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LANDPRO

Draft Construction Environmental Management Plan for Parkburn Subdivision

Prepared for Fulton Hogan Land Development Ltd



Project Name:	**Parkburn Subdivision Bulk Earthworks CEMP**
Client:	Fulton Hogan Land Development Limited
Document Name	Draft Construction Environmental Management Plan
Date:	29 October 2026
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Job Number:	26007
Version:	Draft

Revision:	A	**Date:**	19/6/2026	**Status:**	Draft
Description:	Draft for FTAA substantive application				
Revision:	B	**Date:**	2/10/2026	**Status:**	Draft
Description:	Revisions following feedback from ORC peer review				
Revision:		**Date:**		**Status:**	
Description:					

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1. Introduction

Fulton Hogan Land Development Ltd (the applicant; FHLD) is seeking to undertake subdivision and use of land for urban development as part of rehabilitation of the existing Parkburn Quarry. Key components of the project include:

- A staged subdivision to provide for approximately 1,000 residential lots/units, together with a local commercial centre, a potential primary school site, and reserve areas.
- Associated bulk earthworks, landscaping and infrastructure development, including the construction of new roads and two intersections with State Highway 6 (SH6).
- The formation of two coves extending into Lake Dunstan/Te Wairere/Te Wairere.
- Restoration works along the margins of the Park Burn and Lake Dunstan/Te Wairere.

FHLD has engaged Landpro Ltd to prepare this Construction Environmental Management Plan (CEMP) to mitigate potential adverse effects on the environment from the proposed bulk earthworks and associated disturbance. For the purposes of this document and its appendices, CEMP and 'Environmental Management Plan' (EMP) are interchangeable and refer to the same overarching environmental management document.

This CEMP has been prepared generally in accordance with the following guidelines:

- Otago Regional Council's 'Residential Earthworks in Otago' 2023 (ORC Guidelines), and
- Auckland Council's 'Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region' 2023 (GD05)

This document recognises and has regard to Lake Dunstan/Te Wairere as a Statutory Acknowledgment Area under the Nagi Tahu Claims Act 1998 and seeks to ensure the water quality of Lake Dunstan/Te Wairere and areas of interest are protected and not degraded. To this end we are aware that FHLD has been consulting with Kā Rūnaka and has proposed consent conditions to protect the water quality of Te Wairere.

This document has been prepared in support of a fast track substantive application for subdivision and development at the site, and is to be treated as a live document that must be implemented and updated for the duration of the earthworks activities.

1.1 Author experience

This CEMP has been authored by Will Nicolson, a Principal Environmental Consultant and Planner at Landpro Ltd. Will holds a BAppSc in Environmental Management, is a certified Environmental Practitioner (CEnvP), an Associate member of the New Zealand Planning Institute, and a Practitioner of the Institute of Sustainability and Environmental Professionals.

Over the past 15 years, Will has undertaken a wide range of environmental management-related work for a variety of clients, with a particular focus on erosion and sediment control (ESC) and EMPs. Will has developed, implemented and audited EMPs on large, complex projects in New Zealand, Canada and the UK.

Will meets the prerequisites for constituting a Suitably Qualified and Experienced Professional/Person/Practitioner (SQEP) in relation to the creation and implementation of this CEMP. In Will's role as author of this report, he confirms that he has read and complies with the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023.

2. Project details

Project location: Parkburn Quarry, 922 Luggate-Cromwell Road. Approximately 8 km northwest of Cromwell township. The site location in relation to Cromwell is shown in Figure 1, below.

The property encompasses a total of approximately 118 ha, with the proposed ground disturbance area encompassing virtually all of this area, plus a small area of Crown Land.



Figure 1: General site location (Source: GRIP)

Project duration: As the project is pending necessary approvals required prior to tendering and programming the works, the duration is unknown at this stage. However, given the size of the development, earthworks will be ongoing for several years as the developer iteratively releases the various subdivision stages.

The existing general site layout is shown in Figure 2.



Figure 2: General site layout, at time of writing (source: Insight Engineering)

2.1 Project description

The proposed development consists of the following construction elements:

- Formation of allotments, totalling 987 lots divided over 15 stages that will progress from south to north (Figure 3);
- Roading network, including pedestrian/cycle paths;
- Drainage and utility reticulation throughout the development, including construction of a wastewater pump station;
- Associated earthworks; and
- Associated landscaping and restoration works, including weed removal and revegetation works along the margins of Lake Dunstan/Te Wairere and the Park Burn (Figure 4).

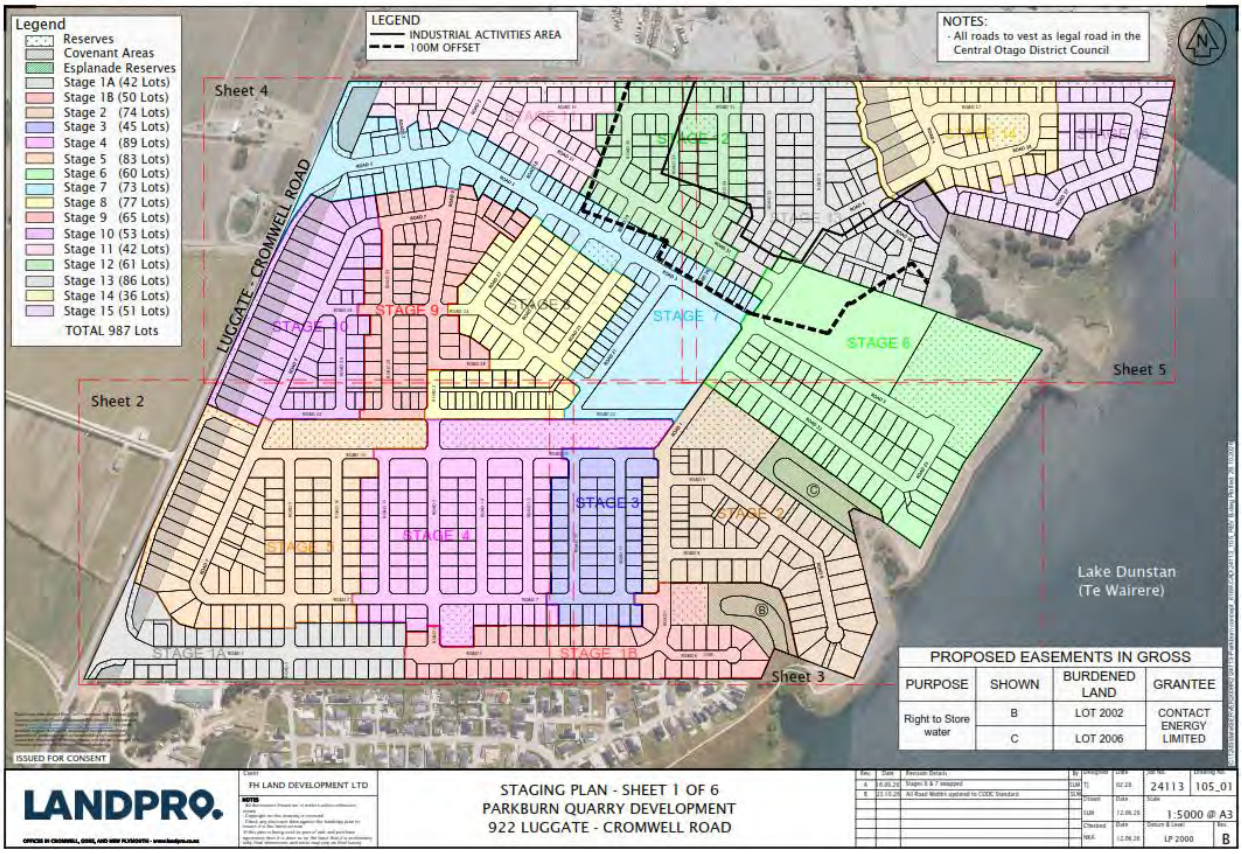


Figure 3: Development staging plan



Figure 4: Proposed instream / water margin works.

2.1 Earthworks

Table 1, below, provides a summary of proposed earthworks details associated with the development. As the design develops, these areas and volumes may be subject to change.

Table 1: Cut and fill values associated with bulk earthworks within the site. Note: existing onsite pea gravel cut and fill volumes are excluded; all volumes are solid measure

Area	1	2	3	4	5	6	7	8	9	R1	R2	**Total**
Cut (m^3)	39,400	287,300	187,700	971,400	49,400	25,200	60,500	134,100	48,200	7,600	448,700	**2,259,500**
Fill (m^3)	1,186,900	454,900	644,800	-	600	-	-	-	48,200	532,500	448,700	**1,029,400**
Area of disturbed ground (ha)	17.6	15.4	20.1	20.8	9.7	2.4	5.7	5.3	3.6	9.0	8.2	**117.8**

In addition to the above, the applicant is proposing approximately 2.2 ha of earthworks within Crown Land, within and adjacent to Lake Dunstan/Te Wairere, along with works within and adjacent to the Park Burn.

The maximum cut depth is 12.3 m, within Area 4, while the maximum fill height is 14.6 m, towards the southwest corner of the site in Area 1. Refer to the Bulk Earthworks Staging Plans, provided in Appendix A, for further details.

Topography varies across the site, with some of the site composed of active quarry or former quarrying, some of the site composed of flat to gently-sloping undisturbed grassland, along with smaller areas of sloped river and lake margins.

As the site is directly adjacent to the lake, the general natural slope is in an easterly to southeasterly direction from the state highway to the lake margin. As the design contour plan below shows, post-development design grades will continue this gentle east to southeast grade towards the lake, with the addition of a large drainage swale towards the middle of the development, and minor recontouring works in the Park Burn stream corridor.

To achieve the design contours shown in Figure 5, significant quantities of fill are to be relocated from the higher, currently unquarried sections of the site (roughly the northwestern quarter of the site) to the lower, quarried sections of the site (the southern and eastern portions)(Figure 6).

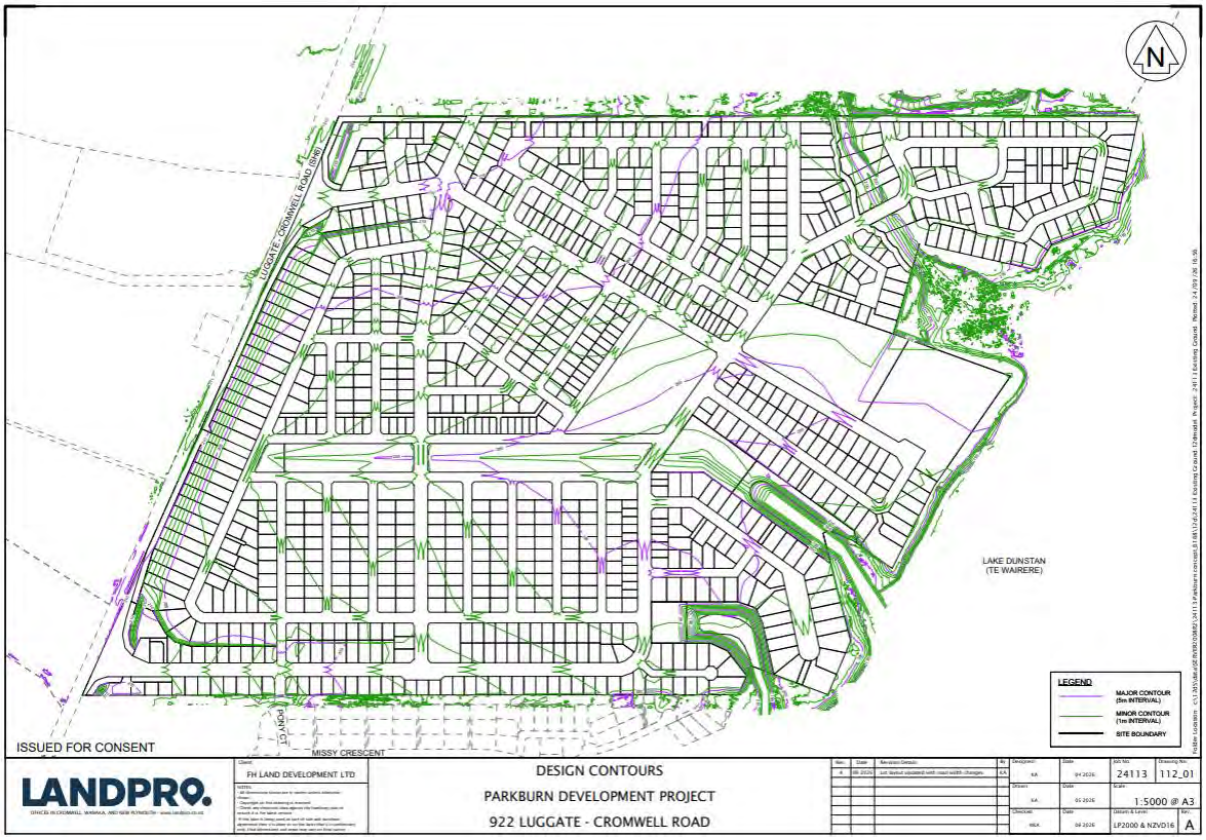


Figure 5: Project design contours

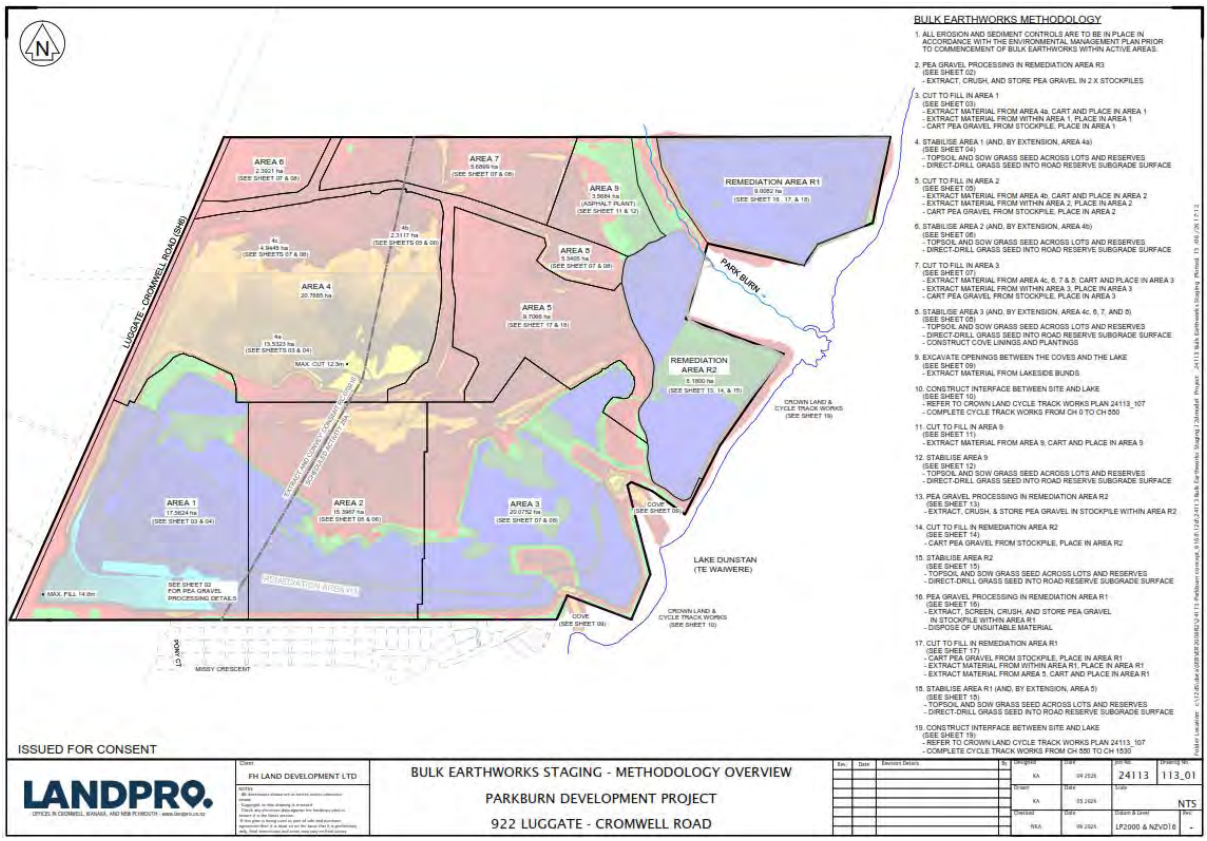


Figure 6: Bulk earthworks staging plan - overview

Much of the available fill from within the property consists of pea gravels, which will be crushed and compacted onsite to provide certified fill for the development. This will occur as part of the ongoing, existing consented quarry works.

Topsoil will also be stockpiled and reused following achievement of design grades, however as much of the site has already been quarried, additional topsoil may need to be imported from offsite to ensure adequate stabilisation of earthworked areas.

Note that larger copies of all project plans, including detailed area-specific cut and fill plans, are provided in Appendix A.

2.2 Construction sequencing

Given the size and scale of the works, the bulk earthworks have been broken up into several areas, with some areas further divided into smaller sub-areas. While detailed construction sequencing is still being finalised, it is likely that two stages will be simultaneously earthworked, with one providing the fill material required to infill the other. For example, Area 4a will be excavated to provide fill for Area 1. Once these areas have reached design grade, they will be stabilised, and the bulk earthworks will move onto the next area.

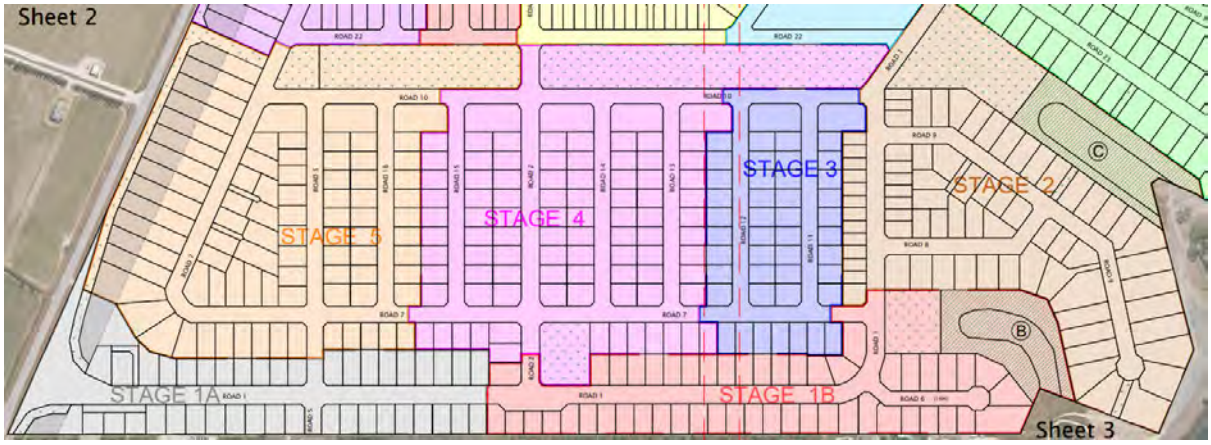
This staging has been proposed in order to minimise the environmental risk posed by disturbing large areas of ground simultaneously, which can lead to significant detrimental erosion, sedimentation, and dust-related effects in particular.

Prior to works within each earthworks area commencing, perimeter ESCs (including stabilised access, where required) will first be installed, followed by the remaining ESCs. As earthworks progress, ESCs for the next bulk earthworks area will be prepared, with stabilisation of the earlier area(s) timed such that there is only a very short period within which any multiple stages are exposed at the same time.

Infiltration basins (IBs) will be constructed in key locations, to detain sediment-laden runoff and encourage infiltration of runoff through the native gravels.

Where present, topsoil will be stripped and stockpiled in appropriate locations for later reuse. Vegetation removals other than grass are likely to be negligible, with any small mulch stockpiles to be situated adjacent to (but separate from) topsoil stockpiles. An exception to this will be the cycleway works, which will be predominantly within Crown Land, both adjacent to and (occasionally) over Lake Dunstan/Te Wairere. Where larger vegetation (such as exotic trees, including willows) is scheduled for removal as part of the works, it will also be mulched and stockpiled separately for onsite reuse in ESC or landscaping.

Following vegetation clearance and topsoil stripping, bulk earthworks within designated cut and full areas will commence, succeeded by topsoiling and vegetation of lots. For earthworks within the southernmost areas, civils works will follow a different order to the bulk earthworks (due to other infrastructure constraints), as per the below indicative plan:



Where an area has been bulk earthworked to design grades, lots and reserves will be topsoiled and seeded, while road reserves will be direct-drilled to establish grass cover and stabilise these areas in the interim. When ready, the contractor will then return to these areas to install the services and then seal roads and footpaths. An exception to this is where a sub-area is to have services installed immediately post-bulk earthworks – such as in the case of Stage 1A above. In this instance, services will be installed and roads and footpaths sealed immediately following.

As final grades are achieved, exposed areas will be successively topsoiled and seeded to stabilise exposed soil and prevent erosion. Where grass establishment is not practical or possible (particularly during the winter), temporary stabilisation will consist of hay mulch or polymer. Hay mulch may also be used to assist in the grass establishment process.

Site access will be via the existing sealed road off State Highway 6.

2.3 Hours of operation

It is expected that hours of operation will be stipulated in the consents being sought, however anticipated hours are as follows:

- Monday to Friday: 7:00 AM to 6:00 PM
- Saturday: 7:30 AM to 5:30 PM
- Sundays and public holidays: No activity

Note that no heavy vehicles are to enter or exit the site prior to 8:00 AM or after 6:00 PM.

2.4 Nearby sensitive receptors

2.4.1 Natural receptors

The key sensitive receptor in relation to the project is Lake Dunstan/Te Wairere, which forms the full eastern boundary of the site (Figure 7). Additionally, the Park Burn flows through the northeast section of the site, ultimately discharging to Lake Dunstan/Te Wairere as shown in the below figure.

Lake Dunstan/Te Wairere is a Statutory Acknowledgment Area and is of significant cultural significance to Kāi Tahu whānui. Approximately 7km to the south of the site is the Nohoanga entitlement at McNulty Inlet.

As can be seen in Figure 8, the generalised overland flow path for the site is to the southeast, directly to the lake. Runoff beyond the western side of the property (including SH6) tends to flow away from the site, in a southwest direction.



Figure 7: Sensitive environmental receptors within/adjacent to the development area (source: GRIP)



Figure 8: Generalised direction of overland flow in relation to sensitive receptors (source: GRIP)

Lake Dunstan/Te Wairere is a man-made lake formed by damming the Clutha River/Mata-au above the township of Clyde. Land Air Water Aotearoa (LAWA) lists the current lake water quality as Good, with a trophic level index of 2.1. Lake Dunstan/Te Wairere is an important recreation feature for the region, with popular

activities including boating, swimming and fishing. Further, Lake Dunstan/Te Wairere is of cultural significance to local Iwi. Any uncontrolled discharge from the site must be treated as a potential contaminant in the lake, therefore extra care must be taken to intercept and treat all dirty runoff prior to discharging to the lake.

The Park Burn has a catchment of approximately 2,000 hectares, draining the eastern face of the Pisa Range. While there are a number of consented water takes from the creek, it is understood that the creek naturally reverts to subsurface flows in its lower reach for much of the year. While this means that the creek bed within and adjacent to the site will likely be dry for most of the year, any discharges from the site to the creek should always be monitored to ensure they meet the relevant discharge standards.

2.4.2 Anthropogenic receptors

The below figure provides a summary of potentially sensitive anthropogenic receptors adjacent to the site.



