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Class	Description	Doc Set Id / Note Id	Version	Date
PUB_ACC	Appendix 14 - Environmental Management Plan	8029140	1	14-May-2024
PUB_ACC	Appendix 15 - Architectural Plans	8029139	1	14-May-2024
PUB_ACC	Appendix 16 - Rules Assessment	8029138	1	14-May-2024
PUB_ACC	Appendix 17 - Preliminary Detailed Site Investigation Report	8029137	1	14-May-2024
PUB_ACC	Appendix 18 - Wetland Delineation Memo	8029136	1	14-May-2024

Environmental Management Plan (Rev B)

832 Malaghans Road

May 2024

Document Control	
Title	832 Malaghans Road - Environmental Management Plan
Address	832 Malaghans Road
Consent Number	TBC
Client	I & R MacRae
Our Reference	24017
Prepared by	 **Tom Grandiek** (BAppSc, CEnvP) Senior Environmental Consultant

Document Control			
Revision	Revision Date	Revision Details	Prepared by
A	27/03/2024	For client review	TG
B	08/05/2024	EMP updated – Revised earthworks plan and Geotech report.	TG

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Disclaimer

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

Emergency Contacts

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

Table 1: Emergency Contacts

Element	Emergency Contact	Details
Pollution incident	Otago Regional Council (ORC) Spill Hotline	0800 800 033 compliance@orc.govt.nz
Environmental complaint	Environmental Representative	TBC
Discovery of contaminated land	Environmental Representative	
Unexpected heritage finds	Environmental Representative	
Human remains	New Zealand Police	111
Fire including bushfire	Fire and Emergency New Zealand (FENZ)	111
Public utilities	Queenstown Lakes District Council (QLDC)	(03) 441 0499 rcmonitoring@qldc.govt.nz
Internal contacts	Project Manager	TBC
Internal contacts	Environmental Consultant	Tom Grandiek Enviroscope 027 2633 113

1.0 INTRODUCTION

1.1 Purpose and Scope

On behalf of I & R MacRae, Enviroscope has prepared this Environmental Management Plan (EMP) for earthworks associated with the construction of a residential dwelling and the associated driveway, bridge and landscaping at 832 Malaghans Road, Queenstown. This EMP aims to reduce the effects of the project's construction activities on the environment and sensitive receptors.

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

This document will also ensure that the project aligns with the objectives and policies of the Otago Regional Council's (ORC) Plan Change 8, specifically *Topic 7: Part G: Sediment from earthworks for residential development*. *Otago Regional Council: Guide - Residential Earthworks in Otago.*

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

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

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

1.2 Site Overview

The subject site at 832 Malaghans Road is situated upon a 16.9 ha property within Wakatipu Basin Rural Amenity Zone. The site is accessed by an existing driveway off Malaghans Road, in the north-west corner of the site. The general topography of the site transitions from a steep face in the southern portion of the site, to a flat expansive paddock to the north. Mill Creek intersects through the centre of the site from west to east. Mill Creek is enclosed by the local purpose reserve. The Queenstown Trails network has a recreational walking and cycling trail that is situated within this reserve, running alongside Mill Creek.

The vegetative cover of the site is characterised by existing pasture grass historically associated with farming activities. The local purpose reserve and Mill Creek are lined by mature willow trees and some riparian planting. This is shown in **Figure 1** below.

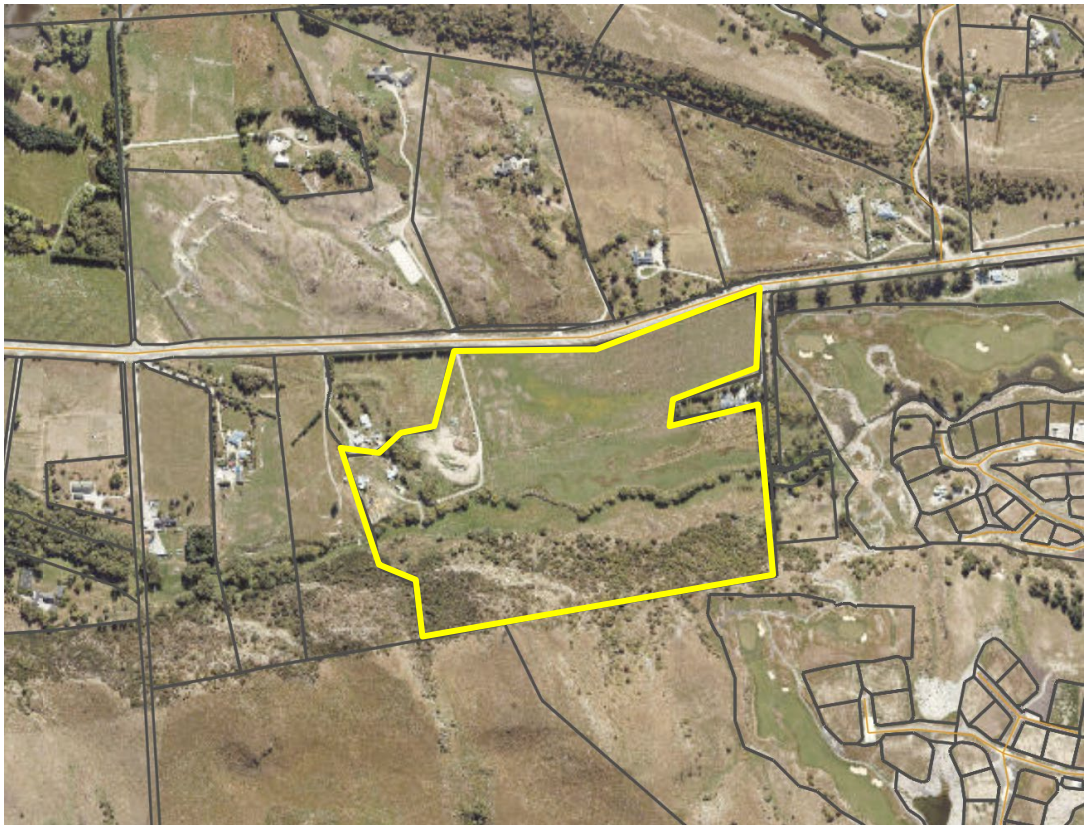


Figure 1: Location of the site (Source: QLDC GIS)

1.2.1 Soils and Geotechnical Summary

A geotechnical and flooding assessment report has been prepared by Geosolve dated April 2024. Test pits and associated investigations were undertaken by Geosolve in June 2023. The test pits report on the geotechnical conditions. The general stratigraphy consisted of *"topsoil overlying alluvial sand, overlying alluvial sand and gravel, overlying schist bedrock. The alluvial sand was generally defined to be Silty fine SAND; light brown, massive, Loose; moist. The Alluvial sand and gravel were generally described as Silty gravelly fine to coarse SAND; brown grey. Loose to medium dense; moist; gravel, fine to medium, subangular. Groundwater was encountered in some test pits at depths between 1.4 m and 2.1 m".*

1.2.2 Summary of Earthworks

A total of 2,695 m^3 of material will be cut, with 811 m^3 of fill to be utilised on site. Excess material is expected to be removed off site. The total extent of earthworks will be undertaken over an area of 5,384 m^2. Earthworks will occur in two stages with the driveway and bridge constructed initially, before undertaking earthworks to form the rockfall protection buns and building platform. The extent of earthworks is depicted on the Erosion and Sediment Control (ESCP) drawing in **Appendix 1**.

1.3 Associated Resource Consents

This EMP has been prepared to ensure that all relevant conditions of associated resource consents are addressed. Provided the project undertakes its operations in accordance with this EMP, it will comply with the relevant conditions. The resource consents associated with this project are given in **Table 2**.

Table 2: Associated resource consents

Resource Consent Number	Related Council	Activity Description	Date of Decision Issue
TBC	QLDC		TBC
TBC	ORC		TBC

1.4 Suitably Qualified and Experienced Professional

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

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

2.0 CONSTRUCTION METHODOLOGY

2.1 Sequencing of Works

The following sequencing will ensure the earthworks are undertaken efficiently while ensuring good environmental outcomes. This is a preliminary staging methodology and may be subject to change based on site conditions encountered during construction. This methodology shall be read in conjunction with the Erosion and Sediment Control Plan (ESCP) attached as **Appendix 1**.

Preliminary works and site establishment (prior to as-built confirmation)

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

Stage 1 – Driveway and Bridge Construction

Driveway construction:

- Install stabilised access and establish site laydown area as per ESCP-001, **Appendix 1.**
- Install engineer designed culvert to allow the access driveway to cross the ephemeral flow path. This is to be completed utilising the following methodology:
    - Works should only commence during a clear weather window in dry conditions with low, or no flow observed within the flow path.
    - Install silt socks downslope of the works extent within the ephemeral flow path.
    - From a dry location, extend excavator arm to excavate required area and drop culvert into position.
    - Add fill material and compact. Complete final shaping and stabilise the surface as per engineering design.
    - Install rock armoured outlet where required in accordance with design. Ensure any excavation is minimised as far as practicable during this work.
    - Any exposed areas in the flow path that are susceptible to erosion will need to be immediately grassed or lined with geofabric.
- Begin excavating driveway alignment. Install dirty water diversion channel (DWDC) within driveway alignment. Then install drop-out pits and silt socks at the end of the DWDCs. The number of silt socks on ESCP- 001 & 002 are indicative only, additional silt socks may be required and will be determined by SQEP on site.
- Construct driveway, ensuring that the road is crowned or graded towards the DWDCs as depicted on ESCP-001, **Appendix 1**. Stripped topsoil is to be located in the nominated stockpile area.
- Immediately lay and compact AP65 base once subgrade is reached.
- Avoid the delineated wetland areas when forming the driveway. These wetland areas have been mapped in **Appendix 1.**
- Ensure progressive stabilisation occurs as works progress by applying topsoil and grass seed to batters.

Bridge construction (Single span concrete/steel bridge with timber detail):

- Works to construct the bridge footings are to be undertaken in a fine weather window.
- Place silt socks below the footings, above Mill Creek as per ESCP-001, **Appendix 1**. Install drop-out pits and silt socks on both sides of Mill Creek at the end of dirty water diversion channels.
- Excavate bridge footings. Any material excavated should be stockpiled away from Mill Creek in the designated stockpile areas as per ESCP-001 & 002, **Appendix 1**. Retain all existing vegetation as much as practicably possible.
- Ensure spill kit is on hand. Construct bridge footings and abutments, pour concrete to set. Concrete is to be carefully poured and restricted to the footings area. Concrete should not be allowed to enter Mill Creek. If any spills are observed, contain and remove immediately.
- Cover exposed areas with geotextile erosion matting between works days and prior to any forecast rainfall.
- Construct, secure and brace bridge platform as per engineer specifications.
- Ensure that all cutting for superstructure and deck (except final trim) is undertaken at least five metres from the edge of the bridge works area. This is to avoid potential contaminants entering Mill Creek. Remove any waste and dispose of in accordance with details provided in **Section 11** – Waste Management.

Stage 2 – Rockfall protection Bund & Building Platform Earthworks

- Install super silt fence along the northern boundary of the works extent adjacent the banks of Mill Creek. Ensure that the super silt fence is adequately trenched in and has regular returns. A vegetated buffer zone should be maintained between the super silt fence and Mill Creek.
- Scrape topsoil from building platform and stockpile in nominated stockpile area.
- Undertake cut to form the rockfall protection bund. Install pipe drop structures at edges of the rockfall protection bund. Refer to **Appendix 2** for sizing and dimensions.
- Undertake cut to fill and compaction required to construct the building platform and raise the height of the lawn area at the northern extent of the works area. Cart excess material off site.
- Earthworks are to be undertaken in a staged approach, working progressively from the west to the east to minimise the exposed area. Ensure that exposed areas are progressively stabilised by topsoiling, re-seeding and laying clean aggregate.

Landscaping and revegetation

- Undertake final landscaping and revegetation of any remaining exposed areas.

Decommissioning

- Remove erosion and sediment control devices once stabilisation has occurred across the entire site. This is generally defined as 80% vegetative cover.

2.2 Hours of Operation

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

3.0 EMP IMPLEMENTATION

3.1 Environmental Roles and Responsibilities

3.1.1 Project Manager

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

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

3.1.2 Environmental Representative

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

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

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

3.1.3 Environmental Consultant

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

3.1.4 All Staff and Sub-Contractors

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

3.2 Site Environmental Induction

All staff and subcontractors shall attend an Environmental Induction to ensure they are aware of the project's environmental risks as well as their responsibilities to help manage these risks. Prior to ground-disturbing activities, the Environmental Consultant will deliver the induction to core staff. During the project, the Environmental Representative will induct sub-contractors and new staff. The site induction handout is attached as **Appendix 3** and all persons inducted will be recorded on the Induction Register attached as **Appendix 4**.

3.3 Environmental Inspections

Table 3 outlines the regular environmental inspections to be undertaken.

Table 3: Environmental inspections

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

Environmental Inspection	Timing	Purpose
Pre-Event Inspection	Prior to a significant rain event[1]	To ensure that erosion and sediment controls are present, functional, and adequate for forecast rain event. This inspection will inform any preventative work required and may result in the Rapid Response Procedure being implemented (see Section 4.6).
Rain Event Monitoring	During a significant rain event	To ensure that: • Erosion and sediment control devices continue to function correctly and inform any necessary emergency responses. • Drop-out pits and super silt fences are functioning effectively and have capacity available. • No dirty[2] water is crossing the boundary of the site. Observations and remediation measures taken will be recorded in a daily job diary.
Post-Event Inspection	Immediately following a significant rain event	Any observations and corrective actions should be recorded in a daily job diary.

3.4 Monthly Environmental Inspection and Reporting by SQEP

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

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

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

[1] A significant rain event is defined as any forecast/actual rain event of 15 mm within a 24-hour period or a rain event that can generate overland flow, noting that this varies seasonally.

[2] 'Dirty water' is defined as water that exceeds the maximum allowable water quality value outlined in the Discharge Criteria at **Section 5.2**.

3.5 Environmental Incident Management

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

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

The Project Manager shall notify QLDC and ORC of the details of any Environmental Incident within 12 hours of becoming aware of the incident. Notification will be through a phone call to Council monitoring staff (see Emergency Contacts on page four). The Project Team shall provide an Environmental Incident Report within ten working days of the incident occurring. The Incident Report form is attached as **Appendix 6**.

3.6 Complaints Procedure

Any complaint received will be recorded and an investigation will be carried out. The complainant will be provided with a response acknowledging receipt of the complaint and outlining corrective actions to be implemented. After the investigation, any necessary corrective actions will be carried out and a follow-up of the original complaint is to be conducted to ensure the actions implemented have been effective. All complaints will be recorded on the Complaints Register attached as **Appendix 7**.

3.7 EMP Non-Conformance and Corrective Actions

EMP non-conformances found during site inspections, monitoring or as a result of environmental incidents or complaints shall be recorded in the EMP Non-Conformance Register. The non-conformance register attached as **Appendix 8** will detail when corrective actions are due, how they are to be carried out and the close out date. The non-conformance register ensures that issues do not escalate or are missed, as well as, providing a clear record of evidence that can be used to defend any potential complaint or formal enforcement action.

3.8 Records and Registers

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

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

3.9 EMP Updates

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

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

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

4.0 EROSION AND SEDIMENT CONTROL MEASURES

4.1 Performance Criteria

Design, install and maintain erosion and sediment controls in accordance with industry best practices. Generally, this is:

- *Residential Earthworks in Otago Guidelines*, 2023 (Otago Regional Council);
- *QLDC Guidelines for Environmental Management Plans*, June 2019 (Queenstown Lakes District Council).
- *Undertake all earthworks in accordance with the recommendations made within the Geosolve geotechnical report dated April 2024.*

4.2 Erosion and Sediment Control Principles

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

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

4.3 Guidance on Erosion and Sediment Control Devices

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

4.3.1 Site Definition

At the commencement of the project, the following components onsite will be clearly defined as detailed in **Table 4**.

Table 4: Site definition specifications

Site component	Method of Demarcation
Designated site access	Installation of stabilised access

Internal ‘no-go’ areas (protected or sensitive areas)	Bunting or flagging tape with waratahs

4.3.2 Stabilised Entranceway

The stabilised access will be located off the existing driveway off Malaghans Road as indicated on ESCP-001 attached as **Appendix 1**. There is an existing driveway to access the adjacent property, this will be improved and extended to access this site also. The stabilised entranceway will be constructed in accordance with the schematic diagram in ESCP-003, **Appendix 1** (complete guidelines on pages 60-65 of GD05).

4.3.3 “Dirty Water” Diversion Channels and Bunds

Dirty water diversion channels (DWDC) will be installed within the driveway alignment and follow the final design of the driveway swales. These will capture sheet flows off the driveway surface, before directing via drop out pits and silt socks. DWDCs will be constructed in accordance with the schematic diagram in ESCP-004, **Appendix 1** (complete guidelines on pages 43-46 of GD05). Full calculations are included in **Appendix 2**.

4.3.4 Drop-Out Pits

Drop-out pits will be used at the end of the DWDCs, upslope of the bridge and Mill Creek. These drop-out pits will allow the heavier, coarse sediments to drop out of suspension, preventing them from entering Mill Creek. Drop-out pits can be increased in size prior to forecast rain events if additional capacity is anticipated to be required. Drop-out pits will be constructed in accordance with the image reference in ESCP-005, **Appendix 1** (complete guidelines on page 45 of GD05).

4.3.5 Geotextile Erosion Matting

During construction of the access bridge, erosion matting should be used to cover all exposed surfaces surrounding footings at the end of the day’s work and or prior to any forecast rainfall events. These exposed areas are small in nature and due to the proximity of Mill Creek, actively covering the exposed areas will significantly reduce potential erosion and sedimentation. Geotextile matting should be pinned into the bank to ensure they are robustly secured and are not subject to damage from fluctuating Creek levels. A woven geotextile matting should be employed for this purpose. The geofabric should be secured and pinned in place. The geotextile erosion matting will be installed in accordance with the schematic diagram in ESCP-005, **Appendix 1**.

4.3.6 Super Silt Fence

A super silt fence will be used to capture potential sheet flows from the building platform works area. Super silt fences are to be installed at the toe of the works extent on the flat, grassed area adjacent Mill Creek. This will mitigate any sheet flows from the works area and travel over the flat grassed area between the fence and toe of the works extent. This solution has been selected due to the proximity to a sensitive waterbody, flat topography and short slope length which allows for a super silt fence as an appropriate method. It is important that two returns are installed along the length of the fence. Super silt

fence will be installed in accordance with the schematic diagram in ESCP-006, **Appendix 1** (complete guidelines on pages 120-125 of GD05).

4.3.7 Standard Silt Fence

A standard silt fence will be used to capture potential sheet flows from the nominated stockpile area. This solution has been selected due to the proximity to a sensitive waterbody, flat topography and small catchment which allows for a silt fence as an appropriate method. The silt fence will be installed in accordance with the schematic diagram in ESCP-007, **Appendix 1** (complete guidelines on pages 112-119 of GD05).

4.3.8 Silt Socks

Silt socks will be utilised to intercept runoff from the construction of the culvert, bridge footings and driveway access. Silt socks will be used extensively on this project due the minor earthworks extents, proximity to a sensitive receptor and necessity to move sediment controls proactively throughout construction.

Silt socks are to be utilised adjacent to the ephemeral flow path, to capture sediments that may become dislodged during earthworks. Culvert installation is to occur when there are little to know flows present in the flow path. These silt socks are to remain in place until the works area is sufficiently stabilised.

Silt socks are to be installed, and secured in place underneath the proposed bridge, immediately below the footings. The bridge footings are to be formed above the stream banks, outside of the high flow mark. The silt socks will be placed immediately below the footing's excavations. The silt socks are to be pegged and tied into place firmly in accordance with the reference images in ESCP-004, **Appendix 1** (complete guidelines on pages 126-130 of GD05). These silt socks are to remain in place until the works are completed, and surrounding areas stabilised.

Silt socks will also be utilised immediately downslope of the proposed driveway alignment in conjunction with drop out pits. Drop-out pits and the end of the formed driveway swales will reduce channel flow velocity and allow the heavier coarse sediments to drop out, before moving through a series of silt socks, prior to entering Mill Creek. The driveway alignments are small in extent and on a relatively flat gradient, ensuring silt socks are an appropriate sediment control.

Silt sock locations are provided in ESCP-002 **Appendix 1**. It should be noted that that number of silt socks indicated on ESCP-001 & 002 are approximated and may be increased if required. These devices are essentially mesh or fabric tubes filled with sand and or compost.

4.3.9 Pipe-Drop Structures

If clean water flows are encountered, pipe drop structures may be installed as a contingency measure. This can be achieved by capturing clean water at edges of the debris bund and diverted away from the works area. The pipe drop outlets should be directed towards the vegetated ground outside of the works footprint, with stabilised geofabric and rock rip outlets.

This will be monitored regularly by the Environmental Consultant and Representative during regular inspections as detailed in **Sections 3.3 and 3.4**. The pipe drops are to be pegged and tied into place firmly in accordance with the reference images in ESCP-008, **Appendix 1** (complete guidelines on pages 55-60 of GD05).

The pipe drop structures have been designed in accordance with the values derived from Geosolve flood assessment estimations with the full calculations included in **Appendix 2**.

4.3.10 Temporary Stockpiles

Stockpiles may be formed as part of earthworks. It is recognised that the location of stockpiles will change with the progress of the earthworks. It is important that the topsoil stripped from the building works platform is stockpiled in the designated area as depicted in ESCP-001 and ESCP-002. Stockpiles shall be constructed in accordance with the schematic diagram in ESCP-005, **Appendix 1.**

4.3.11 Progressive Rehabilitation

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

4.4 As-Built Verification

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

4.5 Maintenance of Erosion and Sediment Control Devices

Ongoing maintenance of the site shall be undertaken as follows:

- Clean out sediment of erosion and sediment control as soon as 20% capacity has been reached.
- Any mucked-out sediment shall be stockpiled, dried and reused as planting media for revegetation.
- Brush down sediment stains on silt fencing material.

4.6 Rapid Response Procedure for Significant Rain Events

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

4.7 Decommissioning and Removal

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

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

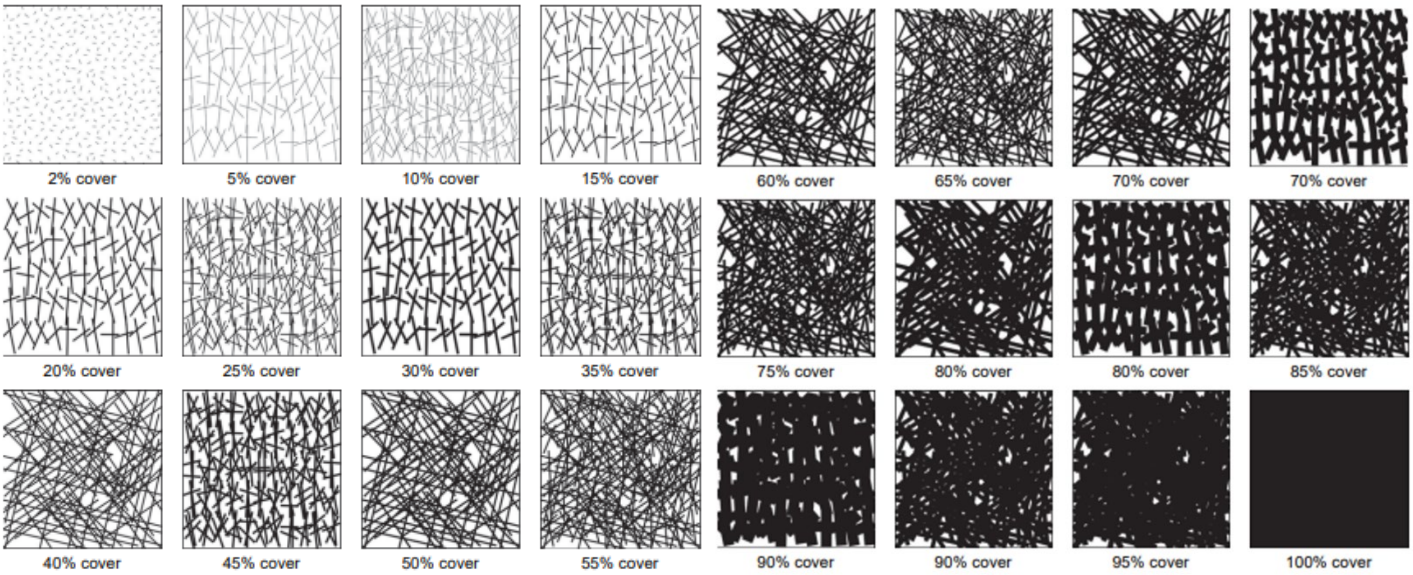


Figure 2: Visual cover estimation (Source: Catchments and Creeks Pty Ltd)

4.8 Inspections and Monitoring

Details of inspections and monitoring are stated in Section 3.3.

4.9 Contingency Measures

The following contingency measures in **Table 5** shall be deployed as required.

Table 5: Erosion and sediment control contingency measures

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

Issue	Contingency Measure
Sediment retention devices are near capacity and more rain is forecast	Contact the Environmental Consultant (SQEP) immediately for advice.
Abatement notice issued by Council	Contact the Environmental Consultant (SQEP) immediately to advise on methods to meeting abatement notice requirements within the time stated by the abatement notice.

4.10 Erosion and Sediment Control Incident

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

5.0 WATER QUALITY MANAGEMENT

Surface water bodies (rivers, streams, lakes and wetlands) provide important habitats for many species of plants, fish, birds and animals, some of which are endemic and/or threatened. To protect these values, water quality must be safeguarded, and the natural flow of the watercourse maintained to the greatest possible extent. Where flow must be reduced or diverted, mitigation is required to ensure the values of the watercourse are not degraded.

5.1 Receiving Waterbodies

Mill Creek intersects the centre of the property, flowing from west to east. Mill Creek is considered a sensitive environmental receptor. It is noted that Mill Creek is the primary waterbody feeding Lake Hayes which is located within the wider Lake Hayes catchment.

A wetland delineation report has been provided by Beale Consultants dated November 2023. This report identifies and maps all wetland areas identified on the site. These wetland areas are located immediately north of Mill Creek as shown in **Figure 3**. The driveway access and building platform have been carefully designed to avoid the waterbodies. In adopting the management measures prescribed within the EMP, adverse environmental effects on these waterbodies can be appropriately mitigated.

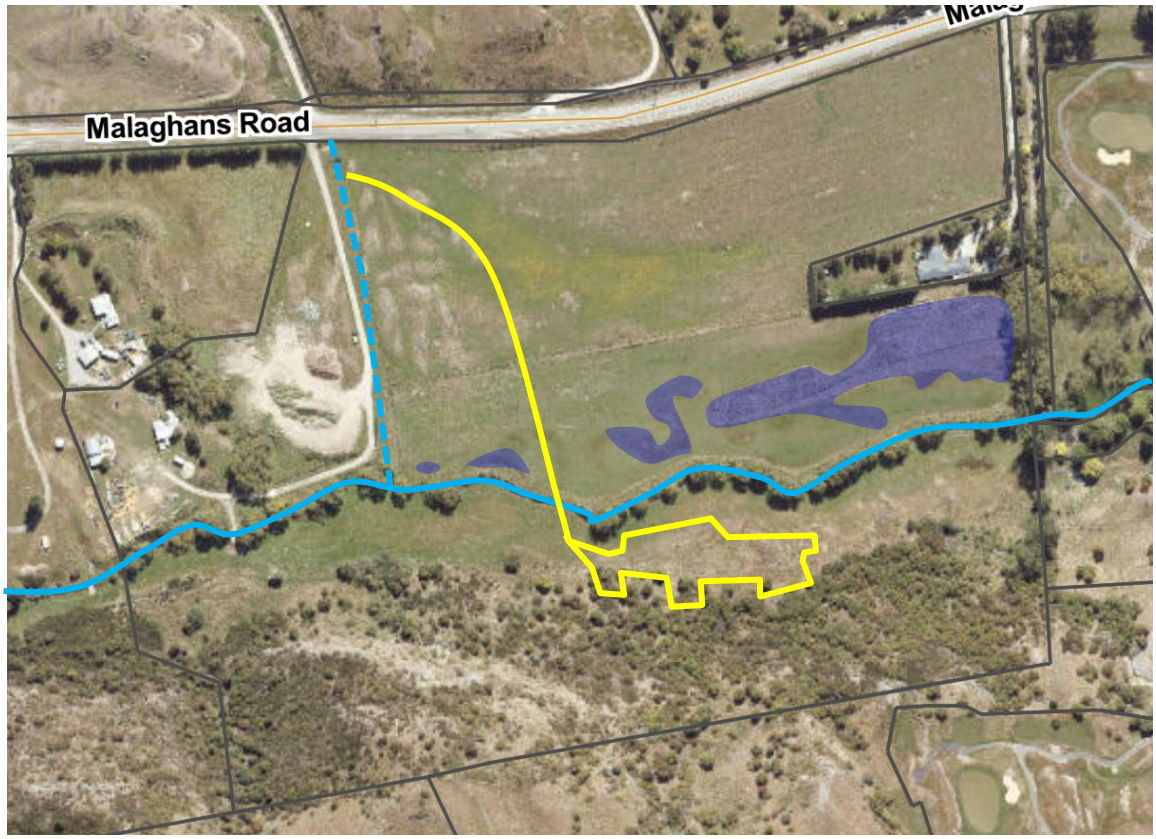


Figure 3: Waterways within proximity to the works area.

5.2 Performance Criteria

Any discharge from the sites' works areas, or erosion and sediment control devices will meet the criteria in **Table 6**.

Table 6: Water quality discharge criteria

Parameter	Discharge Criteria
Turbidity	≤ 150 NTU[3]
Or…	
Comparative Visual Clarity (mm)[4] (As per GD05)	>100 mm
If turbidity or visual clarity is exceeded, test for…	
Total Suspended Sediment (TSS)	≤ 50 mg/L
pH[5]	5.5 – 8.5
Hydrocarbons or tannins	No visible trace
Waste	No waste or litter is visible

5.3 Management Measures

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

- Erosion and sediment controls will be implemented and maintained in accordance with the Erosion and Sediment Control Measures in **Section 4.0**.
- Refuelling, servicing and storage of hydrocarbons will be in accordance with the relevant procedures in the Chemicals and Fuels Management in **Section 10**.
- All concrete washing is to be undertaken in the designated concrete wash-out pit as per the design specifications in ESCP-009, **Appendix 1**.

[3] Turbidity can be instantly measured using a nephelometer. This is considered desirable as opposed to testing TSS which requires laboratory testing and can take several days. Turbidity can be inferred from the relationship with TSS via linear regression. If the specified turbidity value is not met, a water sample will be collected and sent for TSS laboratory testing.

[4] In the absence of a turbidity measure, visual clarity can be inferred from the relationship with turbidity via linear regression. If the specified visual clarity value is not met, a water sample will be collected and sent for TSS laboratory testing.

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

- All plant and equipment onsite will be inspected regularly to ensure they are of an acceptable standard.
- Stockpiling of any organic, erodible or hazardous material onsite is not to be placed within close proximity of a watercourse/major drainage line, unless appropriate controls are in place.

5.4 Monitoring

Water quality will be monitored in accordance with **Table 7**.

Table 7: Water quality monitoring measures

Sampling Scope	
Objective	To assess whether controlled and uncontrolled discharge, meets the Discharge Criteria referred to in Section 5.2.
Responsibility	On site water quality sampling is to be completed by the nominated Environmental Representative. Note: SQEP is available to provide training and guidance regarding on site sampling and can provide sampling services as required.
Spatial boundaries	Discharges from within the sites' work areas and/or erosion and sediment control devices.
Frequency	A significant rain event is defined as any forecast/actual rain event of 15 mm within a 24-hour period or a rain event that can generate overland flow, noting that this varies seasonally. Where a Significant Rain Event occurs through the night, monitoring shall be undertaken the following morning.
Sampling Design	
Water Quality Criteria	As outlined in the Discharge Criteria referred to in Section 5.2.
Sampling Locations	At boundaries of the site where any water is flowing, specifically downstream of bridge instillation works.
Sampling Method	• TSS – Registered laboratory • Turbidity (NTU) – Nephelometer • pH – pH meter – only if utilising chemical treatment • Gross pollutants – visual observations • Tannins – visual observations (any unusual darkening of waters?) • Hydrocarbons – visual observations (is there any oily film[6] on surface or smell?)

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

Quality Control	Any water quality meter will be calibrated according to manufacturer instructions. All observations will be recorded and analysed.
Recording	
Recording Results	All results will be entered into a spreadsheet and kept onsite (form attached as **Appendix 9**).
Actions	
Non-conformances	Any exceedances observed will be reported to the Project Manager/ Environmental Consultant who will investigate and ensure appropriate corrective actions are implemented immediately.

5.5 Contingency Measures

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

Table 8: Water quality contingency measures

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

5.6 Water Quality Incidents

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

6.0 DUST MANAGEMENT

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

There are a range of activities that may produce dust onsite including:

- General disturbance of soil (particularly during drier months).
- Inappropriate staging that does not seek to minimise the extent of exposed soil.
- Vehicle movements along haul roads.
- Sediment-tracking onto surrounding roads.
- Stockpiling of topsoil or subsoil.
- Slow or ineffective revegetation procedures.

6.1 Sensitive Receptors

Key sensitive receptors to protect from the effects of dust include Mill Creek and recreational users of the Queenstown Trail and workers on site. Due to the rural nature of the site, adjacent properties are not within immediate vicinity of the proposed works areas. It is anticipated that there may be some vehicle movements required to cart excess fill off site. It is important that management measures discussed in **Section 6.3** below are followed to mitigate potential dust effects.

6.2 Performance Criteria

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

6.3 Management Measures

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

- Stage works where possible to minimise soil exposure extents and timeframes.
- Revegetate disturbed areas progressively throughout construction.
- Dust suppression of exposed areas and stockpiles by water trucks or other methods (e.g., k-lines) approved by the Environmental Representative.[7]
- If dust activities cannot be controlled during high winds, works will cease until favourable conditions return.
- Only designated access points and haul routes are to be used.
- Site access to be constructed in accordance with GD05 (detail at Section 4.3.2).

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

- All site access and surrounding roads to be swept clean regularly.
- To avoid spillage risks, trucks will not be overloaded.
- All trucks must have tail gates up and swept or cleaned prior to exiting to external roads.
- Stockpile heights are to be minimised where possible (< three metres) unless they are covered (e.g. an erosion blanket, chemical sealant, temporary cover crop or mulched).
- Long-standing stockpiles (greater than six weeks) shall be appropriately stabilised.
- Within two weeks of completion, all earth worked areas will be sown out with grass, landscaped or otherwise stabilised by an appropriate erosion control.

6.4 Monitoring

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

6.5 Contingency Measures

The contingency measures in **Table 9** shall be adopted if required.

Table 9: Dust contingency measures

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

6.6 Dust Incident

A dust incident is considered to have occurred where:

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

The incident procedures outlined at Section 3.5 shall commence.

7.0 NOISE AND VIBRATION MANAGEMENT

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

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

- Excavation and earth moving plant
- Light vehicles near sensitive receptors
- Ancillary plant and equipment
- Compaction equipment
- Reversing alarms

7.1 Sensitive Receptors

Key sensitive receptors to protect from the potential effects of noise and vibration are the neighbouring dwellings to the north-west and east of the works extent. Due to the rural nature of the site, adjacent properties are not within immediate vicinity of the proposed works areas and effects associated with construction noise and vibration are anticipated to be minor.

7.2 Performance Criteria

1. Construction activities shall meet relevant noise limits specified under Rule 36.5.13 of the Queenstown Lakes Proposed District Plan. This rule requires Construction sound at any point within the site must comply with the limits specified in Tables 2 and 3 of *NZS 6803:1999 Acoustics - Construction Noise*, when measured and assessed in accordance with that standard (see **Table 10** below).
2. Construction activities shall meet relevant vibration limits specified under Rule 36.5.10 of the Queenstown Lakes Proposed District Plan. This rule requires vibration from any activity must not exceed the guideline values given in *DIN 4150-3:1999 Effects of vibration on structures* on any structures or buildings on any other site.
3. Construction activities shall be undertaken in accordance with the permitted hours of operation outlined at Section 2.2 above.

