations of Ngāi Tahu, the community and others regarding the conservation and management of historic places on public conservation lands and waters.*	Waka Kotahi have consulted with local iwi resource management consultancy Te Ao Marama Inc (TAMI) representatives on the Homer Tunnel improvements project since September 2021 with the most recent meeting held in April 2022.

	Consultation was undertaken for the purpose of better understanding cultural values within the surrounding environment and how the project may impact on such values. During consultation with iwi representatives TAMI several opportunities were also explored with respect to how the project could include a cultural narrative. Waka Kotahi intends to continue working with mana whenua either directly or via TAMI with respect to the incorporation of cultural design and storytelling elements of the project from a cultural perspective. A record of consultation is provided in Appendix J of the AEE.
PART TWO PLACES - FIORDLAND TE RUA-O-TE-MOKO PLACE	
Objective / Policy	**Assessment**
Policy 2.2.1 *Manage (including when considering concession applications) those parts of the Fiordland Te Rua-o-te-moko Place that are within the Te Wāhipounamu—South West New Zealand World Heritage Area in accordance with the criteria for which the World Heritage Area was nominated and the statement of outstanding universal value (Appendix 14).* **Policy 2.2.2** *Manage Fiordland National Park in accordance with its national park management plan, including the visitor management and aircraft provisions.*	The site is located in the Te Wāhipounamu—South West New Zealand World Heritage Area. A summary of the nominating criteria includes the overwhelming mountainous wilderness and dominating landscape features from glaciations. The site is within an area which is the largest and least modified area of New Zealand's natural ecosystems. The habitats of Te Wāhipounamu contain an extensive range of New Zealand's unusual endemic fauna, a fauna which reflects its long evolutionary isolation and absence of mammalian predators. The site however must be considered within its setting as defined by the Fiordland National Park Management Plan. The site is located within the Frontcountry Visitor Setting of the Fiordland National Park which has the greatest ability to absorb the development or redevelopment of infrastructure such as that being proposed. Frontcountry Visitor Settings anticipate a level of development and usually have a substantial level of infrastructure and includes the following facilities: car parks, picnic and camping areas, toilets, water supplies, signs, interpretation panels, viewpoints, wharves, boat ramps, shelters, bridges and easy walking tracks. Notwithstanding this, technical assessment including landscape values assessments and ecological assessments with respect to indigenous fauna have been undertaken to understand the potential impact on natural character, landscape values and indigenous species. An assessment of effects on the environment has been undertaken which assessed the adverse effects with respect to ecological values, natural character, and cultural values as less then minor while there will be no effect on public access and recreational values. The proposal will result in minor effects on heritage values and landscape and visual values. Furthermore, the project will result in significant positive effects with respect to safety and resilience of the state highway network. In the context of both the applicable visitor setting and the location within the Te Wāhipounamu—South West New Zealand World Heritage Area it is considered that the proposal has been considered and designed as far as practicable so as to maintain the natural and wilderness qualities anticipated.
Policy 2.2.6 *Work with Ngāi Tahu, relevant agencies (such as Southland Regional Council, Southland District Council, Fiordland Marine Guardians, New Zealand Transport Agency, Civil Aviation Authority and Milford Community Trust), commercial interests and the community to:* *(a) promote and increase awareness of the significant ecological, historic and cultural values of the Fiordland Te Rua-o-te-moko Place, including interpretation and recognition of the Māori cultural landscape;* *(b) develop and sustain an integrated approach to managing Milford Sound/Piopiotahi, and access to it as an Icon destination, thereby enhancing its international reputation;[…]*	Waka Kotahi have consulted with local iwi resource management consultancy Te Ao Marama Inc (TAMI) representatives on the Homer Tunnel improvements project since September 2021 with the most recent meeting held in April 2022. Consultation was undertaken for the purpose of better understanding cultural values within the surrounding environment and how the project may impact on such values. During consultation with iwi representatives TAMI several opportunities were also explored with respect to how the project could include a cultural narrative. Waka Kotahi intends to continue working with mana whenua either directly or via TAMI with respect to the incorporation of cultural design and storytelling elements of the project from a cultural perspective. A record of consultation is provided in Appendix J of the AEE.
