SOUTHERNSKIES ENVIRONMENTAL

EROSION AND SEDIMENT CONTROL PLAN

77 Newcombe Road, Cambridge

Prepared for RS Sand Limited

Prepared by: Southern Skies Environmentals Ltd Date: 24 July 2022

SOUTHERNSKIES ENVIRONMENTAL

CONTENTS

1. OVERVIEW

1.1. Scope

The applicant, RS Sand Limited (**RS Sand**) seeks resource consent to establish and operate a sand quarry on a rural property at 77 Newcombe Road, Cambridge (**the Site**).

This Erosion and Sediment Control Plan (**ESCP**) has been prepared to support the resource consent application and determine the most appropriate erosion and sediment control (**ESC**) measures to manage site runoff associated with the earthworks and sand quarrying activities.

This ESCP should be read in conjunction with the Quarry Management Plan that has been prepared for the site by others.

A site visit was undertaken on 4th December 2020, attended by Campbell Stewart (SouthernSkies Environmental Limited), Michael Briggs (Kinetic), and Dale Eastham (Fulton Hogan).

This ESCP has been prepared in accordance with Waikato Regional Councils Technical Report No. 2009/02 *Erosion and Sediment Control Guidelines for Soil Disturbing Activities, January 2009* (**TR2009/02**).

This ESCP addresses the following earthwork activities:

- Establishment of the erosion and sediment controls;
- Site establishment and enabling works;
- General earthworks and quarry activities; and
- Final landscaping and stabilisation.

1.2. Location and Site Description

Site Address	77 Newcombe Road, Cambridge.
Legal Description	Sec 41 SO 510550 and Sec 61 SO 510550 (RT_841793) Lot 2 DP 520523 (RT 821177) Lot 2 DP 541191 and Lot 4 DPS 86453 (RT 908965)
Property Area:	134.67ha (site is up to 27ha)
Map Reference (sand quarry)	-37.89261 S, 175.50836 E (NZGD2000)
Zone	Rural Zone
Overlays	Designation D20 (Expressway – Cambridge Bypass) Cultural Landscape Area Alert (along Karapiro Stream) HV Electricity Structures and Transmission Lines
Road Classification	Local Road (Newcombe Road)

Three records of title make up the Site which total an area of 134.67 hectares, although the quarry is only proposed on approximately 27ha in the western portion of the Site. The quarry will be made up of a 23ha pit area towards the western boundary and a 4ha plant area (for processing and stockpiling) to the east of the pit.

The site is accessed from Newcombe Road, a local road that connects with State Highway (SH) 1 to the south.

The site is predominantly flat to undulating rural dairy farmland, sloping to the north down towards the Karapiro Stream which intersects the site's northern boundary and is the immediate receiving environment.

The stream flows east to west along the northern boundary of the site. The Karapiro Stream joins the Waikato River approximately 4.4km channel length further southwest of the site.

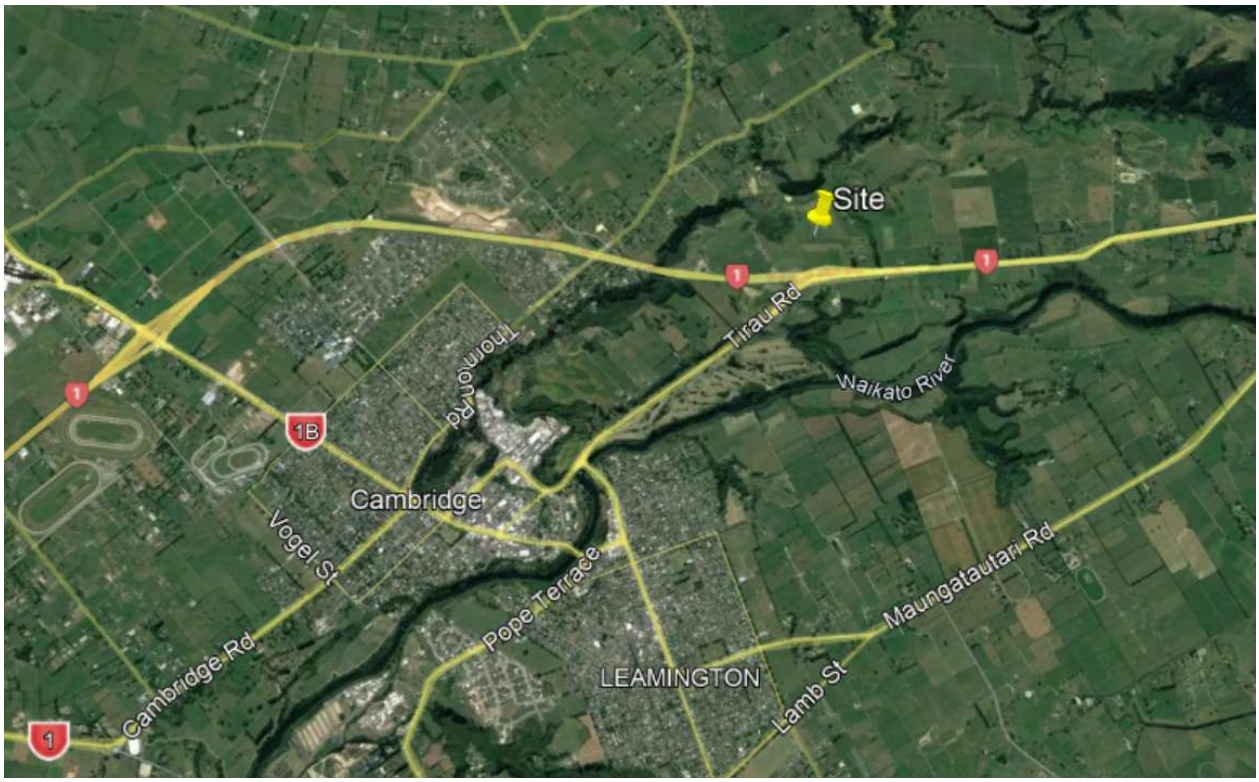

Figure 1: General site location (Source: Google Earth).

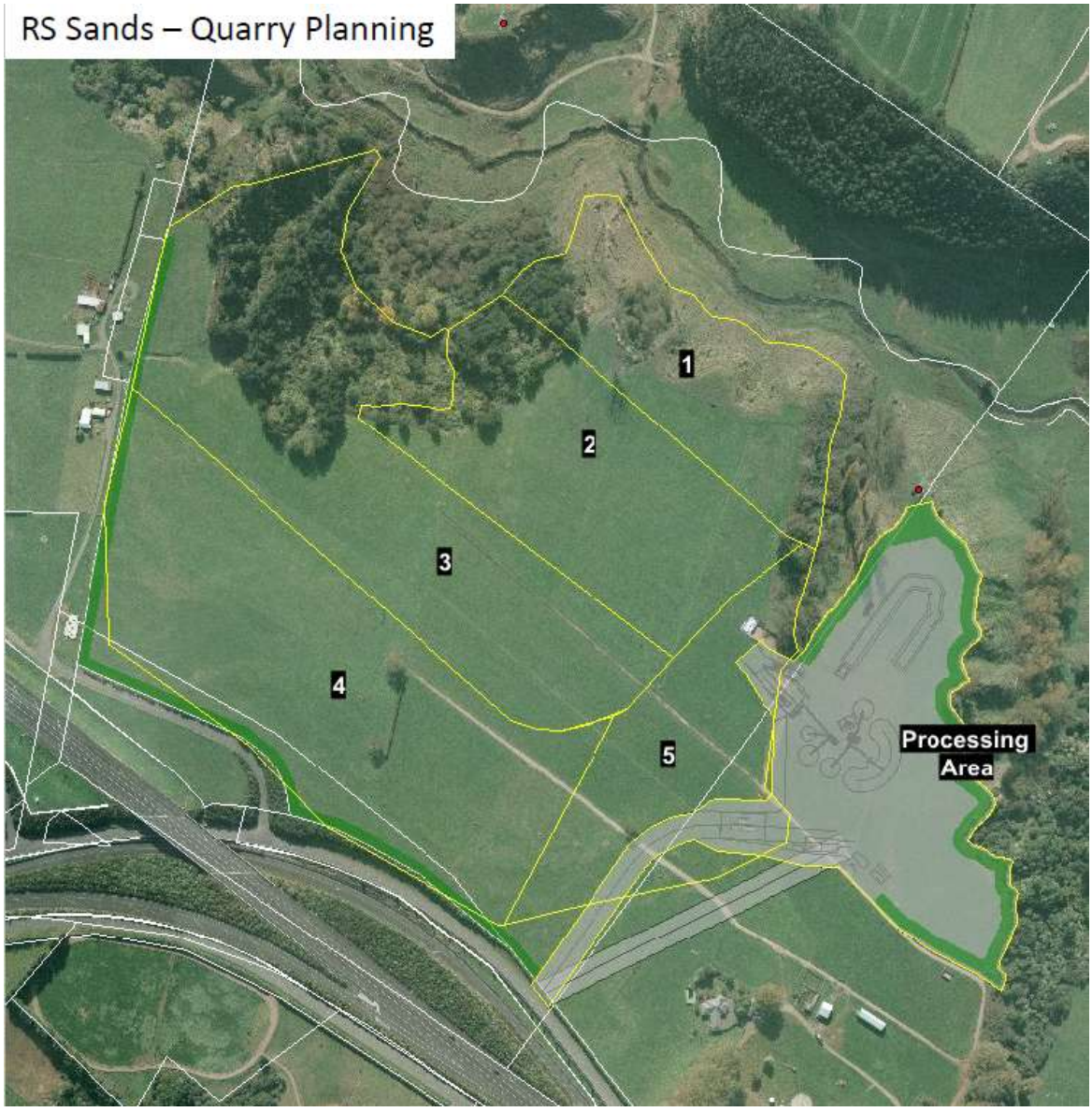

Figure 2: Site features.

2. DESCRIPTION OF WORKS

The pit area is estimated to contain 7,409,700 tonnes (4,116,500m^3) of sand resource, comprising a mixture of pit sand and concrete sand. The quarry is proposed to extract and process up to 400,000 tonnes of sand from the pit area per year (depending on demand) for approximately 25 years, based on the following stages:

Stage 1. Years 1 to 1.7 2.7ha 495,000 tonnes (275,000m^3).

Stage 2. Years 1.7 to 6.1 3.4ha 1,327,500 tonnes (737,500m^3).

Stage 3. Years 6.1 to 13.9 6.6ha 2,346,300 tonnes (1,303,500m^3).

Stage 4. Years 13.9 to 20.7 5.2ha 2,049,300 tonnes (1,138,500m3).

Stage 5. Years 20.7 to 25 5.1ha 1,191,600 tonnes (662,000m^3)

Excavations of the pit area will begin 10-15m from the Karapiro Stream and move towards Newcombe Road. The stages are approximately 120m wide and will excavate approximately 35m below the existing ground level of the existing terrace. The floor of the pit area will be approximately 10m above the level of the Karapiro Stream bank. An internal pit road will link the pit and plant areas.

