Rehabilitation and Closure Management Plan

For Eagleton Quarry

Report Number 630.10712

August 2017

Eagleton Rock Syndicate Pty Ltd

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Version: Final

Rehabilitation and Closure Management Plan

For Eagleton Quarry

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1 INTRODUCTION

1.1 Background

SLR Consulting (SLR) was commissioned by Eagleton Rock Syndicate Pty Ltd (Eagleton Rock Syndicate) to prepare a Quarry Rehabilitation and Closure Management Plan (RCMP) to accompany a new Major Project Application under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act) for a proposed hard rock quarry located at Eagleton, NSW.

The proposed Eagleton hard rock quarry is located approximately 12 km north of the township of Raymond Terrace (**Figure 1**). The study area for the Quarry RCMP is located on the western part of Lot 2 in Deposited Plan 1108702. Lot 2 has a total area of approximately 100 ha. The eastern part of Lot 2 is occupied by an existing landscape supplies facility (which has been operating at the site for over 10 years and is known as Port Stephens Gardenland). It also comprises of a private residence and an extensive area of undisturbed bushland. The redevelopment of the landscape supplies facility is currently subject of a Development Application (DA) that has been submitted to Port Stephens Council (Council). The quarry and the landscape supplies facility will be operated as two separate, independent and unrelated operations; as such this **RCMP only addresses the disturbance footprint of the quarry operations (fully located within the 'EIS Study Area')**. The EIS outlines further detail regarding the larger 'Study Area'.

The extraction area and associated processing and facilities area of the quarry comprises approximately 30 ha and is located within Lot 2 (

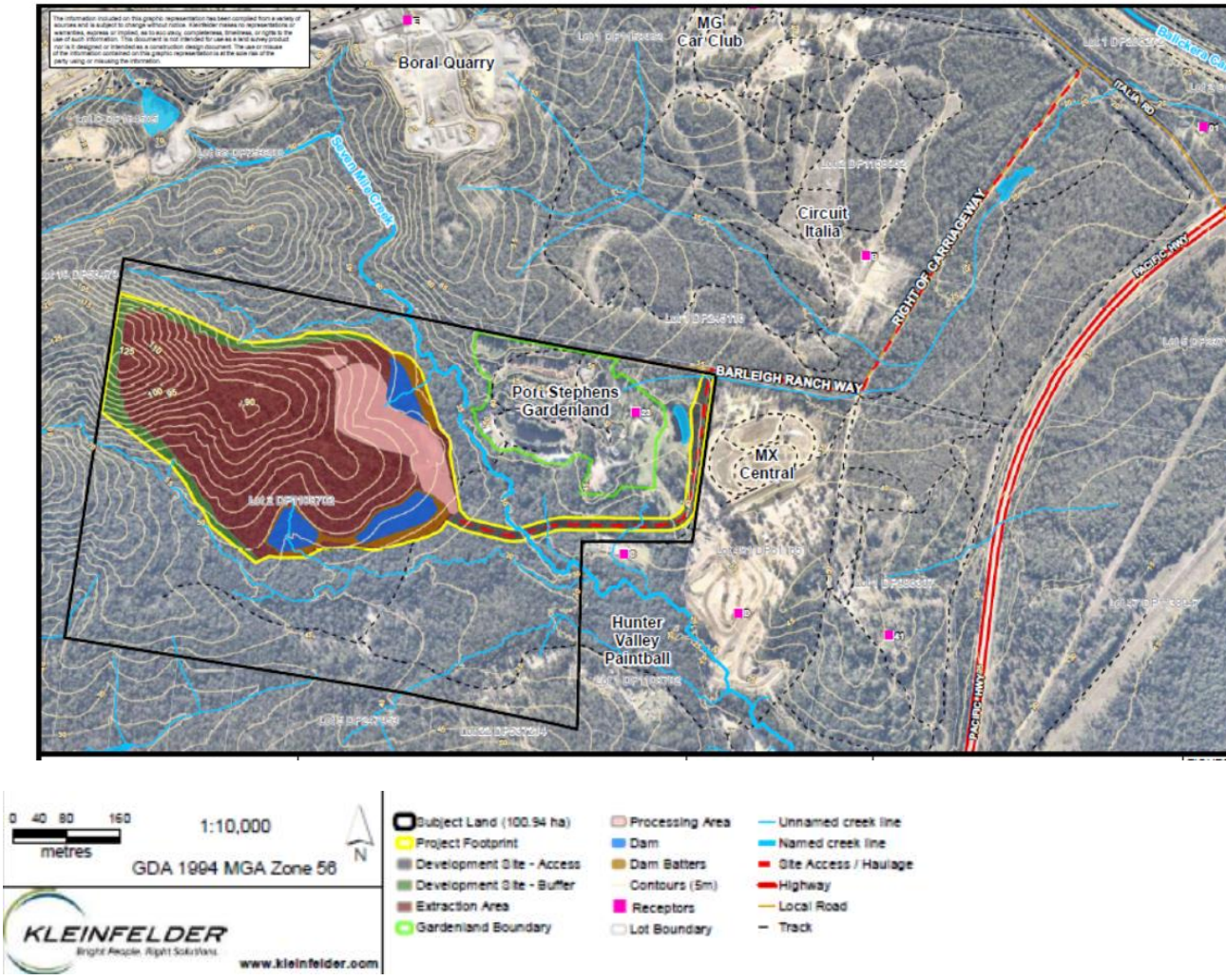

Figure 2).

The Project Site is categorised by predominantly forested area. The site is approximately 1.5km to the west of the Pacific Highway, approximately 2km southwest of the intersection of the Pacific Highway with Italia Road, and approximately 2.5km northwest of Grahamstown Dam.

The project is proposed to extract up to a maximum of 600,000 tonnes per annum for a project life of up to 30 years. The rock resource at the location of the Eagleton Quarry is extensive, and it is expected that it extends beyond the extent proposed for quarrying. If quarrying was not permitted to continue at the site, the area would generally be rehabilitated to a woodland environment consistent with the surrounding landuse. This Plan outlines the methodologies to be undertaken during rehabilitation and closure of the site and documents the closure assumptions to be used by Eagleton Quarry. This Rehabilitation and Closure Management Plan (RCMP) will be progressively reviewed and updated over the life of the operation. It should also be noted that a Final Rehabilitation and Closure Plan will be completed at least three years prior to the planned completion of the operations if an extension to the operating licence is not granted.