PART THREE - SPECIFIC POLICY REQUIREMENTS FOR SOUTHLAND MURIHIKU	

Objective / Policy	Assessment
Policy 3.10.1 Structures and Utilities *Should apply the following criteria when considering applications to erect or retain structures or utilities or the adaptive reuse of existing structures on public conservation lands and waters:* *(a) the purposes for which the land concerned is held;* *(b) the outcomes and policies for the Place where the activity is proposed to occur;* *(c) whether the structure could reasonably be located outside public conservation lands and waters;* *(d) whether the structure could reasonably be located in another location where fewer adverse effects would result from the activity;* *(e) whether the structure adversely affects conservation, including recreational, values;* *(f) whether the structure is readily available for public use;* *(g) whether the structure is consistent with the visitor management zone on Map 3 and as described in Appendix 12;* *(h) whether the activity promotes or enhances the retention of a historic structure;* *(i) whether the activity is an adaptive reuse of an existing structure; […]*	The site is located within the Frontcountry Visitor Settings which anticipate a level of infrastructure. For the most part, the proposed structure will be located within or align to the formed State Highway corridor. The location of the proposal is fixed due to the Homer Tunnel location and therefore cannot be located outside of the national park or an alternative location. The infrastructure is required to safely operate the entrance to the Homer Tunnel and support the resilience of the SH94 / Milford Road network. The structure will support therefore the safety of the public. An assessment of effects on the environment has been undertaken which assessed the adverse effects with respect to ecological values, natural character, and cultural values as less then minor while there will be no effect on public access and recreational values. The proposal will result in minor effects on heritage values and landscape and visual values. Furthermore, the project will result in significant positive effects with respect to safety and resilience of the state highway network. The design of the structure will enable the exposure of the original rock wall of the eastern tunnel portal and thus enhance the appreciation of heritage fabric.
Policy 3.1.12 Authorisations – General *Should not grant authorisations that are inconsistent with the outcomes, objectives and policies in Part One, the outcomes and policies for Places in Part Two—Places, or the policies in Part Three.*	As assessed above the proposal is not assessed as being inconsistent with the applicable outcomes, objectives and policies sought in Parts One, Two or Three of the Southland Murihiku Conservation Management Strategy.

Table 2 Fiordland National Park Management Plan

SECTION 2.1 GIVING EFFECT TO THE PRINCIPLES OF THE TREATY OF WAITANGI	
Objective / Implementation	**Assessment**
Objective – *(1) To give effect to the principles of the Treaty of Waitangi to the extent that they are compatible with the provisions of the National Parks Act 1980, and in accordance with the General Policy for National Parks 2005* **Implementation –** *(1) Actively consult and work with papatipu rünanga and also, where required or appropriate, with Te Rünanga o Ngäi Tahu from the early stages of proposed undertakings that may affect Ngäi Tahu values.*	Waka Kotahi acknowledge that Te Rünanga o Ngäi Tahu is recognised as the iwi who have authority over the area of Fiordland National Park. Waka Kotahi have consulted with local iwi resource management consultancy Te Ao Marama Inc (TAMI) representatives on the Homer Tunnel improvements project since September 2021 with the most recent meeting held in April 2022. Consultation was undertaken for the purpose of better understanding cultural values within the surrounding environment and how the project may impact on such values. During consultation with iwi representatives TAMI several opportunities were also explored with respect to how the project could include a cultural narrative.

	Waka Kotahi intends to continue working with mana whenua either directly or via TAMI with respect to the incorporation of cultural design and storytelling elements of the project from a cultural perspective. A record of consultation is provided in Appendix J of the AEE.
