

Appendix 11

Erosion and Sediment Control Management Plan



Otaika Quarry – Pegram Overburden Disposal Area

Assessment of Adverse Effects arising from Erosion and Sediment

1. Introduction

GBC Winstone has prepared an Erosion and Sediment Control Management Plan (ESCP) for earthworks associated with the deposition of overburden material in the Pegram Overburden Disposal Area (Pegram OBDA). The Pegram OBDA is located within a broad gully directly adjacent to the Otaika Quarry operational area. The ESCP has been approved by the Northland Regional Council [REF. AUT.039161.01 - .04.01] on the 27th April 2017.

Overburden is material overlying the greywacke resource and comprises topsoil, clay, greensand, limestone and highly weathered greywacke and contains less than 1% of vegetation which is required to be removed from the quarry pit prior to the extraction of rock.

The purpose of this memo is to address the specific requirements for land use consent under the District Plan that relate to the management of erosion and sediment control, and potential effects on water quality.

The specific requirements are covered in the following objectives, policies and rules:

- *Policy 11.4.2*
To ensure that land uses activities avoid, remedy or mitigate adverse effects on water quality, by means which may include separating land use activities from water bodies and coastal waters and by encouraging the retention and enhancement of riparian vegetation as buffer areas.
- *Objective 12.3.2:*
Activities on the surface of water bodies do not result in adverse environmental effects.
- *Policy 12.4.1: Adverse Effects*
To ensure that the adverse effects of subdivision, use and development adjoining water bodies or the coastal marine area, or activities on the surface of water bodies or the coastal marine area, on water quality and quantity (including ground water), natural character, and cultural and ecological values of water bodies and the coastal marine area, are avoided, remedied or mitigated.
- *Rule 38.3.3: Matters of Control and Discretion*

- iii. *Quality of storm water run off.*
 - ix. *Effects of disturbance and stockpiling of topsoil, and measures to conserve and preserve topsoil.*
 - x. *Effects of excavation, mineral extraction, transport and processing (including the effects of dust) on any water body or indigenous vegetation.*
 - xii. *Quality of storm runoff.*
- *Rule 64.3.1: Matters of Control and Discretion*
 - v. *The extent of any adverse effects on ecological values or water quality, arising from the land use.*
 - viii. *The extent to which any rehabilitation programme will enable the land to be returned to a state suitable for use by other activities.*
 - *Rule 64.3.1: Contents of Management Plan*
 - iv. *The anticipated life span of operation, the estimated volume of material to be excavated, and any staging of works.*
 - v. *The proposed location and dimensions of overburden storage and deposition areas and stockpiles of mineral material.*

2. Background and Context

The earthworks are described in the attached Erosion and Sediment Control Management Plan, in summary:

- The earthworks will be located within a broad gully currently in pasture to the north of the quarry operational area. The gully contains a watercourse which discharges to the Te Waiiti Stream located to the east of quarry entrance road.
- The catchment area of the watercourse to the quarry entrance road is approximately 51 hectares.
- During any overburden campaign, the area of active earthworks exposed at any one time in the OBDA will be restricted to 3 hectares (excluding topsoil mounds and haul road). With the overall footprint of the life time of the works being some 16.7 hectares.
- The overburden material from the quarry will be placed within the Pegram OBDA in distinct earthwork seasons anticipated to occur periodically at three to five year intervals (depending on market demand) with each earthworks season being some 6 to 8 months in length.
- The earthworks will generally be undertaken over the months of October to April however there may be a need to deposit overburden at other times.
- Appropriate erosion and sediment control measures and procedures will be put in place whenever the earthworks are undertaken which will include consideration of the time of year the works are undertaken. These measures are outlined on the ESCP.

3. Potential for adverse effects arising from earthworks

Without appropriate sediment and erosion control measures there is the potential for discharges of sediment laden stormwater, which can degrade the receiving environment and in particular water quality. The works have been designed to address these actual and potential effects. In summary these works include:

Interception of Clean Water Flows – clean water flows from the catchments above the overburden disposal area will be intercepted up-slope of the fill area and directed to the subsurface drainage.

Vegetation Buffer Strip – a grassed buffer strip will be retained around the earthworks especially across the base of the gully between the works and the watercourse.

Stabilised Earthwork Surfaces – In addition to the buffer, the initial toe retaining bund to be constructed at the base of the OBDA prior to overburden being placed will be constructed from rock sourced from the quarry and the batter slope will be constructed with granular greensand material. This will provide a semi-stabilised surface with respect to stormwater runoff.