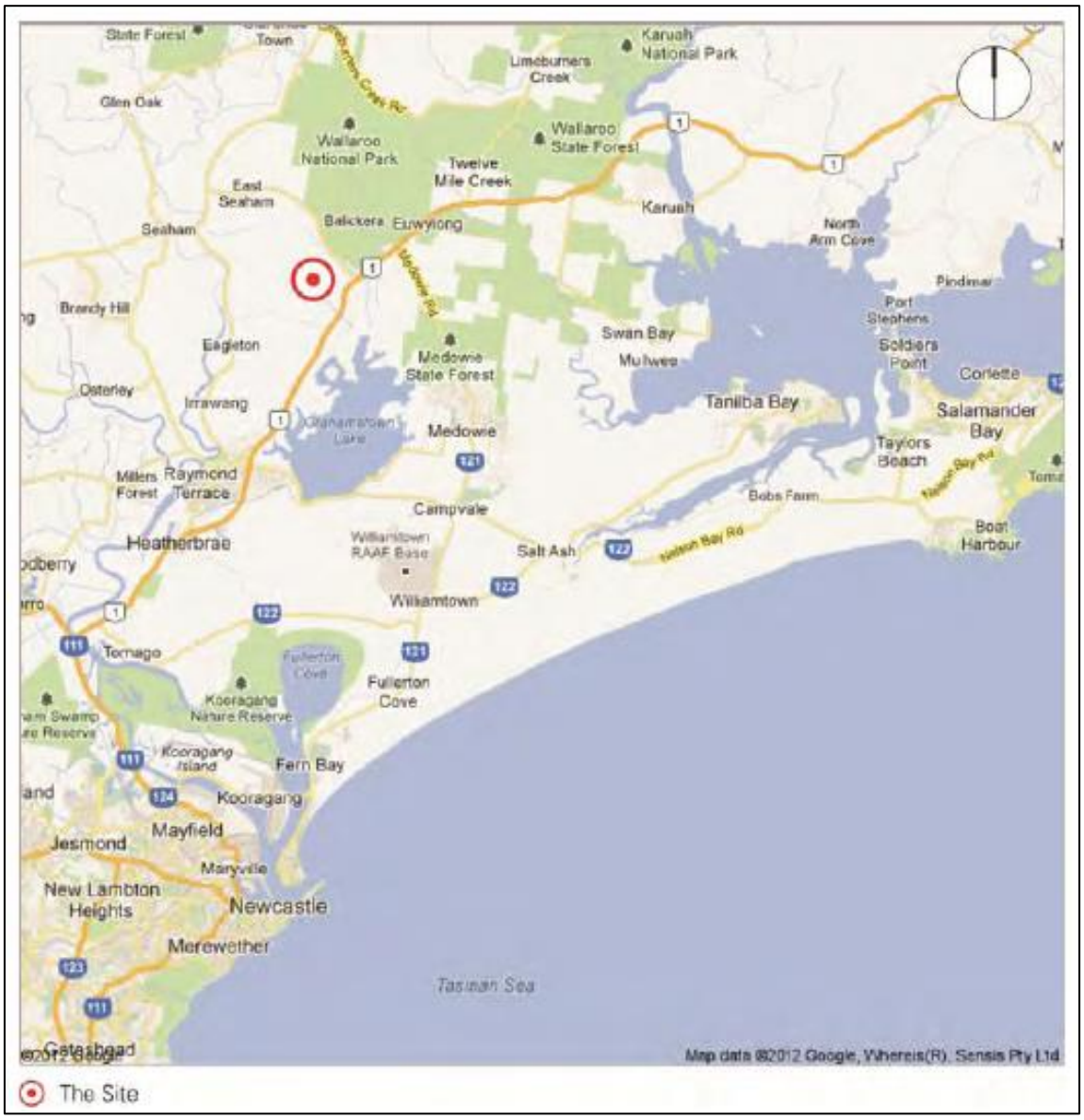

Figure 1 Locality Plan

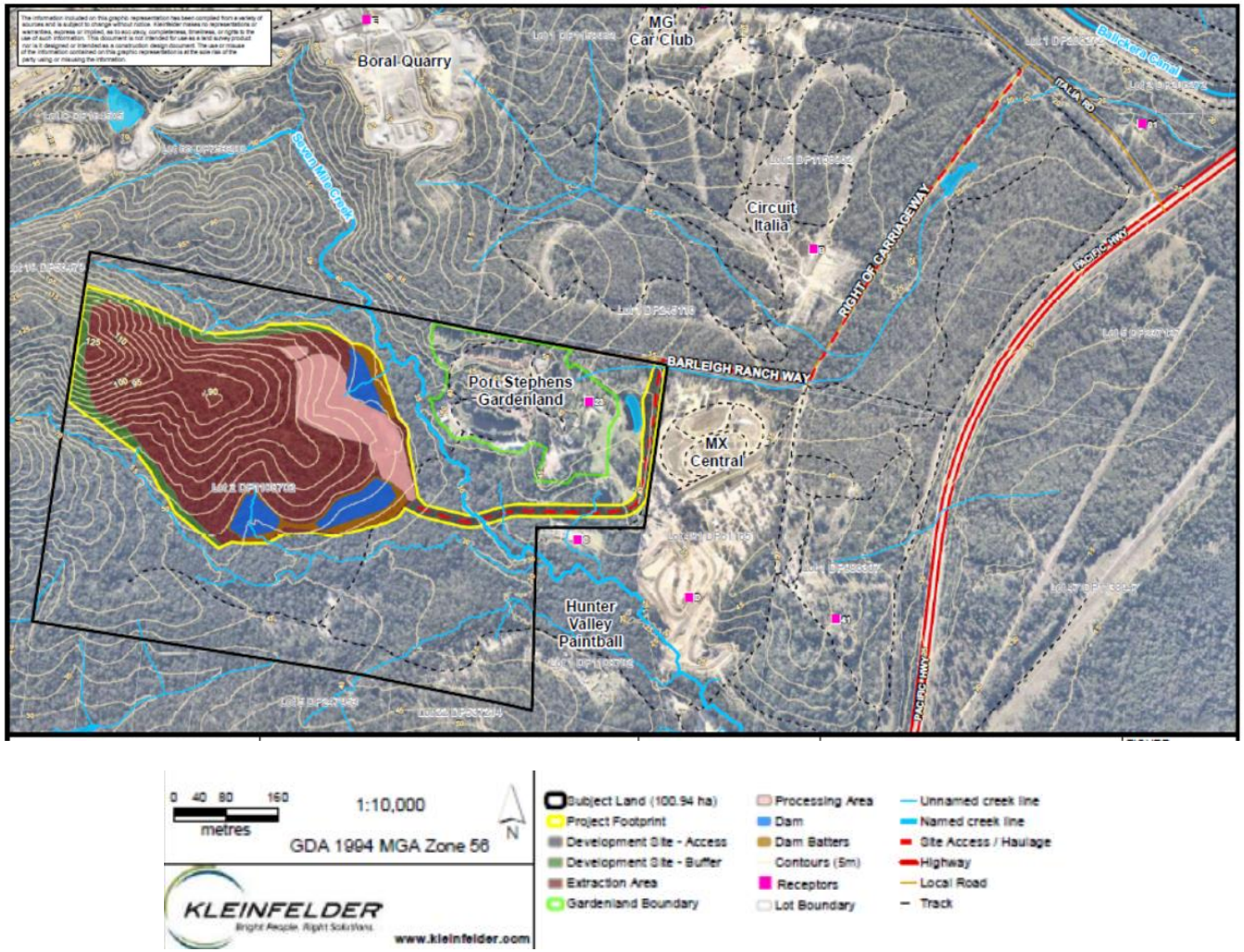

Figure 2 Site Plan

1.2 Purpose

This Plan outlines the methodologies to be undertaken or proposed for the rehabilitation of the site and documents the closure assumptions to be used by Eagleton Quarry. These methodologies will be used to make appropriate financial provisions for the eventual decommissioning and rehabilitation of the site.

The objective of this Plan is to address the key aspects of quarry closure and rehabilitation so that they will meet the Government, community and company expectations. Specifically, the RCMP has been prepared in accordance with the following objectives:

- Achievement of acceptable post-disturbance land use suitability:
    - Rehabilitation will aim to create a stable landform with land capability similar to that prior to disturbance, unless other beneficial land uses are pre-determined and agreed. This will be achieved by setting clear rehabilitation success criteria and outlining the monitoring requirements that assess whether or not these criteria are being accomplished.
- Creation of stable post-disturbance landform:
    - Disturbed land will be rehabilitated to a condition that is self-sustaining, or one where maintenance requirements are consistent with the agreed post- quarry land use.
- Preservation of downstream water quality:
    - That post closure surface waters that leave the site are not degraded to a significant extent. Current and future water quality will be maintained at levels that are acceptable for users downstream of the site.

In order to achieve this it is necessary to coordinate a practical approach that will include, but not be limited to:

- Conducting proven and resilient revegetation techniques that acknowledge altered landform and soil conditions;
- Undertaking sound landform and surface water management design;
- Implementing effective soil management techniques including stripping, stockpiling, re-spreading and appropriate weed control; and
- Establishing a recognised (statistically viable) monitoring program that can compare the progression of revegetated areas against analogue sites and demonstrate that the rehabilitated areas are moving towards a successful outcome.

1.2.1 General Principles of Rehabilitation

Temporary rehabilitation methodologies may be applied to provide short-term stabilisation of areas. Although final land use for Eagleton Quarry has not yet been defined, any rehabilitation that is to be completed will include the following aspects:

- The final landform is stable and not subject to slumping or erosion which would result in the agreed post closure landform not being achieved;
- The water quality of any residual water bodies is suitable for the nominated use and does not have the potential to cause environmental harm;
- The potential for water and wind-induced erosion is minimised including the likelihood of environmental impacts caused by the generation of dust;
- Suitable species of vegetation are sown/planted and established to achieve the nominated post facility closure land use; and
- Monitor rehabilitation success in terms of physical and biological parameters.

1.3 Consent and Lease Requirements

1.4 Response to Adequacy

The then Department of Planning Infrastructure and relevant agencies reviewed the EA submitted on the 15 October 2012. It was found to be inadequate for public exhibition. A summary of their requirements with rehabilitation is provided in **Table 1** and where they have been addressed in this table.

Table 1 Summary of EA Adequacy Assessment

Agency	Details of Requirements	Addressed in this Report
Department of Planning and Infrastructure (Now the Department of Planning and Environment)	• Further information is required in relation to closure and rehabilitation of the site, in the event that quarrying does not continue beyond the 30 year life of the project, and for those areas of the site no longer subject to a viable quarrying resource. In particular, further information on the final landform topography, drainage and water management and land use options/ preference should be provided. Further, the EA should consider presenting staged rehabilitation options where staging of such can be achieved within the life of the project. • Further consideration of relevant strategic land use planning or resource management plans or policies, including future interactions with Kings Hill conservation and residential areas should be provided in the context of rehabilitation and closure of the site. • The EA would benefit from presentation of the approximate volume of overburden material likely to be generated by the project, to contextualise closure and rehabilitation plans (for which overburden is intended to be used), the assessment of dust generation from the site, and location, management and design of proposed overburden stockpile areas.	Section 6 Section 3 and 6.2 Section 6.1.3
Port Stephens Council	• A rehabilitation plan for the quarry needs to be drafted that includes details on the long term ownership and management of the quarry post extraction. It is particularly important considering the preliminary assessment discusses that the revegetation of the quarry area to its pre-existing vegetation condition would be unlikely to be feasible.	Section 3
Office of Environment & Heritage	• Proposed surveys, such as pre-extraction baseline, pre-clearance and rehabilitation surveys • Details of any rehabilitation program, including details of timing (including proposed staging details), rehabilitation measures (including details of proposed revegetation and species mix), and post rehabilitation monitoring	Section 6.7 Section 6.3

1.5 Secretary's Environmental Assessment Requirements

Table 2 Summary of EA Adequacy Assessment

Agency	Details of Requirements	Addressed in this Report
Department of Planning and Environment (DP&E)	• A rehabilitation strategy to apply during, and after completion of, extraction operations, and proposed final use of site; and	Section 6
	• Rehabilitation – including the proposed rehabilitation strategy for the site having regard to the key principles in the Strategic Framework for Mine Closure, including: – rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria; – nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies; and – the potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region.	Section 3.3, 3.4, 6.7 & 8.4.4
Department of Primary Industries - Water (DPI Water)	• Details of the final landform of the site, including final void management (where relevant) and rehabilitation measures.	Section 6.2
	• The EIS should address the potential impacts of the project on all watercourses likely to be affected by the project, existing riparian vegetation and the rehabilitation of riparian land.	Section 6.5 of the Water Resources Assessment
	• Where significant modification to landform is proposed, the EIS must include: – Justification of the proposed final landform with regard to its impact on local and regional surface and groundwater systems; – A detailed description of how the site would be progressively rehabilitated and integrated into the surrounding landscape; – An outline of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation; and – The measures that would be established for the long-term protection of local and regional aquifer systems and for the ongoing management of the site following the cessation of the project.	Section 6
	• Proposed rehabilitation procedures during, and after completion of, extraction operations, and proposed final use of site.	Section 6
	• Aspects of the management of the proposal, both during construction and after completion, which relate to impact minimisation and site rehabilitation eg Environment Management Plans, Rehabilitation Plans, Compensatory offsets.	This report

1.6 Response to Issues Raised in Exhibition Period

There were three issues raised during the exhibition period for Eagleton Quarry relating to rehabilitation and final landform. These issues are outlined in **Table 3**.

Table 3 Response to Issues from Exhibition Period

Agency/ Organisation	Issue	Comment
Boral	Topsoil stripping management and location	Topsoil stockpiles are to be located away from traffic areas and watercourses. The proposed locations of topsoil stockpiles will not be determined until clearing has been undertaken. See **Section 6.1.2**.

Agency/ Organisation	Issue	Comment
Boral	Different bench and batter heights	Benches are proposed at 12.5 metres wide for every 12.5 metres of depth.
Port Stephens Council	Specific details have not been provided on how the proposed final landform will form part of the surrounding landscape including linkages to existing waterways and fauna movement corridors. Further details on how rehabilitation objectives will be achieved to post quarry landforms is required.	Corridors will be viable along the western benches of the quarry within the first five years of quarrying through the addition of topsoil, mulch and seeds or tube stock. The floor of the quarry final land form will include depressions and drainage lines linking to established dams, before connecting to the existing creeks. In this manner the final landform in the longer term has the potential to increase the connectivity for some fauna through removal of the currently, steep and exposed rocky hill. The proposed disturbance area for Eagleton Quarry dominated by Seaham Spotted Gum – Ironbark Forest with Hunter Valley Moist Forest interspersed. The broad rehabilitation objective for the post-quarry landform is to establish a similar landuse on the disturbed areas (woodland). By undertaking progressive rehabilitation and rehabilitation of all disturbed areas prior to final closure, this will assist in the development of linkages with the remnant vegetation. Locally endemic species will be used in the seed mix to assist with linkages. This plan will be implemented through the life of the operation, with adaptive management activities undertaken based on monitoring data and the quality of rehabilitation.