Figure 9: Key anthropogenic receptors adjacent to the site (source: Google Earth; Koordinates)

As can be seen, the residential area of Pisa Moorings is directly to the south, along with a fruit packhouse (CentralPac Ltd), cherry orchard, and workers' accommodation. On the western side of SH6 is predominantly vineyards, while to

the north is another active quarry (also potentially subject to future subdivision by another developer).

The western Lake Dunstan/Te Wairere cycle trail runs through the eastern margin of the site, between the applicant's property and the lake.

2.5 EMP risk level

The project is considered to be **High Risk** under the ORC Guidelines, for the following reasons:

- Large-scale, complex project with multiple stages;
- Close proximity to sensitive receptors, including Lake Dunstan/Te Wairere, the Park Burn, and residential receptors directly to the south; and
- Potential for adverse effects on ecological, cultural and recreational values.

2.6 Site overview

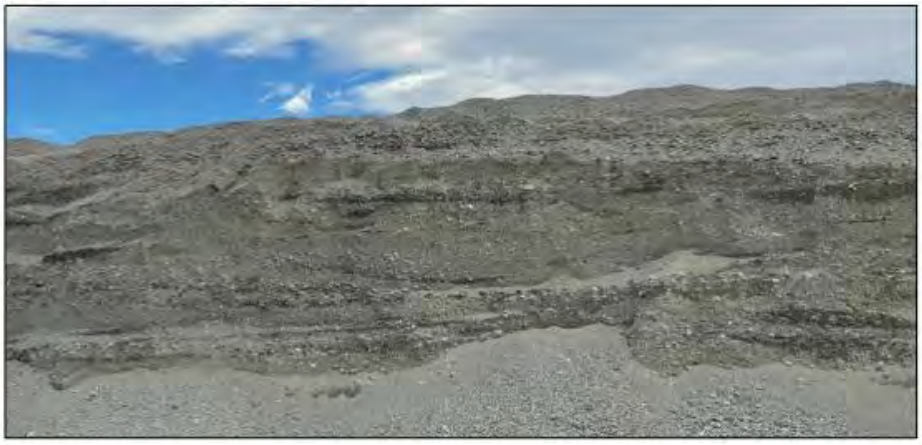
Key environmental details relating to the site are presented in the below table.

Table 2: Site environmental details overview

Existing topography	The site is predominantly flat, with a gentle slope from northwest to southeast, towards the lake. Average slope of unmodified ground is estimated at approximately 2%. However, much of the site has either been previously quarried or remains actively quarried, and it is understood that large undisturbed areas may yet be quarried prior to bulk earthworks for the present subdivision beginning. Quarried areas generally follow the flat to gently-sloping nature of the surrounding terrain, interspersed with large stockpiles and steep batters between work platforms/terraces.  *Figure 10: Facing south towards quarry floor, from southern edge of proposed Earthworks Area 4* Existing quarry floors are virtually completely flat.

Geology	Insight Engineering have prepared a Geotechnical and Earthworks Assessment for the proposed subdivision. The report notes that the majority of the site is underlain by Late Pleistocene outwash deposits, described as *unweathered to slightly weathered, loose, sandy to silty, well rounded gravel*. Lithology records indicate that the subsoils below and around the site are primarily comprised of silty and sandy gravel extending to approximately 28 m depth below original ground level. The report states that *maximum excavations heights are indicated to be up to 15 m, and are generally expected to expose native materials like those visible in the quarry sides. Native deposits could include surficial Loess, layers and lenses of silts, and fine to coarse sands and gravels that are typical of Pleistocene outwash deposits.* Another geotechnical report, prepared by Geotago[1] in 2022 for the proposed development, undertook a site investigation via 12 test pits to a maximum depth of 2.2 m. A summary of the findings are as follows: • Fill was encountered across the quarry in three main forms: o Crusher dust (tightly packed sand with gravels used as a finishing surface or operational roadway) o General fill (coarse granular material used to backfill previously quarried areas. Contains extraneous materials such as timber, wood, concrete etc. Encountered in northeast corner of site) o Pea gravel (5-8 mm diameter gravel that is too small to crush and too large to be included in sand-based products. This is loose, free-running gravel that collapses on excavation) In unworked areas, the investigation reported the following: • Topsoil, comprising organic sandy SILT, with roots to depths of approx. 0.2 m. • Loess, comprising SILT, to a maximum depth of 1.2 m. • Outwash deposits, comprising sandy GRAVELS with cobbles and occasional boulders (see below figure).

[1] Geotago Ltd, 2022. *Geotechnical Assessment for Proposed Residential Development*.

	Figure 1: Outwash Deposits Vertical Sequence  In addition to the above, limited soil permeability testing was undertaken by Insight Engineering and Landpro to inform ESCP development and implementation (see Appendix H). The results are briefly summarised below: • Test 1 (central section of earthworks staging area 4 – see Figure 6): infiltration rate of 1,380 mm/hr • Test 2 (approx. midpoint between earthworks staging areas 1 and 2): infiltration rate of 175 mm/hr • Test 3: (eastern side of earthworks staging Area 3 – west of Lake Dunstan/Te Wairere): water did not soak away. The Insight Engineering soil permeability testing report also provided a limited assessment of soil erodibility, based on pit run material sampled from the quarry. Based on an assumed composition of sand (13%), silt (1%) and clay (1%), the calculated K-factor is 0.0182 (SI units). This is considered to fall within the low to moderate soil erodibility band[2].
Groundwater	The Geotago report encountered groundwater in three test pits on the basal floor of the quarry in the southern section of the property. Groundwater depth below ground level ranged from 1.1 m to 1.6 m. The report notes that groundwater below the quarry is reasonably static and in hydraulic conductivity with the lake, which has a reported daily fluctuation of approx. 750 mm (with a normal operating range of 193.5 to 194.5 m AOD). For context, the approximate average minimum elevation of the quarried southern section of the property is 195 m AOD. It is anticipated that a small portion of this area may need to be excavated down to approximately 194 m, however generally this is the minimum operating

[2] Donovan, M (2022) *Modelling soil loss from surface erosion at high-resolution to better understand sources and drivers across land uses and catchments; a national-scale assessment of Aotearoa, New Zealand*.

	level for earthworks, noting that all of the southern quarry floor will be infilled (elevation increasing).
Surface water	**Park Burn**: The Park Burn is an intermittent stream that flows through the northeast sector of the site, discharging into Lake Dunstan immediately to the east of the site. The Viridis Draft Fish Management Plan for the development notes that the reach of the creek that flows through the site periodically runs dry (no surface flows present). The Viridis report states that a survey of the Park Burn within the site yielded a single common bully, while the NZFFD only has records of brown trout in the Park Burn. The modelled mean flow for the Park Burn within the site is shown as 252 l/s on NZ River Maps. **Lake Dunstan/Te Wairere**: Lake Dunstan is an approximately 26 km^2 hydroelectric lake that was formed in the 1990s due to construction of the Clyde Dam, which impounded the Clutha River/Mata-au. Lake water quality is listed in LAWA as Good (oligotrophic). Fish species expected[3] to be present in the Park Burn and Lake Dunstan include: • Longfin eel (Anguilla dieffenbachii, At Risk - Declining) • Shortfin eel (Anguilla australis, Not Threatened) • Common bully Upland bully (Gobiomorphus breviceps; At Risk - Naturally Uncommon) • Brown trout (Salmo trutta, Introduced and Naturalised) • Koaro (Galaxias brevipinnis; At Risk - Declining) • Rainbow trout (Oncorhynchus mykiss; Introduced and Naturalised) • Perch (Perca fluviatilis; Introduced and Naturalised)
Climate	**Precipitation**: Reported annual rainfall of 437 mm for Cromwell, with Dec-January comprising the average wetted months, and July-September the driest months[4] (based on data collected for Cromwell between 1981 and 2010). ORC's growOTAGO indicates 71-80 annual rain days for the site, and a median annual rainfall of 401-450 mm (which correlates NIWA's reported annual average). NIWA reports an average of 4 snow days per year for Alexandra, with the site expected to largely mirror this.

[3] Viridis Environmental Consultants (2026) *Parkburn Draft Fish Management Plan*.

[4] NIWA, 2015. *The climate and weather of Otago*.

	Wind: No officially-reported wind statistics are available for Cromwell, with the closest monitoring stations being Wanaka Airport and Lauder[4]. The predominant wind direction for Wanaka Airport is westerly, while the predominant wind direction for Lauder is northeast. The strongest winds for both locations are from the northwest. For Wanaka, summer and spring have the greatest incidence of strong winds, whereas most strong wind in Lauder is experienced in spring. From a diurnal perspective, late afternoon is when there is the highest probability of experiencing strong winds. **Temperature**: Clyde (the closest station to the site) has an average of 93 days where the temperature drops below 0˚C. Average daily temperatures are strongly seasonal, and range from a high of 19˚C and low of 8˚C in February, to a high of 3˚C and low of -4˚C in July.
Vegetation	Where the site has not yet been quarried, vegetation largely consists of exotic grass and ground cover species. Exotic shelterbelt trees flank the property on the southern, western and northwestern boundaries, with occasional incidence of willows on the margins of Lake Dunstan/Te Wairere, and at the Park Burn confluence.
Contaminated land	Insight Engineering have produced a Remediation Action Plan[5] for the development. The plan details that potentially contaminated areas were identified during a PSI, with HAIL areas shown in the below figure.  *Figure 11: On-site HAIL areas (source: e3 Scientific, via Insight Engineering)*

[5] Insight Engineering (2026) *Remediation Action Plan for the Parkburn Quarry*

	As can be seen, contaminants are concentrated in the northeast section of the site, in the vicinity of the asphalt plant, concrete block manufacturing facility, equipment storage areas and cleanfill stockpile. Small isolated areas of potential impact were also identified in the active quarry area to the south, associated with bitumen and fuel storage, and location of a generator. **'Cleanfill' stockpile and yards** A small percentage of the 'cleanfill' stockpile is expected to contain contaminants at concentrations marginally exceeding soil contaminant standards. However, separating contaminated material from material that meets the definition of cleanfill is difficult, therefore the entire stockpile must be treated as contaminated – this volume is estimated at 180,000 m^3. The contractors' yards, used for storing machinery and treated timber poles, are estimated to contain approximately 100 m^3 of contaminated material. **Asphalt plant** The volume of contaminated (hydrocarbon-impacted) material associated with the plant is conservatively estimated at up to 100 m^3. **Fuel storage areas** It is conservatively estimated that up to 50 m^3 of potentially contaminated material associated with fuel storage areas (particularly below-ground tanks) may be encountered. **Orchard** The former orchard area is unlikely to contain significant contaminant concentrations from persistent pesticide use, however there is a chance that up to 70 m^3 of contaminated material may be encountered.

3. CEMP updates

The Guidelines state the Consent Holder (subsequent to the applicant) or Contractor is to develop and document a process of periodically reviewing the CEMP/EMP. This process is to focus on continuous improvement of processes and practices to ensure that the CEMP is relevant to the project works.

These updates should ensure that any environmental incident corrective actions and/or relevant legislative changes are factored into the CEMP. The Consent Holder or Contractor is to establish and implement document version control, noting that the responsibility of ensuring this is done lies with the Consent Holder.

Updates to the CEMP will be undertaken when:

1. Any significant changes have been made to the construction methodology or erosion and sediment control plan (ESCP) since the original CEMP was accepted; or
2. There has been an Environmental Incident and investigations have found that the management measures are inadequate; or
3. As directed by ORC's and CODC's compliance teams.

Any updates to the CEMP are to be submitted to ORC and CODC for acceptance at compliance@orc.govt.nz and monitoring@codc.govt.nz, respectively.

Works implementing the updated CEMP/ESCP must not commence until the updated CEMP has been accepted by ORC and CODC. All works must be undertaken in accordance with the most current accepted version of the EMP.

4. Administrative requirements

4.1 Site environmental induction

The purpose of the site environmental induction is to ensure that all staff and subcontractors onsite are aware of their environmental responsibilities.

Prior to commencing ground-disturbing activities, the Consent Holder or Contractor will ensure that all staff involved with onsite works have attended an environmental site induction. This includes, as a minimum, all site management staff, employees and subcontractors working on activities which disturb the ground surface.

The Consent Holder or Contractor will maintain a register signed by those inducted. This register will contain, but not be limited to, the name of the inductee, the name of the inductor, the date inducted and confirm that the inductee is familiar with the CEMP.

A copy of the draft environmental site induction is provided in Appendix B. Note that a finalised induction will be provided with the final CEMP, to be submitted to ORC for acceptance prior to start of ground-disturbing activities.

4.2 Management of sub-contractors

All sub-contractors must attend the environmental site induction and must be recorded on the site environmental induction register. The Consent Holder or Contractor must ensure that all sub-contractors comply with the CEMP at all times.

4.3 Environmental incidents

The Consent Holder or Contractor will notify ORC of the details of any Environmental Incident where the CEMP has failed, leading to any adverse environmental effects offsite (including nuisance effects associated with dust as well as spills of fuels and

chemicals to ground onsite). Concrete contamination is a common source of environmental incidents on construction and earthworks sites, meaning concrete pouring and deliveries must be strictly managed onsite to prevent a discharge to a water body or stormwater reticulation.

All Environmental Incidents will be notified to ORC within 12 hours of becoming aware of the incident, as specified in the below table:

Table 3: Council contact details in the event of an incident or compliance-related matter

Type	Contact
Environmental incident	1. pollution@orc.govt.nz /0800 800 033 and 2. The site's ORC Compliance Officer 3. The site's CODC Compliance Officer (if required)
Compliance-related matters	1. pollution@orc.govt.nz /0800 800 033 and 2. The site's ORC Compliance Officer

The Consent Holder or Contractor will undertake immediate remedial actions to mitigate adverse environmental effects. Once the immediate risk from the Environmental Incident is alleviated, the Consent Holder or Contractor will investigate the cause of the breach and/or environmental effects, then identify and implement corrective actions as soon as practicable.

The Consent Holder or Contractor will provide an Environmental Incident Report to ORC within 10 working days of the incident occurring. This report must detail:

- The nature of the Environmental Incident.
- What management measures were in place to prevent the incident from occurring.
- Probable causes of the incident.
- What corrective actions have been undertaken to prevent incidents reoccurring.

An Environmental Incident Report template is provided in Appendix C.

4.4 Environmental roles and responsibilities

The following table identifies relevant environment-specific roles and responsibilities of personnel involved with the project. The table will be populated with all relevant personnel in the final CEMP.

Table 4: Project key environmental personnel

Role	Name	Phone Number	Email
Project Manager	FHLD yet to appoint		
Site Supervisor			
Environmental Representative			
Environmental Consultant (SQEP)	Will Nicolson	[redacted]	[redacted]

Qualifications/experience for key environmental personnel can be provided upon request.

4.4.1 Environmental Representative

The Environmental Representative should actively support the Project Manager and/or Supervisor with the day-to-day implementation of environmental controls and administrative activities. In particular, the role includes:

- Implementation of environmental management:
    - Undertake thorough environmental site inductions to all staff and sub-contractors
    - Ensure installation of environmental controls as per the CEMP and ESCP
    - Undertake environmental site inspections of the project
    - Oversee the maintenance and improvement of defective environmental controls
    - Undertake Environmental Incident reporting
    - Ensure the chemical treatment systems for SRPs and DEBs are operating correctly where appropriately trained or supervised by a SQEP
- Communication:
    - Keep project leadership informed of environmental performance of the project

    - Inform staff of procedures and constraints applicable to managing specific environmental issues
- Complaints and Incidents:
    - Assist the project leadership in attending to Environmental Incidents and Complaints
- Familiarity with:
    - Environmental aspects of the project
    - This CEMP, ESCP, CTMP and contaminated-land plans and documents
    - Best practice erosion and sediment control from:
        - *Guidance Document 2016/005: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05)*; and/or,
        - *Residential Earthworks in Otago – A guide for developers, landowners, contractors and service providers* 2023 (ORC Guidelines)

4.5 Records and registers

Environmental records are to be collated onsite and shall be made available to ORC upon request:

- immediately if the request is made by an ORC official onsite, and
- within 24 hours if requested by an ORC officer offsite.

Records and registers to be managed onsite shall include the following:

- Environmental Induction attendance register
- Environmental incident reports and associated corrective actions undertaken
- Complaints register and associated corrective actions undertaken
- Daily diary entries (including pre-start inspection observations)
- Post-rain event inspection observations and corrective actions
- Weekly site inspection checklists
- Water quality monitoring results
- CEMP non-conformance register and associated corrective actions taken

4.5.1 Complaints register

The complaints register will include, but is not limited to:

a) The date, time, location and nature of the complaint;

b) The name, phone number, and address of the complainant, unless the complainant elects not to supply this information; and

c) Action taken by the Consent Holder to remedy the situation and any policies or methods put in place to avoid or mitigate the problem occurring again.

A record of the complaints must be submitted to ORC in the Monthly Environmental Report, or as specified in the consent.

4.6 Inspections

The Environmental Representative or appropriate delegate shall undertake and document weekly and pre- and post-rain event[6] site inspections for the purpose of monitoring the following:

- Verifying that the management measures prescribed in the CEMP are present, functional and adequate
- Observing the site for actual or potential adverse environmental effects
- Identifying maintenance requirements for implemented management measures
- Verifying preparedness for adverse weather conditions where rain and/or wind is forecast

In some situations, such as during sensitive phases in the works or following Environmental Incidents, weekly inspections may need to be undertaken by the SQEP.

The Consent Holder or Contractor shall undertake corrective actions to rectify issues identified by the site inspections. Each weekly inspection shall be recorded, including date, observations and corrective actions.

The weekly and post-rain event site inspections shall be made available to ORC within 24 hours of a request being made.

Between the weekly and post-rain event inspections, the Environmental Representative shall also undertake a daily pre-start inspection to ensure that no new environmental issues have arisen or mitigation measures have been compromised from the previous day's work. Observations should be recorded (e.g., in a works diary).

During significant rain or adverse weather events, inspections/monitoring may also be necessary to ensure ESCs are correctly functioning, undertake water quality monitoring and implement any contingencies necessary to prevent an

[6] A rain event is defined in the ORC Guidelines as 'any precipitation event that is capable of, or generates, overland flow'. A significant rain event is defined in the QLDC EMP Guidelines as 'a rain event at an intensity of 20mm/12 hrs'.

environmental incident from occurring. Inspections or monitoring during these events should only be undertaken if safe to do so.

The following table summarises the Consent Holder's duties to undertake environmental inspections:

Table 5: Environmental inspection details

Inspection type	Frequency	Tasks
Weekly	Once per week	• Inspect all environmental controls and schedule maintenance as required • Identify any activities that may cause an environmental incident, and if identified, communicate these to the project team.
Pre-event	Prior to a rain, snow or high-wind event.	• Inspect all environmental controls well in advance of a forecast adverse weather event • Use the inspection to schedule urgent ESC maintenance or preventive works prior to the weather event.
Event monitoring	During a significant weather event	• Inspect all critical ESCs to ensure they are functioning correctly • Implement contingency steps as outlined in Section 5.1.8 • Undertake water quality monitoring where offsite discharges are occurring.
Post-event	Following a significant weather event	• Inspect all environmental controls and schedule maintenance as required • Document opportunities for environmental control improvement, and implement corrective actions.

4.7 Monthly monitoring

Monthly inspections of the site will be undertaken by the SQEP (Environmental Consultant). Monthly inspections will ensure that the site is complying with this CEMP, identify any new environmental risks arising that could cause an environmental effect, and suggest alternative solutions that will result in more effective and efficient management.

The outcome of these inspections will be reported and included in the Monthly Environmental Report referred to in the section below.

4.1 Monthly environmental reporting

The Consent Holder or Contractor will complete and submit exception reporting to ORC (and CODC, if requested) in the form of a monthly environmental report. The monthly environmental report will be submitted to ORC's compliance team within five working days of the end of each month.

The monthly environmental report will include exception reporting and statements actively addressing, but not limited to, the following that occurred during the reporting month:

- Updates to the CEMP and the Erosion and Sediment Control Plan (ESCP)
- Weekly site inspections – number of inspections completed, and summary of corrective actions undertaken
- Monitoring reporting – summary of monitoring and whether non-conforming results were obtained
- Reporting on monitoring undertaken, including pre- and post-rain events
- Positive environmental outcomes achieved and opportunities identified by the Consent Holder or Contractor
- Complaints received
- Water quality monitoring results of any discharges (controlled and/or uncontrolled) from the discharge point or any waters crossing the boundary and/or the receiving environment.
- Summary of monthly visual assessment of fuel and chemical management controls, including spill kits.

Where exception reporting demonstrates repeated or multiple non-conformances of the same issue, ORC may instruct the Consent Holder or Contractor to undertake a review of the adequacy of management measures outlined in the CEMP and provide a response back to ORC within five working days (or as otherwise specified), either confirming and justifying the suitability of the existing CEMP or notifying of updates to the CEMP and the justification.

5. Operational requirements

5.1 Erosion and sedimentation

The Consent Holder or Contractor is responsible for temporary erosion and sediment control and for ensuring that controls are adequately designed, installed, adapted, maintained and decommissioned.

5.1.1 Project risk

Based on criteria in the Guidelines, the Erosion Risk of the project is considered to be **High**. This is based on the assessment provided in the following table. Note that the parameters used to quantify the risk level are based on Queenstown Lakes District Council's Guidelines for Environmental Management Plans 2019 (QLDC EMP Guidelines), acknowledging that the development site is not located within QLDC's jurisdiction.

Table 6: Project Erosion Risk assessment

Erosion risk	Characteristics of risk level	Proposal assessment
Low	<2500m^2 disturbed surface area open at any one time	>2,500 m^2 will be disturbed at any one time
Medium	All projects not meeting the characteristics above and below	Cannot meet all characteristics of Low risk level. Multiple High-Risk characteristics apply.
High (projects with 2 or more of the following characteristics)	Project duration > 6 months	Project duration is greater than 6 months
	Project working within or discharging to Sensitive Environmental Receptors such as a Waterbody	Works within the Park Burn riverbed are proposed. In-water works within Lake Dunstan/Te Wairere, and along the lake margins, are proposed.
	Projects which have > 1 hectare of land exposed	>1 ha will be exposed
	Topography where any slope is greater than 15% (6.6 degrees)	The majority of the site ranges from entirely flat to lightly sloping. Only small areas (batters) would come close to a 15% slope.
	Soils with high erodibility (e.g. silts or other soil types with high silt content) as determined by geotechnical advice.	Based on information provided in Geotago's *Preliminary Geotechnical Assessment* (2022) for the development, soil erosivity varies spatially and with depth across the site.

		Overall, highly erosive soils are generally unlikely but may be encountered at least periodically.

5.1.2 Erosion and sediment control principles and standards

To the extent possible, erosion and sediment controls for the project will be designed, installed, maintained and decommissioned in accordance with the following principles:

- Erosion and sediment controls are integrated with construction planning
- Effective and flexible erosion and sediment control plans are developed based on soil, site slope, weather, construction conditions and the receiving environment
- The extent and duration of soil exposure is minimised
- Water movement through the site is controlled – in particular, clean water is diverted around the site and 'dirty' and 'clean' water is kept separated as far as practicably possible
- Soil erosion is minimised as far as reasonable and practical (to the satisfaction of ORC)
- Disturbed areas are promptly stabilised
- Sediment retention on site is maximised
- Controls are maintained in proper working order at all times
- The site is monitored and erosion and sediment control practices adjusted to maintain the required performance standard
- Discharges are avoided, especially offsite discharges of sediment-laden runoff, but also dust from wind erosion.