Table 10: Upper limits in dB(A) for construction work noise in residential areas for more than 20 weeks

Time of Week	Time Period	$L_{Aeq(t)}$	L_{Afmax}
Weekdays	0630 – 0730	55 dB	75 dB
	0730 – 1800	70 dB	85 dB
	1800 – 2000	65 dB	80 dB

Saturdays	0630 – 0730	45 dB	75 dB
	0730 – 1800	70 dB	85 dB

Table 11: Vibration Thresholds for Structural Damage (PPV mm/s)

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

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

7.3 Management Measures

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

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

7.4 Monitoring

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

7.5 Contingency Measures

The following contingency measures in **Table 12** shall be adopted if required.

Table 12: Noise and vibration contingency measures

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

7.6 Noise and Vibration Incident

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

8.0 CULTURAL HERITAGE MANAGEMENT

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

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

8.1 Location of Known Cultural Heritage Significance

A search of QLDC's database indicates there are no known items of cultural or heritage significance on the site.

8.2 Performance Criteria

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

8.3 Management Measures

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

8.4 Monitoring

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

8.5 Accidental Finds

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

9.0 VEGETATION MANAGEMENT

The site is predominantly covered in established exotic vegetation and pasture associated with agricultural grazing. Some mature Willow trees are located on the banks of Mill Creek. Riparian planting has been undertaken alongside Mill Creek as part of the Queenstown Trails Network, utilising local indigenous species. Additional Planting is proposed as part of the landscape plan.

9.1 Sensitive Receptors

There is no indigenous vegetation or protected trees located within the proposed works extent. It is important that any indigenous vegetation planted for riparian management and wildlife habitat is monitored regularly and carefully marked off to ensure no disturbance occurs. Any wetland areas are to be clearly demarcated to ensure no disturbance occurs to any wetland species.

9.2 Performance Criteria

- Undertake vegetation removal and replanting in accordance with the approved landscape plan.
- Avoid the clearance of indigenous or protected vegetation where possible during excavation works.
- Avoid the spread of noxious weeds onsite or to other sites.

9.3 Management Measures

The following measures will be deployed to manage vegetation:

- Demarcate protected vegetation areas as no go zones.
- Treating weeds prior to disturbance of the natural surface.
- Maintain existing indigenous and or any protected vegetation.
- Weed free topsoil will be retained for reuse in site rehabilitation.

9.4 Monitoring

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

9.5 Vegetation Incident

A vegetation incident is considered to have occurred where:

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

The environmental incident procedures outlined at Section 3.5 shall commence.

10.0 CHEMICALS AND FUELS MANAGEMENT

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

10.1 Sensitive Receptors

Key sensitive environmental receptors include staff members working on the site and Mill Creek.

10.2 Performance Criteria

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

10.3 Management Measures

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

- All hazardous substances to be stored, transported and used according to the safety data sheet requirements.
- Storage of chemicals and fuels shall be located as far as practicably possible from waterways and concentrated flows.
- Refuelling of vehicles and plant onsite will occur in the designated refuelling bay as shown in ESCP-009, **Appendix 1**.
- All concrete washing is to be undertaken in the designated concrete wash-out pit as per the design specifications in ESCP-009, **Appendix 1**.
- One 40 L Oil and Hydrocarbon spill kit and one 40 L Chemical spill kit will be located in close proximity to the location of liquid hazardous materials storage and refuelling areas.
- The volumes of the hazardous substances listed in **Table 13** will not be exceeded.

Table 13: Maximum volumes of chemicals and fuels

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

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

10.4 Monitoring

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

10.5 Contingency Measures

The following contingency measures in **Table 14** shall be adopted if required.

Table 14: Chemicals and fuels contingency measures

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

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

10.6 Chemicals and Fuels Incident

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

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

The environmental incident procedures outlined at Section 3.5 shall commence.

11.0 WASTE MANAGEMENT

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

11.1 Sensitive Receptors

Key sensitive environmental receptors include Mill Creek and surrounding neighbours.

11.2 Performance Criteria

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

11.3 Management Measures

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

- The Waste Management Hierarchy philosophy will be implemented, as illustrated in **Figure 4**.

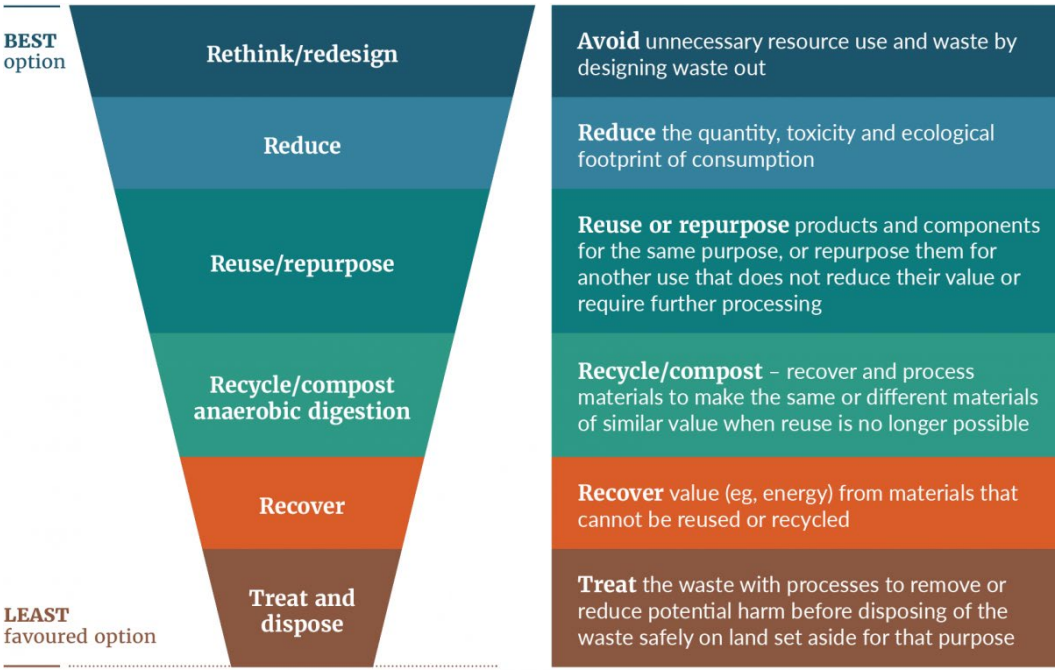


Figure 4: The Waste Hierarchy (Source: Ministry for the Environment).

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

11.4 Monitoring

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

11.5 Contingency Measures

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

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

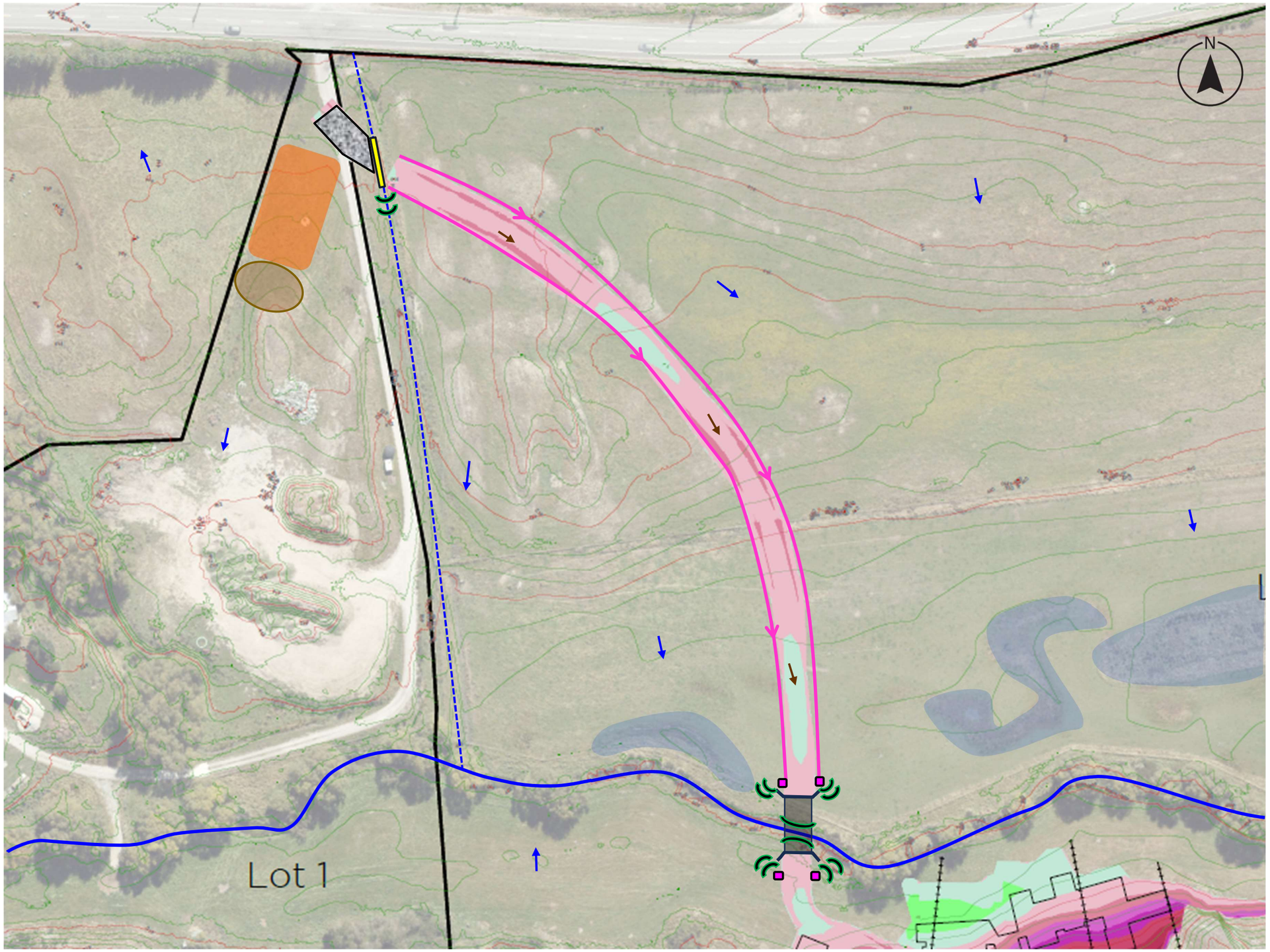
11.6 Waste Incident

A waste incident is considered to have occurred where:

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

The environmental incident procedures outlined at Section 3.5 shall commence.

APPENDIX 1 Erosion and Sediment Control Plan Drawing



Legend

	Stabilised access
	Clean water overland flow
	Dirty water overland flow
	Dirty water diversion channel
	Waterbody
	Ephemeral flow path
	Wetland
	Laydown area
	Culvert (Final Engineer Design)
	Stockpile
	Silt sock
	Drop-out pits

Notes

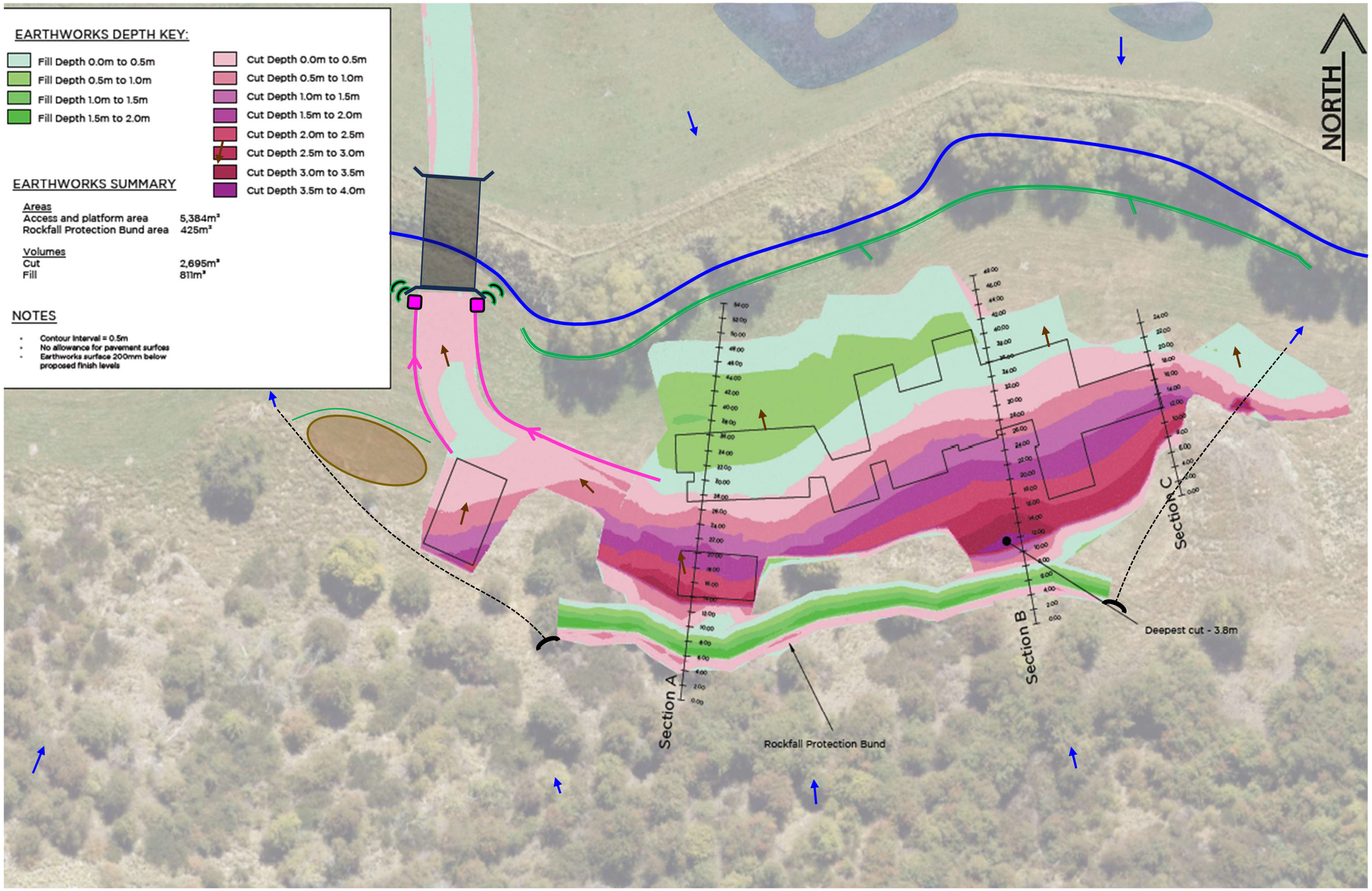
1. This plan is to be read in conjunction with the Environmental Management Plan document prepared by Enviroscope. Ensure construction methodology is read and understood prior to completing works within proximity of Waterbodies.
2. All locations of erosion and sediment control (ESC) devices are indicative and exact placement to be confirmed onsite.
3. ESC devices to be installed and maintained in accordance with Auckland Council's 'Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05) and manufacturer's instructions where relevant.
4. All devices are to be inspected daily and pre and post-rain event to ensure they are fully functional.
5. The number of silt socks shown on this plan are indicative only. More silt socks may be required downslope of the drop-out pits or within the ephemeral flow path, as to be confirmed by Environmental consultant on site, during construction.

enviroscope

Project: 832 Malaghans Road

Description: Erosion and Sediment Control Plan Drawing – Stage 1 - Access and Bridge

Drawn	Approved	Date	Drawing No.	Revision
SJ	TG	8/05/2024	ESCP - 001	B



Legend

	Stabilised access
	Clean water overland flow
	Dirty water overland flow
	Dirty water diversion channel
	Waterbody
	Wetland
	Super silt fence
	Silt fence
	Stockpile
	Silt sock
	Drop-out pits
	Pipe drop structure (Contingency)

Notes

1. This plan is to be read in conjunction with the Environmental Management Plan document prepared by Enviroscope.
2. All locations of erosion and sediment control (ESC) devices are indicative and exact placement to be confirmed onsite.
3. ESC devices to be installed and maintained in accordance with Auckland Council's 'Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05) and manufacturer's instructions where relevant.
4. All devices are to be inspected daily and pre and post-rain event to ensure they are fully functional.
5. Building platform works are to commence after installation of bridge and access.
6. Potential clean water flows from upslope of the work area will be diverted via a formed rockfall protection bund to be formed initially. If clean water is observed, this can be captured at edges of the bund and diverted away from the works area utilising a pipe drop structure.

enviroscope

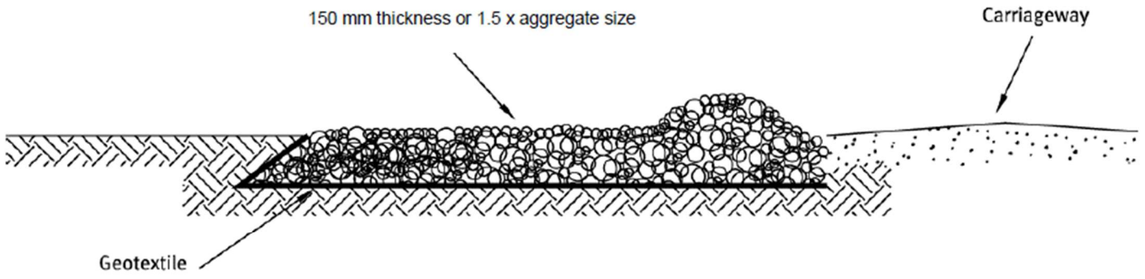
Project: 832 Malaghans Road

Description: Erosion and Sediment Control Plan Drawing – Stage 2 – Building platform.

Drawn	Approved	Date	Drawing No.	Revision
SJ	TG	9/05/2024	ESCP - 002	B

STABILISED ACCESS

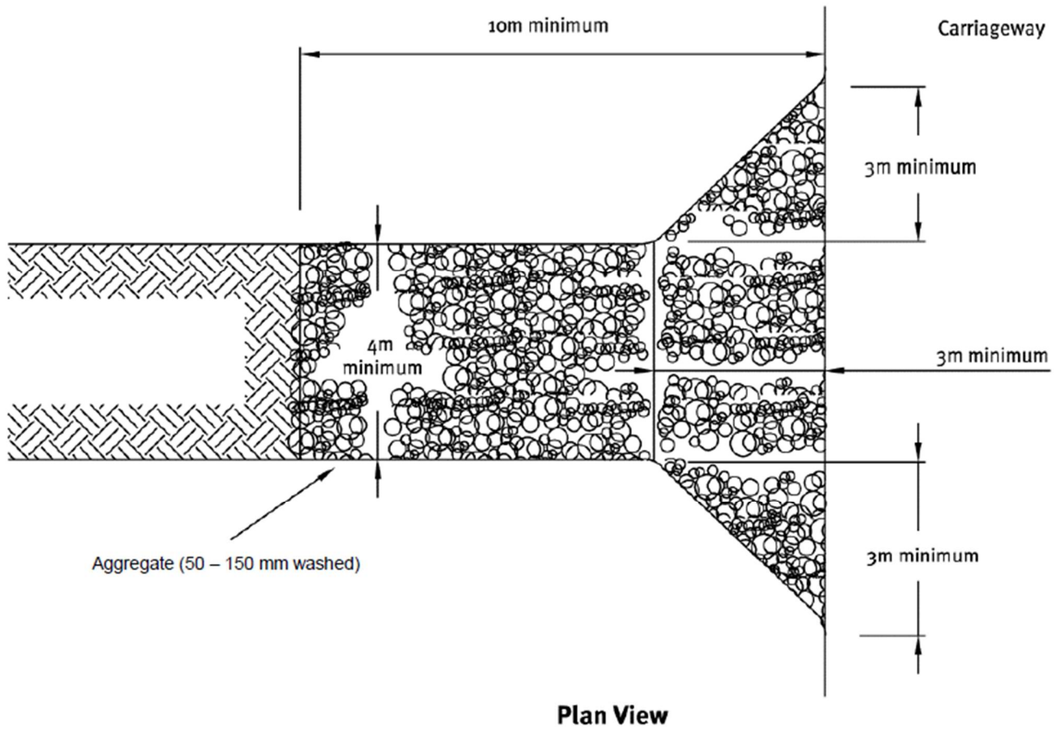
(Page 60 from GD05)



Side Elevation

Design Parameter	Specification
Aggregate size	50-150 mm washed aggregate
Minimum thickness	150 mm
Minimum length	10 m
Minimum width	4 m

- Additional aggregate may need to be added to the stabilised entranceway throughout the project to maintain the thickness.
- Any sediment that has been tracked onto the surrounding roads must be swept away at regular intervals.



Plan View

Project: 832 Malaghans Road

Description: Erosion and Sediment Control Plan - Schematics

Drawn	Approved	Date	Drawing Number	Revision
SJ	TG	9/05/2024	ESCP - 003	B

SILT SOCK

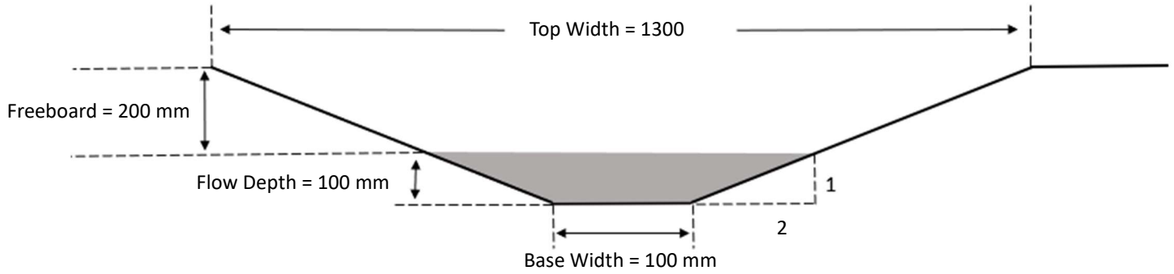
Page 126-130 from GD05

Slope steepness (%)	Slope length (m) (maximum)	Spacing of returns (m)
Less than 2%	100	N/A
2- 10%	40	30
10- 20%	30	25
20- 33%	10	10
33- 50%	5	10
Greater than 50%	2	5

- The silt sock should run the length of the bridge footings.
- It is important that the silt socks are secured flush with the ground to prevent sediment from undercutting the sock.
- Ensure silt socks are placed along the contour and secured with pegs.

DIRTY WATER DIVERSION CHANNEL

(Pages 43-46 from GD05)



- This has been designed to convey up to a 5% AEP design event.
- Trapezoidal shape
- Full calculations are included in **Appendix 2**.

enviroscope	**Project:** 832 Malaghans Road **Description:** Erosion and Sediment Control Plan - Schematics				
	Drawn	**Approved**	**Date**	**Drawing Number**	**Revision**
	SJ	TG	9/05/2024	ESCP - 004	B

DROP-OUT PIT

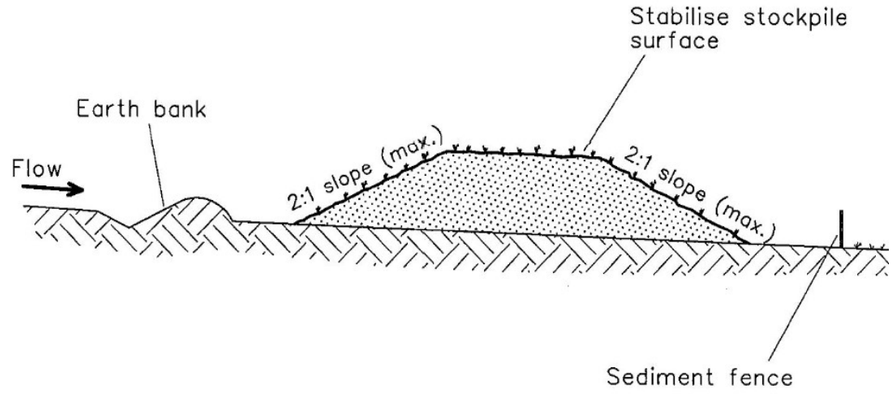
Page 45 from GD05

- Drop out pits should be one metre deep by one-metre-wide cube.
- As a contingency measure, drop out pits can be increased in size and lined to prevent any scour of the pit.

GEOTEXTILE EROSION MATTING

- For the bridge works within direct proximity of Mill Creek, geotextile erosion matting should be placed over exposed surfaces prior to rain events and at the end of the working day.

TEMPORARY STOCKPILES



- Temporary stockpiles should be a maximum height of two metres to mitigate wind effects and to preserve the quality of the topsoil as future planting media for revegetation.
- If the stockpile is to be left insitu for a period of 4 weeks or more it shall be seeded with grass or erosion control matting to provide erosion and dust protection.
- A silt fence should be installed on the downslope of the stockpile.

enviroscope

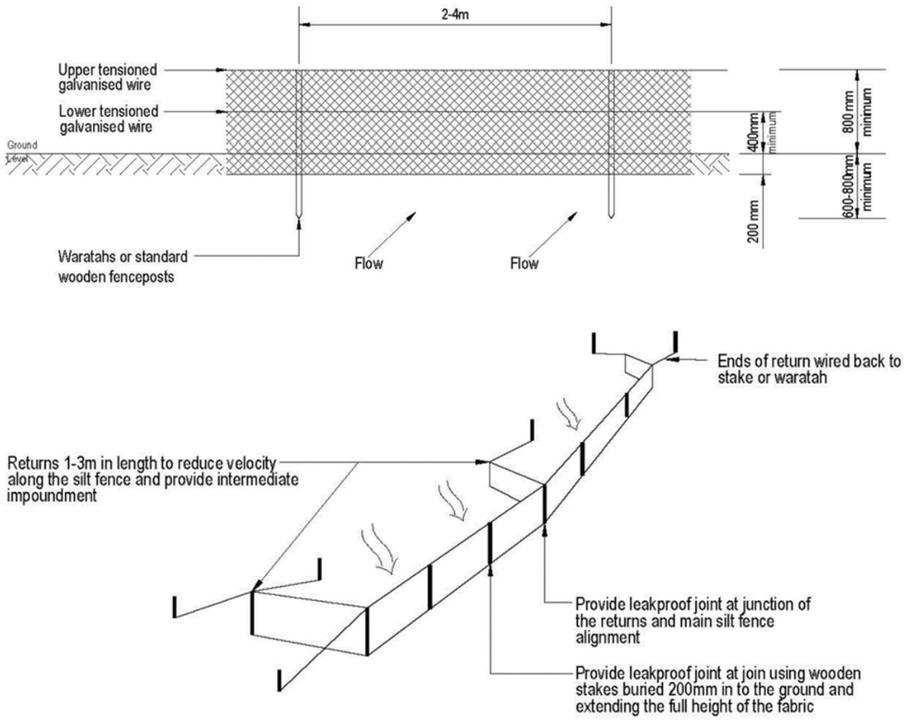
Project: 832 Malaghans Road

Description: Erosion and Sediment Control Plan - Schematics

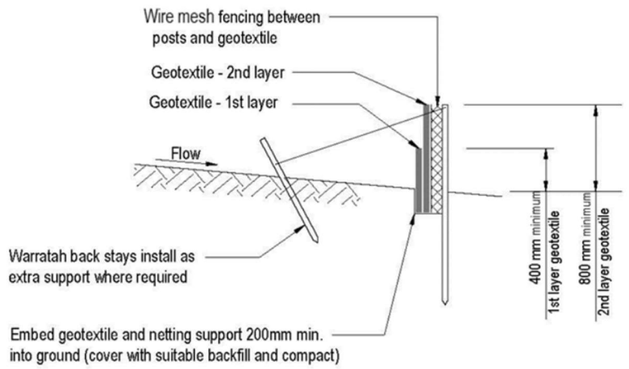
Drawn	Approved	Date	Drawing Number	Revision
SJ	TG	9/05/2024	ESCP - 005	B

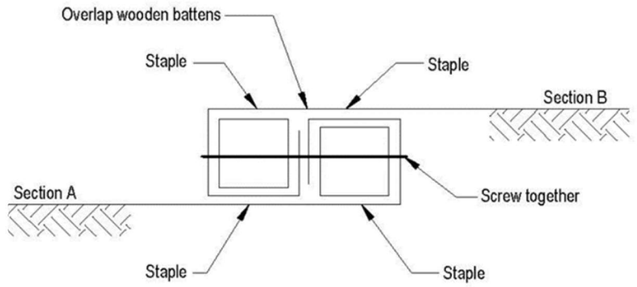
SUPER SILT FENCE

(Page 120-125 from GD05)



Slope steepness (%)	Slope length (m) (maximum)	Spacing of returns (m)	Silt fence length (m) (maximum)
0- 10%	Unlimited	60	Unlimited
10- 20%	60	50	450
20- 33%	30	40	300
33- 50%	30	30	150
Greater than 50%	15	20	75





- The super silt fence should be 800 mm above ground level and a minimum of 200 mm below ground level.
- The anchoring of the silt fence should ensure stability and the double layered geotextile should provide for drop-out prior to any water filtering through the upper portions of the fabric.
- It is imperative that the front face of the fence follows the contour as close as possible to ensure the designed holding capacity is achieved and to avoid creating pressure points on the fence.
- Supporting waratahs should be placed at 2-4 m intervals.
- Returns will be installed very ten metres along the silt fence.
- Stays to be installed with silt fence to provide additional structural support.

enviroscope

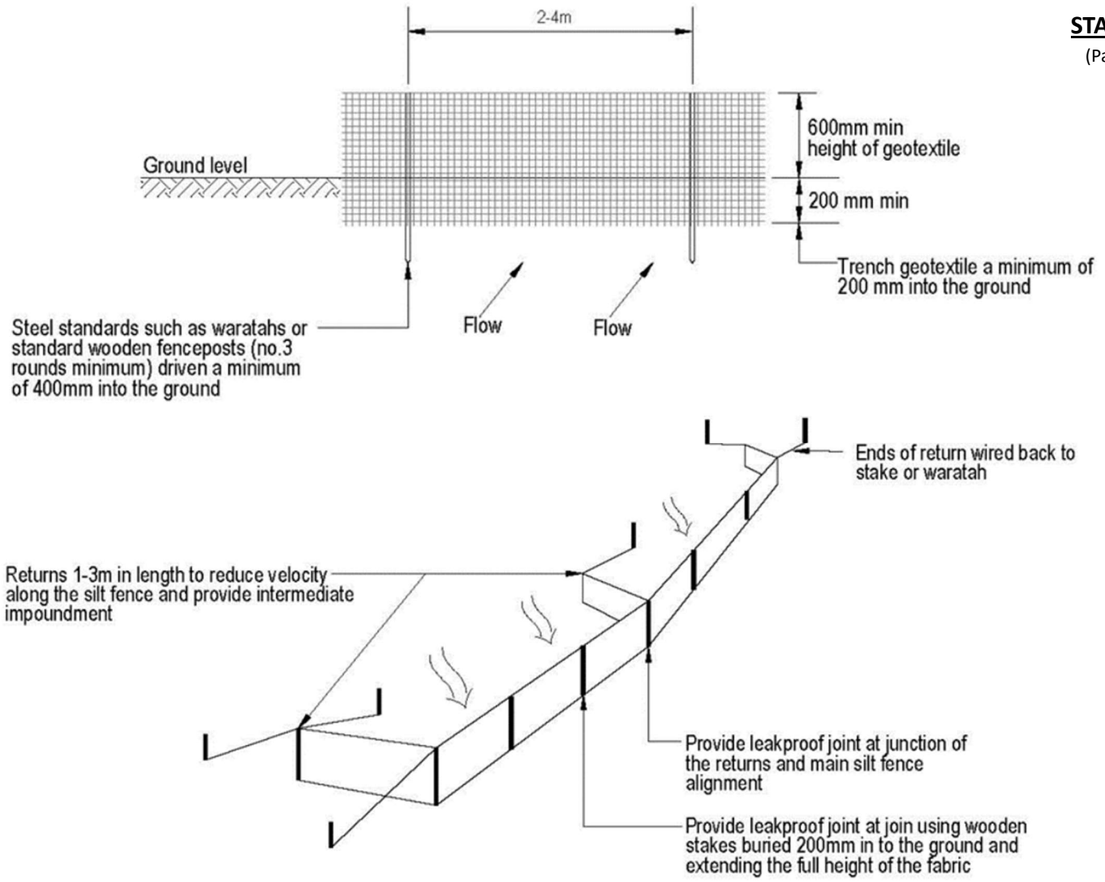
Project: 832 Malaghans Road

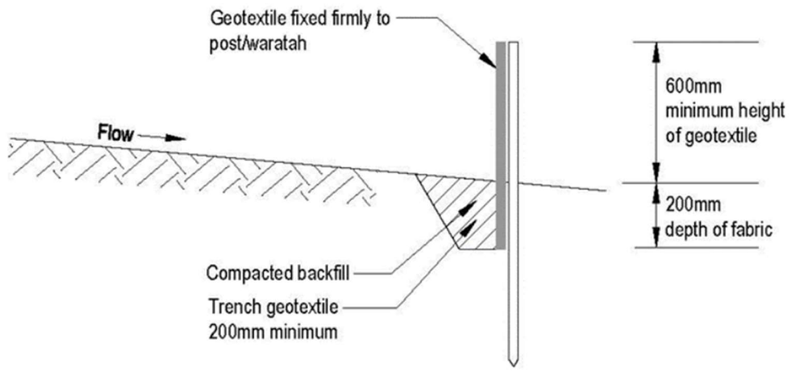
Description: Erosion and Sediment Control Plan - Schematics

Drawn	Approved	Date	Drawing Number	Revision
SJ	TG	9/05/2024	ESCP - 006	B

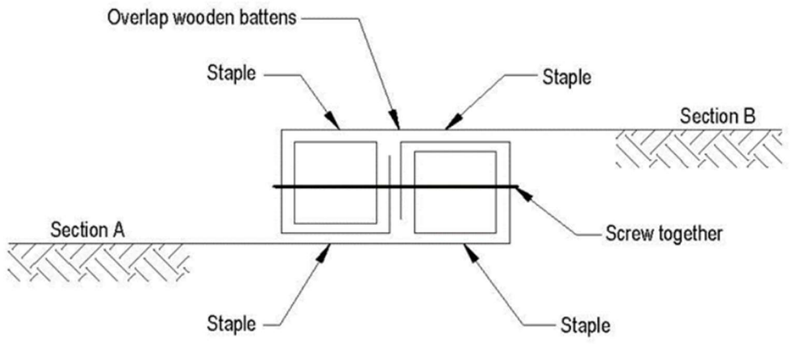
STANDARD SILT FENCE

(Page 112-119 from GD05)





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



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

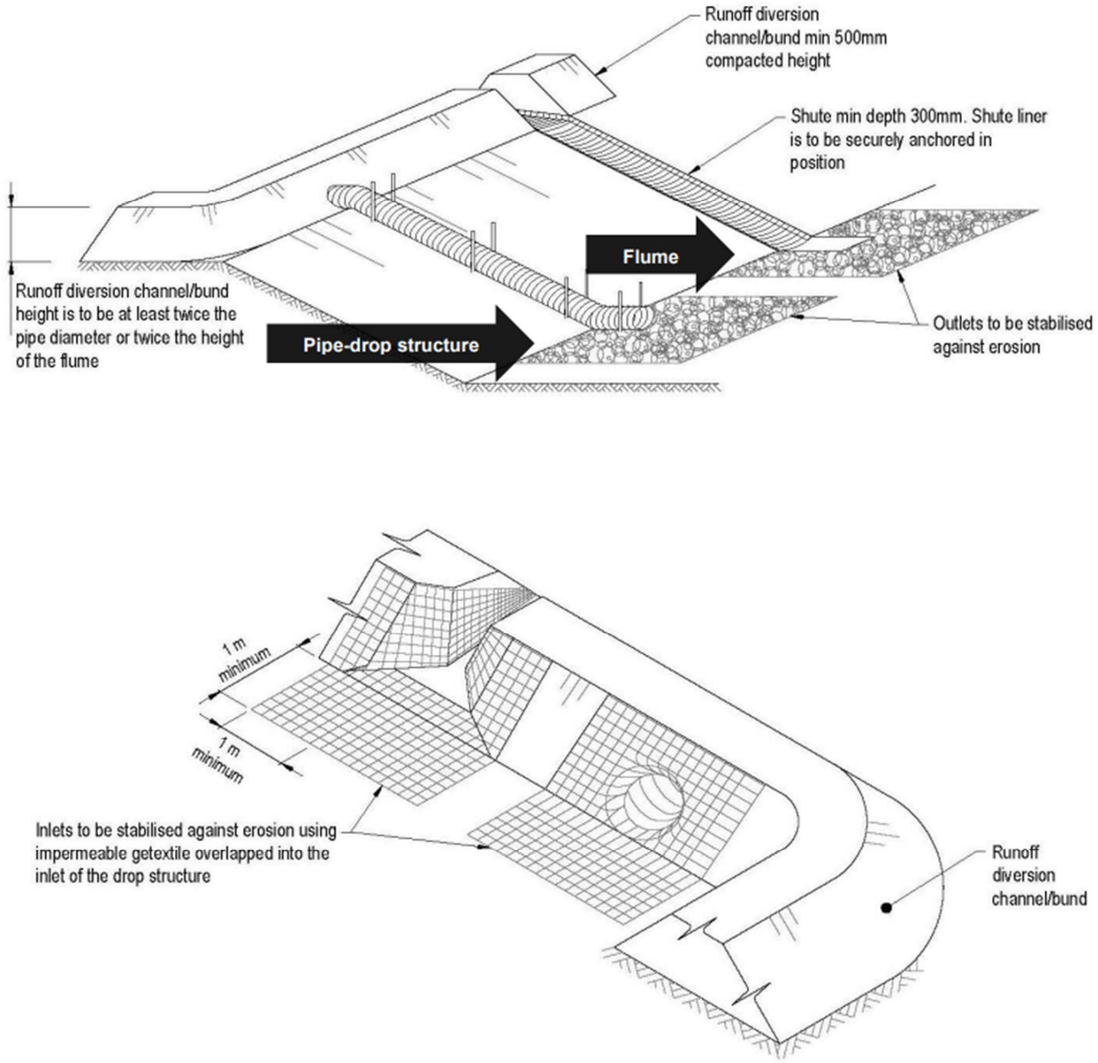
Project: 832 Malaghans Road

Description: Erosion and Sediment Control Plan - Schematics

Drawn	Approved	Date	Drawing Number	Revision
SJ	TG	9/05/2024	ESCP - 007	B

PIPE DROP STRUCTURE

Page 55-60 from GD05



- Ensure the height of the bund is 2x the pipe diameter).
- Attach a 250 mm pipe into the bund.
- The drainage coil will be unpunched and ensure all connections are water tight.
- The pipe will be pinned every four metres to anchor it. There will be no less than two anchors equally spaced along the length of the pipe.
- Ensure the flume or pipe extends beyond the toe of the slope and the outlet is stabilised with geofabric or rock rip rap to avoid downslope scouring.
- The pipe drop structure will be monitored and maintained regularly to ensure it operates effectively.
- See **Appendix 2** for full calculations.

enviroscope

Project: 832 Malaghans Road

Description: Erosion and Sediment Control Plan - Schematics

Drawn	Approved	Date	Drawing Number	Revision
SJ	TG	9/05/2024	ESCP - 008	B

REFUELING BAY

- Locate the hardstand as far as practicably possible from waterways and concentrated flows.
- Ensure spill kit is located nearby.