1.7 Land Ownership

The Eagleton Quarry site is located on part of Lot 2 DP 1108702, located on Barleigh Ranch Way, Eagleton. The quarry site forms the part of Lot 2 to the west of the Six Mile Creek. The land is owned by the owner and operator of the existing landscape supplies business which operates on the eastern part of Lot 2 DP 1108702. The right of carriageway upon which access to the proposed Eagleton Quarry site relies is located on private land legally described as Lot 2 DP 1158962 and Lot 1 DP 245116.

1.8 Overview of Operations

The Eagleton Quarry Project is for the extraction of a hard rock reserve that is a mixture of various igneous and sedimentary rock formations (including conglomerate, rhyodacite and rhyolite materials). The rock product has been identified to suit the local and regional construction markets. The site will be a greenfield site that requires clearing of established vegetation communities and the establishment of new infrastructure and equipment.

The Eagleton Quarry proposal incorporates a 30 year quarry operations area of approximately 30 ha which includes a processing, sales and administrative area. A maximum extraction rate of up to 600,000 tonnes per annum is planned to be extracted from the site annually which is anticipated to be achieved within the first 5 years of operation.

The quarrying process will generally involve the following:

- Clearing of vegetation and topsoil stripping – approximately 30 ha of vegetation is required to be cleared for the ultimate quarry footprint, however this would mostly take place sequentially as the quarry develops over time;
- Improvements to the access roads;
- Construction of internal site access road and quarry haul roads;
- Construction of the processing area;
- Construction of initial water containment cells;
- Drill and blasting of the quarry face;

- Ripping and removal of the material by excavator and truck to the stockpile area;
- Crushing and sorting of raw material ready for transport; and
- Progressive rehabilitation of worked quarry areas when available.

The processing area will provide for stockpiling of extracted material, mobile or modular crushers, screening plant and pug mill. The processing area will be located generally on the part of the site that is already cleared and graded.

The administration area will include the administration, sales stock pile areas, training and staff amenities, laboratory test room, weighbridge, refuelling tanks, and maintenance area.

All trafficked areas internal to the site including the processing areas, the administration area and the internal site access road will be compacted crushed rock finish.

2 THE EXISTING ENVIRONMENT

This section includes a description of the existing environment which sets the basis on which a number of potential post quarrying land uses have been considered as part of this RCMP.

2.1 Site Description

The site is located in an area of undulating hills and is heavily wooded with a mix of mature trees and regeneration with vegetation type Seaham Spotted Gum – Ironbark Forest. Past logging is evident by regrowth, old logging camps and stumps.

The site is on a west to east trending spur which ranges from approximately 120m AHD at the north western boundary to about 30m AHD in the southeast. The site is split north-south by Six Mile Creek, which has a minor tributary running east-west through the site. Six Mile Creek conveys water to the south-east spilling Grahamstown Dam. As such, the site is within the drinking water catchment of Grahamstown Dam into water management is outlined in the Water Management Plan.

The site has a number of un-sealed partially formed vehicle tracks, including an existing crossing of Seven Mile Creek, and an area of approximately 0.6 ha which has been cleared and graded.

2.2 Land Use

The part of the proposed Eagleton Quarry site is occupied by an existing landscape supplies facility, a private residence and an extensive area of undisturbed bushland.

The site is surrounded by a number existing residential uses including:

- Seaham quarry is located on an adjacent lot to the north and northwest and is operated by Boral.
- The MG Car Club located at Lot 1 DP 1158962 to the northeast of the proposed Eagleton Quarry.
- Lot 2 DP 1158962 to the northeast of the proposed Eagleton Quarry is owned privately. A Development Application has been lodged for this land for a racing facility.
- Hunter Valley Paintball is located at Lot 1 DP 1108702 to the southeast of the proposed quarry.
- Hunter MCC Raceway and MX Central are located at Lot 481 DP 611651 to the east of the site.

2.2.1 Sensitive Receptors

There is a residential dwelling located adjacent to the lands cape supplies operation, otherwise the nearest residential dwellings are located approximately 1km to the southwest of the site along Six Mile Road. There is a single residential dwelling located to the northeast of the site, located on Italia Road between the intersections with the Pacific Highway and the right of carriageway. This dwelling is approximately 1.8 km away from the quarry site. The nearest dwelling to the west is approximately 2km away.

2.3 Soil, Landform and Geology

Geology across the site varies, including sandstone, course conglomerate and fractured igneous rock. Reference to the Statewide Geology GIS database and the Newcastle 1:100,000 Geology Sheet indicates that three geological units are present near the site, as follows:

- The Italia Road (Cui) comprises sandstone, shale and coal. This is shown as sub cropping at the eastern side of the site.
- The Balickera Conglomerate (Cul) comprises conglomerate, rhyolite, tuff and ingnimbrite and is shown as sub cropping over the remainder of the site.
- The Eagleton Volcanics (Ceg1e) comprises lithic sandstone, tuffs, rhyodacitic lavas, volcanic breccia and conglomerate and sub crops to the north west of the site.

Erosion of these units has created the predominantly northeast-southwest trending hills at and around the site. Cross-faulting and associated fracturing controlled drainage evolution, such as Seven Mile Creek, to produce the general northwest-southeast trending creeks in the area around the site.

Estuarine and alluvial sediments comprise the surficial and shallow geology in the low-lying areas flanking the hills where the site is located. These sediments consist of sands and gravels interbedded with clays and silts.

2.4 Ecology

The proposed development will remove approximately 30 ha of the 100 ha study area (**Figure 3**). This removal will include (Kleinfelder / Ecobiological 2013):

- 1.7 ha of the Hunter Valley Moist Forest;
- 27.1 ha of the Seaham Spotted Gum – Ironbark Forest; and
- 1.6 ha of Cleared Land.

The majority of the disturbance footprint is composed of the Seaham Spotted Gum – Ironbark Forest with only a small component of the Hunter Valley Moist Forest to be disturbed. However, the Seaham Spotted Gum – Ironbark Forest is closely related to the Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion Endangered Ecological Community.

Additionally, there are cleared areas (14.8 ha) within the site that consist of tracks and residential/ industrial buildings associated with Port Stephens Gardenland, and there are also several dams (0.6 ha) within the works of Gardenland.

2.4.1 Koala Presence and Habitat

Targeted surveys revealed the presence of koalas in the study area although there were no sightings were within the development footprint. A small area in the south of the study site is mapped as preferred Koala habitat.

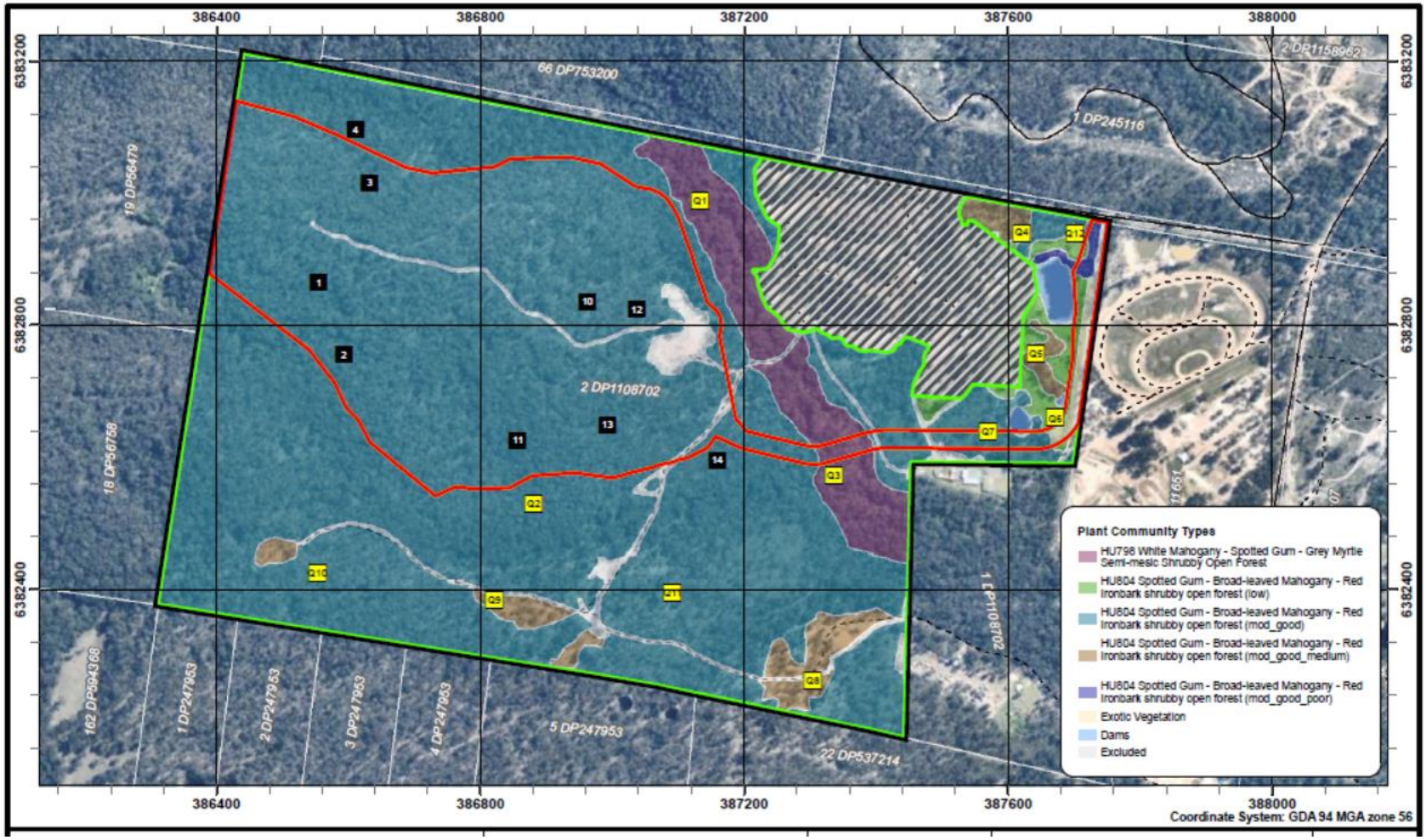

Figure 3 **Plant Types and Vegetation Zones (Kleinfelder 2017)**

2.5 Catchments, Hydrology and Meteorology

2.5.1 Catchment and Site Hydrology

The surface water characteristics of the site are dominated by Seven Mile Creek which runs through the site from north to south. The Seven Mile Creek catchment is typically steep with undulating hills covered with woodland areas and some pastoral grasses. The vegetation within the catchment exhibits considerable variation in the density of the undergrowth.