The proposed plant area includes a processing plant towards the middle of the area and a water recycling pond towards the north. The processing plant will use and discharge water to and from the recycling pond to grade the sand with spirals, screens, conveyors, and pumps on multiple levels. Graded sand will be stockpiled around the plant area.

2.1. Staging

The project will be completed within five stages following an initial enabling works phase. The following table provides the estimated volumes of material to be removed.

Table 1: Estimated volumes.

	Volume (m^3)			Volume (*t*)			Years
	Overburden	Pit sand	Concrete sand	Pit sand	Concrete sand	Subtotal	
Stage 1	23,000	23,000	252,000	41,400	453,600	495,000	1.65
Stage 2	62,500	62,500	675,000	112,500	1,215,000	1,327,500	4.43
Stage 3	105,500	105,500	1,198,000	189,900	2,156,400	2,346,300	7.82
Stage 4	127,500	127,500	1,011,000	229,500	1,819,800	2,049,300	6.83
Stage 5	73,000	73,000	589,000	131,400	1,060,200	1,191,600	3.97
Sub total	391,500	391,500	3,725,000	704,700	6,705,000	7,409,700	24.70
Totals	**4,508,000**			**7,409,700**			**24.70**

Prior to the commencement of Stage 1 enabling works will need to be completed to establish the site ready for sand extraction. The enabling works are expected to take approximately 4 to 6 months to complete and will involve:

- Site access (20m wide, 250m long from Newcombe Road)
- Site office and weigh bridge.
- Excavation and construction of the processing area (approximately 4.8ha).
- Construction of the noise/visual bund.

Upon the completion of the enabling works the first stage will commence.

Each stage will be approximately 120m wide and will excavate approximately 35m below the existing ground level of the existing terrace. The bottom of the pit area will be approximately 10m above the level of the Karapiro Stream bank. An internal pit road will link the pit and plant areas.

2.2. Quarrying Process

The process of extracting sand involves using heavy machinery for the following processes:

Remove Existing Vegetation

Using bulldozers and/or excavators and trucks, any existing vegetation, trees, and structures within the extent of works will be removed.

Topsoil Stripping and Stockpiling

Topsoil and organic materials will be stripped, transported, and stockpiled using motor scrapers, bulldozers and/or excavators and trucks. These materials will be stockpiled on site for later stage rehabilitation. Some of this material will be used for construction of perimeter screening bunds for landscaping, noise control and erosion and sediment control.

Sand Extraction, Processing and Stockpiling

Quarrying of the sand using excavators and trucks and/or loaders to excavate and transport the sand materials to the processing plant or stockpiles. Any unsuitable materials will be used for perimeter bunding, or landscaping/rehabilitation.

Storage and Distribution

Sand products will be stockpiled on-site, where loaders are used to load customer's trucks for transportation off site. Records will be kept of individual truck volumes taken from site.

2.3. Processing Area, Site Establishment and Access

Refer to ESCP-PA-01

Access from Newcombe Road to the plant area will be provided via a new vehicle crossing and internal access road to the west of the site's existing access. The new internal road will include a weighbridge and wheel wash on the outbound lane, approximately 60m from the road frontage. South of the weighbridge and wheel wash will be an office and breakroom building, as well as car parking for site personnel. To enable machinery to be maintained and serviced on-site, a workshop area is proposed towards the eastern end of the new internal road and the south of the plant area.

For Stages 1–4 (Years 1–20.7), a 20m wide internal road will be constructed from the new vehicle crossing to the weighbridge and stockpiling area. The road will initially be positioned over Stage 5 to limit the impact on

the existing dairy farm and dwelling on the Site. For Stage 5 (Years 20.7–25), the internal road will be realigned to the south to provide access to the sand beneath Stage 5.

The access road will be approximately 20m wide and 250m long. Once formed it will be stabilised with aggregate and / or chip seal / asphalt.

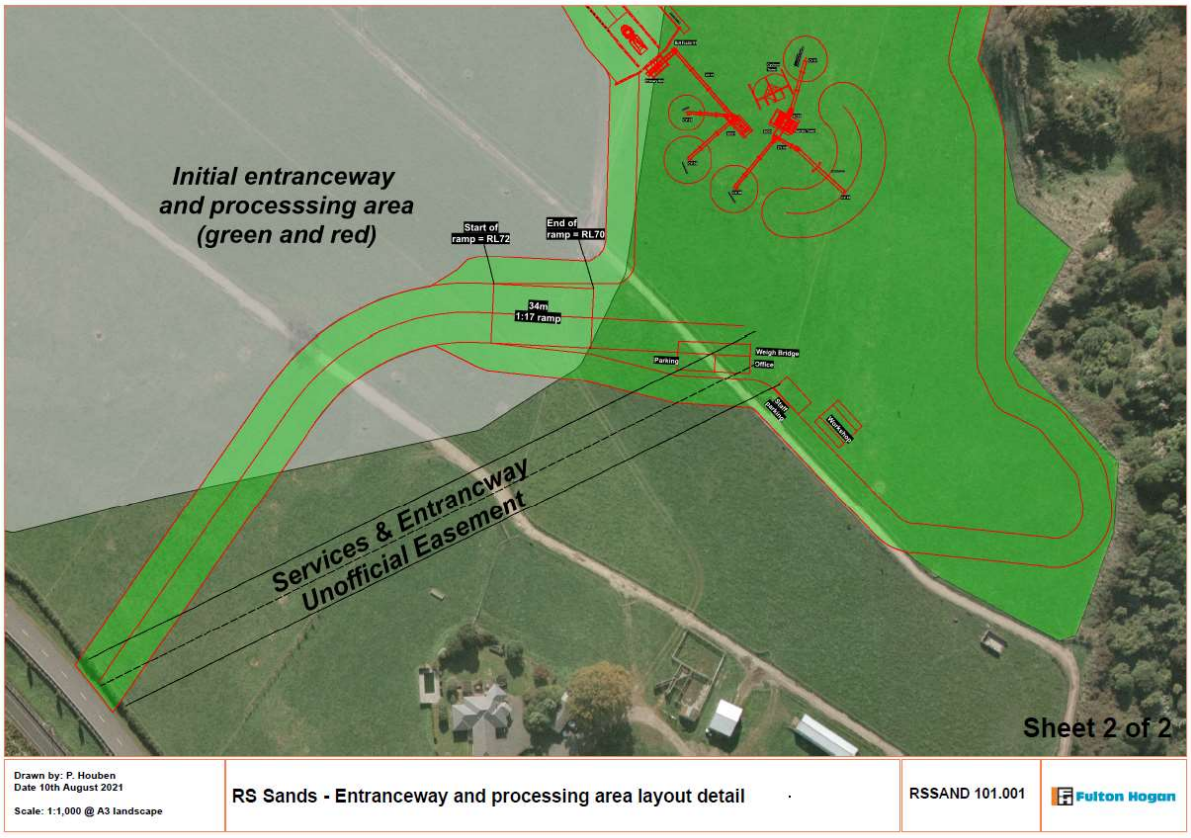

Figure 3: Indicative design for site access.

Prior to the commencement of the enabling earthworks, a sediment retention pond (SRP) will be built within the future location of the water recycling pond. The SRP will capture runoff from an area of approximately 4.8ha and has been sized to cater for a maximum catchment area of 5ha. Specific design details are provided in Section 4.4. The SRP will discharge to the gully, approximately 220m upslope from the Karapiro Stream.

Once all earthworks are completed over the processing area, the SRP will be converted into the water recycling pond.

The construction of a processing plant includes an approximately 6m high and 20m wide structure towards the middle of the area. The plant building will use and discharge water to and from the recycling pond to grade the sand. Graded sand will be stockpiled around the plant area.

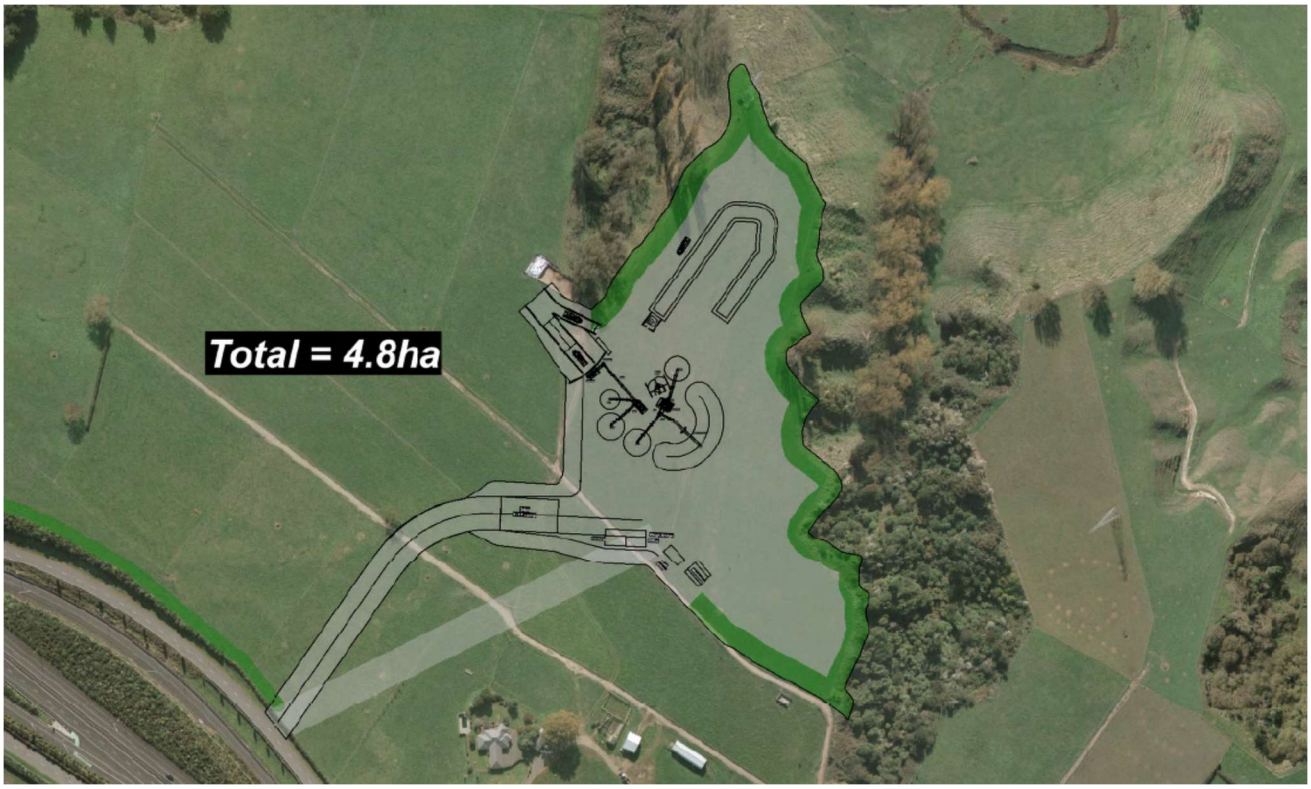

Figure 4: Enabling works footprint.