Ponding of Stormwater Flows – the retained overburden will be deposited in a series of lifts with a bund being maintained around the front (downstream) edge of the disposal area at all times.

Haul Road – bunds will be maintained along the sides of the access road to prevent clean water flowing over the road, and to channel runoff from the road surface to the sumps adjacent to the road alignment.

Topsoil Mounds – topsoil mounds will be sited so as to avoid clean water flows washing sediment from the mounds and with the surface roughened to minimise sediment runoff.

Sediment Retention Ponding Area – sediment ponding areas will be established and maintained on the earthworks surface while the works are being undertaken and until the disturbed areas have been stabilised against erosion.

Stabilisation against Erosion – completed overburden batter slopes will be topsoiled and grassed immediately following construction. Areas of exposed earthworks with the potential to generate discharges of sediment laden runoff will be stabilised by 30 April each year. Topsoil mounds will be grassed if left in place beyond 30 April.

4. Conclusions

Sediment control measures put in place will include manage the potential for discharges of sediment laden stormwater by directing water flows, temporary diversion and treatment of water before it is released into the receiving environment. These measures will minimise and avoid, the actual and potential adverse effects and maintain the quality of water. Following the completion of each earthworks season, the area of works will be restored and rehabilitated with the progressive transition of the Peagram OBDA for use as pasture.

A detailed Erosion and Sediment Control Plan regarding these measures will be prepared and forwarded to the Northland Regional Council immediately prior to each earthworks season as required by the conditions of consent [AUT.039161.01 - .04.01]. This final detailed Erosion and Sediment Control plan can also be provided to the Whangarei District Council prior to each earthworks season.



Otaika Quarry – Pegram Overburden Disposal Area

Erosion and Sediment Control Management Plan

Background

This Erosion and Sediment Control Management Plan is for earthworks associated with the deposition of overburden material in the Pegram Overburden Disposal Area (Pegram OBDA) located within a broad gully adjacent to the Otaika Quarry operational area.

The overburden material will consist of topsoil, clay, greensand, limestone and highly weathered greywacke which is required to be removed from the quarry pit prior to the extraction of rock.

Erosion and Sediment Control for the Pegram OBDA will be undertaken in general accordance with this Management Plan. Erosion and Sediment Control Plans, based on this Management Plan, will be prepared prior to each earthworks season.

Location and Site Description

The earthworks will be located within a broad gully currently in pasture to the north of the quarry operational area. The gully contains a watercourse which discharges to the Te Waiiti Stream located to the east of quarry entrance road.

The attached development plans show the location and extent of the earthworks.

A watercourse is located in the base of the gully which discharges to the Te Waiiti Stream. Base flow in the watercourse is from springs and seepages located at the heads of small gullies and in the invert of the watercourse.

The catchment area of the watercourse to the quarry entrance road is approximately 51 hectares.

Indicative natural slopes within the footprint of the Pegram OBDA are 12 degrees. The retaining bund downstream slopes are made up of 10m high fill batters sloping at 27 degrees separated by catch benches. The final slopes on the retained overburden will be 10 to 12 degrees.

In total, the earthworks extend to some 16.7 hectares. The area of active earthworks exposed at any one time in the OBDA will be restricted to 3 hectares.

Scope of Earthworks

The earthworks are required for the deposition of overburden material arising from Otaika Quarry.

The overburden material from the quarry will be placed within the Pegram OBDA in distinct earthwork seasons at three to five year intervals with each earthworks season being some 6 to 8 months in length. The actual timing and extent of each earthworks season will depend upon market conditions as these will influence the amount of rock required to be exposed in the quarry.

The earthworks will generally be undertaken over the months of October to April however there may be a need to deposit overburden at other times. Appropriate erosion and sediment control measures and procedures will be put in place whenever the earthworks are undertaken which will include consideration of the time of year the works are undertaken.

Areas of overburden placement will be stabilised against erosion at the completion of each overburden stripping season. The exception will be haul roads to be used in subsequent earthworks seasons. Stabilisation will include top soiling and grassing of completed earthwork surfaces and the bunding and containment of stormwater runoff from uncompleted areas such that discharges of sediment laden water are minimised.

Access to and from the overburden disposal area will be via a haul road from the quarry operational area. This haul road will extend into the overburden disposal area from the quarry operational area. Stormwater arising from this haul road will be captured and settled in roadside treatment sumps prior to discharge.

The earthworks development includes an initial enabling works phase with the construction of the haul road from the quarry operational area, the construction of a shear key and toe bund, the installation of subsurface drainage, the placement of material at the base of the OBDA, and the formation of a surface water diversion channel.