CONCRETE WASHOUT PIT

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

SPILL KITS

- One 40 L Oil and Hydrocarbon spill kit and one 40 L Chemical spill kit will be located in close proximity to the location of liquid hazardous materials storage and refuelling areas.

WASTE

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

enviroscope

Project: 832 Malaghans Road

Description: Erosion and Sediment Control Plan - Schematics

Drawn	Approved	Date	Drawing Number	Revision
SJ	TG	9/05/2024	ESCP - 009	B

APPENDIX 2 Calculations for Erosion and Sediment Controls

DIRTY WATER DIVERSION CHANNEL CALCULATIONS - 832 MALAGHANS ROAD

Specifications			Units	Reference/Notes
Site Details				
Contributing catchment		0.15	ha	
Design rainfall event		0.05	AEP	5% AEP as required by GD05
Time of Concentration				
Overland sheet flow path length (L)		230	m	
Hortons roughness value (n)		0.3		
Slope of surface (S)		3.5	%	
Time of Concentration (Tc)		14.4	minutes	
Rounded Tc to align with HIRDS		10	minutes	10 minute minimum required if Tc <10
Rational Method: Q = (C*I*A)/360				
Area ground cover	Grass	Bare soil		
Proportion of catchment	0.1	0.9		
Runoff coefficient (C)	0.2	0.5		Manning's Roughness Coefficient (n)
Rainfall intensity (I)	35	35	mm	NIWA HIRDS, 10 min (Tc), 5% AEP
Catchment Area (A)	0.02	0.14	ha	
Qp (Peak runoff flow)	0.0003	0.0066	m3/s	Rational Method: Q = CIA
Total Qp (Peak runoff flow)		0.0069		
Channel Design				Manning's Formula Uniform Trapezoidal Channel Flow
Bottom Width		100	mm	
Batter ratio= 1 to		3	ratio	
Manning's roughness coefficient of channel (n)		0.025		Gravelly earth channel
Channel slope		3.5	%	
Flow depth		100	mm	
Channel depth		300	mm	
Flow (Q)		0.0245	m3/s	
Buffer		257	%	
Top width		1300	mm	

PIPE DROP STRUCTURE - 832 MALAGHANS ROAD - CONTRIBUTING CATCHMENT

Specifications	Value 1	Value 4	Value 5	Units	Reference/Notes
Site Details					
Contributing catchment			5	ha	Values derived from Geosolve flood assesment estimations
Design rainfall event			0.20	AEP	20% AEP as per Geosolve flood assesment estimations - Noting earthworks period < 3 months
Time of Concentration					
Overland sheet flow path length (L)			350	m	Values derived from Geosolve flood assesment estimations
Hortons roughness value (n)			0.17		Values derived from Geosolve flood assesment estimations
Slope of surface (S)			30.0	%	Values derived from Geosolve flood assesment estimations
Time of Concentration (Tc)			8.9	minutes	Values derived from Geosolve flood assesment estimations
Rounded Tc to align with HIRDS			10	minutes	
Rational Method: Q = (C*I*A)/360					
Area ground cover	Pasture	Shrubs	Rock		
Proportion of catchment	0.7	0.2	0.1		
Runoff coefficient (C)	0.45	0.6	1.0		Manning's Roughness Coefficient (n)
Rainfall intensity (I)	53.8	53.8	53.8	mm	NIWA HIRDS, 10 min (Tc), 20% AEP
Catchment Area (A)	3.50	1.00	0.50	ha	
Qp (Peak runoff flow)	0.2354	0.0897	0.0710	m3/s	Rational Method: Q = CIA
Total Qp (Peak runoff flow)			0.5268		Values derived from Geosolve flood assesment estimations

PIPE DROP STRUCTURE - 832 MALAGHANS ROAD - PIPE DIMENSIONS

Specifications	1	4	Value	Units	Reference/Notes
Pipe diameter			250	mm	
Pipe material			Drainage coil		
Pipe length			20	m	
Drop			6	m	
Flow velocity			11.59	m/s	
Flow discharge			0.5689	m3/s	Hazen-Williams Equation
Flow discharge in L/s			568.9	L/s	
Buffer			8	%	

APPENDIX 3 Environmental Site Induction Handout

ENVIRONMENTAL SITE INDUCTION HANDOUT

Key Roles and Responsibilities

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

Key Environmental Locations

Environmentally sensitive receptors: Waterbodies, staff members working on the site, neighbouring properties and recreational users of the Queenstown Trails Network.

Key Resource Consent Conditions

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

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

Limits of Clearing and Importance of Staging

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

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

Key Environmental Management Measures in EMP

Erosion and Sediment Control (Section 4 of EMP)

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

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

Water Quality Management (Section 5 of EMP)

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

Dust Management (Section 6 of EMP)

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

Noise and Vibration Management (Section 7 of EMP)

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

Historic Heritage Management (Section 8 of EMP)

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

Vegetation Management (Section 9 of EMP)

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

Chemicals and Fuel Management (Section 10 of EMP)

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

Waste Management (Section 11 of EMP)

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

Environmental Incidents

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

- Environmental incidents must be reported as soon as they occur, and the Project team must respond immediately to mitigate further environmental impacts.
- Investigation into the cause of the incident should be completed and a solution should be constructed to remediate the Environmental damage.
- The Project Manager must then notify the QLDC and/or the ORC of the details of the incident within 12 hours of being made aware of the incident.

Rapid Response for Storm Events

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

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

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

APPENDIX 4 Environmental Site Induction Register

832 Malaghans Road

ENVIRONMENTAL SITE INDUCTION REGISTER

Name	Organisation	Date Inducted	Induction Delivered by	Signature

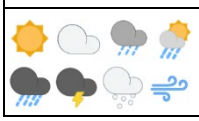
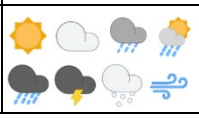
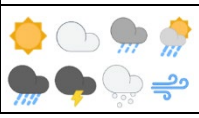
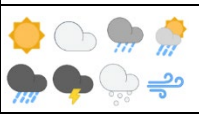
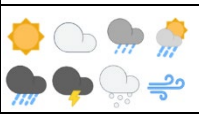
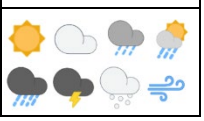
APPENDIX 5 Weekly Environmental Site Inspection Form

832 Malaghans Road

WEEKLY ENVIRONMENTAL SITE INSPECTION FORM

Environmental Representative: Date:

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

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
						

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

Item	Yes	No	Comment
Have any finds of cultural significance been found?	☐	☐	
Noise and Vibration			
Have any complaints been received during the week?	☐	☐	*If yes, complete Complaints Register
Are nearby sensitive receptors being notified before significant noise and/or vibration causing activities?	☐	☐	
Are works only occurring within the hours of operation?	☐	☐	
Dust			
Have any complaints been received during the week?	☐	☐	*If yes, complete Complaints Register
Are works being staged to minimise soil exposure?	☐	☐	
Have completed areas been revegetated or stabilised?	☐	☐	
Is dust suppression of disturbed work areas and stockpiles occurring?	☐	☐	
Are works ceasing during high winds?	☐	☐	
Are only designated access points and haul routes being used?	☐	☐	
Is the site access and surrounding roads swept clean of sediment?	☐	☐	
Vegetation			
Are vegetated surfaces being maintained as far as reasonably possible?	☐	☐	
Contaminated Soils			
Have any contaminants been uncovered during excavations?	☐	☐	
Chemicals and Fuels			
Are all hazardous substances on site stored, transported and used according to the safety data sheet requirements?	☐	☐	
Are vehicles and plant being refuelled in the refuelling bay?	☐	☐	
Is concrete washing being undertaken in the concrete wash-out pit?	☐	☐	
Is there an adequate supply of spill kits onsite? Have any used materials been replaced?	☐	☐	
Waste			
Is the site in a safe, clean and tidy state?	☐	☐	

Item	Yes	No	Comment
Are wastes segregated into labelled bins with lids?	☐	☐	
Are skip bins not overfilled?	☐	☐	
Is waste removed from open drains and drainage paths?	☐	☐	

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

Additional Comments:

Names and Signatures of inspection attendees:

APPENDIX 6 Environmental Incident Report Form

ENVIRONMENTAL INCIDENT REPORT FORM

Project Address: 832 Malaghans Road	**Consent Number:** TBC
Brief Project Description: Construction of a new dwelling and associated driveway, bridge and landscaping.	

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

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

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

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

APPENDIX 7 Environmental Complaints Register

832 Malaghans Road

ENVIRONMENTAL COMPLAINTS REGISTER

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

APPENDIX 8 Environmental Non-Conformance Register

832 Malaghans Road

ENVIRONMENTAL NON-CONFORMANCE REGISTER

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

APPENDIX 9 Water Quality Monitoring Results Form

WATER QUALITY MONITORING RESULTS FORM

Date		Monitoring Trigger		Location Description	
			Yes	No	Measurement
Is the clarity of the water more than 100 mm?			☐	☐	____ mm
Is turbidity less than 150 NTU?*			☐	☐	____ NTU
Is the pH of the water between 5.5-8.5?*			☐	☐	pH ____
Are total suspended solids less than 50 mg/L?*			☐	☐	____ mg/L
Are hydrocarbons visible?			☐	☐	
Are tannins visible in the water?			☐	☐	
Is there any waste in the water?			☐	☐	
Description of any non-conformance and actions required: •					
Include images of sampling location:					

*Enviroscope can provide Water Quality Monitoring services to measure turbidity and pH. If 100 NTU is exceeded, collect a water sample to send to laboratory for TSS measurement.

HOW TO: WATER QUALITY SAMPLING

1. Select a Sampling Location

Sampling a discharge

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

Sampling a waterway

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

Sampling a from a Sediment Retention Device

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

2. Collect a Water Sample

Taking a Water Sample

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

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

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

3. Measure and Record Turbidity, Clarity, and pH

Measuring Turbidity using a Turbidity Meter

- ➔ Fill the turbidity pottle with the sampled water. Wipe away any moisture on the outside of the pottle and insert it into the meter. Turn the meter on and once the standby value appears press read. Record the turbidity value.

Measuring Clarity using a field testing seechi disc

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

Measuring pH using a pH Meter

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

APPENDIX 10 Archaeological Discovery Protocol

HERITAGE NEW ZEALAND
POUHERE TAONGA

Heritage New Zealand Pouhere Taonga Accidental Discovery Protocol

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

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

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

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

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

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

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

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

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

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

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

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

Heritage New Zealand Pouhere Taonga Archaeologist contact details:

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

6587-MacRae-Res-S6.240415

CONCEPT DESIGN

MASON&WALES

ARCHITECTS ESTD 1862

MACRAE RESIDENCE
832 MALAGHANS ROAD • ARROWTOWN

S6 - April 2024

CONCEPT DESIGN

Landscape indicative only Refer to Landscape Plan

0 20 40 60m

Location Plan

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ARCHITECTS

MACRAE RESIDENCE
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PRELIMINARY
WORK IN PROGRESS

Project 6587
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SHEET REV **S6 02**

CONCEPT DESIGN

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0 10 20 30m

Site Plan

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MACRAE RESIDENCE
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SHEET REV
S6
03

CONCEPT DESIGN

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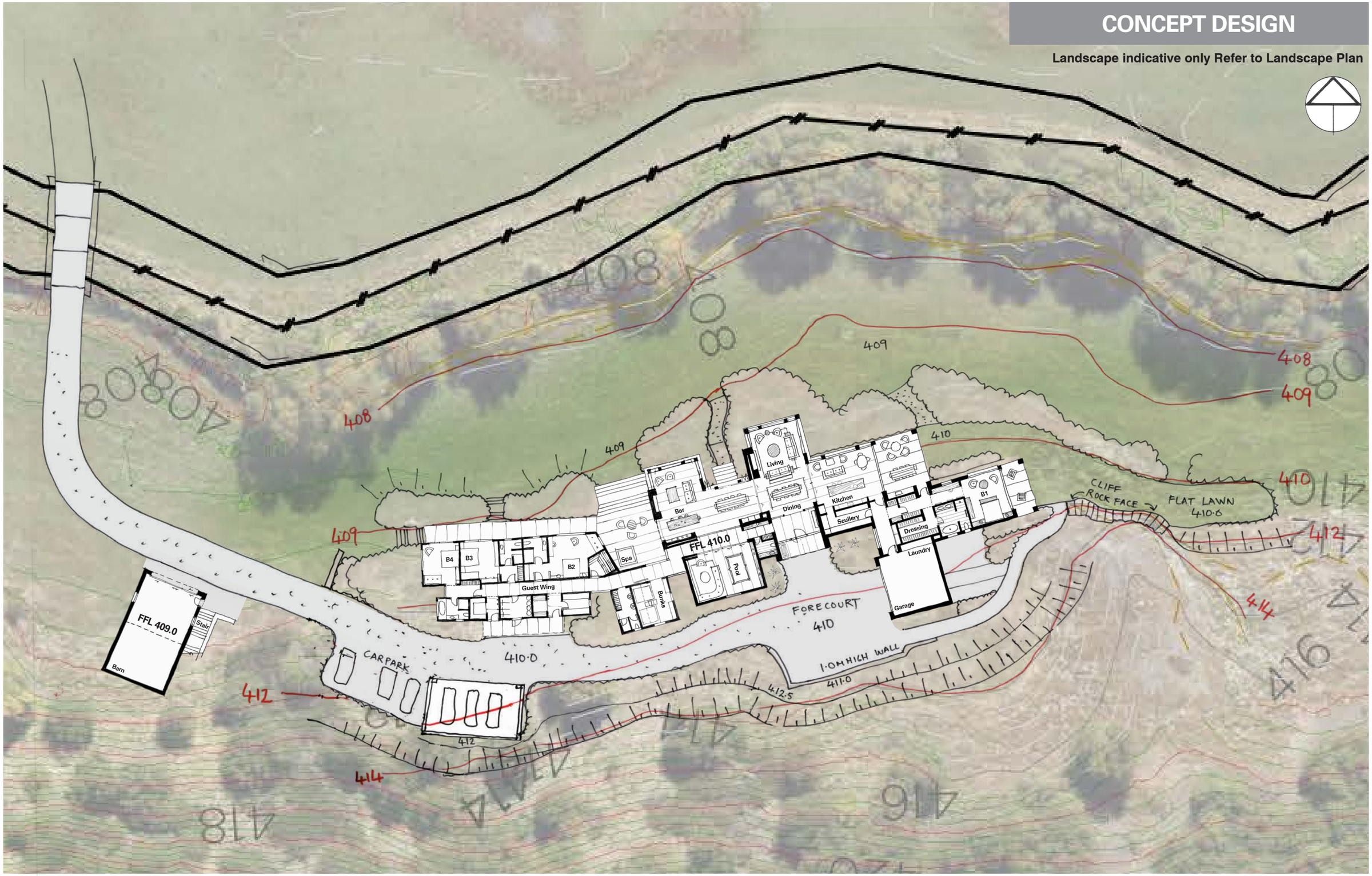

0 4 8 12m

Site Plan

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MACRAE RESIDENCE
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CONCEPT DESIGN

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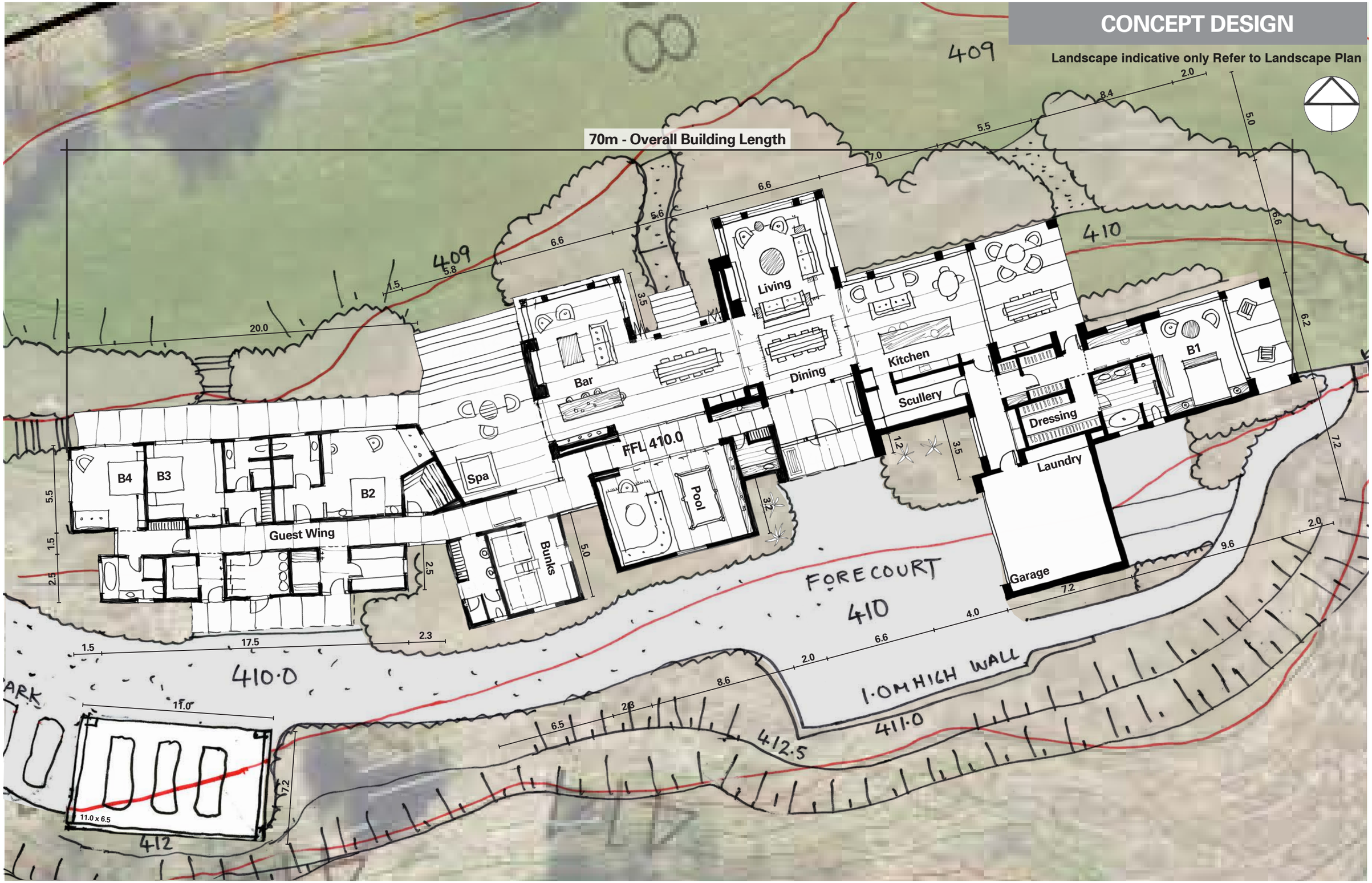

0 2 4 6m

House Floor Plan

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MACRAE RESIDENCE
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WORK IN PROGRESS

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SHEET S6
REV 05

CONCEPT DESIGN

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EXTERIOR COLOUR SCHEDULE

THE PROPOSED EXTERIOR MATERIALS, COLOURS AND FINISHES ARE DESCRIBED BELOW. DIFFERENT COLOUR OPTIONS HAVE BEEN INCLUDED, TO ALLOW THE CLIENT TO MAKE A COORDINATED FINAL SELECTION BASED ON ACTUAL SAMPLES DURING CONSTRUCTION, AND TO ALLOW FOR SUBTLE VARIATION IN COLOURS BETWEEN THE DIFFERENT BUILDING FORMS TO SOFTEN THE VISUAL SCALE.

ROOFING, SPOUTINGS & DOWNPIPES - METAL

PREPAINTED COLORCOTE®/COLORSTEEL®/ COLOURBOND® METAL ROOFING IN SELECTED COLOUR, FROM SHORTLISTED COLOUR RANGE BELOW OF GREY/ BROWNS WITH LOW LIGHT REFLECTANCE VALUES (LRV) AND LOW GLOSS 'G10' FINISH.

- IRONSAND
- SLATE
- GREY FRIARS
- THUNDER GREY
- WEATHERED COPPER
- FLAXPOD
- TERNSTYLE

CHIMNEY FLUES AND CAPS

PAINTED METALWORK, IN COLOUR AND FINISH TO MATCH ROOF

WALL CLADDING - STONE

LOCAL STACKED SCHIST STONE, WITH BAGGED, PLASTERED MORTAR
– REFER TO REFERENCE IMAGE FROM AMISFIELD BISTRO

CONCRETE LINTELS AND DETAILING
NATURAL DARK GREY CONCRETE, IN TEXTURED BOARDED FINISH

WALL CLADDING – TIMBER

CEDAR STAINED IN SELECTED WOOD OIL, FROM SHORTLISTED COLOUR RANGE OF DARK GREY/ BROWNS.

- *WOOD-X FORGE*
- *WOOD-X HAAST*
- *WOOD-X BENMORE*
- *WOOD-X TASMAN*
- *WOOD-X FLINT*
- *WOOD-X DOUBLE CONE*
- *WOOD-X STOCKADE*
- *WOOD-X TOR*
- *WOOD-X FOUNDRY*
- *WOOD-X BUSCOT*

WALL CLADDING DETAILS – METAL

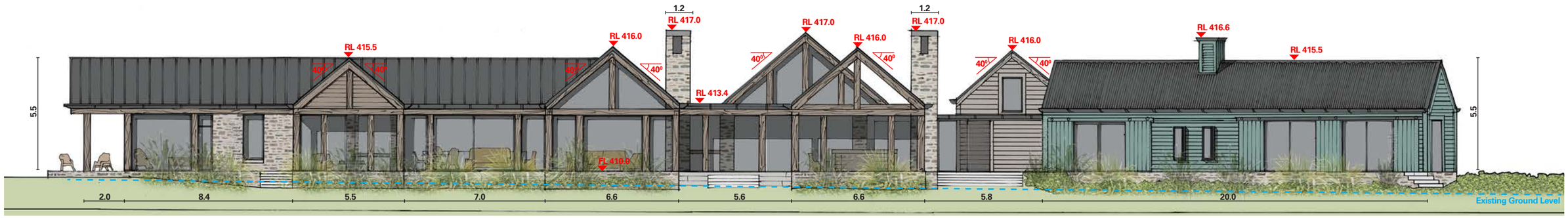
POWDERCOAT TO MATCH ROOF COLOUR, /OR BLACKED MILD STEEL

WINDOW AND DOOR JOINERY

POWDERCOAT FINISH IN SELECTED COLOUR, FROM SHORTLISTED COLOUR RANGE BELOW OF DARK GREY/ BROWNS WITH LOW LIGHT REFLECTANCE VALUES (LRV) AND LOW GLOSS 'G10' FINISH

POWDERCOAT TO MATCH ROOF COLOUR, /OR FROM DURALLOY RANGE

- COAL DUST
- MATT CHARCOAL
- MATT GRAVEL
- MATT BLACK
- BLACK ACE
- DARK BRONZE
- ELECTRIC COW



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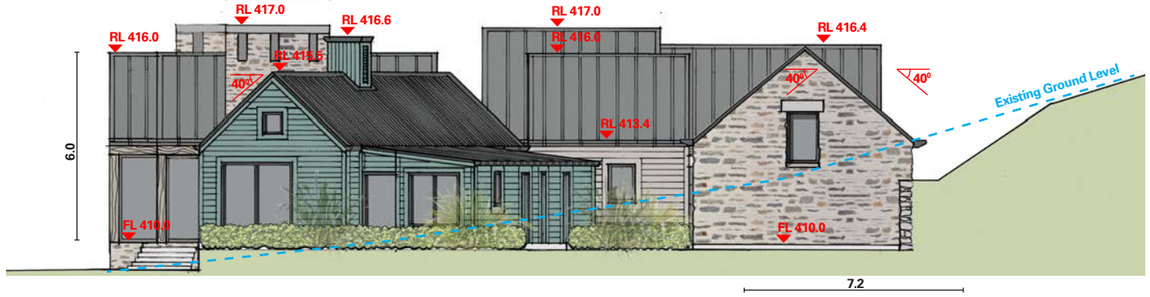

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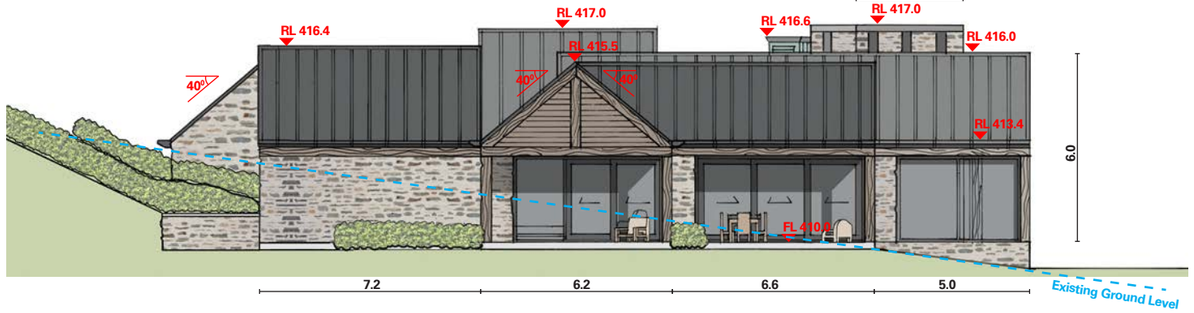
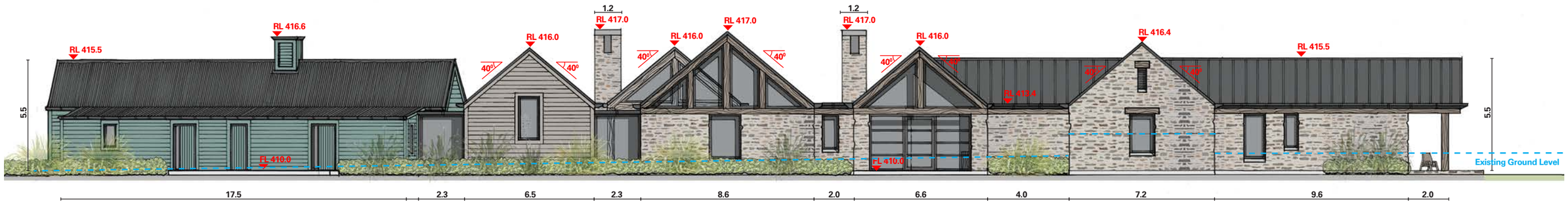


East Elevation



South Elevation

0 2 4 6m

House Elevations

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SHEET S6
REV 06

6587-MacRae-Res-S6-240415

EXTERIOR COLOUR SCHEDULE

THE PROPOSED EXTERIOR MATERIALS, COLOURS AND FINISHES ARE DESCRIBED BELOW. DIFFERENT COLOUR OPTIONS HAVE BEEN INCLUDED, TO ALLOW THE CLIENT TO MAKE A COORDINATED FINAL SELECTION BASED ON ACTUAL SAMPLES DURING CONSTRUCTION, AND TO ALLOW FOR SUBTLE VARIATION IN COLOURS BETWEEN THE DIFFERENT BUILDING FORMS TO SOFTEN THE VISUAL SCALE.

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- IRONSAND
- SLATE
- GREY FRIARS
- THUNDER GREY
- WEATHERED COPPER
- FLAXPOD
- TERNSTYLE

CHIMNEY FLUES AND CAPS

PAINTED METALWORK, IN COLOUR AND FINISH TO MATCH ROOF

WALL CLADDING - STONE

LOCAL STACKED SCHIST STONE, WITH BAGGED, PLASTERED MORTAR
– REFER TO REFERENCE IMAGE FROM AMISFIELD BISTRO

CONCRETE LINTELS AND DETAILING
NATURAL DARK GREY CONCRETE, IN TEXTURED BOARDED FINISH

WALL CLADDING – TIMBER

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- WOOD-X BUSCOT

WALL CLADDING DETAILS – METAL

POWDERCOAT TO MATCH ROOF COLOUR,
/OR BLACKED MILD STEEL

WINDOW AND DOOR JOINERY

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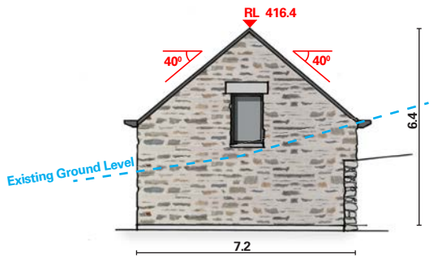
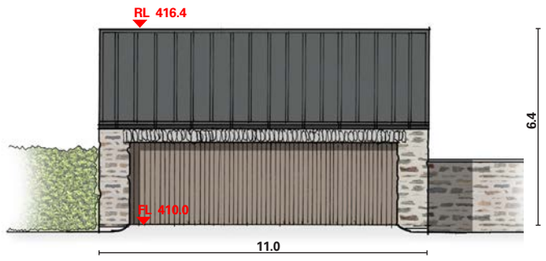
- MATT GRAVEL
- MATT BLACK
- BLACK ACE
- DARK BRONZE
- ELECTRIC COW

CONCEPT DESIGN

Landscape indicative only Refer to Landscape Plan

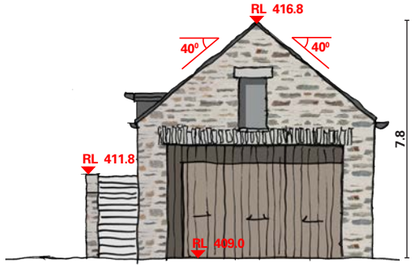


West Elevation



North Elevation

East Elevation



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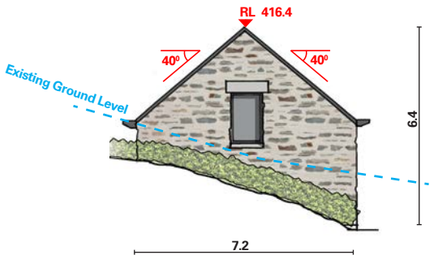
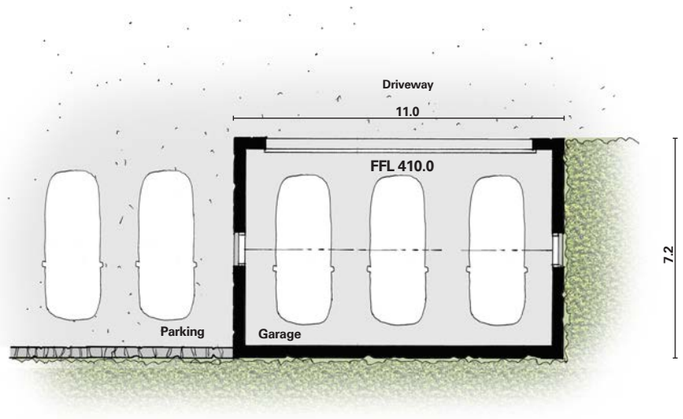
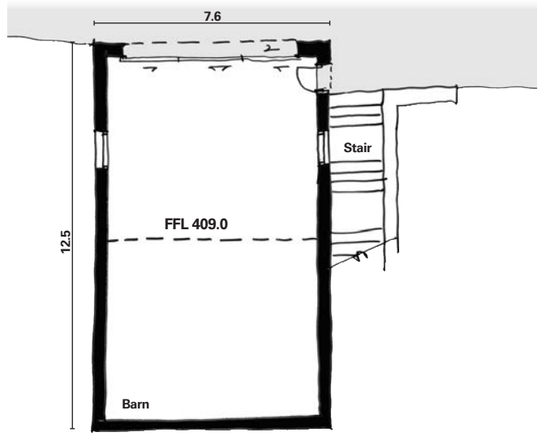