Where practicable, erosion and sediment controls are to be designed, installed and maintained in accordance with current ESC best practice, including (but not limited to) the following guidelines:

- Auckland Council's *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region* (2016; reprinted 2023)(GD05)
- Otago Regional Council's *Residential Earthworks in Otago* 2023 (ORC Guidelines)
- Queenstown Lakes District Council's *Guidelines for Environmental Management Plans* 2019 (QLDC EMP Guidelines)

Given some of the site's unique characteristics, however, departure from default measures outlined in these guidelines is necessary to ensure ESCs remain efficient and effective. Notably, the following key characteristics apply to much of the site:

- Former quarry.
- Internal drainage.
- Significant bunding around the perimeter, separating most of the site from the receiving environment.
- High soil infiltration in most locations.
- Very low gradients.
- Generally low runoff coefficients.
- Coarse gravel the most common working medium.
- Relatively low assumed soil erodibility.
- High water table on the southern quarry floor.

The above factors mean that traditional GD05-recommended sediment retention ponds (SRPs) are unlikely to be an effective means of runoff detention and treatment in most instances. SRPs are not proposed because:

1. There is a very low fraction of silts and clays.
2. Soil infiltration is generally very high.
3. The native gravels are likely to be prohibitive towards the relatively steep embankments of a traditional SRP – a lack of cohesion means they're likely to fail and/or require constant maintenance.
4. The water table is high in quarried areas of the site. Any SRP in these areas would therefore need to be very shallow, which would mean the SRP surface footprint would be huge, in order to achieve the required storage volume.

Instead, a shallow, infiltration-driven system is being proposed for most of the site. This generally entails large, shallow swales with dropout pits leading to large, shallow infiltration basins that fully utilise high soakage potential while avoiding interception of the water table. Given extremely low gradients and relatively low soil erodibility, scour is not expected to present a significant problem, and any overflow from the infiltration basins will simply spill onto the surrounding gravels and be contained within the bunded site.

Notwithstanding the above, there remains a possibility of the site still implementing SRPs in some of the later stages of the works, if site conditions are more conducive to this form of sediment retention.

5.1.3 Erosion and Sediment Control Plan scope

It is expected that a condition of consent will require that, prior to any works commencing on site, the Consent Holder shall submit for review and acceptance, a final ESCP. The ESCP is to be implemented prior to any onsite disturbance.

Figure 5 of this report shows the extent of earthworks proposed for the development. As can be seen, bulk earthworks encompass all of the property, along with narrow sections of Crown Land on the margins of Lake Dunstan/Te Wairere, along with minor in-water works within Lake Dunstan/Te Wairere itself.

The present ESCP encompasses the full extent of earthworks that will take place within the southwestern portion of the property, along with draft measures for managing water quality risk associated with earthworks on Crown land (adjacent to Lake Dunstan/Te Wairere) and works within and adjacent to the Park Burn. Thus, the ESCP presented in this version of the CEMP covers bulk earthworks within the following areas and activities:

- Cut to fill from Area 4a to Area 1
- Cut to fill from Area 4b to Area 2
- Earthworks within Crown Land and directly adjacent to Park Burn (may run in tandem with other earthworks phases)

Access and egress to the earthworks areas from SH6 is also included in this version of the ESCP.

Due to the large size of the property and the length of time it will take for the works to progress to Area 3/4c and above, it is more prudent to develop ESCs for these areas closer to these works starting – this will be addressed via an updated ESCP and CEMP, and submitted to ORC for review and acceptance well in advance of scheduled start of works.

While in-water works associated with construction of the two coves are likely to occur during or after Area 3 earthworks, an indicative ESCP for these works has been provided due to their high-risk nature. A more detailed ESCP for these works will be developed and submitted for council review and acceptance prior to these works starting.

5.1.4 Earthworks staging

While earthworks and associated civils staging is still in the preliminary stages of design, the following provides an indicative summary of anticipated sequencing and timeframes. Sequencing should be read in conjunction with the earthworks staging plans, and the subdivision staging plan (excerpt provided below).

- Year 1: cut to fill from Area 4a to Area 1
- Year 2: cut to fill from Area 4b to Area 2

- Year 3: cut to fill from Areas 4c-8 to Area 3; civil works for subdivision Stage 1A
- Year 4: civil works for subdivision Stage 1B; formation of southern cove (including in-water works within Lake Dunstan/Te Wairere)
- Year 5: civil works for subdivision Stage 2

Staging beyond this point is yet to be determined, with this section to be updated as works progress and the construction programme is developed.

Importantly, however, progressive stabilisation is the be implemented at all times. It is expected that, as bulk earthworks within a given area progress, formed lots, reserves and roads will be stabilised either prior to or in tandem with ongoing earthworks elsewhere in the area. This is likely to mean that where an area of approximately 1 ha of bulk earthworks is completed, it will be topsoiled and hydroseeded (in the case of lots and reserves) or seed drilled (in the case of roads). This is critical for minimising disturbed catchments, alleviating pressure on ESCs, and reducing dust generation risk.

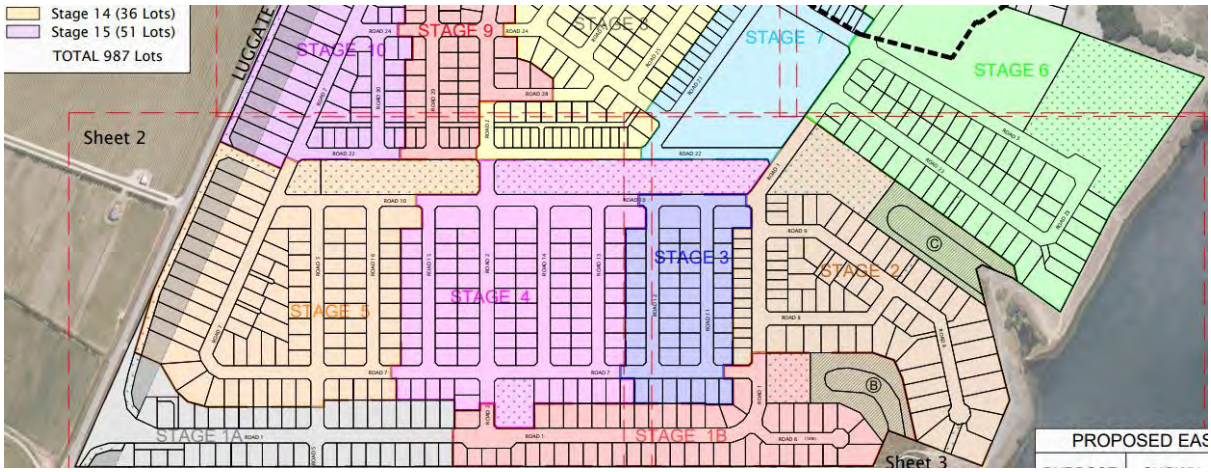


Figure 12: Subdivision staging plan (the coves are demarcated by easements B and C)

5.1.5 ESC plans and methodologies

Due to the size of the site, and the varied activities that will take place across the site, the ESCP features a number of plans that specify specific controls for individual earthworks areas – both before and after bulk earthworks. The following subsections explore earthworks for Areas 1, 2, 4a-4b, Crown Land works and Park Burn works. Further details will be added to this section for successive earthworks areas as the works progress.

5.1.5.1 Earthworks Areas 1 and 2 (and associated cut to fill)

The below plan provides a generalisation of large-scale overland flow paths associated with the existing site (full-scale existing contour plan provided in Appendix A). As can be seen, most of the site drains towards the south, where the

excavated quarry floor effectively presents the end-point for virtually all runoff. This, along with the relatively high soakage rates for much of the area, provides the critical context for the proposed ESC methodology outlined below.

Area 1

1. Retain western boundary bund and/or swale adjacent to SH6 to continue diverting clean water to west.
2. Construct Infiltration Basins 1 and 2 (IB1, IB2) beyond eastern end of Area 1, as shown in the ESCP and as per the associated designs in Appendix F.

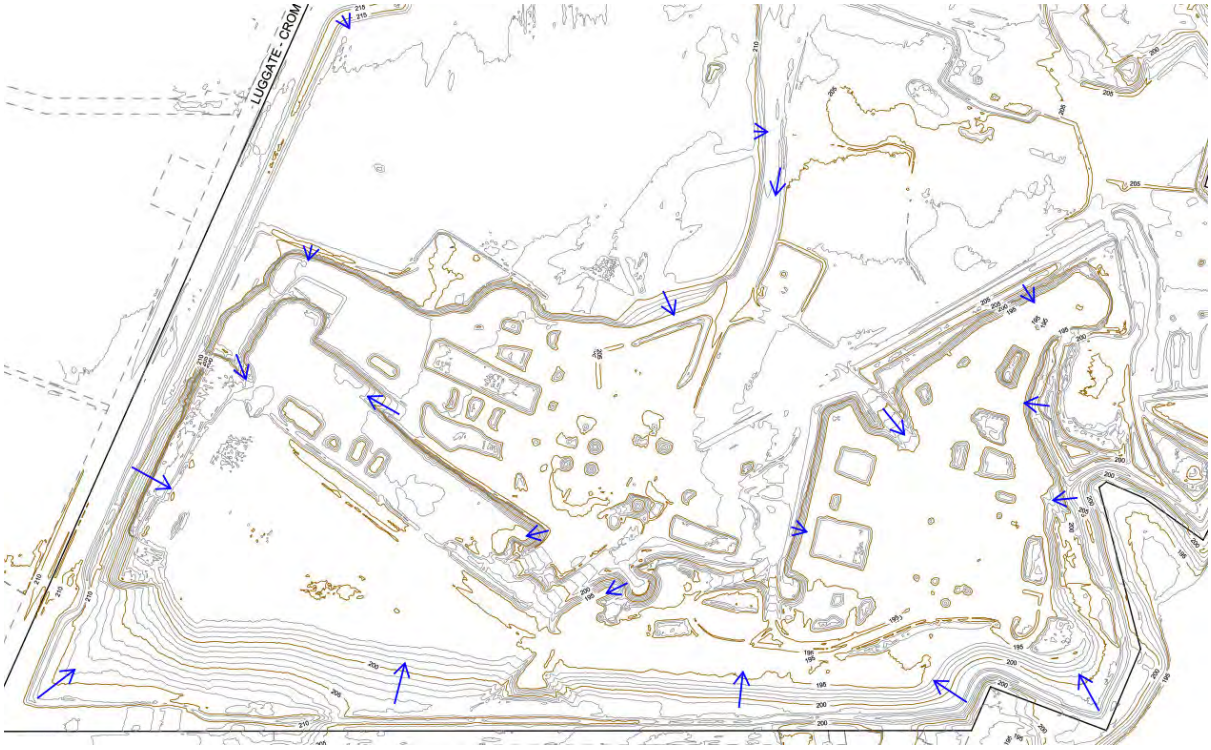
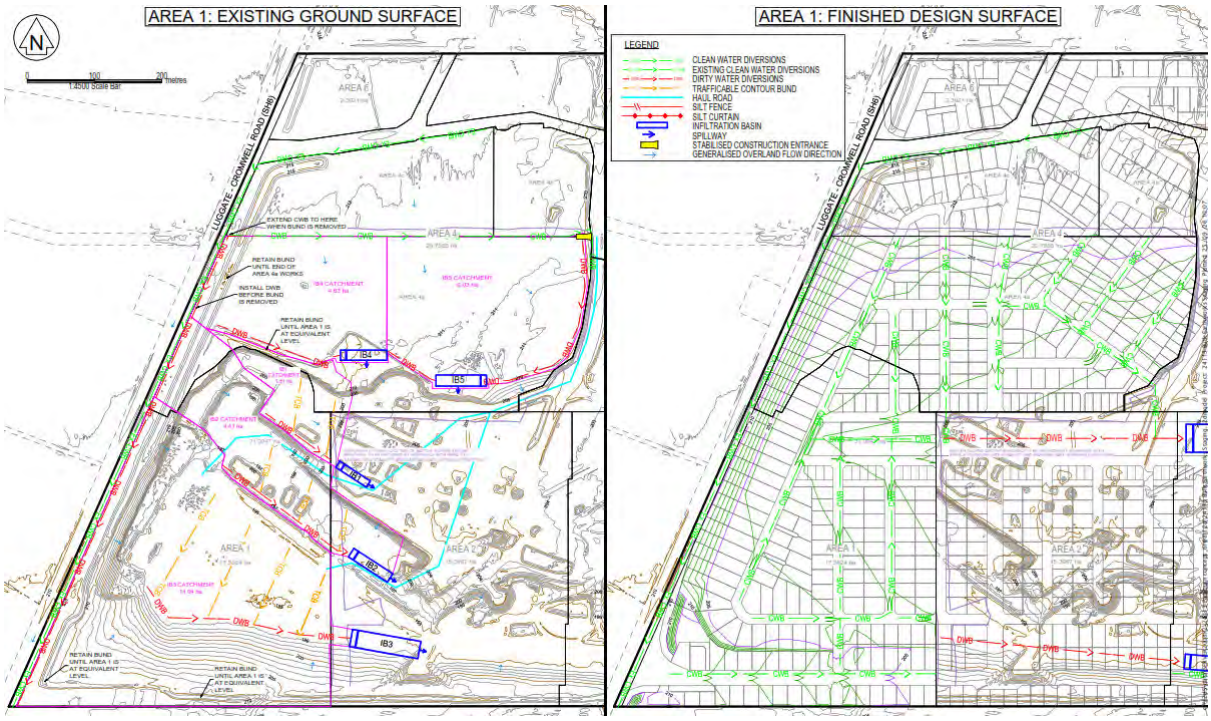


Figure 13: Existing overland flow paths for southern portion of site

3. Construct dirty water diversion channels/swales (DWBs) from west to east within Area 1.
4. Construct shallow dropout pits at approximately 50 m intervals along the DWBs, as shown on ESCP.
5. Construct lateral trafficable contour bunds/drains as shown on ESCP, to break up the larger catchments and direct runoff towards the two main diversion channels.
6. Begin bulk earthworks.
7. As infilling progresses roughly from west to east, adjust diversion channels and contour bunds as needed. At the batter interface between the infill zone and the existing quarry floor, diversion channel stabilisation (or fluming) may be required where the longitudinal slope exceeds 2%.

8. As works progress and design grades are achieved, lots and reserves will be successively topsoiled and hydroseeded, and road subgrades will be seed drilled to provide interim stabilisation until civil works can start. Each grassed road will feature at least one swale (also seed drilled, for long-term stabilisation), which will direct flows in a generally easterly direction. Most road swales will eventually discharge into a centralised swale, that will be successively constructed as bulk earthworks move from west to east. Subject to detailed design, there is an option to construct small soak pits at regular intervals along these roadside swales, to both encourage localised infiltration and reduce runoff velocities within the swales.
9. Once all bulk earthworks in Area 1 are complete, and design grades are achieved, most grassed roadside swales will discharge into the central grassed swale. This swale will be continued through Area 2, initially as a large, shallow gravel swale that will terminate in a large infiltration basin east of the Area 2 earthworks extent, then formally graded and stabilised as per detailed design.



Area 4a

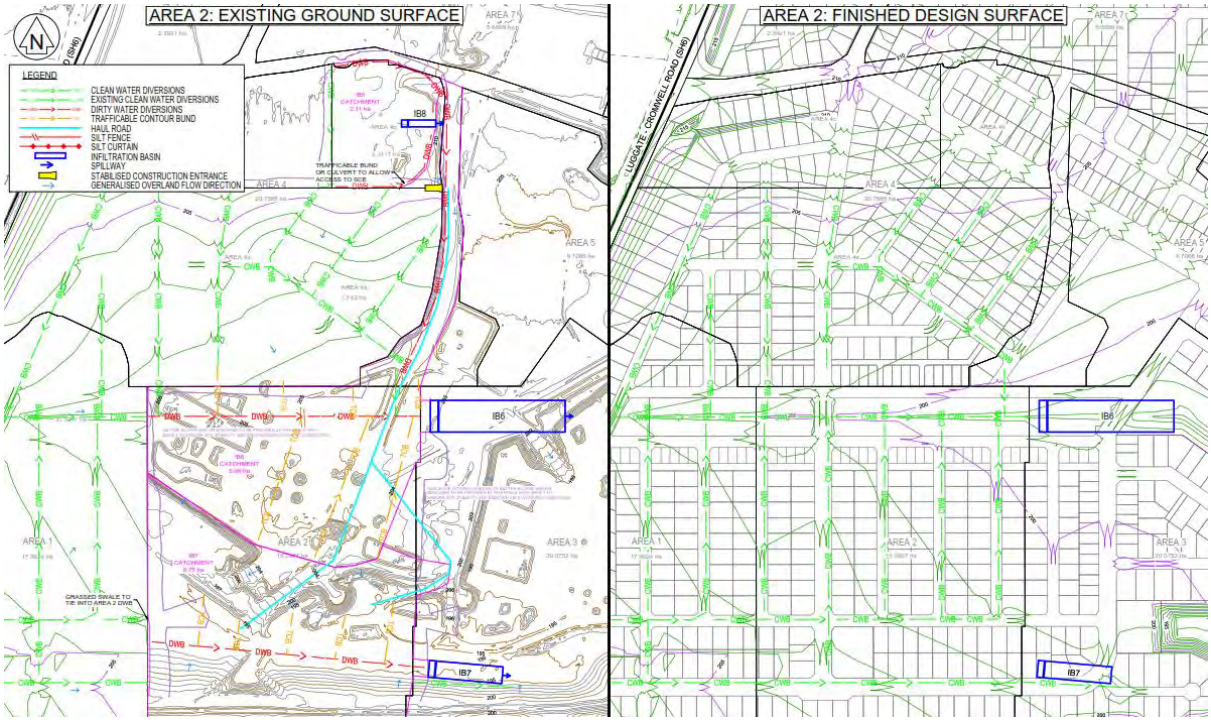
1. Construct clean water diversion bund at northern end of works area, to divert any uncontaminated overland runoff around the works and to the east.
2. Retain western boundary bund and/or swale adjacent to SH6 to continue diverting clean water to west.
3. Construct SCE. Note, the proposed SCE location connects the earthworks area to an existing sealed road. Vehicles that travel from here back to the

site entrance at SH6 will have close to 600 m of sealed road to travel along, meaning the risk of tracking mud onto the state highway is minimal – however the SCE and regular internal road sweeping will further minimise this risk.

4. Construct Infiltration Basins 3 and 4 (IB3, IB4) along southern zone of Area 4a, as shown in the ESCP and as per the associated designs in Appendix F.
5. Construct dirty water diversion channels/swales (DWDCs) into the IBs as shown.
6. Construct shallow dropout pits at approximately 50 m intervals along the DWDCs, as shown on ESCP.
7. Begin bulk earthworks. As earthworks within this area are virtually all cut, internal contour bunds or catchment breaks are not considered necessary, as soil disturbance will only be within large depressions, that due to the high soakage rates will act as an oversized infiltration basin.
8. Towards the end of the Area 4a bulk earthworks, Infiltration Basins 3 and 4 will need to be decommissioned. At this point, swales from this area will be constructed to connect runoff from this area to the central swale that will drain through Area 2 to a large infiltration basin on the western side of Area 3.

Area 2

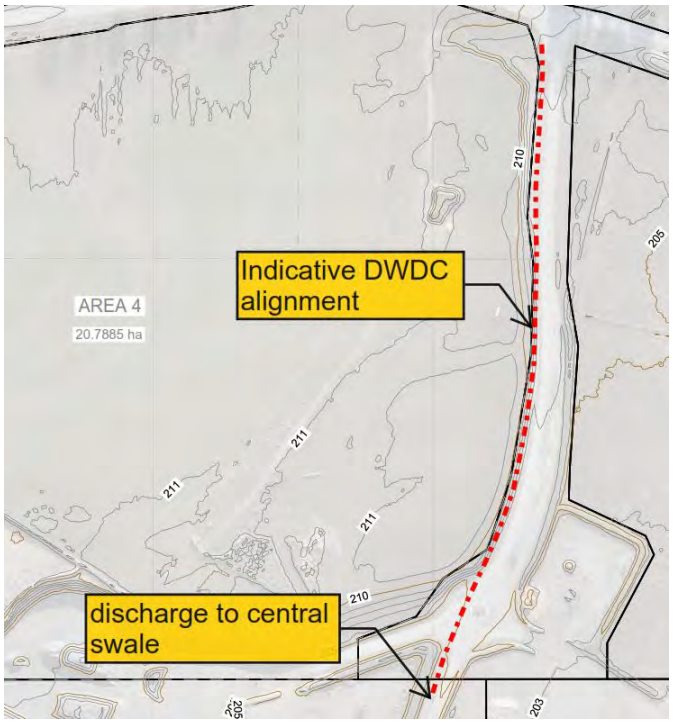
1. Prior to works progressing into Area 2, IBs 1 and 2 will be decommissioned. IBs 5 and 6 will subsequently be constructed beyond the eastern extent of Area 2, with corresponding DWBs, contour drains and dropout pits designed similar to Area 1.
2. Begin bulk earthworks.
3. As infilling progresses roughly from west to east, adjust diversion channels and contour bunds as needed. At the batter interface between the infill zone and the existing quarry floor, diversion channel stabilisation (or fluming) may be required where the longitudinal slope exceeds 2%.
4. Progressive stabilisation of lots, reserves and roads, and formation of roadside swales, which themselves discharge to two large swales that drain into IBs 5 and 6. IBs 5 and 6 will remain operational for as long as possible following completion of bulk earthworks in Area 2 – at least until Area 2 is fully stabilised.



Area 4b

1. Construct clean water diversion bund at western end of works area, to divert any uncontaminated overland runoff around the works and to the south and north.
2. Maintain SCE. Note, the proposed SCE location connects the earthworks area to an existing sealed road. Vehicles that travel from here back to the site entrance at SH6 will have close to 600 m of sealed road to travel along, meaning the risk of tracking mud onto the state highway is minimal – however the SCE and regular internal road sweeping will further minimise this risk.
3. Construct Infiltration Basin 7 (IB7) to west of existing internal road, as shown in the ESCP and as per the associated designs in Appendix F.
4. Construct dirty water diversion channels/swales (DWBs) into the IB as shown.
5. Construct shallow dropout pits at approximately 50 m intervals along the DWBs, as shown on ESCP.
6. Begin bulk earthworks. As earthworks within this area are all cut, internal contour bunds or catchment breaks are not considered necessary, as soil disturbance will only be within a large depression, that due to assumed the high soakage rate will act as an oversized infiltration basin.
7. Towards the end of the Area 4b bulk earthworks, IB7 will need to be decommissioned. To subsequently manage runoff/stormwater from this area following the removal of IB7, a large DWB will be constructed running

along the western side of the existing sealed road (care must be taken not to damage the seal), to divert runoff draining from Area 4b to the central swale (see below indicative drawing), until such time as subdivision earthworks progress to the east of 4b.



5.1.5.2 Crown land earthworks

The below plan provides an indicative ESCP for the southern section of proposed Crown Land works. This includes in-water earthworks associated with the formation of two "coves", localised linear earthworks associated with improvements to the existing cycle track, and fringe earthworks associated with battering adjacent infilling within the applicant's property back to existing ground level.