When the enabling works phase is completed, the 'general works' phase will commence and overburden material from the quarry will be placed in layers to form an overburden disposal area building on material placed in the enabling works.

Topsoil arising from the development will be stored in mounds in the upper areas of the overburden disposal area for subsequent placement on the final batter faces. During later stages of the earthworks, topsoils arising from the development may be placed directly on completed slopes.

The layout and extent of works are shown on the attached plans.

Programme of Works

The overburden disposal activity will occur in two distinct phases being an 'enabling works' phase and a 'general works' phase.

The enabling works are preparatory works required to be undertaken prior to the successive 'overburden campaigns' during the 'general works' phase.

In any earthworks season, the following works will generally be undertaken:

Haul Road – a haul road will be constructed/extended to the Pegram OBDA from the quarry operational area. This road will initially give access to the gully invert to enable the construction of the shear key, subsurface drainage and retaining bund, and subsequently to maintain access to the active overburden disposal area as works proceed.

Stormwater arising from this haul road will be captured and settled in roadside treatment sumps

prior to discharge to land. The road surface and watertables will be maintained to avoid the build-up of sediment.

Shear Key and Toe Bund – surficial clays and soils will be progressively excavated from the shear key footprint down to a suitable foundation material for the placement of rock which will form the shear key to the retaining bund for the overburden disposal area.

Toe and perimeter bunds will be formed from top soils excavated from the footprint of the shear key and retaining bund.

Surface water and seepages will be piped through these works. Runoff from disturbed areas will be ponded and settled prior to discharge.

Subsurface Drainage – subsurface drainage will be constructed in the invert of the watercourse commencing at the toe of the overburden disposal area. The aggregate materials used in the subsurface drains will be sourced from the quarry. Subsequent subsurface drains will be placed according to the stage of the earthworks development.

Subsurface drainage will be installed to provide separation of the earthworks from flow in the gully inverts. 110mm diameter solid pipes will be used to convey flow under the earthworks. Each pipe will generally be able to discharge approximately 14 litres per second. 110mm diameter slotted pipes will also be installed in the watercourse invert to collect seepage from under the placed material.

Retaining Bund – a retaining bund will be constructed from rock and greensand at the base of the overburden disposal area. Any in-situ material required to be excavated from beneath the toe bund will be deposited within the upper areas of the OBDA. The downstream slopes of the retaining bund will be progressively top soiled and sown as they are formed.

Surface Water Diversion Channel – to be constructed in stages commencing at the downstream end of the diversion channel. The channel will be progressively stabilised with rock armouring where appropriate, with the disturbed area adjacent to the channel works stabilised by mulching. Disturbance to be limited to the channel excavation and immediate adjacent area.

The works will be undertaken in dry weather conditions with surface flow diverted into the diversion channel as sections of the channel are completed.

The works to connect the diversion channel with the upstream and downstream watercourse will be undertaken over a minimal time period in dry weather and in low flow conditions.

Undisturbed Buffer – an undisturbed buffer below the gully toe bund will be left to separate the earthworks from the downstream watercourse. Topsoil will be used to create a bund between the buffer area and the earthworks. Soils on the sides of the gully will not be disturbed until the subsurface drainage has been installed, and then only enough soils will be removed to allow immediate placement of overburden. Drainage from the earthworks surface will be progressively directed upstream of the earthworks area.

Topsoil removal – topsoil located within the footprint of the earthworks will be progressively removed but only enough at any one time to facilitate immediate development. Topsoil removed from the initial development of the OBDA will be placed in topsoil mounds towards the rear of the first stage of the overburden disposal area development. During later stages of the earthworks, top soils arising from the development may be placed directly on completed batter slopes.

Overburden Deposition – overburden deposition will commence with the placement of material in lifts commencing at the toe of the gullies. The OBDA will be developed such that its upper surface has a fall back towards the back (upstream) part of the disturbed area where ponding areas will be constructed. The subsurface drainage will be extended up the secondary gullies as the development proceeds.

Reinstatement – completed slopes will be top soiled and grassed immediately following construction (subject to suitable weather and growing conditions).

Sediment Control Methodology

The following sediment control methods will be used to minimise discharges of sediment laden stormwater.

Interception of Clean Water Flows – clean water flows from the catchments above the overburden disposal area will be intercepted up-slope of the fill area and directed to the subsurface drainage. This will be achieved by channels and bunds upslope of the works, and ponding areas draining to the subsurface drainage under the deposited material.

Vegetation Buffer Strip – a grassed buffer strip will be retained around the earthworks especially across the base of the gully between the works and the watercourse.

