

EROSION AND SEDIMENT CONTROL ASSESSMENT REPORT

Drury Quarry – Sutton Block

475 Quarry Road, Drury

Prepared for Stevenson Aggregates Limited

Prepared by: SouthernSkies Environmental Ltd

Date: 7 March 2025

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1. OVERVIEW

1.1 Scope

The applicant, Stevenson Aggregates Limited (SAL), seeks resource consent to develop a new pit to the northeast of the existing Drury Quarry, an area referred to as the Sutton Block. The Drury Quarry is located at 475 Quarry Road, Drury (the Site).

This Erosion and Sediment Control Assessment Report (ESCAR) has been prepared to support the resource consent application. It incorporates an Erosion and Sediment Plan (ESCP) that identifies the erosion and sediment control (ESC) measures proposed to manage site runoff associated with the earthworks and streamworks required for the development of the Sutton Block pit and for the on-going operational quarrying associated activities within the Sutton Block. It then assesses the suitability of those measures to minimise the potential discharge of sediment to an acceptable level.

The site holds an existing earthworks consent (Ref: R/LUC/2015/2419 and R/Reg/2015/2420) to undertake land disturbance and earthworks activities at Drury Quarry over an area of 315ha, including across the majority of the proposed Sutton Block pit. The ESCP has been prepared in accordance with the consent conditions of the approved resource consent.

Additional earthworks activities outside the scope of the existing consent, that are to be incorporated by the new consent application, include earthworks within the Significant Ecological Area overlays and streams within the proposed Sutton Block area, as well as development of the Northern Bund and works proposed outside of the Special Purpose – Quarry Zone as mapped in the Auckland Unitary Plan: Operative in Part (AUP: OP). Refer to Figure 1 below showing the existing earthworks consent area and the proposed additional areas.

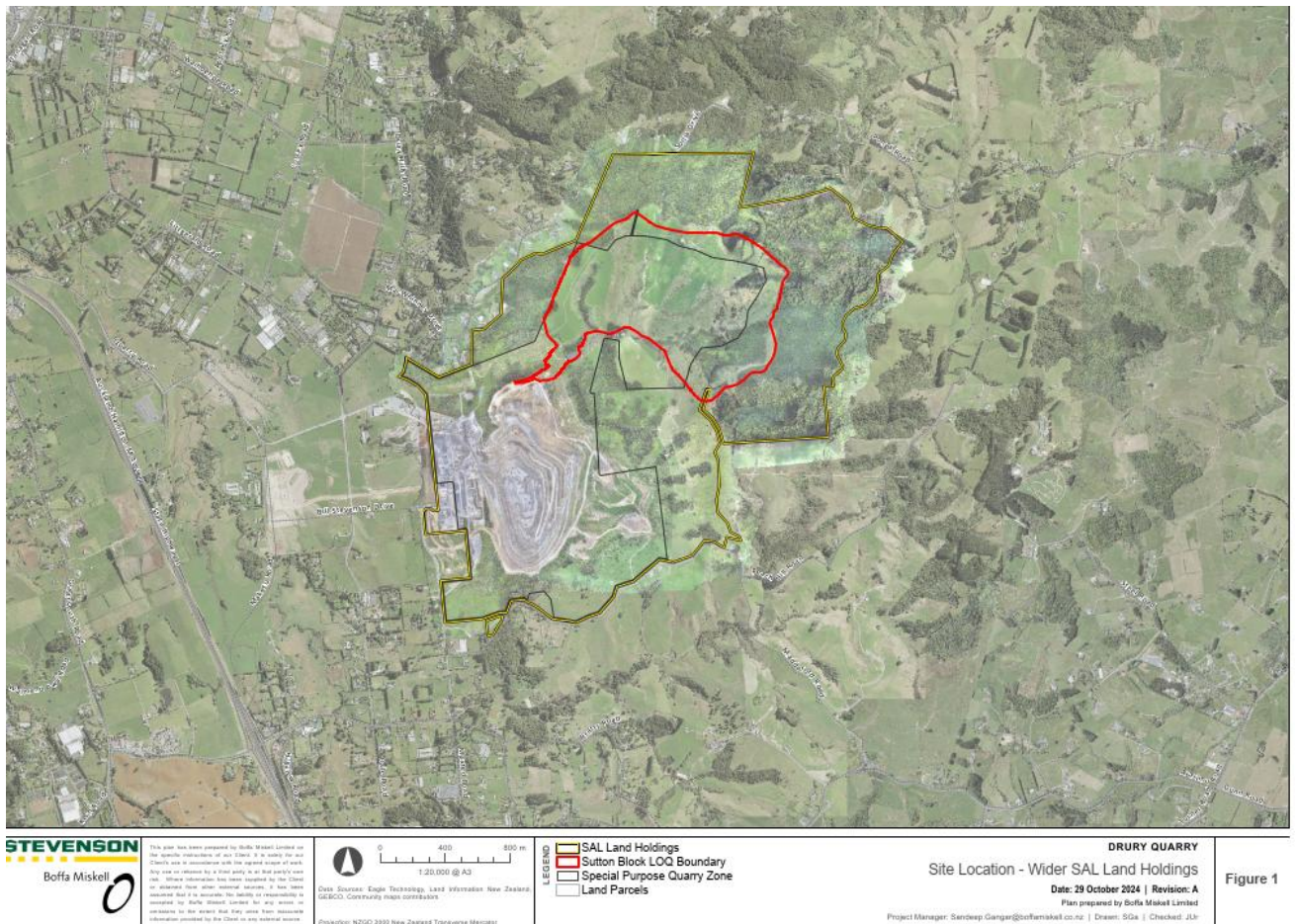


Figure 1: Existing earthworks consent area vs additional proposed earthworks.

The ESCP will form part of the Sutton Block Quarry Management Plan (QMP). A copy of the draft QMP is attached to the Assessment of Environmental Effects (AEE) report.

A site visit was undertaken on 29th April 2022, attended by Campbell Stewart (Southern Skies Environmental Limited), Kurt Hine (SAL), Jo Young (SAL), Graeme Fulton (Terra Mining Consultants Ltd), and Emile van Zyl (Fulton Hogan).

The ESCP has been prepared in accordance with design principles of the Auckland Council Guideline Document 2016/005 *Erosion and Sediment Control Guideline for Land Disturbing Activities in the Auckland Region (GD05)*.

This ESCAR and the ESCP address the following earthwork and streamworks activities:

- Establishment of the erosion and sediment controls;
- Site establishment and enabling works;
- General earthworks, streamworks and quarry activities; and
- The establishment of the northern disposal bund including erosion and sediment controls.

1.2 Location and Site Description

The SAL land holdings cover an area of approximately 562ha that comprises a range of terrain and land use typologies, including pastoral farmland and existing quarrying activity. The Sutton Block “Life of Quarry” (LOQ) footprint is approximately 108ha that is currently predominately grazed and contains two farm dwellings and two sheds. The SAL landholdings are zoned Rural – Mixed Rural, Special Purpose – Quarry Zone,

Business – Heavy Industry Zone, and Business – Light Industry Zone. The zoning and planning notations relevant to the Sutton Block development are outlined in the AEE report.

The SAL landholdings have been delineated into 3 areas for ease of description, based on current land use (refer to Figures 2 and 3 below).

- Drury Quarry, comprising an area of approximately 75ha, containing the existing Drury Quarry pit, processing plant, stockpiles, internal access roads, stormwater treatment ponds and infrastructure related to quarry operation.
- Thorburn Fill, comprising an area of approximately 21.4ha located east of the existing quarry operation and is primarily used as a disposal area for quarry overburden.
- Sutton Block, comprising approximately 108ha located on the north-eastern part of the SAL landholdings, and currently used as grazing pasture.

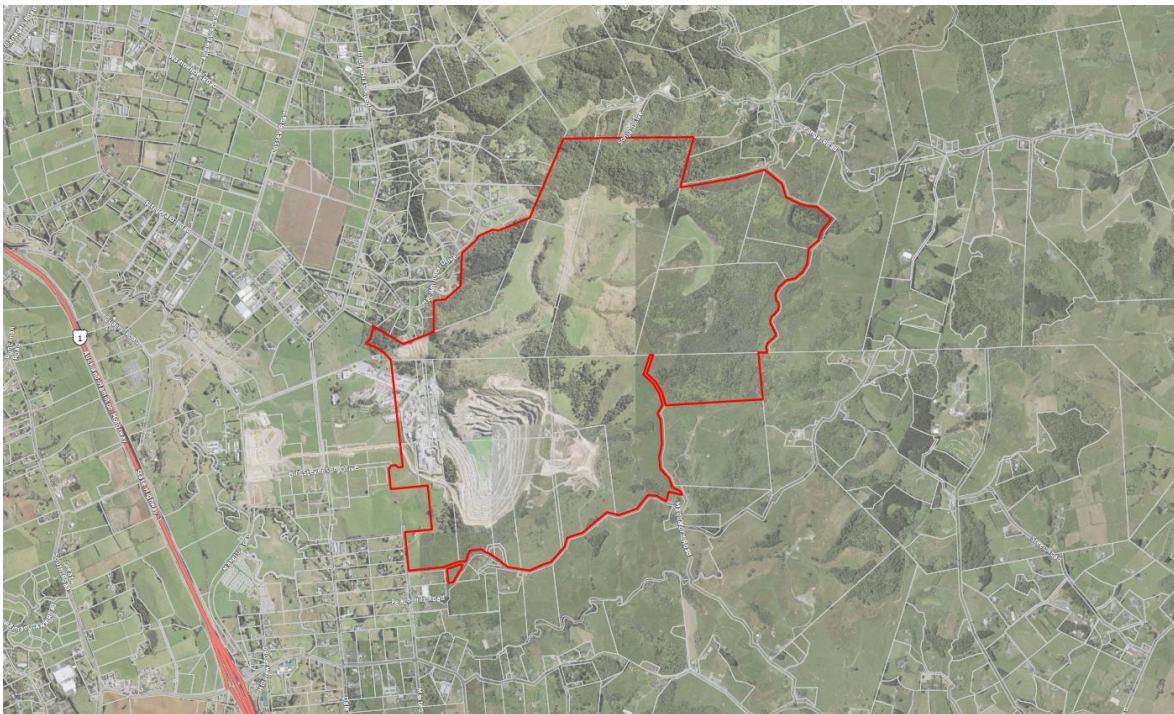


Figure 2: Site location and SAL land holdings.



Figure 3: Drury Quarry and Sutton Block.

1.3 Background

SAL Drury Quarry is located in Drury, within the Auckland Region, and has been in operation for over 80 years. Drury Quarry is a greywacke hard rock quarry supplying concrete, asphalt and roading aggregate to the Auckland market. The Drury Quarry pit is located within the wider landholdings owned by SAL which encompasses an area of approximately 562ha. This landholding includes quarrying activities, a clean fill, farmland and large swathes of native vegetation.

Based on current demand estimates, the existing pit will provide approximately 20 years of aggregate supply to Auckland. To continue to provide a local supply of aggregate resource, SAL proposes to develop a new pit within the existing site called the “Sutton Block”. The Sutton Block pit has been designed to provide approximately 240 million tonnes of additional aggregate to the market.

The Sutton Block is located to the northeast of the existing pit. The development of the Sutton Block will involve the staged development of an area of approximately 108ha to a maximum pit depth of approximately RL-60m. The overall site layout, including staging plans, is shown on the drawings set attached as Appendix C of the AEE report. The Sutton Block is designed to be a separate quarry pit although it will be serviced by the existing Drury Quarry ancillary site infrastructure and facilities. These include the “Front of House (FOH)” activities such as the weigh bridge, processing plant(s), storage bins and stockpile area, the lamella, staff facilities etc.

It is anticipated that as the existing Drury Quarry pit nears the end of its life and reduces aggregate extraction, the Sutton Block pit will increase its aggregate extraction. This will ensure a continuous aggregate supply to

the market.

There are two main, stream systems associated with the Drury Quarry; Quarry Stream in front of the quarry and Peach Hill Stream behind it. Both are permanent flowing watercourses. Two water supply dams are located on Quarry Stream above the quarry. Intermittent and ephemeral farm drains and watercourses also drain the Sutton Block area. The Sutton Block is part of the upper catchment of the Drury Stream.

To enable the development of the Sutton Block and support the extraction of aggregate, the project will also include the establishment of haul road access and road infrastructure, overburden removal, stockpiles including bunding, additional supporting infrastructure, and the construction of a conveyor belt connecting the Sutton Block pit to the existing Drury Quarry static primary crusher located within the FOH area. The works will also require stream diversions, stream reclamation, wetland reclamation, vegetation removal and mitigation offsets. The Sutton Block will generally be developed in the following five stages. The timing of these stages are indicative only and may vary over the life of the quarry but provide an appropriate basis for assessment purposes.

Stage 1 – Infrastructure establishment (3-year plan)

The initial stage of work involves the construction of the roading infrastructure required to access the site, draining of the existing farm dam to establish a sediment retention pond, associated stream diversion, initial offset planting, commencement of overburden removal, stockpiles (including bunding), and establishment of the conveyor system. Figure 4 below shows the extent of Stage 1.



Figure 4: Sutton Block – Establishment of Pit – Indicative 3 - year.

Stage 2 -Operating Quarry (15-year plan)

The second stage of work is the 15-year plan which involves the commencement of quarrying within the interim pit boundary (refer to Figure 5 below). An indicative staging plan shows the expansion of the pit to the east however, the direction of the expansion will depend on market demand. Expansion of the pit will be incremental, deepening and widening as resource is extracted. Internal pit roads will be constructed as the

pit expands. Offset planting and weed/pest control will continue.

The works involved in Stage 2 will generally include, tree removal, stream diversion, wetland reclamation, mitigation planting, removal of overburden, blasting, excavation and loading of broken rock onto trucks or conveyors for transport to be crushed and sorted at the existing Drury Quarry processing facilities.



Figure 5: Sutton Block – Pit Plan – Indicative 15 - year.

Stage 3 - Operating Quarry (30-year plan)

The third stage of work is further expansion of the interim pit boundary (refer to Figure 6 below). An indicative staging plan shows the expansion of the pit to the east however, the direction of the expansion will depend on market demand. During this stage of the works, the expansion of the pit will be incremental, widening and deepening as resource is extracted. Internal pit roads will be constructed as the pit expands.

The works involved in Stage 3 will generally include the same activities as Stage 2.



Figure 6: Sutton Block – Pit Plan – Indicative 30 - year.

Stage 4 – Operating Quarry (40-year plan)

The fourth stage of work is further expansion of the pit boundary (refer to Figure 7 below). An indicative staging plan shows the expansion of the pit to continue to the east and south however, the direction of the expansion will depend on market demand. During this stage of the works, the expansion of the pit will be incremental, widening and deepening as resource is extracted. Internal pit roads will be constructed as the pit expands. The works involved in Stage 4 will generally include the same activities as previous stages.



Figure 7: Sutton Block – Pit Plan – Indicative 40 - year.

Stage 5 – Life of Quarry Plan (50-year Plan)

The fifth and final stage reflects the full extent of the quarry pit over an approximate 50-year period (refer to Figure 8). As with the previous stages, expansion of the pit will be incremental, deepening and widening as resource is extracted. During this stage, the northern bund will be removed, and the pit will be predominately progressively deepened to a maximum depth of 60mRL¹. Internal pit roads will be constructed as the pit expands.



Figure 8: Sutton Block – Pit Plan – Indicative 50 - year.

1.4 The Sutton Block

The Sutton Block lies northeast of the current quarry pit. The site is currently pastoral land with a small block of plantation forest. The site drains to the southwest and forms the upper catchment area of the Quarry Stream, described below.

1.5 Receiving Environment

Runoff from the Sutton Block, the Drury Quarry pit, and immediate quarry area drains westward to the watercourse termed the Quarry Stream (and elsewhere referred to as NT1 stream). This watercourse drains across the front (north-western) side of the quarry and then flows west across the lower flats. Two existing manmade dams are located on the stream. The upper dam is located within the footprint of the Sutton Block Quarry Expansion area. The lower dam is located to the north of the current quarry pit, refer to Figure 9 for dam locations.

¹ Reduced Level (RL) refers to equating elevations of survey points with reference to a common assumed vertical datum. It is a vertical distance between survey point and adopted datum surface.



Figure 9: Quarry Aerial – Upper and Lower Dams

The Quarry Stream has an approximate catchment area of 220ha at Ramarama Road that includes some 45ha of quarry pit and associated catchment. The runoff from a further 25ha of land on the lower western side of the quarry flows via intermittent farm drains down to Ramarama Road.

The Quarry Stream and the drains combine just west of Ramarama Road and discharge to the Hingaia Stream.

The Hingaia Stream combines with Slippery Creek to form Drury Creek, an estuarine arm of the Manukau Harbour.

For further information on the receiving environment refer to the Assessment of Ecological Effects: Proposed Sutton Block, Drury Quarry report.

2. DESCRIPTION OF WORKS

2.1 Background: Drury Quarry Water Management System

The current Drury Quarry water management system has recently been upgraded with the installation of a new site water treatment system.

A large percentage of site water is used in the washing and processing of the materials and is recycled through the processing operations. Water discharging off site is via the water treatment system or direct from the quarry pit via a turbidity-controlled pump. Note, all site water runoff from within the current quarrying footprint (including the northern expansion area) drains to the pit.

The current water treatment system is made up of a lamella² and filter-press, discharging to a cleanwater pond. A description of the water management system implemented onsite is detailed below in Section 2.2.1. The system has been designed, installed, and managed with significant extra capacity availability that can accommodate the Sutton Block pit once it comes online.

² A Lamella Clarifier is a type of sedimentation tank that uses a series of inclined plates to separate solid particles from liquid. These plates, also known as lamella plates, are arranged at an angle to increase the effective settling area of the tank.

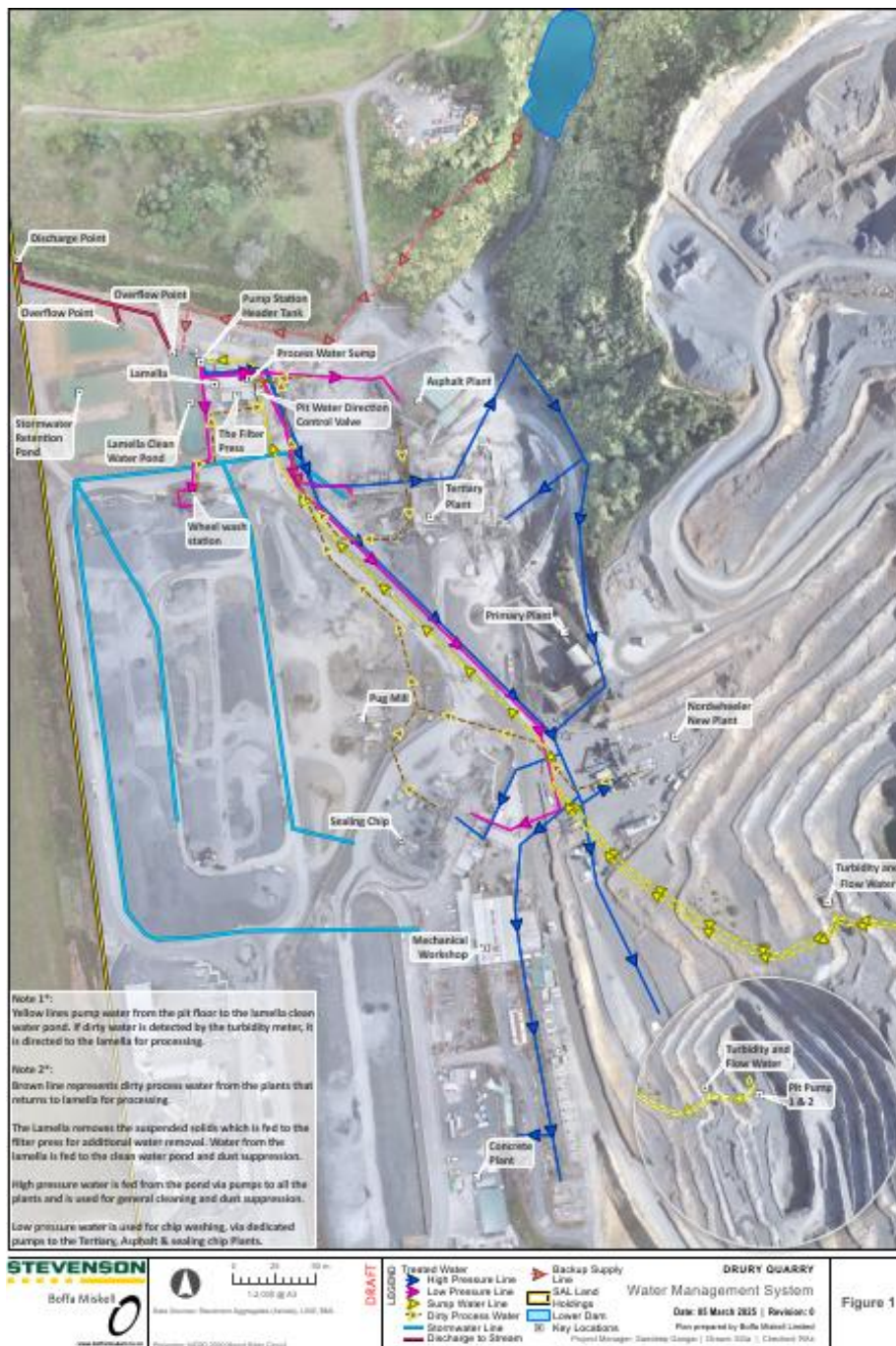


Figure 10: Drury Quarry Water Management Plan.

2.1.1 Current Drury Site Water Management System

The current Drury Quarry site water management system consists of a series of automated and manual pumps that move water around the site to operate the plant and to treat water before being discharged off site. The following is a breakdown of the water management system.

Pit Pump Number 1 –Automated Circuit.

Controlled by a Program Logic Controller (PLC) from the Sealing chip plant. The PLC maintains a constant pit water level set by the Quarry Manager. There are three set point levels “**High Level**”, “**Operational Level**” (set by the Quarry Manager), and the “**Low Level**” which shuts down the pump.

The pump is electronically driven and has a maximum capacity of around 200m³/hr at 150m of head. The line has a dedicated flow meter, electronic turbidity meter, a directional control valve, and a pressure transmitter.

The line delivers water to two locations, the cleanwater pond or the lamella and filter press for treatment and then into the cleanwater pond. From the cleanwater pond water is pumped to the quarry facilities as required.

- When the plant is running, the pump maintains constant delivery of water from the pit to the clean water pond to ensure that chip plant is adequately supplied cleanwater to be available as process water.
- If the turbidity concentration exceeds the set point (100 NTU), then the directional valve directs all the water to the lamella and filter press the water treatment plant for treatment before discharging into the clean water pond.

Pit Pump Number 2 – Manual Control

This pump is identical to the automated unit but is manually operated. All the water from this unit is directed to the cleanwater pond. It is only used when the automated unit is unable to cope with large rain events. The line is measured via a flow meter.

Wheel Wash Pump

The wheel wash pump is fully automated and takes water from the clean water pond. When a truck is sensed, the delivery valve is opened and pumping starts, delivering water to the wheel wash until the vehicle has passed through.

Water used in the wheel wash is considered dirty water and reports to the lamella water treatment system.

The Wash Circuit

The wash circuit represents the water transfer through the site to provide water to all the quarry operations. The wash circuit delivers water to the following points:

- Tertiary plant wash hoses;
- Dust suppression on various conveyors within the tertiary plant;
- Primary plant wash hoses;
- Dust suppression on various primary plant conveyors;
- Pugmill plant;
- Sealing chip plant wash hoses and conveyors for dust suppression;
- Fire hose reels at the mechanical workshops;
- Supply to the Drury concrete plant; and
- The truck wash station and truck wash hoses.

Water Treatment System (Lamella and Press)

Dirty process water is received via gravity from the following locations:

- 989 plant (Asphalt chip plant)
- Tertiary plant
- Sealing chip plant
- Pugmill mixer

In addition, water is pumped to the treatment system from:

- Truck wash area
- Wheel wash

The water is pumped from a sump through to the lamella for treatment.