SECTION 4.3 PRESERVATION OF INDIGENOUS SPECIES AND HABITATS	
Objective / Implementation	**Assessment**
Objective – *(1) To maintain natural biodiversity by preventing, where possible, the further loss of indigenous species from areas where they are currently known to exist within Fiordland National Park and adjacent lands and waters.* **Implementation –** *(11) Undertake all management activity (including animal control, weed control, facilities development and maintenance, visitor management) in a manner compatible with, and wherever practical, integrated with ecosystem and species preservation*	To inform the actual and potential effects associated with the proposal on natural biodiversity and indigenous species, ecological assessments were commissioned to understand the potential species present within the project footprint. As per Section 3.7 of the AEE report, no lizard species were identified within the project footprint. Indigenous species identified as being present and which require management were noted to be kea and rock wren. While no nesting areas have been identified within the project footprint measures are proposed to manage the potential for nesting activity and the potential adverse effects associated with construction activity on kea and rock wren. This is considered to be an appropriate approach for managing the potential impacts to indigenous species during construction and therefore the proposal is assessed as consistent with this objective and supporting policies.
SECTION 4.12.3 FURTHER RECOGNITION OF HERITAGE VALUES	
Objective / Implementation	**Assessment**
Objective – *(1) To attain an understanding sufficient for management purposes of the values of historic resources within Fiordland National Park, and the threats they face.* *(2) To protect historic resources within Fiordland National Park from injurious human actions.* *(3) To identify and actively manage, within Fiordland National Park, historical places which are of high significance and provide the best possible balanced representation of the history of those lands.* *(4) To instil in the public an understanding of the nature and values of historic resources within Fiordland National Park so that those places are understood and treated with respect by visitors.* *(5) To promote appropriate storage, conservation, display, and interpretation of artefacts, archives, and photographs removed from or relating to Fiordland National Park* **Implementation –** *(2) Undertake thematic studies, area surveys, and site appraisals to improve knowledge of historic resources. Record archaeological remains or items or sites of cultural significance which have been, or may be, discovered.* *(3) Assess historical values using Historic Places Act criteria and papatipu rūnanga input for Ngāi Tahu values where appropriate.* *(4) Actively manage historical places identified in Table 3 and give consideration to managing any other places of importance that papatipu rūnanga may wish to nominate within Fiordland National Park.*	The 'Homer Tunnel Portal Avalanche Damage, Milford Road' is listed in Table 3 of the FNPMP as an actively managed historical site within FNP with a listed significance of 'local importance'. Waka Kotahi commissioned Origin Consultants to undertake a 'heritage significance' assessment of the Tunnel to fully understand the heritage values associated with the existing protection structure which concludes that the Homer Tunnel shelter structure (despite being largely crushed in 1945) is a notable and unique form of construction and contributes to the Tunnel's high technology, engineering and scientific value. Additionally, several plaques commemorating the lives of individuals lost during the construction of the Homer Tunnel are attached to the east elevation of the existing plant room. The remaining portion of the protection structure and the commemorative plaques on the plant room are considered to have high significance with respect to heritage values. Several options to mitigate the adverse effects of removing the structure have been recommended by Origin Consultants including relocating a section of the shelter offsite, reflecting the design of the existing shelter in the replacement shelter, or dismantling and burying a section of shelter for future use. The recommendation to relocate a piece of the structure is however not proposed to be adopted due to feasibility issues as set out within the AEE. Burying part of the structure is also not proposed as it is unlikely that the heritage values will be realised in the future as it is likely the structure will remain buried. In adopting the other recommended options, the design of the proposed protection structure has deliberately incorporated elements and features of the original shelter design as set out in the AEE while largely maintaining the existing experience of the remote environment and minimal human impact upon it. The proposed protection shelter also seeks to integrate the heritage fabric of the stone façade to ensure that its values can be visible and appreciated while the design of the proposed protection structure has deliberately incorporated elements and features of the original shelter design as set out in the AEE while largely maintaining the existing experience of the remote environment and minimal human impact upon it. Commemorative plaques currently located on the plant room will be relocated onto the new plant room to maintain a meaningful connection of the commemoration to the site.