Downstream of the site, Seven Mile Creek flows in a south easterly direction through woodland area, under the Pacific Highway and down to Grahamstown Dam approximately 2km to the southeast of the site. The Creek is a minor ephemeral stream with intermittent flow of short duration, however, water quality is significant as the proximity to Grahamstown Dam places the site within the Newcastle drinking water catchment.

Further water management controls are outlined in the Surface Water Assessment.

3 OBJECTIVES OF THE REHABILITATION AND CLOSURE MANAGEMENT PLAN

Planning for rehabilitation and closure includes identifying the timing of the planning process, considering issues which relate to specific rehabilitation methods and economical and community objectives, as well as making sure adequate financial provisions have been set aside.

The general objective adopted in the development of this RCMP is to derive the most appropriate option(s) for closure in terms of performance and cost.

3.1 Post Quarrying Land Use

The proposed quarry activities will not have a significant impact on land capability in the area. No impacts will occur on adjacent lands and the only impacts will be associated with the area immediately impacted by the quarry operation.

The area contains a valuable state resource and the proposed development will involve extracting this resource prior to returning the area to native vegetation.

Throughout the life of the quarry, progressive rehabilitation activities will be undertaken. Following completion of extraction, the remaining disturbed area will be rehabilitated and returned to native vegetation (woodland). The land capability of this area will not alter from current land capability although the area of the void will be altered in terms of topography. The land is currently not suited for grazing or agriculture and is best vegetated using a woodland seed mix to create an open forest environment.

3.2 Post Quarrying Goals

The area is dominated by Seaham Spotted Gum – Ironbark Forest with Hunter Valley Moist Forest interspersed. The broad rehabilitation objective for the post-quarry landform is to establish a similar landuse on the disturbed areas. The topography of the final landform will consist of a large number of 12.5m stepped benches formed in an amphitheatre configuration, each with a revegetated bench (**Plate 1**). The final pit/void will be approximately 28.6ha in area. Until such time that extraction has ceased, rehabilitation will occur around the perimeter of the pit only along the benches, and will not involve the pit floor. The primary purpose of rehabilitation during the operational phase is to mitigate any visual impacts.

Once operations have ceased, all buildings and infrastructure will be removed from the hardstand. These areas will be reshaped and ripped where necessary for topsoiling and revegetation. The pit floor (void area) will be vegetated with appropriate native species to create a stable wetland. The wetland will be formed as a shallow depression with the low point in the location of the final retention pond in the south east corner of the void.

Plate 1 Example of Bench Rehabilitation

3.3 Rehabilitation and Closure Objectives

The objectives of this RCMP are to:

- Providing an overall framework for quarry closure – including rehabilitation and decommissioning strategies that are consistent with stakeholder expectations;
- Establishment of clear and agreed criteria that can be used to provide the standard against which the final rehabilitation and post-quarrying land use can be assessed;
- Ensuring that the needs of employees and the local community are appropriately considered and addressed in the closure planning process, with an emphasis on generating minimal negative impacts;
- Ensuring the closed facility does not pose an unacceptable risk to public health and safety, it needs to be safe, stable and non-polluting;
- Minimise the environmental impact of the operation during the development and operational phases, ensuring that protection of water quality and erosion control works are key priorities, and to ensure progressive rehabilitation is completed as soon as possible;
- Ensure that vegetative matter and topsoil is made available for the site rehabilitation as required;
- Where practical, ensuring that consideration is given to the biodiversity value of the surrounding area and the integration of these values with the final land use ;
- Restore ecosystem function including maintaining or establishing self-sustaining ecosystems by: reinstating wildlife corridor value, planting local native species and creating a landform consistent with the surrounding environment;
- Minimise visual impact of the operation during the operational phase as well as post-quarrying;
- Ensuring surface water dams identified to be retained will be safe, self-sustaining and functional for the post-quarrying land uses. In addition, they should be constructed to drain to the natural environment;
- Reducing or eliminating adverse environmental effects once the site ceases operation;

- Ensuring closure is completed in accordance with leading industry practice, including the removal of all surface infrastructure;
- Ensuring that the site, and any nominated infrastructure, can be put to a suitable beneficial use post closure to minimise the adverse socio-economic effects associated with closure; and
- Produce a final landform that is geotechnically stable that blends aesthetically into the surrounding landforms, yet as far as possible does not limit possible future land uses.

3.4 Performance Indicators & Completion Criteria

Rehabilitation success criteria have been developed to provide long-term performance goals for rehabilitation activities. The rehabilitation success criteria presented in **Table 4** are considered conceptual, and will be developed further following consultation with the relevant stakeholders during the detailed quarry closure planning stage. The success criteria are performance objectives or standards against which rehabilitation success in achieving a sustainable system for the proposed post-quarry land use is demonstrated. Satisfaction and maintenance of the success criteria (as indicated by monitoring results) will demonstrate that the rehabilitated landscape is ready to be relinquished from the quarry's financial assurance and could be handed back to stakeholders in a productive and sustainable condition.

The success criteria comprise indicators for decommissioning, landform establishment, final void development, grow medium development, ecosystem establishment and development, and relinquishment that reflects the nominated post-quarry land use of native forest vegetation.

For each element, criteria that define rehabilitation success at quarry closure are provided. Based on the generic criteria in **Table 4**, each criterion will be further developed to be specific, measurable, achievable, realistic and outcome based, and to reflect the principle of sustainable development. This will be based on results of further research and ongoing monitoring of the progressive rehabilitation areas. The success criteria will be reviewed every five years based on rehabilitation results and current industry guidelines.

Table 4 Preliminary Rehabilitation Success Criteria

Rehabilitation Element	Rehabilitation Success Criteria
Decommissioning	• Remove all nominated infrastructure (except those used by the public or unless stakeholders have entered into formal written agreements for their retention); • Make safe any remaining footings; • Remove all remaining rubbish and debris; • Removal of all mobile machinery from the site; • Removal of all petroleum, chemicals and explosive products from the site; and • Access to members of the public and livestock is restricted as appropriate to site conditions.
Landform Establishment	• Create a stable land form; • Average soil loss per annum per domain unit is <40 tonnes/ha/yr (sheet erosion). • Erosion mitigation measures have been applied to ensure slope stability. • Final landform is consistent with surrounding landforms; • Establish drainage systems (contour banks and diversion drains as part of batter formation to ensure stability; • Constructed contour banks and diversion drains to direct water into the new REA pollution control pond; and • Completed batters to be top-dressed and sown within six months of completion.
Final Void	• High wall faces exhibit long-term geotechnical stability and a geotechnical report has been completed. • Competent rock high wall to have slope of <70° to the horizontal. • Ramp walls not backfilled exhibit long-term geotechnical stability and a geotechnical

Rehabilitation Element	Rehabilitation Success Criteria
	report has been completed. • A minimum slope of the order of 1 per cent will be applied to the quarry floor to ensure that runoff from the quarry operational areas occurs post closure (rather than ponding.
Growth Medium Development	• Progressively remove and stockpile available topdressing material from the disturbed areas; • Respread topsoil/topdressing media at a depth of at least 15 cm. Where topsoil is not available other soil ameliorates will be used; • Areas designated for forest rehabilitation will be deep ripped and then direct seeded with a mix of native tree and shrub species which is blended with an appropriate application of fertiliser or other ameliorant as determined by soil testing; • Benchmark soil structure and nutrient status to establish target soil condition; • Determine soil characterisation of the topdressing material and treat as necessary with soil conditioners and fertilisers; • Topsoil stockpiles will be less than 2 m high, 4 m wide at the base, and of a length governed by the amount of topsoil generated; and • Undertake follow-up soil testing as considered necessary.
Ecosystem Establishment	• The introduction and spread of weeds and pests should be prevented and an active program in place to minimise their presence; • Undertake vegetation monitoring as required to determine target community structure and floristics; and • Sow initial coloniser species with follow-up sowing and/or tubestock planting as required.
Ecosystem Development	• Evidence of active use of habitat provided during rehabilitation such as logs and signs of natural generation of shelter sources including leaf litter; • Presence of representatives of a broad range of functional indicator groups involved in different ecological processes; • Typical food and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present; • Water quality of the receiving waters is not affected by surface water runoff from the site, discharge water meets the contaminant limits (EC, pH, TSS and oil and grease); • Nutrient cycling and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts; • Representation of a range of species characteristics from each fauna assemblage (e.g. reptiles, birds, mammals) based on analogue rehabilitation monitoring reference sites; • Continue monitoring until self-sustaining levels are confirmed; and • Undertake maintenance work as required – including soil treatment, erosion control, weed spraying and re-sowing.
Relinquishment	• Meets the criteria in the 'Ecosystem Development' rehabilitation phase. • Establishment of a self-sustaining vegetation community compatible with the chosen land use. • The quality of water leaving the site should be such as not to cause no significant deterioration of water quality to the downstream beneficial use(s) or water quality objectives of the receiving waters declared under the Section 73 of the water Act (1992).

4 LEGAL REQUIREMENTS AND GUIDELINES FOR REHABILITATION AND CLOSURE PLANNING

Federal, State and Local Governments have formulated regulations, policies and guidelines that relate to closure and decommissioning. This RCMP has been developed to be consistent with the objectives of these key policies and guidelines. This section describes only the legislation that is relevant to rehabilitation and closure.

4.1 Key Legislation

4.1.1 Environmental Planning and Assessment Act 1979

The development assessment and approval system for NSW is outlined in Parts 4 and 5 of the *Environmental Planning and Assessment Act 1979 (EP&A Act).* Objectives of the EP&A Act include:

"(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

(ii) the promotion and co-ordination of the orderly and economic use and development of land,

(iii) the protection, provision and co-ordination of communication and utility services,

(iv) the provision of land for public purposes,

(v) the provision and co-ordination of community services and facilities, and

(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and

(vii) ecological sustainable development ..."

This Plan has been prepared with consideration of the *EP&A Act.*

4.1.2 Protection of the Environmental Operations Act 1997

The objectives of the Protection of the Environmental Operations Act 1997 (POEO Act) are outlined below:

(a) to protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development,

(b) to provide increased opportunities for public involvement and participation in environment protection,

(c) to ensure that the community has access to relevant and meaningful information about pollution,

(d) to reduce risks to human health and prevent the degradation of the environment by the use of mechanisms that promote the following:

(i) pollution prevention and cleaner production,

(ii) the reduction to harmless levels of the discharge of substances likely to cause harm to the environment,

(iia) the elimination of harmful wastes,

(iii) the reduction in the use of materials and the re-use, recovery or recycling of materials,

(iv) the making of progressive environmental improvements, including the reduction of pollution at source,

(v) the monitoring and reporting of environmental quality on a regular basis,

(e) *to rationalise, simplify and strengthen the regulatory framework for environment protection,*

(f) to improve the efficiency of administration of the environment protection legislation,

(g) to assist in the achievement of the objectives of the Waste Avoidance and Resource Recovery Act 2001.