The generalised ESC methodology for these works is as follows:

1. Coves (in-water works):
    a. Install floating boom with silt curtain across full width of existing inlets prior to start of cove earthworks.
    b. Install DWB/CWB upslope of landward cove earthworks to divert upslope runoff from interior of property away from cove works, should rainfall occur during those works.
    c. Excavate landward side of coves first – remove existing boundary bunds. Insight Engineering note that excavation down to or below 195 masl may require dewatering via sump pump to a protected outlet or infiltration basin within the property (see Appendix I for Draft

Dewatering Plan). Install landward cove edge protection via rock armouring.

d. Use long reach excavator on stabilised gravel platform to excavate the in-water portion of the cove from the shore, where possible.

e. Where required, use excavator on floating platform/barge to excavate cut on landward side of silt curtain.

f. Cut material to be transferred to truck for stockpiling/reuse in the interior of the site.

g. Silt curtain removed once all in-water works are complete, and suspended sediment has settled out of the water column.

2. Crown land earthworks (Lake Dunstan/Te Wairere margin):

    a. Install silt fencing with returns parallel to proposed earthworks on lake side of earthworks, below cycle track. Existing vegetated ground to remain as undisturbed as possible.

    b. Silt fencing removed once earthworks are completed and disturbed ground is topsoiled, seeded, and 80%+ vegetation cover is achieved.

As Lake Dunstan/Te Wairere is a highly sensitive environmental receptor, every effort must be taken to prevent sediment-laden runoff generated from the works from reaching the lake edge. To this end, additional ESC equipment and materials, such as spare silt fencing and waratahs, geofabric, coir logs and sediment socks will be stockpiled close to the works for emergency applications, should they be required.

There is also an option to use interlocking coir logs or silt socks instead of silt fencing as an acceptable means of protecting lake water quality from possible sediment-laden runoff from the adjacent earthworks. Provided these logs or socks aren't damaged during installation (i.e. they are installed interlocking and staked on the downslope side, rather than through the middle of each log), they can be installed in shorter sections and be shifted multiple times as earthworks progress along the lake margins. This would potentially save significant waste, as an alternative to well over 1 km of silt fence.

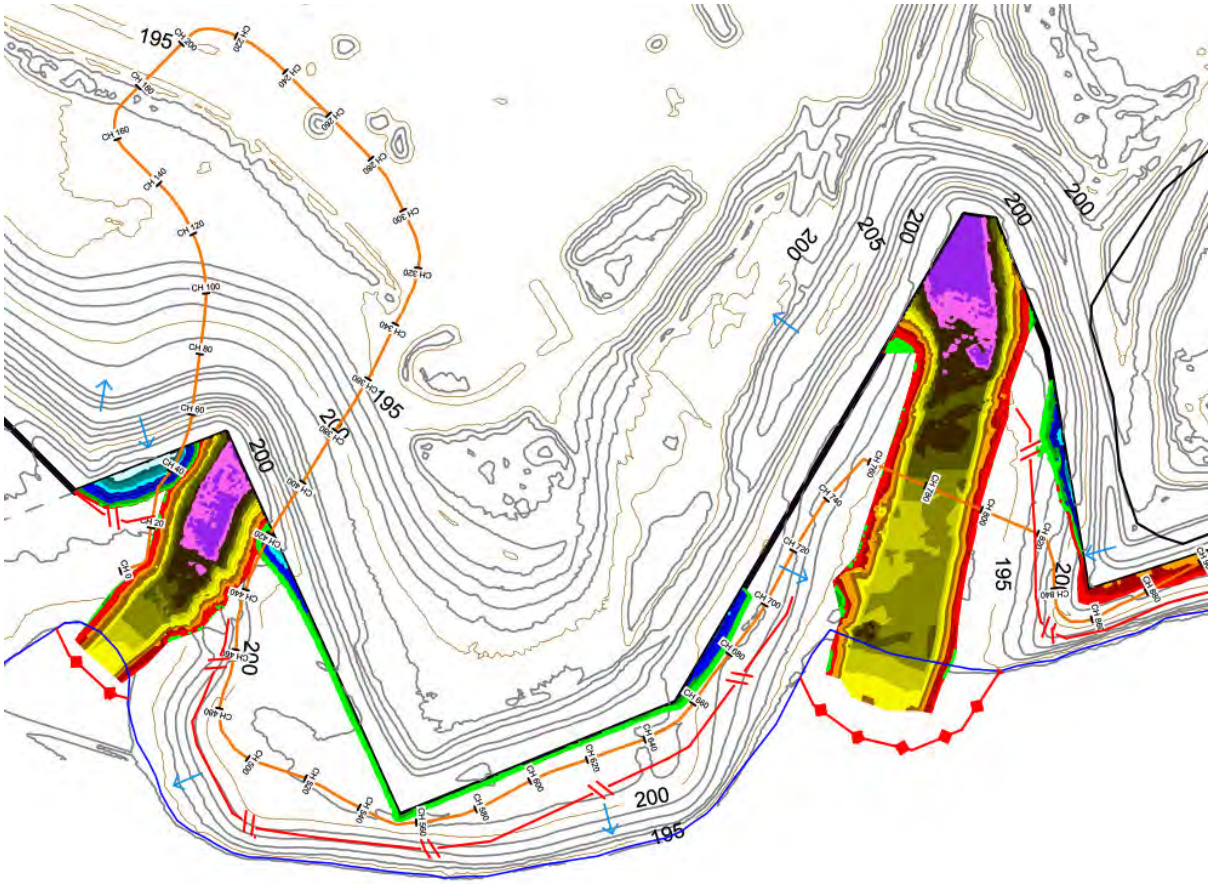


Figure 14: Close up of Crown Land works ESCP, focussing on the two coves

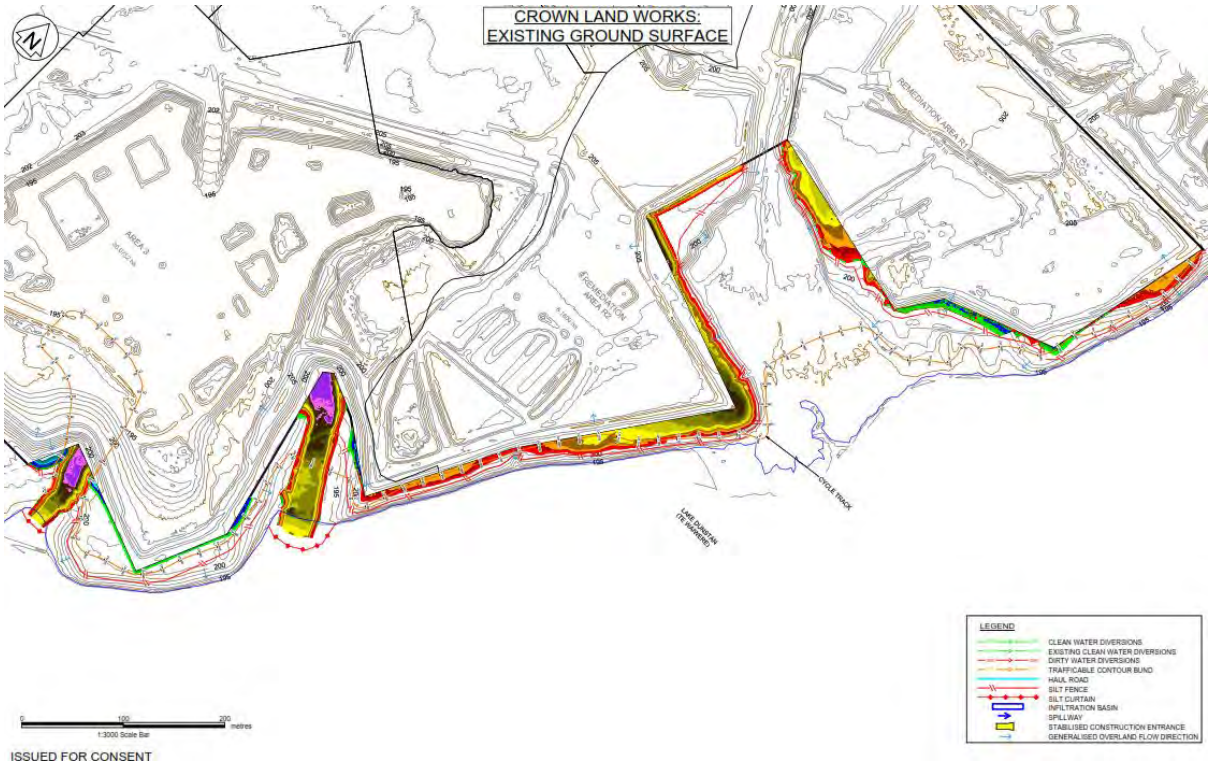


Figure 15: Crown Land works full ESCP

5.1.5.3 Park Burn floodplain works

It is understood that earthworks are required both within and adjacent to the active Park Burn channel to enable safe conveyance of flood flows in the creek to Lake Dunstan/Te Wairere. The below bulk earthworks excerpt shows proposed earthworks in the vicinity of the creek – constituting both cut and fill activities.

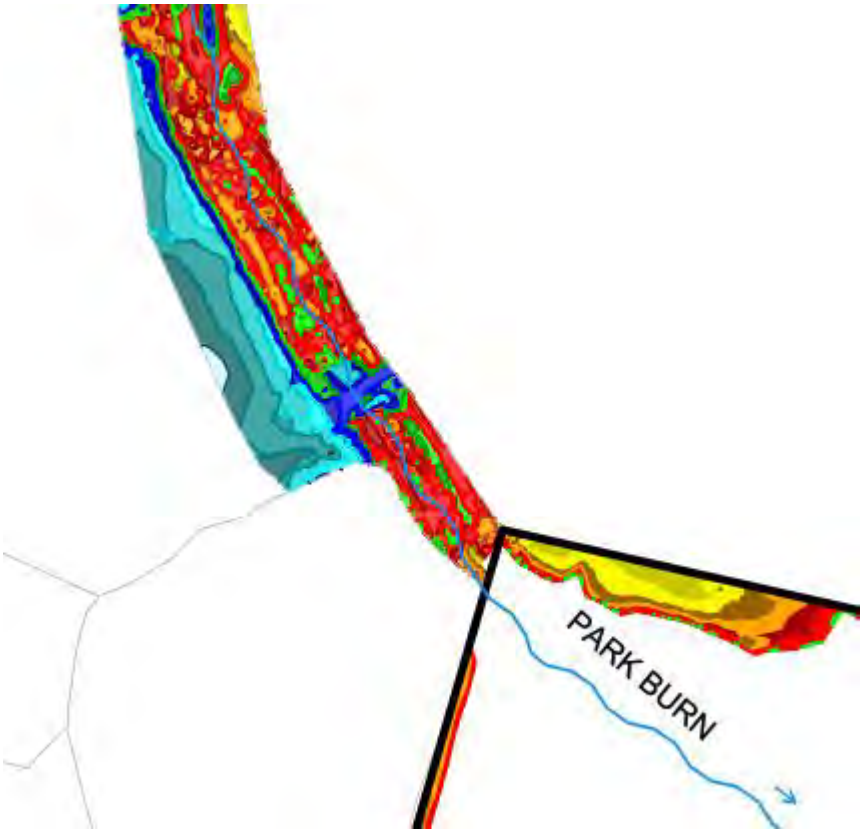


Figure 16: Park Burn bulk earthworks

Earthworks within the Park Burn floodplain and gully will be undertaken progressively in discrete sections to minimise the area of exposed ground, reduce the duration of disturbance within the stream corridor, and enable the active work area to remain hydraulically isolated from any surface flow within the Park Burn.

The Park Burn works area will generally be divided into three sequential work sections, with the precise boundaries of each section to be confirmed as part of detailed earthworks design and contractor programming (Figure 17). Except where required to establish or remove a temporary stream diversion, earthworks will be confined to one section at a time. The preceding section must be substantially completed and stabilised before the diversion is relocated and earthworks commence in the subsequent section.

The temporary stream diversion methodology will follow the principles of Section G4.2 of Auckland Council's GD05. GD05 requires a temporary diversion channel to be constructed and stabilised before being connected to the watercourse, sized to convey the 5% AEP event, with consideration also given to secondary flow paths

and upstream effects during events up to the 1% AEP. It also requires non-erodible upstream and downstream isolation dams and a controlled sequence for establishing and later returning flow to the existing channel.

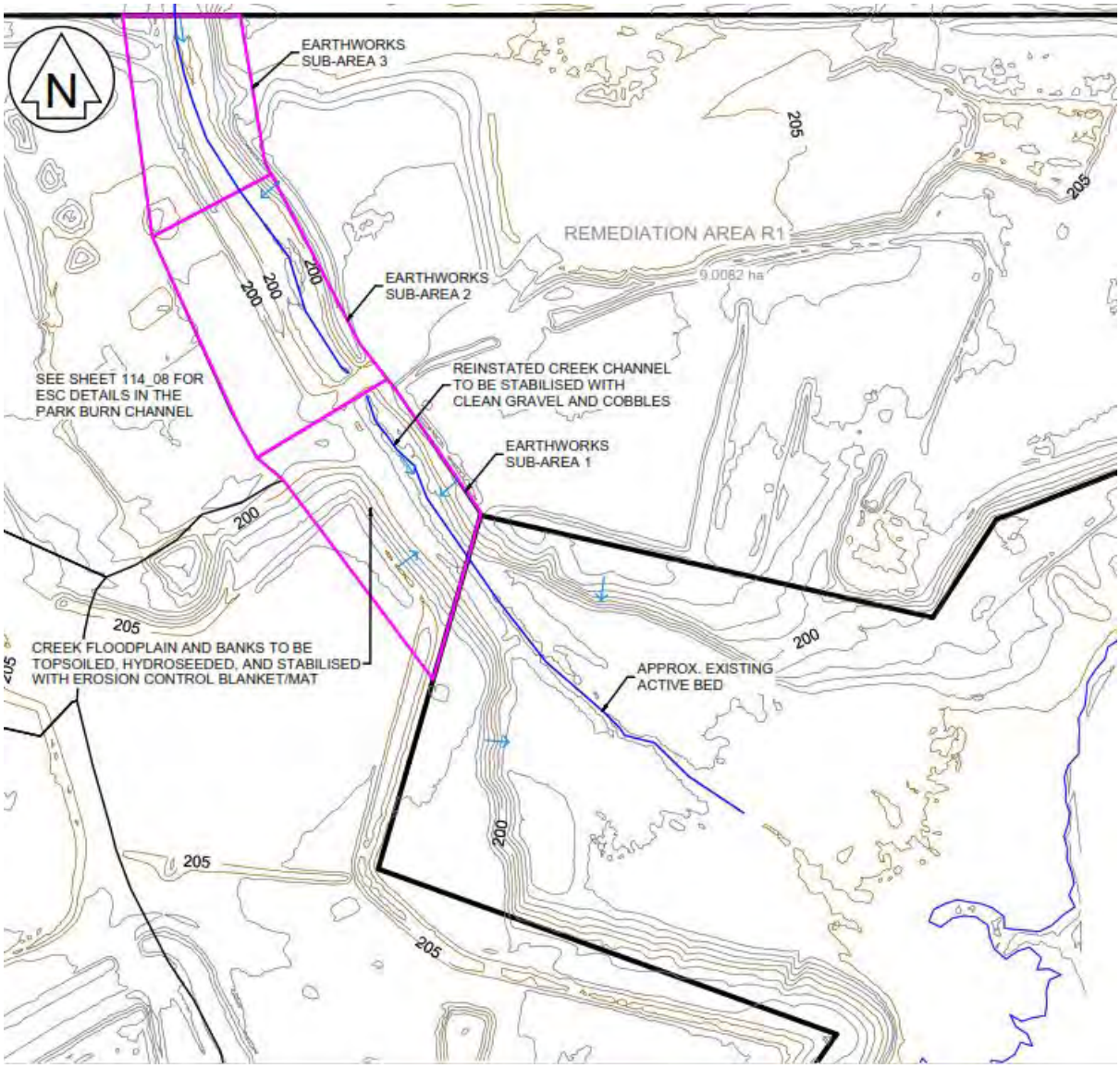


Figure 17: ESCP for works in and around the Park Burn

Staging and timing

Stream diversion establishment, relocation and decommissioning will preferentially be undertaken when the Park Burn is dry and during settled weather. The works programme must account for both rainfall within the immediate site and rainfall/snowmelt within the wider Park Burn catchment.

Before starting each earthworks section:

- the contractor shall review the weather forecast and upstream catchment conditions and confirm that no significant rainfall event is forecast over the period required to establish the diversion and secure the work area;

- Machinery that is to be used in the bed of the Park Burn or in association with the diversion is to be thoroughly cleaned prior to use, to prevent the spread of aquatic pest plants;
- the temporary diversion and all associated ESC measures must be constructed, fully stabilised, and able to receive the full flow of the creek (should it flow during earthworks) before bulk earthworks within the floodplain begins;
- bulk earthworks in the succeeding floodplain earthworks section cannot occur until the next stream diversion channel has been commissioned and earthworks in the preceding section have been completed and stabilised. Recommended rapid stabilisation of the floodplain and associated embankments would involve topsoil spread, hydroseed application (with an appropriate seed mix to be determined by a specialist), then placement and stapling of biodegradable erosion control blankets (such as coir or jute); and
- sufficient plant, materials and personnel must be available to rapidly stabilise the active work area should adverse weather occur.

The Viridis Parkburn Ecological Impact Assessment (EcIA) similarly recommends undertaking Park Burn works preferentially during periods when the stream is dry or flows are significantly reduced.

Temporary diversion construction

For each work section, a temporary diversion channel will be formed generally parallel to the existing Park Burn channel. The diversion will enable earthworks within and directly adjacent to the natural creek bed to be undertaken without surface water coming into contact with disturbed ground.

The temporary diversion will:

1. Be excavated offline, initially leaving an undisturbed plug at both its upstream and downstream ends.
2. Have sufficient hydraulic capacity to convey at least the 5% AEP flow, based on hydraulic calculations prepared or confirmed by the project engineer. The contractor/project engineer will also identify the route that flows would take if the diversion capacity were exceeded during an event up to the 1% AEP, and ensure this route is stable and will not be directed through active earthworks. This follows the GD05 temporary waterway diversion standard.
3. Generally comprise a V-shaped or triangular channel, with side slopes of approximately 1V:2H, or flatter. This channel profile will concentrate low flows towards a narrow gravel invert, thereby maintaining suitable flow depth and avoiding broad, shallow sheet flow, while providing progressively greater conveyance capacity as flow depth increases. The invert may be rounded

or locally flattened to facilitate construction, provided it remains sufficiently narrow to concentrate low flows. The final channel dimensions, longitudinal grade and freeboard (along with supporting calculations) will be confirmed via detailed design in the Final CEMP to provide the required flow capacity and maintain acceptable flow velocities and substrate stability.

4. Feature raised banks to prevent dirty runoff intrusion into the diverted creek, similar to dirty water diversion bunds.
5. The diversion will be fully stabilised before being commissioned, but continuous geotextile or synthetic lining will not be required where the Project Engineer and Environmental Representative confirm that the exposed gravel/cobble substrate is sufficiently erosion-resistant for the anticipated design velocities. Preference shall be given to retaining stable natural gravel substrate to minimise unnecessary use and subsequent disposal of synthetic lining materials. Where finer or readily erodible material is encountered, or hydraulic conditions indicate a risk of scour, the affected reach shall be locally stabilised using clean gravel or rock armouring, geotextile, erosion-control matting, or another suitable treatment.
6. Incorporate erosion protection and energy dissipation at the diversion inlet and outlet, such as clean graded rock/rip-rap over suitable geotextile, so that neither the existing bed nor banks are scoured when flow enters or leaves the diversion.
7. Where the diversion is expected to remain operational for more than approximately two weeks, incorporate an inset low-flow channel within the broader diversion cross-section. This should provide a continuous, relatively shallow flow path through the diversion during normal Park Burn flows rather than allowing low flows to spread thinly over the full diversion width. This reflects the specific recommendation of the project ecologist, who advised that a low-flow channel is preferable for a longer-duration wide, shallow diversion.
8. Before connection to the Park Burn, the completed diversion will be inspected by the Project Engineer and/or Environmental Representative to confirm that its dimensions, capacity, freeboard and stabilisation are appropriate and that no material scour or sediment-generation risk is anticipated.

Fish exclusion and salvage

The requirements of the project Fish Management Plan (FMP) will apply to each Park Burn work section.

Fish exclusion barriers will be installed immediately upstream and downstream of the full instream works area (i.e. approximately at the point where the Park Burn crosses the northern and eastern boundaries of the site). The FMP requires these

barriers even where the Park Burn is dry, because rainfall could re-establish surface flow while the works are underway. The FMP specifies barriers that allow water to pass but prevent fish movement, extending beyond the wetted channel and securely fixed to the bed and banks.

Where water is present, fish salvage and relocation shall be undertaken by the project freshwater ecologist immediately before the works, in accordance with the FMP. The FMP provides for electrofishing together with trapping/netting where appropriate. Where no surface water is present but saturated mud or sediment remains, the substrate is to be checked for eels. No salvage is required where the channel is genuinely dry at the time of installing the fish barriers.

Commissioning the diversion

Once the diversion is formed, stabilised and inspected:

1. The downstream plug shall be removed first, allowing water to back into the lower end of the diversion and reducing erosion when full flow is introduced.
2. The upstream plug shall then be progressively removed to establish flow through the diversion.
3. Once flow through the diversion is confirmed to be stable, a non-erodible upstream isolation dam shall be installed across the existing Park Burn channel immediately downstream of the diversion inlet.
4. A second non-erodible isolation dam shall be installed at the downstream end of the isolated work section to prevent backflow.
5. Isolation dams may comprise sandbags, proprietary water-filled barriers or another non-erodible system suitable for the expected hydraulic conditions. Earth or streambed material shall not simply be pushed across the creek to form an unstabilised bund. If an earth bund is used, it must be fully stabilised with well-anchored geofabric.

This sequence closely follows the GD05 temporary waterway diversion methodology.

Dewatering the isolated work section

While it is expected that the diversion will be constructed and commissioned while there are no flows present in the Park Burn, in practice this may not always be possible. Any water remaining in the natural channel between the isolation dams will be removed before earthworks within or adjacent to the channel commence.

Where the water is clean, it may be pumped through an appropriately screened intake and discharged to a stable, erosion-protected location downstream, provided this can be undertaken without generating turbidity. Note that the

discharged water must be in accordance with the discharge criteria listed in Section 5.2.3.

Water that does not meet the discharge criteria will be:

- pumped to an appropriate sediment treatment device or infiltration area within the site; and/or
- treated until suitable for discharge in accordance with the discharge criteria.

Pump intakes used where fish may be present shall be screened. Discharge hoses shall terminate onto a stabilised energy-dissipation area, to avoid localised scour.

Earthworks within each section

Once the diversion is active within the earthworks section, cut and fill activities may proceed.

The following requirements are to apply:

- clean water from outside the work area will continue to be excluded from disturbed ground;
- runoff generated within the isolated work section will be regarded as dirty water and contained within the work area for treatment or infiltration;
- stockpiles and loose spoil will not be placed within the active flood-conveyance area;
- machinery will remain outside flowing water at all times;
- refuelling, maintenance and storage of fuels or hazardous substances will occur outside the Park Burn floodplain/gully wherever practicable;
- no sediment-laden water will be intentionally discharged into the temporary diversion;
- progressive trimming and stabilisation will occur during earthworks rather than being deferred until the whole section has been completed; and
- earthworks will cease and the work area will be made secure where forecast rainfall or observed catchment conditions indicate that the diversion could be placed at risk.