	It is proposed that all features of the existing structure are systematically recorded to a Level 1 standard of recording as outlined in the HNZPT (2018) 'Archaeological Guidelines Series No. 1: Investigation and recording of buildings and standing structures' prior to and during demolition. The recording of the structure is proposed to be incorporated into a digital interpretation of the construction of the Homer Tunnel and Milford Road to improve the story telling of Homer Tunnel. The interpretive material to be displayed shall be determined in consultation with the Department of Conservation and Iwi. The proposal is not inconsistent with the objectives and implementation to further recognise heritage values in the FNPMP.
SECTION 5.3.9 FRONTCOUNTRY VISITOR SETTINGS / 5.3.9.2 MILFORD ROAD	
Objective / Implementation	**Assessment**
Section 5.3.9 of the FNPMP sets out the overarching objectives for front country visitor settings which are: *(1) To provide opportunities for predominantly passive to mildly active recreation activities with high vehicle accessibility, while protecting other national park values. […]* *(2) The six frontcountry areas will be managed to allow vehicle-based visitors to experience Fiordland National Park with safety and without compromising national park values.* *(3) To ensure the roads within these settings continue to provide significant access opportunities into the backcountry and remote settings of Fiordland National Park.* *(4) To ensure that other facilities do not have an adverse impact on the national park values of the setting or surrounds*	SH94 / Milford Road itself is recognised as a tourist attraction in its own right as it provides for an opportunity to passively experience Fiordland National Park (FNBP) as people traverse through it on the only road connection through to Milford Sound. An assessment of effects on the environment has been undertaken which assessed the adverse effects with respect to ecological values, natural character, and cultural values as less then minor while there will be no effect on public access and recreational values. The proposal will result in minor effects on heritage values and landscape and visual values. Furthermore, the project will result in significant positive effects with respect to safety and resilience of the state highway network. The proposal will therefore allow vehicle-based visitors to continue experiencing FNP with safety and without compromising national park values. The proposal seeks to ensure that State Highway 94 / Milford Road can be operated safely and provide a resilient connection between Te Anau and Milford Sound now and into the future ensuring access to backcountry and remote settings of FNP. The proposal is assessed as being consistent with the overarching objectives for the frontcountry visitor setting.
Section 5.3.9.2 of the FNPMP sets specific objectives that apply to the FNP in relation to the ongoing integrated operation alongside SH94 as follows: *(1) The Fiordland National Park that adjoins the Milford Road will be managed to provide for and protect the following attributes:* *(a) The spectacular views of forested catchments, open grasslands, lake systems and outstanding mountain scapes;* *(b) Its significant indigenous flora and fauna;* *(c) A place which is a destination in its own right;* *(d) The Eglinton Valley's open and uninterrupted views of the surrounding mountains and valleys and its overall sense of naturalness;* *(e) The steep, winding and narrow character that forms large parts of the adjoining road;* *(f) The easily accessible and safe visitor opportunities at designated sites;* *(g) The valuable access for many who are accessing remote parts of Fiordland National Park;* *(2) To provide for the integrated management of the Milford Road and Fiordland National Park adjacent to the road in a way that ensures visitor safety, protection of park values and a high-quality visitor experience.*	The construction activities and the ongoing presence of the proposed replacement shelter structure will ensure that SH94 / Milford Road and FNP are well integrated. The replacement shelter structure has been designed to ensure that the natural character and landscape elements associated with the surrounding environment are protected. The following elements have been considered in the design of the replacement structure: • Keeping the size and extent of the shelter to the minimum size necessary to fulfil its purpose. • The use of a simple, functional form for the shelter. • The use of colour, texture and pattern in the exposed concrete work that are natural and sympathetic to the surrounding environment. • The excavation and removal of the 'carpark' fill area. • The placement of local fill material on the southern flank of the shelter. • The rehabilitation including natural revegetation of the fill areas as disturbed talus slope An assessment of effects on the environment has been undertaken which assessed the adverse effects with respect to ecological values, natural character, and cultural values as less then minor while there will be no effect on public access and recreational values. The proposal will result in minor effects on heritage values and landscape and visual values. Furthermore, the project will result in significant positive effects with respect to safety and resilience of the state highway network. A key outcome of the project will be that SH94 / Milford Road can be maintained to ensure visitor safety and protection from natural hazards present within the environment.