This Act has been considered in the preparation of this Plan, in particular in the management of water and waste from the Eagleton Quarry operation.

4.1.3 State Environmental Planning Policy 44 Koala Habitat Protection (SEPP 44)

The aim of SEPP 44 (NSW 2000) is to, as far as possible, preserve Koala habitat in the state. SEPP 44 encourages the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.

Under SEPP 44, the identification of Potential Koala habitat and Core Koala habitat is outlined. Potential Koala habitat is defined as areas of native vegetation where the tree species outlined in **Table 5** constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. Of the species listed, only three are known to commonly occur within the Port Stephens LGA: Swamp Mahogany, Forest Red Gum and the Parramatta Red Gum.

Table 5 List of SEPP 44 – Schedule 2 Preferred Koala Feed Trees

Scientific Name	Common Name
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus microcorys	Tallowwood
Eucalyptus punctata	Grey Gum
Eucalyptus viminalis	Ribbon or Manna Gum
Eucalyptus camaldulensis	River Red Gum
Eucalyptus haemastoma	Broad-leaved Scribbly Gum
Eucalyptus signata	Scribbly Gum
Eucalyptus albens	White Box
Eucalyptus populnea	Bimble Box or Poplar Box
Eucalyptus robusta	Swamp Mahogany

4.2 Environmental Planning Instruments

4.2.1 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP) applies to extractive industries related activities. Section 10 of the Mining SEPP describes various exempt developments that do not require approval under the EP&A Act.

The definition of "extractive industry" set out in Clause 3 of the SEPP includes "*means the winning or removal of extractive materials (otherwise than from a mine) by methods such as excavating, dredging, or quarrying, including the storing, stockpiling or processing of extractive materials by methods such as recycling, washing, crushing, sawing or separating*". Exempt development listed under the Mining SEPP which specifically relates to the decommissioning process includes the demolition of a building or structure that is carried out in accordance with Australian Standard AS2601-2001, Demolition of Structures, but only if the building or structure is not, or is not part of, a heritage item, or in a heritage conservation area, identified by an environmental planning instrument (Mining SEPP). Such demolition work is exempt from planning approvals provided it takes place on an approved site and is of minimal environmental impact.

4.2.2 Local Council Policy

The site is located within the Port Stephens Local Government Area (LGA) and as such the provisions of the *Port Stephens Local Environmental Plan 2000* (Port Stephens LEP) would ordinarily apply. Under the Port Stephens LEP the site is zoned No. 1(a) Rural Agriculture “A”. The proposed development is permissible under the existing zone.

The Port Stephens Development Control Plan 2007 (Port Stephens DCP) applies to all land within the Port Stephens Local Government Area. This document provides principles and controls for development in the Port Stephens area in relation to the development that requires consent under Part 4 of the EP&A Act. As the proposed development will be assessed under the provision of Part 3A (prior to its repeal), the provisions of the Port Stephens DCP do not strictly apply, however as required by the Port Stephens Council consideration of the relevant provisions of the Port Stephens DCP.

4.3 Policies and Guidelines

4.3.1 Strategic Framework for Mine Closure, Minerals Council of Australia

The Strategic Framework for Mine Closure has evolved as a cooperative development between the Australian and New Zealand Minerals and Energy Council (ANZMEC) and the Australian Minerals Industry (represented by the Minerals Council of Australia). It is designed to provide a broadly consistent framework for mine closure across various Australian jurisdictions.

The objective of the Strategic Framework for Mine Closure is to encourage the development of comprehensive closure plans that return all sites to viable, and whenever practicable, self-sustaining ecosystems, and to ensure these plans are adequately financed, implemented and monitored within all jurisdictions.

The Strategic Framework for Mine Closure is structured around a set of objectives and principles under six key areas:

- Stakeholder Engagement - To enable all stakeholders to have their interests considered during the rehabilitation and closure process;
- Planning - To ensure the process of closure occurs in an orderly, cost effective and timely manner;
- Financial Provisioning - To ensure the cost of closure is adequately represented in company accounts and that the community is not left with a liability;

- Implementation - To ensure there is clear accountability, and adequate resources, for the implementation of the closure plan;
- Standards - To establish a set of indicators which will demonstrate the successful completion of the closure process; and
- Relinquishment - To reach a point where the company has met agreed completion criteria to the satisfaction of the responsible authority.

4.3.2 A Guide to Leading Practise Sustainable Development in Mining, Leading Practice Sustainable Development Program for the Mining Industry, Australian Government, 2011

This guide consolidates a series of handbooks relevant to all stages of a mine or quarries life – exploration, feasibility, design, construction, operation, closure and rehabilitation. The aim of the guideline is to identify key issues affecting sustainable development in the mining industry and provide information and case studies to enable a more sustainable basis for its operation. This Plan has been developed in accordance with a number of guides generated through the Leading Practice Sustainable Development Program for Mines.

4.3.3 Guidance Paper - Financial Assurance for Mine Closure and Reclamation (ICMM, 2006)

This document has been prepared by the International Council of Mining and Metals (ICMM) and considers environmental financial assurance measures. It looks at issues and current policies in the use of financial assurances through the industry; analysing trends that were revealed through a survey of the industry, governments and financial institutions.

This document provides guidance on environmental financial assurance for both operators and regulators and covers the following areas:

- The case for financial assurance;
- Key issues associated with the application of financial assurance policies; and
- Recommendations for improving standards of practice relating to financial assurance.

5 THE APPROACH TO PREPARING THE REHABILITATION AND CLOSURE PLAN

5.1 Domain Selection

This section describes the primary and secondary rehabilitation domains proposed for the Project (**Figure 4**).

- Primary domains are land management units within the site with unique operational and functional purpose and similar geophysical characteristics. Primary domains outline the current land use at the site.
- Secondary domains are land management units characterised by a similar post-quarrying land use objective (final land use). For the site this will include the majority of the quarry will be rehabilitated to woodland with some water management features retained and access road for use as fire trails and continuing maintenance activities by the landholder (See **Figure 4**)

Table 6 Primary and Secondary Domains

Primary Domain		Secondary Domain	
1	Existing Woodland Vegetation	1	Rehabilitated Woodland
2	Existing Cleared Area (including roads)	2	Water Management
		3	Access Roads

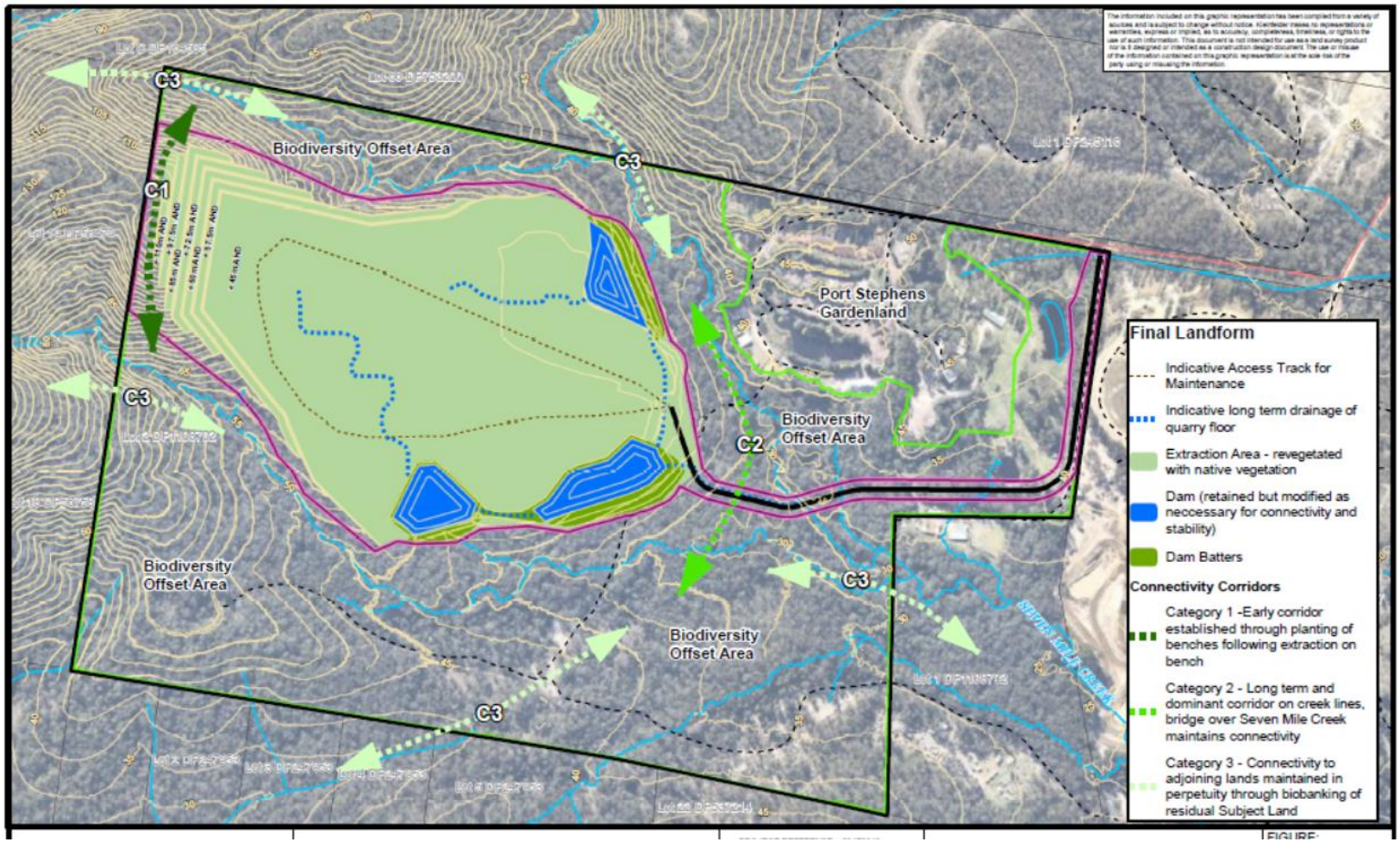

Figure 4 Secondary Domains at Closure (Kleinfelder 2017)

5.1.1 Primary Domains

Currently the site is a greenfield site with the majority of the area under established vegetation and a minor area composed of cleared tracks . For the development of the quarry the development footprint will need to be progressively cleared and levelled, with infrastructure and pit areas installed.