Treated water from the lamella discharges to a clean water pond. The water in the clean water pond is pumped back through the site for process water and reuse. Excess is discharged to the stream via an overflow pipe.

Clean Water Pond Pump

This pump returns water from the lamella clean water pond back into the water management system for process water and reuse. The line also supplies water to the truck filling points and the truck wash water cannon.

2.2 Sutton Block

The Sutton Block expansion area is proposed to connect with the Drury Quarry via a new haul road and a conveyor belt that is yet to be established. The proposed conveyor belt will connect into the existing Drury Quarry primary processing plant located in the FOH area. As the Sutton Block develops, primary crushing will occur in the Sutton Block and a conveyor belt will transport the rock from the Sutton Block to the FOH area for further processing.

The Sutton Block is estimated to contain approximately 240 million tonnes of aggregate resource. The quarry is proposed to extract and process up to 5 million tonnes of material from the pit area per year (depending on demand) for approximately 50 years.

Appendix C of the AEE contains the proposed pit plan. In general, the plans refer to approximate three-year, fifteen-year, thirty-year, forty-year and life of quarry pit drawings. The maximum pit depth indicated on those plans is RL-60m.

As detailed in Section 1.3, the general indicative plan is as follows:

- Stage 1: Three-year plan: Create the road infrastructure, establish access, overburden removal, install conveyor belt system, begin ecological mitigation and commence quarry pit activities.
- Stage 2: Fifteen-year plan: This is indicative as it could move west or east depending on needs (whether market want blue or brown rock).
- Stage 3: Thirty-year plan: This is indicative as it could move west or east depending on needs (whether market want blue or brown rock).
- Stage 4: Forty-year plan: The indicative pit plans show the ongoing expansion to the east and south.
- Stage 5: To Life of Quarry plan: The pit will provide 50 years of aggregate based on an average of 4.8 million tonnes per year.

Once the pit is established and operating, the Sutton Block will utilise a primary crusher at the southern end of the site, with a conveyor linking to the Drury Quarry northern pit extension area.

In the initial stages of Sutton Block, it is proposed to use the existing fixed plant and a new one currently in planning. It is also likely that some mobile plant processing will occur in Sutton Block. This material will be trucked to the existing pit.

Over time, it is proposed to install a primary crusher in Sutton Block and convey crushed rock to the existing fixed processing plant.

Prior to the commencement of quarry operations within the Sutton Block, enabling works are required to ready the site for aggregate extraction. The enabling works are expected to take approximately three years and will primarily involve:

- Sutton Block site access will be gained by forming an approximate 20m wide by approximately 350m long quarry road from the existing Drury Quarry area. This site access road will connect to existing quarry access roads.
- Stream and cleanwater diversions.
- Establishment of the conveyor system to shift material to the existing crushing and plant area within Drury Quarry area. The conveyor system will be installed along the edge of the road.

Upon the completion of the enabling works, the initial quarry operations will commence. The expansion of the quarry pit will be incremental. The quarry pit will deepen and widen as resource is extracted. Internal pit roads will be constructed as the pit expands.

2.3 Quarrying Process

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

Removing Existing Vegetation

Any existing vegetation within the extent of works will be removed using excavators and trucks. Note, the removal of vegetation, topsoil etc., will be progressive over the life of the quarrying operations as and when required. Refer to the Assessment of Ecological Effects: Proposed Sutton Block, Drury Quarry report for further details regarding the removal of vegetation and timing.

Topsoil Stripping and Stockpiling

Topsoil and organic materials will be stripped, transported, and removed using excavators and trucks. The initial topsoil stripping will be used to form the erosion and sediment control clean water diversion bunds.

The removal of material will be to the Northern Bund (refer below) or to an overburden specific temporary stockpile to be located on the Sutton Block (refer below).

Overburden Removal

The initial excavation of material is classed as overburden. Where possible this material will be sold off to be used as fill. The demand for overburden does however fluctuate. If at the time of overburden stripping the material cannot be sold off site, the material will be placed in a designated overburden disposal area. Initially the overburden will be taken to the northern site boundary and form the Northern Bund. The Northern Bund will eventually be removed as the quarry pit operations move into Stage 5 of operations.

In addition, an overburden stockpile is proposed to be established in the Sutton Block, refer to Figure 11 for approximate location. In the future when the quarry pit expands, the overburden stockpile will be removed. It is expected that the overburden will be required to remain in place for 10-15 years. It will be removed prior to the advancing of the quarry footprint.

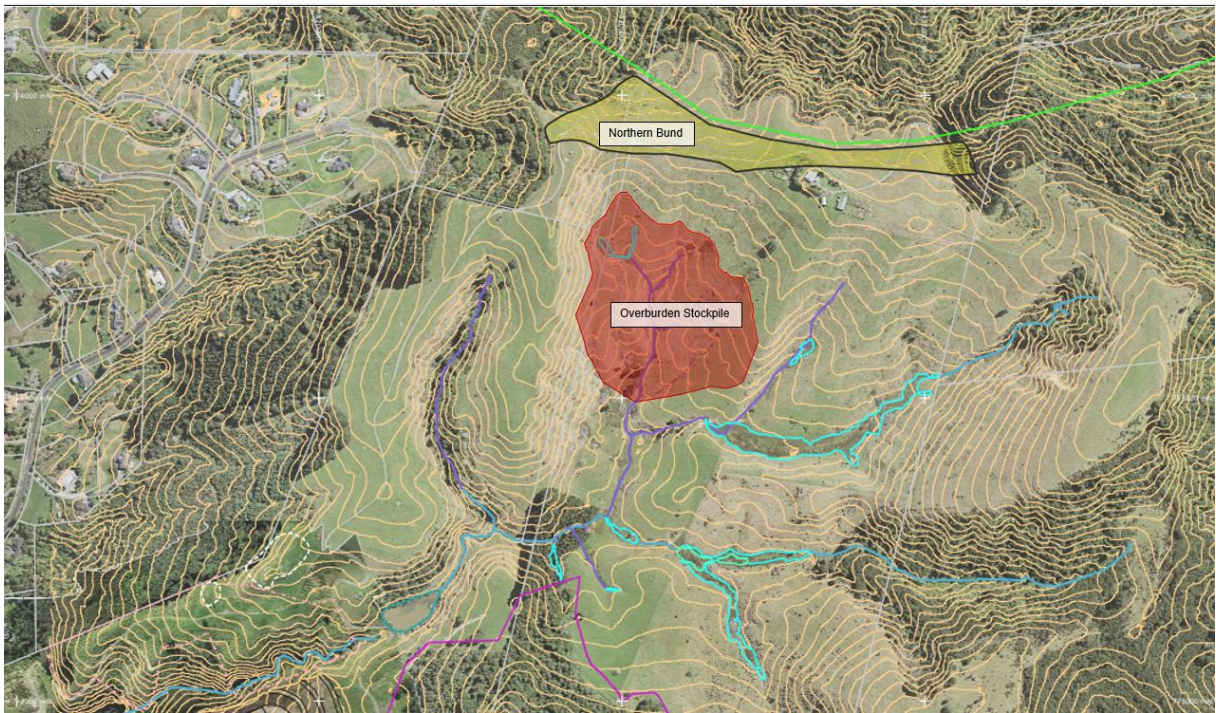


Figure 11: Northern Bund and Overburden Stockpile

Aggregate Extraction, Processing and Stockpiling

Quarrying of the aggregate will occur using excavators, trucks, and/or loaders, to excavate and transport the aggregate materials to a transfer area within the pit. The material will then be placed on the conveyor system to take the material to the processing plant or stockpiles within the Drury Quarry.

Eventually as the Drury Quarry pit operations wind down and the Sutton Block pit expands, some of the process plant and stockpile areas will be relocated to the Sutton Block.

2.4 Site Establishment and Access

Refer to ESCP-DQSB-01 to ESCP-DQSB-10 and ESCP-DQSB-HR-01

The establishment of the construction access road requires enabling earthworks including the diversion of an existing watercourse. These works are separate to the quarry operation that will commence once the access and enabling works are complete.

The works to establish the access road will be phased. The phasing descriptions are outlined below. Approximately 6ha of earthworks is required during the establishment works, of which 2ha will drain back to the existing Drury Quarry pit. Approximately 4ha will be managed via GD05 controls but these will be further staged so that less than 4ha will be exposed at any one time. Indicative staging has been used in the Universal Soil Loss Equation (USLE)³ estimate of sediment yield discussed later in this report; being up to 2.2ha in Year 1 and up to 3.4ha in each of Years 2 and 3. These areas can be further managed such that these estimates are likely maximums. Draft ESC drawings and construction details have been provided in Appendix B and Appendix C of this ESCAR.

³ The USLE is a relatively simple model suitable as a sediment yield estimation tool for a range of land disturbing activities including earthworks. The USLE method can be used to identify variation in potential sediment yield across a site rather than providing a numerically accurate estimate of actual total sediment yield. While the overall estimate of the yield is indicative of the magnitude of sediment likely to be discharged, the range of assumption required in the USLE calculation means that it should not be relied on as an accurate assessment of the actual total yield.

A summary of the phase details is provided below.

Enabling Works [ESCP-DQSB-01]

A Sediment Retention Pond (SRP), SRP-1 will be installed to treat site runoff for early phases of Stage 1. The location of SRP-1 is to be in the footprint of the existing manmade farm dam. To allow this to occur pre-enabling works are required.

The dam weir will be removed to allow the dam level to drop and the stream to flow and to re-establish its flow path along its “original” alignment. This will allow the current dam wetted footprint area to begin to dry up for approximately two months before earthworks commence.

A new temporary stream channel will be constructed offline, established around the outside (true left bank) of the dam footprint and will discharge into the left bank culvert at the road crossing. Once the new temporary stream channel has been constructed and stabilised, a stabilised coffer dam upstream of the current dam water level footprint will be installed to direct water into the new temporary stream channel.

This will take the stream channel offline and allow the old dam area to be desilted (mucked out).

SRP-1 (refer to ESCP-DQSB-02) will be built within the dam footprint and will discharge into the right bank culvert. The SRP has been designed to service a catchment of 4.1ha. As noted above, the actual catchment draining to the SRP at its largest will be no more than 3.4ha. For the first year to 18 months the catchment is expected to be less than 2ha.

Establishment of the Northern Bund – [ESCP-DQSB—NB-01 and ESCP-DQSB-HR-01]

During the establishment phase and early works stages to set up the quarry pit, overburden will either be taken directly off site (sold as product), or to the new Northern Bund Disposal Area. The Northern Bund is expected to be in place for approximately 40 years. As the quarry pit operations expand from Stage 4 into Stage 5, the bund will be removed, as the bund lies with the footprint of the Stage 5 northern boundary extent.

The Northern Bund will be established in a staged and progressive manner as overburden is produced. The total area of the Northern Bund is approximately 4ha. Two Sediment Retention Ponds (SRPs) will be installed to treat runoff from the construction of the bund. Perimeter bunds will be installed to direct site runoff to the SRPs.

The overburden bund batters will be progressively stabilised as the fill levels are lifted. The filling and establishment of the Northern Bund will be staged. As areas of the bund are completed, they will be progressively stabilised.

The construction of the SRPs will also be staged in accordance with the filling operation. All controls will be installed in advance of the bund extending beyond the catchment of the previous control device.

The existing farm track will be used to gain access to the Northern Bund area. The existing access track will be widened to form a 12m wide haul road (referred to as the Northwest Haul Road). Two Decanting Earth Bunds (DEBs) will be installed to treat the upper sections of the haul road. The runoff from the lower section of haul road will be directed to SRP-1 (refer to ESCP-DQSB-02 below).

Topsoil will be stripped to form bunds on both sides of the haul road. The bunds will be seeded and mulched immediately upon completion. The bunds will prevent clean water from flowing towards the haul road and will direct all haul road runoff to a treatment device (DEB or SRP).

Establishment Works - Stage 1 [ESCP-DQSB-02, ESCP-DQSB-03, ESCP-DQSB-04, ESCP-DQSB-05 & ESCP-DQSB-06]

Phases 1 to 5 of Establishment Works – Stage 1, refer to Appendix B for phased ESC plans.

Cut material will be required to establish SRP-1 and the clean and dirty water diversions. The initial topsoil strip will be used to establish the cleanwater diversion bunds (CWB). The diversions will be seeded and mulched immediately upon completion. Note the CWB alignment is to be established to allow for the future phases through to the end of Stage 1.

Unsuitable material will be cut and taken to the designated overburden disposal site (initially the Northern Bund and later the temporary overburden stockpile) as required. Suitable material (engineering quality) will be used to establish SRP-1.

Upon completion of SRP-1, the dirty water diversion drains will be installed. Any remaining material will be removed.

The earthworks will then consist of a staged bench cut to reduce the levels of the area immediately to the north of SRP-1. The excavated material will be taken off site, either directly off site (sold as product), or taken to the new Northern Bund Disposal Area.

As the benches are excavated, completed bench cuts will be progressively stabilised, topsoiled, seeded and mulched.

Establishment Works - Stage 1 [ESCP-DQSB-07, ESCP-DQSB-08, ESCP-DQSB-09 & ESCP-DQSB-10]

Phases 6 to 9 of Establishment Works – Stage 1, refer to Appendix B for phased ESC plans.

As part of the works a new section of realigned stream channel is to be formed. The new section of realigned stream will be constructed offline. A specific stream channel bench will be formed (bench excavated to an extra width). On the designated bench the new stream channel will be formed. The upper benches above the stream channel bench will be completed and stabilised.

Once the new permanent stream diversion channel has been completed offline, the downstream end of the diversion channel will be extended to marry into the existing stream. Isolated silt fences will be used during the channel formation and stabilisation. The DEB will be removed. The works will be completed in the dry and are expected to take 2-4 days to complete. The channel will be formed, stabilised with geotextile, and erosion protection rock rip rap will be laid.

A new temporary culvert will then be installed to direct the temporary stream diversion into the new permanent channel. The culvert will be installed offline and made live upon completion.

The work requires the operations to be sequenced to set up and manage site construction water. SRP-1 will be removed, and site water will be directed to the Drury Quarry Pit where the water will be managed via the Drury Quarry Water Management treatment system (refer to Section 2.1). The works will be sequenced indicatively as follows:

Step 1

- Excavate the footprint of the future access road to a minimum level to allow fall from SRP-1 catchment area to drain to the Drury Quarry Pit. The excavation works will be undertaken to ensure all runoff falls back to the Drury Quarry Pit (box cut operation).
- Once the grade has been achieved, a diversion drain will be constructed along the edge of the haul road.

Step 2

- The site water will be directed to the Drury Quarry Pit for management and treatment. Once the runoff is diverted to the Drury Quarry Pit, SRP-1 will be decommissioned.

- A temporary culvert will be installed to divert the stream diversion to the new stream channel. The existing twin culverts will be removed, followed by the removal of SRP-1.
- The Stage 2 works area can now be expanded, and excavation works can continue. All site construction water will discharge to the Drury Quarry Pit.

Step 3

- The immediate area of the old stream channel below the farm access road, is now “dry” (offline with no catchment). The area will be mucked out and filled and a silt fence will be installed immediately upstream of the confluence of the channel and temporary stream diversion.

Step 4

- Once the access road has been constructed past the location of the old twin culverts, a new permanent culvert will be installed from the stream diversion channel to the new stream channel. The culvert will be installed offline. The culvert will be made live upon completion of installation.

Step 5

- The access road will be completed, and works will commence to excavate and form a quarry pit (Sutton Block Quarry Pit).

During these works all overburden material will be taken to the designated overburden disposal site. Should any quarry rock material be encountered, it will be taken to the Drury Quarry for processing. All site water will continue to be directed to the Drury Quarry Pit for management and treatment.

Establishment of the Temporary Overburden Stockpile – [ESCP-DQSB-OB-01]

At some stage throughout the enabling works, the Northern Bund will near completion. In advance of this, a temporary overburden stockpile will be established.

The overburden stockpile will be established in a staged manner as overburden is produced. The total area of the overburden stockpile footprint is approximately 7ha. A SRP will be installed to treat runoff from the construction and establishment of the stockpile area. The SRP will be sized for 5ha catchment. Perimeter bunds will be installed to direct site runoff to the SRP and to limit its catchment to no more than 5ha. No more than 5ha of this area will be open to erosion at any one time, and the works will be staged with progressive stabilisation to further minimise the open area to the greatest extent practicable at any given time.

The overburden area and batters will be progressively stabilised as the material is placed and the expected levels are achieved. The filling and establishment of the stockpile will be staged. As areas of the bund are completed, they will be progressively stabilised. The diversion bunding will be adjusted as required to ensure that the working 5ha is directed to the SRP and clean and stabilised areas are directed away from the SRP as clean water discharges.

Initially to gain access to the stockpile area, a track will be formed and stabilised down from the Northern Bund area.

2.5 Pit Development

Upon the completion of the enabling works, the initial quarry operations within the Sutton Block Quarry Pit footprint will commence. The expansion of the quarry pit will be incremental. The Sutton Block quarry pit will deepen and widen as the resource is extracted. Internal pit roads will be constructed as the pit expands. All site water will fall to the pit. From the pit, water will be either used for preliminary processing within the pit or pumped and managed in the same manner as the Drury Quarry Water Management and Processing system (refer to below).

Draft and indicative pit footprint drawings have been prepared to visualise the expansion of the pit over time. Refer to Appendix B, ESC drawings ESCP-DQSB-P-01 to ESCP-DQSB-P-05.

As the pit footprint expands cleanwater stream diversion channels will be constructed to ensure as far as practicable the objective of keeping cleanwater clean is achieved. Ultimately, the catchments will fall within the pit footprint. The indicative drawings referred to above indicate the approximate timing.

2.6 Sutton Quarry Pit Water Management

In the same manner as the existing Drury Quarry pit, the pit water will be pumped from the pit via a turbidity-controlled pump. Like the Drury Quarry pit water, the Sutton Quarry pit water is expected to be clean. The clean pit water will be pumped into Stream 4, within the section of the newly constructed stream diversion channel. Stream 4 drains down to the Lower Dam. If water being pumped exceeds the turbidity set limit, the pump turns off and ceases pumping. The current turbidity limit set on the Drury Quarry pit pump is 100NTU. The water is then retained in the pit until it meets the minimum set limit before pumping resumes.

If water needs to be removed from the pit and the water exceeds the set limit, this water will be pumped to the Drury water treatment system (lamella) for treatment before discharging off site via the cleanwater pond.

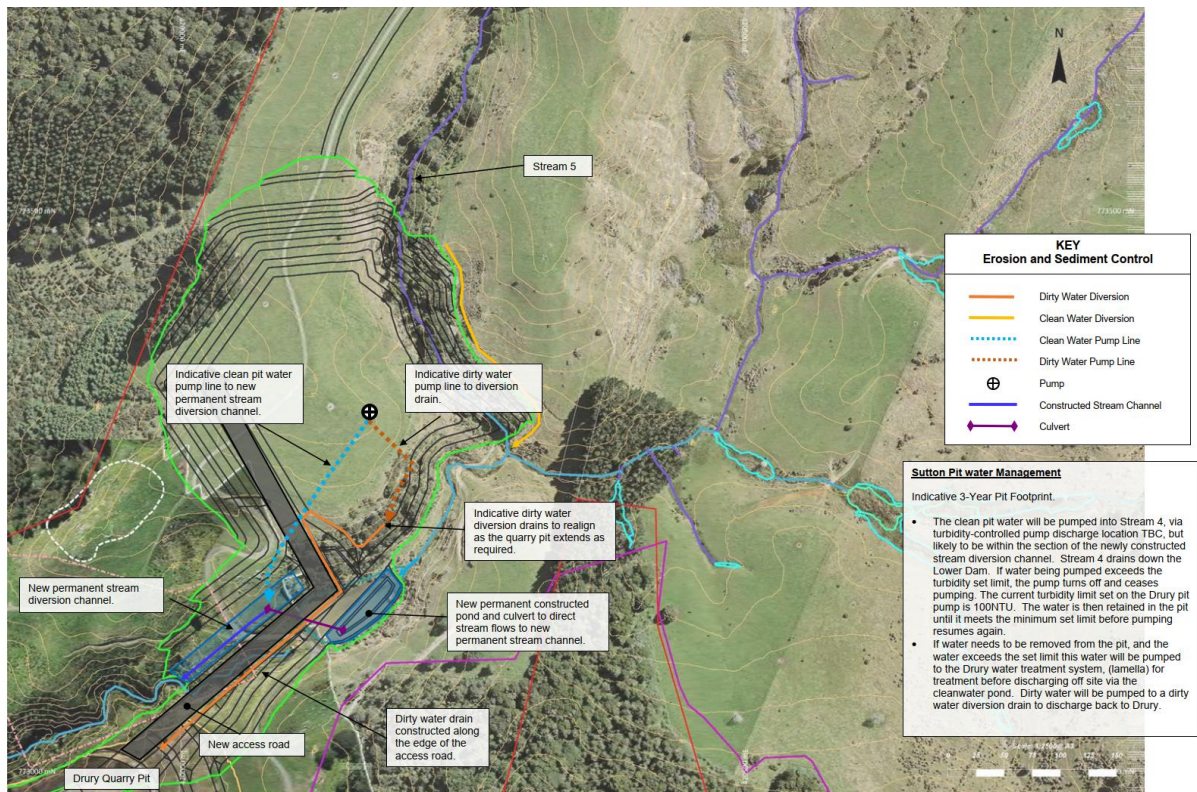


Figure 11: Sutton Pit Water Management System

3. EROSION AND SEDIMENT CONTROL PHILOSOPHY AND PROCESSES

3.1 Objectives

The Sutton Block enabling, and establishment works are expected to take approximately three years to complete and are considered “traditional” earthworks. Once the pit is established, the water management systems will operate in the same manner as the Drury Quarry, with cleanwater pumped directly to Stream 1 and any “dirty” water pumped via the existing Drury Quarry, with the possibility that the treatment system is eventually relocated to the Sutton Block in later years.

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 as outlined below:

- 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 for the enabling, and establishment works have been designed in accordance with the design principles of GD05, as a minimum.

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 aggregate. It is expected that any updated ESCPs will be prepared and submitted to Auckland Council for certification in advance of any changes being made on site.

A set of ESC drawings with sizing specific to the enabling works and staged stream channel diversions are provided in Appendix B Indicative Pit Plans for information. Actual staging and timing of the pit development will be determined by the overall quarry management and demand for aggregate. The controls and methodologies have been designed to meet the site requirements and to meet the design philosophy of GD05.

The ESC design and methodology for the establishment works is based around full compliance with GD05. Once the pit operations commence, upper catchment cleanwater water will be directed around the pit while all site water will discharge to the pit floor to be integrated into the Drury Quarry Pit water management system. GD05 provides for a “best management practice” approach to ESC for land disturbing activities developed by Auckland Council for the Auckland Region. The Drury Quarry Pit water management system

(refer to sections above) provides additional control of water discharges over that achievable by an SRP. While best-practice GD05 devices such as SRPs are flow-through devices that pass water through during and immediately after rainfall, the Quarry water management system provides mechanical control of when water is pumped from the pit, and then further mechanical control of the discharge from the treatment plant for any “dirty” water. So, in that way, the system is independent of weather systems in terms of when water is discharged and the quality of the discharge.

The expansion of the pit will be staged, and existing vegetation will be retained wherever possible.

Sizing and design information for the ESC measures are included in Appendix C. 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 have been 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 establishment works and quarrying operations whilst progressively stabilising exposed areas following completion as far as practicable.
- Divert clean water runoff away from the active quarry works area, 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 the quarry pit floor) 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 Staging

As stated above, the quarry operations will be slowly expanded in a series of stages following an initial site establishment works phase. This will manage the exposed area of the active quarry operations.

3.5 Review

The ESCP is a live document and will be revised / confirmed prior to the 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, Auckland 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 an updated version number and dated. 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 Auckland Council for review and certification at least 10 days before becoming operational.

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 GD05. Note, the Sutton Block enabling and establishment works are expected to take approximately three years to complete and are considered general earthworks that will be treated via GD05 principles and controls.