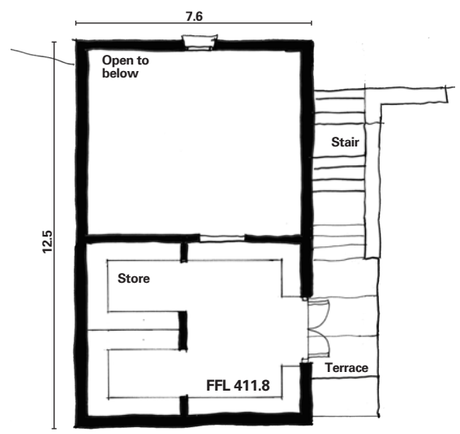
East Elevation



Garage Plan



Barn Plan



Barn Loft Plan

0 2 4 6m

Garage and Barn

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EXTERIOR COLOUR SCHEDULE

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- FLAXPOD
- TERNSTYLE

CHIMNEY FLUES AND CAPS

PAINTED METALWORK, IN COLOUR AND FINISH TO MATCH ROOF

WALL CLADDING - STONE

LOCAL STACKED SCHIST STONE, WITH BAGGED, PLASTERED MORTAR
– REFER TO REFERENCE IMAGE FROM AMISFIELD BISTRO

CONCRETE LINTELS AND DETAILING
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WALL CLADDING DETAILS – METAL

POWDERCOAT TO MATCH ROOF COLOUR,
/OR BLACKED MILD STEEL

WINDOW AND DOOR JOINERY

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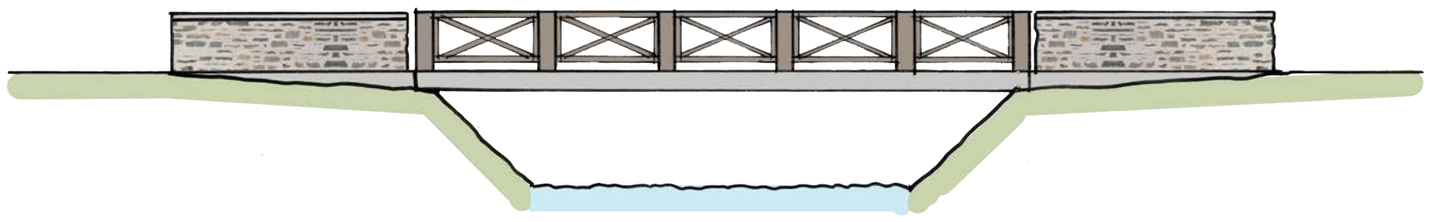
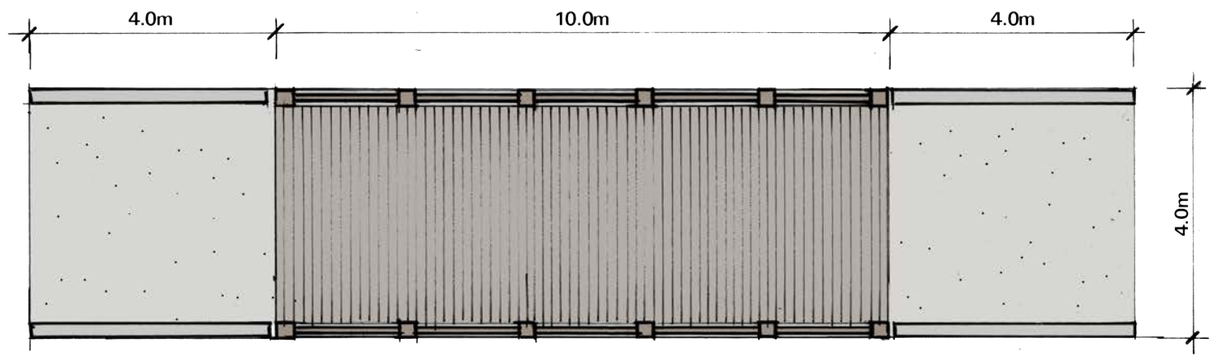
- ELECTRIC COW

CONCEPT DESIGN

Landscape indicative only Refer to Landscape Plan



Bridge - West Elevation



Bridge - Plan

0 2 4 6m

Entry Bridge

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MACRAE RESIDENCE
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CONCEPT DESIGN

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North Elevation

Elevation

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MACRAE RESIDENCE
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6587-MacRae-Res-S6-240415

CONCEPT DESIGN

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North Elevation

Elevation

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ARCHITECTS

MACRAE RESIDENCE
832 MALAGHANS ROAD • ARROWTOWN

PRELIMINARY
WORK IN PROGRESS

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SHEET REV **S6 10**

CONCEPT DESIGN

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North Elevation

Elevation

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ARCHITECTS

MACRAE RESIDENCE
832 MALAGHANS ROAD • ARROWTOWN

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REV **11**

6587-MacRae-Res-S6-240415

CONCEPT DESIGN

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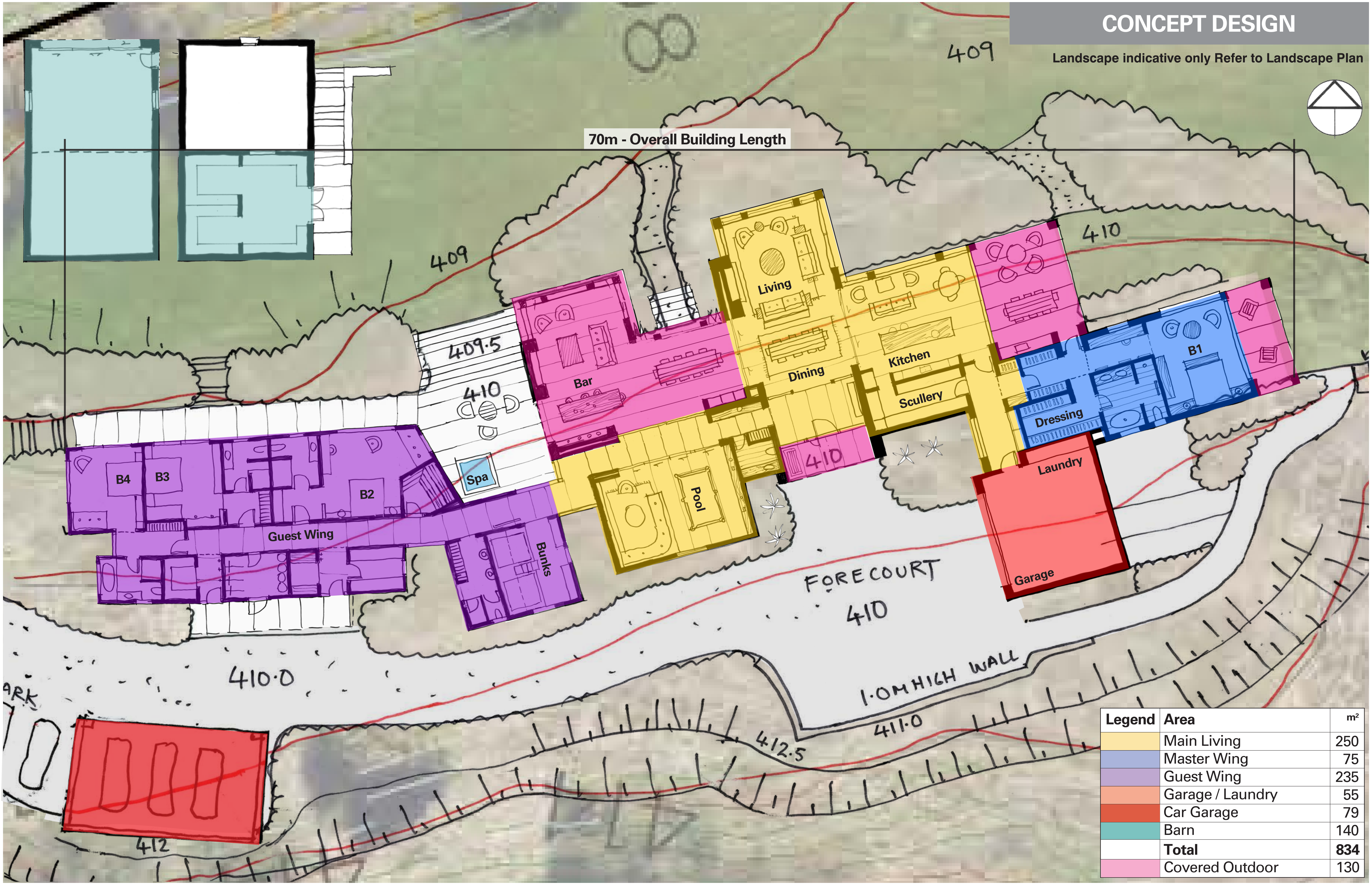

Legend	Area	m²
	Main Living	250
	Master Wing	75
	Guest Wing	235
	Garage / Laundry	55
	Car Garage	79
	Barn	140
	Total	**834**
	Covered Outdoor	130

Area Plan

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ARCHITECTS

MACRAE RESIDENCE
832 MALAGHANS ROAD • ARROWTOWN

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15 April 2024

SHEET S6
REV 12

Document Set ID: 8029139
Version: 1, Version Date: 14/05/2024

RULES ASSESSMENT – PROPOSED DISTRICT PLAN

Chapter 2 – Definitions

Definition		Comment
Residential Activity	Means the use of land and buildings by people for the purpose of permanent residential accommodation, including all associated accessory buildings, recreational activities and the keeping of domestic livestock. For the purposes of this definition, residential activity shall include Community Housing, emergency refuge accommodation and the non-commercial use of holiday homes. Excludes visitor accommodation, residential visitor accommodation.	Use of the proposed bridge across Mill Creek which provides access to the building platform, and use of the accessory buildings outside the platform, are considered part of the proposed residential activity on the site.

Chapter 24 – Wakatipu Basin

Rule		Activity Status	Comment
Residential activities and buildings			
24.4.5	24.4.5.1 The construction of buildings for residential activity, including residential flats, that are located within a building platform approved by a resource consent and registered on the applicable record of title. Control is reserved over: a. Effects on landscape character associated with the bulk and external appearance of buildings; b. Access; c. Infrastructure; d. Landform modification, exterior lighting, landscaping and planting (existing and proposed). e. Where the site is located within the Lake Hayes Catchment as identified in Schedule 24.9, the contribution of, and methods adopted by, the proposal to improving water quality within the Lake Hayes Catchment.	C	Controlled activity consent sought for dwelling within the approved platform
24.4.6	The construction of buildings for residential activity not provided for by Rules 24.4.5 to27.4.7A.	RD	Consent is sought to construct a bridge associated with residential activity over Mill Creek as part of the subdivision works
24.4.7	The construction of buildings for residential activity outside a building platform approved by a resource consent and registered on the applicable record of title on a site where there is such a building platform.	NC	Consent is sought to construct the barn and garage outside the approved platform
24.4.7A	Any new residential activity including the construction of buildings for that residential activity within those areas identified in Rule 24.5.1.6	D	N/A – the site is not within an

			area identified in 24.5.1.6
24.5.1	Residential Density		
24.5.1.4	Any site in the Wakatipu Basin Rural Amenity Zone located wholly outside the Precinct in respect of which resource consent creating the site was granted before 21 March 2019, and a record of title subsequently issued, and with an area less than 80 hectares, a maximum of one residential unit per site. Except this rule shall not apply where Rule 24.5.1.6 is applied.	NC	N/A - subdivision of the site is proposed before any residential units are constructed. Consent is sought to breach the minimum lot size of 80ha for subdivision (see 27.5.22 below)
24.5.1.5	For that part of all other sites in the Wakatipu Basin Rural Amenity Zone wholly located outside of the Precinct, a maximum of one residential unit per 80 hectares net site area. Except this rule shall not apply where Rule 24.5.1.6 is applied.	NC	Complies – there will be only one residential unit per lot. Each lot will have less than 80ha net site area. Rule 24.5.1.6 does not apply
24.5.2 Residential Flats	24.5.2.1 Within the Wakatipu Basin Lifestyle Precinct, any residential flat must be separated from the principal residential unit by no more than 10 metres. 24.5.2.2 Rule 24.5.2.1 does not apply to a residential flat located within a building platform approved by a resource consent, and registered on the applicable record of title.	RD	N/A – the site is not located in the Precinct
24.5.4 Building Material and Colours	Any building and its alteration, including shipping containers that remain on site for more than six months, are subject to the following: All exterior surfaces* must be coloured in the range of browns, greens or greys including; 24.5.4.1 Pre-painted steel and all roofs must have a light reflectance value not greater than 20%; and 24.5.4.2 All other exterior surface** finishes, except for schist, must have a light reflectance value of not greater than 30%. * Excludes soffits, windows and skylights (but not glass balustrades). ** Includes cladding and built landscaping that cannot be measured by way of light reflectance value but is deemed by the Council to be suitably recessive and have the same effect as achieving a light reflectance value of 30%.	RD	Complies
24.5.5 Building Ground Floor Area	Where a residential building is constructed within a building platform under Rule 24.4.5, the ground floor area of all buildings must not exceed 500m^2.	RD	Consent is sought to exceed 500m^2 ground floor area
24.5.6 Building Coverage	The building coverage of all buildings on a site not subject to Rule 24.5.5 must not exceed 15% of net site area, or 500m^2, whichever is the lesser.	RD	Complies – the building coverage of the accessory buildings not subject to 24.5.5

			will not exceed 15% of net site area or 500m^2.
24.5.7 Setback from internal boundaries	The minimum setback of any building from internal boundaries shall be 10m.	RD	Complies
24.5.8	Height of buildings		
24.5.8.1	The maximum height of buildings shall be 6.5m.	RD	Consent is sought for buildings greater than 6.5m (but less than 8m) high
24.5.8.2	The maximum height of buildings shall be 8m.	NC	Complies
24.5.9 Setback from roads	24.5.9.1 The minimum setback of any building from any road boundary shall be 75m in the Precinct and 20m in the Rural Amenity Zone. 24.5.9.2 The minimum setback of any building from any unformed road shall be 20m in the Rural Amenity Zone and Lifestyle Precinct. 24.5.9.3 Rules 24.5.9.1 and 24.5.9.2 do not apply to the construction of buildings for residential activity pursuant to Rule 24.4.5.	RD	Complies
24.5.12 Setback of buildings from waterbodies	The minimum setback of any building from the bed of a wetland, river or lake shall be 30m. This rule does not apply to: a. waterbodies that have been built as part of a subdivision or development for the primary purpose of treating and disposing of stormwater, or b. the construction of buildings for residential activities pursuant to Rule 24.4.5.	RD	Consent is sought to construct the barn accessory building 20m from the bed of Mill Creek
24.5.17 Glare	a. All fixed exterior lighting shall be directed away from adjacent roads and sites. b. Activities on any site shall not result in more than a 3 lux spill (horizontal and vertical) of light to any other site, measured at any point within the boundary of the other site. c. There shall be no upward light spill.	RD	Will comply – a condition is proposed
24.5.19 Firefighting water and access	New buildings for residential activities where there is no reticulated water supply, or any reticulated water supply is not sufficient for firefighting, must have one of the following: either a sprinkler system installed and plumbed with a maintained static water storage supply of at least 7,000 litres available to the system, or water supply and access for firefighting that meets the following requirements: a. Water storage of at least 45,000 litres shall be maintained (excluding potable water storage for domestic use) with an outlet connection point that can provide 1500L/min (25 L/s) and any necessary couplings; b. A hardstand area with a minimum width of 4.5m and length of 11m located within 6m of the firefighting water supply connection point and capable of supporting a 20 tonne fire service vehicle; c. The connection point or the firefighting water supply must be located more than 6m and less than 90m from the building for	RD	Will comply – a standard condition can be imposed

	residential activities and be accessible by emergency service vehicles during fire events; d. Access from the property road boundary to the hardstand area capable of accommodating a 20 tonne fire service vehicle.		

Chapter 25 – Earthworks

Under 25.3.2.5 of the PDP, earthworks associated with subdivision under Chapter 27 are exempt from the following rules:

- 25.2 Maximum Volume;
- 25.5.15 Cut Standard;
- 25.5.16 Fill Standard; and
- 25.5.21 Transport of Cleanfill.

The only earthworks that will be undertaken as part of the subdivision works are those associated with the formation of the driveway and construction of the bridge.

Rule		Activity Status	Comment
25.4.2	Earthworks that do not comply with the standards for the maximum total volume of earthworks in Table 25.2, except for earthworks covered by Rules 25.4.1A and 25.4.1B.	RD	Consent is sought for earthworks greater than the maximum volume of 400m^3 specified under 25.5.4 for the WBRAZ
	Nuisance effects, erosion, sediment generation and run-off		
25.5.11	Earthworks over a contiguous area of land shall not exceed the following area: 25.5.11.1 2,500m² where the slope is 10° or greater. 25.5.11.2 10,000m² where the slope is less than 10°. 25.5.11.3 2,500m2 at any one time for the construction of a trail.	RD	Consent is sought under 25.5.11.1
25.5.12	Erosion and sediment control measures must be implemented and maintained during earthworks to minimise the amount of sediment exiting the site, entering water bodies, and stormwater networks.	RD	Will comply
25.5.13	Dust from earthworks shall be managed through appropriate dust control measures so that dust it does not cause nuisance effects beyond the boundary of the site.	RD	Will comply
25.5.14	Earthworks that discovers any of the following: 25.5.14.1 kōiwi tangata (human skeletal remains), wāhi taoka (resources of importance), wāhi tapu (places or features of special significance) or other Māori artefact material, or 25.5.14.2 any feature or archaeological material that predates 1900, or 25.5.14.3 evidence of contaminated land (such as discolouration, vapours, landfill material, significant odours), that is not provided for by the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, any resource consent or other statutory authority, shall comply with the standards and procedures in Schedule 25.10 'Accidental Discovery Protocol'.	RD	Will comply
	Height of cut and fill and slope		

25.5.15	The maximum depth of any cut shall not exceed 2.4 metres.	RD	Consent is sought for a cut of up to 3.8m
25.5.16	The maximum height of any fill shall not exceed 2 metres.	RD	Complies
25.5.17	25.5.17.1 No farm track or access way shall have an upslope cut or batter greater than 1 metre in height, except on land below 750m asl: a. This may be exceeded for 10% or less of the total track length to a maximum height of 2 metres: and b. Any cut or batter exceeding 1 metre in height shall not have a continuous length of more than 70 metres, and shall be limited to two exceedances of 70 metres per kilometre. 25.5.17.2 All cuts and batters shall not be greater than 65 degrees. 25.5.17.3 The maximum height of any fill shall not exceed 2 metres. This standard shall not apply to roads, or private roads associated with subdivisions under Chapter 27.	RD	N/A – the access will be constructed as part of the subdivision works
25.5.18	Earthworks greater than 0.5 metres in height or depth shall be set back from the site boundary the following minimum distances:	RD	Complies
	Water bodies		
25.5.19.1	Earthworks within 10m of the bed of any water body, or any drain or water race that flows to a lake or river, shall not exceed $5m^3$ in total volume, within any consecutive 12-month period.	RD	Consent is sought to breach this rule
25.5.20	Earthworks shall not be undertaken below the water table of any aquifer, or cause artificial drainage of any aquifer.	RD	Complies
25.5.21	No more than $300m^3$ of Cleanfill shall be transported by road to or from an area subject to Earthworks.	RD	Consent is sought to breach this rule as excess cut material will be taken off site

Chapter 27 – Subdivision and Development

Rule		Activity Status	Comment
27.5.9	All subdivision activities, unless otherwise provided for, in the Wakatipu Basin Rural Amenity Zone or the Wakatipu Basin Lifestyle Precinct. Discretion is restricted to: a. Location of building platforms and vehicle access; b. Subdivision design and lot layout including the location of boundaries, lot shape and dimensions (but excluding lot area); c. Location, scale and extent of landform modification, and retaining structures; d. Property access and roading; e. Esplanade provision; f. Natural hazards;	RD	Consent is sought for subdivision in the WBRAZ

	g. Firefighting water supply and access; h. Water supply; i. Network utility services, energy supply and telecommunications; j. Open space and recreation provision; k. Opportunities for nature conservation values, and natural landscape enhancement; l. Easements; m. Vegetation, and proposed planting; n. Fencing and gates; o. Wastewater and stormwater management; p. Connectivity of existing and proposed pedestrian networks, bridle paths, cycle networks; q. Where the site is located within the Lake Hayes Catchment as identified in Schedule 24.9, the contributions of, and methods adopted by, the proposal to improving water quality within the Lake Hayes Catchment.		
27.5.11	The subdivision of land that results in creation of an additional lot within an identified wāhi tūpuna area outside of the urban environment, where subdivision is a potential threat as set out in Schedule 39.6.	RD	N/A – the site is not identified as wāhi tūpuna
27.5.13	The subdivision of land containing a heritage or any other protected item scheduled in the District Plan.	D	N/A – the site does not contain any heritage or other protected items
27.5.14	The subdivision of land identified on the District Plan web mapping application as a Heritage Overlay Area.	D	N/A – the site is not within a Heritage Overlay Area
27.5.15	The subdivision of a site containing a known archaeological site.	D	N/A – the site does not contain any known archaeological sites
27.5.16	Subdivision that would alter, or create a new boundary within a Significant Natural Area scheduled in the District Plan.	D	N/A – the site does not include any SNA
27.5.19A	Subdivision of any site within the Wakatipu Basin Rural Amenity Zone (outside the Lifestyle Precinct) where located within the following areas identified on the district plan web mapping application:	D	N/A – the site is not within the identified areas
27.5.22	Subdivision that does not comply with the minimum lot areas specified in Part 27.6 with the exception of the Jacks Point Zone which is assessed pursuant to Rule 27.5.18 and Coneburn Industrial Zone Activity Area 2a which is assessed pursuant to Rule 27.5.19, Wakatipu Basin Lifestyle Precinct Rules 27.5.20 and Cardrona Settlement Zone which is assessed pursuant to Rules 27.5.31 and 27.5.32.	NC	Consent is sought as the minimum lot size for the WBRAZ of 80ha will not be met
27.5.28	Subdivision that does not comply with the standards related to servicing and infrastructure under Rule 27.7.33.	NC	Will comply - conditions can be imposed
	Wakatipu Basin Residential Amenity Zone		

27.7.18 Setback from Roads	27.7.18.1 The minimum setback of any building platform identified through subdivision from any road boundary (other than an unformed road) shall be: a. 75m in the Lifestyle Precinct; and b. 20m in the Rural Amenity Zone. 27.7.18.2 The minimum setback of any building platform identified through subdivision from any unformed road shall be 20m in the Rural Amenity Zone and Lifestyle Precinct.	RD	Complies
27.7.20.1 Setback from waterbodies	The minimum setback of any building platform identified through subdivision from the bed of a wetland, river or lake shall be 30m. This rule shall not apply to waterbodies that have been built or are proposed as part of a subdivision or development for the primary purpose of treating and disposing of stormwater.	RD	Consent is sought as the building platform will be 15m from the bed of Mill Creek.
27.7.21.1 Size of building platforms	Any building platform identified shall be not less than 70m^2 in area and not greater than 1000m^2 in area.	NC	Complies
27.7.35	Standards relating to servicing and infrastructure		
27.7.35.3	Where no communal owned and operated water supply exists, all lots other than lots for access, roads, utilities and reserves, shall be provided with a potable water supply of at least 1000 litres per day per lot.	NC	Will comply
27.7.35.4	Electricity reticulation must be provided to all allotments in new subdivisions (other than lots for access, roads, utilities and reserves).	NC	Will comply
27.7.35.6	Telecommunication reticulation must be provided to all allotments in new subdivisions in zones other than the Rural Zone, Gibbston Character Zone and Rural Lifestyle Zone (other than lots for access, roads, utilities and reserves).	NC	Consent is sought to allow the option of providing wireless telecommunications.

Ron Macrea

832 MALAGHANS ROAD, QUEENSTOWN

PRELIMINARY/DETAILED SITE INVESTIGATION

15 AUGUST 2023

CONFIDENTIAL

832 MALAGHANS ROAD, QUEENSTOWN
PRELIMINARY/DETAILED SITE INVESTIGATION

Ron Macrae

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REV	DATE	DETAILS
REV1	27/06/2023	Draft report for review by SQEP.
REV2	04/08/2023	Revision 2 after updating report with additional results.
Final	15/08/2023	Final amendments and finalise for issue.

	NAME	DATE	SIGNATURE
Prepared by:	Tara Verhulst	15/08/2023	
Reviewed by:	Lisa Bond	15/08/2023	
Approved by:	Richard Gill	15/08/2023	

REPORT CHECKLIST

SUMMARY CONTAMINATED SITES REPORT CHECKLIST					
Report contained in this document	☒	☒	☐	☐	☐
Report sections and information to be presented	**PSI**	**DSI**	**RAP**	**SVR**	**MMP**
Executive summary	☒	☒	☐	☐	☐
Scope of work	☒	☒	☐	☐	☐
Site identification	☒	☒	☐	☐	☐
Site history	☒	S	S	S	S
Site condition and surrounding environment	☒	S	S	S	S
Geology and hydrology	A	☒	S	S	S
Sampling and analysis plan and sampling methodology	A	☒	X	☐	☐
Field quality assurance and quality control (QA/QC)	N	☒	X	☐	S
Laboratory QA/QC	N	☒	X	☐	X
QA/QC data evaluation	N	☒	X	☐	X
Basis for guideline values	☒	☒	☐	☐	☐
Results	A	☒	☐	☐	S
Site characterisation	☒	☒	☐	☐	☐
Remedial actions	X	X	☐	S	S
Validation	X	X	X	☐	S
Contaminated materials management plan (CMMP)	X	X	☐	S	S
Ongoing site monitoring	X	X	X	N	☐
Conclusions and recommendations	☒	☒	☐	☐	☐

KEY:

PSI - preliminary site investigation report

DSI detailed site investigation report

RAP - site remedial action plan

SVR - site validation report

MMP - ongoing monitoring and management plan

A - Readily available information should be included

S - A summary of this section's details will be adequate if detailed information has been included in an available referenced report

N - Include only if no further site investigation is to be undertaken

X - Not applicable and can be omitted.

(Ministry for the Environment, 2021a)

TABLE OF CONTENTS

Appendices

ABBREVIATIONS

CLMG 1	Contaminated Land Management Guideline No. 1: Reporting on Contaminated Sites in New Zealand
CLMG 5	Contaminated Land Management Guideline No. 5: Site investigation and analysis of soils
CMMP	Contaminated Materials Management Plan
CoC	Chain of Custody
CSM	Conceptual Site Model
CSMP	Contaminated Site Management Plan
DSI	Detailed Site Investigation
H&S	Health and Safety
HAIL	Hazardous Activities and Industries List
IANZ	International Accreditation New Zealand
ILAC	International Laboratory Accreditation Cooperation
ILAC-MRA	ILAC Mutual Recognition Arrangement
IRB	International Risk Based
LINZ	Land Information New Zealand
LRIS	Land Resource Information Systems
m bgl	meters below ground level
MfE	Ministry for the Environment
MMP	Ongoing Monitoring and Management Plan
N/A	Not applicable
ND	Not derived
NES	National Environmental Standards
NESCS	National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health
NL	No limit - derived value exceeds 10,000mg/kg
NZRB	New Zealand Risk Based
ORC	Otago Regional Council
PoL	Piece of Land

PSI	Preliminary Site Investigation
PSSP	Project Site Safety Plan
QA/QC	Quality assurance and Quality Control
QLDC	Queenstown Lakes District Council
RAP	Remedial Action Plan
SCS (health)	Soil Contaminant Standards for Health
SGV	Soil Guideline Value
SID	Safety in Design
SQEP	Suitable Qualified and Experienced Practitioner
SSL	Soil Screening Level
SVR	Site Validation Report
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxicity Equivalent – indication of the toxicity of a mixture of compounds

EXECUTIVE SUMMARY

BACKGROUND

WSP New Zealand Ltd (WSP) were engaged by John Edmonds and Associates on behalf of Ron Macrae to develop a combined Preliminary/Detailed Site Investigation (PSI/DSI) for 832 Malaghans Road, Queenstown ('the site').

The site currently comprises a rural and residential land use. It is understood that the client wishes to subdivide the existing site into two Lots with a residential building platform proposed in the eastern Lot.

In 2016, a PSI was undertaken by Opus (now WSP) for subdivision of the larger site. The PSI centred around a woolshed located west of the site in this investigation. The PSI concluded a low risk to human health associated with the proposed subdivision and residential development.

However, following the PSI and peer review, the western part of the site was indicated on the Otago Regional Council's Listed Land Use Register (ORC's LLUR) as a Verified HAIL.

Since the investigation, anecdotal evidence suggests that part of the site was used for soil screening activities.

As the nature and origin of these soils are unknown and part of the site is still registered as HAIL, a conservative approach is warranted, and a new PSI commissioned to assess risks to human health associated with the proposed subdivision and residential development.

The PSI has found that the following HAIL activities may have occurred on the site as per the Ministry for the Environment's Hazardous Activities and Industries List (MfE's HAIL):

- A17. Storage tanks or drums for fuel, chemicals or liquid waste;
- G5. Waste disposal to land;
- 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.

As per the NESCS Regulations 2011, a Potential Piece of Land (PoL) was delineated and a DSI was triggered due to subdivision and ground disturbance of a possible HAIL site.

FIELD WORKS AND RESULTS

To achieve the objectives of the DSI, a judgemental sampling pattern was adopted across the PoL. A total of 15 samples were collected. These were collected within near surface soils (approximately 0.10-0.20 meters below ground level (m bgl)). Depending on sample location, the samples were tested for a suite of heavy metals, organochlorine pesticides (OCPs), total petroleum hydrocarbons (TPHs) and polycyclic aromatic hydrocarbons (PAHs).

Human health criteria

Investigation results revealed that none of the samples revealed contaminants present on site in sufficient quantities as to pose a risk to human health for the proposed residential end use as per the NESCS Regulations (Ministry for the Environment, 2011d).

NESCS assessment

Following a review of the site investigation information, it was concluded that it is more likely than not that NO activity or industry described in the HAIL is being or has been undertaken on the site.

- Subdivision: As no HAIL activities have been noted and contaminant concentrations were not found to exceed human health standards, it is considered highly unlikely for there to be a risk to human health associated with the proposed subdivision of the site. As such, subdivision with a residential end use is considered to be a Permitted Activity.
- Soil disturbance: Based on the reported soil results, contaminants of concern exceeding predicted background concentrations are present on a small area of the site, however these are not in sufficient quantity or associated with an activity for the site to be considered HAIL. The volume of soil in the area exceeding predicted background (within the Pole Shed) are considered highly unlikely to exceed permitted activity volumes should ground disturbance occur within this area of the site.

Environmental Risks

Taking into account the proposed development plans, the risk to environmental receptors associated with subdivision and development of a building platform on the eastern lot is considered to be low.

Waste disposal

The majority of the soils are suitable for reuse on site, except for soils in the vicinity of the pole shed which should be disposed of as Managed Fill should they be disturbed (highlighted pink in Figure 14-1).

Although, off-site disposal of soils is currently not envisioned, soils outside of the delineated Managed Fill area can be considered as cleanfill should disposal be required.

RECOMMENDATIONS

Based on the findings of this investigation, WSP recommends that:

- Should any ground conditions be encountered across the site which is not anticipated from the findings of this report a Suitably Qualified and Experienced Practitioner (SQEP) should be consulted in order to reassess the risks to human health;
- This PSI/DSI report is submitted to the consenting authority; and
- This PSI/DSI report is submitted to the regional authority to facilitate updating the HAIL database.

1 INTRODUCTION

1.1 BACKGROUND

A combined Preliminary / Detailed Site Investigation (PSI/DSI) has been undertaken on behalf of Ron Macrae, at 832 Malaghans Road, Queenstown (herein referred to as 'the site').

The site is located approximately 3.7km east of Arrowtown and covers approximately 16.9ha. It is currently occupied by a rural and residential end use.

It is understood that the property owners wish to subdivide the site into two lots with a new residential building platform on the larger lot.

As subdivision of the site is proposed and the site may have been subject to activities as described on the Ministry for the Environment's Hazardous Activities and Industries List (MfE's HAIL), the completion of a PSI/DSI is required in order to assess the potential risks to human health from contaminants in the soil as per NESCS Regulations(Ministry for the Environment, 2011d).

1.2 OBJECTIVE

The objective of this investigation is to characterise the contamination risk both 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 Queenstown Lakes District Council (QLDC) and Otago Regional Council (ORC).

As such, the following objectives have been identified:

- Determine whether potentially contaminating activities have been undertaken on the site or its surrounds;
- Undertake sampling and analysis of selected soils if during the site walkover soil conditions are encountered that indicate potentially elevated contaminant concentrations;
- Assess the risks associated with these potential contaminants to affect human health or the environment;
- Determine the likely impact upon sensitive receptors including site users and occupiers on the site; and
- Give details of further investigations or remedial options, if required.

1.3 SCOPE OF WORK

This report has been prepared in general accordance with the requirements for a PSI/DSI referred to in the *Users' Guide National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health* (Ministry for the Environment, 2012)and *Contaminated Land Management Guidelines No.1: Reporting on Contaminated Sites in New Zealand* (Ministry for the Environment, 2021a)and *No.5: Site Investigation and Analysis of Soils* (Ministry for the Environment, 2021b).

To achieve the objectives, the following scope was undertaken:

- Site walkover to assess the current site condition and its surrounding environment;
- An assessment of historical information relating to the site and its surroundings (this may be from documented or anecdotal evidence), including the review of historical aerial photographs;
- Review local geological and hydrogeological conditions through publicly available sources;
- Review of previous reports and information pertaining to the site from local authority records or other available sources;
- Limited soil sampling and laboratory analysis for contaminants of concern based on the site history (i.e. heavy metals (including lead and copper), hydrocarbons (polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs)) and organochlorine pesticides (OCPs)); and
- Site characterisation indicating the potential human health and environmental risks associated with the site and likely consenting requirements under the NESCS Regulations(Ministry for the Environment, 2011d).

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

1.4 CERTIFYING STATEMENT

WSP confirms that:

This preliminary site investigation meets 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:

- Reported on in accordance with the current edition of *Contaminated land management guidelines No 1 – Reporting on contaminated sites in New Zealand*, and
- The report has been reviewed and approved by a suitably qualified and experienced practitioner.
- The investigation manager and principal certifier details are provided in Table 1-1 below. 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.

Table 1-1: Investigation Management.

ITEM	DETAILS
AUTHOR	
NAME	Tara Verhulst
JOB TITLE	Environmental Scientist
YEARS' INDUSTRY EXPERIENCE	2
REVIEWER	
NAME	Lisa Bond
JOB TITLE	Principal Consultant - Environmental
YEARS' INDUSTRY EXPERIENCE	22

2 SITE DETAILS AND ENVIRONMENTAL SETTING

2.1 SITE IDENTIFICATION

The site is located at 832 Malaghans Road, Queenstown, as shown on the Site Location Plan in Figure 2-1. Site details can be found in Table 2-1 below. Adjacent land uses to the site generally comprise rural and residential land. The site comprises vacant production land and residential dwellings.

Table 2-1: Site details

Site Address	832 Malaghans Road, Queenstown
Territorial Authority	Queenstown Lakes District Council (QLDC)
Legal Description	Lot 5 DP 521688
Titles	0/0/825873
Approximate Total Site Area	16.95ha / 169,500m^2
NES Permitted Activity threshold volumes for 1) disturbance, and 2) yearly off-site movement of soil based on the approximate site area.	1) 8475m^3 2) 1695m^3
Planning Zone	Wakatipu Basin Rural Amenity Zone
Current Site Use	Rural and rural residential
Proposed Site Use	Residential

Figure 2-1: Site location plan

2.2 GEOLOGY

The geology of the site is shown on the 1:250,000 scale GNS Geology Web Map extract presented in Figure 2-2 (GNS Science, 2023).

The site is underlain by Late Pleistocene outwash deposits generally consisting of unweathered, well sorted, loose, sandy to bouldery gravel forming large terraces and outwash plains.

The southern edge of the site and surrounding hillsides comprise very well segregated and laminated; abundant pelitic and subordinate psammitic greyschist, minor greenschist and metachert.

A review of the GNS Active Faults Database indicated that the nearest active fault, the Cardrona Fault, lies approximately 13.5km east of the site. This reverse fault is described to have a low slip rate and recurrence interval of >5,000 to <=10,000 years (IV).