5.1.2 Secondary Domains

Rehabilitated Woodland

The rehabilitation objectives of this domain include:

- Ensure clearing and management of soil and vegetation is completed in accordance with **Section 6.1.1** and **6.1.2**.
- Containment of all surface runoff in external drainage embankment and sediment ponds, and the subsequent recycling of this water;
- Rehabilitation of all final benches, including drainage embankments as soon as practical on completion of quarrying;
- Undertaking soil testing and characterisation to determine soil additives and fertiliser requirements;
- Revegetation of the completed benches using direct sowing – using species suitable for a woodland final land use;
- Establishment of a rehabilitation monitoring program and report the results each year; and
- The area of the former void will be reshaped and rehabilitated with species to form a wetland environment.

Water Management

Overall water management objectives are outlined in **Section 6.4**. The primary water management structures at Eagleton Quarry include the:

- Dam 1; and
- Dam 2.

These dams were constructed as part of the quarrying activities on site and formed an essential component of the dirty water management system. Dam 1 and Dam 2 will be remain as part of the long term management of water quality

Access Roads

Eagleton Quarry private access roads (sealed) will remain following closure of the site to allow for firefighting access. Smaller access tracks (excluding the main haul road) will be ripped and seeded.

5.2 Stakeholder Engagement and Community Consultation

In accordance with Part 3A of the EP&A Act consultation is required to occur at the following stages:

- The Secretary (previously Director General) of the Department of Planning and Environment (DP&E) is required to consult with relevant public authorities in preparing the environmental assessment requirements for the Concept Plan;
- The Secretary is required to advertise and exhibit the Environmental Assessment and appended reports and documentation; and

- In preparing the DGRs for the Environmental Assessment, the DP&E consulted with the following assessment authorities and groups:
    - Office of Environment and Heritage;
    - NSW Office of Water (now DPI Water);
    - Roads and Traffic Authority;
    - Port Stephens Council.

Previous community consultation includes a letter box drop (September 2012) informing the local community of the proposal and the intention to lodge a planning application. The letter box drop was focussed around the residents of Six Mile Road. A number of community members have responded to the correspondence and ongoing consultation is being carried out with these members of the community.

Detailed stakeholder engagement will be undertaken during development of the Final Rehabilitation and Closure Plan. The detailed consultation process will include:

- Identification of all stakeholders and preparation of a stakeholder engagement strategy;
- Discussion regarding the opportunities for the re-use of infrastructure at Eagleton Quarry;
- Detailed discussion on the final land-use for disturbance areas; and
- Identification of any other issues, key risks and information needs regarding decommissioning and rehabilitation of the site.

A detailed socio economic assessment will be completed as part of the Final Rehabilitation and Closure Plan. This will be completed at least three years prior to the site being closed.

6 REHABILITATION PLANNING, METHODOLOGY AND MANAGEMENT

Native open woodland currently occurs over most of the proposed quarry site. It is proposed to re-establish a similar cover to the majority of the post-quarrying landform (excluding the void). On completion of quarry operations, the pit floor (void) will be re-shaped and revegetated with wetland plant species to form a wetland environment.

Native vegetation will largely be established using direct seeding and from the seed store within re-spread topsoil. Supplementary native pasture/woodland seeding will be undertaken where specific species combinations are required.

Rehabilitation of the site will be undertaken once extraction is complete. As the extraction progresses through the resource, approximately 12.5m wide benches will be left every 12.5m of depth to provide a horizontal platform on which native flora species will be established.

The revegetation program will re-establish native woodland and will stabilise reshaped and benched areas. Benches will be deep ripped where practical to actively promote infiltration of water which will enhance soil moisture requirements for direct tree seeding and minimise surface runoff to underlying benches and the pit floor dirty water control system. Revegetation will also visually screen disturbed areas and will re-establish habitat and the corridor for native fauna.

6.1 Rehabilitation Phases

The rehabilitation and closure objective for the site is to create stable, non-polluting post closure landforms that allow the achievement of the post closure land use. Any rehabilitation at the site will be completed through a series of conceptual stages which are described as:

- Stage 1: Decommissioning – removal of hard stand areas, buildings, contaminated materials, hazardous materials;

- Stage 2: Landform Establishment – incorporates gradient, slope, aspect, drainage, substrate material characterisation and morphology;
- Stage 3: Growth Medium Development – incorporates physical, chemical and biological components of the growing media and ameliorants that are used to optimise the potential of the media in terms of the preferred vegetative cover;
- Stage 4: Ecosystem Establishment – incorporates revegetated lands and habitat augmentation, species selection, species presence and growth together with weed and pest animal control /management and establishment of flora;
- Stage 5: Ecosystem Development – incorporates components of floristic structure, nutrient cycling recruitment and recovery, community structure and function which are the key elements of a sustainable landscape; and
- Stage 6: Rehabilitated Land – lands that have met the required rehabilitation and closure requirements.

These rehabilitation phases are consistent with the Mining Operations Plan Guideline (DRE, October 2013). Eagleton Quarry will report on the status of the rehabilitation phases as part of the Annual Review.

6.1.1 Vegetation Clearing

Organic green materials from clearing of vegetation will occur predominately during site establishment and early phases of quarry operations. This material will be transferred to the landscape supplies facility on the eastern part of the site where they will be incorporated into the normal input streams.

6.1.2 Soil Management

With the site mainly vegetated there are opportunities for the salvage and reuse of topsoil at Eagleton Quarry during progressive clearing.

Soil Testing

Material and soil characterisation may be undertaken at an appropriate scale across the site, prior to clearing activities or the re-handling of topsoil that has been stored on site for a period of two years or more. Representative samples may be taken to characterise the nature of the soil material (e.g. sodicity, acid-generating potential, etc.) to determine the potential limitations to rehabilitation and sustainable plant growth. The results can be used to determine specific ameliorant techniques that may be applied to the soil material in order for rehabilitation to be sustainable. Ameliorants may include gypsum, lime, fertiliser and biosolids. The use of soil ameliorants is designed to balance pH, prevent surface crusting, increase moisture and organic content, and buffer surface temperatures to improve germination.

Topsoil Handling and Management

Topsoil stripping within the disturbed area will be undertaken when the soil is in a slightly moist condition thus reducing damage to soil structure. Stripped material will be placed directly onto the disturbed areas and spread immediately if excavation sequences, equipment scheduling and weather conditions permit. Topsoil stripping will be completed using equipment such as dozers and scrapers, with stripping depth depending on the depth of the soil across disturbance footprint.

A maximum stockpile depth of three metres will be maintained to preserve viability and reduce soil deterioration.

The following soil handling conditions are adopted to prevent excessive soil deterioration at Eagleton Quarry:

- Characterisation of soil (if required);

- Where practical, measures will be adopted to maintain the viability of any biological resources within the topsoil that may be suitable for use in rehabilitation (e.g. soil seed bank);
- Preference will be given to placing topsoil directly on re-contoured areas. Where possible, topsoil will be stripped when moist to help maintain soil structure and to reduce dust generation;
- Topsoil stockpiles are to be located away from traffic areas and watercourses;
- Topsoil (where available) and subsoil stockpile heights will be designed to prevent biological and structural degradation. Where appropriate, clayey soils will be stored in lower stockpiles for shorter periods of time compared to soils that have a coarser texture;
- Stockpiles will be formed to achieve slopes less than 18 degrees;
- Free-draining stockpiles will be created to minimise the formation of anaerobic zones;
- Appropriate sediment controls will be installed to prevent soil loss, including sediment fencing;
- The surface of soil stockpiles will be left in a coarsely textured condition in order to promote infiltration and minimise erosion until vegetation is established;
- Stockpiles to be kept longer than six months will be sown with a suitable cover crop to minimise soil erosion and invasion of weed species;
- Prior to re-spreading, weed growth will be scalped from the top of the stockpiles, if required, to minimise the transport of weeds into rehabilitated areas;
- Any stockpiles that have evidence of any weed growth will be treated prior to the use in rehabilitation; and
- Stockpiles will be appropriately identified, with a register kept onsite.

Where the stockpile is not wholly contained within the “closed loop” water management system, temporary sediment control measures such as sand bags and silt fences will be used to prevent sediment from leaving the disturbed areas. Stockpiles will be placed in areas so as to avoid impediment of natural localised drainage lines and minimise the likelihood of water ponding against the stockpile.

Topsoil will be re-spread in the reverse sequence to its removal, so that the organic layer, containing any seed or vegetation, is returned to the surface. Topsoil will be spread to a minimum depth of 50mm on 3:1 or steeper slopes and to a minimum depth of 150mm on flatter slopes. Re-spreading on the contour will aid runoff control and increases moisture retention for subsequent plant growth. Re-spread topsoil will be levelled to achieve an even surface, avoiding a compacted or an over-smooth finish.

Topsoil and the limited amount of overburden will be used across the site for the stabilization of batter slopes and early revegetation areas. At the quarry closure suitable material will be imported to assist with achieving an optimum rehabilitation outcome of the pit floor.

6.1.3 Overburden and Soil Management

Overburden from extraction areas which will occur predominately during site establishment and early phases of quarry operations. Soil based material are intended to be re-used at the site or temporarily stockpiled in the quarry operations area until they can be reused at the site. Because of the small amount of overburden and the nature of the resource it is not expected that large quantities of overburden will be generated. Overburden would constitute excavated natural material and can be deposited or re-used on-site.

Due to the sites steep terrain and highly weathered surface there is limited overburden to be removed prior to accessing suitable material for conversion into products.

6.1.4 Surface Preparation

The ripping of soil is important in assisting rapid tree growth through deep root growth and enhanced soil water infiltration. The ripping depth must be sufficient to penetrate any near-surface rock or clay. Inadequate site preparation and weed control are often the two biggest single factors responsible for tree revegetation failure. Thorough site preparation will be undertaken to ensure rapid establishment and growth of seedlings. All areas proposed for seeding will be deep ripped to an approximate depth of 400 – 500 mm. Where ripping on slopes is required, the ripping will be undertaken around the contour of the land at right angles to water flow.

6.1.5 Direct Seeding

Direct seeding (via broadcasting) is preferred over tube stock planting as it enables a far greater success rate, limits the need for ongoing maintenance (e.g. watering) and is the most effective method in achieving a successful rehabilitation outcome. Where required, tube stock will be utilised in landscape planting at the boundaries of the site to act as a visual screen.