Once the pit is established, runoff will be controlled via the quarry pit and the quarry water management system (refer above).

Specific erosion and sediment control drawings are attached as Appendix B. Sizing and design details are provided in Appendix C.

4.1 Clean Water Diversions

Clean water diversions will be constructed to divert upper catchment clean water away from the area of works.

This includes the initial cleanwater diversion bunds to divert cleanwater away from the establishment earthwork areas, temporary and permanent cleanwater stream diversion channels to divert the catchment stream flows firstly around the new proposed Sutton Access Haul Road and then as the pit expands over time temporary bunds and diversions will be constructed to ensure as far as practicable the objective of keeping cleanwater clean is achieved. Ultimately, the catchments will fall within the pit footprint.

The clean water diversion bunds (for the earthworks) will likely be constructed using stripped topsoil and will be stabilised immediately following construction. 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 operations progress.

The temporary and permanent cleanwater stream diversion channels will be constructed channel drains. The specific cleanwater stream diversion channels have been sized specifically and are shown in Appendix B.

The maximum contributing cleanwater catchment area above the Stage 1 establishment works is approximately 2ha. To comply with GD05 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 (see Figure 12). Calculations are provided in Table 1 below for the cleanwater diversion bunds.

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

Table 1: Clean water diversion bunds (standard earthworks) assuming maximum clean water area for the site.

Clean water diversions					
Rainfall depth (24hr 5% AEP)	Catchment Area (maximum)	Peak Flow (m ³ /s)	Slope (minimum)	Minimum Design Flow Depth	Design Flow Depth (including 300mm freeboard)
140mm	2ha	0.637	2%	250mm	550mm

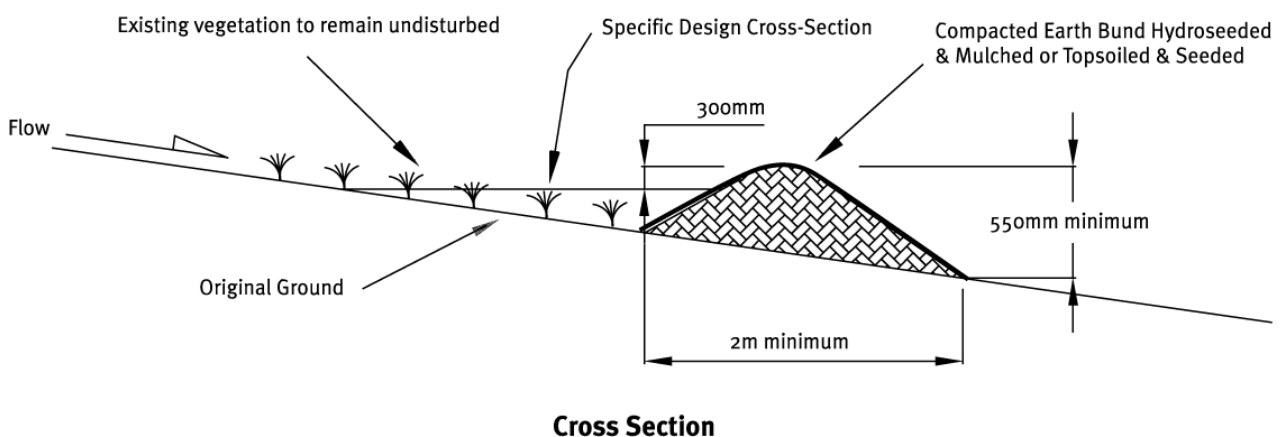


Figure 12: Cross-section of a clean water diversion bund.

4.2 Dirty Water Diversions

Dirty water diversions will generally only be required for the establishment works and for the haul roads. Once the quarry pit excavation commences, all quarry site water will fall into the quarry pit.

The maximum contributing catchment area for the dirty water diversions is <5ha for all SRP catchments. To comply with GD05 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 2 below.

Table 2: Dirty water diversion bunds assuming maximum dirty water area of 5ha.

Perimeter bunds (dirty water diversion)							
Rainfall depth (24hr 5% AEP)	Catchment Area (maximum)	Peak Flow (m ³ /s)	Base Width	Slope (minimum)	Minimum Design Depth	Design flow depth (including 300mm freeboard)	
140mm	5ha	1.061	0.6m	2%	250mm	550mm	

The minimum bund height installed across the site will be 550mm (250mm plus 300mm freeboard), which is designed to convey the 5% Annual Exceedance Probability (AEP) storm (see Figure 13).

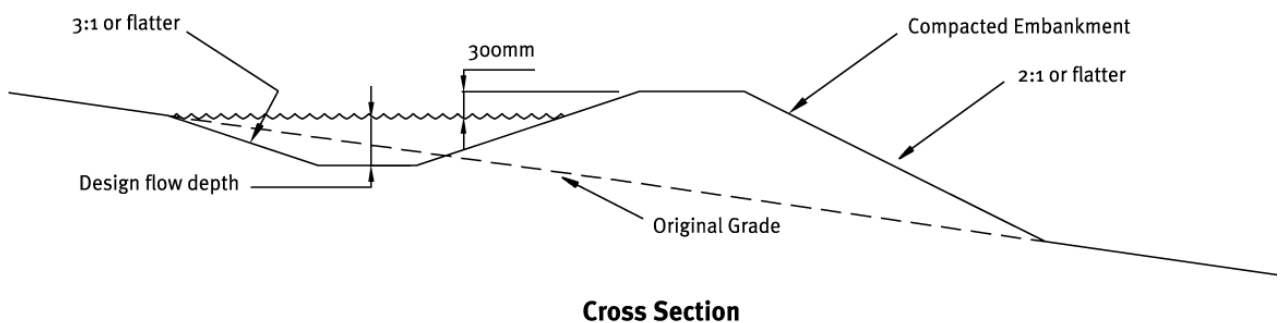


Figure 13: Cross-section of a dirty water diversion.

4.3 Sediment Retention Ponds

One SRP (SRP-1) will be constructed for the earthworks associated with the Enabling Works phase, the set-up of the Sutton Block Access Haul Road, and Permanent Stream Diversion Channel.

This SRP will be constructed within the footprint of the existing farm dam and will have a maximum contributing catchment area of approximately 4.1ha. SRP-1 will discharge to Stream 4 via an existing farm crossing culvert. SRP-1 will be used for the establishment works of Stage 1.

During Phases 8 and 9 of the Stage 1 establishment works, construction water will be directed to the Drury Quarry pit for water treatment via the Drury water management system.

Two SRPs are proposed for the management of the Northern Bund. The construction and management of the SRPs will be staged as the bund is developed.

One SRP is proposed for the management of the temporary overburden stockpile area, and another two SRPs are proposed during the construction of the Stream 2 stream diversion works in the future.

All SRPs have been sized and designed in accordance with GD05. Refer to Appendix C, Construction Details for the SRP sizing and dimensions.

4.4 Decanting Earth Bunds

Two Decanting Earth Bunds (DEBs) will be constructed to manage runoff from the Northwest Haul Road. Both DEBs will discharge to pasture. Another two DEBs will be installed during the Stage 1 enabling works phase. All DEBs have been sized and designed in accordance with GD05. Refer to Appendix C, Construction Details for the DEB sizing and dimensions.

It is noted that the DEB-NWH-2 contributing catchment is 5,250m², greater than the recommended catchment size in GD05. As the haul road is constructed it will be sheeted with aggregate and is therefore expected to have low sediment yield. This specific DEB will be installed with a forebay, and a geotextile lined level inlet. All DEBs will be chemically treated (refer to Section 4.5 below). In this instance, the use of the DEB as the treatment device is considered appropriate.

4.5 Chemical Treatment

The pit operation will discharge to the Drury Quarry pit and water management system. Cleanwater will be pumped off site via a turbidity-controlled pump. Any dirty will be treated via the lamella system (refer to section 2.1), before discharging off site.

In accordance with best practice, all SRPs and DEBs to be used in the enabling works will be chemically treated to enhance sediment retention efficiency. A Flocculation Management Plan (FMP) will be prepared and submitted to Council for certification prior to works commencing.

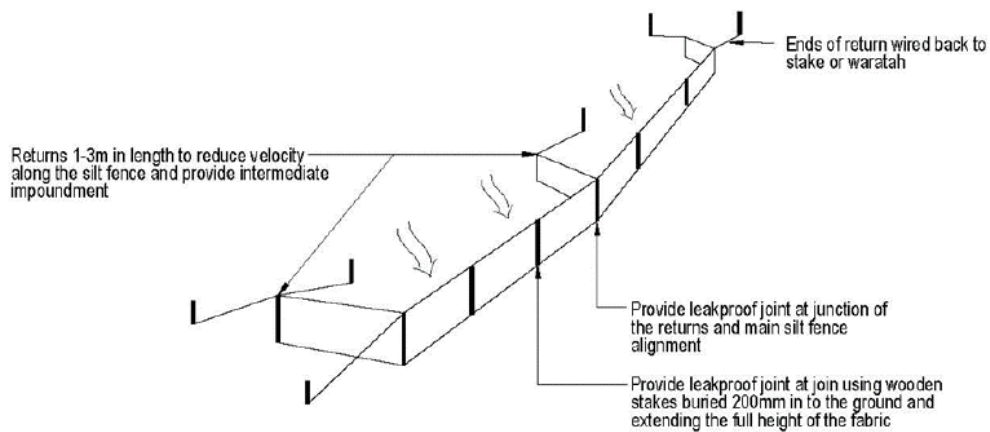
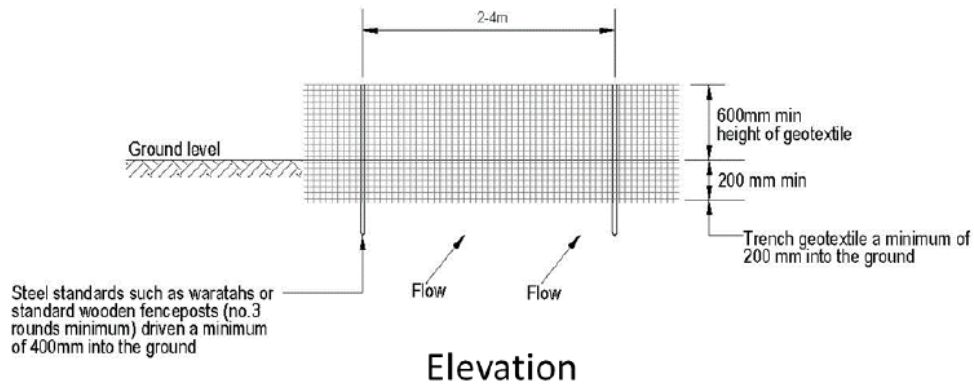
Chemically treated devices typically achieve, 85-90%+ sediment removal efficiency. The Stage 1 earthworks operation will be undertaken within less than 3 years and over a limited area. As the benches are cut and overburden removed, the exposure of rock will reduce the sediment generating potential of the works and therefore improve the sediment efficiency of all devices.

At the commencement and throughout the works, monitoring and bench testing of the SRP will be undertaken in accordance with the FMP. The bench testing will include testing and analysis of several chemical options and will include “organic flocculants” to determine the best water quality outcome.

4.6 Silt Fences

Silt fences will be used to treat site runoff from small areas that will not actively drain to a SRP or DEB and around specific isolated stream channel works.

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 14 provides a schematic of silt fences that may be used on the project.



Silt fence with returns and support wire

Figure 14: Schematic of a silt fence.

Table 3: 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 Auckland Council. The as-built certification will confirm that the controls have been constructed in accordance with the ESCP and GD05.

4.8 Stockpiles

Other than the Northern Bund Disposal Area and the temporary overburden stockpile, any stockpiling will be minor, temporary, and within the catchment devices of the SRPs or DEBs. These temporary stockpiles will be seeded and mulched on completion.

In general, any overburden material will be removed to the overburden sites, the Northern Bund Disposal Area or the temporary overburden stockpile.

Topsoil

Initially topsoil will be temporarily stockpiled within the catchment areas of the SRPs or DEBs 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 completed areas of the Northern Bund or removed off site.

4.9 Dust Management

Dust management will be managed in accordance with the Air Quality Assessment prepared by PDP (refer to Technical Report H attached to the AEE).

4.10 Stabilisation

Progressive stabilisation will be undertaken as earthwork areas are completed. Note, this excludes the quarrying operations that are operating and working in rock. As stated above, any stockpiles will be stabilised immediately upon completion. As the Northern Bund area is progressively constructed, topsoil will be re-spread, and the completed area stabilised with grass seed and hay mulch.

4.11 Winter Works

The quarry establishment/enabling activities are a continuous activity throughout the year. The establishment and management of the Northern Bund will need to align with the quarry establishment works. Once the pit operations commence all site construction water will drain to the pit and is then incorporated into the Drury Water Management System. As such, 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 GD05. 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, as soon as practically safe to do so.

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

The SRPs and DEBs 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.

Construction water from the quarry operations will be managed via computer-controlled pumping systems set on a turbidity-controlled pump. The majority of the water will be clean and pumped directly off site. Any “dirty” water will be directed to the existing Drury Quarry. From there the water is used in the Quarry Water Management and Processing System (refer to Section 2.1 above).

5. ESTIMATED SEDIMENT YIELD

An estimate of sediment yield for the works that are to be treated via GD05 devices (the enabling works and the overburden stockpile) has been developed using the Universal Soil Loss Equation (USLE). The table of results of these estimates are provided in Appendix A and discussed in Section 7 below. In brief:

- The USLE estimates are based on conservative assumptions.
 - The open areas are taken as maximums. It is likely that they can be staged down to smaller areas at any given time.
 - The length-slope ratio is based on assumed slope lengths that exceed the likely cut bench spacing, and do not take account of the low gradients of the benches.
 - The assumed soil does not take account of the exposure of less erodible regolith and rock that will occur as the cuts progress.
- The existing upstream catchment load (including the site) is estimated to be 90ha.
- The 2ha open during year 1 of the enabling works is estimated to result in up to 4.3 tonnes of sediment, representing a 1.2% increase in the load derived from the existing catchment.
- For years 2 and 3 of the enabling works, the up to 3.4ha earthworks area is estimated to generate 6.7 tonnes per year, representing a 1.9% increase in the load derived from the existing catchment each year.
- After year three, the majority of this area will be diverted to the new quarry pit and then the turbidity-controlled pumping of cleanwater and the Quarry water treatment plant for site dirty water.
- The overburden stockpile is assumed to have an average open area of 4ha. This may be managed in a manner to reduce open area.
- The overburden stockpile is estimated to generate 3.4 tonnes per year, representing a 1.6% increase in the load derived from the existing catchment each year.
- The Northern Bund will be established in a staged and progressive manner as overburden is produced. The total area of the Northern Bund is approximately 4ha. Two Sediment Retention Ponds (SRPs) will be installed to treat runoff from the construction of the bund. The SRP's discharge to pasture prior to discharging to bush to catchment north of the quarry. The overburden bund batters will be progressively stabilised as the fill levels are lifted. The filling and establishment of the Northern Bund will be staged. As areas of the bund are completed, they will be progressively stabilised. A USLE based on an open area of 2ha is estimated to generate approximately 2.8 tonnes per year.

6. STATUTORY CONSIDERATIONS

6.1 National Policy Statement for Freshwater Management

The National Policy Statement for Freshwater Management 2020 (NPSFM) contains an objective and 15 policies relating to the management of water quality and quantity, and any activities that may impact on those attributes, within the concept of Te Mana o te Wai, being:

the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri of the wai. Te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community.

Objective 2.1(1) states:

(1) The objective of this National Policy Statement is to ensure that natural and physical resources are managed in a way that prioritises:

(a) first, the health and well-being of water bodies and freshwater ecosystems

(b) second, the health needs of people (such as drinking water)

(c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

These provisions have been taken into account in the preparation of this ESCP. The adoption of the measures detailed in the ESCP are anticipated to manage and mitigate sediment loading downstream to achieve a level of water quality management that I consider will be consistent with the objectives and policy direction of the NPSFM and in accordance with Te Mana o te Wai.

6.2 Auckland Unitary Plan: Operative in Part

Chapter B7 (Natural Resources) of the Regional Policy Statement is relevant. B7.3 seek to ensure the enhancement of degraded freshwater systems, freshwater system loss is minimised, and that any adverse effects are avoided, remedied, or mitigated. B7.4 seeks to maintain water quality in freshwater bodies and coastal waters which have good water quality, and to enhance the water quality in degraded systems.

Chapter E3 (Lakes, rivers, streams, and wetlands) of the AUP: OP provides regional plan provisions that are of most relevance to this proposal. Those provisions are Objectives E3.2 (1) to (5) and (7) and Policies E3.3 (2), (3), (7) and (8). These objectives and policies seek to ensure that activities in, on, under or over the bed of a lake, river, stream, and wetland are managed to minimise adverse effects on the lake, river, stream, or wetland.

Chapter E11 (Land Disturbance – Regional) of the AUP: OP provides the regional plan provisions directly relevant to earthworks. Those provisions are Objectives E11.2 (1)-(3) and Policies E11.3 (1)-(7).

Rule E11.8.2(1) provides the assessment criteria for consideration of the regional earthwork's activities. These are:

(a) whether applicable standards are complied with;

(b) the proximity of the earthworks to any water body and the extent to which erosion and sediment controls and the proposed construction methodology will adequately avoid or minimise adverse effects on: E11 Land disturbance – Regional Auckland Unitary Plan Operative in part 19

(i) water quality including of the coastal marine area;

(ii) ecological health including of the coastal marine area;

(iii) riparian margins;

(iv) the mauri of water; and

(v) the quality of taiāpure or mahinga mātaītai.

- (c) the extent to which the earthworks minimises soil compaction, other than where it benefits geotechnical or structural performance;*
- (d) the proximity of the earthworks to areas of significant ecological value and the extent the design, location and execution of the works provide for the maintenance and protection of these areas;*
- (e) whether monitoring the volume and concentration of sediment that may be discharged by the activity is appropriate within the scale of the proposed land disturbance; and*
- (f) whether the extent or impacts of adverse effects from the land disturbance can be mitigated by managing the duration, season or staging of such works.*
- (g) the extent to which appropriate methods are used to prevent the spread of total control pest plants or unwanted organisms (as listed under the Biosecurity Act 1993), such as kauri dieback disease.*

7. ASSESSMENT OF EFFECTS

The assessment of sediment yield from a large-scale project is uncertain and based on multiple assumptions. Any changes to an assumption can drastically alter the estimated yields.

In the specific case of the Sutton Block, only the first 3 years, Stage 1 Establishment Works phase is considered “traditional” earthworks and will utilise “traditional” GD05 erosion and sediment control. This establishment phase covers a relatively small area over a short timeframe in the context of the Quarry life.

Once the Sutton Block pit is formed, the controlled water management system takes over as the water management and treatment process for the site.

Other variables may include that the Sutton Block catchment drains to the Drury Quarry lower dam, before discharging off site. The lower dams will provide further treatment before discharging from the Drury site and to the wider receiving environment.

As described in previous sections, the proposed ESC approach is based on minimising the area exposed to erosion at any given time, implementing best-practice ESC measures, and diverting as much of the works site as possible to the Quarry water treatment system as the enabling works are completed.

The estimate of sediment yield indicates that the enabling works may result in a 1.2% to 1.9% increase in sediment yield from the catchment at the downstream extent of the works site during the establishment stage. Likewise, the operation of the overburden stockpile may result in a 1.6% increase in sediment yield, estimated at that same downstream point.

As noted, the assumptions underlying the estimates are deliberately conservative i.e., the characteristics of the works site and further staging and reduction of open areas are likely to result in lower estimated and actual sediment yields. Similarly, it is important to note that the USLE estimates are not directly representative of actual sediment yield (loads). They provide a means of comparative analysis, and also assist the refinement of ESCPs to minimise likely sediment yield to the greatest extent practicable.

It is also noted that the discharge from the sediment retention devices servicing the enabling works is proposed to flow via an existing section of stream to the online pond from which the existing quarry operation takes water. That pond will provide some additional retention of sediment, albeit that is not relied on in this assessment as the assessment considers impacts on the upstream reach. Nonetheless, the pond will further reduce the likely sediment to downstream reaches, the Hingaia Stream, and Pahurehure Inlet coastal receiving environment.

The proposed ESC methodology is the best practicable option for the proposal. It represents best-practice

control measures, staged establishment, 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 Auckland Region.

The establishment phase earthworks will take approximately three years to complete. 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.

The quarry operation captures all site water within the pit. Excess water is pumped off site via a turbidity set controlled pump ensuring any water discharging off site is quality controlled. Dirty water will be pumped to the Drury Quarry water management and processing system for treatment. During the removal of the Northern Bund during the later stages of the quarry life, the works will be managed to ensure that all runoff from the operation falls into the quarry pit and is managed via the Drury Quarry water management and processing system.

My proposed approach to ESC as described in this report, and my assessment of potential effects therein, is provided as a technical expert. To the extent that my understanding of the life supporting capacity of receiving waters and habitats overlaps with mauri, wairua and other concepts of significance to Mana Whenua, I am satisfied that the proposed approach to ESC management will minimise potential sediment effects. On that basis, the potential discharge of treated sediment laden water during the earthworks, streamworks and subsequent quarrying has taken account of the relevant assessment criteria and would in my opinion, on a technical basis, be consistent with relevant policies including those that direct our consideration to matters of significance to Mana Whenua.

Overall, within the scope of my technical assessment, I consider the proposal to be consistent with the relevant provisions of the AUP: OP. The more detailed planning assessment is provided in the AEE.

On this basis, the ESC measures proposed for the establishment works and quarrying activity and predicted sediment discharges are anticipated to be consistent with the relevant statutory provisions and contribute to the outcomes they seek to achieve with respect to water quality and downstream environments.

8. SUMMARY

This ESCAR and ESCP addresses the proposed ESC measures associated with the earthworks and quarrying activities proposed to be undertaken on site for the project referred to as the Sutton Block Extension at the existing Drury Quarry site located at 475 Quarry Road, Drury.

The quarrying activities are estimated to continue for approximately up to 50 years with a proposed consented term of 30 years.

The works will be carried out in accordance with this ESCP, the principles of GD05 and the relevant conditions of consent. The methodology proposed should ensure that any potential adverse effects of the construction of the project are appropriately managed and minimised.