	In summary, the project recognises the important reliance on SH94 / Milford Road for accessing remote parts of FNP while ensuring that its upgrade can be integrated in a way that maintains the natural elements of the FNP. The proposal is assessed as consistent with Section 5.3.9.2 of the FNPMP.
Implementation of the above objectives (5.3.9.2): (1) *Work with Transit NZ and its consultants and contractors to provide an integrated approach to management of the road corridor.* (6) *All development proposals including those proposed by the Department of Conservation and Transit NZ will demonstrate how the adverse effects on natural, cultural, historical and recreational values can be avoided, remedied or mitigated. Roading proposals will need to be consistent with the provisions of section 5.7 Roading, Vehicle Use and Other Transport Options (Other Than Aircraft and Boating) and will need to demonstrate that existing facilities are being used to their full capacity and potential and that there is a proven demand for the new facility beyond what the existing infrastructure can cope with.*	The Milford Road Alliance partnership of Waka Kotahi with Downer administers maintenance along SH94 / Milford Road and is responsible for the day-to-day management of SH94 / Milford Road. An assessment of effects on the environment has been undertaken which assessed the adverse effects with respect to ecological values, natural character, cultural and heritage values and on public access and recreational values to be less than minor while the landscape and visual effects will be minor. Furthermore, the project will result in significant positive effects with respect to safety and resilience of the state highway network. The proposed works consider the existing infrastructure, topography and visual amenity when viewed from SH94 and adjacent accessible areas to ensure the visitor experience in the wider FNP area is not significantly reduced. SH94 / Milford Road is heavily relied on for accessing Fiordland National Park and the diverse recreational opportunities, Milford Sound for tourism activity and forms part of a key visitor experience in its own right. An avalanche and rockfall protection structure is critical for the safe operation and resilience of SH94 / Milford Road. Assessments have identified that the current structure is not fit for its intended purpose when measured by current standards and therefore there is a proven need for the replacement infrastructure beyond what currently exist. The proposal is assessed as being consistent with the implementation of Objective 5.3.9.2.
SECTION 5.7 ROADING, VEHICLE USE AND OTHER TRANSPORT OPTIONS (OTHER THAN AIRCRAFT AND BOATING)	
Objective / Implementation	**Assessment**
Objectives – (1) *To maintain, subject to natural hazards, the existing road access routes available to visitors within Fiordland National Park, recognising the opportunities they provide for public use and enjoyment.* (2) *To consider provision of new roading, or other land transport links, in frontcountry visitor settings only (see Map 7), and then only if they will improve visitor access and enjoyment of Fiordland National Park without impacting significantly on other recreation opportunities and national park values.*	The proposal seeks to ensure that State Highway 94 / Milford Road can be operated safely during natural hazard events and provide a resilient connection between Te Anau and Milford Sound ensuring access for visitors to recreational opportunities within FNP can be maintained. The proposal will improve the safety and resiliency of visitor access and enjoyment of FNP. An assessment of effects of the proposal on recreation opportunities and national park values has been undertaken within Section 8 of the AEE. It is assessed that the proposal will not impact significantly on these aforementioned opportunities and national park values. The proposal is therefore consistent with this objective.