To establish the quarry, the top 2m of ground of the plant area will be stripped to form a level and stable platform. Overburden from the plant area will be used to form bunding along the western and southern boundaries of the pit area, the eastern boundary of the plant area and the internal access road from Newcombe Road to screen the activities. The screening bunds around the site will generally be 3m high, 8m wide at the base and approximately 2m wide at the top. These bunds will be planted with vegetation capable of growing 2-3m high. A typical bund section is shown in Figure 4. The alignments of the bunds are shown on Figure 5.

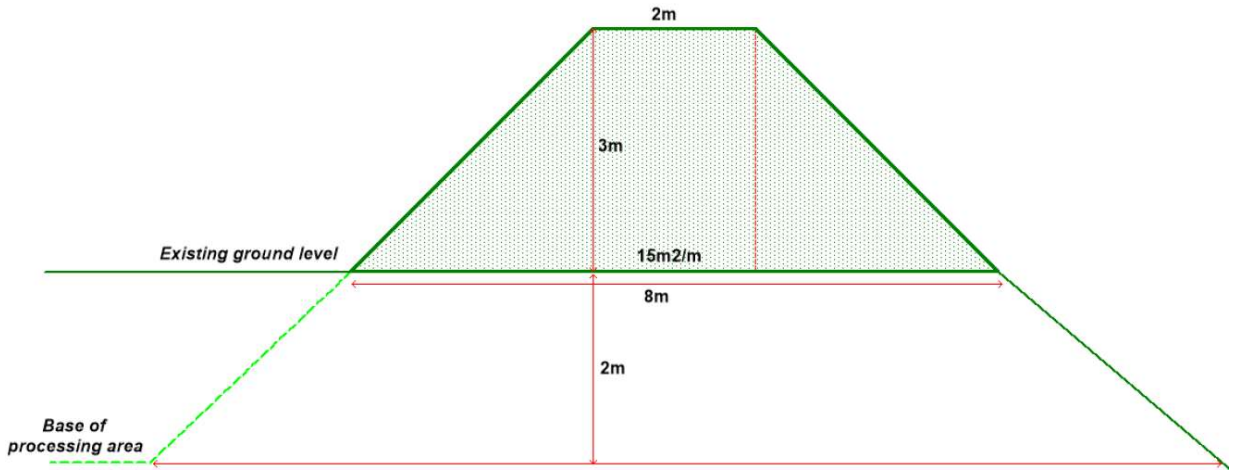

Figure 5: Typical bund section.

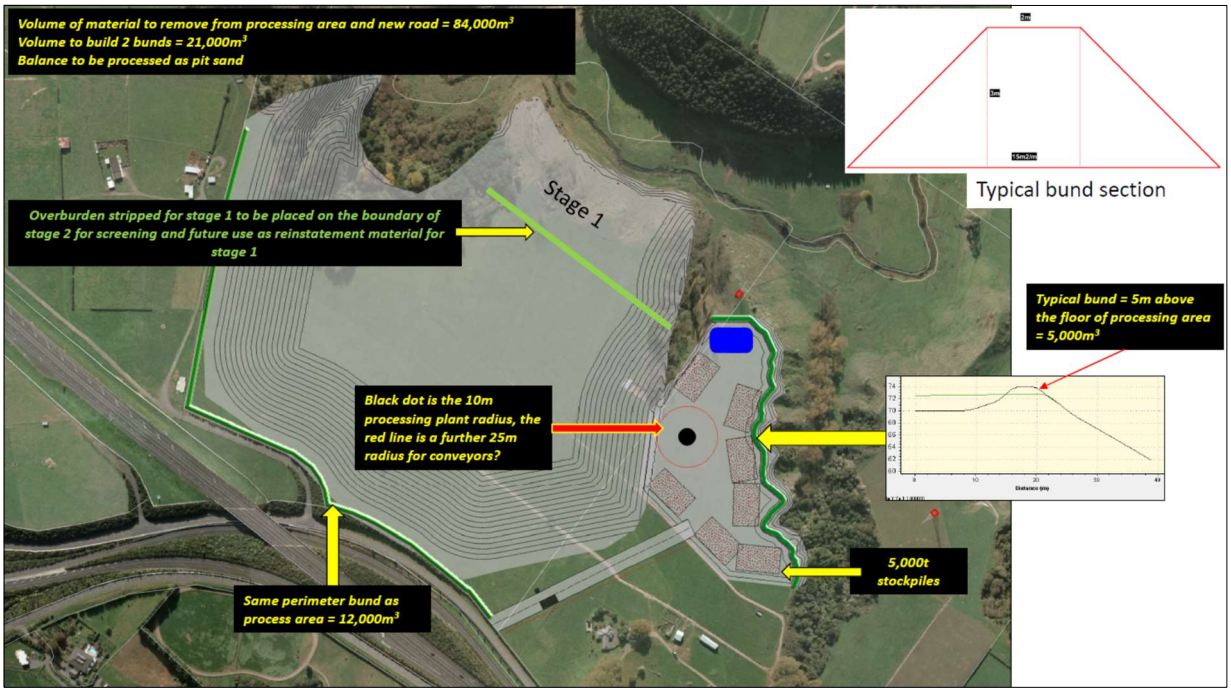

Figure 6: Schematic of site showing alignment of screening bunds.

2.4. Stage 1 (Years 1-1.7)

Refer to ESCP-001-01A, ESCP-001-01B and ESCP-001-01C

Excavations of the Stage 1 pit area will start from the top of the slope above the Karapiro Stream to construct benches down towards the stream. Bunding will be used to contain the excavated slopes and benches. Each bench will be bunded and will be sloped back into the bank and any runoff (not expected due to soakage rates) will be contained within the bench cut.

Once the benched slopes are constructed, providing sufficient room for the Stage 1 SRP (SRP-2), the SRP will be constructed, to service a maximum contributing catchment area of 5ha (to allow for transition to Stage 2, i.e. part of Stage 1 still open as Stage 2 is developed), although the Stage 1 contributing catchment area will be approximately 2.7ha.

The high soakage rates are expected across the site and during the quarrying activities (refer to Section 4.1). Nevertheless SRP-2 has been sized in accordance with TR2009/02.

With the combination of high soakage rates and the guideline-compliant SRP-2, construction discharges from the site via the SRP are expected to be limited to heavy rain events, if at all.

Overburden from Stage 1 will be placed along the northern boundary of Stage 2 up to 5m high and re-grassed for screening and storage for the future reinstatement of Stage 1.

Quarrying operations and excavation of the pit area will begin 10-15m from the Karapiro Stream and move towards Newcombe Road. The stages are approximately 120m wide and will excavate approximately 35m below the existing ground level of the existing terrace. The bottom of the pit area will be approximately 10m above the level of the Karapiro Stream bank. An internal pit road will link the pit and plant areas.

At the completion of each stage or portion of stage the pit floor and any final batters will be rehabilitated back to grass using topsoil stockpiled during stripping operations and regrassed, fenced and water reticulation installed. This area will then be returned to farming.

Figure 7: Stage 1 footprint.

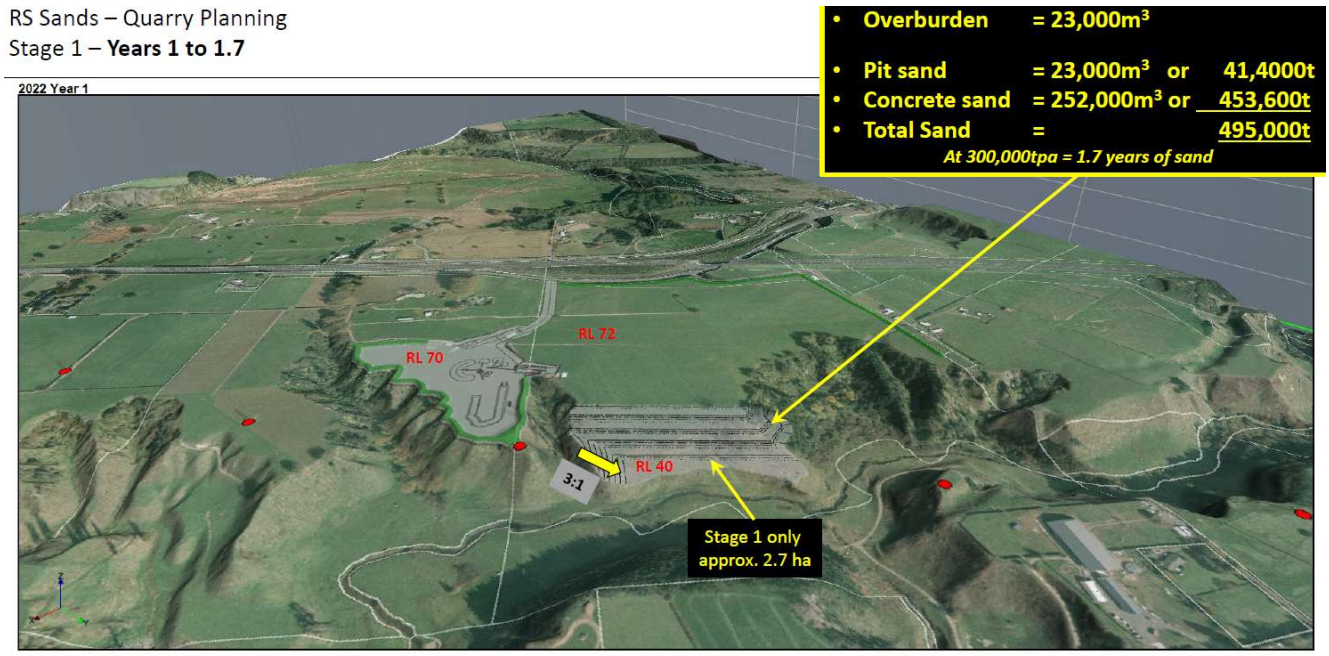

Figure 8: Stage 1 footprint.

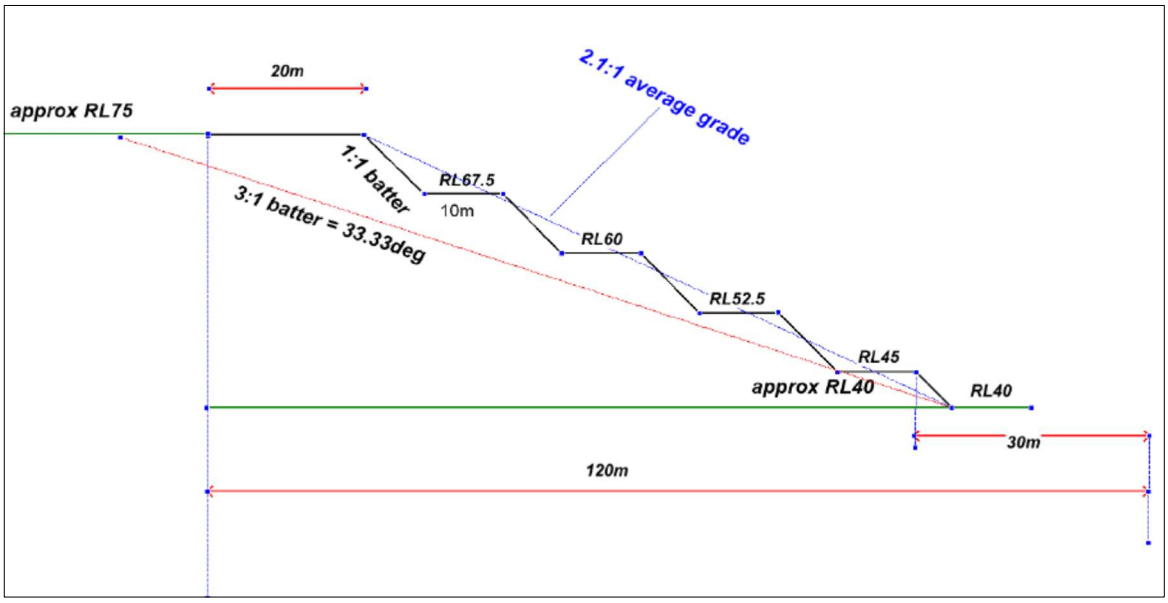

Figure 9: Cross-section of the Stage 1 benching.