9. APPENDICES

Appendix A – Summary of USLE Results

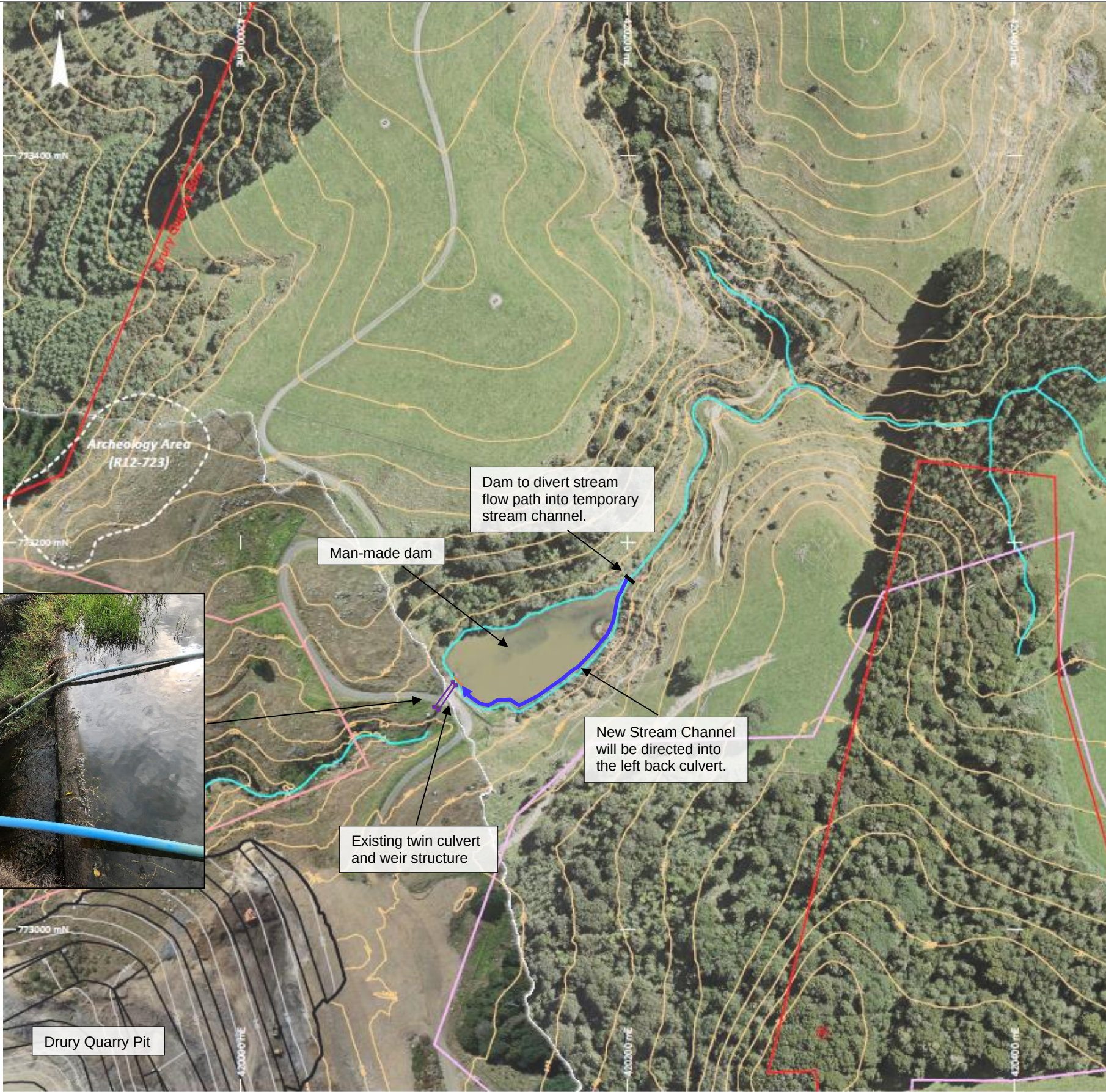
Appendix B - Erosion and Sediment Control Drawings

Erosion and Sediment Control Drawing Schedule

Title	Drawing No.	Sheet No.	Revision	Date
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Enabling Works	ESCP-DQSB-01	1	D	14.12.23
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 1: Phase 1	ESCP-DQSB-02	2	D	14.12.23
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 1: Phase 2	ESCP-DQSB-03	3	D	14.12.23
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 1: Phase 3	ESCP-DQSB-04	4	D	14.12.23
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 1: Phase 4	ESCP-DQSB-05	5	D	14.12.23
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 1: Phase 5	ESCP-DQSB-06	6	D	14.12.23
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 1: Phase 6	ESCP-DQSB-07	7	D	14.12.23
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 1: Phase 7	ESCP-DQSB-08	8	E	12.02.24
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 1: Phase 8	ESCP-DQSB-09	9	E	12.02.24
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 1: Phase 9	ESCP-DQSB-10	10	E	12.02.24
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Northern Bund	ESCP-DQSB-NB-01	11	C	26.09.23
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – NW Haul Road	ESCP-DQSB-HR-01	12	B	26.09.23
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Overburden Stockpile Area	ESCP-DQSB-OB-01	13	B	14.12.23
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 1: Pit Plan 3-Year (Indicative)	ESCP-DQSB-P-01	14	C	12.02.24
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 2: Pit Plan 15-Year (Indicative)	ESCP-DQSB-P-02	15	C	12.02.24
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 3: Pit Plan 30-Year (Indicative)	ESCP-DQSB-P-03	16	C	12.02.24
Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 4: Pit Plan 40-Year (Indicative)	ESCP-DQSB-P-04	17	E	17.10.24

Erosion and Sediment Control Drawing Schedule

Drury Quarry – Sutton Block Erosion and Sediment Control Plan – Stage 5: Pit Plan Final	ESCP-DQSB-P-05	18	A	17.10.24
Drury Quarry – Sutton Block - Pit Plan 3-Year (Indicative) – Sutton Pit Water Management	ESCP-Sutton Blk-H20	19	C	17.10.24

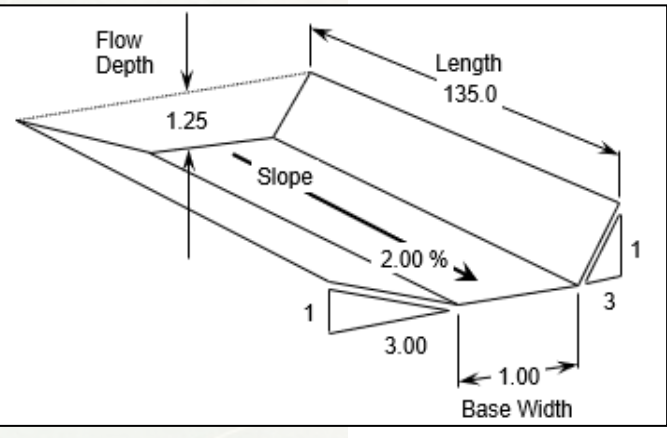


Construction Methodology:

Enabling works to allow for the establishment of SRP-1.

1. Removal of the weir to allow the stream to flow to re-establish its flow path along its original alignment. This will allow the dam to begin to dry up for approximately 2 months before earthworks commence.
2. To be constructed offline, a new temporary stream channel will be established around the outside (left bank) of the dam footprint and will discharge into the left back culvert at the road crossing.
3. Once the new temporary stream channel has been constructed and stabilised, the construction of the dam upstream of the current lake footprint will allow water to flow into the new stream channel. Stabilised temporary dams and over-pumping will be set up to construct this dam.
4. Mucking out of the old lake/dam will occur once the stream has been diverted to the new stream channel.
5. An SRP (refer to ESCP-DQSB-02) will be built within the dam footprint and will discharge into the right back culvert. The SRP will be constructed to service the largest catchment area across all stages in this area.

New Stream Channel cross-section



**KEY
Erosion and Sediment Control**

- Dirty Water Diversion
- Clean Water Diversion
- Silt Fence
- Sediment Retention Pond
- Decanting Earth Bund (DEB)
- Constructed Stream Channel
- Culvert

NOTES

1. All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
2. Earthworks are to be programmed to ensure rapid stabilisation.
3. All erosion and sediment control measures will be inspected on a daily basis by the site foreman.
4. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

REV	DATE	REVISION DETAILS	APPROVED
A	19.05.22	Draft for review.	
B	29.06.22	Consent issue.	
C	20.09.23	Review for consent issue	
D	14.12.23	Update of Naming and Phasing Protocols	



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Checked
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Project

DRURY QUARRY – SUTTON BLOCK

Title

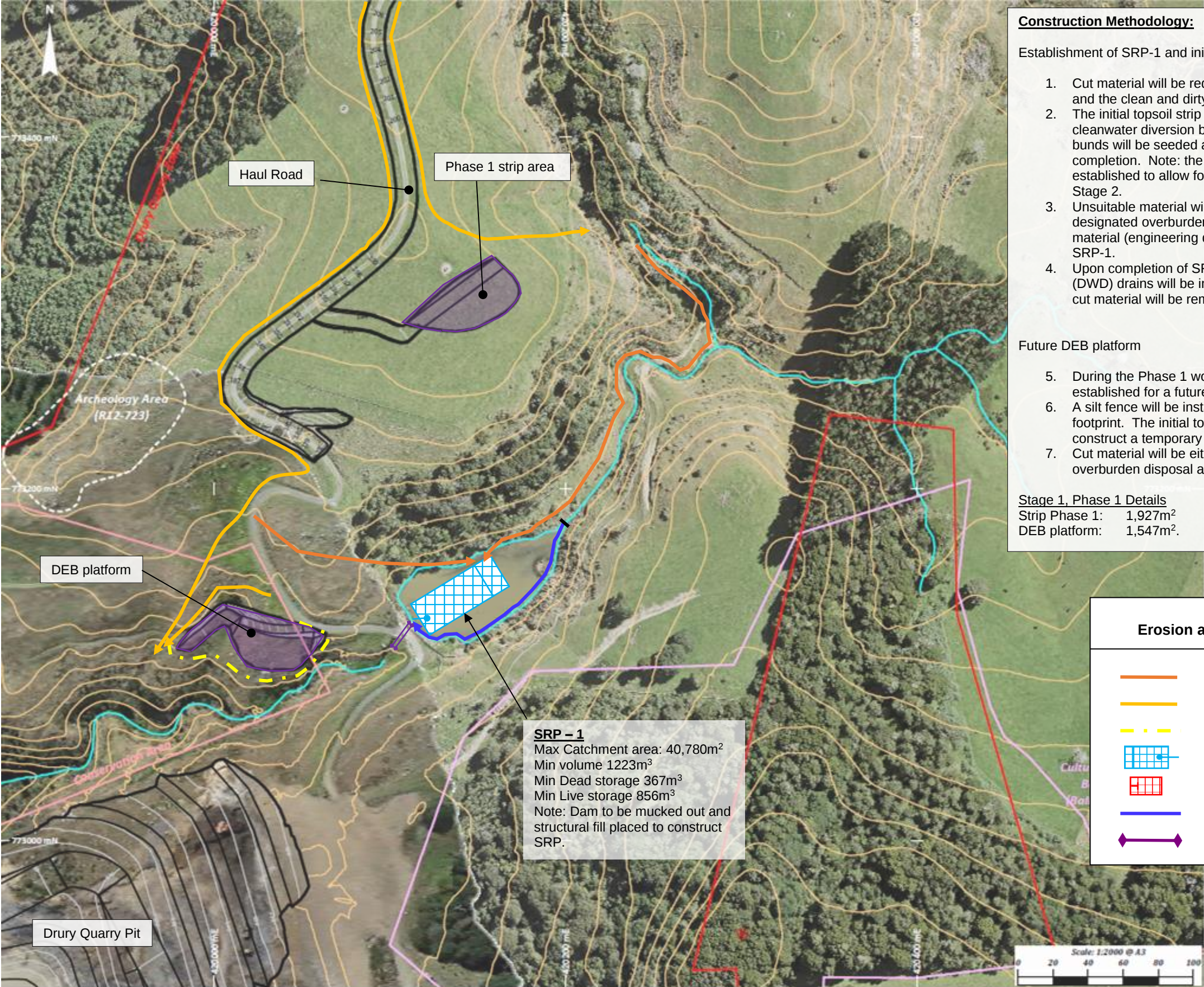
Erosion and Sediment Control Plan –
Stage 1: Enabling Works

Drawing No.

ESCP-DQSB-01

Sheet No.

1



Construction Methodology:

Establishment of SRP-1 and initial strip.

1. Cut material will be required to establish the SRP-1 and the clean and dirty water diversions.
2. The initial topsoil strip will be used to establish the cleanwater diversion bunds (CWB). The diversion bunds will be seeded and mulched immediately upon completion. Note: the CWB alignment is to be established to allow for the future phases through to Stage 2.
3. Unsuitable material will be cut and taken to the designated overburden disposal site. Suitable material (engineering quality) will be used to establish SRP-1.
4. Upon completion of SRP-1, the dirty water diversion (DWD) drains will be installed. Any remaining cut material will be removed from Phase 1.

Future DEB platform

5. During the Phase 1 works, a platform will also be established for a future DEB.
6. A silt fence will be installed below the platform footprint. The initial topsoil strip will be used to construct a temporary CWB.
7. Cut material will be either taken to the designated overburden disposal area or used to construct SRP-1.

Stage 1, Phase 1 Details

Strip Phase 1: 1,927m²
DEB platform: 1,547m².

**KEY
Erosion and Sediment Control**

- Dirty Water Diversion
- Clean Water Diversion
- Silt Fence
- Sediment Retention Pond
- Decanting Earth Bund (DEB)
- Constructed Stream Channel
- Culvert

SRP - 1
Max Catchment area: 40,780m²
Min volume 1223m³
Min Dead storage 367m³
Min Live storage 856m³
Note: Dam to be mucked out and structural fill placed to construct SRP.

NOTES

1. All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
2. Earthworks are to be programmed to ensure rapid stabilisation.
3. All erosion and sediment control measures will be inspected on a daily basis by the site foreman.
4. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

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A	05.05.22	Draft for review.	
B	28.06.22	Haul Road added	
C	20.09.23	Review for consent issue	
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Project

DRURY QUARRY – SUTTON BLOCK

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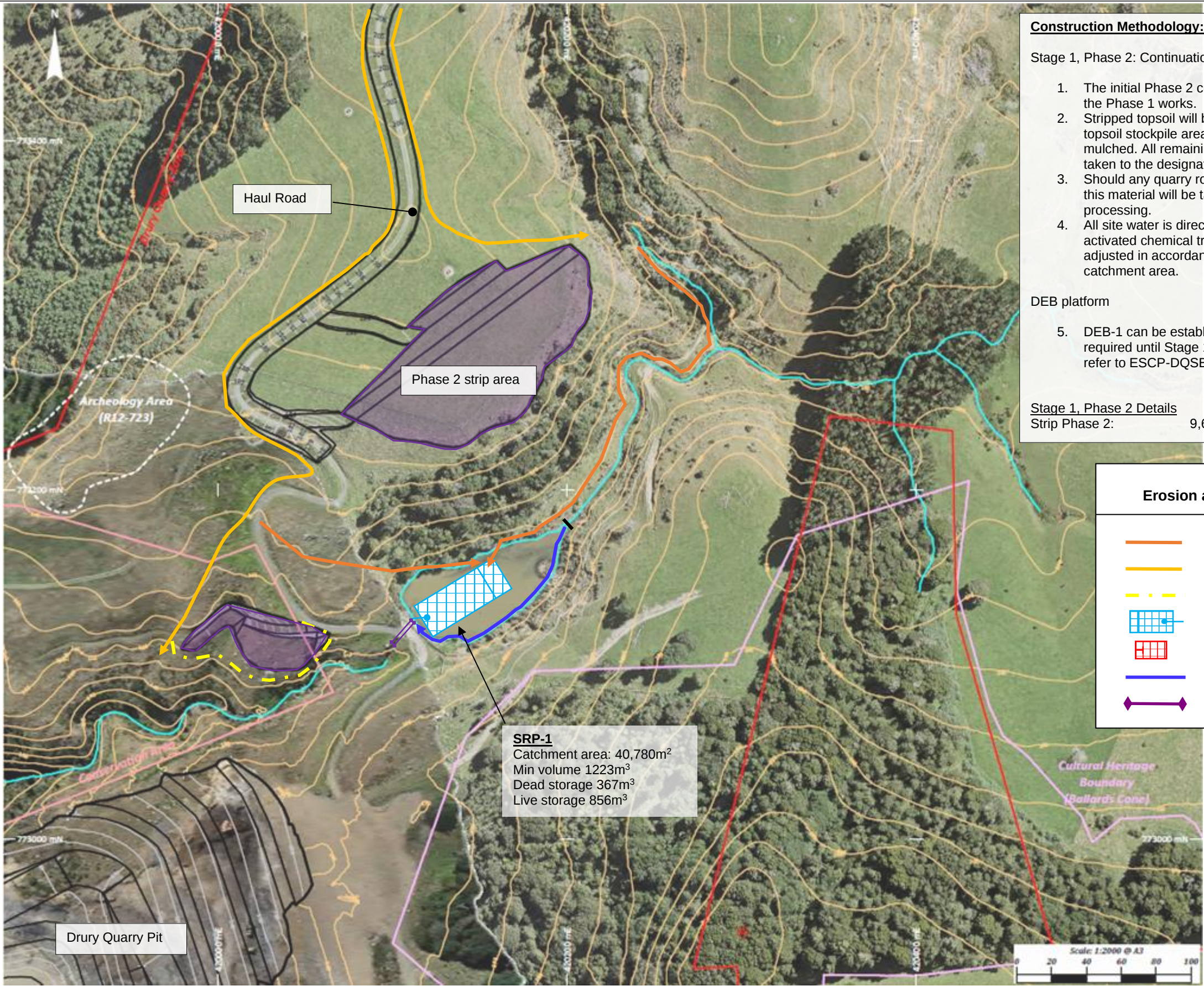
Erosion and Sediment Control Plan
Stage 1: Phase 1

Drawing No.

ESCP-DQSB-02

Sheet No.

2



Construction Methodology:

Stage 1, Phase 2: Continuation of staged cut.

1. The initial Phase 2 cut will be extended as part of the Phase 1 works.
2. Stripped topsoil will be taken to the designated topsoil stockpile area and will be seeded and mulched. All remaining overburden material will be taken to the designated overburden disposal site.
3. Should any quarry rock material be encountered, this material will be taken to the Drury Quarry for processing.
4. All site water is directed to SRP-1. Note: rainfall activated chemical treatment shed tray size to be adjusted in accordance with CTMP and contributing catchment area.

DEB platform

5. DEB-1 can be established at any time. It will not be required until Stage 1 Phase 5. For sizing details refer to ESCP-DQSB-06.

Stage 1, Phase 2 Details

Strip Phase 2: 9,623m²

**KEY
Erosion and Sediment Control**

- Dirty Water Diversion
- Clean Water Diversion
- Silt Fence
- Sediment Retention Pond
- Decanting Earth Bund (DEB)
- Constructed Stream Channel
- Culvert

NOTES

1. All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
2. Earthworks are to be programmed to ensure rapid stabilisation.
3. All erosion and sediment control measures will be inspected on a daily basis by the site foreman.
4. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

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D	14.12.23	Update of Naming and Phasing Protocols	



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Project

DRURY QUARRY – SUTTON BLOCK

Title

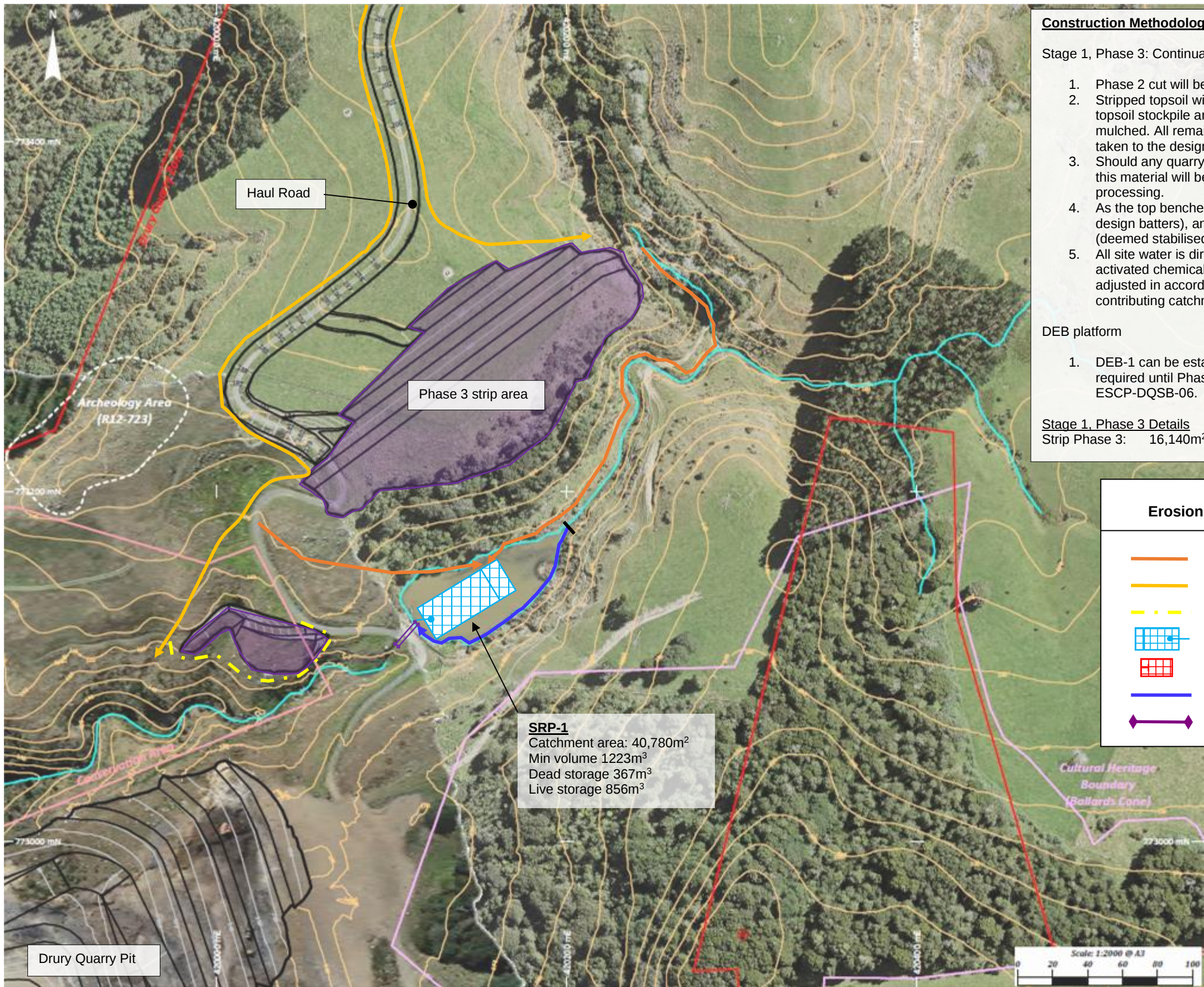
Erosion and Sediment Control Plan –
Stage 1: Phase 2

Drawing No.

ESCP-DQSB-03

Sheet No.

3



Construction Methodology:

Stage 1, Phase 3: Continuation of staged cut.

1. Phase 2 cut will be extended.
2. Stripped topsoil will be taken to the designated topsoil stockpile area and will be seeded and mulched. All remaining overburden material will be taken to the designated overburden disposal site.
3. Should any quarry rock material be encountered, this material will be taken to the Drury Quarry for processing.
4. As the top benches are completed (trimmed to design batters), any batters that are not rock (deemed stabilised) will be hydroseeded.
5. All site water is directed to SRP-1. Note: rainfall activated chemical treatment shed roof tray to be adjusted in accordance with CTMP and the contributing catchment area.

DEB platform

1. DEB-1 can be established at any time. It will not be required until Phase 5. For sizing details refer to ESCP-DQSB-06.