Stabilisation and transfer to the next section

Following completion of earthworks within a section, the reconstructed Park Burn bed and adjoining floodplain is to be generally stabilised before the diversion is moved.

Stabilisation is expected to comprise, as applicable:

- placement of clean gravel/cobble substrate within the active channel in accordance with the final channel design;

- topsoiling and hydroseeding of floodplain and upper-bank areas as appropriate;
- installation of biodegradable erosion-control blanket such as coir or jute on vulnerable batters and banks; and
- rock or other erosion-resistant treatment at locations subject to concentrated flow.

The temporary diversion must not be relocated to the next section until the Environmental Representative is satisfied that the completed creek section is sufficiently stabilised and able to receive surface flows.

Diversion inspection and maintenance

While a temporary diversion is operational it will be inspected:

- at least once each working day;
- before forecast rainfall;
- following rainfall or any material increase in Park Burn flow; and
- immediately following any observation of abnormal ponding, scour, liner movement or leakage.

Inspections are to check for erosion at the diversion inlet and outlet, damage or uplift of any liner used, scour beneath the liner (if applicable), accumulation of debris, loss of freeboard, bank instability, damage to isolation structures, and any evidence that dirty water is entering the diversion.

Any deficiency that could materially compromise the diversion shall be rectified immediately. Where necessary, earthworks within the associated section shall cease until the diversion has been repaired.

Water quality monitoring of the Park Burn is to take place during floodplain works, as specified in Section 5.2 of this CEMP.

High flow contingency

Detailed design for the stream diversion will include calculations and provisions for the 1% AEP, as recommended in GD05. This will preferentially be provided for in the main diversion channel, but may require an alternative/higher capacity flowpath depending on the main channel capacity and calculated peak flow for the creek. Regardless, no stockpiles, plant, materials or temporary structures are to obstruct the 1% AEP flowpath.

Where rainfall, snowmelt or upstream observations indicate a significant rise in Park Burn flow is likely:

- earthworks within the active section will cease;

- loose material will be removed, secured, or relocated away from concentrated flow paths;
- exposed surfaces will be temporarily stabilised, where possible;
- emergency erosion-protection material will be made immediately available; and
- the diversion inlet, outlet and secondary flow path (where applicable) will be inspected and cleared of debris.

If diversion failure, overtopping or uncontrolled sediment discharge occurs, the event shall be treated as an environmental incident under the CEMP.

Decommissioning

At completion of the final earthworks section within the creek floodplain, the temporary diversion shall only be removed once the permanent Park Burn channel and adjoining disturbed floodplain are adequately formed and stabilised.

Flow shall be returned to Park Burn in the following sequence:

1. remove the downstream isolation dam first, allowing the permanent channel to inundate progressively (if surface flows are present);
2. remove the upstream isolation dam progressively and allow flow to re-enter the permanent channel;
3. retain fish exclusion measures as required by the freshwater ecologist during the transition;
4. isolate the temporary diversion from flow;
5. pump any turbid residual water to the approved treatment system rather than discharging it directly to the Park Burn;
6. fill the diversion progressively with approved material; and
7. immediately topsoil, seed and protect high-risk disturbed areas with erosion-control blanket or another approved stabilisation treatment.

5.1.6 ESC design details

Full details of design guidance for ESCs are provided in Appendix E. The sections below provide a summary of these details, and are to be read in conjunction with those in the appendix.

5.1.6.1 Erosion controls

Hydroseed and hydromulch

Hydroseeding and hydromulching will be used to provide rapid vegetative stabilisation of exposed soils.

- Hydroseeding may be applied to completed earthworks surfaces, topsoiled areas and batters to promote vegetation establishment.
- Hydromulch may be used where enhanced erosion protection is required, particularly on steeper slopes, exposed batters and areas subject to high wind erosion.
- Seed mixes shall be selected to provide rapid germination and long-term stabilisation appropriate to the site conditions.

Hay mulch

Hay mulch may be applied to exposed soils as a temporary erosion control measure where immediate stabilisation is required.

- Mulch provides protection from raindrop impact, reduces wind erosion and assists moisture retention for vegetation establishment.
- Hay mulch may be applied in conjunction with hydroseeding, particularly where grass establishment is limited by cooler seasonal temperatures.
- Mulch shall be anchored where necessary to prevent displacement by wind.

Note that straw mulch is not an acceptable replacement for hay mulch, which has a much greater erosion control efficacy than the former.

Soil binders (polymers)

Environmentally-approved soil binders/polymers may be used for temporary stabilisation of exposed soils and stockpiles.

- Soil binders assist by forming a surface crust that reduces susceptibility to wind and water erosion.
- Polymers are the most common form of soil binders used for erosion control in Otago, and are intended as a short-term stabilisation measure and do not constitute permanent stabilisation.
- Soil binders shall not be used within areas of concentrated flow, active drainage channels or locations subject to frequent inundation. High-traffic areas should also be avoided in relation to polymer application, unless a dedicated high-traffic polymer is used.

Aggregate Stabilisation

Aggregate may be used to stabilise trafficable surfaces, laydown areas and completed earthworks areas.

- Aggregate reduces soil erosion, sediment tracking and dust generation.
- Aggregate surfacing is particularly applicable to haul roads, access tracks, laydown areas and completed building platforms.

- Aggregate surfaces shall be maintained throughout construction to ensure effectiveness.

Clean Water Diversion Channels and Bunds

Clean water diversion channels (CWDCs) and bunds (CWBs) shall be installed where required to intercept and divert runoff originating from undisturbed catchments around active earthworks areas.

- Diversions shall be located upslope of disturbance areas wherever practicable.
- Diversions shall discharge to stable receiving areas.
- Diversion channels and bunds need to be stabilised (such as with grass, erosion control blankets, or geofabric) to prevent clean water being contaminated via scour in the channel or on the bund.
- The objective is to minimise the volume of runoff requiring treatment within sediment control devices.

Dirty Water Diversion Channels and Bunds

Dirty water diversion channels (DWDCs) and bunds (DWBs) shall be installed to collect runoff from disturbed areas and direct flows to sediment retention devices.

- Diversions shall be designed to prevent uncontrolled runoff from disturbed areas.
- Channels and bunds shall discharge to the inlet of the relevant infiltration basin or other approved sediment control device.
- Diversions shall be inspected regularly and maintained free of excessive sediment accumulation.

Trafficable Contour Bunds

Trafficable contour bunds shall be used to intercept and convey runoff while allowing construction vehicle access.

- Bunds function similarly to contour drains but are designed to withstand regular vehicle crossings. They are installed roughly parallel with the contour, meaning their longitudinal gradient is close to flat, and concentrated runoff velocities are very low.
- Bunds shall reduce flow velocities, break up catchment lengths and direct runoff to designated treatment devices via DWDCs.
- Bunds shall be maintained to prevent rutting, erosion or loss of capacity.

Stockpiles

Stockpiles of topsoil, subsoil and imported materials shall be managed to minimise erosion and sediment generation.

- Stockpiles shall be located away from drainage paths, watercourses and the Lake Dunstan/Te Wairere margin where practicable.
- Stockpile heights shall be minimised where practical.
- Long-term stockpiles shall be stabilised using seeding, hydroseeding, hydromulch, mulch or polymers.
- Perimeter controls on the downslope side of stockpiles shall be installed where necessary to intercept sediment-laden runoff. This is higher priority closer to the lake and creek, and lower priority within the quarried areas of the site.

5.1.6.2 Sediment controls

Infiltration Basins

Infiltration basins will be the primary sediment retention device used across the site.

The infiltration basins have been specifically designed for the site's highly permeable outwash gravels, and are intended to provide both sediment retention and runoff infiltration.

- Runoff from disturbed catchments shall be directed to infiltration basins via dirty water diversion channels and bunds.
- Each basin incorporates a sediment forebay to promote coarse sediment settlement prior to discharge into the main basin.
- The basins have been designed to store at least the volume of runoff generated for their given catchment up a 24 hour, 1 in 20 year storm event (5% AEP) in a worst-case scenario where no infiltration occurs.
- Emergency spillways shall be provided to safely manage flows during extreme rainfall events.
- Basins shall be inspected regularly and accumulated sediment removed when necessary to maintain storage and infiltration capacity.
- Detailed design calculations and construction specifications are provided in Appendix F. These designs are preliminary, will be updated as part of the CEMP finalisation process, and will be further considered in relation to significant changes in surrounding cut or fill heights that may impact their efficacy.

- As part of detailed design, further soakage testing consistent with Auckland Council's GD07 will be undertaken to verify the infiltration assumptions used to guide preliminary design of the basins.

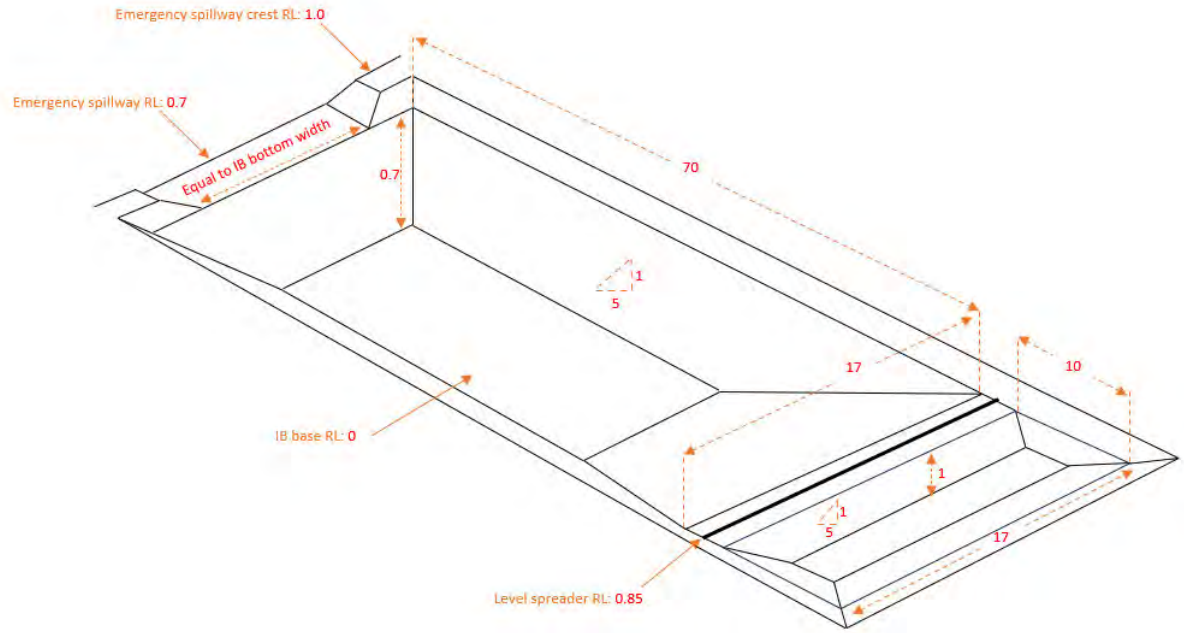


Figure 18: Indicative infiltration basin design

Silt Fencing

Silt fences will be used to intercept sheet flow runoff from small, disturbed areas.

- Silt fences are suitable for low-gradient areas where concentrated flow paths are not expected.
- Silt fences shall be installed along contour lines (to prevent concentrated "weak spots") and keyed into the ground to prevent underflow.
- Sediment is to be removed before accumulated material reaches one-third of the fence height.

Silt Socks and Coir Logs

Silt socks and coir logs shall be used to intercept sediment-laden runoff and provide temporary flow attenuation, and can be used as an alternative to silt fences.

- These controls are suitable for small drainage paths, stockpile protection, perimeter controls and disturbed areas adjacent to sensitive environments.
- Coir logs may also be used to provide temporary stabilisation of channel edges and batters.

Silt Curtains

Silt curtains shall be used where earthworks are undertaken within or immediately adjacent to the Lake Dunstan/Te Wairere margin – specifically, at the two proposed cove construction areas.

- Silt curtains provide a floating barrier that limits the migration of suspended sediment within the water column.
- Curtains shall be installed prior to commencement of works and remain in place until disturbed sediments have settled and water clarity has recovered.
- Installation shall account for anticipated lake level fluctuations, wind fetch and wave action.
- Curtains shall be inspected regularly and repaired immediately if damaged.

5.1.7 Chemical treatment

Based on the information available, it is not expected that chemical treatment of runoff in sediment retention devices will be necessary. This is on the basis of the apparent lack of fine sediment (clays and silts) and most of the works taking place well away from any sensitive receptors.

Certain areas, however, may require development of a chemical treatment management plan CTMP), to ensure any risk to surface water quality is appropriately mitigated. This may be the case for eastern earthworks areas, where infiltration basins may not be as effective at detaining and dissipating runoff, or where there is a heightened risk of uncontrolled runoff into the lake or creek. As works progress and the ESCP is updated to match progress, the need for a CTMP will be reassessed and, if necessary, submitted for council review ahead of works.

5.1.8 Adverse weather and contingencies

Significant weather events have the potential to overwhelm ESCs and greatly increase risk to sensitive environmental receptors. The following provides a summary of steps to be taken to mitigate this risk.

Forecast monitoring

The Environmental Representative (ER) will check the forecast daily, and ideally review multiple different forecast platforms (e.g. Metservice, Windy, MetVUW) to help to calibrate a reliable forecast. The project team is to review and document the forecast at weekly project meetings.

Significant and/or successive rain events

Any forecasted rain event that is expected to reach or exceed 20 mm over 12 hours will trigger the following actions at least 1 day prior to the forecasted event:

a. Where possible, all IBs, forebays, dropouts, check dams and channels/swales are to be checked to ensure they are in good working order. Maintenance, including accumulated sediment removal, to be undertaken immediately if not.

b. Install temporary stabilisation measures in high-risk areas – particularly those in close proximity to water bodies. Measures may include erosion control blankets, hay mulch, or polymers.

c. If works are taking place in or adjacent to the Park Burn or Lake Dunstan/Te Wairere, stop works well in advance and stabilise disturbed ground to the extent possible.

d. Where safe to do so, monitor ESCs and high-runoff risk locations actively during the rain event. Undertake immediate maintenance or corrective actions (such as pumping runoff from one area to another) where required.

Ice or snow

a. Inspect and maintain ESCs prior to forecasted snow events.

b. Inspect ESCs prior to, and during, ice or snow thaw. Devices that may have appeared operational while cover in snow/ice may fail as the thaw begins.

c. Be aware of and manage where meltwater is likely to flow. This may differ from overland flow paths during rain events.

ESC stockpile

An important aspect of preparedness for adverse weather events is having easy access to spare ESC equipment. These should ideally be available at all key earthworks activity areas, to reduce lag time. Recommended spare ESCs include (as a minimum):

- At least 1 roll of standard silt fence, and 1 roll of super silt fence, including waratahs, fasteners and wire.
- Spare polythene.
- At least 4 large rolls of geofabric.
- Bales of hay (for hay mulch application).
- 10 large coir logs or silt socks.
- Sandbags (for rapid and localised water diversions or small check dams).
- Clean rock riprap for emergency check dams and SCEs.
- At least 1 pump, long hose and generator.

5.1.9 Monitoring and maintenance

Weekly and post-rain CEMP inspections shall take into account the state and suitability of erosion and sediment control measures, and schedule maintenance where appropriate. Additionally, all personnel on site have a duty to inform the Environmental Representative, Project Manager or Site Supervisor of any issues relating to the ESC measures, and these are to be rectified as soon as practicable.

Monthly inspections undertaken by the Environmental Consultant (SQEP) will examine the state and suitability of the ESC measures in more detail, with the ESCP subsequently amended or updated where any problems are identified.

Indicative maintenance to erosion and sediment controls is presented in the following table.

Table 7: ESC maintenance requirements

Control/device	Maintenance requirements
Silt fencing, diversion bunds/channels & swales, check dams, IBs, drop out pits	Remove sediment build-up from all ESC controls at or before 20% capacity is reached. Also remove any sediment prior to any forecast significant rainfall event[7]. Removed sediment must be placed on stable ground where it cannot re-enter the device or be washed into any runoff conveyance feature.
Silt fences and/or coir logs and silt socks	Check for damage, including rips, tears, bulges, broken support wires or loose waratahs. Unclog muddy/sediment-laden geotextile with a light broom or brush.
Diversion bunds	Inspect weekly and after every rainfall for scour and potential breach points. Repair immediately. Scour points may require geotextile lining, if not already lined.

5.1.10 ESCP implementation

The Consent Holder and/or Contractor will:

- Provide and implement As Built plans for the ESCP
- Monitor the continued effectiveness of the ESCP during the contract
- Update the ESCP where necessary

The plan will be updated when:

[7] An event likely to cause runoff

- The construction program moves from one earthworks area to another; or
- Any significant changes have been made to the construction methodology since the original plan was accepted for that area; or
- There has been an Environmental Incident and investigations have found that the management measures are inadequate; or
- As directed by council's compliance team.

Bulk earthworks may not commence until the following has been completed:

- The ESCP has been accepted by council, in conjunction with the overarching CEMP; and
- The ESC devices have been installed correctly; and
- As Built plans have been provided to and accepted by council.

5.1.11 Decommissioning and removal

ESCs may only be decommissioned when permanent stormwater management measures for a given catchment are operational and/or site stabilisation (defined as at least 80% revegetation cover) has occurred.

Note that sealed surfaces (e.g. asphalt or concrete) or aggregate (in certain circumstances, with complete coverage and appropriate design) also constitute permanent stabilisation.

5.2 Water quality

Erosion and sediment control is directly linked to water quality management, whereby the discharge of runoff containing high sediment loads or other contaminants can significantly alter the receiving water chemistry and adversely impact physical freshwater ecosystems. This dictates a strategic, diligent approach to any earthworks activities that take place in, adjacent to, or in areas that ultimately discharge to surface water bodies.

5.2.1 Surface water

With regards to the project, the greatest risk to surface water quality relates to works on the Lake Dunstan/Te Wairere and Park Burn margins, and physically within both of those water bodies. There is also a lower risk contamination from earthworks within the property (and further from those water bodies), should those works be poorly managed.

5.2.2 Groundwater

As discussed earlier in this report, the water table largely mimics Lake Dunstan/Te Wairere water levels. In the southern part of the site, on the lowest quarry floor, groundwater is relatively shallow and may be encountered during excavations in

this area. Furthermore, the shallow water table means there is a higher risk of groundwater contamination from fuel or chemical spills in particular.

5.2.3 Performance criteria

Water quality is to be monitored at any location where runoff flows from any disturbed area onsite beyond the boundary, or into a receiving water body (the Park Burn or Lake Dunstan/Te Wairere). During in-water works required for the coves in Lake Dunstan/Te Wairere, water quality monitoring will also be undertaken on the lakeward side of the silt curtains, to ensure in-water controls are working as required. Additionally, while surface flows are present and Park Burn floodplain or channel works are being undertaken, water quality monitoring is to take place upstream and downstream of the active works section.

The below table presents proposed discharge water quality criteria, that are recommended in order to avoid significant adverse effects on receiving waters. It is likely that discharge quality criteria will be imposed by way of resource consent conditions from ORC, meaning this section will likely be subject to update following grant of the relevant discharge consent. Furthermore, FHLD has agreed proposed consent conditions with Kā Rūnaka which include their involvement with the preparation of the final management plans and water sampling regime.

Table 8: Discharge water quality limits

Parameter	Discharge criteria
Total suspended solids (TSS) [8]	≤ 50 mg/L
Turbidity	≤ 150 NTU
pH	5.5 – 8.5
Hydrocarbons, tannins, paint	No visible trace
Waste	No visible trace

5.2.1 Stormwater reuse

The reuse of collected runoff for dust suppression, roadworks or landscaping is preferred over discharge. Where collected water is likely to be encountered, ESCs

[8] To provide an instantaneous onsite estimate of TSS, turbidity monitoring will be used as the proxy measure for TSS monitoring in the field; however if the correlated TSS-turbidity limit is reached, samples will be taken and sent to a lab for TSS analysis.

(such as infiltration basins or SRPs) will be designed to enable abstraction for reuse onsite.

5.2.2 Water quality management measures

To ensure water discharges from site meet the criteria outlined above, water quality management measures are outlined in the following table.

Table 9: Management measures to protect water quality

Measure no.	Action(s) required
1	Refuelling of machinery only to occur within designated locations at least 30 m from onsite water features, including IBs, pipe inlets, and swales. See Section 5.8.2 for further details.
2	Concrete washout pits to be provided well away from onsite water features (including IBs, pipe inlets and swales). Washout pits should be regularly checked and maintained, and drivers made aware of their locations and appropriate procedures for their use. No uncontrolled concrete washout is to occur elsewhere on site.
3	Where possible, stockpiles are to be located at least 30 m from IBs and/or major drainage lines/pipes.
4	All machinery is to be inspected for oil, fuel or other fluid leaks prior to use onsite, then on a daily basis prior to start of works.
5	If deemed necessary, only flocculants appropriate for the treatment of native soils, and for the receiving environment, are to be used. Flocculants must be dosed, monitored and stored in accordance with best practice, GD05 (specifically, Section F2.0) and the subsequent chemical treatment management plan (CTMP).

5.2.3 Water Quality Monitoring Plan

The primary goal of the WQMP, provided below, is to ensure that any non-airborne discharges beyond the property boundary remain within the discharge limits outlined in Table 8, above.

Table 10: Water Quality Monitoring Plan

Sampling scope	
Objectives of sampling	To ensure all offsite stormwater discharges are within the discharge limits outlined in Table 8.
Spatial boundaries	While the property boundary would typically form the sampling catchment, in this instance there are works proposed both adjacent to and within two water bodies. Therefore, any discharge from disturbed areas associated with the works that is **likely to enter a surface water body** is to be sampled.
Frequency	• Sampling when water is discharging beyond the site boundary OR to the Park Burn or Lake Dunstan/Te Wairere. • Daily sampling upstream and downstream of Park Burn floodplain earthworks, when surface flows are present. • If a Significant Rain Event[9] has occurred overnight and water is discharging beyond the site boundary or to surface water, sampling is to occur the following morning. • Visual water quality monitoring of IBs or SRPs (if used) will be undertaken following Significant Rain Events and during Weekly Environmental Inspections.
Sampling design	
Sampling suite	Sampling for TSS (via turbidity) and pH. Visually inspecting for hydrocarbons, tannins, paint and waste.
Sampling locations	Primary sampling locations: 1. At the Park Burn active channel, where works are taking place in this area. In addition to any discharge flowing from the works into the wetted bed of the creek or associated diversion, upstream and downstream monitoring in the creek is required during the works.

[9] A rain event at an intensity of 20mm/12hrs.