2.5. Stage 2 (Years 1.7-6.1)

Refer to ESCP-002-01.

Stage 2 sand quarry operations will be a continuation of Stage 1 and cover a total area of approximately 3.4ha.

The SRP built during Stage 1, which has been sized for a maximum catchment area of 5ha, will continue to be used during Stage 2.

As the final RL's are achieved through the completed Stage 1 area, topsoil will be respread, and the area grassed, and the completed stabilised grassed areas separated from the quarry site and any runoff diverted away from the SRP.

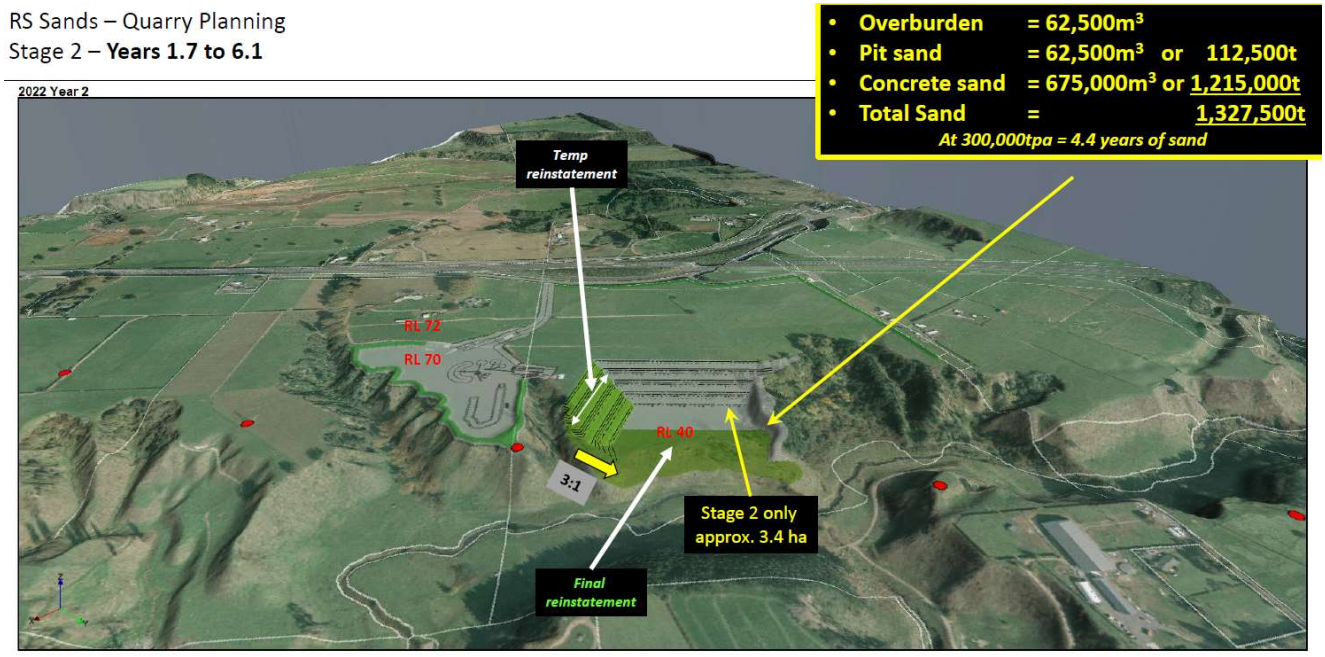

Figure 10: Stage 2 footprint.

2.6. Stage 3 (Years 6.1-13.9)

Stage 3 will be undertaken over an area of approximately 6.6ha. A future ESCP will detail the controls for this stage.

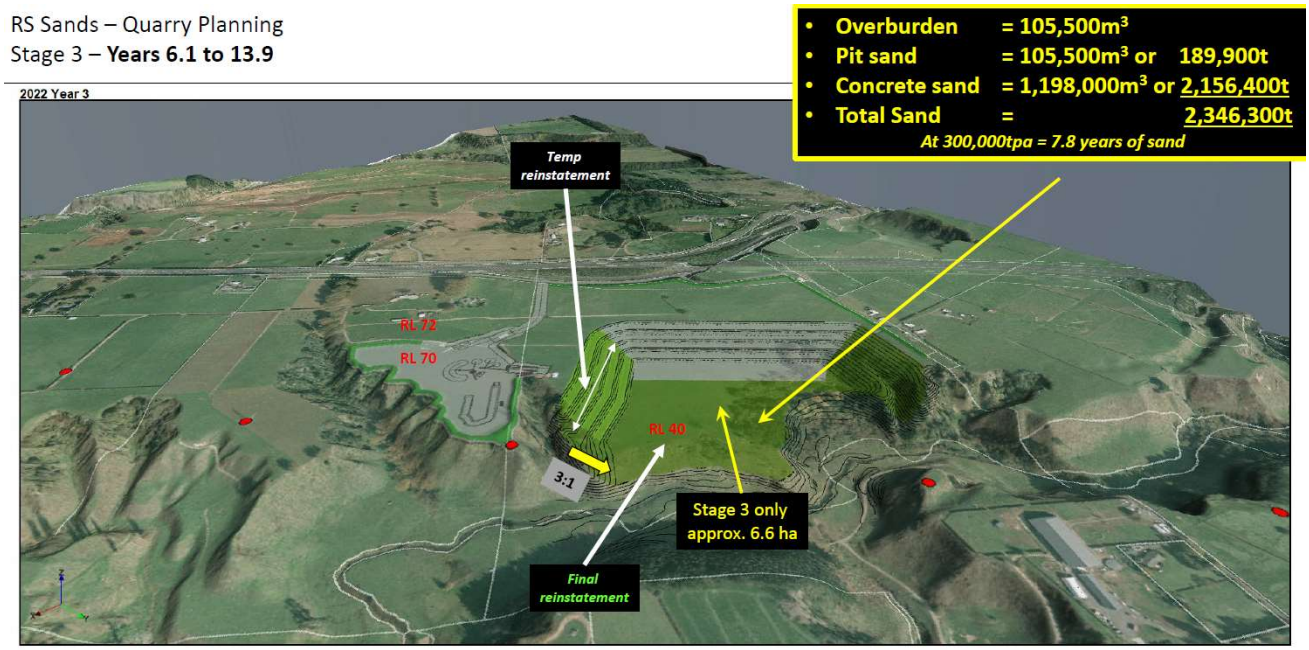

Figure 11: Indicative Stage 3 footprint.

2.7. Stage 4 (Years 13.9-20.7)

Stage 4 will be undertaken over an area of approximately 5.2ha. A future ESCP will detail the controls for this stage.

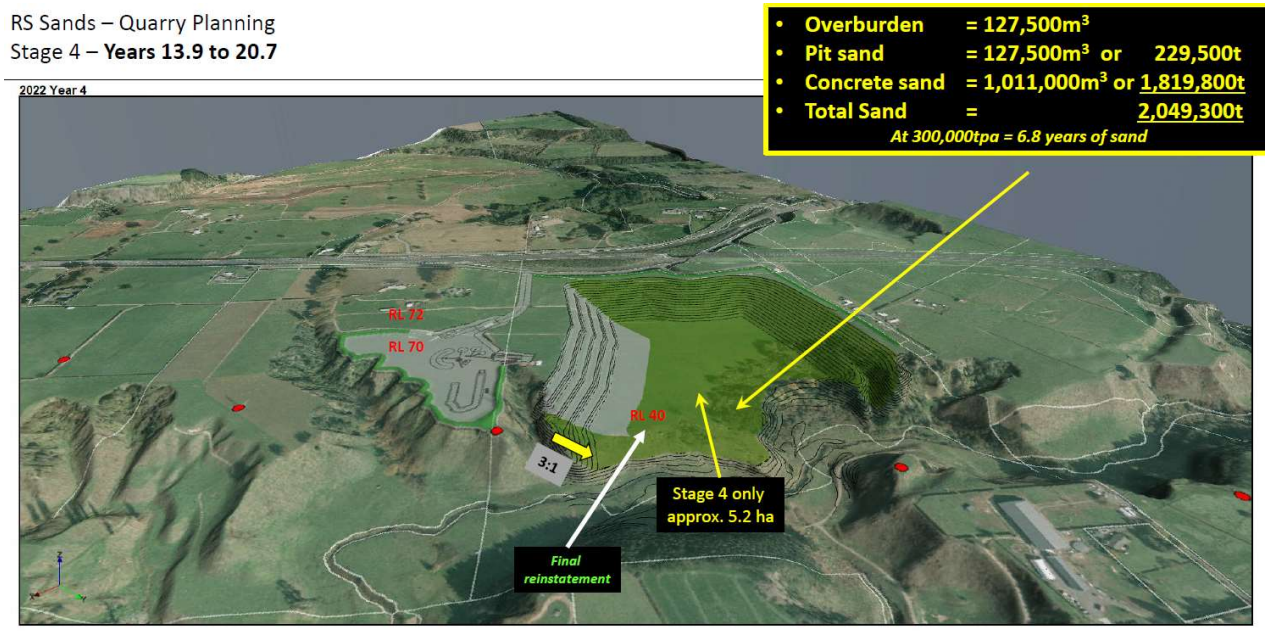

Figure 12: Indicative Stage 4 footprint.

2.8. Stage 5 (Years 20.7-24.7)

Stage 5 will be undertaken over an area of approximately 5.1ha. A future ESCP will detail the controls for this stage.