Implementation – (4) *All planned roading developments within Fiordland National Park, including reconstruction, upgrading and significant maintenance works, will require an assessment of environmental effects. The assessment will outline the need for the work and deal with the potential adverse affects on visitor experience and the natural, historical, cultural, recreational, landscape and amenity values […]* (5) *While recognising that regular maintenance works are essential to providing a continued quality service to visitors, these maintenance tasks should be carried out with a greater degree of sympathy and understanding for the environmental and scenic qualities of Fiordland National Park than would normally be applied in a rural setting. The following conditions should apply:* (a) *Road line vegetation should be trimmed back to the minimum necessary to be consistent with the needs of safe traffic passage;* (b) *Aggregate for all works should be sourced from acceptable sites within the Fiordland National Park, wherever possible, to reduce the risk of introducing weeds. Sites should be chosen based*	An assessment of effects on the environment has been undertaken which assessed the adverse effects with respect to ecological values, natural character, and cultural values as less then minor while there will be no effect on public access and recreational values. The proposal will result in minor effects on heritage values and landscape and visual values. Furthermore, the project will result in significant positive effects with respect to safety and resilience of the state highway network. The replacement structure has been designed as sympathetically as possible to take into account existing heritage values, landscape values and natural character values of the receiving environment. The duration of construction effects will be minimised as far as practicable with the construction period being proposed to be completed over an approximate 5-month period. Disturbance activities including earthworks and vegetation removal will be limited to those areas and scale necessary to facilitate the works.

on historical use, availability of material and environmental effects including visual impact, and effects on indigenous flora and fauna. Gravel extraction is unlikely to be allowed from the Homer Hut area. Aggregate may be stockpiled at agreed sites but stockpiles should be used for works at the earliest opportunity and should be of a size and location to minimise visual effects. Some aggregate-based materials such as sealing chip and concrete aggregate will be allowed to be brought into Fiordland National Park, but should only be authorised on a case-by-case basis, if it is impractical to make it from resources from within Fiordland National Park (also refer to section 6.3 Mining and Gravel Extraction); and […] (6) *The Milford Road will be managed according to the provisions of this section and section 5.3.9.2 Milford Road. The Transit NZ Avalanche Programme for State Highway 94 will be supported, including providing for the necessary infrastructure directly associated with this programme, subject to all statutory and environmental considerations.*	Aggregate for all works will be sourced from acceptable sites within the Fiordland National Park and in line with existing concessions. The proposal directly supports the intention of Implementation number 6.
SECTION 6.15 ACCESS AND UTILITIES	
Objective / Implementation	**Assessment**
Objective – (1) *To allow land uses or activities requiring concessions only where they will not significantly compromise natural, historical and cultural or recreation values, and their purposes cannot be reasonably achieved by other means on other land*	It is considered that a concession for the proposed land use from the Department of Conservation can be granted as the adverse effects associated with the proposal will not significantly compromise natural, historical and cultural or recreation values. An assessment of effects on the environment has been undertaken which assessed the adverse effects with respect to ecological values, natural character, and cultural values as less then minor while there will be no effect on public access and recreational values. The proposal will result in minor effects on heritage values and landscape and visual values. Furthermore, the project will result in significant positive effects with respect to safety and resilience of the state highway network. The purpose of the proposal cannot be reasonably achieved by other means.
Implementation – (1) *All applications to use lands in Fiordland National Park involving vegetation clearing, earthworks or the erection of any structure will require an environmental impact assessment which should clearly show that all alternatives have been investigated. Applications should only be accepted if the report shows the application to be acceptable in terms of minimising adverse impacts on natural values.* (2) *Any construction on lands administered by the Department of Conservation as a result of an approved concession, will be subject to performance conditions and the deposit of a performance bond to guarantee compliance with conditions and remedying of any unforeseen effects of constructions.*	The above matters are discussed fully above in the Assessment of Effects on the Environment (Section 8) which concludes that the proposal will not significantly compromise natural, historical and cultural or recreation values. Notwithstanding this, the location of the Homer Tunnel and supporting infrastructure is fixed and therefore the purpose of the proposal works cannot be reasonably achieved by other means on other land.

Table 3 Te Tangi Au Tauira - Management Plan Assessment

SECTION 3.3.1 NGA MAUNGA	
Objective / Policy	**Assessment**

Policy 3.3.1.7 Encourage respect for Ngāi Tahu's association with culturally significant mountains, including those recognised as Tōpuni, through working with the Department of Conservation to develop educational material to be made available to mountain climbers, the public, concessionaires and users of the area (e.g. encouraging users to remove rubbish and waste).	The site is in the basin below Te Kōhaka-o-Te-Ruru/Homer Saddle. Iwi have been consulted with in relation to the project via Te Ao Marama Inc – consultant service for local Rūnanga. No issues were raised with respect to the overall project. The inclusion of cultural storytelling through artwork and cultural education were discussed as possible opportunities associated with the project. Waka Kotahi intends to continue working with mana whenua either directly or via TAMI with respect to the incorporation of cultural design and storytelling elements of the project from a cultural perspective. A record of consultation is provided in Appendix J of the AEE.