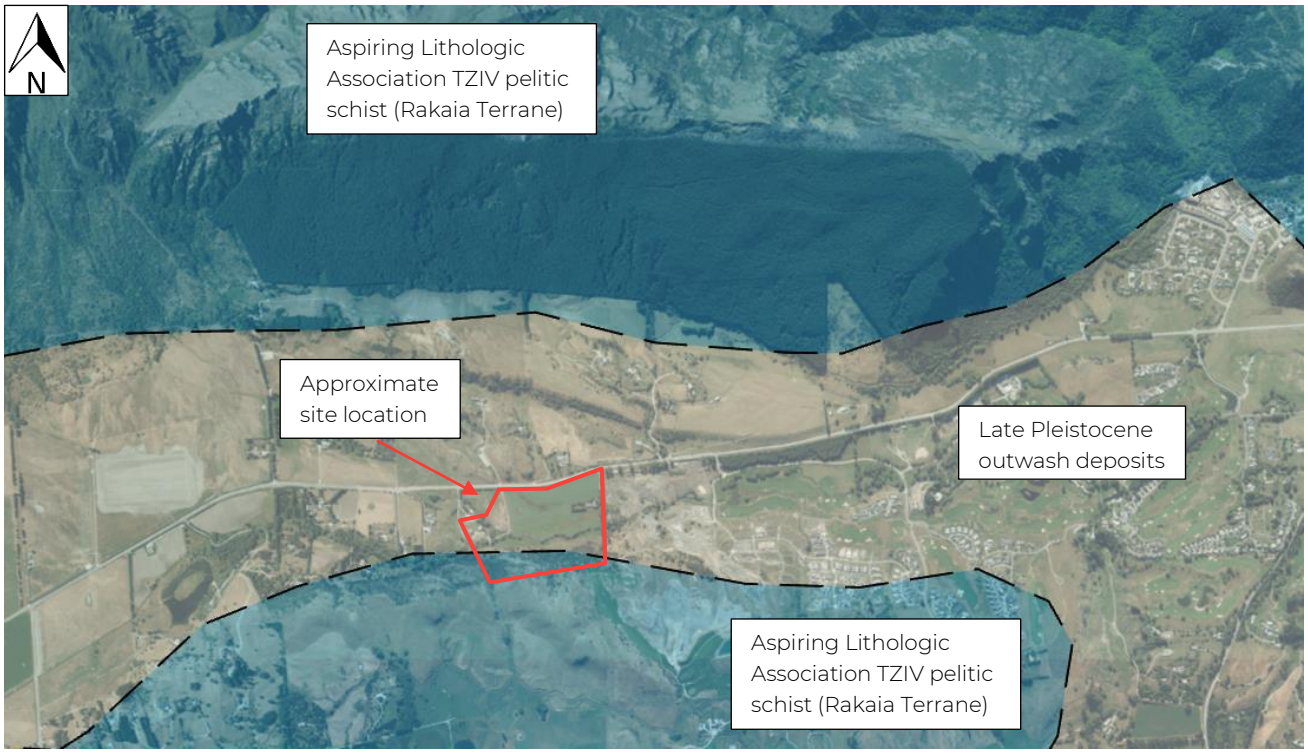

Figure 2-2: Geology of the site

2.3 TOPOGRAPHY, HYDROLOGY AND HYDROGEOLOGY

The topography was reviewed via the QLDC Spatial Data Hub (Queenstown Lakes District Council, 2023)A creek flows in an easterly direction across the site and discharges into Lake Hayes approximately 2.8km south-eastwards. The site is located within the Mill Creek Aquifer groundwater zone with an approximate depth to groundwater of 15m below ground level (m bgl).

The site is located at approximately 410-415m above mean sea level (amsl) with the hills in the southern part of the site sloping up to approximately 500m amsl. Surface water flow direction is expected to be in an easterly / south-easterly direction towards Lake Hayes.

There are two known bores located on site used for domestic purposes. Depth to water is indicated as 1.22m bgl and 2.20m bgl.

The Otago Natural Hazards Portal (Otago Regional Council, 2023a) reveals the majority of the site is underlain by rock or firm sediments with a low liquefaction potential. The southern hills of the site comprise poorly consolidated stream sediments with a low to moderate liquefaction potential.

A summary of the site topographical and hydro(geo)logical data is given in Table 2-2 below.

Table 2-2: Summary of topographical, hydrological and hydrogeological data

Topography	Generally flat with hills in the south
Nearest Surface Water Body	Creek in centre of the site, flowing east
Height above Mean Sea Level	Approximately 410-415m amsl
General Flow Direction	South-east
No. of known Boreholes and wells on site	Two

3 DEVELOPMENT PROPOSALS

It is understood that consent is being sought for a two-lot subdivision. An additional residential building platform will be established on the new allotment.

Figure 3-1 below shows an overview of the proposed development plans. The yellow line on the figure shows the proposed new lot boundary, and the blue area indicates the location of the proposed building platform. Building platform BE has already been consented for (RM161092).

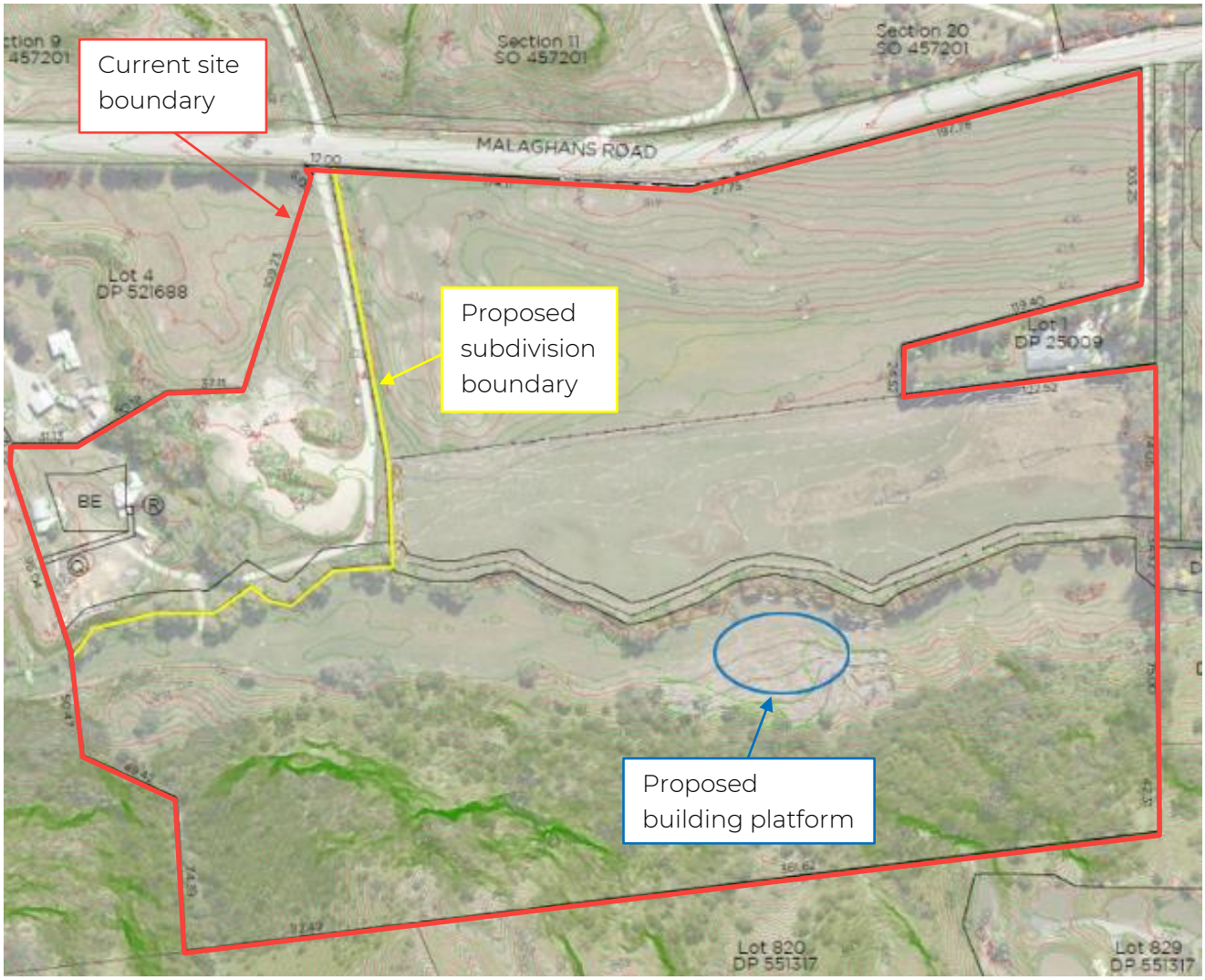

Figure 3-1: Proposed Development Plans.

4 DESKTOP REVIEW

4.1 HAIL DATABASE SEARCH

The Ministry for the Environment (MfE) created a list of potentially contaminating activities and industries in October 2011. This Hazardous Activities and Industries List (HAIL) is a compilation of the activities and industries likely to cause land contamination resulting from hazardous substance use, storage or disposal (Ministry for the Environment, 2011b)

A review of the online Listed Land Use Register held by ORC (Otago Regional Council, 2023b) has revealed that part of the site, along the western boundary, is recorded as a HAIL site. Details of the HAIL status are found in Table 4-1 below with the location of the HAIL indicated on Figure 4-1.

Table 4-1: HAIL Database Search Summary

SITE NUMBER & NAME	DISTANCE FROM SITE	HAIL STATUS	HAIL CATEGORY & DESCRIPTION	CONTAMINATION STATUS	SUMMARY
HAIL.01237.01	On part of site, western boundary	Verified HAIL	A8. Livestock dip or spray race operations. A17. Storage tanks or drums for fuel, chemicals or liquid waste.	Partially investigated	Possible sheep dip, stock truck effluent to land, fuel storage, and filling on property. Opus PSI partially investigated area around woolshed.

Figure 4-1: Extract of ORC's Listed Land Use Register.

4.2 PREVIOUS INVESTIGATIONS

Opus International Consultants Ltd (now WSP) was commissioned in 2016 to undertake a PSI for subdivision of the properties on 792 – 816 Malaghans Road and establishment of residential building platforms on each of the five lots proposed (Opus, 2016). The preliminary site investigation centred around a historic woolshed and stock effluent disposal located to the west outside of the current investigation site.

HAIL activities were identified on the investigated site namely: A8 (Livestock dip or spray race operations), A17 (Storage tanks or drums for fuel, chemicals or liquid waste), and G5 (Waste disposal to land).

Limited samples were taken around the woolshed only and analysed for a suite of heavy metals and organochlorine pesticides (OCPs), and asbestos. All results were found below their relevant rural residential soil guideline values (SGVs).

It was concluded that taking into account the relationships between the sources of contaminants on site, their sensitive receptors and the linkages or pathways which have been assessed to exist between them, the risk to primary and secondary receptors associated with historical activities undertaken on the site is considered to be LOW and the site was suitable for the proposed development. Better housekeeping of the site was recommended due to various materials including motor vehicles and hydrocarbon storage containers.

The 2016 PSI was submitted as part of the subdivision consent application and the findings incorporated into the ORC HAIL database.

4.3 HISTORICAL AERIAL PHOTOGRAPHS

Two historic maps (1996 & 2017) were obtained from Maps Past (Maps Past, 2023), four historical aerials (1958 - 1984) were available to view on Retrolens (LINZ, 2023) and eight aerials were available from Google Earth (2001 - 2022) (Google, 2023).

A summary of observations made following the review of historical aerials is presented in Table 4-2. The maps and aerials are presented in Appendix A.

Table 4-2: Summary of historical aerials

YEAR	OBSERVATIONS
1958 Retrolens	The site is situated along Malaghans Rd, with surrounding sites comprising rural land. A creek crosses the centre of the site from west to east and a residential dwelling is noted in the north-western corner. Several rocky outcrops are seen on the property with hills in the southern part of the site.
1959 - 1976 Retrolens	No notable changes are seen compared to the 1958 aerial.
1984 Retrolens	The northern part of the site along Malaghans Rd seems to have been worked as production land. Some ground disturbance is noted in the north-western corner of the site with a large shed built adjacent to the western boundary.
1996 Maps Past	Topographic map of the site shows the site at approximately 410m amsl. The site is generally flat with steep hills seen in the southern part of the site. A creek crosses the site from west to east with two tributaries originating in the north.

2001 Google Earth	First coloured aerial of the site. Some additional sheds or dwellings can be seen in the north-western corner of the site and along the boundary. Development of residential dwellings has occurred in the surrounding area.
2004 Google Earth	A large woolshed with livestock pens can be seen west of the site. A new driveway is noted from Malaghans Rd to the south of the shed with a large area of ground disturbance. The creek with its two tributaries can clearly be seen on this aerial. Another residential dwelling has been constructed along the eastern boundary of the site.
2010 Google Earth	Some stockpiles of possibly wood are noted in the north-western corner of the site.
2016 Google Earth	A large area of ground disturbance is noted near the centre of the site with a new gravel driveway leading from Malaghans Rd.
2017 Google Maps	Two residential dwellings are established on the site with several noted along the western boundary of the site.
2018 Google Earth	The driveway leading to the area of ground disturbance has been extended towards the former woolshed, which has been removed. Stockpiles of wood can be seen along the driveway. The northern part of the site is slightly discoloured, possible due to hot weather. Evidence of another waterway can be seen north of the creek.
2019 Google Earth	The area of ground disturbance is larger compared to the 2018 aerial. Some trucks can be seen along the driveway near the ground disturbance.
2021 Google Earth	Some heavy machinery and a large stockpile are noted with the area of ground disturbance. Temporary storage boxes seem to be located along the western boundary.
2022 Google Earth	Most recent aerial available. The ground disturbance is slightly overgrown. The trucks have been removed. Remaining evidence of the meandering waterway north of the creek is seen.

4.4 COUNCIL RECORDS

A review of QLDC's District Plan Maps indicates that the site lies within the Wakatipu Basin Rural Amenity Zone (Queenstown Lakes District Council, 2023).

Two resource consents were available for the site on QLDC eDocs. A summary of the consents is given in Table 4-3 below.

Table 4-3: Summary of resource consents related to the site.

CONSENT REFERENCE	SUMMARY	NOTES
RM200647	Consent was sought in 2020 for an industrial activity to stockpile and screen earthworks at 832 Malaghans Rd, Queenstown.	The consent was withdrawn prior to approval. A site plan showing the proposed extent of operations is added in Appendix B.

RM200336	Application for resource consent to establish the Tucker Beach to Arthurs Point to Arrowtown Trail Project. The proposed trail will link into the existing trail network established by the Queenstown Trails Trust.	Consent was granted with conditions. The trail would run across the site along the southern boundary, in front of the hills.

5 SITE WALKOVER

A site walkover with limited targeted sampling was undertaken by a WSP Environmental Scientist on 15 June 2023 focusing on the former soil screening area. Additional sampling was undertaken on 19 July 2023 to cover the western part of the site designated as HAIL by ORC. Photographs were taken during the site visits, a summary of which can be found in Appendix C. At the time of both walkovers the weather was fine following a morning frost. There had been no significant rainfall within the weeks prior.

The site is accessed via an unsealed road on the southern side of Malaghans Road. To the east of the access road is a generally level field that appears to be used for grazing. It does not appear that there have been any significant changes in this area since the previous PSI. Immediately to the west of the road is a grassed area with a raised earth bund.

A working area with the soil screening machinery is present at the southern end of the access road comprising bare compacted earth. At the time of the inspection, this area was clear of any stockpiled or imported soils, however, aerial images and anecdotal evidence indicate this to be the location of the soil screening/stockpiling. There is general storage of material in this area, including electrical equipment (power poles, insulators), wooden pallets and shipping containers. No fuel storage was noted.

A creek is present approximately 50m south of this area. The creek runs in a general east-west direction and is bordered by tussocks and mature trees.

The area of the proposed building platform in the western part of the site has some general storage of material goods, such as shipping containers, a prefabricated coolstore, and construction material. A large domed corrugated iron shed is present used for storing hay bales, with an adjoining wooden shed in poor condition. An additional wooden shed is present, also in poor/deteriorating condition. The shed appeared to be used for general storage of equipment, such as for chopping firewood.

During the site walkover no olfactory evidence of contamination was noted, nor any significant places of vegetation dieback.

6 SUMMARY OF IDENTIFIED HAIL ACTIVITIES

A review of information along with a site walkover indicates that HAIL activities have occurred on the western side of the site. Additional evidence gained since the original 2016 PSI and activities undertaken since that time indicate that additional areas may have been subject to HAIL activities.

An assessment of the potential HAIL activities on site has been completed to determine which of these are likely to be present and whether they would therefore warrant further investigation.

- A17. Storage tanks or drums for fuel, chemicals or liquid waste:

  The previous PSI (Opus, 2016) described the presence of fuel storage tanks on the larger previous site area located outside of the current site boundary and recommended better housekeeping around the area due to the presence of vehicles and general machinery.

  During the site investigation undertaken as part of this PSI, some signs of possible hydrocarbon spillage was noted on one small area, requiring further investigation, however no evidence of fuel storage (and hence HAIL) was present on the site.

- G5. Waste disposal to land:

  A review of historical aerials and council records, anecdotal evidence and the site walkover confirmed former soil screening activities have been undertaken on the site in an area to the east of the ORC delineated HAIL. As the origin and nature of the screened and stockpiled soils is unknown, a conservative approach is warranted, and further investigation of the area is required to determine whether HAIL activities have in fact occurred and whether contaminants of concern are present on site.

- 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 / A8. Livestock dip or spray race operations:

  The woolshed beyond the western site boundary is no longer present, however historical activities associated with spray race or sheep dipping may have given rise to migration of sheep dip chemicals on to the site.

  Based on the findings of the previous preliminary site investigation (Opus, 2016) the risk to human health or the environment associated with the former woolshed on the adjacent site was low. However, only limited sampling was undertaken surrounding the woolshed. As such, although considered unlikely, migration of contaminants onto the investigated site should be considered taking into account site topography and boundaries.

7 PRELIMINARY CONCEPTUAL SITE MODEL

Using the identified potential HAIL activities or industries, a site-specific conceptual site model (CSM) was developed.

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).

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. The desk-based information on the site has enabled the development of a CSM as shown in Table 7-1.

Table 7-1: Conceptual Site Model

Likely sources of impact	Potential (historical) sources were identified: — Soil screening and soil stockpiling of imported materials; — Accidental fuel spillages from storage containers observed during the previous investigation site walkover; — Migration from adjacent HAIL site (woolshed).
Potentially impacted media	Impacts are likely to be limited to shallow soils (the upper meter).
Contaminants of concern	Potential sources of impact associated with historical activities may have given rise to the following potential contaminants being on site: — Heavy metals (particularly arsenic and copper); — Petroleum Hydrocarbons; and — Organochlorine pesticides (OCPs).
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; and — Groundwater transport through soil, including in preferential pathways (service trenches, through higher permeability soils and/or high groundwater levels).
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; and — Ingestion or dermal contact with impacted surface water or groundwater during excavation work or from groundwater bore installation being utilised for public consumption.
Potential sensitive receptors	Identified sensitive receptors comprise: — Workers and visitors at the site during the proposed site works; — Workers during future soil disturbance; and — Future residents.

On the basis of the findings within the desk-based study and potential risks to human health detailed in the CSM from identified contaminants of concern on site, a potential Piece of Land (PoL) has been delineated in Figure 7-1, under the NESCS Regulations (Ministry for the Environment, 2011d).

Further assessment in the form of a DSI is warranted for any ground disturbance activities in excess of permitted activity volumes. Findings of the DSI are presented in the following sections of this report.

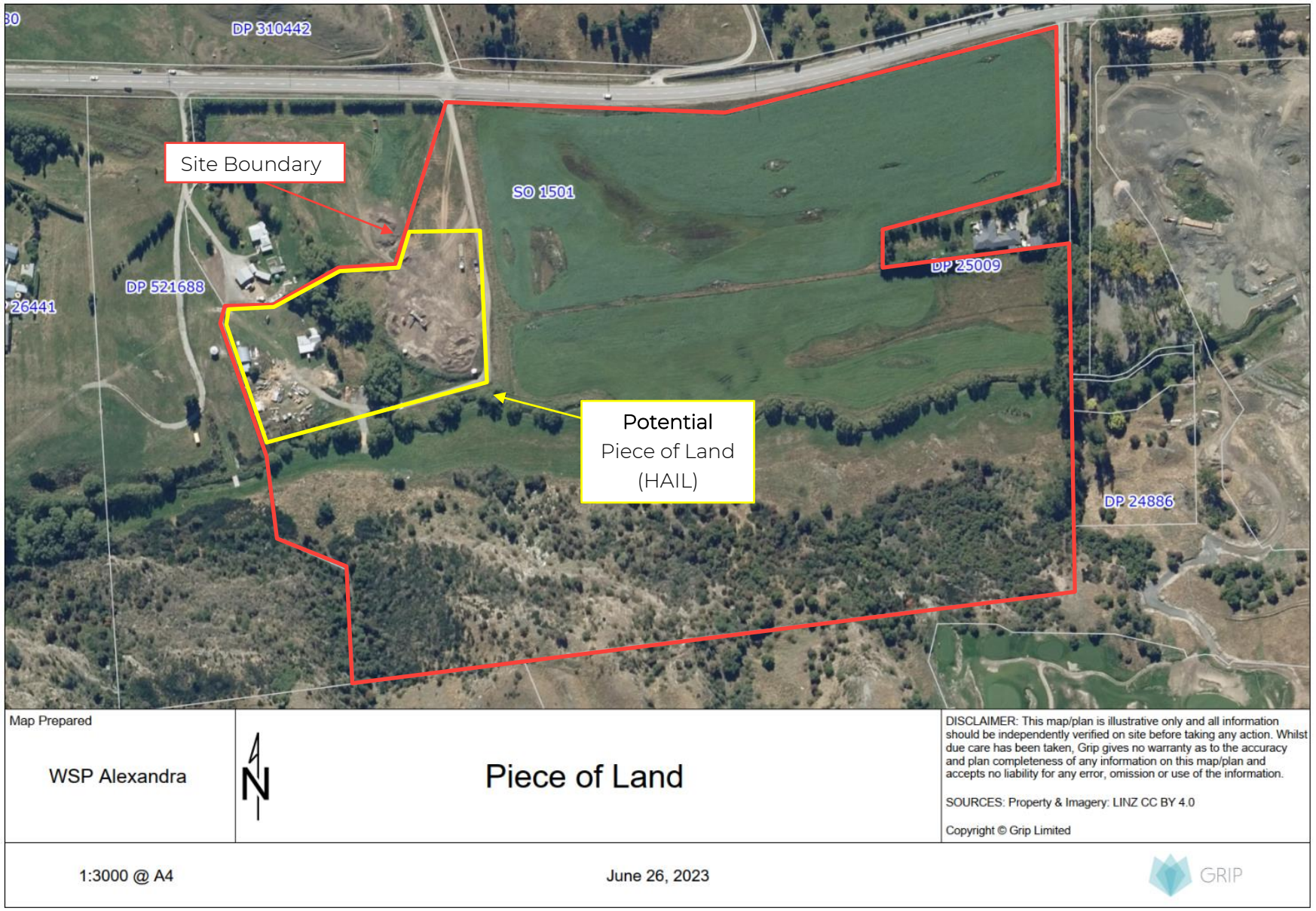

Figure 7-1: Potential Piece of Land (PoL) requiring further investigation.

8 DATA QUALITY OBJECTIVES

Systematic planning is critical for 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 (Ministry for the Environment, 2021b).

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 the 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 that meets all performance criteria and other design requirements and constraint. The DQO process adopted for the DSI is outlined in Appendix D.

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 (Ministry for the Environment, 2021b).

To achieve the objectives of the DSI, based on the findings of the desk-based study and on-site observations, a judgemental sampling pattern was adopted across the PoL delineated in Figure 7-1 above.

The intrusive investigation works were undertaken at the site on 15 June 2023 and 19 July 2023 by a WSP Environmental Scientist. During the first sampling event, a total of four samples were collected across the former soil screening area within near surface soils (approximately 0.10m bgl). As samples were taken as screening to confirm the nature of the uncontrolled fill, they were composited on a 2:1 ratio and analysed for a suite of heavy metals.

During the July sampling, seven samples (including one QA: samples SS4A and SS4B) were taken from the western part of the site to assess migration of CoC from the former woolshed and possible hydrocarbon spillages. Moreover, four additional samples were taken from the soil screening area. Depending on the sample location, soils were analysed for a suite of heavy metals, petroleum hydrocarbons and/or OCPs.

Samples were placed in laboratory supplied jars, leaving minimal headspace, and closed with Teflon-coated lids. Soils were logged concurrently.

Samples were stored in a sealed cooler and transported to the laboratory under chain of custody, which can be found in Appendix E. Dedicated disposable nitrile gloves were worn for each sampling episode and all non-dedicated equipment was decontaminated between sampling locations to minimise the potential of cross-contamination.

A sample location plan is presented in Figure 9-1 below.

9.2 LABORATORY ANALYSIS

The June soil samples were submitted to Analytica Laboratories and the July samples to Eurofins for analysis of determined contaminants of concern. Both laboratories are accredited by International Accreditation New Zealand (IANZ) for the analytical suites requested.

Figure 9-1: Sample Location Plan.

10 BASIS FOR GUIDELINE VALUES

10.1 SOIL CONTAMINANT STANDARDS FOR THE PROTECTION OF HUMAN HEALTH

The MfE *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health* ('MfE (2011) Methodology') (Ministry for the Environment, 2011c) 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 (New Zealand Government, 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')(Ministry for the Environment, 2011d). These numerical criteria are 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 for health ($SCSs_{(health)}$) 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 of the site as residential (10% produce), as detailed in Table 10-1. We consider that based on the proposed use of the PoL, this exposure scenario is appropriate and no further adjustment of the $SCSs_{(health)}$ as set out in the NESCS is necessary in this instance.

10.1.1 OTHER SOIL GUIDELINES

Where there is no appropriate soil contaminant standard for the contaminant, the *MfE Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values* (Ministry for the Environment, 2011a) provides the following hierarchy to determine the order in which guideline 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 requirements in this report.

Table 10-1: Land Use Scenario

Scenario	Description
Rural / lifestyle block	Rural residential land use, including home-grown produce consumption (25 per cent). Applicable to the residential vicinity of farm houses for protection of farming families, but not the productive parts of agricultural land. Note: Consumption of eggs, milk and meat from animals raised on site is excluded. Produce consumption is limited to home-grown vegetables. Sites for which consumption of home-grown eggs, milk or meat is important will need to be evaluated on a site-specific basis.
Residential	Standard residential lot, for single dwelling sites with gardens, including home-grown produce consumption (10 per cent).
High-density residential	Urban residential with limited soil contact, including small ornamental gardens but no vegetable garden (no home-grown produce consumption); applicable to urban townhouses, flats and ground-floor apartments with small ornamental gardens, but not high-rise apartments.
Parks / recreational	Public and private green areas and reserves used for active sports and recreation. This scenario is intended to cover playing fields and suburban reserves where children play frequently. It can also reasonably cover secondary school playing fields but not primary school playing fields.
Commercial / industrial outdoor worker (unpaved)	Commercial / industrial site with varying degrees of exposed soil. Exposure of outdoor workers to near-surface soil during routine maintenance and gardening activities with occasional excavation as part of maintaining subsurface utilities (ie, a caretaker or site maintenance personnel). Also conservatively applicable to outdoor workers on a largely unpaved site.

10.2 SOIL CONTAMINANT STANDARDS FOR THE PROTECTION OF THE ENVIRONMENT

In the absence of published and gazetted guidelines for environmental protection, soil guideline values developed to protect terrestrial biota (soil microbes, invertebrates, plants, wildlife and livestock) (Eco-SGVs) provide a useful means to readily assess potential environmental impact.

the Envirolink tools project 'Background concentrations and soil guideline values for the protection of ecological receptors' (Eco-SGV tools project) commenced in July 2014 and was updated in June 2019 with the objective of developing Eco-SGVs for the most commonly encountered contaminants and establishing agreed methods for derivation such that values can subsequently be developed for other contaminants of concern as needed.

Along with background concentrations from the LRIS portal(Landcare Research Limited, 2016), the Eco-SGV's have been used to assess potential risks to environmental receptors for 8 selected metals (arsenic, boron, cadmium, chromium, copper, fluoride, lead and zinc) for five potential land use scenarios, namely:

- Ecologically sensitive areas;
- Non-food production land;
- Agricultural land;
- Residential and recreational areas; and
- Commercial/ Industrial land.

The laboratory results have been assessed against the 'Residential and recreational areas' Eco-SGV's. Where background concentrations exceed Eco-SGV values then these are considered to take precedence for assessment purposes.

11 RESULTS

11.1 SUBSURFACE CONDITIONS

Samples were collected from near surface soils only (0.10-0.20m bgl). No groundwater was encountered within any of the locations investigated.

A summary of the soil geology of each sample is given in Table 11-1 below with the scheduled laboratory analyses and on-site observations.

Table 11-1: Summary of sample geology and scheduled laboratory analyses.

SAMPLE NAME	DEPTH (M BGL)	GEOLOGY	ANALYSIS SCHEDULED
Composite 1 (S01 & S02)	0.10	Brown, fine to coarse silty GRAVEL with lots of schist. Moist, well graded.	Heavy metals
Composite 2 (S03 & S04)	0.10	Brown, fine to coarse silty GRAVEL with lots of schist. Moist, well graded.	Heavy metals
SS1	0.10	Topsoil, dark brown, fine to coarse gravelly SILT with some schist, moist, medium plasticity,	Heavy metals
SS2	0.10	Brownish grey, fine to coarse silty GRAVEL with lots of schist, moist, well graded. Note: Between two buried concrete beams by the western boundary fence.	Heavy metals & OCPs
SS3	0.10	Brownish grey, fine to coarse silty GRAVEL with lots of schist, moist, well graded. Note: adjacent to large metal pipes	Heavy metals, TPHs, PAHs
SS4A & SS4B	0.05	Brownish grey, fine to coarse GRAVEL (fill), dry, well graded.	Heavy metals
SS5	0.05	Brownish black, organic gravelly SILT with some charcoaled pieces of wood. Medium plasticity, dry. Inside shed, appears darker soil possibly hydrocarbon stained.	Heavy metals, TPHs, PAHs
SS6	0.10	Topsoil, brown, fine to coarse gravelly SILT with some schist. Medium plasticity, moist.	Heavy metals, TPHs, PAHs
SS7	0.15	Brown, fine to coarse silty GRAVEL with lots of schist. Moist, well graded.	Heavy metals

SS8	0.10	Brown, fine to coarse silty GRAVEL with lots of schist. Moist, well graded.	Heavy metals
SS9	0.20	Brown, SILT with some gravel and lots of schist. Moist, medium plasticity.	Heavy metals
SS10	0.10	Topsoil, brown SILT. Moist, medium plasticity. Note: from stockpiled material. Old wire cable seen in soil.	Heavy metals

11.2 ANALYTICAL RESULTS

Tables 11-2 and 11-3 provide a summary of the soil results for heavy metals and hydrocarbons respectively. Detailed laboratory reports and chain of custody are provided in Appendix E.

Table 11-2: Summary of analytical results

Sample Name	Sampling Date	Depth (m bgl)	Heavy Metals								OCPs		
			Arsenic	Cadmium	Chromium (VI)	Copper	Lead	Mercury	Nickel	Zinc	DDT + DDE + DDD (Total)	Aldrin	Dieldrin
Background Concentrations[1]			12.06	0.34	80.15	42.85	44.34	-	44.96	182.8	-	-	-
Limit of Reporting (LOR)			0.125	0.005	0.125	0.075	0.25	0.025	0.05	0.05	0.01	0.01	0.01
NESCS[2]	Residential (10% produce)		20	3	460	>10,000	210	310	-	-	70	-	2.6
IRB NEPM SGV HILD[3]			-	-	-	-	-	-	400	7400	-	-	-
NZRB[4]	Eco-SGV Residential/Open Space		60	12	390	240	900	-	-	300	-	-	-
Disposal[5]	Class A Landfill		**100**	**20**	**100**	**100**	**100**	**4**	**200**	**200**	-	-	-
	Class B Landfill		*10*	*2*	*10*	*10*	*10*	*0.4*	*20*	*20*	-	-	-
Units			mg/kg										
Composite 1	15-Jun-23	0.1	7.6	0.054	12.9	7.88	12.1	<0.025	9.74	46.3	-	-	-
Composite 2	15-Jun-23	0.1	8.6	0.06	17.5	10.2	12	0.035	11.8	50.1	-	-	-
SS1	19-Jul-23	0.1	13	0.04	9.1	8.7	20	0.01	7.7	60	-	-	-
SS2	19-Jul-23	0.1	7.9	0.03	9.6	18	21	0.02	12	58	<0.01	<0.01	<0.01
SS3	19-Jul-23	0.1	10	0.02	8.2	21	12	< 0.01	12	49	-	-	-
SS4A	19-Jul-23	0.05	6.9	0.06	8.1	13	13	0.04	9.1	58	-	-	-
SS4B	19-Jul-23	0.05	7.9	0.02	8.1	11	8.9	0.05	8.1	32	-	-	-
SS5	19-Jul-23	0.05	6.7	2.2	9.5	63	120	0.04	10	**950**	-	-	-
SS6	19-Jul-23	0.1	9	0.02	8.3	6.8	16	0.04	6.4	41	-	-	-
SS7	19-Jul-23	0.15	4.9	0.05	10	7.5	11	0.02	7.7	35	-	-	-
SS8	19-Jul-23	0.1	5.1	0.04	13	7.1	11	0.03	7	34	-	-	-
SS9	19-Jul-23	0.2	12	0.1	13	10	12	0.01	12	59	-	-	-
SS10	19-Jul-23	0.1	8.7	0.12	7.7	7.5	16	0.01	7	44	-	-	-

Key:

Underline	Exceedance of Background Concentrations
Yellow Fill	Exceedance of Residential SCS
Pink Fill	Exceedance of Eco-SGV (typical aged soil)
Bold	Exceedance of Waste Disposal Criteria - Class A
Italics	Exceedance of Waste Disposal Criteria - Class B

Notes:

1. LRIS Predicted Background Soil Contaminants, New Zealand, Landcare Research Limited, Updated 2016
2. Ministry for the Environment, 2012. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.
3. National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Australia); Schedule B1 (as amended May 2013) - Guideline on Investigation Levels For Soil and Groundwater, Federal Register of Legislative Instruments F2013C00288, National Environmental Protection Council. (HIL - Health Investigation Level).
4. New Zealand Risk Based Guidelines: Development of Soil Guideline Values for the Protection of Ecological Receptors (Eco-SGVs) Landcare Research 2019
5. MfE Module 2 - Hazardous Waste Guidelines: Landfill Waste Acceptance Criteria and Landfill Classification. Appendix A.

Table 11-3: Summary of analytical results for TPHs and PAHs.

			Total Petroleum Hydrocarbons (TPHs)			Polycyclic Aromatic Hydrocarbons (PAHs)		
Sample Name	Sampling Date	Depth(m bgl)	TPH C7 - C9	TPH C10 - C14	TPH C15 - C36	Benzo(a)pyrene TEQ (lower bound)	Napthalene	Pyrene
Limit of reporting (LOR)		mg/kg wt	10	15	25	0.03	0.1	0.05
Protection of Human Health - NZRB[1]		Residential Use [2,3,4]	(500)[m]	(510)[x]	NA	-	(63)[v]	(1,600)[p]
NESCS[5]			-	-	-	10	-	-
Disposal[6]		Class A Landfill	-	-	-	**300**	**200**	-
		Class B Landfill	-	-	-	*30*	*20*	-
Units			mg/kg					
SS3	19-Jul-23	0.1	<5	<10	<20	0.03	<0.1	<0.03
SS5	19-Jul-23	0.05	<5	<10	1100	0.09	<0.1	<0.03
SS6	19-Jul-23	0.1	<5	<10	<20	0.04	<0.1	<0.03

Key:

Underline	Exceedance of Background Concentrations (=LOR)
Yellow Fill	Exceedance of Residential SCS
Bold	Exceedance of Waste Disposal Criteria - Class A
Italics	Exceedance of Waste Disposal Criteria - Class B
Bold	

Notes:

1. Ministry for the Environment (MfE) Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (Revised 2011) Module 4: Tier 1 Soil Acceptance Criteria.
2. Applied criteria are for sandy silt surface soils (<1m) and all pathways are assessed.
3. Brackets denotes values exceed threshold likely to correspond to residual separate phase hydrocarbons. The suffixed letters indicate the limiting pathway for each criterion as follows: m - maintenance/excavation; v - volatalisation; x - PAH surrogate.
4. NA - indicates estimated health-based criterion exceed 20,000mg/kg. At 20,000mg/kg residual separate phase is expected to have formed in the soil matrix. Some aesthetic impact may be noted.
5. Ministry for the Environment, 2012. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.
6. MfE Module 2 - Hazardous Waste Guidelines: Landfill Waste Acceptance Criteria and Landfill Classification. Appendix A.

12 QUALITY ASSESSMENT AND QUALITY CONTROL

The field and laboratory quality assurance and quality control (QA/QC) programme 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 PROGRAMME

Table 12-1 summarises the field quality programme for the DSI.

Table 12-1: Field Quality Programme

Environmental consultant	The environmental consultant maintains Quality Assurance Systems certified to AS/NZS ISO 9001:2000. Qualified and experienced personnel with at least 5 years' experience completed the field works.
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 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 E, and include the sampler's name, date samples were sent to and received by the lab, 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 duplicates.