Stage 1, Phase 3 Details
Strip Phase 3: 16,140m²

**KEY
Erosion and Sediment Control**

- Dirty Water Diversion
- Clean Water Diversion
- Silt Fence
- Sediment Retention Pond
- Decanting Earth Bund (DEB)
- Constructed Stream Channel
- Culvert

SRP-1
Catchment area: 40,780m²
Min volume 1223m³
Dead storage 367m³
Live storage 856m³

NOTES

1. All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
2. Earthworks are to be programmed to ensure rapid stabilisation.
3. All erosion and sediment control measures will be inspected on a daily basis by the site foreman.
4. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

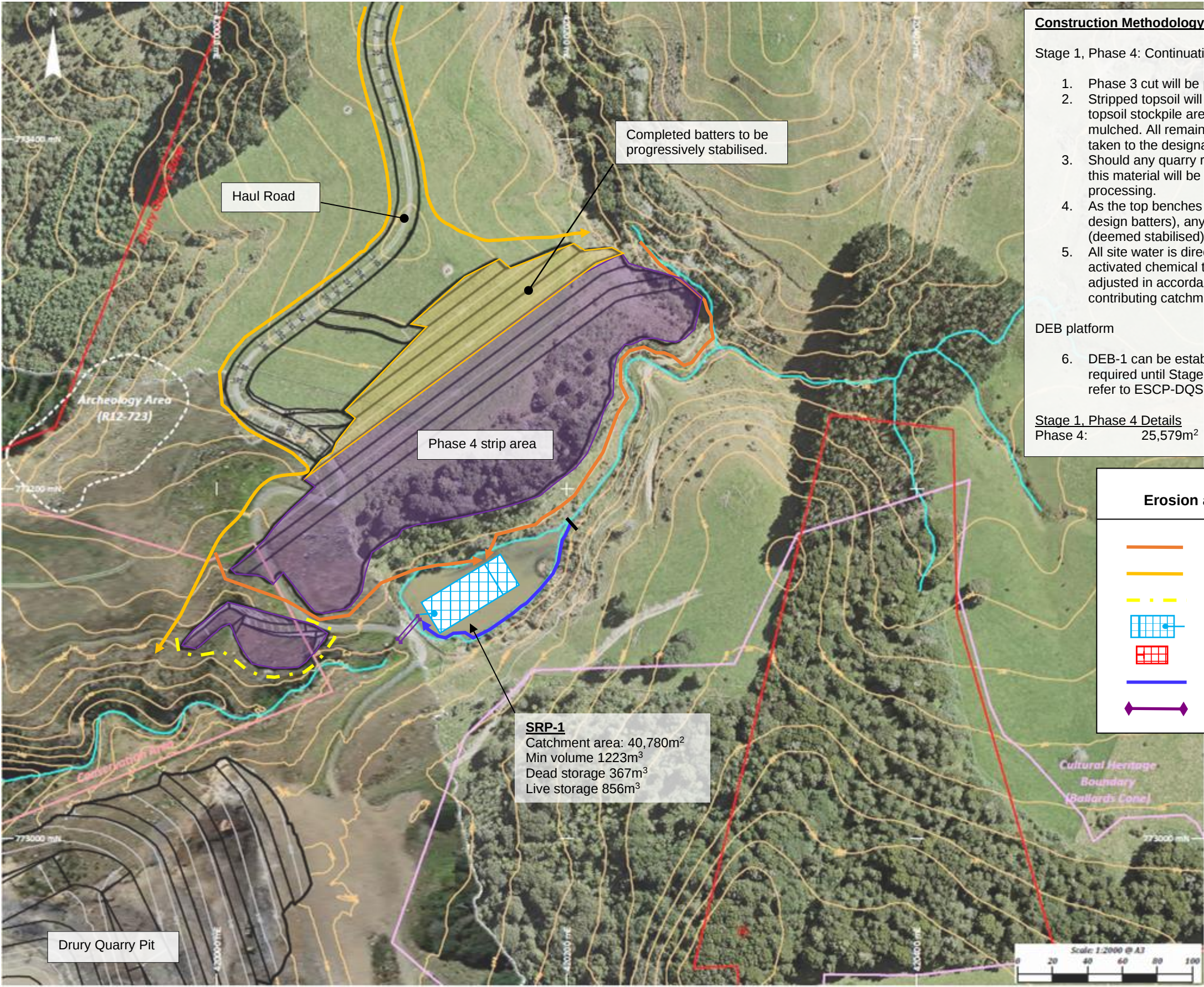
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C	20.09.23	Review for consent issue	
D	14.12.23	Update of Naming and Phasing Protocols	



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Project	DRURY QUARRY – SUTTON BLOCK
Title	Erosion and Sediment Control Plan – Stage 1: Phase 3
Drawing No.	ESCP-DQSB-04
Sheet No.	4



Construction Methodology:

Stage 1, Phase 4: Continuation of staged cut.

1. Phase 3 cut will be progressively extended.
2. Stripped topsoil will be taken to the designated topsoil stockpile area and will be seeded and mulched. All remaining overburden material will be taken to the designated overburden disposal site.
3. Should any quarry rock material be encountered, this material will be taken to the Drury Quarry for processing.
4. As the top benches are completed (trimmed to design batters), any batters that are not rock (deemed stabilised) will be hydroseeded.
5. All site water is directed to SRP-1. Note: rainfall activated chemical treatment shed roof tray to be adjusted in accordance with CTMP and the contributing catchment area.

DEB platform

6. DEB-1 can be established at any time. It will not be required until Stage 1, Phase 5. For sizing details refer to ESCP-DQSB-06.

Stage 1, Phase 4 Details
Phase 4: 25,579m²

KEY
Erosion and Sediment Control

- Dirty Water Diversion
- Clean Water Diversion
- Silt Fence
- Sediment Retention Pond
- Decanting Earth Bund (DEB)
- Constructed Stream Channel
- Culvert

NOTES

1. All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
2. Earthworks are to be programmed to ensure rapid stabilisation.
3. All erosion and sediment control measures will be inspected on a daily basis by the site foreman.
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D	14.12.23	Update of Naming and Phasing Protocols	



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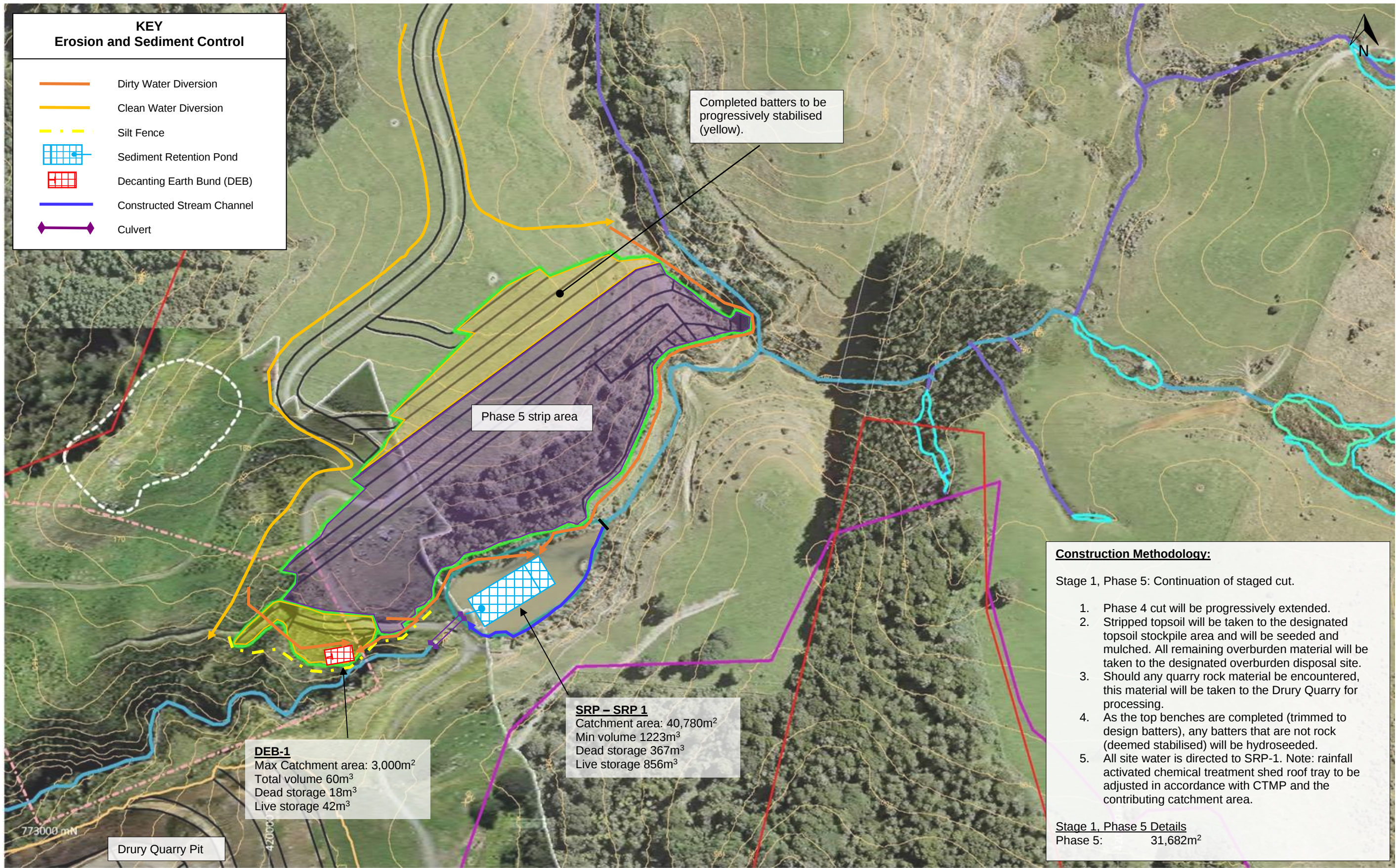
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Project
DRURY QUARRY – SUTTON BLOCK

Title
Erosion and Sediment Control Plan – Stage 1: Phase 4

Drawing No.
ESCP-DQSB-05

Sheet No.
5



Construction Methodology:

Stage 1, Phase 5: Continuation of staged cut.

1. Phase 4 cut will be progressively extended.
2. Stripped topsoil will be taken to the designated topsoil stockpile area and will be seeded and mulched. All remaining overburden material will be taken to the designated overburden disposal site.
3. Should any quarry rock material be encountered, this material will be taken to the Drury Quarry for processing.
4. As the top benches are completed (trimmed to design batters), any batters that are not rock (deemed stabilised) will be hydroseeded.
5. All site water is directed to SRP-1. Note: rainfall activated chemical treatment shed roof tray to be adjusted in accordance with CTMP and the contributing catchment area.

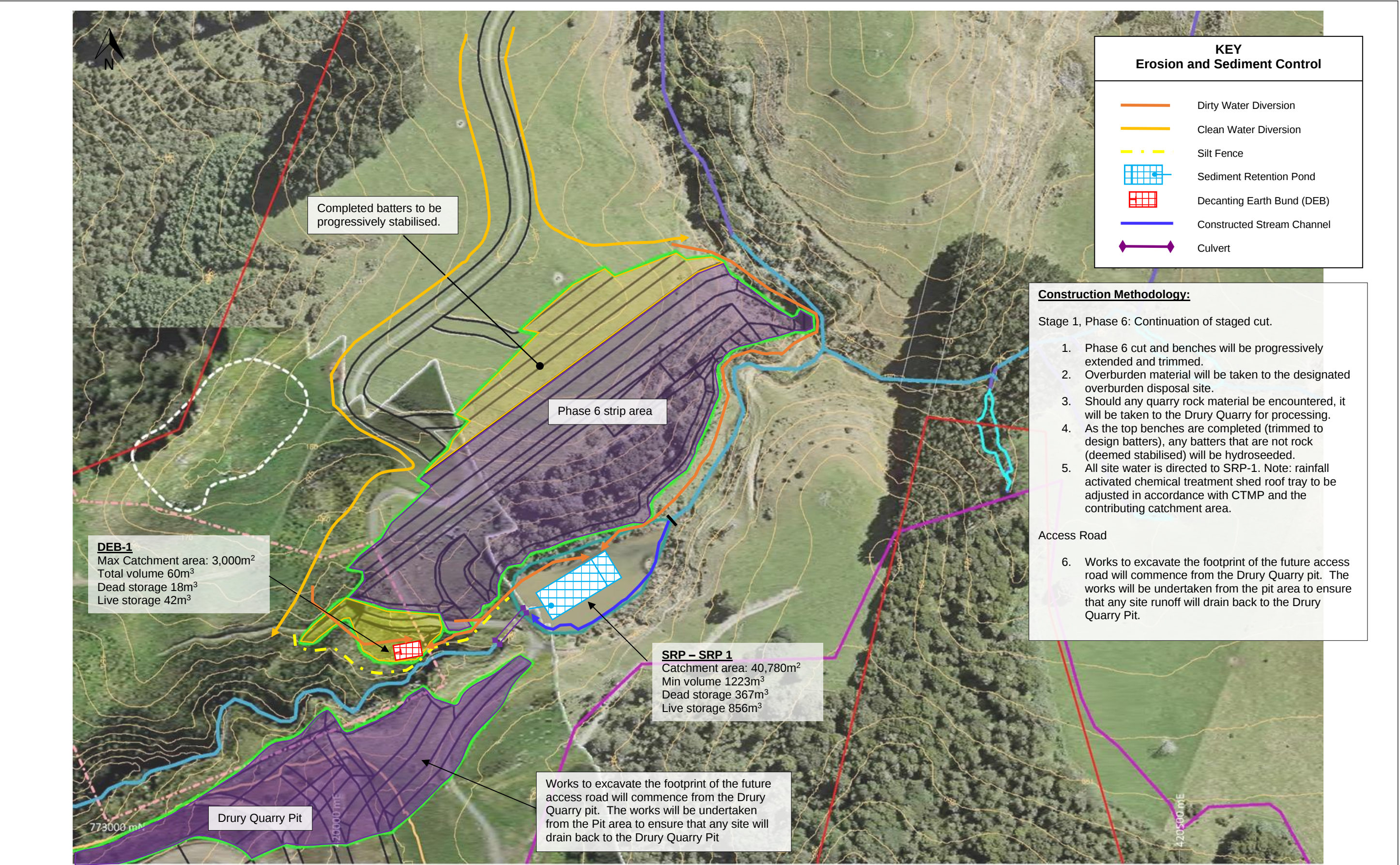
Stage 1, Phase 5 Details
Phase 5: 31,682m²

- NOTES**
1. All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
 2. Earthworks are to be programmed to ensure rapid stabilisation.
 3. All erosion and sediment control measures will be inspected on a daily basis by the site foreman.
 4. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

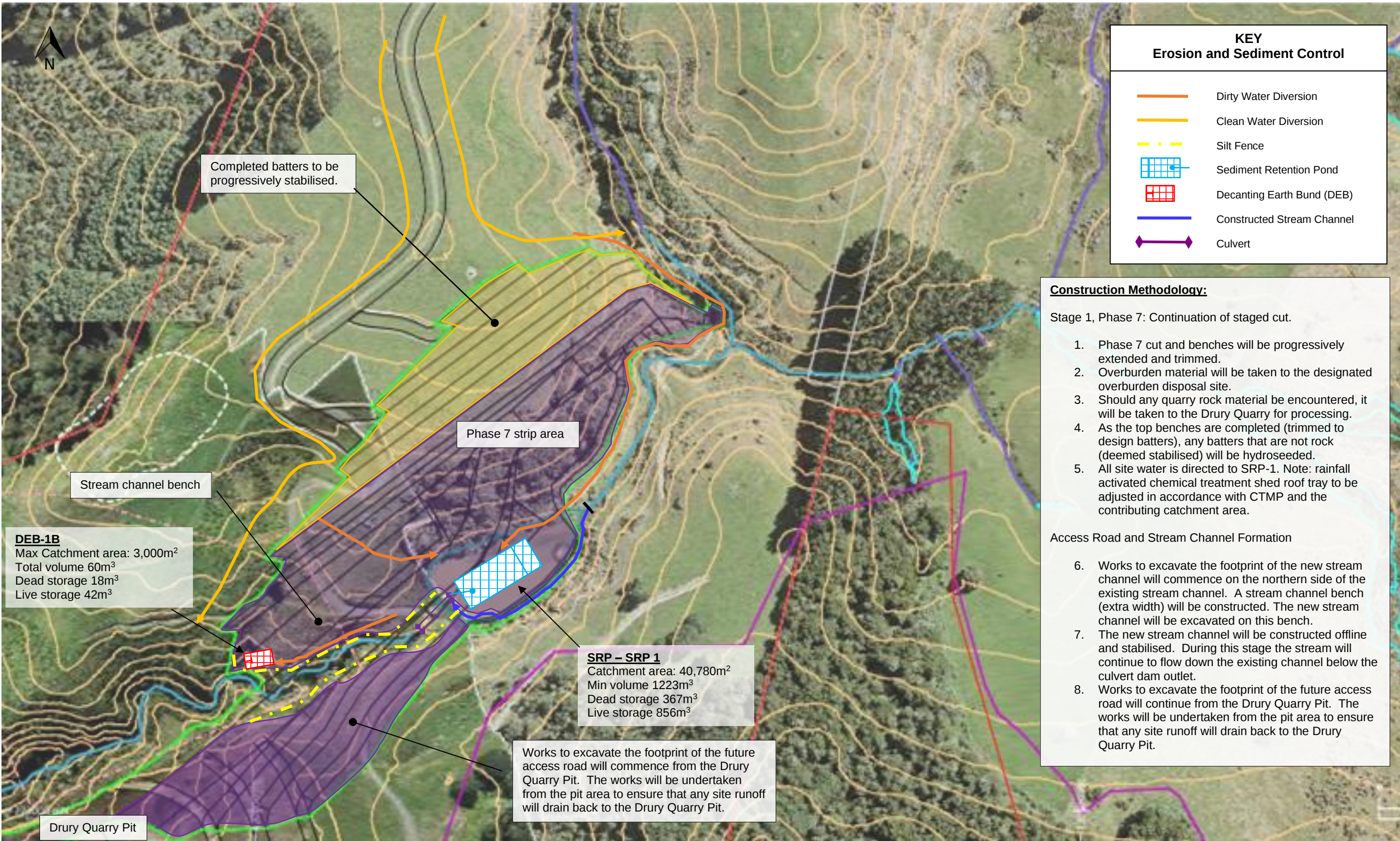
REV	DATE	REVISION DETAILS	APPROVED
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C	20.09.23	Review for consent issue	
D	14.12.23	Update of Naming and Phasing Protocols	



Project	DRURY QUARRY – SUTTON BLOCK		
Title	Erosion and Sediment Control Plan – Stage 1: Phase 5		
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ZW	CS	ESCP-DQSB-06	6



NOTES 1. All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 ‘Erosion and Sediment Control Guide for Land Disturbing Activities’ (GD05). 2. Earthworks are to be programmed to ensure rapid stabilisation. 3. All erosion and sediment control measures will be inspected on a daily basis by the site foreman. 4. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.	<table><tr><th>REV</th><th>DATE</th><th>REVISION DETAILS</th><th>APPROVED</th></tr><tr><td>A</td><td>05.05.22</td><td>Draft for review.</td><td></td></tr><tr><td>B</td><td>28.06.22</td><td>Consent issue</td><td></td></tr><tr><td>C</td><td>20.09.23</td><td>Review for consent issue</td><td></td></tr><tr><td>D</td><td>14.12.23</td><td>Update of Naming and Phasing Protocols</td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>	REV	DATE	REVISION DETAILS	APPROVED	A	05.05.22	Draft for review.		B	28.06.22	Consent issue		C	20.09.23	Review for consent issue		D	14.12.23	Update of Naming and Phasing Protocols																														Fulton Hogan STEVENSON		Project	DRURY QUARRY – SUTTON BLOCK	
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KEY
Erosion and Sediment Control

- Dirty Water Diversion
- Clean Water Diversion
- Silt Fence
- Sediment Retention Pond
- Decanting Earth Bund (DEB)
- Constructed Stream Channel
- Culvert

Construction Methodology:

Stage 1, Phase 7: Continuation of staged cut.

- Phase 7 cut and benches will be progressively extended and trimmed.
- Overburden material will be taken to the designated overburden disposal site.
- Should any quarry rock material be encountered, it will be taken to the Drury Quarry for processing.
- As the top benches are completed (trimmed to design batters), any batters that are not rock (deemed stabilised) will be hydroseeded.
- All site water is directed to SRP-1. Note: rainfall activated chemical treatment shed roof tray to be adjusted in accordance with CTMP and the contributing catchment area.

Access Road and Stream Channel Formation

- Works to excavate the footprint of the new stream channel will commence on the northern side of the existing stream channel. A stream channel bench (extra width) will be constructed. The new stream channel will be excavated on this bench.
- The new stream channel will be constructed offline and stabilised. During this stage the stream will continue to flow down the existing channel below the culvert dam outlet.
- Works to excavate the footprint of the future access road will continue from the Drury Quarry Pit. The works will be undertaken from the pit area to ensure that any site runoff will drain back to the Drury Quarry Pit.

NOTES

- All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
- Earthworks are to be programmed to ensure rapid stabilisation.
- All erosion and sediment control measures will be inspected on a daily basis by the site foreman.
- Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

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A	05.05.22	Draft for review.	
B	28.06.22	Consent issue	
C	20.09.23	Review for consent issue	
D	14.12.23	Update of Naming and Phasing Protocols	
E	12.02.24	Removal of constructed pond.	



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Project

DRURY QUARRY – SUTTON BLOCK

Title

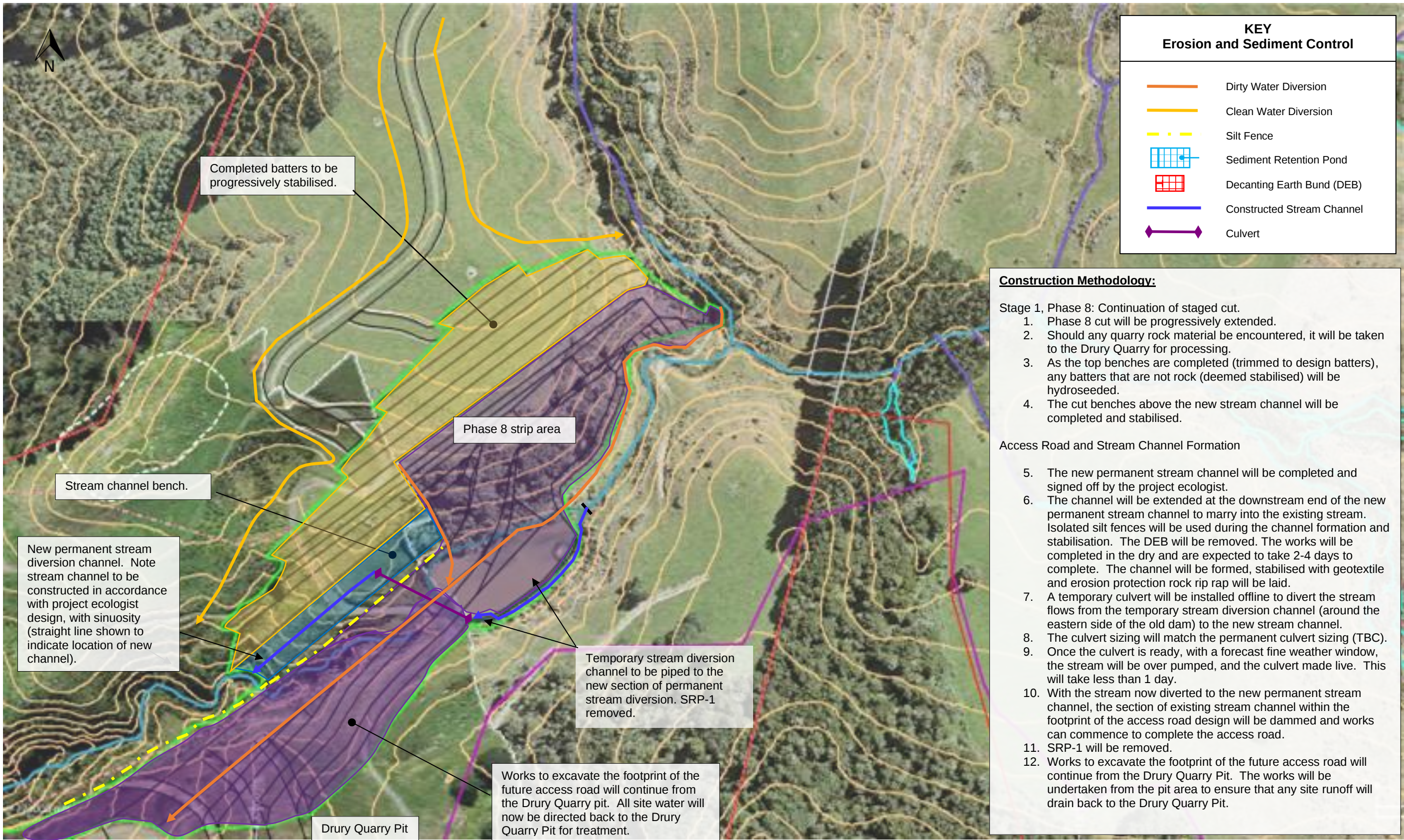
**Erosion and Sediment Control Plan –
Stage 1: Phase 7**

Drawing No.

ESCP-DQSB-08

Sheet No.