6.1.6 Species Selection

A mixture of native trees, shrubs and grasses endemic to the area will be sown onto the majority of the reshaped and bed pit areas following topdressing and site preparation. This tree and shrub seed will complement natural regeneration from seed contained within the soil seed bank. The seed mix used for revegetation of the disturbed quarry area will include many of the major tree, shrub and groundcover species shown in **Table 7**. This species list is consistent with the existing species found on site and will enable integration with the surrounding habitat. In addition by utilising the endemic species they will be suited to the pre-existing conditions and will successfully establish on the available growth medium, bind the soil and will result in a variety of structure and food/habitat resources.

The seed will be sourced from reputable seed supply agents. Some native species have difficult dormancy mechanisms that need to be broken before germination can occur. Native seed for revegetation of the quarry will be appropriately pre-treated in order to break dormancy restrictions. Subject to sufficient follow up rain, high initial tree densities can be expected. These high densities will quickly help stabilise and screen the site and will result in healthy mature tree stands over time. It is intended to create, over time, a mosaic of variable native species and plant densities representative of that currently occurring in the area. Growth rates of between one and two metres per year can be initially expected for many of the more dominant trees and shrubs.

The correct treatment and application of seed in the appropriate ratios is important in controlling emerging weeds and in allowing the tree stand to develop in a positive direction. The native tree and shrub seed mix will be sown at a total combined rate of approximately 6.3 kg/ha. Seed will be broadcast evenly onto topdressed areas. Care will be taken to ensure it will not be buried. Seeding will be conducted in late spring and early autumn giving superior results due to higher ground temperatures. However opportunistic revegetation will be undertaken if areas become available for sowing in summer or winter.

After surface soil amelioration and tillage is completed for any given area, revegetation will commence as soon as practicable. The proposed method of sowing will be via conventional spreading using agricultural broadcasting equipment, or by hand if the terrain is difficult and machinery use is not possible. Slope stabilising techniques such as hydro seeding and straw mulching will be undertaken on slopes exceeding 18 degrees for enhancement of pasture germination.

Seed will be collected from areas cleared for the operation of the site and other adjoining areas, with this seed to be used in rehabilitation.

Species which could be used for revegetation (dependent upon seed availability) are listed below in **Table 7** (Kleinfelder / Ecobiological 2013); with these found within Seaham Spotted Gum – Ironbark Forest and Hunter Valley Moist Forest vegetation communities.

Kleinfelder / Ecobiological (2013) advise the planting of 'preferred Koala food trees' at ratio of at least 2:1 for any 'preferred' trees removed from the proposed extraction area. This will result in a net increase in 'Preferred Koala food trees' species specified under SEPP 44 and CKPoM guidelines occurring within the subject site. These areas should be rehabilitated immediately post works to ensure fauna corridor linkages are maintained.

Table 7 Potential Rehabilitation Species (Kleinfelder / Ecobiological 2013)

	Dominant Species	Additional Species
Canopy	*Corymbia maculata* (Spotted Gum)	*Angophora costata*
	Eucalyptus acmenoides (White Mahogany)	*Corymbia gummifera* (Red Bloodwood)
	Eucalyptus punctata (Grey Gum)	*Eucalyptus crebra* (Narrow-leaved Ironbark)
	Eucalyptus siderophloia (Grey Ironbark)	*Eucalyptus globoidea* (White Stringybark)
Mid-Story	*Acacia falcata*	*Melaleuca nodosa* (Prickly-leaved Paperbark)
	Acacia irrorata subsp. irrorata (Green Wattle)	
	Acmena smithii (Lilly Pilly)	
	Allocasuarina torulosa (Forest Oak)	
	Dodonaea triquetra (Large-leaf Hopbush)	
	Glochidion ferdinandi var. ferdinandi (Ceese Tree)	
	Melaleuca styphelioides (Prickly-leaved Tea Tree)	
	Myrsine variabilis, Cryptocarya microneura (Murrogun)	
	Persoonia linearis (Narrowleaved Geebung)	
Shrub Layer	*Acrotriche aggregata* (Red Cluster Heath)	
	Breynia oblongifolia (Coffee Bush)	
	Leucopogon juniperinus (Prickly Beard-heath)	
	Maytenus silvestris (Narrow-leaved Orangebark)	
	Notelaea ovata	
	Plectranthus parviflorus (Cockspur Flower)	
	Pultenaea euchila (Orange Pultenaea)	
	Zieria smithii (Sandfly Zieria)	
Groundcover Species	*Adiantum aethiopicum* (Common Maidenhair)	
	Carex longebrachiata	
	Desmodium rhytidophyllum	
	Dianella caerulea var. producta (Blue Flax-lily)	
	Dichondra repens (Kidney Weed)	
	Dioscorea transversa (Native Yam)	
	Doodia aspera (Prickly Rasp Fern)	
	Goodenia heterophylla subsp. eglandulosa	
	Gymnostachys anceps (Settlers' Twine)	
	Entolasia stricta (Wiry Panic)	
	Imperata cylindrica (Blady Grass)	
	Lepidosperma laterale	

	Dominant Species	Additional Species
	Lomandra longifolia (Spiny-headed Mat-rush)	
	Microlaena stipoides var. stipoides (Weeping Grass)	
	Oplismenus aemulus (Australian Basket Grass)	
	Pratia purpurascens (Whiteroot)	
	Pseuderanthemum variabile (Pastel Flower)	
Climbing and Twining Species	*Billardiera scandens* (Hairy Apple Berry)	
	Eustrephus latifolius (Wombat Berry)	
	Glycine clandestina	
	Morinda jasminoides (Sweet Morinda)	
	Pandorea pandorana subsp. Pandorana (Wonga Wanga Vine)	
	Parsonsia straminea (Common Silkpod)	
	Sarcopetalum harveyanum (Pearl Vine)	

All revegetated areas will be regularly monitored (**Section 6.7**) in order to manage long-term establishment and success. Revegetation techniques will be continually assessed and refined over the life of the site through an ongoing process of monitoring and recognition of other industry experiences.

Special Treatment Areas

Additional erosion control measures such as the application of hydromulch will be considered, particularly in drainage lines and areas of temporary rehabilitation. Sugar cane (or other) mulch as slurry provides cover for the soil to control erosion. The mulch also has the effect of protecting the soil surface against raindrop impact, improving the micro-environment for seed, reducing evaporation losses and assisting in the control of surface erosion caused by overland water flow.

Opportunities for the use of potential soil ameliorants to accelerate the revegetation process will also be considered where appropriate.

6.2 Landform Design and Planning

Landform design and modelling will be undertaken during closure planning. Areas of rehabilitation will be designed to achieve a stable final landform commensurate with the surrounding environment and analogue sites. Analogue sites are to be selected as part of the rehabilitation monitoring process.

The final landform must provide long-term stability. Overall slopes no greater than 1:3 (V:H), by re-contouring overburden or in situ material. Elements such as drainage paths, contour drains and ridgelines will be shaped, as much as practical, to undulating profiles in keeping with natural landforms of the surrounding environment.

The proposed quarry operation will result in a final landform that comprises a series of 12.5 m wide benches every 12.m metres of depth at the western end of the quarry. The floor of the quarry will have an overall slope of approximately 0.5% and will drain along varying drainage line alignment from the benched section at the western end of the quarry to Dams 1 and 2 at the south-eastern boundary of the extraction area. The floor of the quarry will be predominantly free draining and will not have a final void. Several minor depressions will however be created along the in the alignment of the drainage line. These minor depressions will help reduce erosion potential, enhance the sediment trapping capacity and in the longer term increase habitat value of the quarry floor which is to be vegetated with native species.

The minor depressions will also provide a passive mechanism for groundwater recharge into the underlying stratum. This will assist in offsetting the predicted 13.5 ML/year reduction groundwater recharge as a result of groundwater seeping from the elevated benched area the western edge of the proposed quarry onto the quarry floor.

It is proposed that:

- A minimum slope of the order of 0.5% will be applied to the quarry floor to ensure that runoff from the Project Area occurs post-closure; and
- The water management system will remain in place until the water quality from the Project area meets the target objectives for the area. With the use of vegetation and only limited exposed inert rock, it is expected that there will be limited risk of impacts on surface water post-closure.

6.3 Progressive Rehabilitation

Approximately 30 ha of native forest vegetation will be disturbed by quarrying over the duration of the project. Rehabilitation work will be undertaken progressively as soon as reshaped, benched and topsoiled areas become available. **Table 8** provides an indication of progressive revegetation during operations and shows the proposed final rehabilitation following closure of the quarry.

Table 8 Planned Progressive Rehabilitation

Year	Cummulative Disturbance Area (ha)	Cummulative Rehabilitation Area (ha)
5	15.4	0.6
10	19.9	1.5
15	24.3	2.5
20	28.8	3.5
25	28.8	4.5
30	28.8	28.8

6.4 Water & Erosion Management

The following principles will continue to be used for erosion and sediment control on site throughout the operation and during rehabilitation:

- Erosion and sediment controls as per the Surface Water Management Plan;
- Key erosion and sediment and sediment controls at site include:
    - Drainage channels;
    - Contour banks;
    - Absorption banks;
    - Sediment basins;
    - Energy dissipaters; and
    - Sediment fencing.
- Designing and operating drainage systems with scour protection of open drains;
- Minimising the area of soil disturbed and therefore exposure to erosion;
- Conserving topsoil and subsoil for later site rehabilitation (in a stabilised stockpiles);
- Where practical, diverting up-slope runoff water away from disturbed areas so that concentrated flows are below erosive levels and sediment is retained from disturbed areas;

- Progressive rehabilitation when practical;
- Fines and sediments from processing activities will ultimately end up in the sediment basins located at the southern extent of quarry area. Once full, these sediment basins will be dried out, and topped with overburden, and natural vegetation reinstated;
- Where dams are to be retained at closure, ensure that drainage structures are designed to capture runoff from sufficient catchment area so that the dam can be utilised for its intended use; and
- Maintaining erosion and sediment control measures appropriately.

Water management and erosion and sediment control should be completed in accordance with the following government guidelines:

- DECC (2008) Managing Urban Stormwater: Soils and Construction Volume 2C Unsealed Roads;
- DECC (2008) Managing Urban Stormwater: Soils and Construction Volume 2D Main Road Construction;
- DECC (2008) Managing Urban Stormwater: Soils and Construction Volume 2E - Mines and Quarries;
- Department of Environment and Climate Change (DECC) (2008) Managing Urban Stormwater: Soils and Construction Volume 2A Installation of services; and
- Landcom (2004) Managing Urban Stormwater: Soils and Construction Volume 1.

6.5 Revegetation and Weed Management

Fencing (or a similar barrier) will be erected and maintained to exclude and prohibit the movement of persons and vehicles into areas that have been rehabilitated. The fencing will be routinely checked and repaired where necessary. Signs will be placed in prominent locations to indicate areas that are undergoing rehabilitation.