Reporting	Report generally complies with the MfE CLMG No. 1 (Ministry for the Environment, 2021a)

12.2 LABORATORY QUALITY PROGRAM

Table 12-2 summarises the laboratory quality programme for the DSI.

Table 12-2: 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 (Ministry for the Environment, 2021b).
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 sampler 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.

Samples SS4A and SS4B were collected in duplicate for quality assurance purposes. The relative percent difference (RPD) was calculated using following formula:

$$RPD\ (\%) = \frac{|R_0 - R_d|}{|(R_0 + R_d)/2|}\ x\ 100\%$$

Where R_0 is the primary sample and R_d is the primary duplicate.

The majority of the tests returned RPD values <50%, except for the cadmium and zinc concentrations with 100% and 58% respectively. As the concentrations of these analytes are low and all other RPD values for the same samples are<50%, this is not considered of concern.

As such, it is considered that the sampling methods are sufficiently consistent for the purposes of this investigation.

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 SITE GEOLOGY

Soils across the site generally comprise of outwash deposits of well graded, brown, fine to coarse silty GRAVEL or gravelly SILT with various amounts of schist.

14.2 ANALYTICAL RESULTS

14.2.1 HUMAN HEALTH CRITERIA

No human health exceedances were reported for any of the samples analysed based on a residential end use with 10% produce consumption from on-site grown vegetables. As such, all sample locations are considered to have contaminant concentrations below soil guideline values for a residential end use under the NESCS Regulations (Ministry for the Environment, 2011d).

14.2.2 ENVIRONMENTAL DISCHARGE CRITERIA (NESCS APPLICABILITY)

The heavy metal concentrations were assessed against predicted local background concentrations to determine applicability of the NESCS (Landcare Research Limited, 2016).

Sample SS5, reported heavy metal concentrations exceeding the predicted local background concentrations for cadmium, copper, lead and zinc. All other metal results were considered to be within an acceptable local background concentration range.

In addition, diesel range organics and PAHs were detected in sample SS5. Hydrocarbons are not generally considered to be naturally occurring substances and as such their LOR are taken as a proxy for background concentrations. Marginal concentrations of PAH were also noted in SS3 and SS6, however Total PAH in SS3 were below detection and SS6 were at detection. These concentrations are therefore considered to be ambient within the environment.

As such, one location on site, namely within the pole shed, reported exceedances of predicted background concentrations, however, although contaminants have been found in excess of local background for this part of the site, no evidence of HAIL activities have been noted on the site.

14.2.3 ENVIRONMENTAL RECEPTOR CRITERIA

Assessment of results against Eco-SGV criteria indicates that sample SS5 exceeds zinc values for a residential/ open space criteria based on typical soils which are aged. As hydrocarbons were also found slightly elevated and the soils were found at the entrance of the pole shed, it is assumed that some fuel spillage may have occurred along with the storage of machinery and materials within the shed. The nature of the contamination is thought to be a hotspot due to a point source rather than widespread contamination. As such, the migration risk is considered to be low. Photo 13 in Appendix C shows the location of the sample taken.

The risks to environmental receptors associated with assessed contaminants of concern within the shed are therefore considered to be low.

The rest of the site complied with Eco-SGVs resulting in risks to environmental receptors considered to be very low.

14.3 WASTE DISPOSAL

As all results are considered below human health criteria for a residential end use, excess soils are suitable for reuse on site.

However, due to the soils within the shed containing zinc concentrations above Eco-SGVs and a creek flowing approximately 30m east of the shed, and through the centre of the site, a more sensitive approach is recommended for this area. If the soils within the shed (pink on Figure 14-1) are to be disturbed, it is recommended that surface soils (0.00 – 0.15m bgl) are scraped separately and disposed of as Managed Fill rather than reused on site.

The remainder of the site can be considered suitable for disposal as cleanfill.

Prior acceptance of the landfill should be sought prior to disposal of soils, and the appended laboratory results (referencing SS5) may need to be presented prior to acceptance.

Figure 14-1: Summary of waste disposal recommendations.

15 UPDATED CONCEPTUAL SITE MODEL

Based on the site inspection, desktop review, and results of the soil sampling investigation, an updated CSM has been developed for the site. The updated CSM is summarised in Table 15-1.

Table 15-1: Updated CSM

SOURCE	PATHWAY TO RECEPTORS	RECEPTORS	RISK PATHWAY STATUS	REASONING
Heavy metals	Inhalation of dust or vapours Ingestion or dermal contact with impacted soil, including surface soils including during excavation works. Ingestion or dermal contact with impacted surface water	Ongoing site users, construction workers	Incomplete	Heavy metal concentrations were reported above predicted background concentrations in one location only (SS5) and below adopted human health criteria in all locations.
Hydrocarbons (TPH & PAH)	Inhalation of dust or vapours Ingestion or dermal contact with impacted soil, including surface soils including during excavation works. Ingestion or dermal contact with impacted surface water	Ongoing site users, Construction workers	Incomplete	Hydrocarbon (Diesel and BaP) concentrations were reported above predicted background concentrations in one location only (SS5) and below adopted human health criteria in all locations.
Organochlorine Pesticides (OCPs)	Inhalation of dust or vapours Ingestion or dermal contact with impacted soil, including surface soils including during excavation works. Ingestion or dermal contact with impacted surface water	Ongoing site users, Construction workers	Incomplete	OCP concentrations were reported below predicted background concentrations and below adopted human health criteria in all locations.

16 CONCLUSION AND RECOMMENDATIONS

A combined Preliminary / Detailed Site Investigation was carried out at the site on 15th June and 19th July 2023 in order to determine the chemical characteristics of near surface soils where HAIL activities were considered to have occurred. An assessment of the risks to human health associated with potential contaminants of concern was required in order to satisfy the NESCS and local council requirements for residential development.

16.1 NESCS ASSESSMENTS

Following a review of the site investigation information, it was concluded that it is more likely than not that NO activity or industry described in the HAIL is being or has been undertaken on the site.

16.1.1 SUBDIVISION

As no HAIL activities have been noted and contaminant concentrations were not found to exceed human health standards, it is considered highly unlikely for there to be a risk to human health associated with the proposed subdivision of the site. As such, subdivision with a residential end use is considered to be a Permitted Activity.

16.1.2 SOIL DISTURBANCE

Based on the reported soil results, contaminants of concern exceeding predicted background concentrations are present on a small area of the site , however these are not in sufficient quantity or associated with an activity for the site to be considered HAIL.

The volume of soil in the area exceeding predicted background (within the Pole Shed) are considered highly unlikely to exceed permitted activity volumes should ground disturbance occur within this area of the site.

16.2 ENVIRONMENTAL RISKS

Taking into account the proposed development plans, the risk to environmental receptors associated with subdivision and development of a building platform on the eastern lot is considered to be low.

16.3 WASTE DISPOSAL

The majority of the soils are suitable for reuse on site, except for soils in the vicinity of the pole shed which should be disposed of as Managed Fill should they be disturbed (highlighted pink in Figure 14-1).

Although, off-site disposal of soils is currently not envisioned, soils outside of the delineated Managed Fill area can be considered as cleanfill should disposal be required.

16.4 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 CSM and selected site sampling, assessed the qualitative level of risk posed to human health and have made various recommendations to address the plausible risks. The risks have been assessed to be low.

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 (Ministry of Business, 2015). Risks include potential exposure to contaminated soils through ingestion or dermal contact.

16.5 RECOMMENDATIONS

Based on the findings of this investigation, WSP recommends that:

- Should any ground conditions be encountered across the site which is not anticipated from the findings of this report a Suitably Qualified and Experienced Practitioner (SQEP) should be consulted in order to reassess the risks to human health;
- This PSI/DSI report is submitted to the consenting authority; and
- This PSI/DSI report is submitted to the regional authority to facilitate updating the HAIL database.

17 REFERENCES

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18 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Ron Macrae('Client') in accordance with the Short Form Agreement with the Client signed 9 May 2023 and Variation signed 16 July 2023 ('Agreement').

Permitted Purpose

This Report has been prepared expressly for the purpose of a combined Preliminary / Detailed Site Investigation ('Permitted Purpose'). WSP accepts no liability whatsoever for the use of the Report, in whole or in part, for any purpose other than the Permitted Purpose. Unless expressly stated otherwise, this Report has been prepared without regard to any special interest of any party other than the Client.

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Appendix A

Historical information

1958

Approximate Site Location

1959

Approximate Site Location

1976

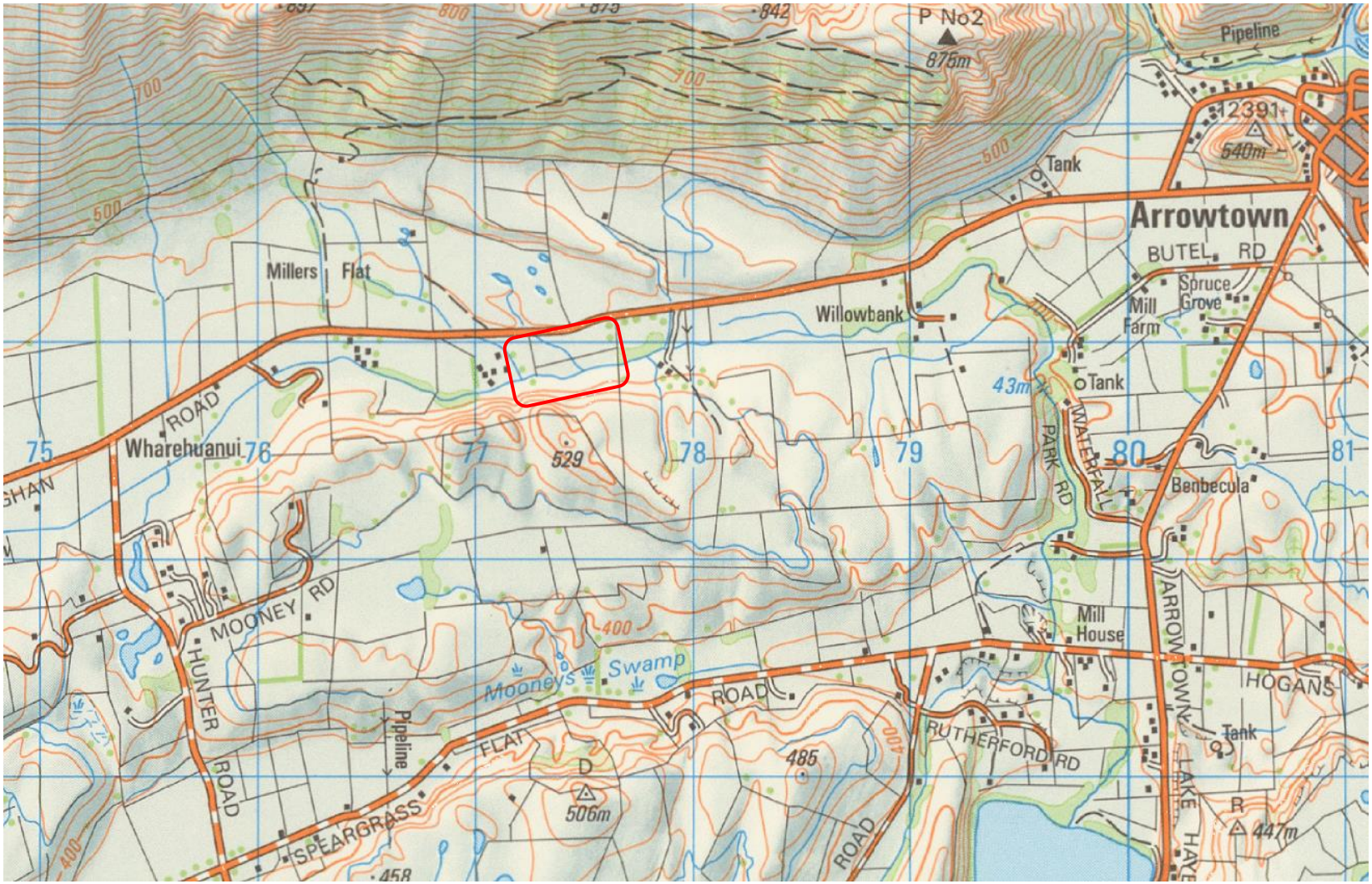
Approximate Site Location

1984

N

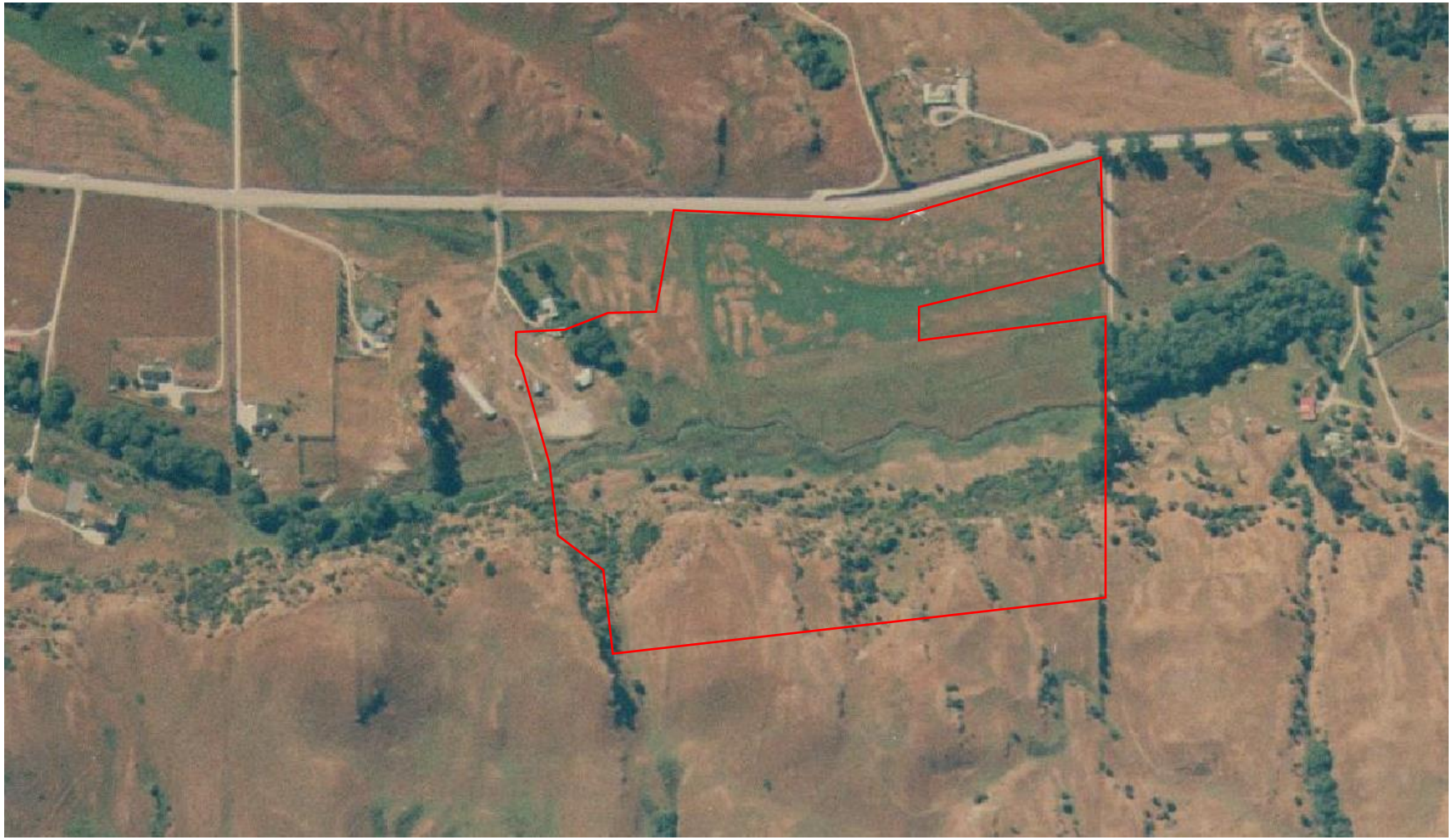
Approximate Site Location

1996



Approximate Site Location

2001



N

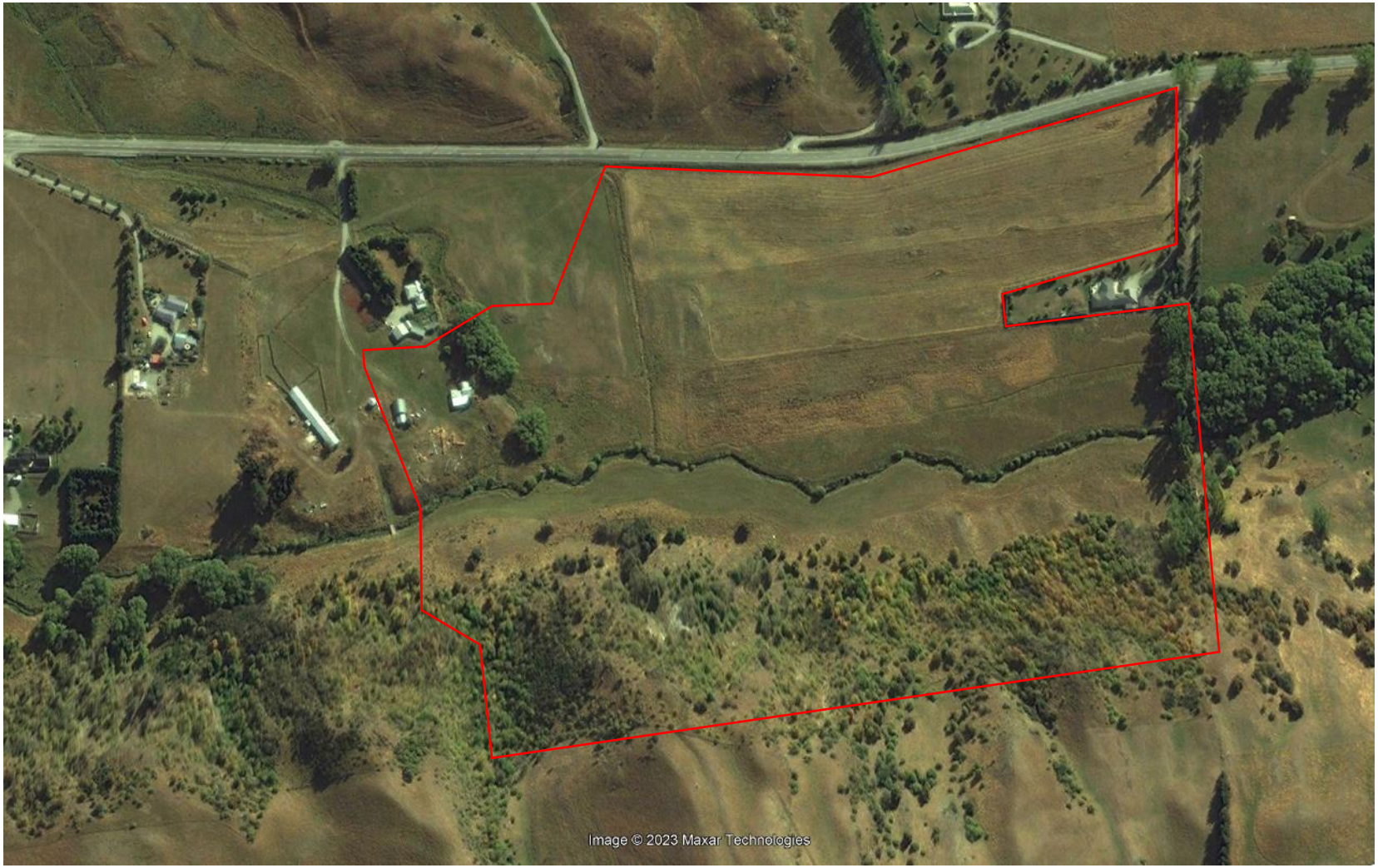
Approximate Site Location

2004

N

Approximate Site Location

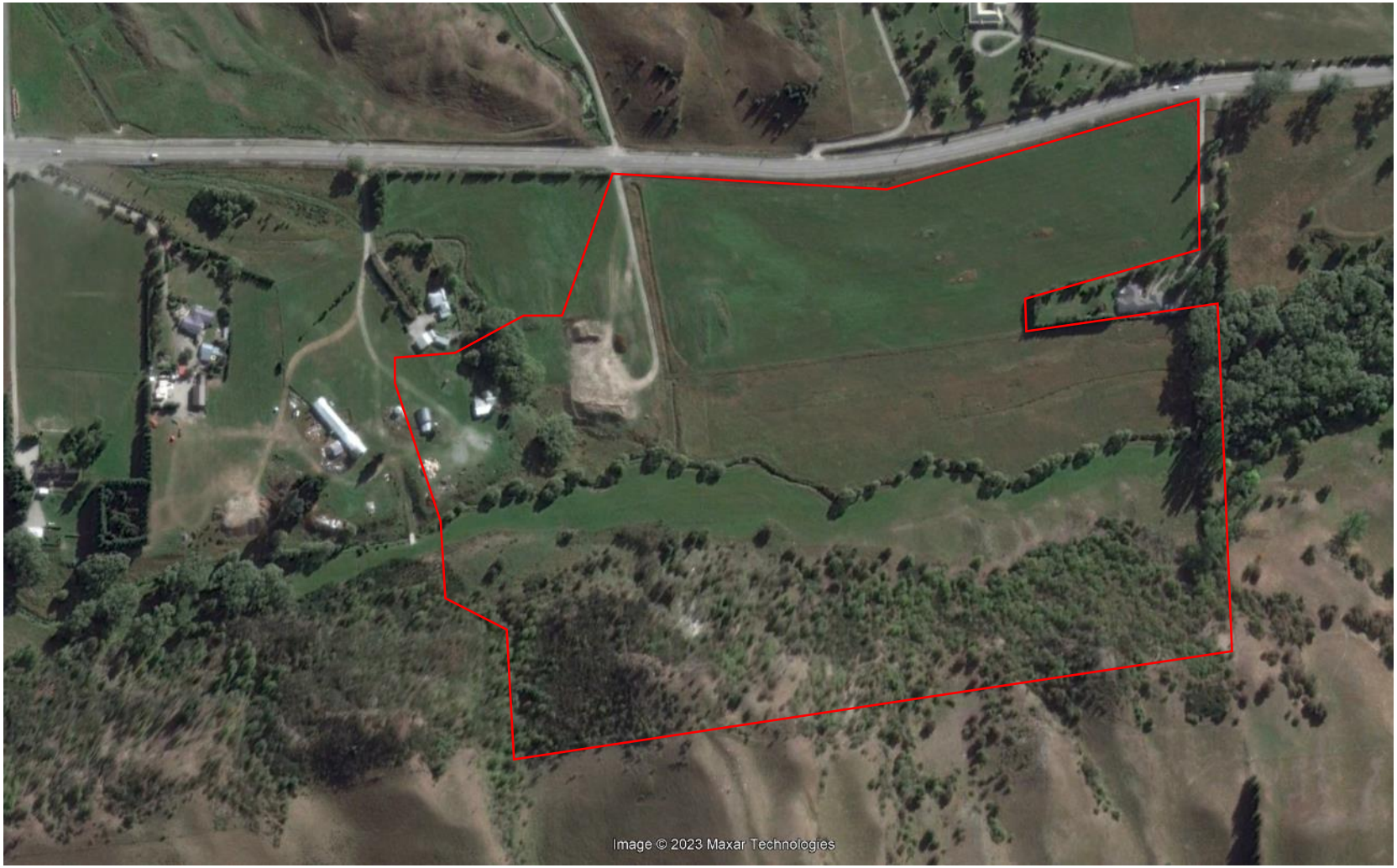
2010



N

Approximate Site Location

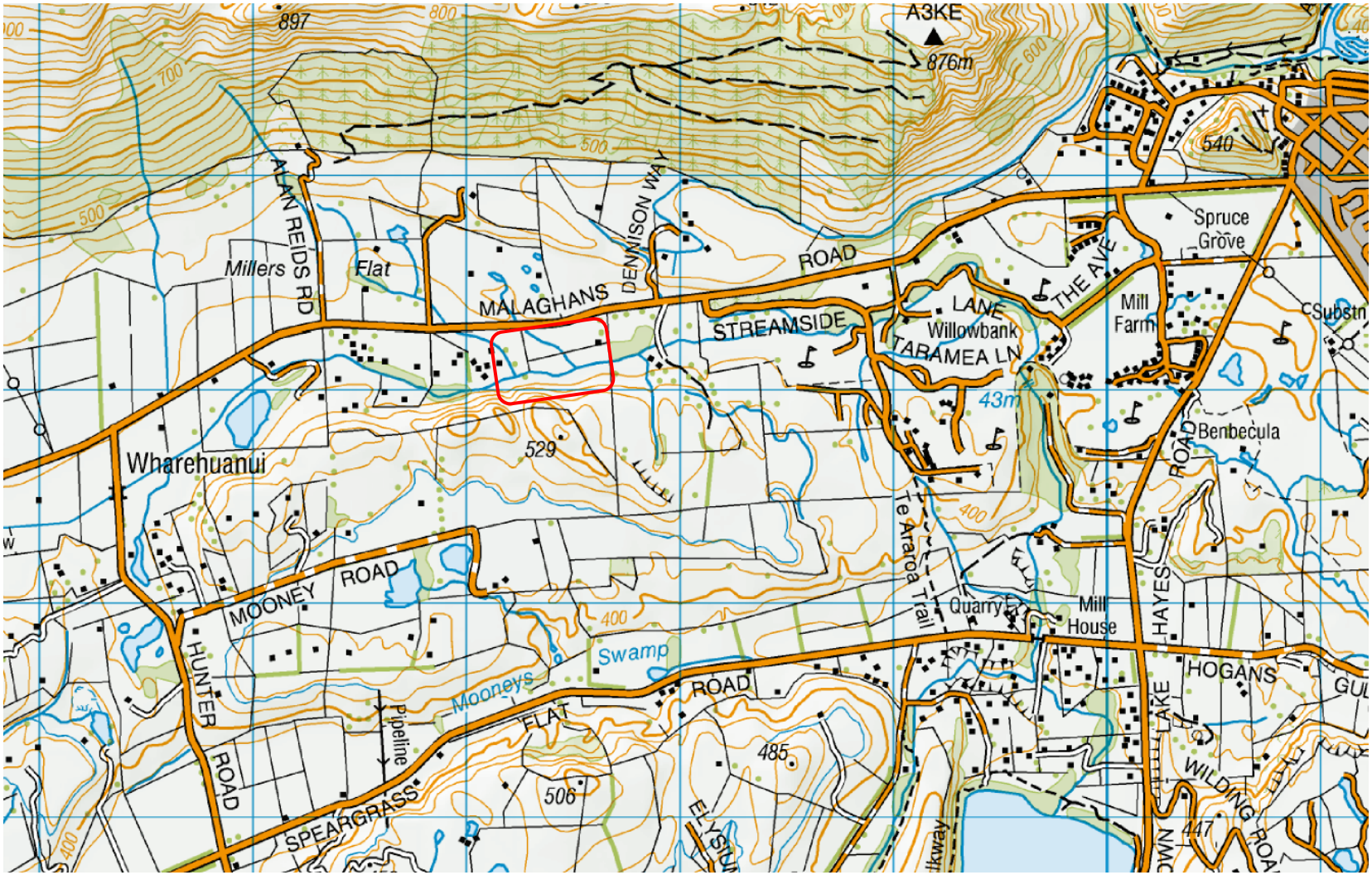
2016



N

Approximate Site Location

2017



Approximate Site Location

2018

N

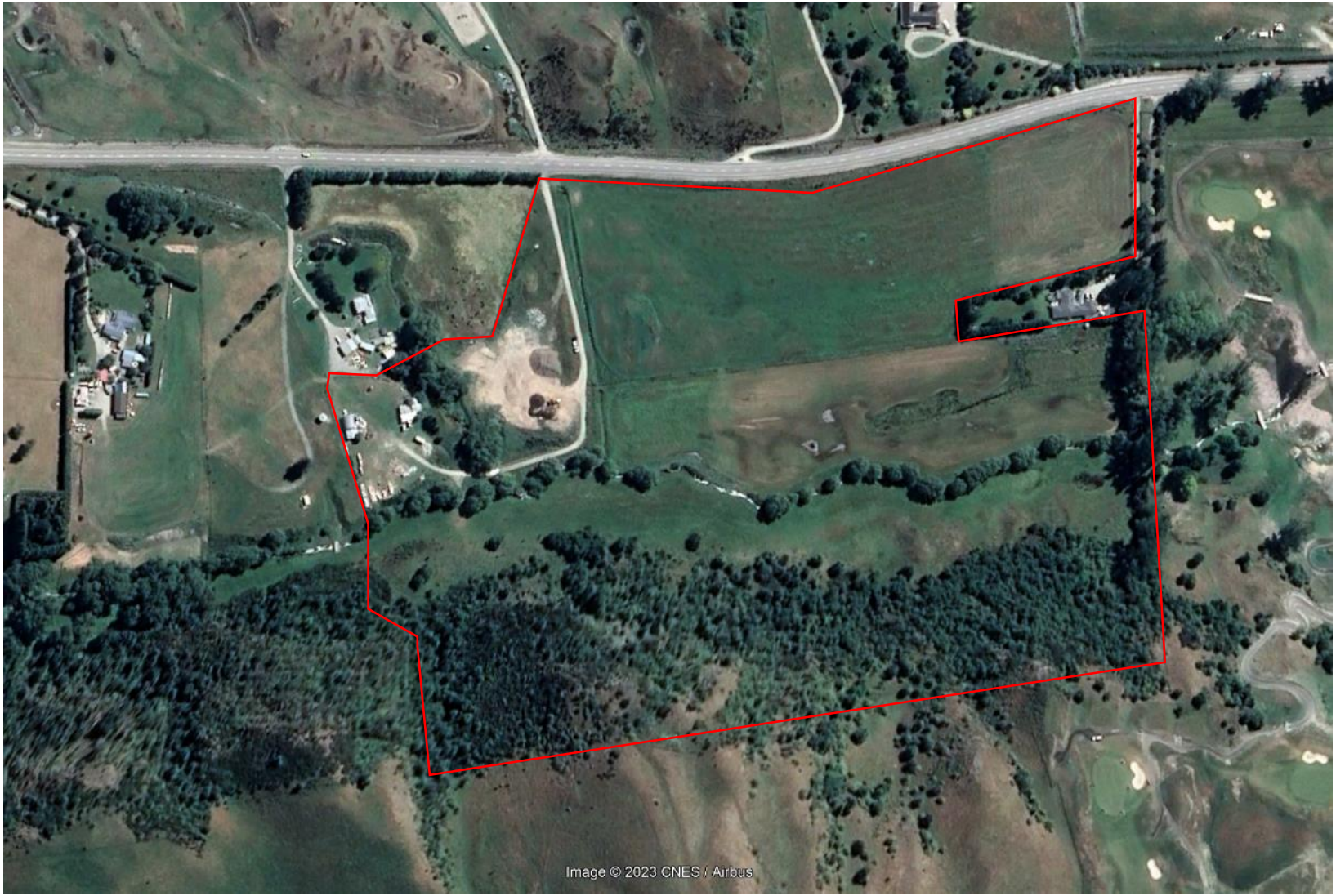
Approximate Site Location

2019

N

Approximate Site Location

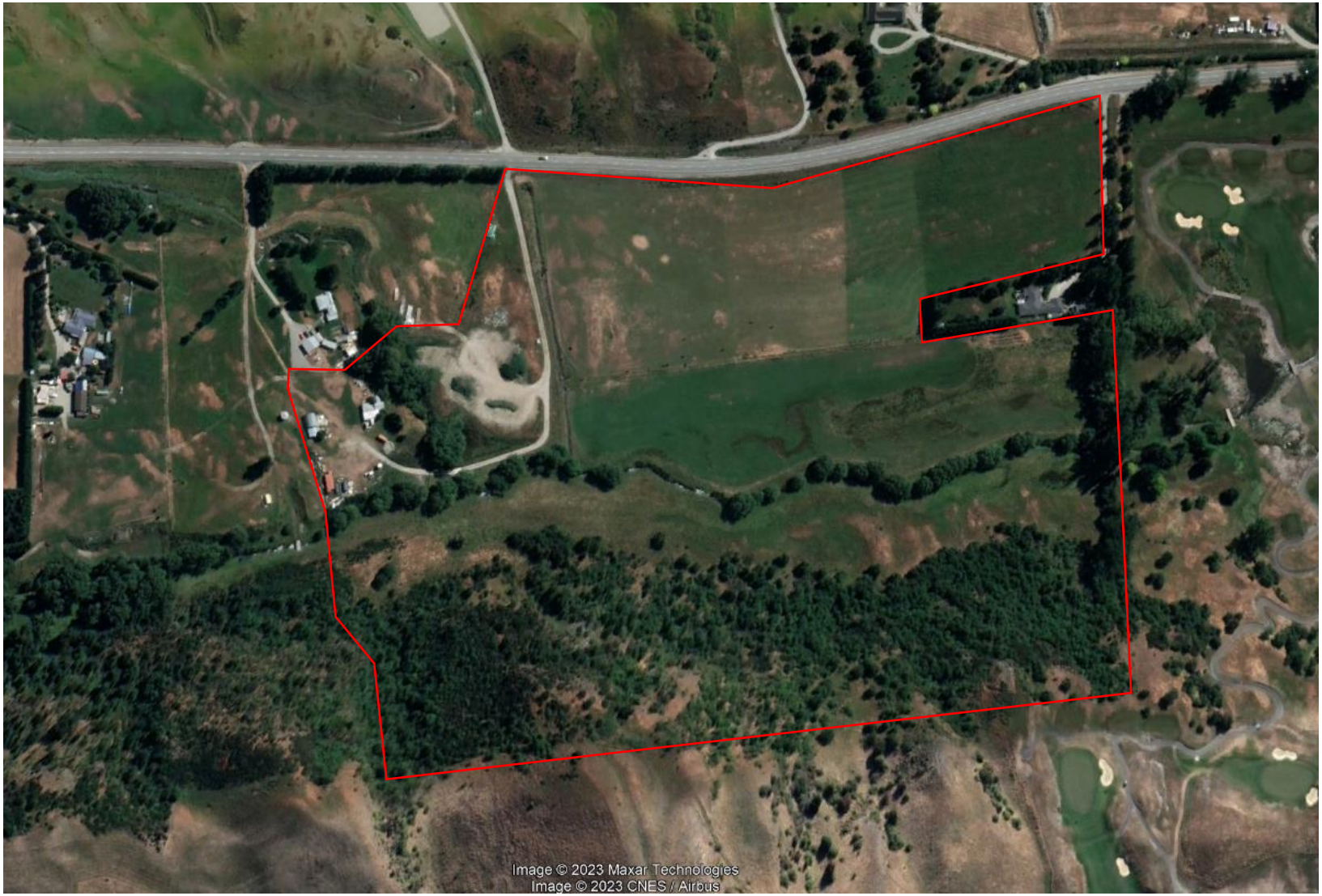
2021



N

Approximate Site Location

2022

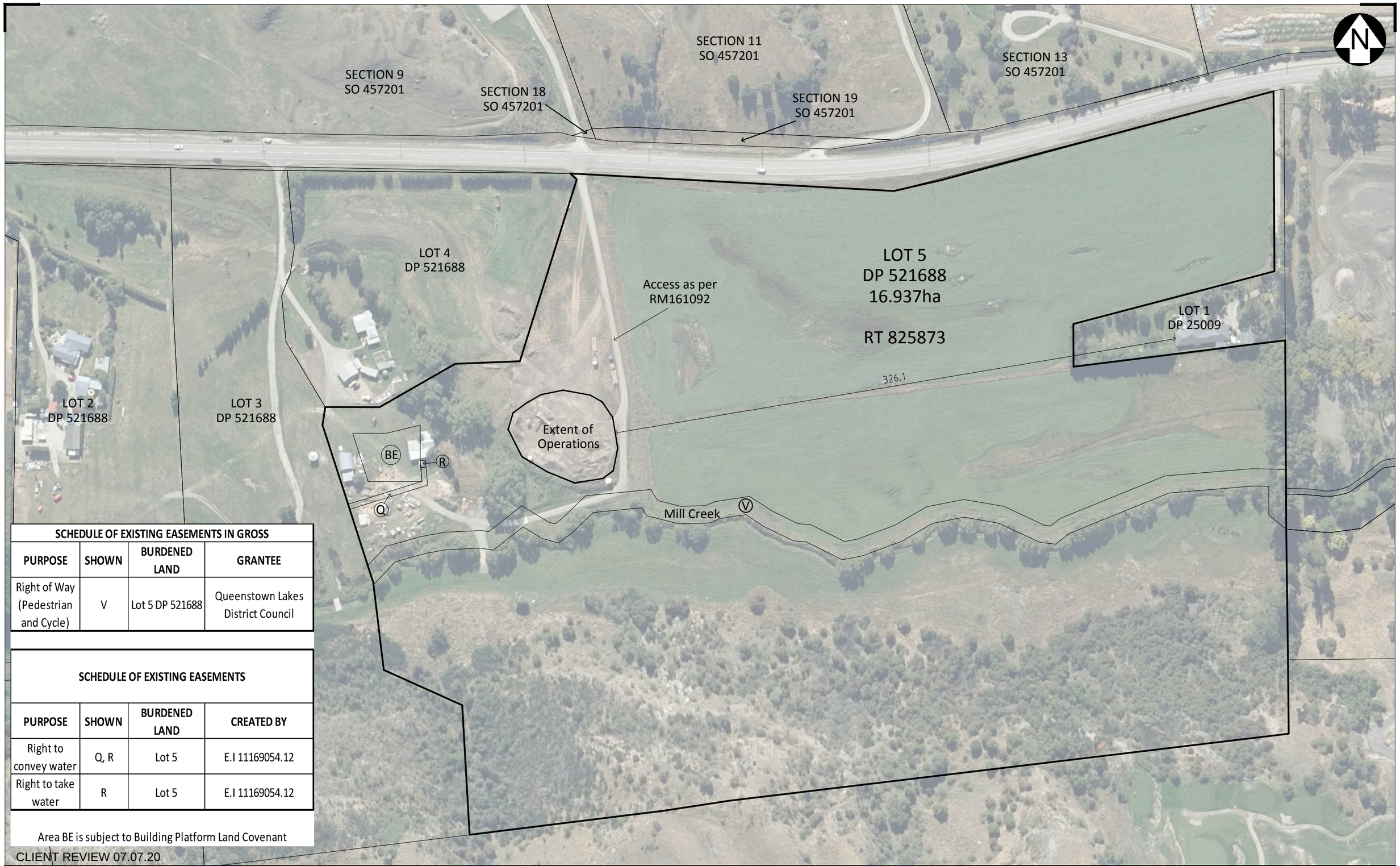


N

Approximate Site Location

Appendix B

Extent of previously proposed soil screening operations



SCHEDULE OF EXISTING EASEMENTS IN GROSS			
PURPOSE	SHOWN	BURDENED LAND	GRANTEE
Right of Way (Pedestrian and Cycle)	V	Lot 5 DP 521688	Queenstown Lakes District Council

SCHEDULE OF EXISTING EASEMENTS			
PURPOSE	SHOWN	BURDENED LAND	CREATED BY
Right to convey water	Q, R	Lot 5	E.I 11169054.12
Right to take water	R	Lot 5	E.I 11169054.12

Area BE is subject to Building Platform Land Covenant

CLIENT REVIEW 07.07.20

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Rev.	Date	Revision Details	By
-	-	-	-

832 MALAGHANS ROAD
SITE PLAN

Client: Base Contracting

Notes:
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Surveyed	Date	Checked	Job No.	Drawing No.
-	-	TO BE CHECKED	13668	- Sheet 001
Drawn	Date	Checked	Scale	
NT	07.07.20	TO BE CHECKED	1:1000 @ A1 1:2000 @ A3	
Designed	Date	Checked	Datum & Level	Rev.
-	-	TO BE CHECKED	NZGD2000 / MSL	-

S:\JOBS\13600\13668\acad\13668 832 Malaghans Road Site Plan.dwg Plotted: 16.09.2020

CLIENT REVIEW 07.07.20

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Rev.	Date	Revision Details	By
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832 MALAGHANS ROAD SITE PLAN

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Surveyed	Date	Checked	Job No.	Drawing No.
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NT	07.07.20	TO BE CHECKED	1:250 @ A1 1:500 @ A3	
Designed	**Date**	**Checked**	**Datum & Level**	**Rev.**
-	-	TO BE CHECKED	NZGD2000 / MSL	-

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Appendix C

Site photographs

PHOTOGRAPHIC LOG

Client Name	Site Location	Project No.
Ron Macrae	832 Malaghans Road, Queenstown	6-XZ760.00

Photo No.	Date
1	19/07/2023

Description

The site investigations took place on 15 June 2023 and 19 July 2023 by a WSP Environmental Engineer.