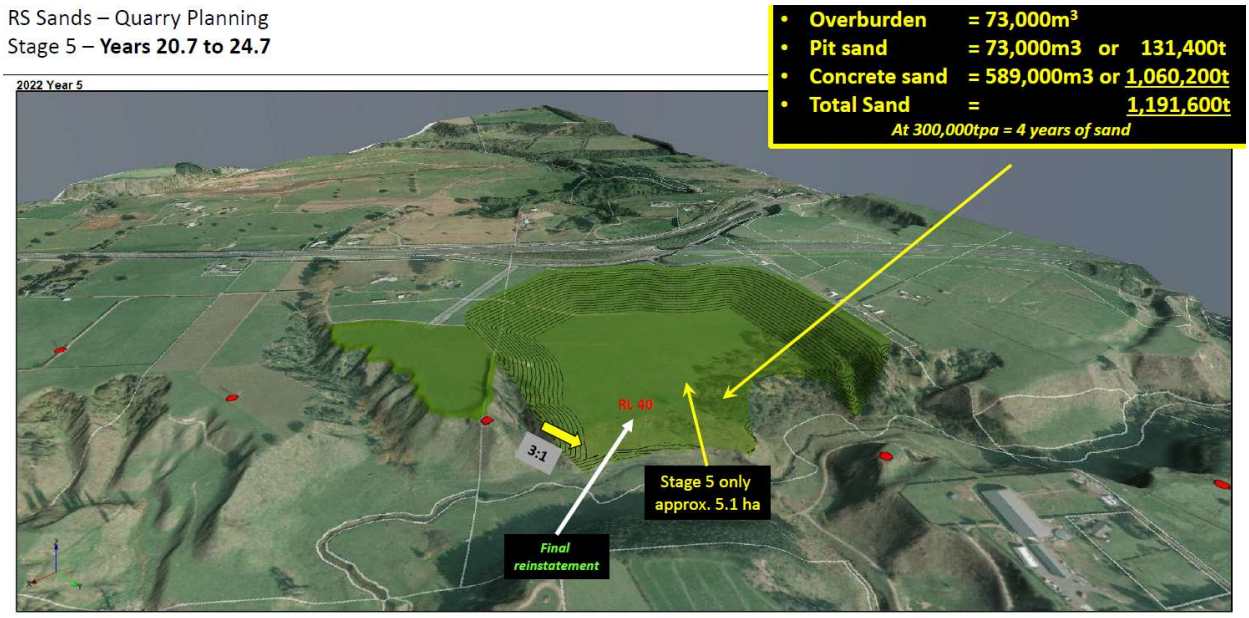

Figure 13: Indicative Stage 5 footprint.

3. EROSION AND SEDIMENT CONTROL PHILOSOPHY AND PROCESSES

3.1. Objectives

The ESCP objectives for these works are:

- To ensure that sediment discharges from the works are minimised to the greatest extent practical.
- To ensure that all ESC measures are designed and approved prior to construction works.
- To ensure that all ESC measures are implemented prior to commencement of construction works.
- To ensure that all contractual and regulatory requirements are met as a minimum standard.

These objectives will be measured by the project's ability to meet environmental targets.

- No environmental or regulatory breaches (compliance with consent conditions; no prosecutions, enforcement orders, abatement or infringement notices received).
- Conduct regular environmental inspections.
- Induct all employees and subcontractors on the environmental rules and procedures relevant to the project.
- Include environment as a topic in project meetings and toolbox talks.

3.2. Design

ESC devices have been designed in accordance with the design principles of TR2009/02.

The ESCP has been designed to accommodate work operations being undertaken over the expected duration of the quarry. This will provide flexibility in the management of the Quarry to meet the possible fluctuation of the demand of the sand material. It is expected that any updated ESCPs will be prepared and submitted to the WRC for certification in advance of Stages 3, 4 and 5 and any changes to the quarry ESC operations.

A set of ESCP drawings specific to the enabling works, Stage 1 and Stage 2 are provided in Appendix A with the intention that updated ESCPs will be provided to WRC for certification prior to Stages 3, 4 and 5 commencing. The controls and methodologies have been designed to meet the site requirements and to meet the design philosophy of TR2009/02.

In general, the ESC design and methodology is based the high soakage rates and on the use of sediment retention ponds (SRPs), supported by progressive stabilisation as areas are completed. Existing vegetation will be retained wherever possible.

Sizing and design information for the ESC measures are included in Appendix A. The general philosophies and strategies behind the ESCP are outlined below.

As-builts and an audit programme ensures compliance with the design requirements and guidelines. Catchment areas (both clean and dirty) will adjust during the life of the quarry (this is discussed below) and regular audits and as-built revisions will be undertaken.

Areas will be stabilised as soon as practical and in a progressive manner.

3.3. Principles

The general principles to be adopted during the quarry activities, and which will be incorporated in the ESCP, are as follows.

- Minimise the necessary area of disturbance as far as practically possible while meeting the development requirements of the site.
- Stage the quarry and progressively stabilise exposed areas following completion.
- Divert clean water runoff away from the quarry works site, thus reducing the contributing catchment to the exposed working areas.
- Intercept, divert and impound any sediment laden runoff from exposed working areas to either prevent site discharge to the receiving environment (via soakage) or as a minimum, provide treatment via sediment control devices prior to discharging into the downstream environment.
- Regularly inspect the ESC measures and undertake any maintenance necessary to maximise the sediment retention efficiency of the site.
- Undertake ongoing assessment of the ESC methodology and, if required, adjust as the work progresses.
- Ensure site staff are aware of the requirements of the ESCP and the relevant resource consent conditions.

3.4. Review

This ESCP is a live document and will be revised / confirmed prior to commencement of works to address:

- Final stage design;

- Associated confirmed construction methodologies; and
- Consent Conditions.

Commitment and continuous improvement to the environmental culture by management is critical to its success and continuation. As part of continuous improvement, additional changes to the ESCP may be appropriate during the course of the project.

These changes may be a result of:

- Any significant changes to construction activities or methods.
- Key changes to roles and responsibilities within the Project.
- Changes in industry best practice standards or recommended erosion and sediment controls.
- Changes in legal or other requirements (social and environmental legal requirements, Resource Consent conditions, Waikato Regional Council objectives and relevant policies, plans, standards, specifications, and guidelines).
- Results of inspection and maintenance programmes, logs of incidents, corrective actions, internal or external assessments.
- The outcome of investigations into discharges of contaminants.

Reasons for making changes to the ESCP will be documented. Any new/updated version of the ESCP documentation will be issued with a version number and date. A copy of the current ESCP document and subsequent versions will be kept for the Project records. Superseded versions will be marked as obsolete.

Any relevant revisions to the ESCP will be submitted to the Waikato Regional Council for review and certification at least 10 days before becoming operational.

3.5. Staging

As stated above, the sand quarry operations will be completed within five stages following an initial site establishment works phase. In addition to the five primary staging areas, the quarry operations will be operated in a phased manner. This will manage the exposed area of the active quarry operations. As the phasing progresses the completed areas will be progressively topsoiled and grassed.

4. EROSION AND SEDIMENT CONTROL DETAILS

The erosion and sediment control methodology has been designed in accordance with best practice and the principles outlined in TR2009/02.

Specific erosion and sediment control drawings are attached as Appendix A.

4.1. Soakage

High soakage rates are experienced on site due to the characteristics of the sandy soils.

Percolation tests undertaken by HD Geo (test completed 13.12.21) on the property, across four bore sites (refer to Figure 14 for bore locations), confirm the following soakage rates detailed in Table 2.

Table 2: Percolation test results provided by HD Geo.

Site	Hole depth	Groundwater depth	Percolation rate	50% Percolation rate
ST01	4.0 m	NA	1438 mm/hr	718 mm/hr
ST02	1.850 m	1.9 m	311 mm/hr	155 mm/hr
ST03	2.0 m	NA	369 mm/hr	184 mm/hr
ST04	2.0 m	1.7 m	306 mm/hr	153 mm/hr

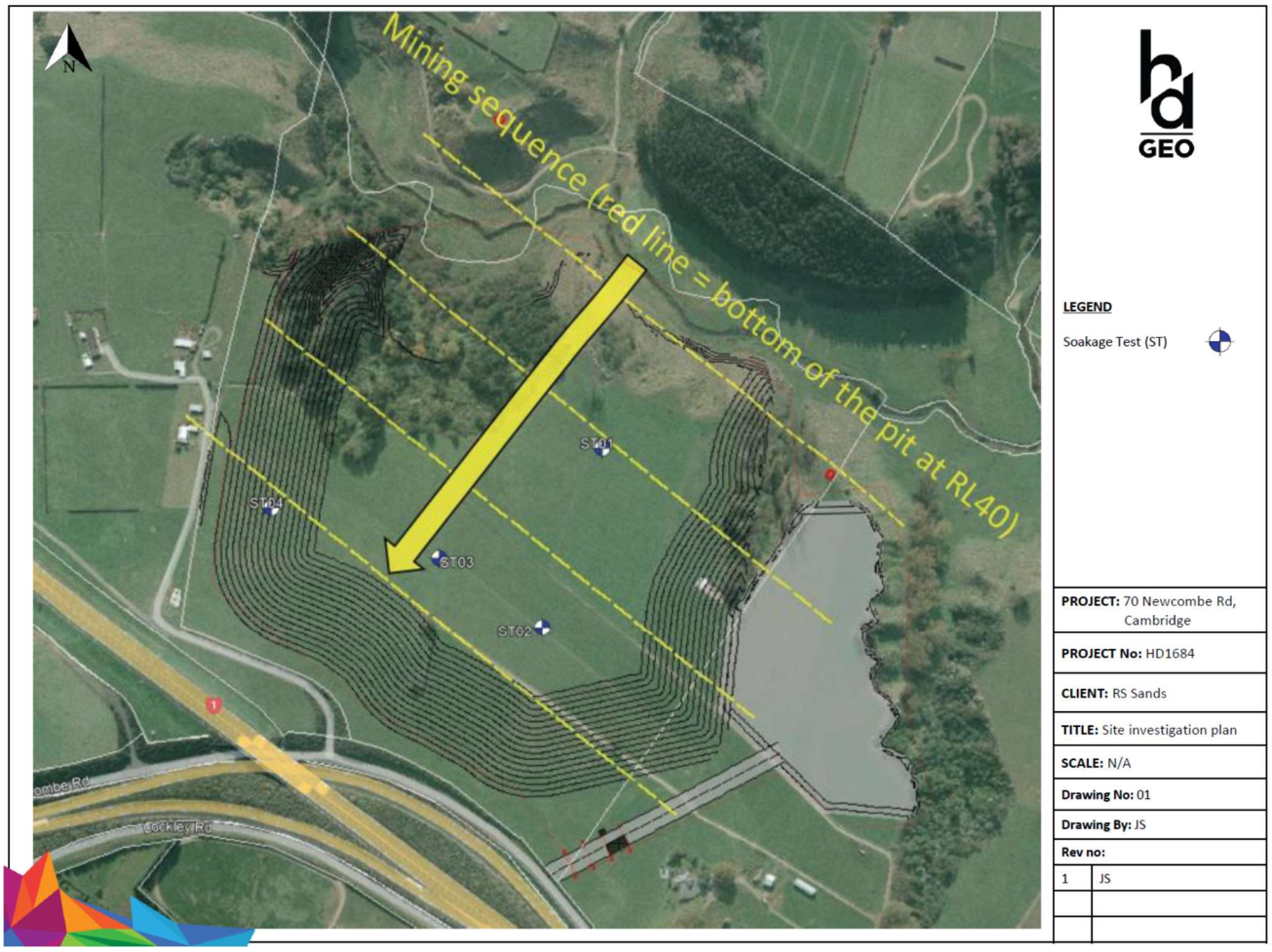

Figure 14: Bore hole locations (Source: HD Geo).