SECTION 3.3.5 FIORDLAND FUTURE DEVELOPMENT	
Objective / Policy	**Assessment**
Policy 3.3.5.1 The relationship of manawhenua with their ancestral lands, water, sites wāhi tapu and other taonga of Fiordland must be recognised and provided for in all decisions relating to development.	The activity will not impede access to taonga sites. The use of an existing modified area for the activities ensures consolidation of services and avoiding developing additional natural areas of the FNP. Aspects of the proposal including the removal of the carpark plateau area and the backfilling of material over the new avalanche protection shelter seeks to better incorporate the built form into the natural environment. As a result of the project, the current car park area will be returned to a more natural landform. The proposal will result in significant improvements to existing infrastructure to provide for increased efficiency and resilience to the operation of a piece of critical infrastructure for future generations. New technology will be utilised where practicable.
Policy 3.3.5.4 Advocate for keeping future development in areas that are presently modified and that already have infrastructure in place. The preference of Ngai Tahi ki Muruhiku is to leave undeveloped or minimally developed areas of Fiordland in as natural state as possible.	
Policy 3.3.5.5 Advocate for existing infrastructure to be improved to the highest possible standards, and for the utilisation of new technologies that can enable new growth and development while minimising adverse effects.	
Policy 3.3.5.6 Planning for future development must recognise and provide for cumulative effects on the land, water, biodiversity and cultural landscape of Fiordland.	The potential for cumulative effects associated with the proposal in the context of this policy is considered to be low as the effects are consolidated to an existing modified area. While the alteration to the designation will result in additional land area being incorporated to support the new structure (rock rip), the 'built form' footprint is considered to still remain consolidated and aligning to the state highway formation. Expanded areas will largely take a natural form comprising of locally sourced rock for erosion protection for example.
SECTION 3.3.7 CONCESSIONS	
Objective / Policy	**Assessment**
Policy 3.3.7.2 Where relevant, concession activities on conservation land are subject to Ngāi Tahu Standard Conditions for Concessions (Appendix 5), and any other special conditions requested by Ngāi Tahu ki Murihiku.	With both a notice of requirement to alter the designation and a concession required for the activity, these conditions will be required. The Ngāi Tahu ki Murihiku accidental discovery protocol (ADP) will be adopted and initiated for any potential sites uncovered in the foundation activities.
Policy 3.3.7.5 Consider the potential effects (positive and adverse) on native birds and other taonga species when assessing any resource consent or concession application in Fiordland.	The areas of development are largely modified with only minimal significant natural indigenous vegetation being affected by the works. Indigenous bird species of kea and rock wren have been identified as being present within the project footprint which require management. While no nesting areas have been identified, measures are proposed to manage the potential for nesting activity and the potential adverse effects associated with construction activity on kea and rock wren species

	that may be in close proximity to the works. This is considered to be an appropriate approach for managing the potential impacts to indigenous species during construction.
Policy 3.3.7.6 Avoid adverse effects on the environment as a result of a concessions activity through appropriate conditions on permits.	An accidental discovery protocol, along with standard operating procedures for works within FNP will be adopted.
SECTION 3.3.19 PROTECTING SITES OF SIGNIFICANCE IN FIORDLAND NATIONAL PARK	
Objective / Policy	**Assessment**
Policy 3.3.19.1 Ensure that Ngāi Tahu ki Murihiku are able to effectively exercise their role as kaitiaki over wāhi tapu and wāhi taonga in Fiordland	Te Ao Marama Inc as the consultant service for local Rūnanga have been consulted with in relation to the proposal with opportunities for input into the design and cultural narrative opportunities being provided.