<table>
<tr><td></td><td colspan="2">2. At the Lake Dunstan/Te Wairere shoreline.
3. Within Lake Dunstan/Te Wairere, on the immediate lakeward side of the silt curtain, during and following in-water works.</td></tr>
<tr><td rowspan="6">Sampling methodology</td><td>Parameter</td><td>Method of assessment</td></tr>
<tr><td>TSS</td><td>Use of a portable turbidimeter or turbidity probe sensor, with turbidity correlated to TSS via lab analysis. Provides an instant turbidity reading as an acceptable proxy for TSS, avoiding delays associated with TSS lab analysis.</td></tr>
<tr><td>pH</td><td>pH meter</td></tr>
<tr><td>Hydrocarbons</td><td>Visual inspection for oily films[10] on water surface, or small.</td></tr>
<tr><td>Tannins, paint</td><td>Visual inspection for discolouration of waters leaving the site.</td></tr>
<tr><td>Waste</td><td>Visual inspection for litter in erosion and sediment controls and water conveyance features, including IBs/SRPs, swales and pipes.</td></tr>
<tr><td>Quality control</td><td colspan="2">All water quality meters or equipment used are to be maintained and calibrated in accordance with manufacturer’s instructions.
Visual inspections are to be recorded and actioned as appropriate.</td></tr>
<tr><td>Records</td><td colspan="2">The results of all sampling and visual water quality inspections are to be recorded on the Water Quality Monitoring Log, provided in Appendix C.</td></tr>
<tr><td>Non-conformance</td><td colspan="2">Any exceedance of the discharge criteria is to be immediately reported to the Site Supervisor/Environmental</td></tr>
</table>

[10] Excluding films created by naturally-occurring bacteria, which tend to form geometric shapes that break apart. Hydrocarbons form as globules on the water surface.

	Representative or Project Manager, who is to coordinate immediate remedial action. Actions may include: 1. Cease or modify work in the area to discontinue any potential source of contamination. 2. Take action to ensure contaminants present in water leaving the site do not migrate to receiving water bodies. 3. Contact the SQEP, if appropriate (as SQEP may already be undertaking inspections/sampling). 4. Contact ORC Pollution Control on 0800 800 033. 5. Investigate the Environmental Incident and develop remedial measures to ensure it does not occur again. 6. Report the incident to ORC within 48 hours of discovery, and prepare and submit an incident report as per Section 4.3 of this CEMP. 7. Update the CEMP to incorporate additional/revised environmental controls as appropriate. Any sample that has exceeded the discharge criteria is to be sent to lab within 24 hours to verify all of the measured discharge parameters.

5.3 Dust

Dust from earthworks and associated construction activities has the potential to generate the following adverse effects:

- Nuisance effects on neighbouring residents, members of the public and motorists on adjacent roads.
- Safety issues for motorists in particular, where dust plumes are significant and can obscure vision.
- Health issues for adjacent residents, members of the public and even personnel working on the job site generating the dust.
- Sedimentation on adjacent land and directly into nearby surface water bodies, contributing to water quality degradation.

Dust is primarily a function of wind-based (aeolian) erosion. Where vegetation and topsoil is removed, the underlying subsoils are more prone to wind erosion, which can lead to increased incidence of significant dust events. The contractor and the

consent holder have an obligation to minimise dust generation onsite in the first instance, and secondarily ensure that dust does not migrate beyond the site boundary.

5.3.1 Performance requirements

The Consent Holder and Contractor shall at all times take reasonable and practicable management measures to avoid dust moving beyond the boundaries of the site.

5.3.2 Monitoring

Weekly inspections shall include observations of the site for visual evidence of dust travelling beyond the site boundary, and evidence of dust fallout from the works on adjacent vegetation. Daily (pre-start) inspections will take into account the forecast for the day, and schedule works accordingly.

5.3.3 Dust management

The following figure is a reproduction of Figure 9, with the addition of a wind rose taken from Windy.com showing the historic average predominant wind directions (northwest to west the predominant wind directions).

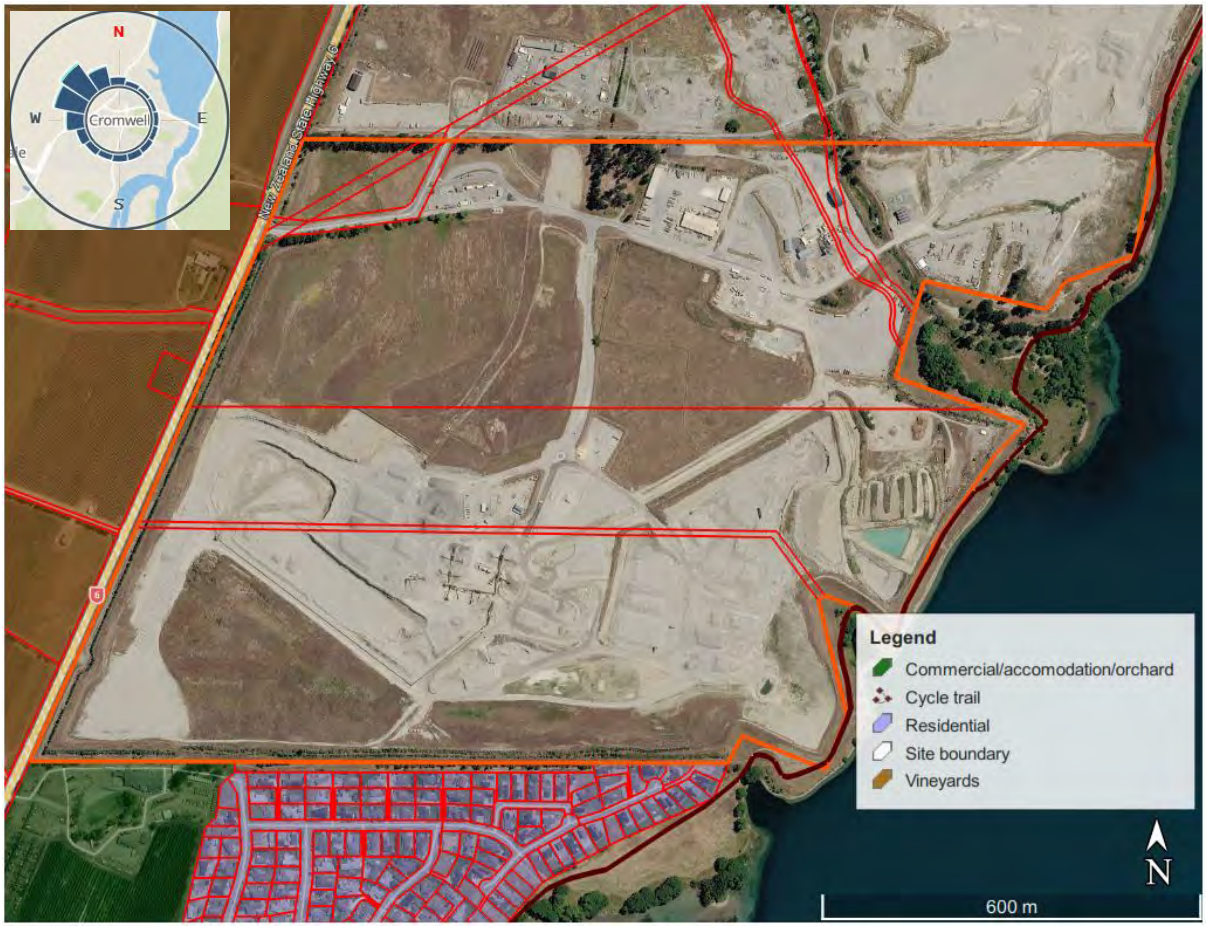


Figure 19: Potential sensitive receptors to dust that may be generated via site works (inset: wind rose for Cromwell, via Windy.com)

Northwest winds pose a risk of significant dust effects on residents in the northern section of Pisa Moorings, directly to the south of earthworks areas 1-3 in particular. Strong westerly and northwest winds also present a water quality risk to Lake Dunstan/Te Wairere from all areas of the site, and to the Park Burn from earthworks in the northern sector of the property. Cycle trail users to the east of the property are also at risk of dust nuisance.

The following table addresses key considerations and management approaches relating to dust onsite. A full Dust Management Plan will be provided in the Final version of this CEMP, and will incorporate and expand on the measures listed below.

Table 11: Dust considerations and proposed onsite management

Requirement	Response/proposal
Works likely to cause adverse environmental effects including Environmental Nuisance effects in relation to dust and location of these works onsite	Key project activities with potential to cause environmental effects in relation to dust: • Site strip/vegetation removal • Earthworks • Stockpiling • Gravel/subsoil processing • Civils works
Prevailing wind direction and speeds generally expected for the site location	Based on NIWA climate data relating to Wanaka and Lauder (the closest stations to the site), the strongest winds are from northwest, with this statistic reflected in Windy for Cromwell. This means that residents in the northern part of Pisa Moorings (south of the site), users of the cycle trail to the east, and the lake and Park Burn themselves are at significant risk from strong northwesterlies. Summer and spring have the highest frequency of strong winds. For Wanaka, summer and spring have the greatest incidence of strong winds, whereas most strong wind in Lauder is experienced in spring.
Evaluation outcome of which air quality sensitive receivers will likely experience Environmental Nuisance effects or	Without mitigation, residents to the south of the site are most likely to be impacted by dust generated from the works – particularly during bulk earthworks in Areas 1 to 3, but also in Area 4 as this is elevated. While a lower risk, there remains potential for dust

Requirement	Response/proposal
adverse environmental effects in relation to dust	effects on the adjacent state highway, in the event of a strong easterly wind.
Management measures and strategies for mitigating Environmental Nuisance and adverse environmental effects associated with dust	Dust nuisance and environmental effects will be kept to a minimum onsite via the following: • Dust suppression via water carts. Approximately 5 mm/day across all exposed areas of the site when the ground is not already damp, including stockpiles as necessary. At this stage, it is understood that water for dust suppression will be sourced via a newly established lake intake, subject to necessary approvals. The ground is to be kept moist (but not wet) at all times. Where access is limited, sprinkler systems can be utilised for dust suppression. • Establish sprinkler systems in concentrated high-risk areas, such as where regular load-outs to stockpiles are occurring. As winds increase, the sprinklers can be activated to continuously suppress dust as load-outs continue. • High-risk dust generating areas within the site are to be sprayed via water cart utilising GRT Haul-Loc (dust suppressant). GRT Haul-Loc is advertised as being environmentally safe and biodegradable. • Compact fill within the disposal area on a regular basis. • Use soil binders/polymers where required. • High-risk dust generating areas within the site can be sprayed via water cart utilising GRT Haul-Loc (dust suppressant). GRT Haul-Loc is advertised as being environmentally safe and biodegradable, and can be used in trafficable areas (such as haul roads or

Requirement	Response/proposal
	laydown areas) or to provide a longer-term stabilisation alternative to standard polymers. • Seed or mulch exposed areas that are sitting idle for extended periods of time. • Topsoil and hydroseed formed allotments and reserves as soon as practicable. Seeded areas to be irrigated for optimum grass strike and growth. • Once formed, internal roads and berms to be trimmed to subgrade and direct drilled to encourage grass stabilisation, until such time as permanent sealing can occur as part of the civils works. • No small stockpiles to be allowed onsite – excavated material is to be carted to designated larger stockpiles. • Designated stockpiles are to be kept as low as possible, smoothed and tamped down, and dampened via water cart or hose. Where stockpiles are no longer to be added to, they will be sprayed with polymer. • Stop/adjust works during times of high winds, particularly during the earthworks phase. Forecasting should be used to avoid undertaking disturbance activities near sensitive receptors during windy periods. • Limit onsite speed limit to 20 km/hr.

5.3.4 Dust contingency measures

The below table outlines measures that are to be followed in the event of significant dust-related issues.

Table 12: Contingency measures for dust-related issues

Issue	Contingency measures to be followed
Dust migration beyond the site boundary due to earthworks	• Cease dust-generating activities, particularly excavation. • Increase water cart dust suppression. Activate any sprinkler systems set up in the area.
Dust migration beyond the site boundary due to stockpiling	• Cease any further additions to the stockpile, until wind speeds have reduced. • Use water cart hoses to dampen stockpiles, or position sprinklers to continuous spray stockpiles with water. • Apply polymer to stockpiles that will be left for more than a month. • Location stockpiles away from site boundaries, and away from ridgelines or exposed areas. Given the strongest winds are likely to be from the west or northwest, locate stockpiles where they are screened from this direction.
Dust migration beyond the site boundary due to haulage	• Increase water cart activity to regularly spray roads. • Further reduce vehicle speeds. • Consider applying a trafficable polymer like Haul-Loc, or apply a thin layer of clean aggregate.

5.4 Cultural heritage

The Consent Holder or appointed sub-Contractor shall be responsible for the management and protection of Cultural Heritage within and adjacent to the site to avoid adverse environmental effects to Cultural Heritage. While there are no known locations of Cultural Heritage significance within or adjacent to the site, it is noted that Lake Dunstan/Te Wairere holds cultural and spiritual significance to Kāi Tahu, and is formally recognised by the Crown through a Statutory Acknowledgement under section 61 of the Ngāi Tahu Claims Settlement Act 1998.

While a large portion of the site has already been heavily modified and excavated as part of the ongoing quarry operations, should information become available that indicates there are areas or items of cultural significance within the site, then this section will be updated accordingly.

5.4.1 Accidental discovery

In the event of an accidental cultural heritage discovery, the Consent Holder or Contractor shall adhere to the Accidental Discovery Protocol found in Appendix 4 of the QLDC EMP Guidelines. This is also provided in Appendix G of this document for convenience.

5.5 Noise and vibration

The Consent Holder or Contractor is responsible for the management of construction noise and vibration.

5.5.1 Performance requirements

5.5.1.1 Noise

Under the Central Otago District Plan (CODP), construction noise is exempt from standard residential zone limits if it complies with *NZS 6803:1999 (Acoustics – Construction Noise)*. This standard allows for significantly higher noise levels during typical working hours, categorised by the type of equipment used and the duration of the project.

The following table provides a summary of noise limits relating to long term (>20 weeks) construction activities. If these cannot be adhered to, resource consent will need to be sought from CODC for exceeding the limits. All decibel levels (L_{eq} and L_{max}) are measured at a distance of 1 metre from the facade of any neighbouring occupied building or at the designated notional boundary of adjacent rural/residential properties.

Table 13: Relevant noise limits

Days/ timeframe	Permitted hours	L_{eq} limit (average)	L_{max} limit (peak)	Activity suitability/ earthworks focus
Weekdays & Saturdays *(Morning Prep)*	6:30 am – 7:30 am	55 dBA	75 dBA	Unpacking light gear, site arrivals, engine idling. No heavy earthmovers.
Weekdays & Saturdays *(Core Work Window)*	7:30 am – 6:00 pm	70 dBA	85 dBA	Main earthworks window: Diggers, heavy dump trucks, rollers, and loaders.

Days/ timeframe	Permitted hours	L_{eq} limit (average)	L_{max} limit (peak)	Activity suitability/ earthworks focus
Weekdays & Saturdays *(Evening Wind-Down)*	6:00 pm – 8:00 pm	65 dBA	80 dBA	Restricting heavy compactors. Interior site tasks or final equipment parking.
Night-time *(All Days)*	8:00 pm – 6:30 am	45 dBA	75 dBA	No active earthworks. Only minor, silent maintenance or security watch.
Sundays & Public Holidays	All Hours	45 dBA	75 dBA	Heavy machinery banned. Site must revert to baseline quiet residential limits.

5.5.1.2 Vibration

The following publications typically guide vibration monitoring associated with large projects in New Zealand:

- DIN 4150-3:1999 (to prevent cosmetic structural damage); and
- BS 5228-2:2009 (to manage human comfort/amenity).

Vibration is quantified using Peak Particle Velocity (PPV), measured in millimetres per second (mm/s).

The following table summarises vibration limits set under these standards.

Table 14: Relevant vibration limits

Criteria target	Timeframe	PPV limit at receptor	Target application and risks
Structural / Building Damage *(DIN 4150-3)*	All Hours	5.0 mm/s	Standard residential dwellings (prevents plaster cracking, brick/facade cosmetic damage).
Human Amenity / Comfort *(BS 5228-2)*	Daytime (7:00 am – 6:00 pm)	1.0 mm/s	Vibration is clearly perceptible to neighbours, but tolerated for necessary daytime earthworks.
Human Amenity / Comfort *(Night-time / Rest Periods)*	Night-time & Sundays (6:00 pm – 7:00 am)	0.3 mm/s	Just at the cusp of human perception. High-vibration heavy plant is functionally unviable.

The above limits for noise and vibration are to be adhered to for the full duration of the development.

In addition, the Consent Holder will ensure that earthworks are constrained to any hours of operation specified in any consents or approvals granted by CODC. Adhering to these hours of operation will help to minimise noise and vibration effects on nearby receptors.

5.5.2 Noise and vibration management

The following table summarises measures that should be implemented onsite to ensure noise and vibration effects on neighbouring properties are minimised to the extent practicable. Note that the most at-risk receptors are those in the northern part of Pisa Moorings, directly to the south of the property.

A Construction Noise and Vibration Management Plan will be provided with the Final CEMP, both incorporating and expanding on the below management measures.

Table 15: Management measures for noise and vibration

Measure	Details
Require broadband reversing alarms on all applicable vehicles	Replace standard, high-pitch "beep-beep" alarms on all trucks and diggers with white-noise "squawker" alarms. These direct sound only behind the vehicle and dissipate rapidly with distance.
Use modern plant	The contractor and any sub-contractors are only to use heavy earthworks machinery that is modern, with well-maintained mufflers and acoustic engine enclosures. Regularly service all machinery.
Maintain smooth haul roads	Regularly grade and water the internal site haul roads. Eliminating potholes and ruts stops large empty dump trucks from rattling, bouncing, and creating sudden transient vibration spikes.
Switch to static compaction near residential boundaries	Near residential boundaries (within 50–60 metres), switch vibration rollers to "static mode" or use smaller pneumatic rollers to meet the 1.0 mm/s PPV human amenity limit. Alternatively, track rolling (which produces lower vibration than standard rollers) may be an acceptable alternative near boundaries.

Enforce restricted high-impact work windows	Schedule the loudest and most vibration-heavy activities between 9:00 am and 4:00 pm only, avoiding the highly sensitive early morning and evening periods.

5.5.2.1 Monitoring

Weekly inspections by the Environmental Representative and monthly inspections by the Environmental Consultant will include a subjective assessment of whether the site is adhering to the noise and vibration limits outlined above.

In the event that a noise or vibration-related complaint is received, site management in association with the Environmental Consultant may need to engage an acoustic consultant or engineer. As part of this process, the above management measures will be reviewed, amended and/or supplemented depending on the outcome of the review.

Note that a noise or vibration complaint constitutes an environmental incident, and must be addressed as specified in Section 4.3 of this CEMP.

5.6 Contaminated sites

A full summary of potential contaminants that may be encountered within the site is provided in Table 2 of this CEMP. As a brief recap, contaminants are concentrated in the northeast section of the site, while small isolated areas of potential impact were also identified in the active quarry area to the south, associated with bitumen and fuel storage, and a generator (see below figure).

Insight Engineering have subsequently prepared a Remediation Action Plan (RAP) that details methods for reducing the risk to human health associated with these contaminated areas of the site, and presents procedures that must be followed to undertake remedial work associated with the contaminants.

If unexpected contamination outside of the areas identified in the RAP is discovered by sight or odour during earthworks, the Contractor will:

- Immediately cease all earthworks in the area of contamination, including a conservative buffer zone;
- Notify ORC within 24 hours of the discovery;
- Engage a contaminated land specialist (CL-SQEP) to perform an assessment of the discovery;
- Appropriately remediate the subject area and dispose of the contaminated soils under the direction of the CL-SQEP.

Works in the affected area cannot recommence until the site has been remediated to the CL-SQEP's acceptance and any consents or approvals have been obtained.



Figure 20: On-site HAIL areas (source: e3 Scientific, via Insight Engineering)

5.7 Vegetation management

Viridis Environmental Consultants have undertaken an Ecological Impact Assessment for the proposed development, with existing vegetation both within and adjacent to the site summarised below.

5.7.1 Exotic vegetation

Vegetation within the site was mostly limited to exotic vegetation planted as shelterbelts or large individual or groups of trees. Species present included poplar, macrocarpa, gum and occasional willows. Crack willow was abundant along the Lake Dunstan/Te Wairere margins and the Park Burn (Figure 21), and pines were also present on elevated land above the Park Burn. The remainder of the site that was not currently part of the active quarry or associated yards, was vegetated with mixed exotic pasture species and pasture associated weeds (Figure 22).

Species observed in these latter areas included sheep's sorrel, viper's bugloss, goosefoot, California poppy, mallow, yarrow, rabbitfoot clover and plantain. Much of these unworked areas may yet be quarried prior to the development earthworks beginning in these locations, meaning the majority of this vegetation may be removed by the time works start.

Where land has been quarried, vegetation was either absent, or exotic grass species had re-established.



Figure 21: Willows and scrub on the margins of Lake Dunstan/Te Wairere, from eastern site boundary



Figure 22: Facing west from central portion of proposed Earthworks Area 4

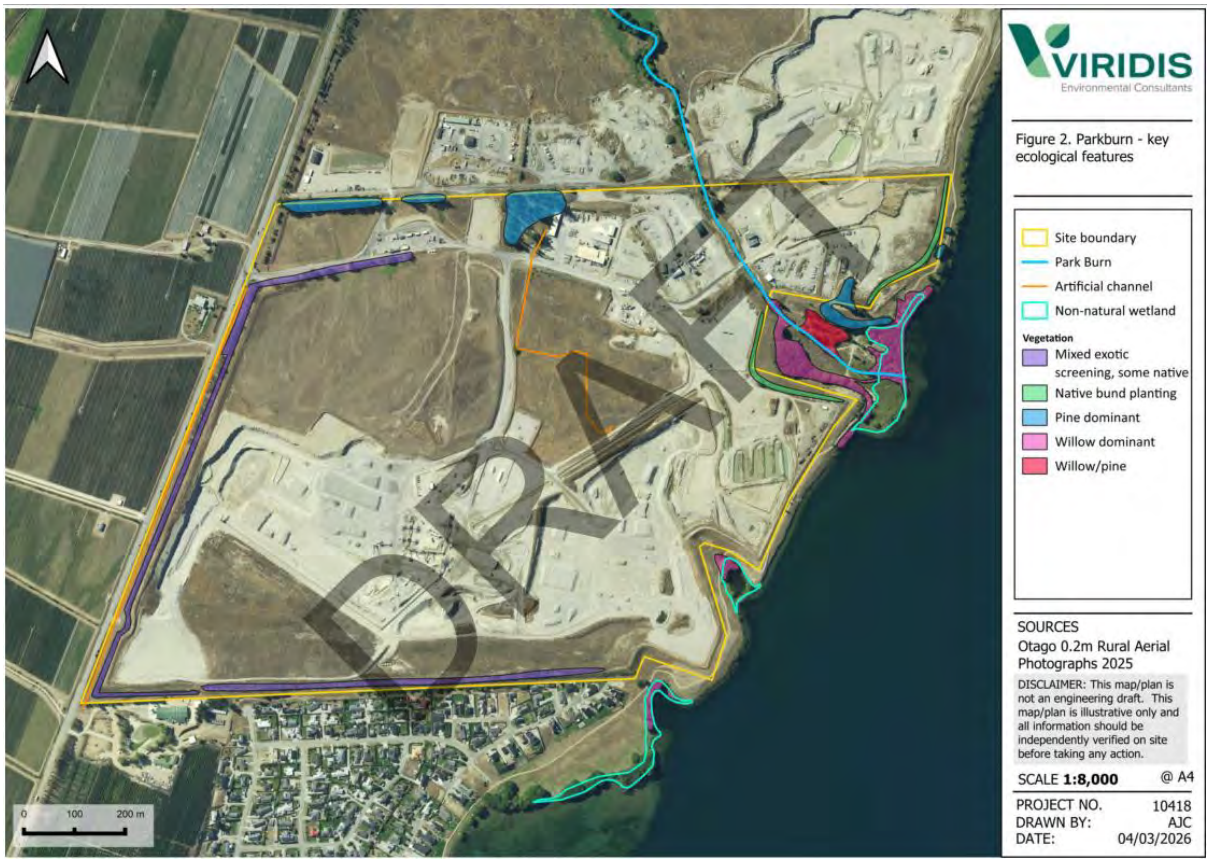


Figure 23: Draft plan showing key vegetation features within and adjacent to the site (source: Viridis EcIA)

5.7.2 Indigenous vegetation

There are small areas of planted native vegetation around the perimeter of the site, mostly in association with the perimeter bunds. Species present along the eastern boundary included common native species such as mingimingi (Coprosma propinqua), toetoe (Austroderia sp.), hebe (Hebe sp.), koromiko (Veronica salicifolia), cabbage tree (Cordyline australis), and Olearia sp. Species present along the western boundary included mingimingi, Coprosma rugosa, marsh ribbonwood (Plagianthus divaricatus), kohuhu (Pittosporum tenuifolium), koromiko, and hebe.