Stabilised Earthwork Surfaces – In addition to the buffer, the initial toe retaining bund to be constructed at the base of the OBDA prior to overburden being placed will be constructed from rock sourced from the quarry and the batter slope will be constructed with granular greensand material. The use of rock and greensand in these areas will provide a semi-stabilised surface with respect to stormwater runoff.

Ponding of Stormwater Flows – the retained overburden will be deposited in a series of lifts with a bund being maintained around the front (downstream) edge of the disposal area at all times. The overburden will be placed so that the earthworks surface slopes back to the rear (upstream) area of the earthworks to avoid discharges of stormwater over the front (downstream) edge.

Sediment retention ponding areas will be developed to the rear of the earthworks, discharging beneath the earthworks via the subsurface drainage to the watercourse. The earthworks will be scheduled such that stormwater discharges from the surface of the overburden disposal area will be to sediment retention ponding areas.

The sediment retention ponding area will generally migrate up the gully inverts as the development of the OBDA proceeds. With each stage of the development the subsurface drainage and the stormwater drain will be extended up to the new location of the sediment retention ponding area.

The sediment retention ponding areas will be sized to be at least 2% of the contributing catchment area (earthwork slopes less than 10%). The earthworks surface will be roughened to reduce the volume of stormwater runoff. The earthworks surface draining to each ponding area will generally be limited to less than 2.0 hectares.

The discharge from ponds will be via a pipe laid beneath the overburden. Interim drainage (while the earthwork surface is being initially developed) may be by infiltration into the underdrainage.

Sediment ponding areas will be inspected daily while earthworks are being undertaken and following rainfall events (greater than 20mm of rainfall recorded in the previous 24 hours). Excess sediment retained in the ponds will be excavated and placed in the overburden disposal area such that it can't be washed back into the ponds.

Sediment ponding areas will generally be decommissioned once the disturbed areas draining to the ponding area has been stabilised against erosion and there is no further use for the pond.

Haul Road – bunds will be maintained along the sides of the haul road to prevent clean water flowing over the road, and to channel runoff from the road surface to the sumps adjacent to the road alignment.

The roadside sumps will discharge to land adjacent to the haul road.

Topsoil Mounds – topsoil mounds will be sited so as to avoid clean water flows washing sediment from the mounds and with the surface roughened to minimise sediment runoff. Topsoil mounds will be re-vegetated if left in place beyond 30 April of any given year.

Sediment Retention Ponding Area – sediment ponding areas will be established and maintained on the earthworks surface while the works are being undertaken and until the disturbed areas have been stabilised against erosion.

Stabilisation against Erosion – completed overburden batter slopes will be topsoiled and grassed immediately following construction. Areas of exposed earthworks with the potential to generate discharges of sediment laden runoff will be stabilised by 30 April each year.

Ponding areas will be left on the earthworks surfaces and the earthwork surfaces will be graded to prevent discharges of sediment laden stormwater. In addition to grassing, materials such as aggregate, rock or mulch could be used to stabilise areas from erosion.

Limitation of Disturbed Area – the extent of disturbed area, comprising the active earthworks surface, slopes and haul roads draining to the watercourse below the works, will be limited to 5.0 hectares at any one time with the active working areas not exceeding 3 hectares, and the area of disturbed ground for batter slopes, haul roads and top soil mounds not exceeding 3 hectares.

Sediment Control Measures and Procedures

Sediment control measures to be put in place will include sediment retention ponding areas, bunds and channels to direct water flows, diversion and ponding of stormwater flows from disturbed areas prior to discharge, stabilisation using rock, aggregate or mulch, and the maintenance of vegetated buffer strips.

Detailed erosion and sediment control measures for each earthworks season of the Pegram OBDA development will be formulated prior to each earthworks season.

A detailed Erosion and Sediment Control Plan will be prepared and forwarded to the Northland Regional Council immediately prior to each earthworks season.

Each Sediment and Erosion Control Plan will include the following:

- A plan showing the location and extent of the earthworks to be undertaken

- The timing and duration of the earthworks
- Areas of vegetation to be removed
- Detailed sediment and erosion control measures to be employed for that earthworks season
- Details and dimensions of sediment retention ponding areas
- Detail and timing of rehabilitation of earthworks at the completion of the earthworks season
- Confirmation that the works will be undertaken in accordance with the conditions of consent

The earthworks contractor will be made aware of these sediment and erosion control measures during the tendering process and while the earthworks are being undertaken. A site meeting to discuss sediment and erosion control will be held with the earthworks contractor prior to each overburden earthworks season. Regular site meetings and inspections to discuss sediment and erosion control measures will be held with the earthworks contractor while the earthworks are being undertaken.