8



NOTES

- All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
- Earthworks are to be programmed to ensure rapid stabilisation.
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CS

Project

DRURY QUARRY – SUTTON BLOCK

Title

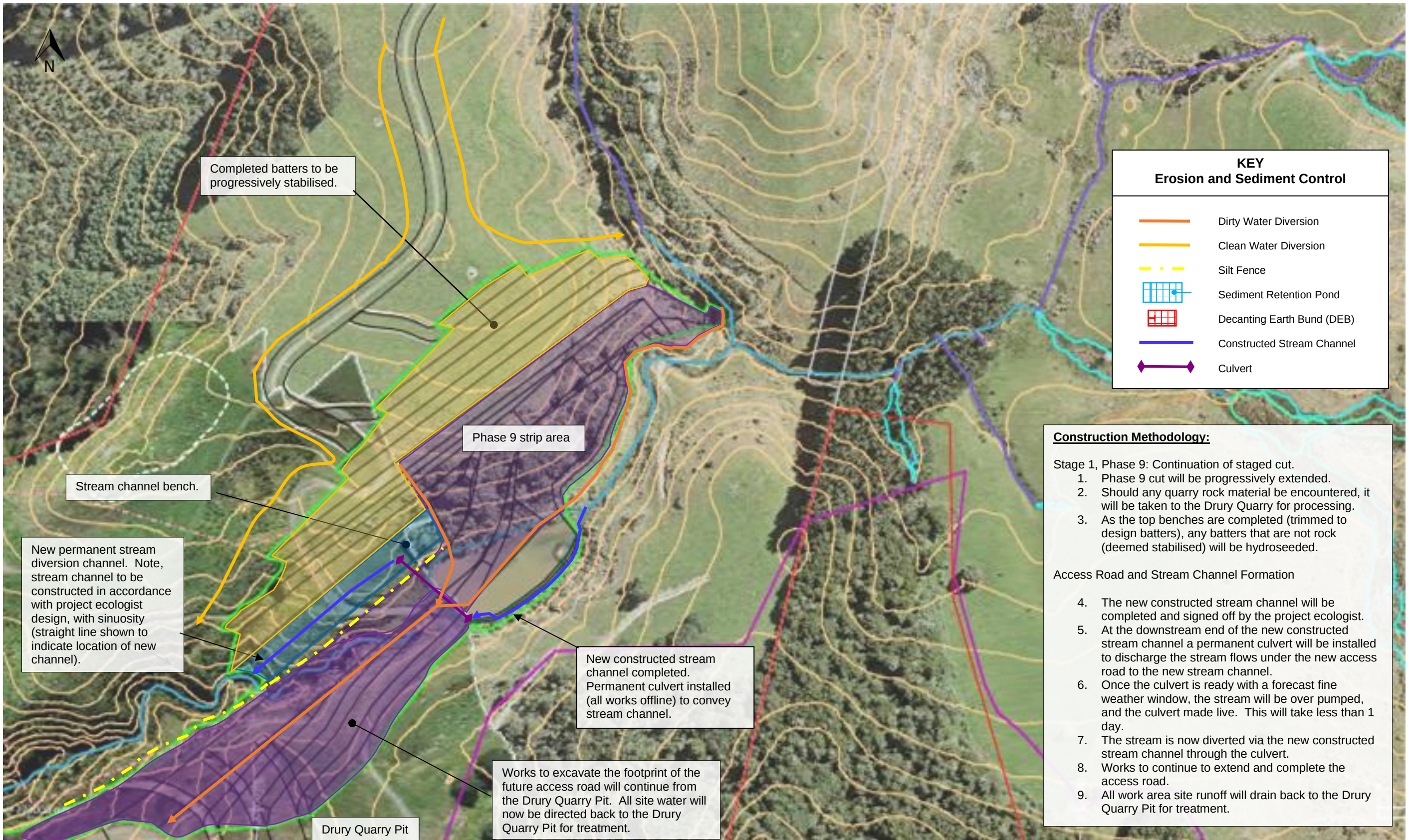
**Erosion and Sediment Control Plan –
Stage 1: Phase 8**

Drawing No.

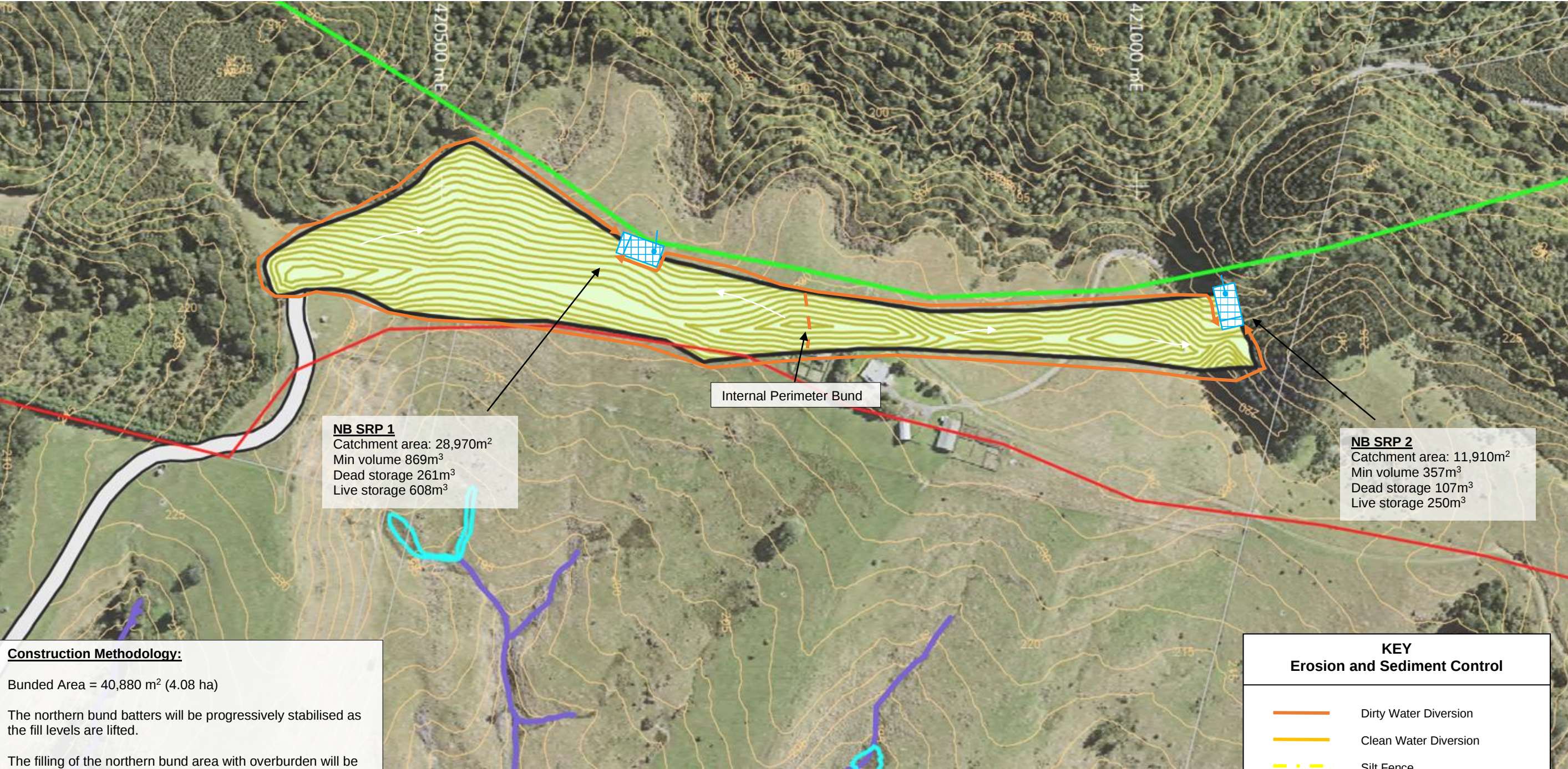
ESCP-DQSB-09

Sheet No.

9



NOTES 1. All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05). 2. Earthworks are to be programmed to ensure rapid stabilisation. 3. All erosion and sediment control measures will be inspected on a daily basis by the site foreman. 4. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.	<table><tr><th>REV</th><th>DATE</th><th>REVISION DETAILS</th><th>APPROVED</th></tr><tr><td>A</td><td>05.05.22</td><td>Draft for review.</td><td></td></tr><tr><td>B</td><td>28.06.22</td><td>Consent issue</td><td></td></tr><tr><td>C</td><td>20.09.23</td><td>Review for consent issue</td><td></td></tr><tr><td>D</td><td>14.12.23</td><td>Update of Naming and Phasing Protocols</td><td></td></tr><tr><td>E</td><td>12.02.24</td><td>Removal of constructed pond.</td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>	REV	DATE	REVISION DETAILS	APPROVED	A	05.05.22	Draft for review.		B	28.06.22	Consent issue		C	20.09.23	Review for consent issue		D	14.12.23	Update of Naming and Phasing Protocols		E	12.02.24	Removal of constructed pond.																						Fulton Hogan STEVENSON <table><tr><td>Project</td><td colspan="3">DRURY QUARRY – SUTTON BLOCK</td></tr><tr><td>Title</td><td colspan="3">Erosion and Sediment Control Plan – Stage 1: Phase 9</td></tr><tr><td>Drawn</td><td>Checked</td><td>Drawing No.</td><td>Sheet No.</td></tr><tr><td>ZW</td><td>CS</td><td>ESCP-DQSB-10</td><td>10</td></tr></table>	Project	DRURY QUARRY – SUTTON BLOCK			Title	Erosion and Sediment Control Plan – Stage 1: Phase 9			Drawn	Checked	Drawing No.	Sheet No.	ZW	CS	ESCP-DQSB-10	10
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NB SRP 1
Catchment area: 28,970m²
Min volume 869m³
Dead storage 261m³
Live storage 608m³

NB SRP 2
Catchment area: 11,910m²
Min volume 357m³
Dead storage 107m³
Live storage 250m³

Construction Methodology:

Bunded Area = 40,880 m² (4.08 ha)

The northern bund batters will be progressively stabilised as the fill levels are lifted.

The filling of the northern bund area with overburden will be staged (specific staging TBC). As areas of the bund are completed, they will be progressively stabilised.

The construction of the SRP's will be staged in accordance with the filling operation. All controls will be installed in advance of the bund extending beyond the catchment of the previous control device.

**KEY
Erosion and Sediment Control**

- Dirty Water Diversion
- Clean Water Diversion
- Silt Fence
- Sediment Retention Pond
- Decanting Earth Bund (DEB)
- Constructed Stream Channel
- Culvert

NOTES

- All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
- Earthworks are to be programmed to ensure rapid stabilisation.
- All erosion and sediment control measures will be inspected on a daily basis by the site foreman.
- Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

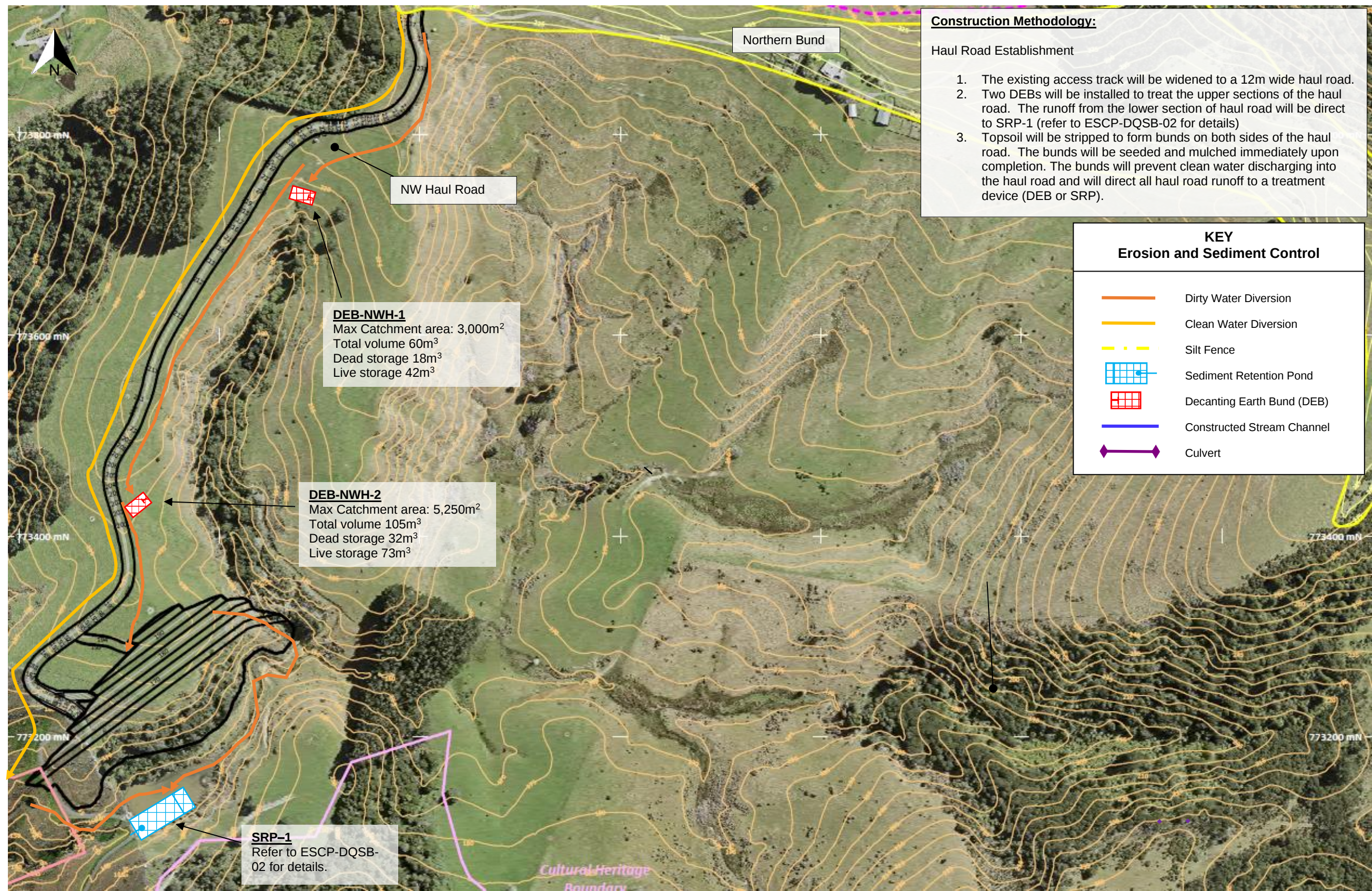
REV	DATE	REVISION DETAILS	APPROVED
A	02.06.22	Draft for review.	
B	29.06.22	Consent Issue.	
C	26.09.23	Updated Design Drawings	



Drawn
ZW

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Project	DRURY QUARRY – SUTTON BLOCK
Title	Erosion and Sediment Control Plan – Northern Bund
Drawing No.	ESCP-DQSB-NB-01
Sheet No.	11



NOTES

1. All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
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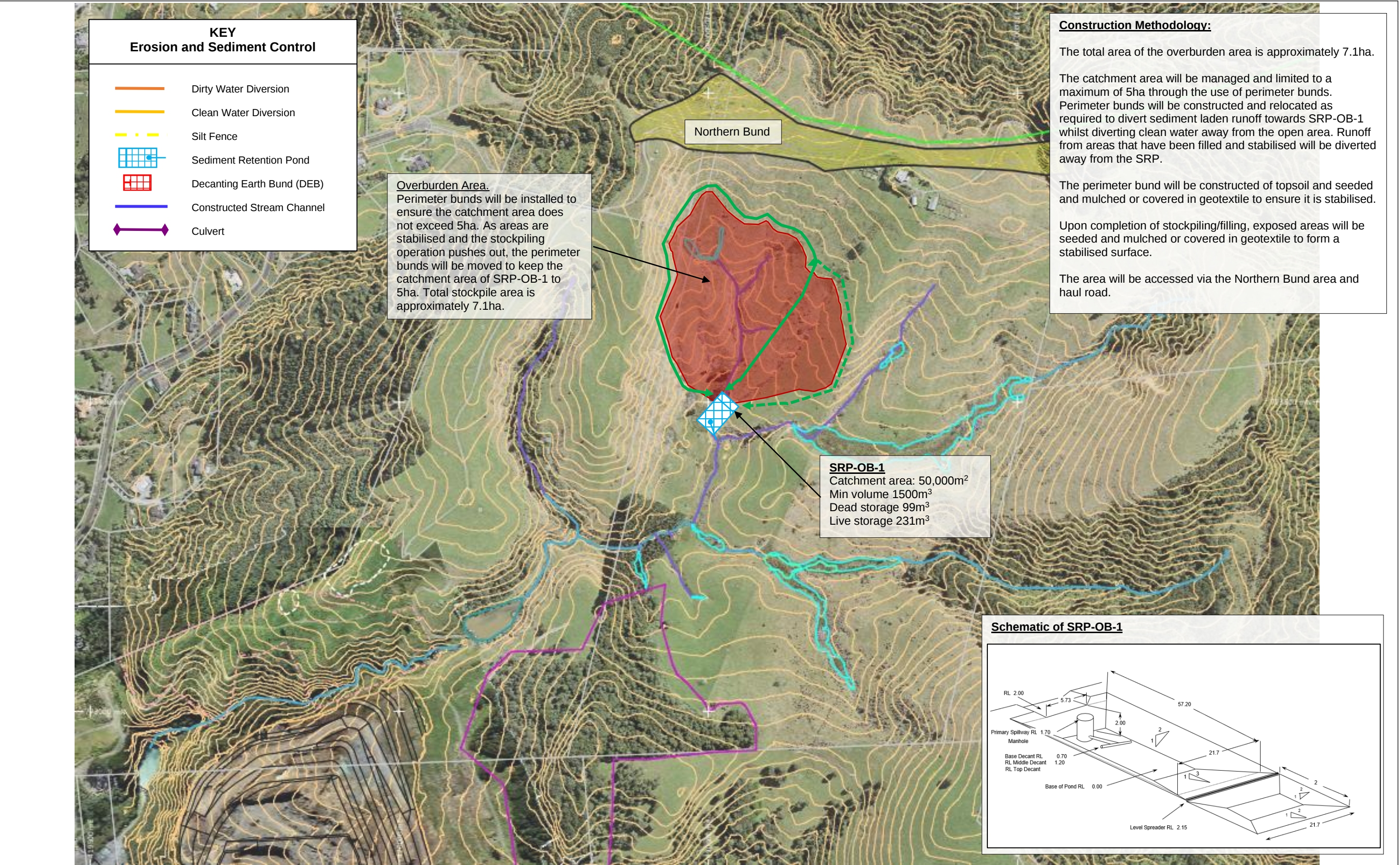
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A	29.06.22	Draft for review.	
B	26.09.23	2023 update	



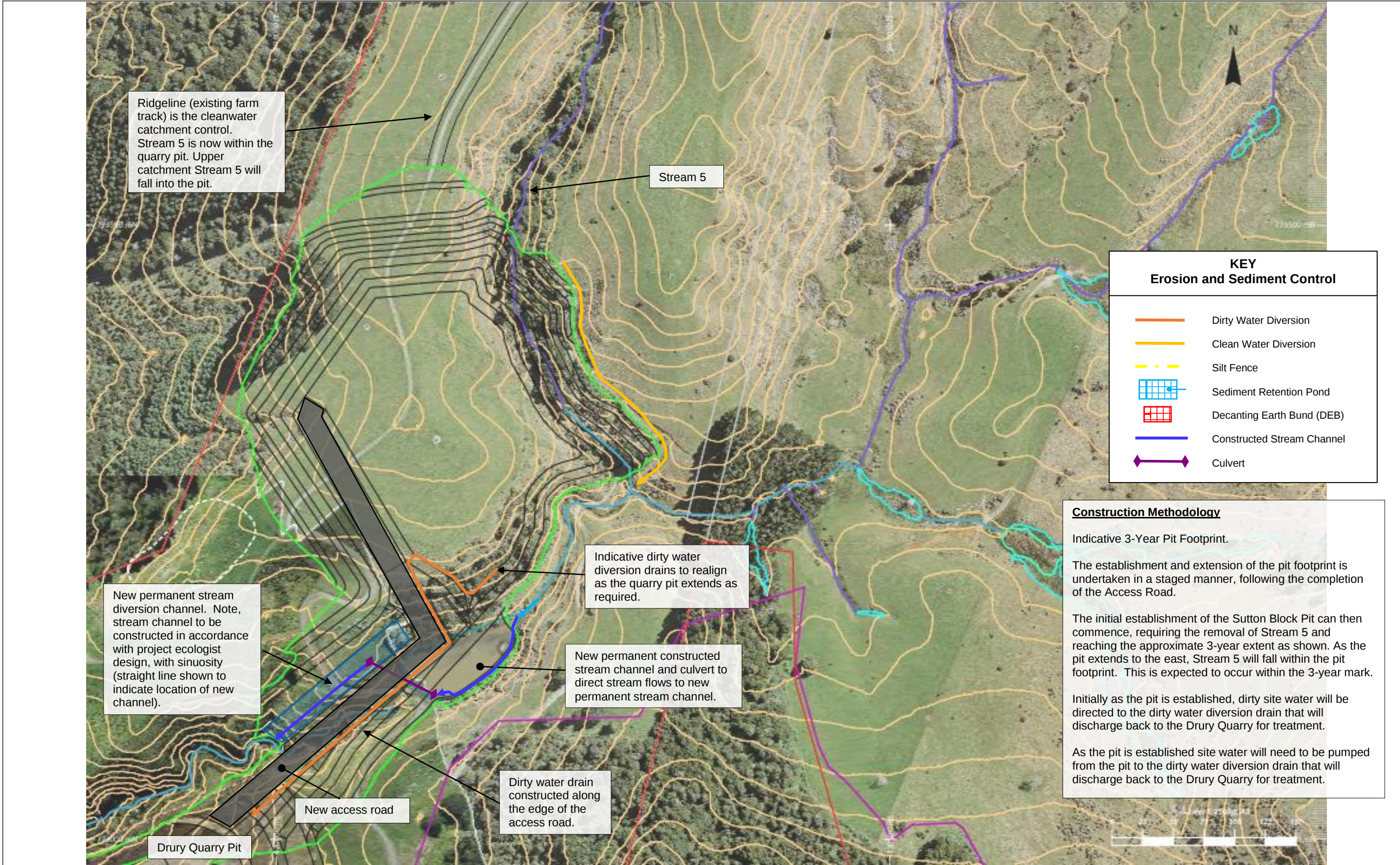
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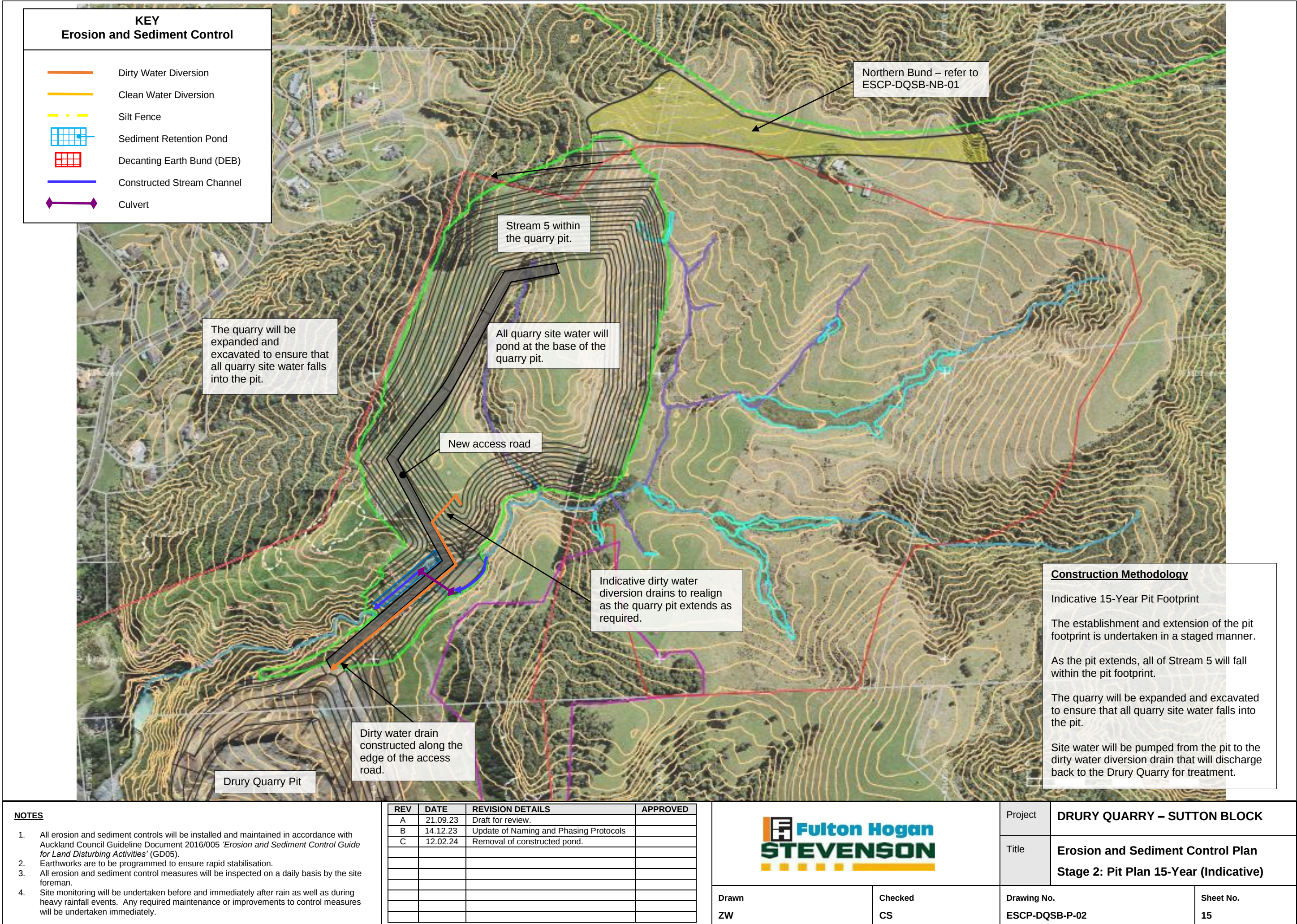
Project	DRURY QUARRY – SUTTON BLOCK
Title	Erosion and Sediment Control Plan NW Haul Road
Drawing No.	ESCP-DQSB-HR-01
Sheet No.	12