Overall, native vegetation was determined by the assessment to have little ecological or habitat value.

5.7.3 Vegetation management measures

The Consent Holder (or nominated Contractor) will at all times take reasonable and practicable management measures to avoid disturbance to vegetation or ground surfaces outside the limits of clearing.

The Contractor will install identification markers along the limits of clearing prior to commencing vegetation clearing and ground disturbance. Identification markers

will be maintained for the duration of the works or at least until works are complete in the adjacent area.

Where works encroach on individual trees or vegetation to be protected/retained, ground disturbance or other works, including stockpiling, will not encroach within the dripline of the tree unless advised otherwise by an arborist in association with any relevant resource consent conditions.

General management measures to minimise unnecessary clearance of unprotected vegetation on the property include:

- Ensuring the proposed disturbance area (extent of earthworks) is clearly marked out with stakes, to ensure no more vegetation is cleared than needs to be.
- Taking a cautious approach to clearance, whereby only those areas that are certain to be disturbed by the works are cleared.
- Ensuring the recommendations and mitigations provided in the Ecological Impact Assessment are known and adhered to.
- Adhering to any conditions of consent concerning ecology or vegetation clearance.
- The Environmental Representative is to be onsite during clearance to ensure the clearance boundary is not trespassed.

The Contractor should ensure that care is taken to avoid disturbing any nesting birds during vegetation clearance. Should nesting birds be encountered, a suitably qualified ecologist or ornithologist should be retained to assess the situation and establish an exclusion zone so that construction activities may continue.

While outside the scope of this CEMP, to provide a central depository for management plans, Viridis Environmental Consultants' Draft Lizard Management and Fish Management Plans are provided in Appendices L and M. Any updates to these plans will be reflected in updated versions of this CEMP and as part of the certification process for all management plans.

5.8 Chemicals and fuel management

The Consent Holder or appointed Contractor is responsible for the management of all chemicals and fuels within the site so as not to cause adverse environmental effects (including environmental nuisance off-site).

5.8.1 Performance requirements

Spill response equipment is to be available at all times around the site for use in an emergency. Spill response equipment shall be commensurate with the site

location, topographical features, type and quantity of chemicals and fuels being stored on site.

The Contractor shall promptly remediate any contamination resulting from spills, leaks and discharges to a condition similar to that existing before the contamination.

Refuelling of machinery shall conform to the following requirements:

- Occur at least 30 m from a waterway or runoff management feature (including CWDs, DWDs and infiltration basins)
- Fuelling activity to be supervised at all times
- Hoses to be fitted with a stop valve at the nozzle end.

Machinery shall be maintained to minimise the leakage of oil, fuel, hydraulic and other fluids.

5.8.2 Chemical and fuel management during construction

Prior to works starting onsite, the Contractor is to provide the following to the Environmental Consultant:

- A list of fuels and chemicals to be used on site, where those volumes are likely to exceed 2,000 l.
- The expected maximum volume and proposed storage location for the above fuels and chemicals.
- The number, size and location of all spill kits to be provided onsite.
- Fuel and chemical containment measures to be employed.

The Environmental Consultant will use the above supplied information to update this section of the CEMP, to ensure it is accurate and fit for purpose.

General management measures for avoiding contamination or discharge to land or water include:

- Refuelling is to take place in designated refuelling areas only, ideally at least 30 metres from any lB, drain or swale. **Absolutely no refuelling is to take place within 30 metres of a watercourse or water body** – specifically, the Park Burn or Lake Dunstan/Te Wairere. Additionally, no refuelling is to take place within 20 metres or any dewatering pit or sump.
- Drip trays or absorbent mats are to be used while refuelling to catch any spilled fuel.
- Chemical and fuel storage areas are to have bunds that are sized based on 110% of the largest container stored inside the bunded area.

- Chemical and fuel storage areas are to be located as far from drainage features (including swales and drains) as possible, to avoid contamination of water and movement of chemicals away from site.
- Store the least amount of fuel on site as possible. Fuel and chemicals are only to be stored within designated, bunded chemical and fuel storage areas.
- Only designated pits are to be used for concrete washout. Drivers to be made aware of these designated washout locations and appropriate procedures for their use.
- All onsite staff are to be trained in spill response and are to be familiar with the spill contingency plan below. Work in the area must immediately cease in the event of a chemical or fuel spill, and the contingency plan in the following section followed.
- Spill kits are to be clearly identified and readily available onsite.
- If a significant rainfall event is forecast, undertake pre-event inspections of chemical and fuel storage areas and immediately rectify any issues found.

A plan showing indicative designated locations for refuelling, fuel and chemical storage, site office(s), laydown areas and waste disposal areas will be provided in the finalised CEMP.

5.8.3 Anticipated chemical storage

The below table provides a list of chemicals and fuels, and associated maximum volumes, that are expected to be used and stored onsite. This list will be updated following receipt of further information from the Contractor, as specified above.

Table 16: Onsite chemicals and fuels

Fuel or chemical	Use	Storage area	Volume
Diesel	Construction equipment	Fuel bowser or trailer close to site entrance	≤2,000 l
Oil	Construction equipment	TBD	≤20 l
Grease / lubricant	Construction equipment	Grease gun in all large machinery	≤5 l
Paint	Spot marking	TBD. Likely in diggers and light vehicles.	≤2 l

5.8.4 Spill contingency plan

If a spill or emergency situation occurs with regards to chemicals or fuels onsite, the following protocol should be followed:

1. **Safety first:** Ensure you know what has been spilt, how much, and whether you can rectify the situation without endangering your life or the lives of others. Use personal protective equipment (PPE) as required.
2. **Stop the source (if safe to do so):** Turn off, plug the leak or right the container.
3. **Protect stormwater:** Confine the spill with booms (these should be stocked in spill kits), sandbags or other suitable material. Block off any drains, races or swales to prevent migration of the spill offsite.
4. **Notify:** Inform the site supervisor and/or the Environmental Representative and/or the Project Manager. ORC's Pollution Hotline can be contacted via 0800 800 033.
5. **Clean up:** Neutralise hazardous substances, pump or sweep into safe container. Clean up residuals without allowing wash or sweepings into stormwater. Ask for advice if required.
6. **Dispose responsibly:** Use an appropriate disposal contractor to remove the contaminated material.
7. **Restock and review:** Restock spill kit(s) and review incident to prevent recurrence.

This CEMP is to be reviewed following any spill to determine whether it is fit for purpose. Amendments are to be made to the CEMP where any issues or inconsistencies are identified, in order to prevent incident recurrence in future.

5.9 Waste management

The Contractor is responsible for the management of all wastes within the site to ensure no environmental or nuisance effects occur. Uncontrolled construction waste/rubbish can pollute the environment, adversely impact flora and fauna, and signal to members of the public that the site is not well-managed.

5.9.1 Waste management during construction

The Contractor shall ensure that all wastes have been removed from site. No waste shall be burnt on site.

The Contractor shall provide bins at common areas at all times. Bins shall be fitted with lids and serviced prior to being filled to capacity. During construction, the Consent Holder shall maintain the site free of litter and ensure that no litter leaves the boundary of the site.

Particular care is to be taken around Lake Dunstan/Te Wairere, with any rubbish generated to be secured such that wind cannot blow it out into the lake.

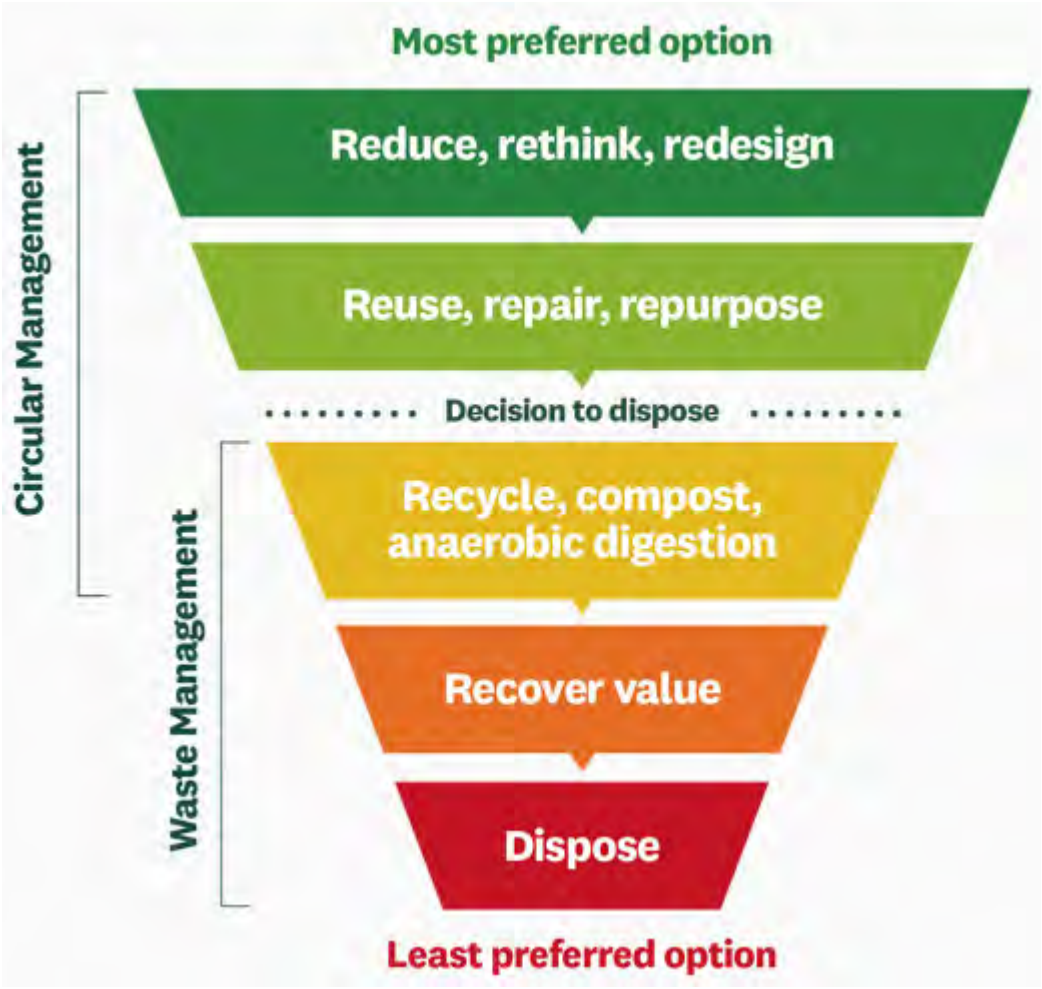
Vegetation waste from clearing and stripping that is free of noxious plants may be used in conjunction with soil erosion and sediment control measures such as brush matting or mulching.

Mulch stockpiles shall be separated from drainage lines and waterways. Mulch stockpiles shall be no higher than 2.5 m. When ambient temperatures exceed 30 degrees Celsius mulch stockpiles should be no higher than 1.5 m and monitored regularly for excess leachate and heat.

Stockpile locations are TBD by the Consent Holder in conjunction with the Environmental Representative and/or SQEP.

5.9.2 Waste minimisation

Both the Consent Holder and Contractor are to prioritise waste minimisation at all times. This includes designing project components to minimise waste generation at the outset (for example, implementing ESC perimeter controls that utilise coir logs or compostable silt socks instead of silt fencing where possible, or constraining earthworks that require silt fencing in the first place), reducing use of consumptive materials, reusing materials, or recycling, prior to resorting to disposing via landfill. This is summarised in the waste management hierarchy, as presented below:



As a minimum, separate waste streams will be maintained, with clearly-marked bins for general waste, recycling, and hazardous waste.

5.9.3 Monitoring

All staff will be briefed on waste management requirements as part of the site environmental induction. Daily pre-start inspections will look for, identify and address any visible unmanaged waste onsite. Weekly and monthly environmental inspections will also include a visual assessment of site waste management, and implemented remedial actions where required.

Appendix A: Project plans

Legend
- Reserves
- Covenant Areas
- Esplanade Reserves
- Stage 1A (42 Lots)
- Stage 1B (50 Lots)
- Stage 2 (74 Lots)
- Stage 3 (45 Lots)
- Stage 4 (89 Lots)
- Stage 5 (83 Lots)
- Stage 6 (60 Lots)
- Stage 7 (73 Lots)
- Stage 8 (77 Lots)
- Stage 9 (65 Lots)
- Stage 10 (53 Lots)
- Stage 11 (42 Lots)
- Stage 12 (61 Lots)
- Stage 13 (86 Lots)
- Stage 14 (36 Lots)
- Stage 15 (51 Lots)

TOTAL 987 Lots

LEGEND
- INDUSTRIAL ACTIVITIES AREA
- 100M OFFSET

NOTES:
- All roads to vest as legal road in the Central Otago District Council

N

Sheet 4

Sheet 2

Sheet 5

Sheet 3

LUGGATE - CROMWELL ROAD

STAGE 1A
STAGE 1B
STAGE 2
STAGE 3
STAGE 4
STAGE 5
STAGE 6
STAGE 7
STAGE 8
STAGE 9
STAGE 10
STAGE 11
STAGE 12
STAGE 13
STAGE 14
STAGE 15

Lake Dunstan
(Te Wairere)

ROAD 6 (16M)

PROPOSED EASEMENTS IN GROSS

PURPOSE	SHOWN	BURDENED LAND	GRANTEE
Right to Store water	B	LOT 2002	CONTACT ENERGY LIMITED
	C	LOT 2006	

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ISSUED FOR CONSENT

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LANDPRO.

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Client
FH LAND DEVELOPMENT LTD

NOTES
- All dimensions shown are in metres unless otherwise shown
- Copyright on this drawing is reserved
- Check any electronic data against the hardcopy plan to ensure it is the latest version
- If this plan is being used as part of sale and purchase agreement then it is done so on the basis that it is preliminary only, final dimensions and areas may vary on final survey

STAGING PLAN - SHEET 1 OF 6
PARKBURN QUARRY DEVELOPMENT
922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By
A	16.09.26	Stages 6 & 7 swapped	SLM
B	23.10.26	All Road Widths updated to CODC Standard	SLM

Designed	Date	Job No.	Drawing No.
TJ	02.26	24113	105_01
Drawn	Date	Scale	
SLM	12.06.26	1:5000 @ A3	
Checked	Date	Datum & Level	Rev.
NKA	12.06.26	LP 2000	B

NOTES:
- All roads to vest as legal road in the Central Otago District Council
- Areas AA - AS subject to Covenants

Legend

- Reserves
- Covenant Areas
- Esplanade Reserves
- Stage 1A (42 Lots)
- Stage 1B (50 Lots)
- Stage 2 (74 Lots)
- Stage 3 (45 Lots)
- Stage 4 (89 Lots)
- Stage 5 (83 Lots)
- Stage 6 (60 Lots)
- Stage 7 (73 Lots)
- Stage 8 (77 Lots)
- Stage 9 (65 Lots)
- Stage 10 (53 Lots)
- Stage 11 (42 Lots)
- Stage 12 (61 Lots)
- Stage 13 (86 Lots)
- Stage 14 (36 Lots)
- Stage 15 (51 Lots)

TOTAL 987 Lots

LUGGATE - CROMWELL ROAD

Sheet 4 adjoining

Sheet 3 adjoining

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STAGING PLAN - SHEET 2 OF 6
PARKBURN QUARRY DEVELOPMENT
922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By
A	16.09.26	Stages 6 & 7 swapped	SLM
B	23.10.26	All Road Widths updated to CODC Standard	SLM

Designed	TJ	Date	02.26	Job No.	24113
Drawn	SLM	Date	12.06.26	Drawing No.	105_02
Checked	NKA	Date	12.06.26	Scale	1:2000 @ A3
				Datum & Level	LP 2000
				Rev.	B

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Sheet 4 adjoining

Sheet 5 adjoining

Sheet 2 adjoining

ROAD 21

ROAD 22 16M LEGAL WIDTH

ROAD 1

ROAD 3 20M LEGAL WIDTH

ROAD 23 18M LEGAL WIDTH

ROAD 10

ROAD 9

ROAD 12 18M LEGAL WIDTH

ROAD 11 18M LEGAL WIDTH

20M LEGAL WIDTH

ROAD 8 18M LEGAL WIDTH

ROAD 7 18M LEGAL WIDTH

ROAD 6 (16M)

Lake Dunstan
(Te Wairere)

Legend

- Reserves
- Covenant Areas
- Esplanade Reserves
- Stage 1A (42 Lots)
- Stage 1B (50 Lots)
- Stage 2 (74 Lots)
- Stage 3 (45 Lots)
- Stage 4 (89 Lots)
- Stage 5 (83 Lots)
- Stage 6 (60 Lots)
- Stage 7 (73 Lots)
- Stage 8 (77 Lots)
- Stage 9 (65 Lots)
- Stage 10 (53 Lots)
- Stage 11 (42 Lots)
- Stage 12 (61 Lots)
- Stage 13 (86 Lots)
- Stage 14 (36 Lots)
- Stage 15 (51 Lots)

TOTAL 987 Lots

NOTES:
- All roads to vest as legal road in the Central Otago District Council

PROPOSED EASEMENTS IN GROSS

PURPOSE	SHOWN	BURDENED LAND	GRANTEE
Right to Store water	B	LOT 2002	CONTACT ENERGY LIMITED
	C	LOT 2006	

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STAGING PLAN - SHEET 3 OF 6
PARKBURN QUARRY DEVELOPMENT
922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By
A	16.09.26	Stages 6 & 7 swapped	SLM
B	23.10.26	All Road Widths updated to CODC Standard	SLM

Designed	Date	Job No.	Drawing No.
TJ	02.26	24113	105_03
Drawn	Date	Scale	
SLM	12.06.26	1:2000 @ A3	
Checked	Date	Datum & Level	Rev.
NKA	12.06.26	LP 2000	B

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NOTES:
- All roads to vest as legal road in the Central Otago District Council
- Areas AT - BJ subject to Covenants

Legend

- Reserves
- Covenant Areas
- Esplanade Reserves
- Stage 1A (42 Lots)
- Stage 1B (50 Lots)
- Stage 2 (74 Lots)
- Stage 3 (45 Lots)
- Stage 4 (89 Lots)
- Stage 5 (83 Lots)
- Stage 6 (60 Lots)
- Stage 7 (73 Lots)
- Stage 8 (77 Lots)
- Stage 9 (65 Lots)
- Stage 10 (53 Lots)
- Stage 11 (42 Lots)
- Stage 12 (61 Lots)
- Stage 13 (86 Lots)
- Stage 14 (36 Lots)
- Stage 15 (51 Lots)

TOTAL 987 Lots

LUGGATE - CROMWELL ROAD

ROAD 1 (16M) · ROAD 2 (20M) · ROAD 3 · ROAD 7 · ROAD 17 (16M) · ROAD 18 (18M) · ROAD 19 (18M) · ROAD 21 · ROAD 24 · ROAD 25 · ROAD 26 · ROAD 27 · ROAD 28 (18M) · ROAD 29 · ROAD 30 · ROAD 31 · ROAD 32 (18M) · ROAD 33 (18M)

20M LEGAL WIDTH · 18M LEGAL WIDTH

Sheet 2 adjoining

Sheet 3 adjoining

Sheet 5 adjoining

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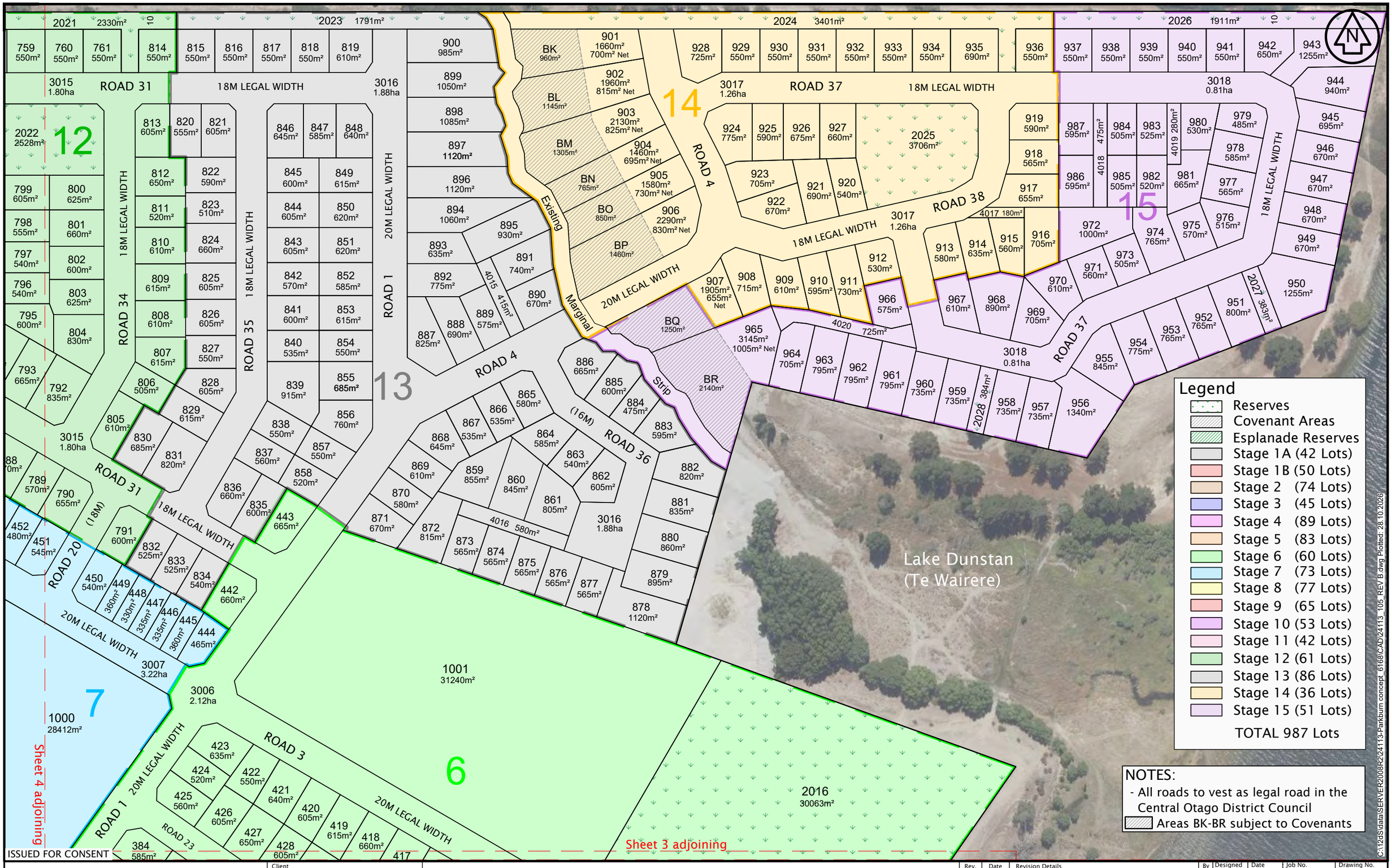
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STAGING PLAN - SHEET 4 OF 6
PARKBURN QUARRY DEVELOPMENT
922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By
A	16.09.26	Stages 6 & 7 swapped	SLM
B	23.10.26	All Road Widths updated to CODC Standard	SLM