It is expected rainfall during (and post) construction will actively soak away. Based on percolation test, soakage rates are a minimum of 153 mm/hr (measured at 50% of the lowest recorded percolation rate) and likely to be significantly higher.

HIRDS (historical) data for the site:

- 1hr 100 yr event = 56.3mm
- 24hr 100 yr event = 155mm

Therefore, it is expected that the soakage rate will exceed the 1hr 100-year rainfall event and minimal, if any, runoff is expected to discharge to the SRPs.

Any water that does discharge to an SRP is likely to soak to ground within the device.

Nevertheless, ESCs have been designed in accordance with the TR2009/02.

4.2. Clean Water Diversions

Clean water diversions will be constructed to divert upper catchment clean water away from the area of works. This will likely include a perimeter bund around the extent of works and stage boundaries and will be progressively installed (and removed) as the quarry operation progress. The clean water diversions will likely be constructed using stripped topsoil and will be stabilised immediately following construction.

Note, these are separate to, and have different dimensions to the screening bunds.

To comply with TR2009/02 the clean water diversion bunds should be a minimum of 550mm high to will provide a diversion capacity for a maximum clean water catchment area of 5ha up to the 5% Annual Exceedance Probability (AEP) storm event, plus a freeboard of 300mm. Calculations are provided in Table 2 below.

All clean water diversions will discharge to stable flow paths beyond each works site.

Note all calculations ignore the site's high soakage rate (refer to section 4.1 above).

Table 3: Clean water diversion bunds assuming maximum clean water area for the site.

Clean water diversions					
5% AEP (24 hr)	Catchment Area (maximum)	Peak Flow	Slope (minimum)	Minimum Design Flow Depth	Including Minimum 300mm Freeboard
116mm	5 ha	0.114 m^3/s	2%	200 mm	500 mm

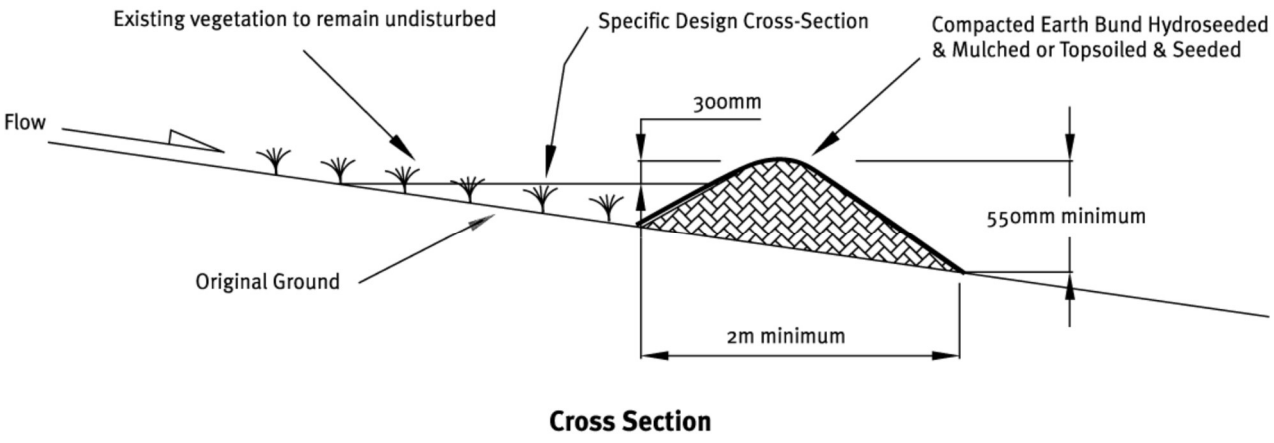

Figure 15: Cross-section of a clean water diversion bund.

4.3. Dirty Water Diversions

Dirty water diversions will generally only be required near the base of the quarry, near the SRP as any site runoff will fall towards the SRP. The base of the quarry will have a slight fall towards the SRP.

A dirty water diversion bund will be installed as the staging progresses within each stage and quarry extent to direct runoff into the respective SRP.

The maximum contributing catchment area for the dirty water diversions is 4.7ha (Stage 2). To comply with TR2009/02 the calculated minimum perimeter bund height installed across the project would be a minimum

of 550mm to provide conveyance of the 5% AEP storm event, plus 300mm freeboard. Calculations are provided in Table 4 below.

Note all calculations disregard the site's high soakage rate detailed in Section 4.1 above.

Table 4: Dirty water diversion bunds assuming maximum dirty water area for Stage 2.

Perimeter bunds (dirty water diversion)						
5% AEP (24 hr)	Catchment Area (maximum)	Peak Flow	Base Width	Slope (minimum)	Minimum Design Flow Depth	Including Minimum 300mm Freeboard
116 mm	5 ha	0.342 m^3/sec	0.5 m	1%	250 mm	550 mm

The minimum bund height installed across the site will be 600mm (300mm plus 300mm freeboard), which is designed to convey the 5% annual exceedance probability (AEP) storm.

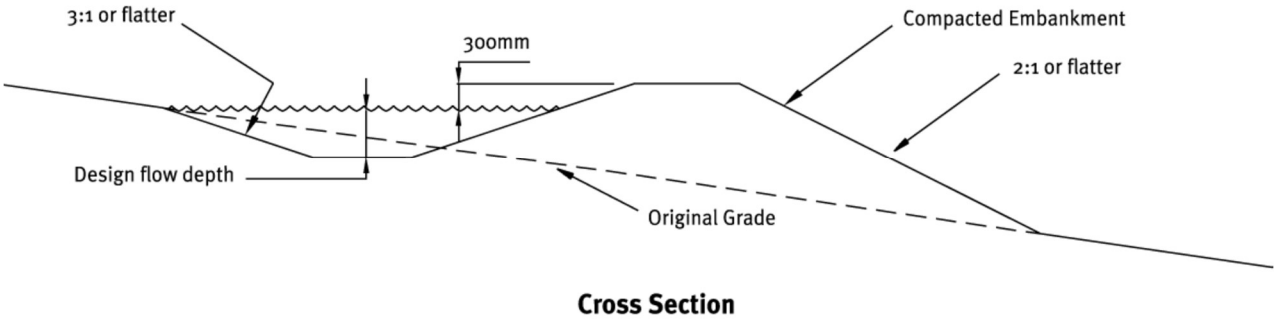

Figure 16: Cross-section of a dirty water diversion.

During Stage 1 works will be undertaken to excavate and bench down to construct sufficient space for SRP-2. During this stage, each bench will be bunded off, the bench tilted back towards the bank and the box cut exercise will form a bund along the outside trapping any runoff within the bench/box cut. The below calculations confirm that a 500mm high bund (200mm depth plus 300mm freeboard) is sufficient to contain the runoff from an area of 0.6ha (assuming minimal soakage).

Table 5: Dirty water diversion bunds to contain runoff during Stage 1 benching operations.

5% AEP (24 hr)	Catchment Area (maximum)	Peak Flow	Base Width	Slope (minimum)	Minimum Design Flow Depth	Including Minimum 300mm Freeboard
116 mm	0.6 ha	0.041 m^3/sec	NA	0.5%	200 mm	500 mm

4.4. Sediment Retention Ponds

Enabling works

One SRP (SRP-1) will be constructed for the earthworks associated with the enabling works phase and set-up of the processing plant. This SRP will be constructed within the future footprint of the water recycling pond and will have a contributing catchment area of approximately 4.8ha. SRP-1 has been designed for a

maximum catchment area of 5ha, providing for a total storage volume of 1,000m^3. This SRP will discharge to the gully to the northwest of the SRP, approximately 150m uphill from the Karapiro Stream.

Once the earthworks are complete the processing area will be stabilised with aggregate. Once the area is stabilised the SRP will be converted into the water recycling pond.

Stage 1

Stage 1 initially requires earthworks to create sufficient space for the SRP (SRP-2) that will be constructed on the northern extent of the sand quarry. This SRP has been designed for a maximum contributing catchment area of 5ha (Stage 2 plus part of Stage 1), with a total storage volume of 1,000m^3. SRP-2 will discharge to the north towards the Karapiro Stream.

Both SRPs have been sized with a minimum storage volume of 2% of the contributing catchment area. The maximum catchment length for both ponds will likely be greater than 200m long. The slope of the catchment of SRP-1 will be less than 10%. The average slope of the catchment for SRP-2 during Stage 1 will be greater than 10% (although the area immediately upstream of the SRP inlet will be flat), due to the batters dropping down to the base of the excavation.

The site's soil characteristics, including a high sand content and corresponding high soakage rates, will significantly reduce the volume of runoff reaching an SRP. Therefore, it is considered appropriate that the SRPs constructed on site are designed to provide a minimum volume of 2% of the contributing catchment (200m^3 capacity for each hectare of contributing catchment). An additional 10% of volume will be provided for in the forebay.

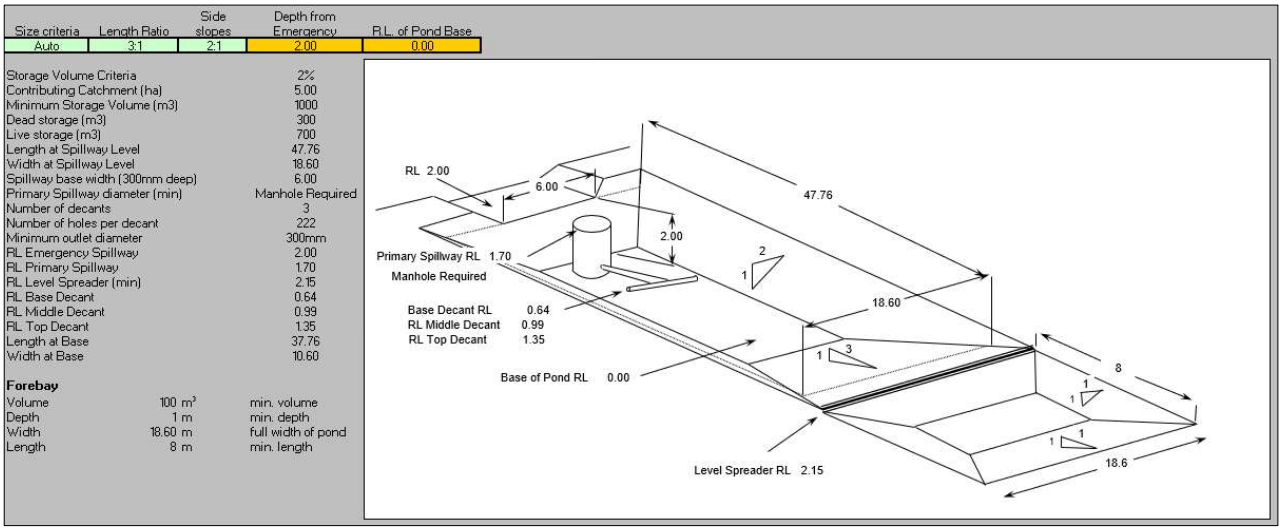

Figure 17: Sediment retention pond design details for SRP-1 and SRP-2.