NOTES 1. All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 ‘Erosion and Sediment Control Guide for Land Disturbing Activities’ (GD05). 2. Earthworks are to be programmed to ensure rapid stabilisation. 3. All erosion and sediment control measures will be inspected on a daily basis by the site foreman. 4. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.	<table><tr><th>REV</th><th>DATE</th><th>REVISION DETAILS</th><th>APPROVED</th></tr><tr><td>A</td><td>15.11.23</td><td>Draft for review.</td><td></td></tr><tr><td>B</td><td>14.12.23</td><td>Update of Naming and Phasing Protocols</td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>	REV	DATE	REVISION DETAILS	APPROVED	A	15.11.23	Draft for review.		B	14.12.23	Update of Naming and Phasing Protocols																														Fulton Hogan STEVENSON		Project	DRURY QUARRY – SUTTON BLOCK	
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			Title	Erosion and Sediment Control Plan – Overburden Stockpile Area																																										
			Drawn	Checked	Drawing No.	Sheet No.																																								
			MD	CS	ESCP-DQSB-OB-01	13																																								



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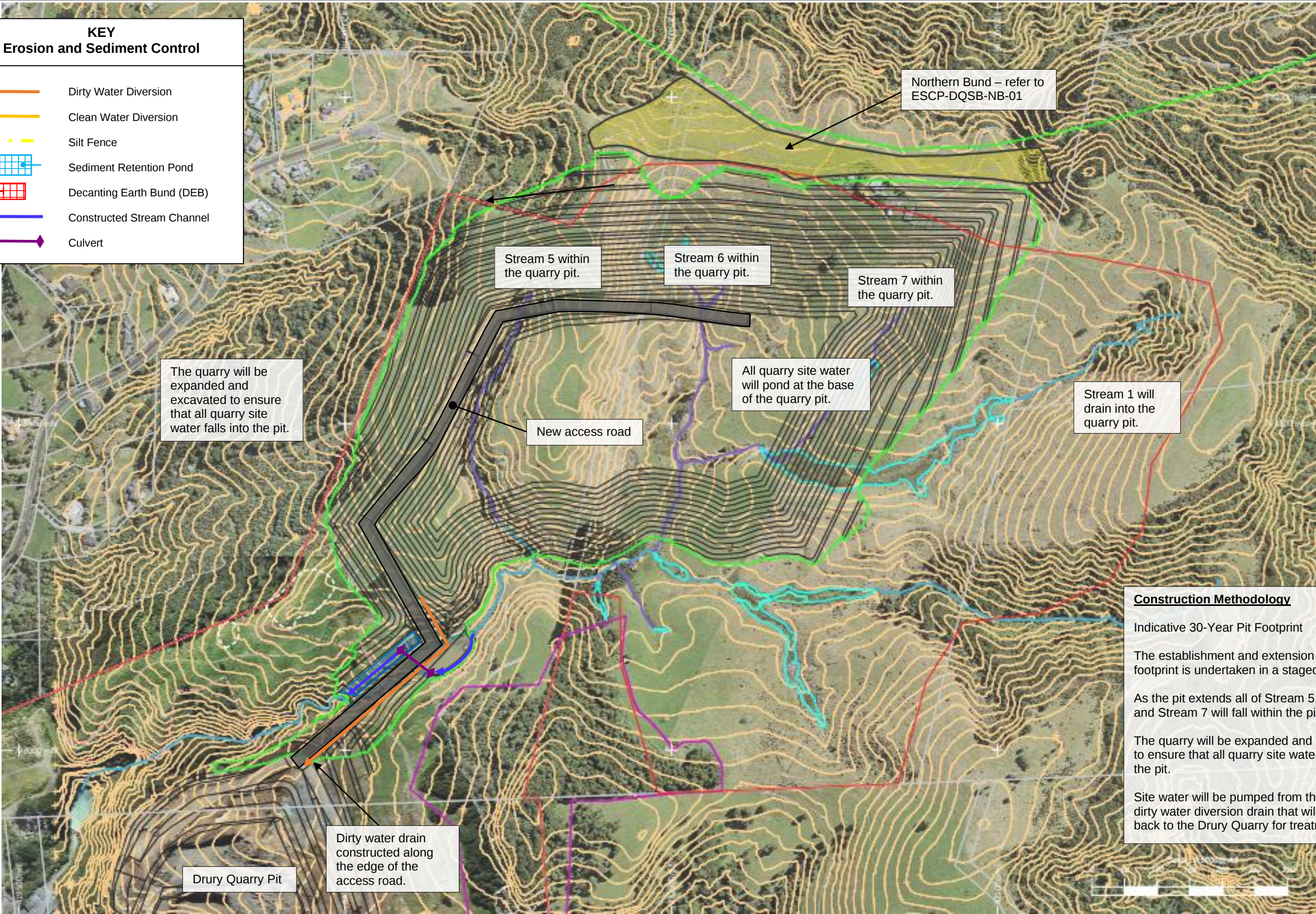


KEY

Erosion and Sediment Control

Dirty Water Diversion

Clean Water Diversion

Silt Fence

Construction Methodology

Indicative 30-Year Pit Footprint

The establishment and extension of the pit footprint is undertaken in a staged manner.

As the pit extends all of Stream 5, Stream 6 and Stream 7 will fall within the pit footprint.

The quarry will be expanded and excavated to ensure that all quarry site water falls into the pit.

Site water will be pumped from the pit to the dirty water diversion drain that will discharge back to the Drury Quarry for treatment.

NOTES

- All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
- Earthworks are to be programmed to ensure rapid stabilisation.
- All erosion and sediment control measures will be inspected on a daily basis by the site foreman.
- Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

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A	21.09.23	Draft for review.	
B	14.12.23	Update of Naming and Phasing Protocols	
C	12.02.24	Removal of constructed pond.	



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Project

DRURY QUARRY – SUTTON BLOCK

Title

Erosion and Sediment Control Plan
Stage 3: Pit Plan 30-Year (Indicative)

Drawing No.

ESCP-DQSB-P-03

Sheet No.

16

KEY

Erosion and Sediment Control

Dirty Water Diversion

Clean Water Diversion

Silt Fence

Sediment Retention Pond

Decanting Earth Bund (DEB)

Constructed Stream Channel

Culvert

Construction Methodology

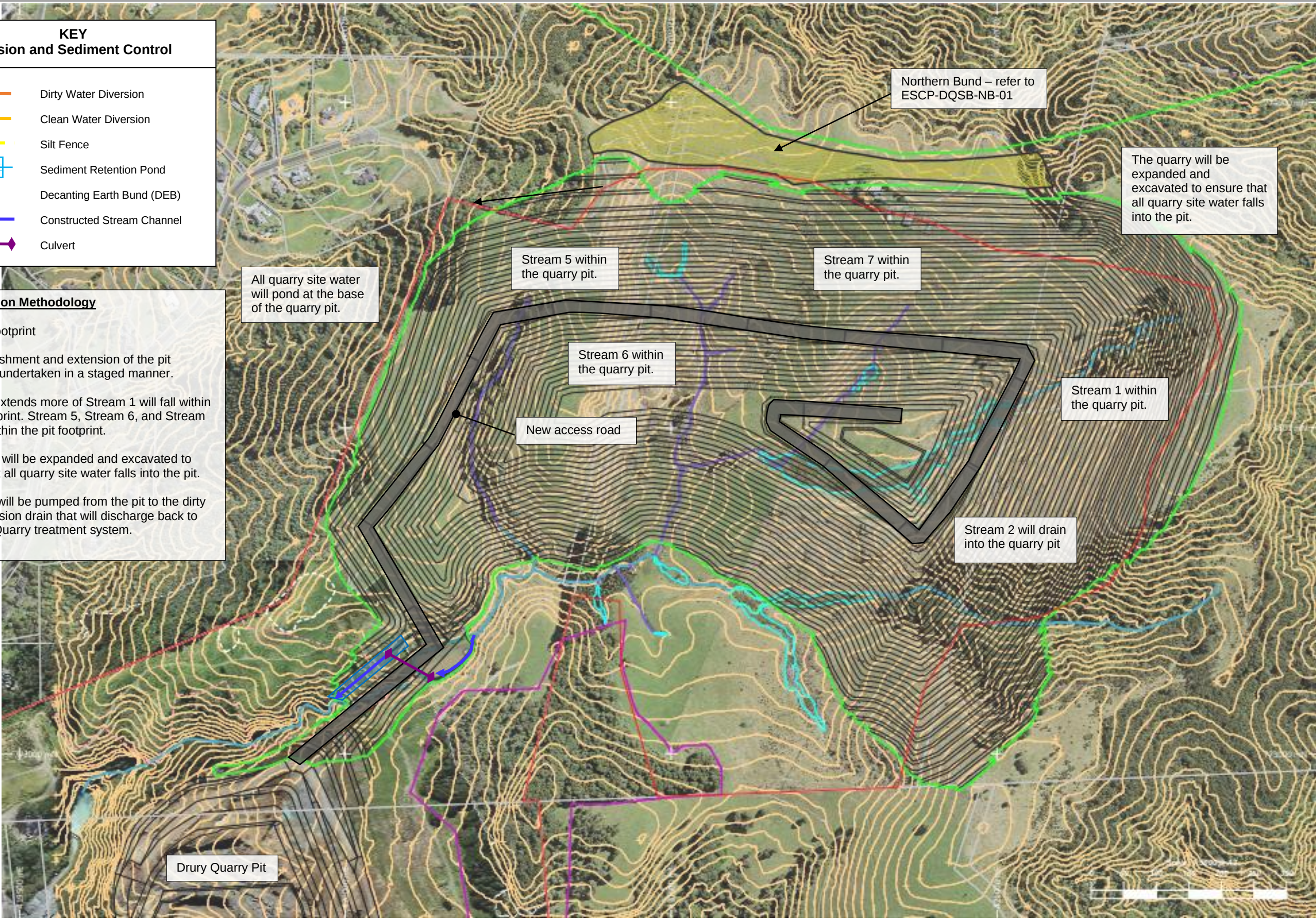
Final Pit Footprint

The establishment and extension of the pit footprint is undertaken in a staged manner.

As the pit extends more of Stream 1 will fall within the pit footprint. Stream 5, Stream 6, and Stream 7 are all within the pit footprint.

The quarry will be expanded and excavated to ensure that all quarry site water falls into the pit.

Site water will be pumped from the pit to the dirty water diversion drain that will discharge back to the Drury Quarry treatment system.



- NOTES
1.

All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
2.

Earthworks are to be programmed to ensure rapid stabilisation.
3.

All erosion and sediment control measures will be inspected on a daily basis by the site foreman.
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Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

REV	DATE	REVISION DETAILS	APPROVED
A	21.09.23	Draft for review.	
B	25.10.23	Stream Diversion Added.	
C	14.12.23	Update of Naming and Phasing Protocols	
D	12.02.24	Removal of constructed pond.	
E	17.10.24	Stage 5 updates (staging refinements)	



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Project

DRURY QUARRY – SUTTON BLOCK

Title

Erosion and Sediment Control Plan

Stage 4: Pit Plan 40-Year (indicative)

Drawing No.

ESCP-DQSB-P-04

Sheet No.

17

KEY

Erosion and Sediment Control

Dirty Water Diversion

Clean Water Diversion

Silt Fence

Sediment Retention Pond

Decanting Earth Bund (DEB)

Constructed Stream Channel

Culvert

Northern Bund – removed in advance of Stage 5 expansion.

The quarry will be expanded and excavated to ensure that all quarry site water falls into the pit.

All quarry site water will pond at the base of the quarry pit.

Access road

Stream 2 within the quarry pit.

Drury Quarry Pit

Construction Methodology

Final Pit Footprint

The establishment and extension of the pit footprint is undertaken in a staged manner.

As the pit extends to its final extent Stream 2 will fall within the pit footprint. Stream 1, Stream 5, Stream 6, and Stream 7 are all within the pit footprint.

Prior to the pit extending to its Northern Extent, the Northern Bund will be removed.

The quarry will be expanded and excavated to ensure that all quarry site water falls into the pit.

Site water will be pumped from the pit to the dirty water diversion drain that will discharge back to the Drury Quarry treatment system.

- NOTES**
- All erosion and sediment controls will be installed and maintained in accordance with Auckland Council Guideline Document 2016/005 'Erosion and Sediment Control Guide for Land Disturbing Activities' (GD05).
 - Earthworks are to be programmed to ensure rapid stabilisation.
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A	17.10.24	Draft for review.	



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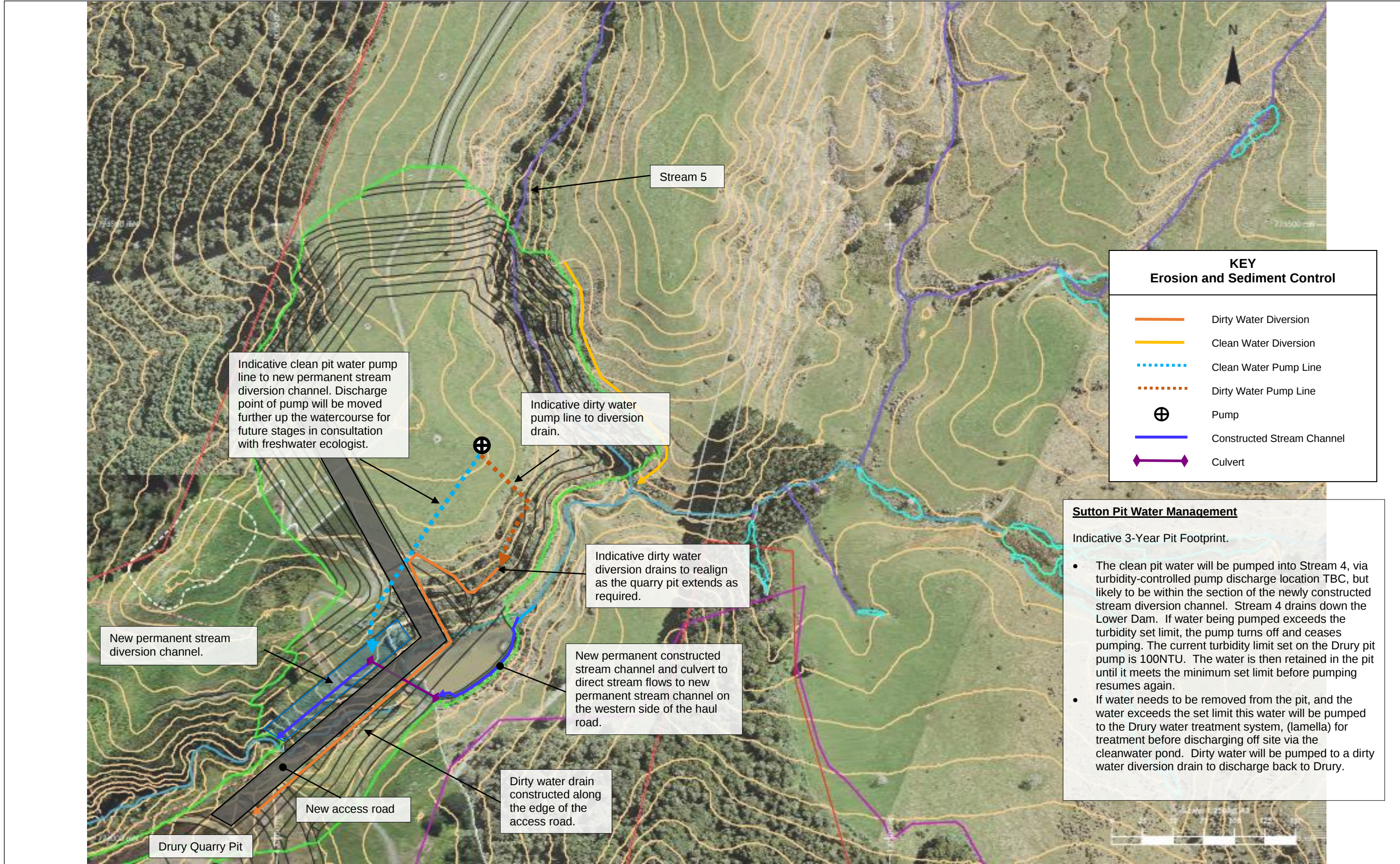
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Project
DRURY QUARRY – SUTTON BLOCK