Designed	Date	Job No.	Drawing No.
TJ	02.26	24113	105_04
Drawn	Date	Scale	
SLM	12.06.26	1:2000 @ A3	
Checked	Date	Datum & Level	Rev.
NKA	12.06.26	LP 2000	B

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STAGING PLAN - SHEET 5 OF 6
PARKBURN QUARRY DEVELOPMENT
922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By
A	16.09.26	Stages 6 & 7 swapped	SLM
B	23.10.26	All Road Widths updated to CODC Standard	SLM

Designed TJ	Date 02.26	Job No. 24113	Drawing No. 105_05
Drawn SLM	Date 12.06.26	Scale 1:2000 @ A3	
Checked NKA	Date 12.06.26	Datum & Level LP 2000	Rev. B

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STAGING LOT SIZES SCHEDULE																	
	STG 1A	STG 1B	STG 2	STG 3	STG 4	STG 5	STG 6	STG 7	STG 8	STG 9	STG 10	STG 11	STG 12	STG 13	STG 14	STG 15	**TOTAL**
STANDALONE LOTS																	
<400m²	0	0	19	0	0	0	0	15	14	5	1	0	0	0	0	0	**54**
400m²-499m²	0	0	0	0	0	0	0	18	7	4	8	5	0	1	0	1	**44**
500m²-599m²	9	4	4	32	28	7	5	18	39	16	10	22	26	33	15	18	**286**
600m²-699m²	19	29	7	11	52	41	16	12	9	26	8	5	28	30	9	10	**312**
700m²>	14	17	44	0	5	32	39	10	8	14	26	10	7	22	12	22	**282**
SUPER LOTS	0	0	0	2	4	3	0	0	0	0	0	0	0	0	0	0	**9**
SUPER LOTS Residential Units	0	0	0	9	20	14	0	0	0	0	0	0	0	0	0	0	**43**
TOTAL LOTS	**42**	**50**	**74**	**45**	**89**	**83**	**60**	**73**	**77**	**65**	**53**	**42**	**61**	**86**	**36**	**51**	**987**
TOTAL RESIDENTIAL UNITS	**42**	**50**	**74**	**52**	**105**	**94**	**60**	**73**	**77**	**65**	**53**	**42**	**61**	**86**	**36**	**51**	**1021**

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LOT SIZE SCHEDULE - SHEET 6 OF 6
PARKBURN QUARRY DEVELOPMENT
922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By
A	16.09.26	Stages 6 & 7 swapped	SLM
B	23.10.26	All Road Widths updated to CODC Standard	SLM

Designed	Date	Job No.	Drawing No.
TJ	02.26	24113	105_06
Drawn	Date	Scale	
SLM	12.06.26	NTS	
Checked	Date	Datum & Level	Rev.
NKA	12.06.26	LP 2000	B



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EXISTING SITE CONTOURS

PARKBURN DEVELOPMENT PROJECT

922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By

Designed: -	Date: -	Job No.: 24113	Drawing No.: 111_01
Drawn: KA	Date: 05 2026	Scale: 1:5000 @ A3	
Checked: NKA	Date: 06 2026	Datum & Level: LP2000 & NZVD16	Rev.: -



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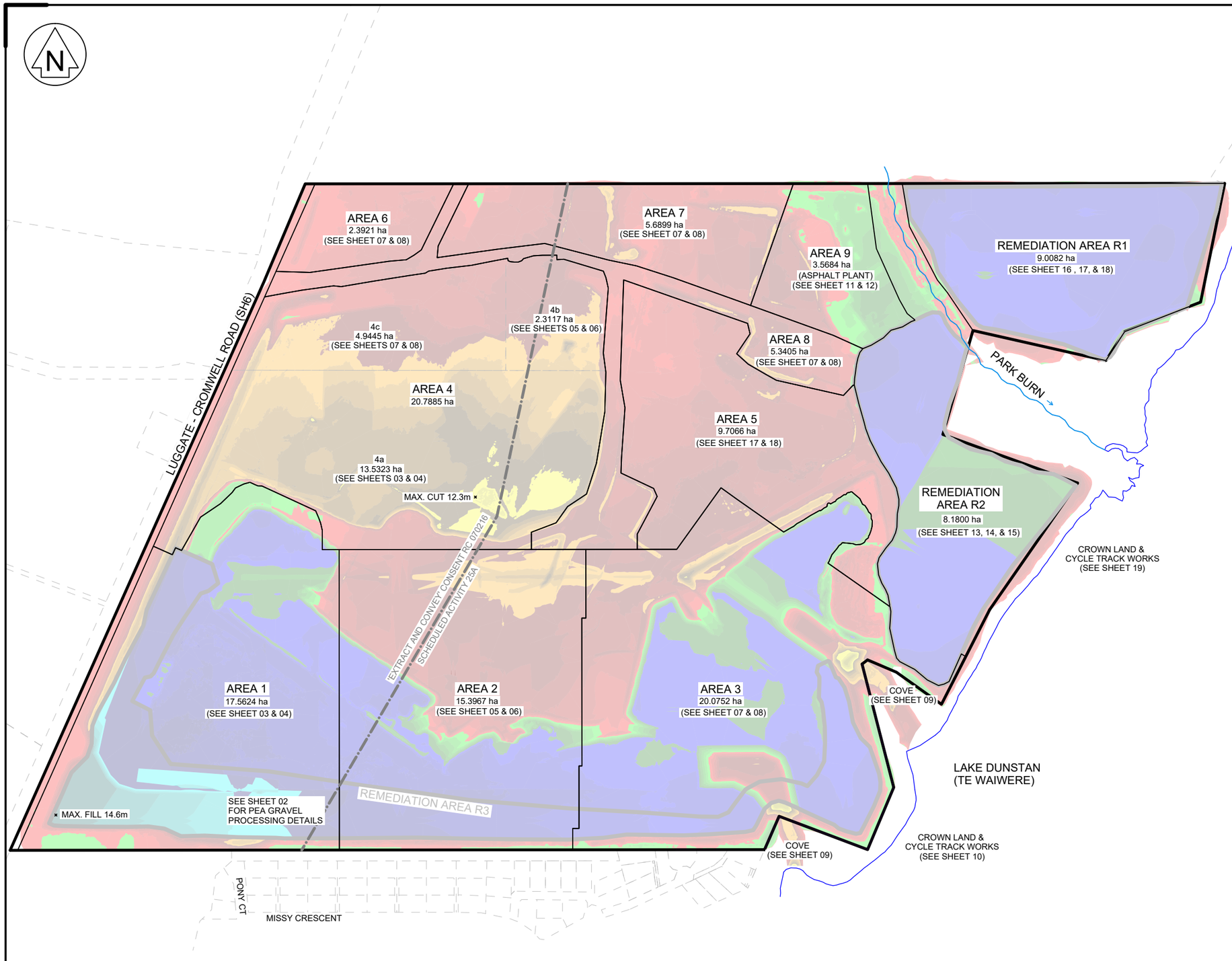
DESIGN CONTOURS

PARKBURN DEVELOPMENT PROJECT

922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By
A	09 2026	Lot layout updated with road width changes	KA

Designed: KA	Date: 04 2026	Job No.: 24113	Drawing No.: 112_01
Drawn: KA	Date: 05 2026	Scale: 1:5000 @ A3	
Checked: NKA	Date: 06 2026	Datum & Level: LP2000 & NZVD16	Rev.: A



BULK EARTHWORKS METHODOLOGY

1. ALL EROSION AND SEDIMENT CONTROLS ARE TO BE IN PLACE IN ACCORDANCE WITH THE ENVIRONMENTAL MANAGEMENT PLAN PRIOR TO COMMENCEMENT OF BULK EARTHWORKS WITHIN ACTIVE AREAS.

2. PEA GRAVEL PROCESSING IN REMEDIATION AREA R3
   (SEE SHEET 02)
   - EXTRACT, CRUSH, AND STORE PEA GRAVEL IN 2 X STOCKPILES

3. CUT TO FILL IN AREA 1
   (SEE SHEET 03)
   - EXTRACT MATERIAL FROM AREA 4a, CART AND PLACE IN AREA 1
   - EXTRACT MATERIAL FROM WITHIN AREA 1, PLACE IN AREA 1
   - CART PEA GRAVEL FROM STOCKPILE, PLACE IN AREA 1

4. STABILISE AREA 1 (AND, BY EXTENSION, AREA 4a)
   (SEE SHEET 04)
   - TOPSOIL AND SOW GRASS SEED ACROSS LOTS AND RESERVES
   - DIRECT-DRILL GRASS SEED INTO ROAD RESERVE SUBGRADE SURFACE

5. CUT TO FILL IN AREA 2
   (SEE SHEET 05)
   - EXTRACT MATERIAL FROM AREA 4b, CART AND PLACE IN AREA 2
   - EXTRACT MATERIAL FROM WITHIN AREA 2, PLACE IN AREA 2
   - CART PEA GRAVEL FROM STOCKPILE, PLACE IN AREA 2

6. STABILISE AREA 2 (AND, BY EXTENSION, AREA 4b)
   (SEE SHEET 06)
   - TOPSOIL AND SOW GRASS SEED ACROSS LOTS AND RESERVES
   - DIRECT-DRILL GRASS SEED INTO ROAD RESERVE SUBGRADE SURFACE

7. CUT TO FILL IN AREA 3
   (SEE SHEET 07)
   - EXTRACT MATERIAL FROM AREA 4c, 6, 7 & 8; CART AND PLACE IN AREA 3
   - EXTRACT MATERIAL FROM WITHIN AREA 3, PLACE IN AREA 3
   - CART PEA GRAVEL FROM STOCKPILE, PLACE IN AREA 3

8. STABILISE AREA 3 (AND, BY EXTENSION, AREA 4c, 6, 7, AND 8)
   (SEE SHEET 08)
   - TOPSOIL AND SOW GRASS SEED ACROSS LOTS AND RESERVES
   - DIRECT-DRILL GRASS SEED INTO ROAD RESERVE SUBGRADE SURFACE
   - CONSTRUCT COVE LININGS AND PLANTINGS

9. EXCAVATE OPENINGS BETWEEN THE COVES AND THE LAKE
   (SEE SHEET 09)
   - EXTRACT MATERIAL FROM LAKESIDE BUNDS

10. CONSTRUCT INTERFACE BETWEEN SITE AND LAKE
    (SEE SHEET 10)
    - REFER TO CROWN LAND CYCLE TRACK WORKS PLAN 24113_107
    - COMPLETE CYCLE TRACK WORKS FROM CH 0 TO CH 880

11. CUT TO FILL IN AREA 9
    (SEE SHEET 11)
    - EXTRACT MATERIAL FROM AREA 9, CART AND PLACE IN AREA 9

12. STABILISE AREA 9
    (SEE SHEET 12)
    - TOPSOIL AND SOW GRASS SEED ACROSS LOTS AND RESERVES
    - DIRECT-DRILL GRASS SEED INTO ROAD RESERVE SUBGRADE SURFACE

13. PEA GRAVEL PROCESSING IN REMEDIATION AREA R2
    (SEE SHEET 13)
    - EXTRACT, CRUSH, & STORE PEA GRAVEL IN STOCKPILE WITHIN AREA R2

14. CUT TO FILL IN REMEDIATION AREA R2
    (SEE SHEET 14)
    - CART PEA GRAVEL FROM STOCKPILE, PLACE IN AREA R2

15. STABILISE AREA R2
    (SEE SHEET 15)
    - TOPSOIL AND SOW GRASS SEED ACROSS LOTS AND RESERVES
    - DIRECT-DRILL GRASS SEED INTO ROAD RESERVE SUBGRADE SURFACE

16. PEA GRAVEL PROCESSING IN REMEDIATION AREA R1
    (SEE SHEET 16)
    - EXTRACT, SCREEN, CRUSH, AND STORE PEA GRAVEL IN STOCKPILE WITHIN AREA R1
    - DISPOSE OF UNSUITABLE MATERIAL

17. CUT TO FILL IN REMEDIATION AREA R1
    (SEE SHEET 17)
    - CART PEA GRAVEL FROM STOCKPILE, PLACE IN AREA R1
    - EXTRACT MATERIAL FROM WITHIN AREA R1, PLACE IN AREA R1
    - EXTRACT MATERIAL FROM AREA 5, CART AND PLACE IN AREA R1

18. STABILISE AREA R1 (AND, BY EXTENSION, AREA 5)
    (SEE SHEET 18)
    - TOPSOIL AND SOW GRASS SEED ACROSS LOTS AND RESERVES
    - DIRECT-DRILL GRASS SEED INTO ROAD RESERVE SUBGRADE SURFACE

19. CONSTRUCT INTERFACE BETWEEN SITE AND LAKE
    (SEE SHEET 19)
    - REFER TO CROWN LAND CYCLE TRACK WORKS PLAN 24113_107
    - COMPLETE CYCLE TRACK WORKS FROM CH 880 TO CH 1830

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BULK EARTHWORKS STAGING - METHODOLOGY OVERVIEW

PARKBURN DEVELOPMENT PROJECT

922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By

Designed: KA	Date: 04 2026	Job No.: 24113	Drawing No.: 113_01
Drawn: KA	Date: 05 2026	Scale: NTS	
Checked: NKA	Date: 06 2026	Datum & Level: LP2000 & NZVD16	Rev.: -

2. PEA GRAVEL PROCESSING IN REMEDIATION AREA R3
- EXTRACT, CRUSH, AND STORE PEA GRAVEL IN 2 X STOCKPILES

N

LUGGATE - CROMWELL ROAD (SH6)

REMEDIATION AREA R1
(SEE SHEET 16, 17 & 18)

PARK BURN

REMEDIATION AREA R2
(SEE SHEET 13, 14 & 15)

"EXTRACT AND CONVEY" CONSENT RC 070216
SCHEDULED ACTIVITY 25A

NOTE:
PEA GRAVEL PROCESSING TO TAKE PLACE WITHIN AREA 1 FIRST.
PEA GRAVEL PROCESSING IN AREAS 2 AND 3 WILL TAKE PLACE CONCURRENTLY WITH AREA 1 BULK CUT TO FILL WORKS.

STOCKPILE (CRUSHED PEA GRAVEL)

STOCKPILE (CRUSHED PEA GRAVEL)

REMEDIATION AREA R3
AREA: 10.62 ha
VOLUME OF PEA GRAVEL: 726,100 m3 (loose)

LAKE DUNSTAN (TE WAIWERE)

CUT

Cut/Fill Depths				
Lower_value		Upper_value		Colour
-15	to	-14	m	
-14	to	-13	m	
-13	to	-12	m	
-12	to	-11	m	
-11	to	-10	m	
-10	to	-9	m	
-9	to	-8	m	
-8	to	-7	m	
-7	to	-6	m	
-6	to	-5	m	
-5	to	-4	m	
-4	to	-3	m	
-3	to	-2	m	
-2	to	-1	m	
-1	to	0	m	
0	to	1	m	
1	to	2	m	
2	to	3	m	
3	to	4	m	
4	to	5	m	
5	to	6	m	
6	to	7	m	
7	to	8	m	
8	to	9	m	
9	to	10	m	
10	to	11	m	
11	to	12	m	
12	to	13	m	
13	to	14	m	
14	to	15	m	

FILL

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BULK EARTHWORKS STAGING - PEA GRAVEL PROCESSING (R3)

PARKBURN DEVELOPMENT PROJECT

922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By

Designed: KA	Date: 04 2026	Job No.: 24113	Drawing No.: 113_02
Drawn: KA	Date: 05 2026	Scale: 1:4500 @ A3	
Checked: NKA	Date: 06 2026	Datum & Level: LP2000 & NZVD16	Rev.: -

3. CUT TO FILL IN AREA 1
- EXTRACT MATERIAL FROM AREA 4a, CART AND PLACE IN AREA 1
- EXTRACT MATERIAL FROM WITHIN AREA 1, PLACE IN AREA 1
- CART PEA GRAVEL FROM STOCKPILE, PLACE IN AREA 1

LUGGATE - CROMWELL ROAD (SH6)

MATERIAL TO BE EXCAVATED FROM AREA 4:
799,200 m3 (loose)
726,500 m3 (solid)
13.5323 ha

AREA 1
17.5624 ha

FILL REQUIRED: 1,186,900 m3
(solid measure)

726,500 m3 (solid measure) cut to fill from Area 4 to Area 1.

STOCKPILE (CRUSHED PEA GRAVEL)

39,400 m3 (solid measure) cut to fill within Area 1.

421,000 m3 (solid measure) of crushed Pea Gravel to be placed as certified fill.

'EXTRACT AND CONVEY' CONSENT RC 070216
SCHEDULED ACTIVITY 25A

PARK BURN

LAKE DUNSTAN
(TE WAIWERE)

CUT

Cut/Fill Depths

Lower_value		Upper_value		Colour
-15	to	-14	m	
-14	to	-13	m	
-13	to	-12	m	
-12	to	-11	m	
-11	to	-10	m	
-10	to	-9	m	
-9	to	-8	m	
-8	to	-7	m	
-7	to	-6	m	
-6	to	-5	m	
-5	to	-4	m	
-4	to	-3	m	
-3	to	-2	m	
-2	to	-1	m	
-1	to	0	m	
0	to	1	m	
1	to	2	m	
2	to	3	m	
3	to	4	m	
4	to	5	m	
5	to	6	m	
6	to	7	m	
7	to	8	m	
8	to	9	m	
9	to	10	m	
10	to	11	m	
11	to	12	m	
12	to	13	m	
13	to	14	m	
14	to	15	m	

FILL

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BULK EARTHWORKS STAGING - AREA 1 - CUT TO FILL

PARKBURN DEVELOPMENT PROJECT

922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By

Designed: KA	Date: 04 2026	Job No.: 24113	Drawing No.: 113_03
Drawn: KA	Date: 05 2026	Scale: 1:4500 @ A3	
Checked: NKA	Date: 06 2026	Datum & Level: LP2000 & NZVD16	Rev.: -

4. STABILISE AREA 1 (AND, BY EXTENSION, AREA 4a)
- TOPSOIL AND SOW GRASS SEED ACROSS LOTS AND RESERVES
- DIRECT-DRILL GRASS SEED INTO ROAD RESERVE SUBGRADE SURFACE

LUGGATE - CROMWELL ROAD (SH6)

31.0947 ha

BATTER SLOPES AND/OR BENCHING TO BE PROVIDED AT INTERFACE WITH AREA 2 TO ENSURE SITE STABILITY AND MAINTAIN SAFE WORKING CONDITIONS

PARK BURN

LAKE DUNSTAN
(TE WAIWERE)

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BULK EARTHWORKS STAGING - AREA 1 - STABILISATION

PARKBURN DEVELOPMENT PROJECT

922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By

Designed: KA	Date: 04 2026	Job No.: 24113	Drawing No.: 113_04
Drawn: KA	Date: 05 2026	Scale: 1:4500 @ A3	
Checked: NKA	Date: 06 2026	Datum & Level: LP2000 & NZVD16	Rev.: -

5. CUT TO FILL IN AREA 2
- EXTRACT MATERIAL FROM AREA 4b, CART AND PLACE IN AREA 2
- EXTRACT MATERIAL FROM WITHIN AREA 2, PLACE IN AREA 2
- CART PEA GRAVEL FROM STOCKPILE, PLACE IN AREA 2

LUGGATE - CROMWELL ROAD (SH6)

AREA 4b
2.3117 ha

MATERIAL TO BE EXCAVATED FROM AREA 4b:
96,600 m3 (loose)
87,800 m3 (solid)

PARK BURN

AREA 2
15.3967 ha

FILL REQUIRED: 454,900 m3
(solid measure)

87,800 m3 (solid measure) cut to fill from Area 4 to Area 2.

287,300 m3 (solid measure) cut to fill within Area 2.

79,800 m3 (solid measure) of crushed Pea Gravel to be placed as certified fill.

EXTRACT AND CONVEY CONSENT RC 070216

SCHEDULED ACTIVITY 25A

STOCKPILE (CRUSHED PEA GRAVEL)

LAKE DUNSTAN (TE WAIWERE)

CUT

Cut/Fill Depths

Lower_value		Upper_value		Colour
-15	to	-14	m	
-14	to	-13	m	
-13	to	-12	m	
-12	to	-11	m	
-11	to	-10	m	
-10	to	-9	m	
-9	to	-8	m	
-8	to	-7	m	
-7	to	-6	m	
-6	to	-5	m	
-5	to	-4	m	
-4	to	-3	m	
-3	to	-2	m	
-2	to	-1	m	
-1	to	0	m	
0	to	1	m	
1	to	2	m	
2	to	3	m	
3	to	4	m	
4	to	5	m	
5	to	6	m	
6	to	7	m	
7	to	8	m	
8	to	9	m	
9	to	10	m	
10	to	11	m	
11	to	12	m	
12	to	13	m	
13	to	14	m	
14	to	15	m	

FILL

Folder Location: c:\12d5\data\SERVER2008R2\24113-Parkburn concept_6168\12d\24113 Bulk Earthworks Staging.12dmodel Project: 24113 Bulk Earthworks Staging Plotted: 15/06/26 17:12

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BULK EARTHWORKS STAGING - AREA 2 - CUT TO FILL

PARKBURN DEVELOPMENT PROJECT

922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By

Designed: KA	Date: 04 2026	Job No.: 24113	Drawing No.: 113_05
Drawn: KA	Date: 05 2026	Scale: 1:4500 @ A3	
Checked: NKA	Date: 06 2026	Datum & Level: LP2000 & NZVD16	Rev.: -

6. STABILISE AREA 2 (AND, BY EXTENSION, AREA 4b)
- TOPSOIL AND SOW GRASS SEED ACROSS LOTS AND RESERVES
- DIRECT-DRILL GRASS SEED INTO ROAD RESERVE SUBGRADE SURFACE

LUGGATE - CROMWELL ROAD (SH6)

2.3117 ha

15.3967 ha

PARK BURN

BATTER SLOPES AND/OR BENCHING TO BE PROVIDED AT INTERFACE WITH AREA 2 TO ENSURE SITE STABILITY AND MAINTAIN SAFE WORKING CONDITIONS

LAKE DUNSTAN
(TE WAIWERE)

ISSUED FOR CONSENT

Folder Location: c:\12d5\data\SERVER2008R2\24113-Parkburn concept_6168\12d\24113 Bulk Earthworks Staging.12dmodel Project: 24113 Bulk Earthworks Staging Plotted: 15/06/26 17:12

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BULK EARTHWORKS STAGING - AREA 2 - STABILISATION

PARKBURN DEVELOPMENT PROJECT

922 LUGGATE - CROMWELL ROAD

Rev.	Date	Revision Details	By

Designed: KA	Date: 04 2026	Job No.: 24113	Drawing No.: 113_06
Drawn: KA	Date: 05 2026	Scale: 1:4500 @ A3	
Checked: NKA	Date: 06 2026	Datum & Level: LP2000 & NZVD16	Rev.: -