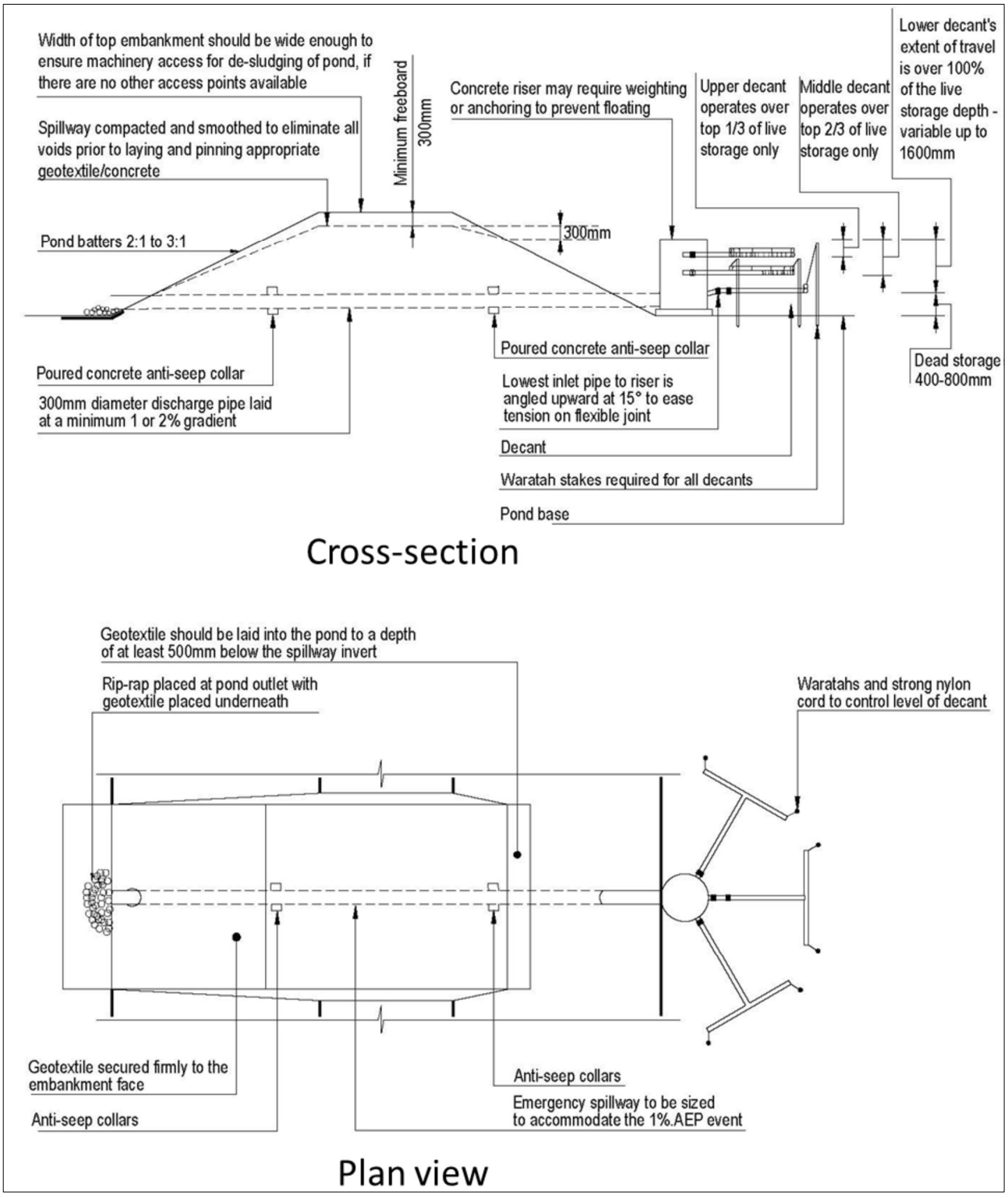

Figure 18: Cross-section and plan view for a sediment retention pond with a contributing catchment area between 3 and 5ha.

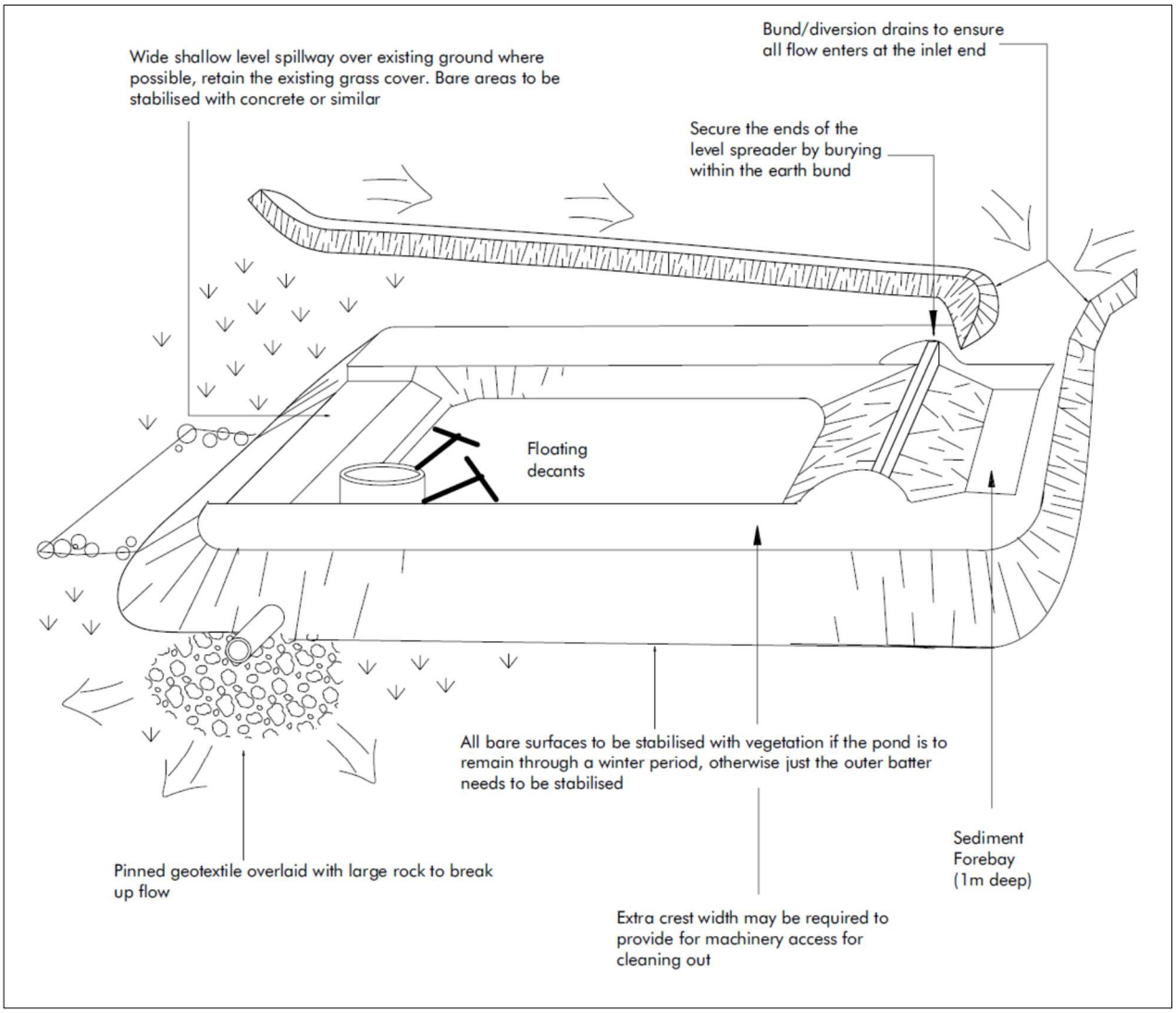

Figure 19: Schematic of a sediment retention pond.

4.5. Chemical Treatment

Chemical treatment is not expected to provide any benefit due to the high soakage rates tested and expected on site and so no Chemical Treatment Management Plan (CTMP) has been prepared.

Chemical treatment will only be employed on site to enhance the sediment removal efficiency of the SRPs, should bench testing show benefits of chemical treatment. Prior to quarry activities commencing chemical bench testing will be undertaken to determine the effectiveness of chemical treatment and the appropriate dose rate.

The results and management of the chemical treatment systems will be detailed within a CTMP. The CTMP will be provided prior to commencement of quarry activities being undertaken on site and will be monitored in accordance with the CTMP throughout project.

If chemical treatment is required, it will be undertaken in accordance with the recommendations of CTMP.

4.6. Silt Fences

Silt fences will be used to treat site runoff from small areas that will not actively drain to a SRP.

Silt fences will be installed below the footprint of the SRPs to capture any runoff generated during the construction of the ponds. Once the ponds are constructed the silt fences will be returned up either side of

the emergency spillway to allow the spillway to function as designed.

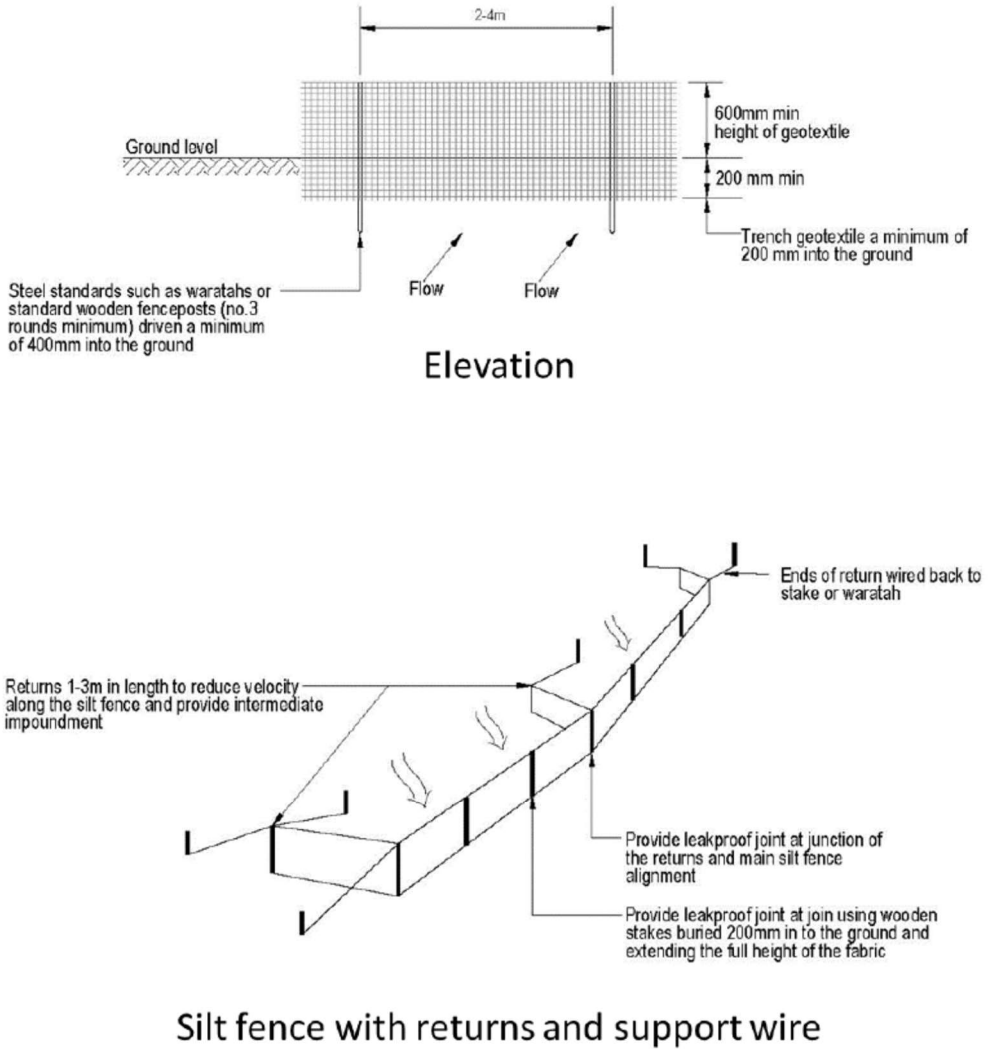

Figure 20: Schematic of a silt fence.