Title
**Erosion and Sediment Control Plan
Stage 5: Pit Plan Final**

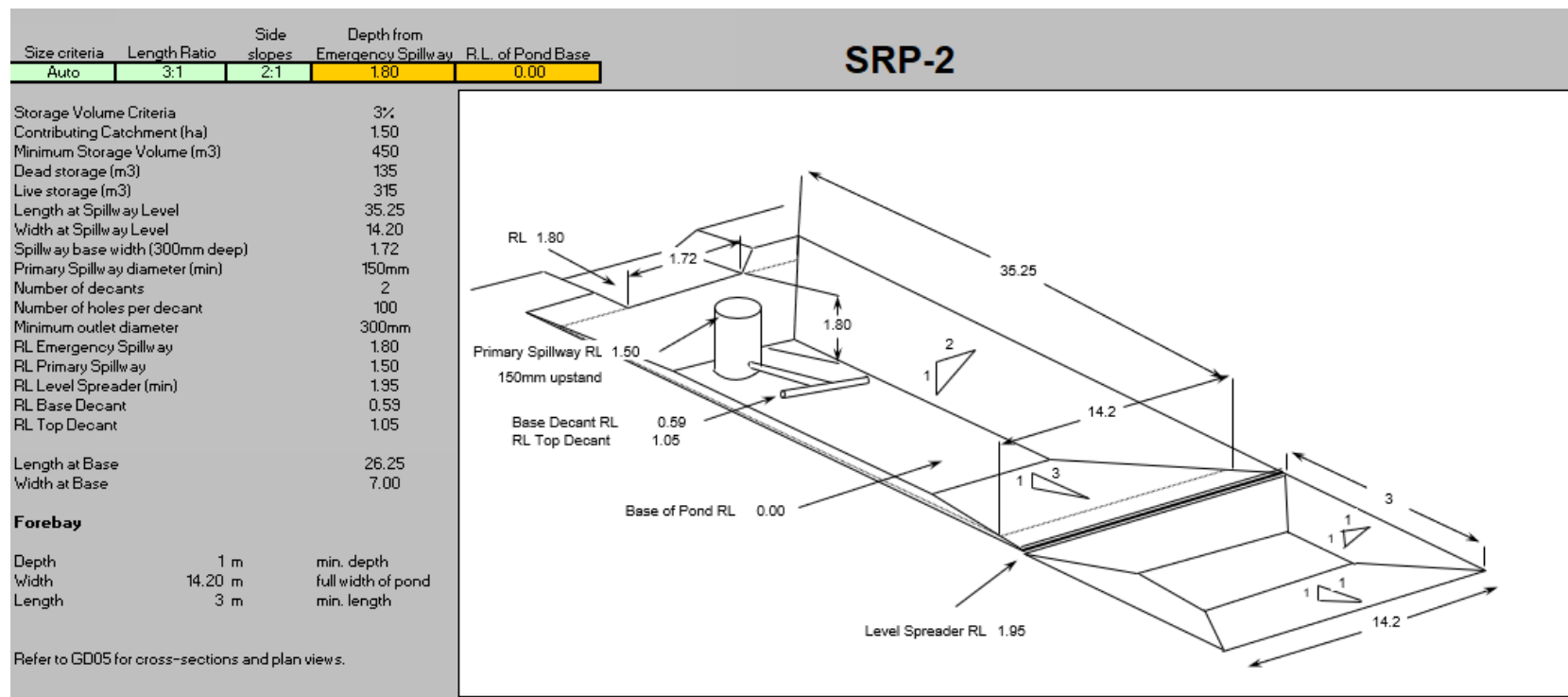
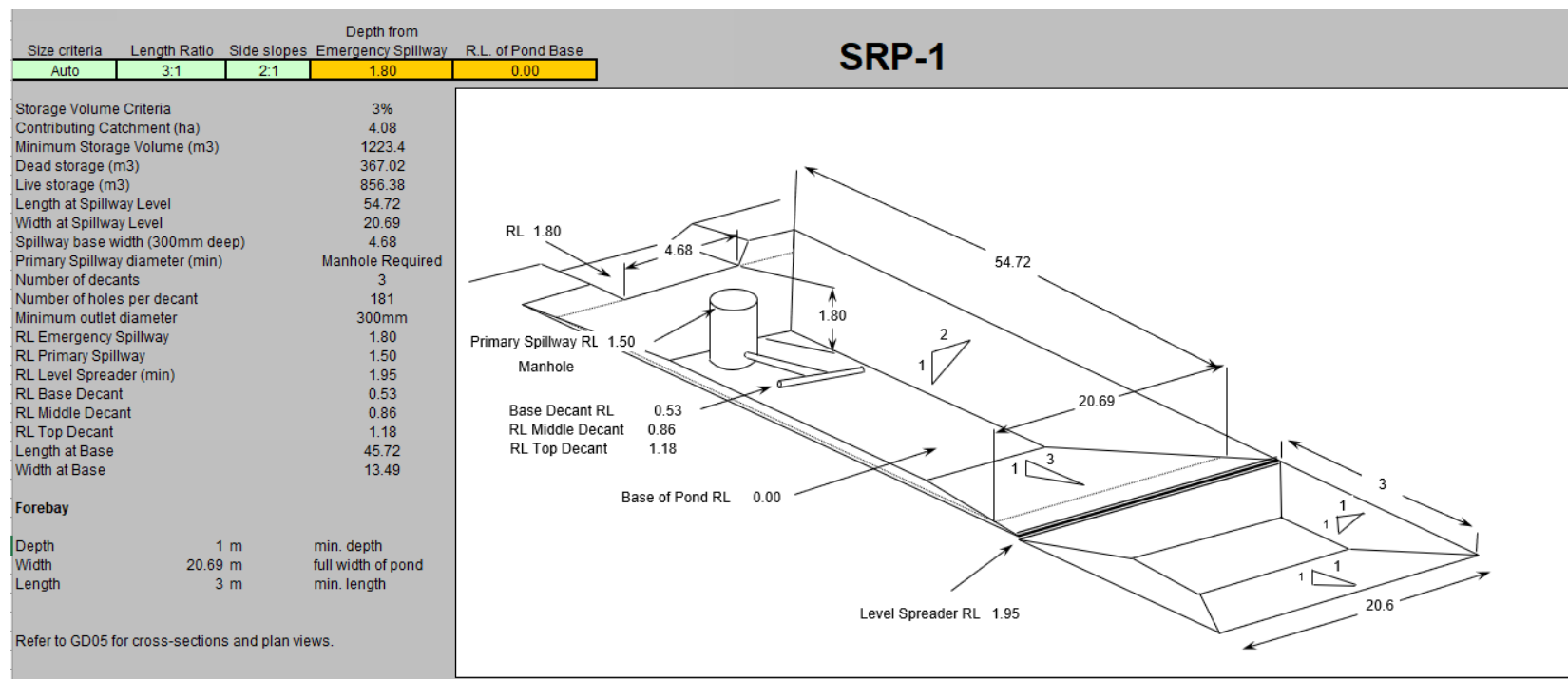
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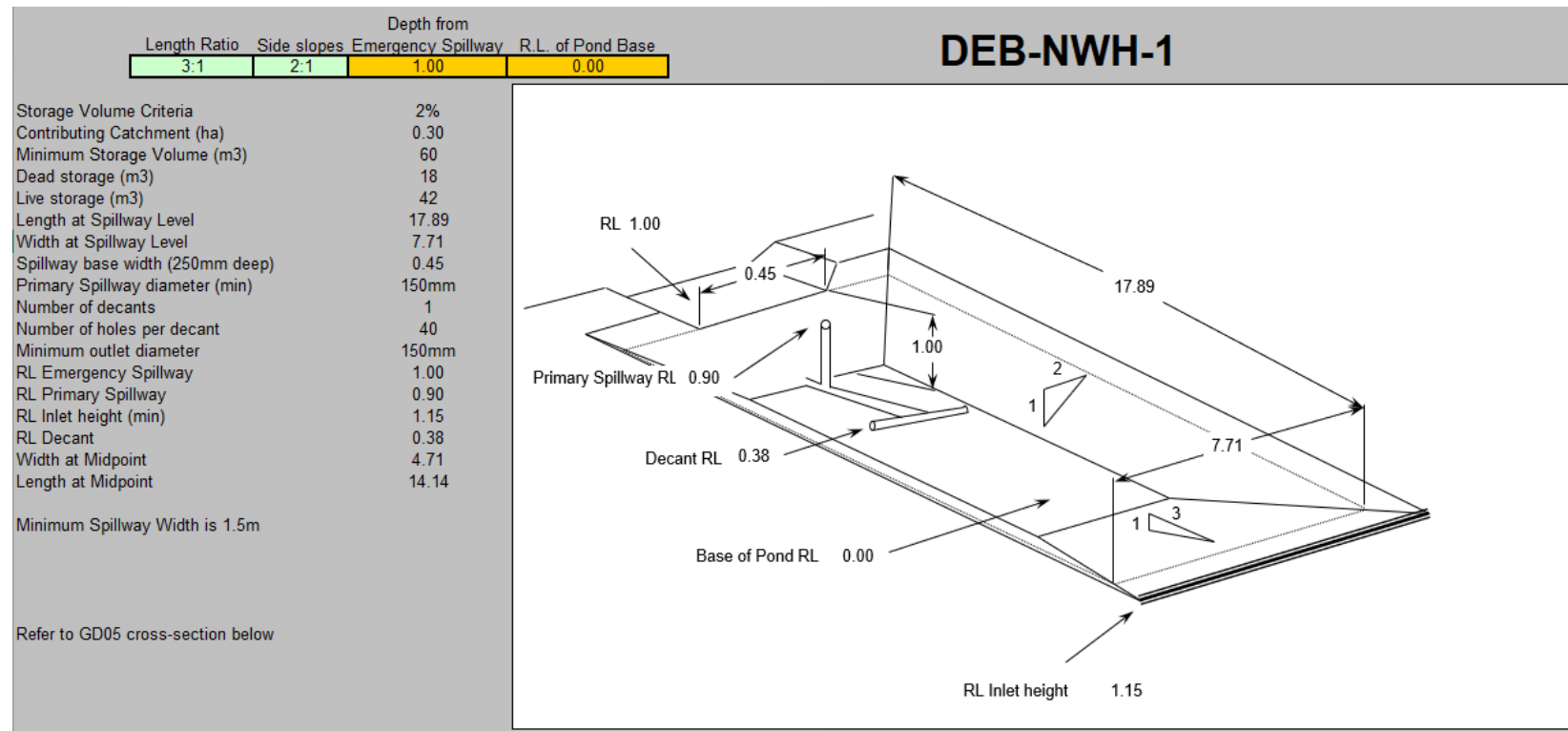
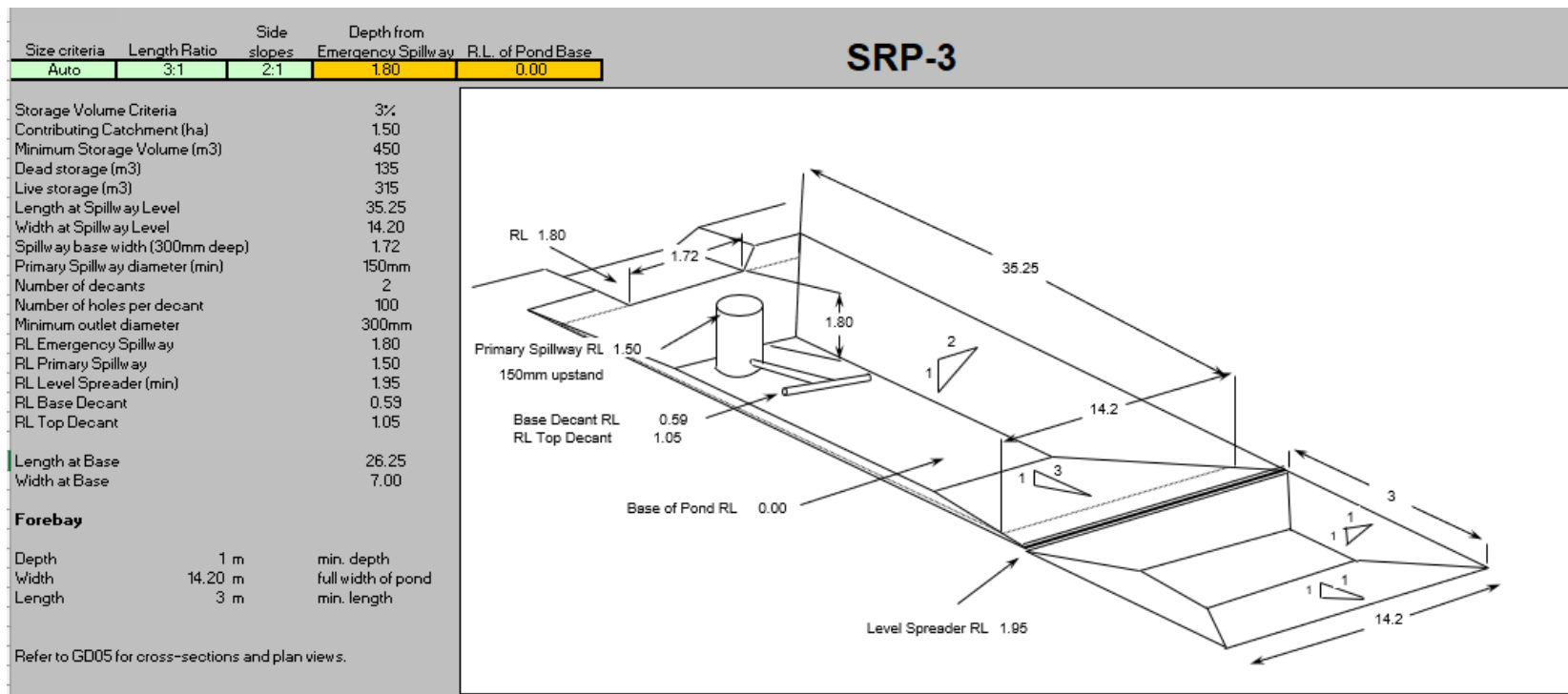
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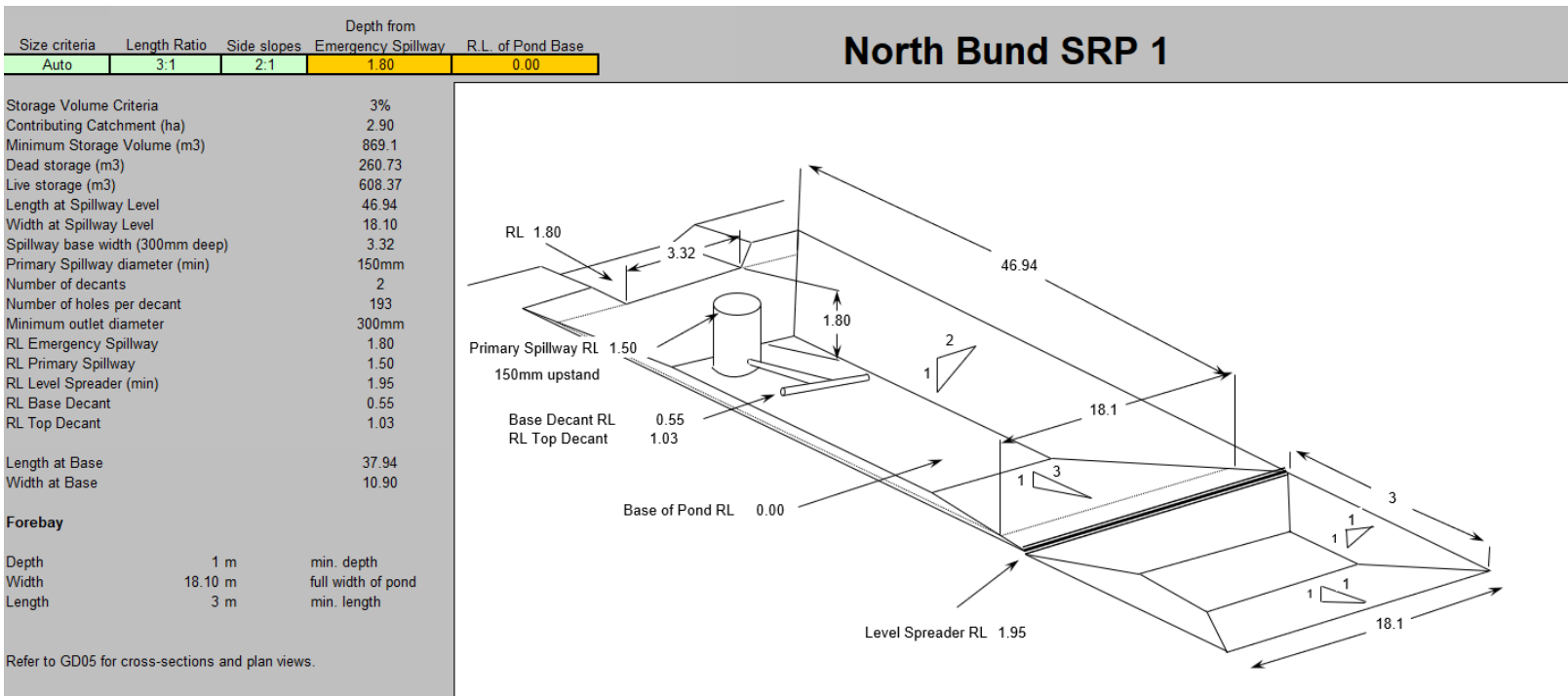
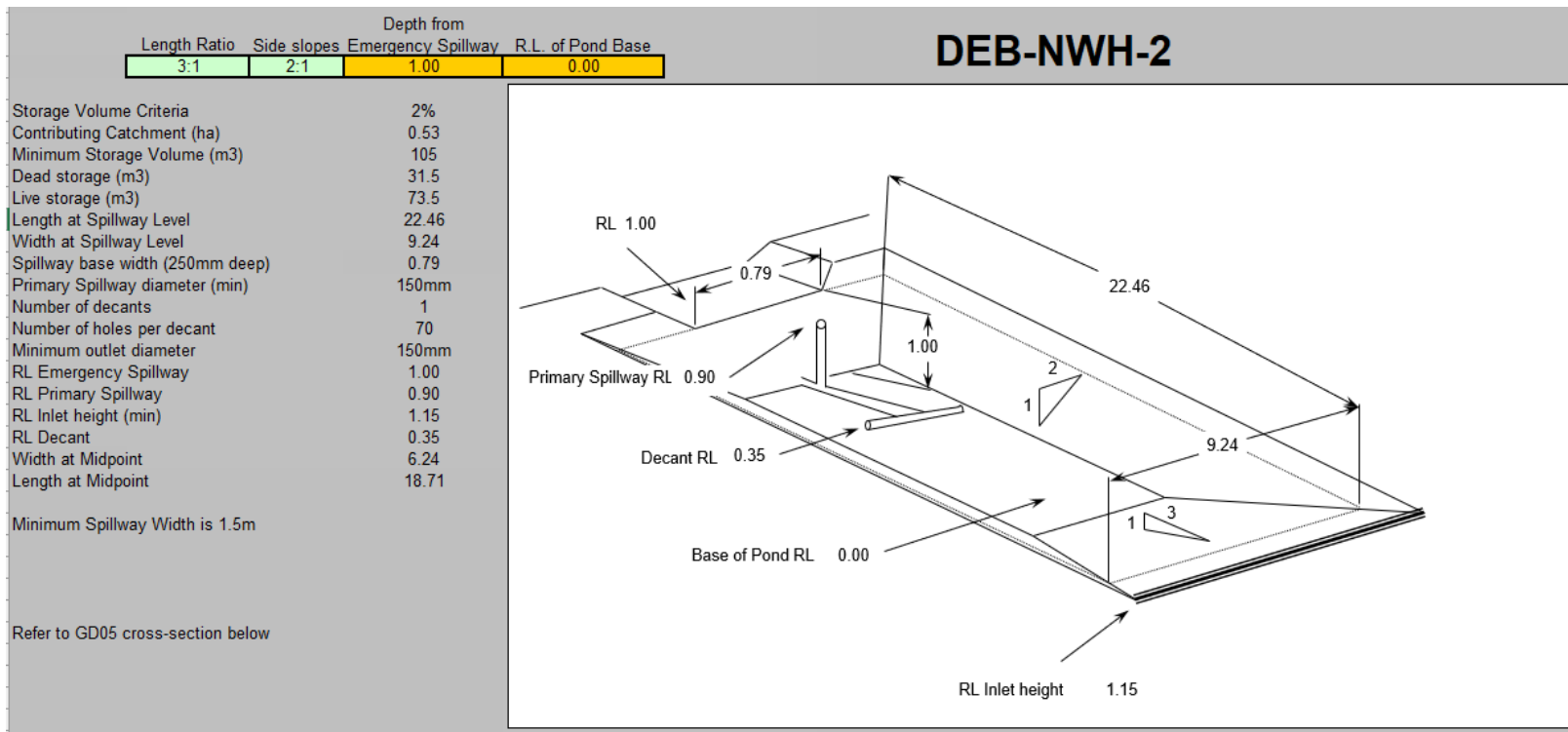


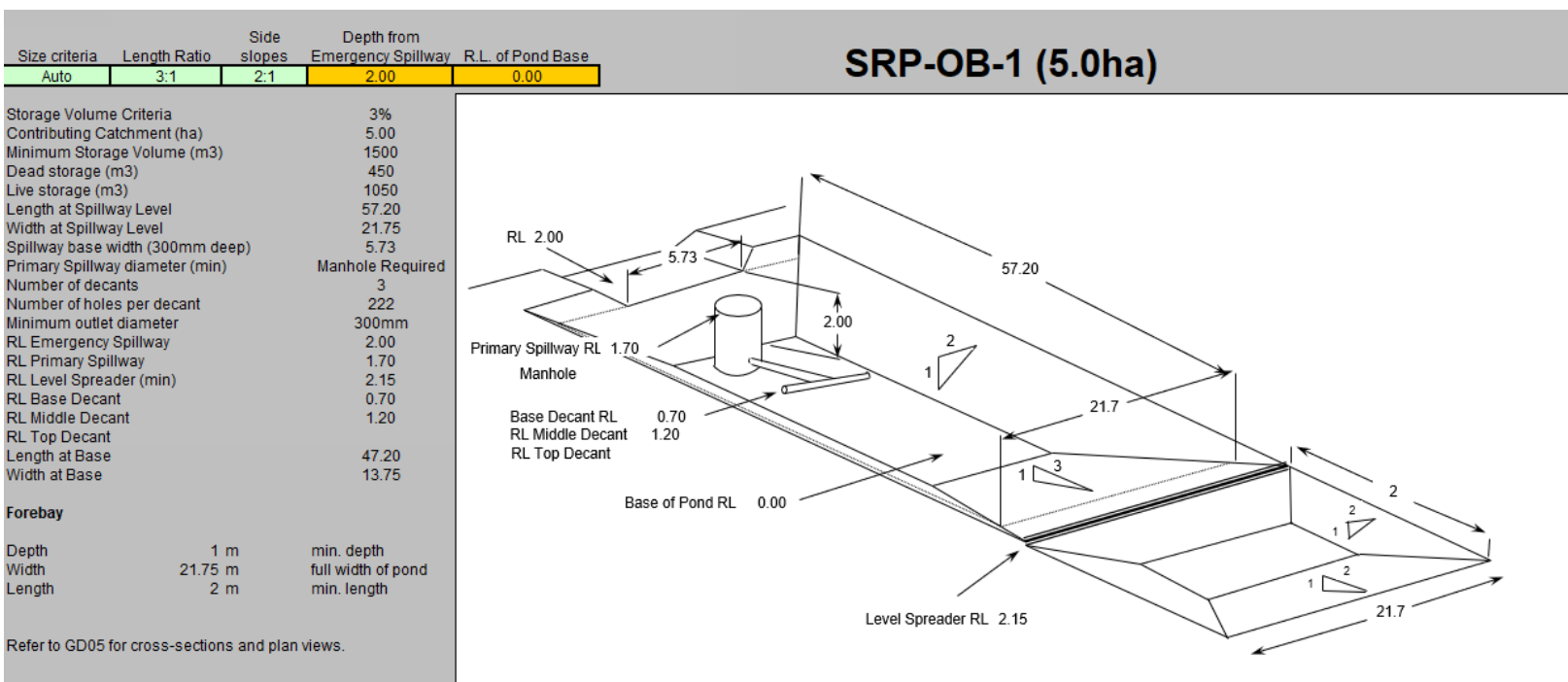
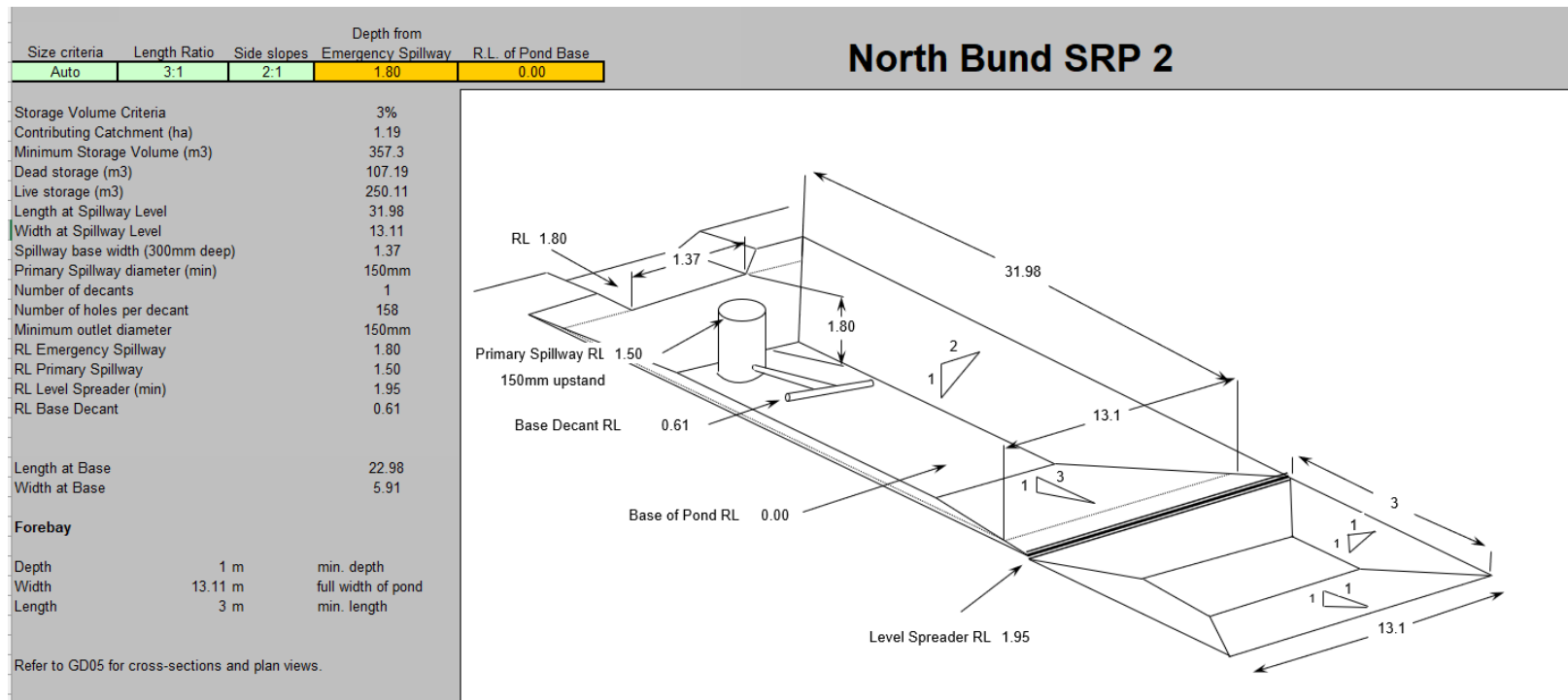
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Appendix C - Erosion and Sediment Control Construction Details









Clean Water Diversion Channel Calculation

Total Catchment Area (ha) 98.00

Weighted CN 74.0

Location Drury (60)

Rainfall Event	User	ARI 2	ARI 5	ARI 10	ARI 20	ARI 50	ARI 100
24hr rainfall (mm)		60	95	120	140	170	200
Peak Flow (m ³ /s)	0.000	3.82	8.41	12.11	15.23	20.07	25.03

Common Criteria

Rainfall Event ARI 20

Peak Flow 15.231

Slope (%) 2.00

Length (m) 135.00

Trapezoidal Channel

Base Width (m) 1.00

Flow Depth (m) 1.25

RH Side Slope (horizontal to 1 vertical) 3:1

LH Side Slope (horizontal to 1 vertical) 3.00

Mannings (n) Geotextile 0.025

Channel Flow Velocity (m/s) 4.32

Channel Capacity (m³/s) 25.63

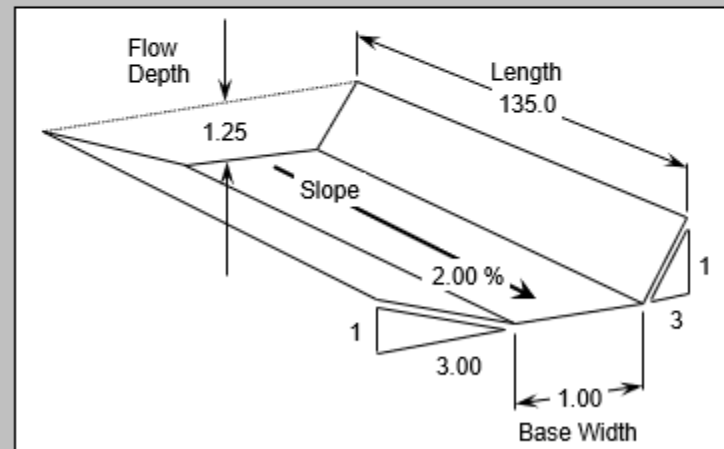
Design accomodates peak flow

Clean water diversions are required to be stabilised

Pull Down Menu

Input Required

Optional Input



Refer to below GD05 cross-section.