The site is accessed via a gravel driveway off Malaghans Road. Some hills with rocky outcrops can be seen south of the site.

Photo No.	Date
2	19/07/2023

Description

The eastern part of the site comprises vacant land, currently used for sheep grazing.

	PHOTOGRAPHIC LOG	
Client Name Ron Macrae	**Site Location** 832 Malaghans Road, Queenstown	**Project No.** 6-XZ760.00

Photo No.	**Date**
3	19/07/2023

Description

Picture shows the location of where the soil screening formerly took place.

A soil screening machine is noted on the ungrassed area south of the access road. No stockpiles or imported soils were noted at the time of the site visit.

Photo No.	**Date**
4	19/07/2023

Description

Some miscellaneous items are stored in the area including electrical equipment (power poles, insulators), wooden pallets and shipping containers.

	PHOTOGRAPHIC LOG

Client Name	**Site Location**	**Project No.**
Ron Macrae	832 Malaghans Road, Queenstown	6-XZ760.00

Photo No.	**Date**
5	19/07/2023

Description

The western part of the site has some general storage of material goods, such as shipping containers, a prefabricated coolstore, and construction material.

Photo No.	**Date**
6	19/07/2023

Description

A domed shed is noted with some old windows and hay bales stored inside.

	PHOTOGRAPHIC LOG	
Client Name Ron Macrae	**Site Location** 832 Malaghans Road, Queenstown	**Project No.** 6-XZ760.00

Photo No.	**Date**
7	19/07/2023

Description

A pole shed can be seen in the vicinity of the domed shed and seemed to be in a tidy condition.

Photo No.	**Date**
8	19/07/2023

Description

Some scrap metal is stored alongside the shed with some construction materials and a generator.

	PHOTOGRAPHIC LOG	
Client Name Ron Macrae	**Site Location** 832 Malaghans Road, Queenstown	**Project No.** 6-XZ760.00

Photo No.	Date
9	19/07/2023

Description

Several storage containers, construction material, water tanks, wooden pallets, etc can be seen along the southern part of the site.

Photo No.	Date
10	19/07/2023

Description

A creek runs along the gravel driveway, through the center of the site.

	PHOTOGRAPHIC LOG	
Client Name Ron Macrae	**Site Location** 832 Malaghans Road, Queenstown	**Project No.** 6-XZ760.00

Photo No.	Date
11	19/07/2023

Description

Samples were taken from near surface soils using a hand trowel. Samples were placed directly into laboratory supplied glass jars and sent to the laboratory under chain of custody for selected analysis. Soils were logged concurrently.

Photo No.	Date
12	19/07/2023

Description

Location of sample SS2 between two concrete beams along the western boundary.

	PHOTOGRAPHIC LOG

Client Name	**Site Location**	**Project No.**
Ron Macrae	832 Malaghans Road, Queenstown	6-XZ760.00

Photo No.	**Date**
13	19/07/2023

Description

Location of sample SS5 near the entrance of the pole shed in the western corner of the site.

Appendix D

Data Quality Objectives (DQO)

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. It is understood that historical activities may include activities associated with soil screening operations. In addition, fuel storage and an adjacent woolshed have been identified, which are activities described on the MfE Hazardous Activities and Industries List (HAIL). 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. Contaminants of concern include heavy metals. It is understood that the proposed works include subdivision of the site into two lots and subsequent residential development. Contaminant characteristics of the soil within a possible piece of land needs to be understood in order to identify possible risks to human health associated with ground disturbance and subdivision. The 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.
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? — 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 infrastructure. — 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 piece of land, as shown on Figure 6-1 and the location of the soil screening area along with the depth of exploration. — Temporal boundaries: the date of the project inception (June 2023) 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 and development of the area is desired, 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 (2023) and presented in this report. The data collection design that is expected to satisfy the DQOs is described in detail in Section 7.1 (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
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
Representativeness	
All required samples analysed	As per Section 7
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 E

Laboratory Reports and Chain of Custody (CoC)

ENVIRONMENTAL TESTING:

CHAIN OF CUSTODY

ANALYTICA LABORATORIES

CLIENT INFORMATION		Lab ID (Lab use only)	23-18179	Registered By	FH	Date Registered	16/6/23
Client	WSP						
Address	WSP, Level 1, 34 Grant Road, Queenstown 9300						
Project Leader	Josh Lamond						
Project ID	6-XZ760.00	PO Number					
Site	832 Malaghans Road						
Sampler	JL						
Phone	027 208 0636						
Email	josh.lamond@wsp.com						
Invoice Email	NZ.AP@wsp.com						

23-18179

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

TESTS REQUESTED

	Sample ID	Depth	Sampling Date	Time	Matrix (Please Circle)	Analysis Requests/Suites [Enter Test Code Below]					Sample Comments (ie: extra test requests, high odour, bulk material)
						8 HM.					
1	S01	0.1	15.6.23	11AM	S	✓					} Please composite S01 and S02
2	S02	0.1	"	11AM	S						
3	S03	0.1	"	11AM	S	✓					} Please composite S03 and S04
4	S04	0.1	"	11AM	S						
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											

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)	DR	Courier company	N2C	Courier #	JD000006903
Date Sent	15.6.23	Time sent	3:00 am/pm	Date Received	16/06/23	Time Received	8 am/pm	Seal Status	✓	Sample Chilled	✓

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Phone +64 7 974 4740
Email enviro.reception@analytica.co.nz
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CHAIN OF CUSTODY RECORD - NEW ZEALAND

Eurofins Environment Testing New Zealand NZBN 9429 04602 4954

☐ **Auckland Laboratory** 35 O'Rorke Road Penrose Auckland 1061 NZ 0800 856450 (free dial) EnviroSampleAKL@eurofins.com

☐ **Wellington Office** 85 Port Road Seaview Lower Hutt 5011 NZ 0800 856450 (free dial) EnviroSampleWLG@eurofins.com

☐ **Christchurch Laboratory** 43 Detroit Drive Rolleston 7675 NZ 0800 856450 (free dial) EnviroSampleCHC@eurofins.com

☐ **Melbourne Laboratory** 2 Kingston Town Close Oakleigh VIC 3166 AU +61 3 8564 5000 EnviroSampleVic@eurofins.com

Company	WSP	Project №	6-XZ760.00	Project Manager	Josh Lamond
Address	69 Tarbert St Alexandra 9320	Project Name	832 Maraghans Rd Variation 2	EDD Format ESdat, EQuIS etc	
Contact Name	Tara Verhulst				
Phone №	029020107 39				
Special Directions					
Purchase Order					
Quote ID №					

Sampler(s)	Tara
Handed over by	Tara
Email for Invoice	NZ.AP@WSP.COM
Email for Results	tara.verhulst@wsp.com

Analyses — Where multiple are requested, please specify "Total" or "Filtered". SUITE code must be used to filtered SUITE pricing

Containers — Change container type & size if necessary.

Required Turnaround Time — Default will be 5 days if not ticked. ♦Surcharge will apply

- ☐ 1 day♦
- ☐ 2 days♦
- ☐ 3 days♦
- ☒ 5 days (Standard)
- ☐ Other( )

№	Client Sample ID	Sampled Date/Time dd/mm/yy hh:mm	Matrix Solid (S) Water (W)	HM-8	TPH/PAH	OCP	500mL Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL Vial	500mL PFAS PET	Jar (Glass or HDPE)	Sample Comments / Dangerous Goods Hazard Warning
1	SS1	19/7/23	S	x										
2	SS2	"	S	x		x								
3	SS3	"	S	x	x									
4	SS4A	"	S	x										
5	SS4B	"	S	x										
6	SS5	"	S	x	x									
7	SS6	"	S	x	x									
8	SS7	"	S	x										#1009792
9	SS8	"	S	x										
10	SS9	"	S	x	-	-	-	-						
11	SS10	"	S	x										
	Total Counts													

Method of Shipment	☒ Courier (#)	☐ Hand Delivered	☐ Postal	Name	Tara Verhulst	Signature	Verhulst	Date	19/7/23	Time	15.45
Eurofins Laboratory Use Only	Received By	Orla Harris	AKL | WLG | (CHC) | MEL	Signature		Date	21.7.23	Time	12:40PM	Temperature	15.3
	Received By		AKL | WLG | CHC | MEL	Signature		Date		Time		Report №	

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Certificate of Analysis

WSP
WSP, Level 1, 34 Grant Road
Queenstown 9300

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

Sampling Site: 832 Malaghans Road

Lab Reference: 23-18179
Submitted by: JL
Date Received: 16/06/2023
Testing Initiated: 16/06/2023
Date Completed: 23/06/2023
Order Number:
Reference: 6-XZ760.00

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			Composite 1 (S01, S02)	Composite 2 (S03, S04)
Date Sampled				
Analyte	Unit	*Reporting Limit*	23-18179-5	23-18179-6
Arsenic	mg/kg dry wt	*0.125*	7.6	8.6
Cadmium	mg/kg dry wt	*0.005*	0.054	0.060
Chromium	mg/kg dry wt	*0.125*	12.9	17.5
Copper	mg/kg dry wt	*0.075*	7.88	10.2
Lead	mg/kg dry wt	*0.25*	12.1	12.0
Mercury	mg/kg dry wt	*0.025*	<0.025	0.035
Nickel	mg/kg dry wt	*0.05*	9.74	11.8
Zinc	mg/kg dry wt	*0.05*	46.3	50.1

Soil Composite

Client Sample ID			S01 0.1	S02 0.1	S03 0.1	S04 0.1
Date Sampled			15/06/2023	15/06/2023	15/06/2023	15/06/2023
Analyte	Unit	*Reporting Limit*	23-18179-1	23-18179-2	23-18179-3	23-18179-4
Soil - Composite prep - DS			Complete	Complete	Complete	Complete

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.
Soil Composite*	Analytica Laboratories is not accredited for the preparation of composite samples; however, the chemical analysis does hold IANZ accreditation. As composite analysis is conducted when requested by the sampler if they deem fit as per the NES guideline, the results of the chemical analyses still hold proper accreditation based on Analytica's methods.

Thara Samarasinghe, B.Sc.
Technician

Astra Southerwood,
Sample Preparation Team Leader

WSP New Zealand Limited
12 Moorhouse Avenue
Addington
Christchurch 8011

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Attention: **Tara Verhulst**

Report **1009792-S**
Project name 832 MALAGHANS RD VARIATION
Project ID 6-XZ760.00
Received Date Jul 21, 2023

Client Sample ID			**SS1**	**SS2**	**SS3**	**SS4A**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**Z23-Jl0044976**	**Z23-Jl0044977**	**Z23-Jl0044978**	**Z23-Jl0044979**
Date Sampled			**Jul 19, 2023**	**Jul 19, 2023**	**Jul 19, 2023**	**Jul 19, 2023**
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	13	7.9	10	6.9
Cadmium	0.01	mg/kg	0.04	0.03	0.02	0.06
Chromium	0.1	mg/kg	9.1	9.6	8.2	8.1
Copper	0.1	mg/kg	8.7	18	21	13
Lead	0.1	mg/kg	20	21	12	13
Mercury	0.01	mg/kg	0.01	0.02	< 0.01	0.04
Nickel	0.1	mg/kg	7.7	12	12	9.1
Zinc	5	mg/kg	60	58	49	58
Sample Properties						
% Moisture	1	%	24	8.8	11	22
Organochlorine Pesticides (NZ MfE)						
2.4'-DDD	0.01	mg/kg	-	< 0.01	-	-
2.4'-DDE	0.01	mg/kg	-	< 0.01	-	-
2.4'-DDT	0.01	mg/kg	-	< 0.01	-	-
4.4'-DDD	0.01	mg/kg	-	< 0.01	-	-
4.4'-DDE	0.01	mg/kg	-	< 0.01	-	-
4.4'-DDT	0.01	mg/kg	-	< 0.01	-	-
DDT + DDE + DDD (Total)*	0.01	mg/kg	-	< 0.01	-	-
a-HCH	0.01	mg/kg	-	< 0.01	-	-
Aldrin	0.01	mg/kg	-	< 0.01	-	-
b-HCH	0.01	mg/kg	-	< 0.01	-	-
Chlordanes - Total	0.01	mg/kg	-	< 0.01	-	-
cis-Chlordane	0.01	mg/kg	-	< 0.01	-	-
d-HCH	0.01	mg/kg	-	< 0.01	-	-
Dieldrin	0.01	mg/kg	-	< 0.01	-	-
Endosulfan I	0.01	mg/kg	-	< 0.01	-	-
Endosulfan II	0.01	mg/kg	-	< 0.01	-	-
Endosulfan sulphate	0.01	mg/kg	-	< 0.01	-	-
Endrin	0.01	mg/kg	-	< 0.01	-	-
Endrin aldehyde	0.01	mg/kg	-	< 0.01	-	-
Endrin ketone	0.01	mg/kg	-	< 0.01	-	-
g-HCH (Lindane)	0.01	mg/kg	-	< 0.01	-	-
Heptachlor	0.01	mg/kg	-	< 0.01	-	-
Heptachlor epoxide	0.01	mg/kg	-	< 0.01	-	-
Hexachlorobenzene	0.01	mg/kg	-	< 0.01	-	-

Client Sample ID			SS1	SS2	SS3	SS4A
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			Z23-JI0044976	Z23-JI0044977	Z23-JI0044978	Z23-JI0044979
Date Sampled			Jul 19, 2023	Jul 19, 2023	Jul 19, 2023	Jul 19, 2023
Test/Reference	LOR	Unit				
Organochlorine Pesticides (NZ MfE)						
Methoxychlor	0.01	mg/kg	-	< 0.01	-	-
Toxaphene	0.5	mg/kg	-	< 0.5	-	-
trans-Chlordane	0.01	mg/kg	-	< 0.01	-	-
Dibutylchlorendate (surr.)	1	%	-	108	-	-
Tetrachloro-m-xylene (surr.)	1	%	-	96	-	-
Total Petroleum Hydrocarbons (NZ MfE 1999)						
TPH-SG C7-C9	5	mg/kg	-	-	< 5	-
TPH-SG C10-C14	10	mg/kg	-	-	< 10	-
TPH-SG C15-C36	20	mg/kg	-	-	< 20	-
TPH-SG C7-C36 (Total)	35	mg/kg	-	-	< 35	-
Polycyclic Aromatic Hydrocarbons (NZ MfE)						
Acenaphthene	0.03	mg/kg	-	-	< 0.03	-
Acenaphthylene	0.03	mg/kg	-	-	< 0.03	-
Anthracene	0.03	mg/kg	-	-	< 0.03	-
Benz(a)anthracene	0.03	mg/kg	-	-	< 0.03	-
Benzo(a)pyrene	0.03	mg/kg	-	-	0.03	-
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	-	-	0.03	-
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	-	-	0.05	-
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	-	-	0.08	-
Benzo(b&j)fluoranthene[N07]	0.03	mg/kg	-	-	< 0.03	-
Benzo(g.h.i)perylene	0.03	mg/kg	-	-	< 0.03	-
Benzo(k)fluoranthene	0.03	mg/kg	-	-	< 0.03	-
Chrysene	0.03	mg/kg	-	-	< 0.03	-
Dibenz(a.h)anthracene	0.03	mg/kg	-	-	< 0.03	-
Fluoranthene	0.03	mg/kg	-	-	< 0.03	-
Fluorene	0.03	mg/kg	-	-	< 0.03	-
Indeno(1.2.3-cd)pyrene	0.03	mg/kg	-	-	< 0.03	-
Naphthalene	0.1	mg/kg	-	-	< 0.1	-
Phenanthrene	0.03	mg/kg	-	-	< 0.03	-
Pyrene	0.03	mg/kg	-	-	< 0.03	-
Total PAH*	0.1	mg/kg	-	-	< 0.1	-
p-Terphenyl-d14 (surr.)	1	%	-	-	95	-
2-Fluorobiphenyl (surr.)	1	%	-	-	97	-

Client Sample ID			SS4B	SS5	SS6	SS7
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			Z23-JI0044980	Z23-JI0044981	Z23-JI0044982	Z23-JI0044983
Date Sampled			Jul 19, 2023	Jul 19, 2023	Jul 19, 2023	Jul 19, 2023
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	0.1	mg/kg	7.9	6.7	9.0	4.9
Cadmium	0.01	mg/kg	0.02	2.2	0.02	0.05
Chromium	0.1	mg/kg	8.1	9.5	8.3	10
Copper	0.1	mg/kg	11	63	6.8	7.5
Lead	0.1	mg/kg	8.9	120	16	11
Mercury	0.01	mg/kg	0.05	0.04	0.04	0.02
Nickel	0.1	mg/kg	8.1	10	6.4	7.7
Zinc	5	mg/kg	32	950	41	35

Client Sample ID			SS4B	SS5	SS6	SS7
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			Z23-JI0044980	Z23-JI0044981	Z23-JI0044982	Z23-JI0044983
Date Sampled			Jul 19, 2023	Jul 19, 2023	Jul 19, 2023	Jul 19, 2023
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	9.5	53	21	12
Total Petroleum Hydrocarbons (NZ MfE 1999)						
TPH-SG C7-C9	5	mg/kg	-	< 5	< 5	-
TPH-SG C10-C14	10	mg/kg	-	< 10	< 10	-
TPH-SG C15-C36	20	mg/kg	-	1100	< 20	-
TPH-SG C7-C36 (Total)	35	mg/kg	-	1100	< 35	-
Polycyclic Aromatic Hydrocarbons (NZ MfE)						
Acenaphthene	0.03	mg/kg	-	< 0.03	< 0.03	-
Acenaphthylene	0.03	mg/kg	-	< 0.03	< 0.03	-
Anthracene	0.03	mg/kg	-	< 0.03	< 0.03	-
Benz(a)anthracene	0.03	mg/kg	-	0.04	0.05	-
Benzo(a)pyrene	0.03	mg/kg	-	0.07	0.03	-
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	-	0.09	0.04	-
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	-	0.11	0.06	-
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	-	0.12	0.08	-
Benzo(b&j)fluoranthene[N07]	0.03	mg/kg	-	< 0.03	< 0.03	-
Benzo(g.h.i)perylene	0.03	mg/kg	-	0.05	< 0.03	-
Benzo(k)fluoranthene	0.03	mg/kg	-	< 0.03	< 0.03	-
Chrysene	0.03	mg/kg	-	0.04	0.04	-
Dibenz(a.h)anthracene	0.03	mg/kg	-	< 0.03	< 0.03	-
Fluoranthene	0.03	mg/kg	-	0.03	< 0.03	-
Fluorene	0.03	mg/kg	-	< 0.03	< 0.03	-
Indeno(1.2.3-cd)pyrene	0.03	mg/kg	-	0.13	< 0.03	-
Naphthalene	0.1	mg/kg	-	< 0.1	< 0.1	-
Phenanthrene	0.03	mg/kg	-	< 0.03	< 0.03	-
Pyrene	0.03	mg/kg	-	< 0.03	< 0.03	-
Total PAH*	0.1	mg/kg	-	0.4	0.1	-
p-Terphenyl-d14 (surr.)	1	%	-	85	70	-
2-Fluorobiphenyl (surr.)	1	%	-	92	59	-

Client Sample ID			SS8	SS9	SS10
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			Z23-JI0044984	Z23-JI0044985	Z23-JI0044986
Date Sampled			Jul 19, 2023	Jul 19, 2023	Jul 19, 2023
Test/Reference	LOR	Unit			
Metals M8 (NZ MfE)					
Arsenic	0.1	mg/kg	5.1	12	8.7
Cadmium	0.01	mg/kg	0.04	0.10	0.12
Chromium	0.1	mg/kg	13	13	7.7
Copper	0.1	mg/kg	7.1	10	7.5
Lead	0.1	mg/kg	11	12	16
Mercury	0.01	mg/kg	0.03	0.01	0.01
Nickel	0.1	mg/kg	7.0	12	7.0
Zinc	5	mg/kg	34	59	44
Sample Properties					
% Moisture	1	%	14	17	20

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Metals M8 (NZ MfE)	Auckland	Jul 26, 2023	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Organochlorine Pesticides (NZ MfE)	Auckland	Jul 26, 2023	14 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water by GCMSMS			
Total Petroleum Hydrocarbons (NZ MfE 1999)	Auckland	Jul 26, 2023	14 Days
- Method: LTM-ORG-2010 TRH and BTEX in Soil and Water by GC FID and PT GCMS			
Polycyclic Aromatic Hydrocarbons (NZ MfE)	Auckland	Jul 26, 2023	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water by GC MSMS			
% Moisture	Auckland	Jul 21, 2023	14 Days
- Method: LTM-GEN-7080 Moisture Content in Soil by Gravimetry			

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email: EnviroSales@eurofins.com

Company Name: WSP New Zealand Limited - SI
Address: 12 Moorhouse Avenue
Addington
Christchurch 8011

Project Name: 832 MALAGHANS RD VARIATION
Project ID: 6-XZ760.00

Order No.: 6-XZ760.00
Report #: 1009792
Phone: 0011 64 4 471 7160
Fax:

Received: Jul 21, 2023 12:40 PM
Due: Jul 28, 2023
Priority: 5 Day
Contact Name: Tara Verhulst

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Organochlorine Pesticides (NZ MfE)	Metals M8 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327						X	X	X	X	X
Christchurch Laboratory - IANZ# 1290										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	SS1	Jul 19, 2023		Soil	Z23-Jl0044976	X			X	
2	SS2	Jul 19, 2023		Soil	Z23-Jl0044977	X		X	X	
3	SS3	Jul 19, 2023		Soil	Z23-Jl0044978	X	X		X	X
4	SS4A	Jul 19, 2023		Soil	Z23-Jl0044979	X			X	
5	SS4B	Jul 19, 2023		Soil	Z23-Jl0044980	X			X	
6	SS5	Jul 19, 2023		Soil	Z23-Jl0044981	X	X		X	X
7	SS6	Jul 19, 2023		Soil	Z23-Jl0044982	X	X		X	X
8	SS7	Jul 19, 2023		Soil	Z23-Jl0044983	X			X	
9	SS8	Jul 19, 2023		Soil	Z23-Jl0044984	X			X	
10	SS9	Jul 19, 2023		Soil	Z23-Jl0044985	X			X	
11	SS10	Jul 19, 2023		Soil	Z23-Jl0044986	X			X	
Test Counts						11	3	1	11	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**µg/L:** micrograms per litre
ppm: parts per million	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Metals M8 (NZ MfE)							
Arsenic	mg/kg	< 0.1			0.1	Pass	
Cadmium	mg/kg	< 0.01			0.01	Pass	
Chromium	mg/kg	< 0.1			0.1	Pass	
Copper	mg/kg	< 0.1			0.1	Pass	
Mercury	mg/kg	< 0.01			0.01	Pass	
Nickel	mg/kg	< 0.1			0.1	Pass	
Zinc	mg/kg	< 5			5	Pass	
Method Blank							
Organochlorine Pesticides (NZ MfE)							
2.4'-DDD	mg/kg	< 0.01			0.01	Pass	
2.4'-DDE	mg/kg	< 0.01			0.01	Pass	
2.4'-DDT	mg/kg	< 0.01			0.01	Pass	
4.4'-DDD	mg/kg	< 0.01			0.01	Pass	
4.4'-DDE	mg/kg	< 0.01			0.01	Pass	
4.4'-DDT	mg/kg	< 0.01			0.01	Pass	
a-HCH	mg/kg	< 0.01			0.01	Pass	
Aldrin	mg/kg	< 0.01			0.01	Pass	
b-HCH	mg/kg	< 0.01			0.01	Pass	
cis-Chlordane	mg/kg	< 0.01			0.01	Pass	
d-HCH	mg/kg	< 0.01			0.01	Pass	
Dieldrin	mg/kg	< 0.01			0.01	Pass	
Endosulfan I	mg/kg	< 0.01			0.01	Pass	
Endosulfan II	mg/kg	< 0.01			0.01	Pass	
Endosulfan sulphate	mg/kg	< 0.01			0.01	Pass	
Endrin	mg/kg	< 0.01			0.01	Pass	
Endrin aldehyde	mg/kg	< 0.01			0.01	Pass	
Endrin ketone	mg/kg	< 0.01			0.01	Pass	
g-HCH (Lindane)	mg/kg	< 0.01			0.01	Pass	
Heptachlor	mg/kg	< 0.01			0.01	Pass	
Heptachlor epoxide	mg/kg	< 0.01			0.01	Pass	
Hexachlorobenzene	mg/kg	< 0.01			0.01	Pass	
Methoxychlor	mg/kg	< 0.01			0.01	Pass	
Toxaphene	mg/kg	< 0.5			0.5	Pass	
trans-Chlordane	mg/kg	< 0.01			0.01	Pass	
Method Blank							
Total Petroleum Hydrocarbons (NZ MfE 1999)							
TPH-SG C7-C9	mg/kg	< 5			5	Pass	
TPH-SG C10-C14	mg/kg	< 10			10	Pass	
TPH-SG C15-C36	mg/kg	< 20			20	Pass	
TPH-SG C7-C36 (Total)	mg/kg	< 35			35	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons (NZ MfE)							
Acenaphthene	mg/kg	< 0.03			0.03	Pass	
Acenaphthylene	mg/kg	< 0.03			0.03	Pass	
Anthracene	mg/kg	< 0.03			0.03	Pass	
Benz(a)anthracene	mg/kg	< 0.03			0.03	Pass	
Benzo(a)pyrene	mg/kg	< 0.03			0.03	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.03			0.03	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.03			0.03	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chrysene	mg/kg	< 0.03			0.03	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.03			0.03	Pass	
Fluoranthene	mg/kg	< 0.03			0.03	Pass	
Fluorene	mg/kg	< 0.03			0.03	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.03			0.03	Pass	
Naphthalene	mg/kg	< 0.1			0.1	Pass	
Phenanthrene	mg/kg	< 0.03			0.03	Pass	
Pyrene	mg/kg	< 0.03			0.03	Pass	
LCS - % Recovery							
Metals M8 (NZ MfE)							
Arsenic	%	107			80-120	Pass	
Cadmium	%	107			80-120	Pass	
Chromium	%	108			80-120	Pass	
Copper	%	111			80-120	Pass	
Lead	%	112			80-120	Pass	
Mercury	%	119			80-120	Pass	
Nickel	%	109			80-120	Pass	
Zinc	%	116			80-120	Pass	
LCS - % Recovery							
Organochlorine Pesticides (NZ MfE)							
2.4'-DDD	%	118			70-130	Pass	
2.4'-DDE	%	120			70-130	Pass	
2.4'-DDT	%	111			70-130	Pass	
4.4'-DDD	%	97			70-130	Pass	
4.4'-DDT	%	90			70-130	Pass	
a-HCH	%	118			70-130	Pass	
Aldrin	%	125			70-130	Pass	
cis-Chlordane	%	102			70-130	Pass	
d-HCH	%	119			70-130	Pass	
Dieldrin	%	119			70-130	Pass	
Endosulfan I	%	120			70-130	Pass	
Endosulfan II	%	118			70-130	Pass	
Endosulfan sulphate	%	125			70-130	Pass	
Endrin	%	113			70-130	Pass	
Endrin aldehyde	%	77			70-130	Pass	
Endrin ketone	%	113			70-130	Pass	
g-HCH (Lindane)	%	108			70-130	Pass	
Heptachlor	%	109			70-130	Pass	
Heptachlor epoxide	%	104			70-130	Pass	
Methoxychlor	%	83			70-130	Pass	
Toxaphene	%	113			70-130	Pass	
trans-Chlordane	%	101			70-130	Pass	
LCS - % Recovery							
Total Petroleum Hydrocarbons (NZ MfE 1999)							
TPH-SG C7-C36 (Total)	%	119			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons (NZ MfE)							
Acenaphthene	%	110			70-130	Pass	
Acenaphthylene	%	114			70-130	Pass	
Anthracene	%	118			70-130	Pass	
Benz(a)anthracene	%	108			70-130	Pass	
Benzo(a)pyrene	%	114			70-130	Pass	
Benzo(b&j)fluoranthene	%	109			70-130	Pass	
Benzo(g.h.i)perylene	%	121			70-130	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(k)fluoranthene			%	123			70-130	Pass	
Chrysene			%	125			70-130	Pass	
Dibenz(a.h)anthracene			%	88			70-130	Pass	
Fluoranthene			%	122			70-130	Pass	
Fluorene			%	118			70-130	Pass	
Naphthalene			%	118			70-130	Pass	
Phenanthrene			%	114			70-130	Pass	
Pyrene			%	121			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Zinc	K23-JI0048309	NCP	%	95			75-125	Pass	
Spike - % Recovery									
Organochlorine Pesticides (NZ MfE)				Result 1					
Aldrin	Z23-JI0039074	NCP	%	117			70-130	Pass	
b-HCH	Z23-JI0039074	NCP	%	104			70-130	Pass	
Endosulfan I	Z23-JI0039074	NCP	%	121			70-130	Pass	
Endrin ketone	Z23-JI0039074	NCP	%	110			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides (NZ MfE)				Result 1					
2.4'-DDD	Z23-JI0044978	CP	%	117			70-130	Pass	
2.4'-DDE	Z23-JI0044978	CP	%	122			70-130	Pass	
2.4'-DDT	Z23-JI0044978	CP	%	121			70-130	Pass	
4.4'-DDD	Z23-JI0044978	CP	%	96			70-130	Pass	
4.4'-DDT	Z23-JI0044978	CP	%	84			70-130	Pass	
a-HCH	Z23-JI0044978	CP	%	114			70-130	Pass	
cis-Chlordane	Z23-JI0044978	CP	%	97			70-130	Pass	
d-HCH	Z23-JI0044978	CP	%	111			70-130	Pass	
Endosulfan II	Z23-JI0044978	CP	%	117			70-130	Pass	
Endosulfan sulphate	Z23-JI0044978	CP	%	116			70-130	Pass	
Endrin	Z23-JI0044978	CP	%	122			70-130	Pass	
Endrin aldehyde	Z23-JI0044978	CP	%	96			70-130	Pass	
g-HCH (Lindane)	Z23-JI0044978	CP	%	112			70-130	Pass	
Heptachlor	Z23-JI0044978	CP	%	111			70-130	Pass	
Heptachlor epoxide	Z23-JI0044978	CP	%	91			70-130	Pass	
Methoxychlor	Z23-JI0044978	CP	%	77			70-130	Pass	
trans-Chlordane	Z23-JI0044978	CP	%	96			70-130	Pass	
Spike - % Recovery									
Total Petroleum Hydrocarbons (NZ MfE 1999)				Result 1					
TPH-SG C7-C36 (Total)	K23-JI0046121	NCP	%	115			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1					
Acenaphthene	Z23-JI0044978	CP	%	106			70-130	Pass	
Acenaphthylene	Z23-JI0044978	CP	%	113			70-130	Pass	
Anthracene	Z23-JI0044978	CP	%	106			70-130	Pass	
Benz(a)anthracene	K23-JI0042401	NCP	%	107			70-130	Pass	
Benzo(g.h.i)perylene	Z23-JI0044978	CP	%	119			70-130	Pass	
Benzo(k)fluoranthene	Z23-JI0044978	CP	%	119			70-130	Pass	
Chrysene	Z23-JI0044978	CP	%	116			70-130	Pass	
Dibenz(a.h)anthracene	K23-JI0042401	NCP	%	122			70-130	Pass	
Fluoranthene	Z23-JI0044978	CP	%	111			70-130	Pass	
Fluorene	Z23-JI0044978	CP	%	108			70-130	Pass	
Indeno(1.2.3-cd)pyrene	K23-JI0042401	NCP	%	118			70-130	Pass	
Naphthalene	Z23-JI0044978	CP	%	112			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Phenanthrene	Z23-JI0044978	CP	%	108			70-130	Pass	
Pyrene	Z23-JI0044978	CP	%	110			70-130	Pass	
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	Z23-JI0044981	CP	%	93			75-125	Pass	
Cadmium	Z23-JI0044981	CP	%	93			75-125	Pass	
Chromium	Z23-JI0044981	CP	%	93			75-125	Pass	
Copper	Z23-JI0044981	CP	%	102			75-125	Pass	
Lead	Z23-JI0044981	CP	%	117			75-125	Pass	
Mercury	Z23-JI0044981	CP	%	105			75-125	Pass	
Nickel	Z23-JI0044981	CP	%	92			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Organochlorine Pesticides (NZ MfE)				Result 1	Result 2	RPD			
2.4'-DDD	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
2.4'-DDE	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
2.4'-DDT	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDD	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDE	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
4.4'-DDT	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
a-HCH	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Aldrin	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
b-HCH	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
cis-Chlordane	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
d-HCH	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Dieldrin	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan I	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan II	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endosulfan sulphate	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin aldehyde	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Endrin ketone	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
g-HCH (Lindane)	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Heptachlor	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Heptachlor epoxide	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Hexachlorobenzene	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Methoxychlor	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Toxaphene	Z23-JI0044977	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-Chlordane	Z23-JI0044977	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1	Result 2	RPD			
Acenaphthene	Z23-JI0044977	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Acenaphthylene	Z23-JI0044977	CP	mg/kg	0.23	0.05	130	30%	Fail	Q15
Anthracene	Z23-JI0044977	CP	mg/kg	0.35	< 0.03	180	30%	Fail	Q15
Benz(a)anthracene	Z23-JI0044977	CP	mg/kg	0.29	0.10	96	30%	Fail	Q15
Benzo(k)fluoranthene	Z23-JI0044977	CP	mg/kg	0.21	0.11	62	30%	Fail	Q15
Chrysene	Z23-JI0044977	CP	mg/kg	0.25	0.09	95	30%	Fail	Q15
Dibenz(a.h)anthracene	Z23-JI0044977	CP	mg/kg	0.17	< 0.03	180	30%	Fail	Q15
Fluoranthene	Z23-JI0044977	CP	mg/kg	0.32	0.11	96	30%	Fail	Q15
Fluorene	Z23-JI0044977	CP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	Z23-JI0044977	CP	mg/kg	0.86	0.06	170	30%	Fail	Q02
Naphthalene	Z23-JI0044977	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Phenanthrene	Z23-JI0044977	CP	mg/kg	0.29	0.14	68	30%	Fail	Q15
Pyrene	Z23-JI0044977	CP	mg/kg	0.31	0.09	110	30%	Fail	Q15

Duplicate									
Total Petroleum Hydrocarbons (NZ MfE 1999)				Result 1	Result 2	RPD			
TPH-SG C7-C9	K23-JI0046120	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
TPH-SG C10-C14	K23-JI0046120	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
TPH-SG C15-C36	K23-JI0046120	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TPH-SG C7-C36 (Total)	K23-JI0046120	NCP	mg/kg	< 35	< 35	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1	Result 2	RPD			
Acenaphthene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Acenaphthylene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Anthracene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benz(a)anthracene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(a)pyrene	K23-JI0042400	NCP	mg/kg	0.03	0.04	13	30%	Pass	
Benzo(b&j)fluoranthene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(g.h.i)perylene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Benzo(k)fluoranthene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Chrysene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Dibenz(a.h)anthracene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Fluoranthene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Fluorene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Naphthalene	K23-JI0042400	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Phenanthrene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Pyrene	K23-JI0042400	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass	
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	Z23-JI0044980	CP	mg/kg	7.9	5.6	33	30%	Fail	Q02
Cadmium	Z23-JI0044980	CP	mg/kg	0.02	0.02	8.7	30%	Pass	
Chromium	Z23-JI0044980	CP	mg/kg	8.1	6.1	28	30%	Pass	
Copper	Z23-JI0044980	CP	mg/kg	11	9.3	20	30%	Pass	
Lead	Z23-JI0044980	CP	mg/kg	8.9	7.3	19	30%	Pass	
Mercury	Z23-JI0044980	CP	mg/kg	0.05	0.03	49	30%	Fail	Q15
Nickel	Z23-JI0044980	CP	mg/kg	8.1	6.6	21	30%	Pass	
Zinc	Z23-JI0044980	CP	mg/kg	32	28	14	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	Z23-JI0044980	CP	%	9.5	11	14	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q02	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Swati Oberoi	Analytical Services Manager
Raymond Siu	Senior Analyst-Metal
Raymond Siu	Senior Analyst-Organic

Raymond Siu
Senior Instrument Chemist (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates IANZ accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

wsp.com/nz

BEALE CONSULTANTS

Memorandum

Subject: Wetland Delineation – 832 Malaghans Road

To: Annemarie Townsley, Planner, John Edmonds & Associates

From: Simon Beale, Senior Ecologist, Beale Consultants Limited

Date: 28 November 2023

1 INTRODUCTION

1.1 Beale Consultants has been engaged by John Edmonds & Associates to determine the presence and extent of inland natural wetlands on the property at 832 Malaghans Road.