Table 6: Silt fence design criteria.

Slope Steepness (%)	Slope Length (m) (Maximum)	Spacing of Returns (m)	Silt fence Length (m) (Maximum)
Flatter than 2%	Unlimited	N/A	Unlimited
2 - 10%	40	60	300
10 - 20%	30	50	230
20 - 33%	20	40	150
33 - 50%	15	30	75
> 50%	6	20	40

4.7. As-Built Certification

Prior to earthworks and quarrying commencing within an area, as-builts for the ESCs for that area will be provided to the WRC. The as-built certification will confirm that the controls have been constructed in accordance with the ESCP and TR2009/02.

4.8. Stockpiles

Any stockpiling will be within the perimeter bunding and will be seeded and mulched on completion. During the enabling works phase, excavated material from the processing area will be used to construct the bunding around the site. The bund will be topsoiled and stabilised, followed by planting to effectively screen the site.

Topsoil

Topsoil will be temporarily stockpiled and / or used for clean water (perimeter) bunds as the stages progress. Topsoil stripped during future stages of the quarry will be used to close out competed areas of the previous stage. The completed areas will be topsoiled, and grass seeded.

4.9. Dust Management

The emphasis of the site dust strategy will be one of prevention.

Truck and vehicle movements will be limited to stabilised roads and tracks and at low speed. These areas will be covered with compacted aggregate and maintained in a stabilised state. Restricting the truck movements to the stabilised areas and designated tipping and turnaround areas will allow dust control measures to be focussed on highest risk areas. This will be achieved by maintaining the quality of the designated tipping and turnaround areas and wetting by water cart, if required.

Vehicle movements on site will be governed by speed restrictions which will assist in preventing dust generation as well as site safety.

As areas of the quarry are completed, they will be progressively topsoil and stabilised. This will minimise the works area at any one time minimising the dust risk.

4.10. Stabilisation

Progressive stabilisation will be undertaken as working areas are completed. As stated above, any stockpiles will be stabilised immediately upon completion. Following completion of each fill area, topsoil will be re-spread and the completed area stabilised with grass seed and hay mulch.

4.11. Winter Works

Quarrying activities are proposed to be a continuous activity throughout the year. Given the high soakage rates and likely minimal discharge of treated sediment laden runoff from the site, a winter works restriction is not necessary as works during winter will not result in an unacceptable high risk of elevated sediment discharge.

4.12. Monitoring and Maintenance

All erosion and sediment control measures and methodologies will be monitored and maintained during the works in accordance with TR2009/02. Monitoring will be undertaken before and immediately after rain events as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

Sediment deposits and bulges against the silt fences will be removed when sediment accumulation reaches 20% of the fabric height.

The SRPs will be cleaned out before accumulated sediment volume reaches 20% of the total volume. Forebays will be cleaned out if there is any evidence of sediment deposition.

5. WAIKATO REGIONAL PLAN REQUIREMENTS

5.1. Waikato Regional Plan

The following objectives and policies of the Waikato Regional Plan are those most relevant to the management of sediment related effects of the proposal.

Objective 3.5.2

Discharges of contaminants to water undertaken in a manner that:

a. does not have adverse effects that are inconsistent with the water management objectives in Section 3.1.2
b. does not have adverse effects that are inconsistent with the discharges onto or into land objectives in Section 5.2.2
c. Ensures that decisions regarding the discharge of contaminants to water do not reduce the contaminant assimilative capacity of the water body to the extent that allocable flows as provided for in Chapter 3.3 are unable to be utilised for out of stream uses.

Policy 3.5.3.2

Control, through resource consents, discharges to water that are likely to have more than minor adverse effects so that:

a. adverse effects on surface water bodies that are inconsistent with the policies in Section 3.2.3 of this Plan are avoided as far as practicable and otherwise remedied or mitigated
b. the discharge causes no significant adverse effects from flooding or erosion
c. there are no significant adverse effects from downstream siltation
d. there are no significant adverse effects on the Coastal Marine Area, wetlands that are areas of significant indigenous vegetation and/or significant habitats of indigenous fauna, cave ecosystems or lakes
e. any subsequent discharges to air do not have adverse effects that are inconsistent with the policies for air quality provided in Section 6.1.3 of this Plan.

Objective 5.1.2

A net reduction of accelerated erosion across the Region so that:

a. soil productivity, versatility and capability is maintained
b. there are no adverse effects on water quality, aquatic ecosystems and wetlands that are inconsistent with Water Management Objective 3.1.2
c. there is no increase in the adverse effects of flooding or land instability hazards
d. accelerated infilling of lakes, estuaries, rivers, wetlands and cave systems is avoided and the rate of infilling of artificial watercourses, excluding structures designed to trap sediment, is minimised
e. significant adverse effects on the relationship tangata whenua as Kaitiaki have with their identified ancestral taonga such as ancestral lands, water and waahi tapu are avoided
f. cumulative adverse effects on the relationship tangata whenua as Kaitiaki have with their identified taonga such as ancestral lands, water, waahi tapu are remedied or mitigated.
g. significant adverse effects on natural character and ecological values associated with land and the coastal environment including dune systems is avoided

h. there are no adverse effects on air quality that are inconsistent with Air Quality Objective 6.1.2, Objectives 2 and 3
i. damage to property and infrastructure is avoided

Policy 5.1.3.2:

Waikato Regional Council will use a mixture of regulatory and non-regulatory approaches to:

a. minimise the adverse effects of soil disturbance and vegetation clearance in high risk erosion areas

b. minimise the accelerated infilling of Coromandel estuaries that are listed as areas of significant conservation value in the Regional Coastal Plan

c. minimise adverse effects of soil disturbance activities in karst environments on cave ecosystems.

Policy 5.2.3.2**:**

Manage discharges of contaminants onto or into land not enabled by Policy 1, in a manner that avoids, where practicable, the following adverse effects and remedies or mitigates those effects that cannot be avoided:

a. contamination of soils with hazardous substances or pathogens to levels that present a significant risk to human health or the wider environment

b. the discharge is not inconsistent with policies in Section 5.1.3

c. any effect on water quality or aquatic ecosystems that is inconsistent with the purpose of the Water Management Classes as identified by the policies in Section 3.2.3

d. the adverse effects outlined in the policies and rules for air quality in Chapters 6.1 and 6.2, particularly for odour and particulate deposition

e. damage to archaeological sites, waahi tapu or other identified sites of importance to tangata whenua as Kaitiaki.

5.2. Plan Change 1

In summary, Plan Change 1 of the Waikato Regional Plan states that the Waikato and Waipā Rivers are degraded and require restoration and protection. One objective has been given particular focus for Chapter 3.11: The restoration of water quality within the Waikato River so that it is safe for people to swim in and take food from over its entire length. This is to be given effect by various mean including:

- Reducing nitrogen, phosphorus, sediment, and microbial pathogen losses from land; and
- Ongoing management of diffuse and point source discharges of nitrogen, phosphorus, sediment, and microbial pathogens.

Policy 5 provides for offsetting/compensation towards overall reducing the diffuse discharge of sediment (etc), or that there is a sufficient reduction in the diffuse discharge of sediment so that the positive benefits to restoration and protection of the health and wellbeing of the Waikato River exceeds the adverse effects from any diffuse discharge.

Policy 12 requires proposals to demonstrate that the discharge represents the Best Practicable Option to prevent or minimise the adverse effects of the discharge and to offset or compensate for residual adverse effects subject to additional conditional clauses.

Policy 13 requires, subject to Policy 12, that resource consent applications for point source discharge including sediment consider the loads of specific contaminants to the Waikato River as they relate to a

progressive improvement in water quality and a range of factors.

5.3. Discussion

The proposed ESC methodology is the best practicable option for the proposal. It represents best-practice control measures, staged quarrying activities and progressive stabilisation. It is consistent with the industry-leading approach that has appropriately minimised sediment discharges and downstream effects on multiple projects throughout the Waikato Region and within the Waikato River catchment, including sites with soils containing a higher clay and silt component.

The sand deposits within the site have confirmed high soakage rates and therefore reduce the volume of runoff entering the proposed sediment control measures. It is expected that only minor volumes and on very few occasions will (via the controls) discharge to the receiving environment. This will significantly minimise the overall potential discharges from the project to low level and compare favourably to runoff from the existing land surface.

The efficiency of the ESC system will be further enhanced from the staging of works and progressive stabilisation, thus reducing the potential area exposed to erosion.

It is anticipated that the proposed ESC methodology will minimise the discharge of sediment from the site to an extent that is similar to the existing land use, and that will not compromise the outcomes sought by the relevant policies of the Waikato Regional Plan including Plan Change 1.

Overall, on a technical basis, the proposal is consistent with the relevant provisions of the Waikato Regional Plan and Plan Change 1. The more detailed planning assessment is provided by others.

6. SUMMARY

This ESCP addresses the proposed ESC measures associated with the earthworks and sand quarrying activities proposed to be undertaken at 77 Newcombe Road, Cambridge.

The quarrying activities are estimated to continue for approximately 25 years with a proposed consented term of 30 years.

The works will be carried out in accordance with this ESCP, the principles of TR2009/02 and the relevant conditions of consent. The methodology proposed will ensure that any adverse effects of the construction are managed in accordance with the WRC guidelines and consent requirements and will be acceptably minimised.

7. APPENDIX

7.1. Appendix A - Erosion and Sediment Control Drawings

Drawing number	Drawing title	Date	Revision
ESCP-PA-01	Erosion and Sediment Control Plan – Processing Area and Site Establishment	21.01.22	A
ESCP-001-01A	Erosion and Sediment Control Plan – Stage 1A	07.07.22	A
ESCP-001-01B	Erosion and Sediment Control Plan – Stage 1B	07.07.22	A
ESCP-001-01C	Erosion and Sediment Control Plan – Stage 1C	07.07.22	A
ESCP-002-01	Erosion and Sediment Control Plan – Stage 2	07.07.22	A