1.2 A site inspection of the property was conducted by Beale Consultants on 22 November 2023.

1.3 The National Policy Statement for Freshwater Management (NPS-FM 2020, amended 2023) defines 'natural inland wetland' as outlined below:

> ***Natural inland wetland*** *– a wetland (as defined in the Act) that is not:*
> *(a) in the coastal marine area; or*
> *(b) a deliberately constructed wetland, other than a wetland constructed to offset impacts on, or to restore, an existing or former natural inland wetland; or*
> *(c) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body; or*
> *(d) a geothermal wetland; or*
> *(e) a wetland that:*
> *(i) is within an area of pasture used for grazing; and*
> *(ii) has vegetation cover comprising more than 50% exotic pasture species (as identified in the National List of Exotic Pasture Species using the Pasture Exclusion Assessment Methodology (see clause 1.8)); unless*
> *(iii) the wetland is a location of a habitat of a threatened species identified under clause 3.8 of this National Policy Statement, in which case the exclusion in (e) does not apply.*

1.4 To confirm a natural inland wetland under the NPS-FM, wetland delineation protocols are required to be followed.

2 WETLAND DELINEATION PROTOCOLS

2.1 Wetland delineation protocols have been developed for delineating wetlands under the RMA 1991and NPS-FM 2020, particularly when the exclusions as stated above do not apply.

2.2 Wetland delineation follows two main steps as outlined on the flow chart provided as Attachment 1. The procedure involves assessing hydrophytic (wetland) vegetation, hydric soils and wetland hydrological characteristics.

2.3 Wetland Delineation Data Forms should be completed to identify hydrophytic vegetation and if necessary presence of hydric soils and wetland hydrology indicators.

2.4 Step 1 involves a rapid test for vegetation that can be conducted off site. Step 2 requires the application of a vegetation tool involving a dominance test and a prevalence index to determine the degree to which the vegetation being sampled is hydrophytic (wetland vegetation) or not. If both the dominance test and the prevalence index are satisfied for the sampled area can be

categorised as a natural inland wetland. See flow chart provided as Attachment 1. The hydric soils and hydrology tools are applied if the vegetation tool test yields uncertain results such as one of the hydrophytic tests not being met.

2.5 The protocol classifies all plant species recorded in wetlands into five categories.

- OBL: Obligate. Almost always is a hydrophyte, rarely in uplands (estimated probability >99% occurrence in wetlands).
- FACW: Facultative Wetland. Usually is a hydrophyte but occasionally found in uplands (estimated probability 67-99% occurrence in wetlands).
- FAC: Facultative. Commonly occurs as either a hydrophyte or non-hydrophyte (estimate probability 34-66% occurrence in wetlands).
- FACU: Facultative Upland. Occasionally is a hydrophyte but usually occurs in uplands (estimated probability 1-33% occurrence in wetlands).
- UPL: Obligate Upland. Rarely is a hydrophyte, almost always in uplands (estimated probability <1% occurrence in wetlands).

Species that are classed as OBL, FACW, or FAC are considered hydrophytic and indicative of wetland habitat.

2.6 For the dominant test to be satisfied over 50% of the sampled plants must be OBL, FACW or FAC. For the prevalence index test, a plot-based algorithm derived from the combination of OBL, FACW, FAC, FACU and UPL plants and their cover is calculated. The vegetation is hydrophytic (wetland) if PI ≤ 3.0, but values around 3.0 can also be considered wetlands when other wetland indicators indicate wetland presence.

3 METHODOLOGY

3.1 A desktop review of recent high resolution aerial photography allowed an off-site Step 1 Rapid Test of the protocol to be performed. This enabled potential wetlands on the property to be identified to a reasonable degree of accuracy based on the presence of rushland and sedgeland which generally contain a dominance of Oligate and Facultative wetland species.

3.2 An on-site inspection was conducted on site to confirm the rapid test results. Stage 2 of the protocol was implemented to provide more precision around the extent of the wetlands in the vicinity of the proposed driveway.

3.3 This exercise involved the placement of a 2 m x 2m plot within herb (grass) stratum in the potential wetlands. The location of the plots is indicated on the aerial provided as Attachment 2. Wetland delineation data forms were completed for each plot and the Step 2 dominance and prevalent index tests performed. The completed forms are provided in Attachment 2.

4 RESULTS

4.1 The vegetation dominance test and prevalence index scores provided on the data forms indicate that a narrow natural inland wetland exists to the west of the driveway in the vicinity of Mill Creek while land immediately to the east of the driveway does not quality as a wetland.

4.2 The vegetation cover recorded in the plots 1 and 2 was dominated by wetland facultative and facultative species such as soft rush (*Juncus effuses*), oval sedge (*Carex leporina*) and the grass Yorkshire fog (*Holcus lanatus*). The vegetation in Plots 3, 4, 5, 6 and 7 comprised of a more extensive cover of exotic grasses such as prairie grass (*Bromus catharticus*), browntop (*Agrostis capillaris*) and sweet vernal (*Anthoxanthum odoratum*) and failed the hydrophyte (wetland plant) dominance and prevalence index tests. The land where plots 3 to 7 are located and where the route of the proposed driveway passes through is therefore not part of any nearby wetland.

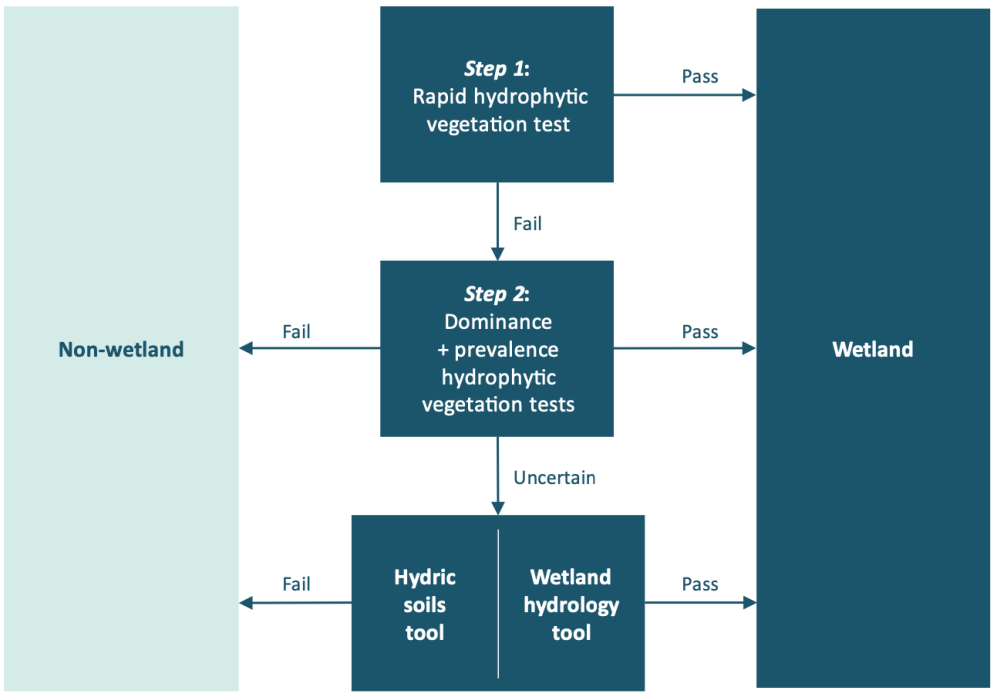
4.3 The location and extent of the wetlands confirmed during the site walkover and through the application of Stage 2 of the wetland delineation protocol is marked on the aerial provided as Attachment 3.

5 CONCLUSIONS

5.1 Inland natural wetlands occur within the property at 832 Malaghans Road in the general vicinity of Mill Creek. These have been identified and defined using Steps 1 and 2 of the MfE Wetland delineation protocol.

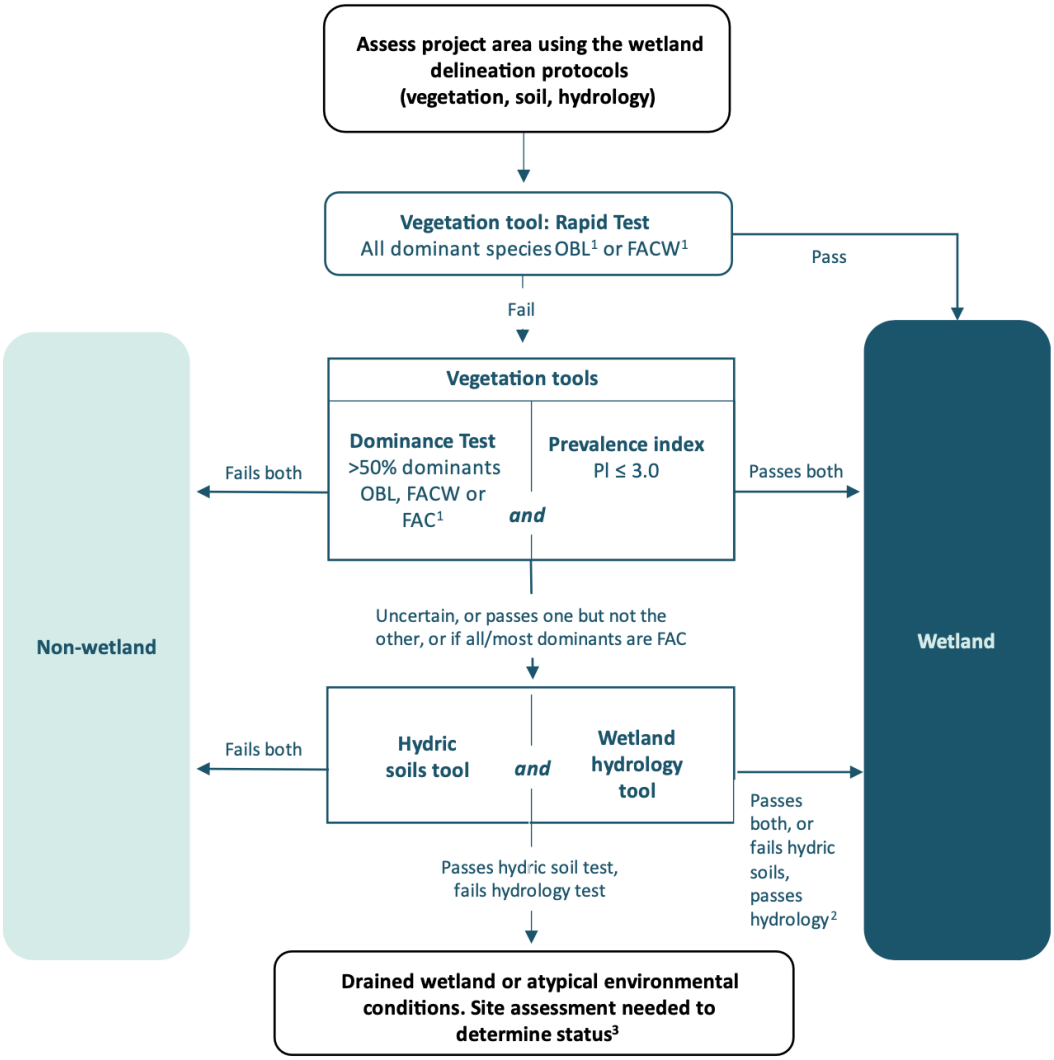
5.2 The route of the proposed driveway does not pass through any natural inland wetlands.

ATTACHMENT 1 – WETLAND DETERMINATION



Source: Ministry for the Environment (MfE), 2022

HYDROGRAPHIC VEGETATION DETERMINATION



Footnotes:
[1] Wetland indicator status abbreviations: FAC = facultative, FACW = facultative wetland, OBL = obligate wetland.
[2] For example, recent wetland.
[3] The US procedures for atypical or problematic situations are recommended.

Source: Ministry for the Environment (MfE), 2022

ATTACHMENT 2 – DELINEATION DATA FORMS

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: 832 Malaghans Road | Region: Otago | Sampling point/ID: 1

Owner/address: | Date: 22 - 11 - 2023 | Land use: Rural

Landform: Floodplain | Local relief: Concave | Land cover: Grassland

Is the land drained? YES ___ NO ✓ UNKNOWN ___ | Investigator(s): S Beale | Slope°: < 5°

GPS (NZTM): | Altitude m: 420 | Photo Nos:

Are climatic/hydrologic conditions on the site typical for this time of year? YES ✓ NO ___ (if NO explain in Remarks)

Are Vegetation ___ Soil ___ or Hydrology ___ significantly disturbed? | Are 'Normal Circumstances' present? YES ✓ NO ___

Are Vegetation ___ Soil ___ or Hydrology ___ naturally problematic? | Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☑

Hydrophytic vegetation present? YES ☑ NO ☐

Hydric soils present? YES ☐ NO ☐

Wetland hydrology present? YES ☐ NO ☐

Is the sampled area within a wetland? YES ☑ NO ☐

SECTION B – VEGETATION

Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
Tree Stratum (Plot size:)				
1.				
2.				
3.				
4.				
Total tree cover (TT) =		50%	20%	
Sapling/Shrub Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
Total sapling/shrub cover (TS) =		50%	20%	
Herb Stratum (Plot size:)				
1. Juncus effusus	5%		FACW	
2. Carex leporina	10%		FACW	
3. Carex cariacea	10%		FACW	
4. Rumex crispus	15%	Yes	FAC	
5. Stellaria graminea	5%		FAC	
6. Holcus lanatus	15%	Yes	FAC	
7. Agrostis capillaris	5%		FACU	
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) = 65%		50%	20%	
Balance Litter			Total (P) =	
Total Vegetation Cover (TVC): TT+TS+TH = 65%		50%		

Pasture Exclusion Test:

Pasture cover/Total vegetation cover (P/TVC) x100 = ___ % N/A

☐ Rapid Pasture Test

☐ Pasture Exclusion Test is >50%

Dominance Test:

No. Dominant Spp. OBL/FACW/FAC (A) 2

Tot. Dominant Spp. across strata (B) 2

% OBL/FACW/FAC (A/B) 100

Prevalence Index:

Total % cover of:		Multiply by:	
OBL		x 1 =	
FACW	25%	x 2 =	50
FAC	35%	x 3 =	105
FACU	5%	x 4 =	20
UPL		x 5 =	
Total	65 (A)		175 (B)

Prevalence Index (B/A) = 2.69

Hydrophytic vegetation indicators:

☐ Rapid Test

☑ Dominance Test is >50%

☑ Prevalence Index is ≤3.0[1]

☐ Morphological adaptations[1] (supporting data in Remarks)

☐ Problematic hydrophytic vegetation[1]

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present?

YES ☑ NO ☐ UNCERTAIN ☐

Remarks:

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: 832 Molaghans Road | Region: Otago | Sampling point/ID: 2

Owner/address: | Date: 22-11-2023 | Land use: Rural

Landform: Floodplain | Local relief: Concave | Land cover: Grassland

Is the land drained? YES___NO___UNKNOWN___ | Investigator(s): S Beale | Slope*: < 5°

GPS (NZTM): | Altitude m: 420 | Photo Nos:

Are climatic/hydrologic conditions on the site typical for this time of year? YES___NO___ (If NO explain in Remarks)

Are Vegetation___Soil___or Hydrology___ significantly disturbed? | Are 'Normal Circumstances' present? YES___NO___

Are Vegetation___Soil___or Hydrology___ naturally problematic? | Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☑

Hydrophytic vegetation present? YES ☑ NO ☐

Hydric soils present? YES ☐ NO ☐

Wetland hydrology present? YES ☐ NO ☐

Is the sampled area within a wetland? YES ☑ NO ☐

SECTION B – VEGETATION

Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
Tree Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
Total tree cover (TT) =		50%___	20%___	
Sapling/Shrub Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
5.				
Total sapling/shrub cover (TS) =		50%___	20%___	
Herb Stratum (Plot size:_____)				
1. Juncus effusus	10%	Yes	FACW	
2. Carex leporina	10%	Yes	FACW	
3. Rumex crispus	5%		FAC	
4. Holcus lanatus	45%	Yes	FAC	
5. Agrostis capillaris	20%	Yes	FACU	
6. TP. Folium repens	5%		FACU	
7. Lotus pedunculatus	5%		FAC	
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) =	100%	50%___	20%___	
			Total (P) =	
Total Vegetation Cover (TVC): TT+TS+TH =	100%	50%___		

Pasture Exclusion Test:

Pasture cover/Total vegetation cover (P/TVC) x100 = ____% N/A

☐ Rapid Pasture Test

☐ Pasture Exclusion Test is >50%

Dominance Test:

No. Dominant Spp. OBL/FACW/FAC (A) 3

Tot. Dominant Spp. across strata (B) 4

% OBL/FACW/FAC (A/B) 75%

Prevalence Index:

Total % cover of:		Multiply by:	
OBL		x1 =	
FACW	20%	x2 =	40
FAC	55%	x3 =	165
FACU	25%	x4 =	100
UPL		x5 =	
Total	100% (A)		305 (B)

Prevalence Index (B/A) = 3.05

Hydrophytic vegetation indicators:

☐ Rapid Test

☑ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological adaptations[1] (supporting data in Remarks)

☐ Problematic hydrophytic vegetation[1]

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? YES ☑ NO ☐ UNCERTAIN ☐

Remarks:

Considered to be wetland due to dominance of FACW + FAC species.

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: 832 Molyneux Road | Region: Otago | Sampling point/ID: 3

Owner/address: | Date: 22-11-2023 | Land use: Rural

Landform: Floodplain | Local relief: Flat | Land cover: Grassland

Is the land drained? YES ___ NO ✓ UNKNOWN ___ | Investigator(s): S Beale | Slope°: <5°

GPS (NZTM): | Altitude m: 420 | Photo Nos:

Are climatic/hydrologic conditions on the site typical for this time of year? YES ✓ NO ___ (if NO explain in Remarks)

Are Vegetation ___ Soil ___ or Hydrology ___ significantly disturbed? | Are 'Normal Circumstances' present? YES ✓ NO ___

Are Vegetation ___ Soil ___ or Hydrology ___ naturally problematic? | Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ✓

Hydrophytic vegetation present? YES ☐ NO ✓

Hydric soils present? YES ☐ NO ☐

Wetland hydrology present? YES ☐ NO ☐

Is the sampled area within a wetland? YES ☐ NO ✓

SECTION B – VEGETATION

Use scientific names of plants. Tree Stratum (Plot size:_____)	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
1.				
2.				
3.				
4.				
Total tree cover (TT) =		50%	20%	
Sapling/Shrub Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
5.				
Total sapling/shrub cover (TS) =		50%	20%	
Herb Stratum (Plot size:_____)				
1. Holcus lanatus	30%	Yes	FAC	
2. Agrostis capillaris	50%	Yes	FACU	
3. T. folium repens	15%	Yes	FACU	
4. Cirsium Arvense	<5%		FACU	
5. Achillea millefolium	<5%		FACU	
6. Stellaria graminea	<5%		FAC	
7. Lotus pedunculatus	<5%		FAC	
8. Plantago major	<5%		FACU	
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) = 120%		50%	20%	
			Total (P) =	
Total Vegetation Cover (TVC): TT+TS+TH = 120%		50%		

Pasture Exclusion Test:

Pasture cover/Total vegetation cover (P/TVC) x100 = ____% N/A

☐ Rapid Pasture Test

☐ Pasture Exclusion Test is >50%

Dominance Test:

No. Dominant Spp. OBL/FACW/FAC (A) 1

Tot. Dominant Spp. across strata (B) 3

% OBL/FACW/FAC (A/B) 50%

Prevalence Index:

Total % cover of:	Multiply by:
OBL	x1 =
FACW	x2 =
FAC 40	x3 = 120
FACU 80	x4 = 320
UPL	x5 =
Total 120 (A)	440 (B)

Prevalence Index (B/A) = 3.67

Hydrophytic vegetation indicators:

☐ Rapid Test

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological adaptations[1] (supporting data in Remarks)

☐ Problematic hydrophytic vegetation[1]

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? YES ☐ NO ✓ UNCERTAIN ☐

Remarks:

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: 832 Maraghan Road | Region: Otago | Sampling point/ID: 4

Owner/address: | Date: 22-11-2023 | Land use: Rural

Landform: Floodplain | Local relief: Concave | Land cover: Grass land

Is the land drained? YES___NO___UNKNOWN___ | Investigator(s): S Beale | Slope°: < 5°

GPS (NZTM): | Altitude m: 420 | Photo Nos:

Are climatic/hydrologic conditions on the site typical for this time of year? YES___NO___ (if NO explain in Remarks)

Are Vegetation___Soil___or Hydrology___ significantly disturbed? | Are 'Normal Circumstances' present? YES___NO___

Are Vegetation___Soil___or Hydrology___ naturally problematic? | Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☐

Hydrophytic vegetation present? YES ☐ NO ☑

Hydric soils present? YES ☐ NO ☐

Wetland hydrology present? YES ☐ NO ☐

Is the sampled area within a wetland? YES ☐ NO ☑

SECTION B – VEGETATION

Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
Tree Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
Total tree cover (TT) =		50%___	20%___	
Sapling/Shrub Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
5.				
Total sapling/shrub cover (TS) =		50%___	20%___	
Herb Stratum (Plot size:_____)				
1. Bromus cathartes	50%	Yes	UPL	
2. Anthoxanthum odoratum	20%	Yes	FACU	
3. Holcus lanatus	10%	Yes	FAC	
4. Festuca rubra	5%		FACU	
5. Lotus pedunculatus	5%		FAC	
6. Rumex crispus	<5%		FAC	
7. Rumex obtusifolius	<5%		FAC	
8. Ranunculus repens	<5%		FAC	
9. Stellaria graminea	<5%		FAC	
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) =	110%	50%___	20%___	
			Total (P) =	
Total Vegetation Cover (TVC): TT+TS+TH =	110%	50%___		

Pasture Exclusion Test:

Pasture cover/Total vegetation cover (P/TVC) x100 = _____%

☐ Rapid Pasture Test N/A

☐ Pasture Exclusion Test is >50%

Dominance Test:

No. Dominant Spp. OBL/FACW/FAC (A) 1

Tot. Dominant Spp. across strata (B) 3

% OBL/FACW/FAC (A/B) 33%

Prevalence Index:

Total % cover of:		Multiply by:	
OBL		x1 =	
FACW		x2 =	
FAC	35%	x3 =	105
FACU	25%	x4 =	100
UPL	50%	x5 =	250
Total	110 (A)		455 (B)

Prevalence Index (B/A) = 4.14

Hydrophytic vegetation indicators:

☐ Rapid Test

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological adaptations[1] (supporting data in Remarks)

☐ Problematic hydrophytic vegetation[1]

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present?

YES ☐ NO ☑ UNCERTAIN ☐

Remarks:

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: 232 Malaghans Road | Region: Otago | Sampling point/ID: 5

Owner/address: | Date: 22-11-2023 | Land use: Rural

Landform: Floodplain | Local relief: Concave | Land cover: Grassland

Is the land drained? YES ___ NO ✓ UNKNOWN ___ | Investigator(s): S Beale | Slope°: < 5°

GPS (NZTM): | Altitude m: 420 | Photo Nos:

Are climatic/hydrologic conditions on the site typical for this time of year? YES ✓ NO ___ (If NO explain in Remarks)

Are Vegetation ___ Soil ___ or Hydrology ___ significantly disturbed? | Are 'Normal Circumstances' present? YES ✓ NO ___

Are Vegetation ___ Soil ___ or Hydrology ___ naturally problematic? | Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☑

Hydrophytic vegetation present? YES ☐ NO ☑

Hydric soils present? YES ☐ NO ☐

Wetland hydrology present? YES ☐ NO ☐

Is the sampled area within a wetland? YES ☐ NO ☑

SECTION B – VEGETATION

Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
Tree Stratum (Plot size:)				
1.				
2.				
3.				
4.				
Total tree cover (TT) =		50%	20%	
Sapling/Shrub Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
Total sapling/shrub cover (TS) =		50%	20%	
Herb Stratum (Plot size:)				
1. Juncus effusus	30 %	Yes	FACW	
2. Bromus catharticus	30 %	Yes	UPL	
3. Agrostis capillaris	15 %	Yes	FACU	
4. Ranunculus repens	5 %		FAC	
5. Rumex crispus	5 %		FAC	
6. Lotus pedunculatus	< 5 %		FAC	
7. Carex leporina	< 5 %		FACW	
8. Holcus lanatum	< 5 %		FACU	
9. Stellaria graminea	< 5 %		FAC	
10. Leontodon saxatilis	< 5 %		FAC	
11. Taraxacum officinale	< 5 %		FACU	
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) =	115 %	50%	20%	
			Total (P) =	
Total Vegetation Cover (TVC): TT+TS+TH =	115 %	50%		

Pasture Exclusion Test:
Pasture cover/Total vegetation cover (P/TVC) x100 = ___ % N/A
☐ Rapid Pasture Test
☐ Pasture Exclusion Test is >50%

Dominance Test:
No. Dominant Spp. OBL/FACW/FAC (A) 1
Tot. Dominant Spp. across strata (B) 3
% OBL/FACW/FAC (A/B) 33 %

Prevalence Index:

Total % cover of:		Multiply by:	
OBL		x 1 =	
FACW	35 %	x 2 =	70
FAC	25 %	x 3 =	75
FACU	25 %	x 4 =	100
UPL	30 %	x 5 =	150
Total	115 %	(A)	(B)

Prevalence Index (B/A) = 3.14 %

Hydrophytic vegetation indicators:
☐ Rapid Test
☒ Dominance Test is >50%
☒ Prevalence Index is ≤3.0[1]
☐ Morphological adaptations[1] (supporting data in Remarks)
☐ Problematic hydrophytic vegetation[1]
Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present?
YES ☐ NO ☑ UNCERTAIN ☐

Remarks:

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: 832 Malaghans Road | Region: Otago | Sampling point/ID: 6

Owner/address: | Date: 22-11-2023 | Land use: Rural

Landform: Floodplain | Local relief: Concave | Land cover: Grassland

Is the land drained? YES__NO__UNKNOWN__ | Investigator(s): S Beale | Slope°: < 5°

GPS (NZTM): | Altitude m: 420 | Photo Nos:

Are climatic/hydrologic conditions on the site typical for this time of year? YES ✓ NO__ (if NO explain in Remarks)

Are Vegetation__Soil__or Hydrology__ significantly disturbed? | Are 'Normal Circumstances' present? YES ✓ NO__

Are Vegetation__Soil__or Hydrology__ naturally problematic? | Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☐

Hydrophytic vegetation present? YES ☐ NO ☑

Hydric soils present? YES ☐ NO ☐

Wetland hydrology present? YES ☐ NO ☐

Is the sampled area within a wetland? YES ☐ NO ☑

SECTION B – VEGETATION

Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
Tree Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
Total tree cover (TT) =		50%_____	20%_____	
Sapling/Shrub Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
5.				
Total sapling/shrub cover (TS) =		50%_____	20%_____	
Herb Stratum (Plot size:_____)				
1. Bromus catharticus	30%	Yes	UPL	
2. Agrostis capillaris	25%	Yes	FACW	
3. Carex lepirina	<5%		FACW	
4. Ranunculus repens	<5%		FAC	
5. Trifolium repens	10%	Yes	FACU	
6. Lotus pedunculatus	10%	Yes	FAC	
7. Leontodon saxatilis	<5%		FAC	
8. Rumex acetosa	<5%		FACU	
9. Cerastium fontanum	<5%		FACU	
10. Anthoxanthum odoratum	15%	Yes	FACU	
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) =		50%_____	20%_____	
			Total (P) =	
Total Vegetation Cover (TVC): TT+TS+TH =		50%_____		

Pasture Exclusion Test:
Pasture cover/Total vegetation cover (P/TVC) x100 = _____%
☐ Rapid Pasture Test
☐ Pasture Exclusion Test is >50%

Dominance Test:
No. Dominant Spp. OBL/FACW/FAC (A) 1
Tot. Dominant Spp. across strata (B) 4
% OBL/FACW/FAC (A/B) 25%

Prevalence Index:

Total % cover of:		Multiply by:	
OBL		x1 =	
FACW	5%	x2 =	10
FAC	20%	x3 =	60
FACU	65%	x4 =	260
UPL	30%	x5 =	150
Total	115% (A)		480 (B)

Prevalence Index (B/A) = 4.0

Hydrophytic vegetation indicators:
☐ Rapid Test
☒ Dominance Test is >50%
☒ Prevalence Index is ≤3.0[1]
☐ Morphological adaptations[1] (supporting data in Remarks)
☐ Problematic hydrophytic vegetation[1]
Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present?
YES ☐ NO ☑ UNCERTAIN ☐

Remarks:

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: 832 Malaghans Road | Region: Otago | Sampling point/ID: 7

Owner/address: | Date: 22-11-2023 | Land use: Rural

Landform: Flood plain | Local relief: Concave | Land cover: Grassland

Is the land drained? YES__ NO✓ UNKNOWN__ | Investigator(s): S Beale | Slope°: < 5°

GPS (NZTM): | Altitude m: 420 | Photo Nos:

Are climatic/hydrologic conditions on the site typical for this time of year? YES✓ NO__ (if NO explain in Remarks)

Are Vegetation__ Soil__ or Hydrology__ significantly disturbed? | Are 'Normal Circumstances' present? YES✓ NO__

Are Vegetation__ Soil__ or Hydrology__ naturally problematic? | Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☑

Hydrophytic vegetation present? YES ☐ NO ☑

Hydric soils present? YES ☐ NO ☐

Wetland hydrology present? YES ☐ NO ☐

Is the sampled area within a wetland? YES ☐ NO ☑

SECTION B – VEGETATION

Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
Tree Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
Total tree cover (TT) =		50%__	20%__	
Sapling/Shrub Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
5.				
Total sapling/shrub cover (TS) =		50%__	20%__	
Herb Stratum (Plot size:_____)				
1. Carex laporina	20 %	Yes	FACW	
2. Anthoxanthum odoratum	30 %	Yes	FACU	
3. Agrostis capillaris	30 %	Yes	FACU	
4. Trifolium repens	5 %		FAC	
5. Holcus lanatus	5 %		FAC	
6. Festuca rubra	10 %		FACU	
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) =	100 %	50%__	20%__	
			Total (P) =	
Total Vegetation Cover (TVC): TT+TS+TH =	100 %	50%__		

Pasture Exclusion Test:

Pasture cover/Total vegetation cover (P/TVC) x100 = ____% N/A

☐ Rapid Pasture Test

☐ Pasture Exclusion Test is >50%

Dominance Test:

No. Dominant Spp. OBL/FACW/FAC (A) 1

Tot. Dominant Spp. across strata (B) 3

% OBL/FACW/FAC (A/B) 33 %

Prevalence Index:

Total % cover of:		Multiply by:	
OBL		x1 =	
FACW	20 %	x2 =	60
FAC	10 %	x3 =	30
FACU	70 %	x4 =	280
UPL		x5 =	
Total	100 (A)		370 (B)

Prevalence Index (B/A) = 3.7

Hydrophytic vegetation indicators:

☐ Rapid Test

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological adaptations[1] (supporting data in Remarks)

☐ Problematic hydrophytic vegetation[1]

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? YES ☐ NO ☑ UNCERTAIN ☐

Remarks:

ATTACHMENT 3 – NATURAL INLAND WETLAND LOCATIONS AND EXTENTS