Weeds present one of the most significant problems to the creation of forest ecosystems. The minimisation of grass and weed competition over the first six to 12 months after seeding is critical to successful tree establishment. Weed control will be undertaken on an “as required” basis should cyclical weed invasion events occur. As trees establish and mature they will compete and eventually eliminate most weeds and grass underneath. For this reason, dense direct seeding is an effective long-term weed control mechanism that reduces maintenance significantly, particularly ongoing weed control. Weeds in most tree-seeded stands typically disappear after 18 months to two years.

The flora survey by Kleinfelder (2013) identified 13 exotic species, one of which *Lantana camara* (Lantana) is declared a Class 4 Noxious Weeds within Port Stephens LGA. The weed program may need to specifically target this species.

In terms of weed management for topsoils to be used in rehabilitation areas, the following actions are completed:

- Stockpiles to be kept longer than six months will be sown with a suitable cover crop to minimise soil erosion and invasion of weed species;
- Prior to re-spreading, weed growth will be scalped from the top of the stockpiles, if required, to minimise the transport of weeds into rehabilitated areas; and
- Any stockpiles that have evidence of any weed growth will be treated prior to the use in rehabilitation.

6.6 Rehabilitation Maintenance

Due to the hardiness of young directly sown tree seedlings (compared to planted tubestock), these trees require minimal maintenance. Direct seeded trees and scrubs require no or minimal watering while planted seedlings (tubestock) may require extensive watering if conditions remain dry. Some maintenance fertiliser will be required for tree areas on one occasion post-closure. Effective control of weed species within rehabilitated areas will be a critical and essential component of the proposed revegetation plan. Weed and noxious animal control will be undertaken on all rehabilitation areas according to relevant state and local government legislation and policy.

All erosion and sediment control measures will be maintained in a functioning condition until individual areas have been deemed "successfully" rehabilitated. Structural soil conservation works will be inspected after high intensity rainfall so that de-silting and prompt repairs and/or replacement of damaged works can be initiated as required.

6.7 Rehabilitation Monitoring

Regular monitoring of the revegetated areas will be required during the initial vegetation establishment period and beyond to demonstrate that the objectives of the rehabilitation strategy are being achieved and that a sustainable, stable landform has been provided. **Table 9** presents the monitoring program, including the specific aspects and elements to be monitored and frequencies for those various aspects.

Monitoring will be conducted periodically by independent, suitably skilled and qualified persons at locations which will be representative of the range of conditions on the rehabilitating areas. Annual reviews will be conducted of monitoring data to assess trends and monitoring program effectiveness. The outcome of these reviews will be included in each Annual Review document.

In addition to the rehabilitated areas, at least two reference sites will be monitored to allow a comparison of the development and success of the rehabilitation against a control. Reference sites indicate the condition of surrounding un-disturbed areas. The reference sites that will be selected for rehabilitation monitoring will have comparable slope, aspect, soil texture, soil cover, resource regulation and vegetation species required in the mature rehabilitation. Data from reference sites is an integral part of the monitoring procedure throughout the monitoring process, so that varying seasonal conditions ultimately result in a "band" of values that act as the long-term target for rehabilitation. At this stage, no reference rehabilitation sites have been chosen, although remaining area of the site outside of the disturbance footprint is dominated by forest with potential analogue sites.

In developing the rehabilitation monitoring program, the following aspects will be taken into consideration.

- Replicated monitoring sites are needed in representative rehabilitation areas of different ages.
- Sites should be monitored 12 months after establishment and then every 2 years.
- A standard monitoring plot design for areas rehabilitated with trees includes:
    - 2 m x 2 m quadrates – these will provide some estimate of statistical variance, so that if required, statistical analyses can be undertaken to objectively compare different rehabilitation treatments and changes over time;
    - a 20 m x 10 m plot overlying the 2 m quadrats and located 5 m either side of the centerline, for ease of monitoring; and
    - a 50 m erosion monitoring transect on contour, running through the centre of the plot.

Figure 5 shows the monitoring plot design that is to be adopted for the monitoring an area revegetated with trees.

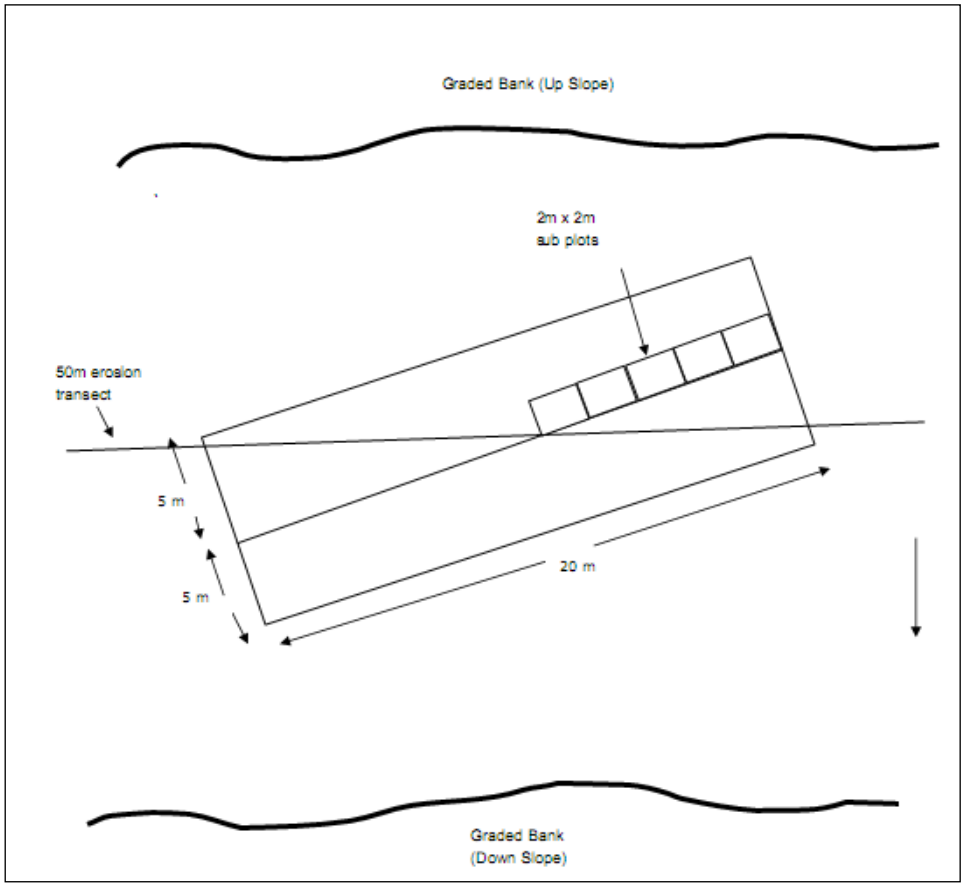

Figure 5 Typical Monitoring Plot Design

More specifically, monitoring of the key elements in **Table 9** will be undertaken.

Table 9 Proposed Rehabilitation Monitoring Program

Aspect of Rehabilitation	Elements to be Monitored	Monitoring Frequency
Ecosystem Establishment		
General Description	• Describe the vegetation in general terms, e.g. mixed eucalypt woodland with grass understorey and scattered shrubs, etc.	12 months after establishment of rehabilitation and then every 2 years
2m x 2m quadrats	• Count the number of plants of all species, excluding grass • Measure live vegetation cover for understorey and grasses (separately) using a line intercept method • Record details of ground cover (litter, logs, rocks etc.)	12 months after establishment of rehabilitation and then every 2 years
20m x 10m plots	• Count, by species, all trees >1.6m tall. • Tag and measure DBH of trees >1.6m tall, to a maximum of 10 for any one species. • Record canopy cover over the whole 20m centreline when trees are tall enough • Subjectively describe tree health, by species if relevant, noting signs of drought stress, nutrient deficiencies, disease and severe insect attack. Where health problems are noted, record the percentage of unhealthy trees.	12 months after establishment of rehabilitation and then every 2 years

Aspect of Rehabilitation	Elements to be Monitored	Monitoring Frequency
	• Record any new plant species not present in the smaller plots, including any problem and declared noxious weeds • Take five surface soil samples (e.g. at approx. 5m intervals along the centreline) and bulk these for analyses of: pH, EC, chloride and sulfate; exchangeable Ca/Mg/K/Na; cation exchange capacity; particle size analysis and R1 dispersion index; 15 bar and field capacity moisture content; organic carbon; total and nitrate nitrogen; total and extractable phosphorus; Cu, Mn and Zn.	
50m transect	• Along the 50m erosion monitoring transect, record the location, number and dimension of all gullies >30cm wide and/or 30cm deep. • Erosion pins may be established in plots located in newer rehabilitation to record sheet erosion if present.	12 months after establishment of rehabilitation and then every 2 years
Rehabilitation in general	• When traversing between monitoring plots, note the presence of species of interest not previously recorded (e.g. key functional or structural species, protected species, noxious weeds), as well as obvious problems including any extensive bare areas (e.g. those greater than 0.1ha). • Observations such as this can provide useful, broad scale information on rehabilitation success and problems.	12 months after establishment of rehabilitation and then every 2 years
Photographic record	• For each 20m x 10m plot, a photograph should be taken at each end of the plot, along the centreline looking in.	12 months after establishment of rehabilitation and then every 2 years
Habitat	• General observations relating to the availability and variety of food sources (e.g. flowering/fruiting trees, presence of invertebrates etc.). • Availability and variety of shelter (e.g. depth of leaf litter, presence of logs, hollows etc.). • Presence/absence of free water in the rehabilitated areas.	12 months after establishment of rehabilitation and then every 2 years
Fauna	• General observations of vertebrate species (including species of conservation significance). • Detailed fauna surveys including presence and approximate abundance and distribution of vertebrate species (focusing on species of conservation significance). • Nest boxes should be monitored for a period of no less than three years, preferably biannually. This will allow the identification of usage rates by target fauna species and will help determine the disturbance rate of key species.	After rehabilitation is three years old undertake monitoring in every 2 years after establishment in both Autumn and Spring Biannually for three years
Weeds and pests	• Species identity. • Approximate numbers/level of infestation. • Observations of impact on rehabilitation (if any).	Quarterly during the first two years and biennially after that. Inspections should be opportunistic after significant rainfall events.
Geotechnical Stability		

Aspect of Rehabilitation	Elements to be Monitored	Monitoring Frequency
	• Assessment of the stability of batters. In particular where these features could impact on the performance of any surface water management system. • Presence / absence of landform slumping.	Annually
Surface and Groundwater		
	• Groundwater quality and depth. • Efficiency of landform surface water drainage systems (integrity of banks and drains). • Water quality including pH, EC and total suspended solids of water in water storages, and pits, sedimentation dams.	Quarterly or following rainfall events Monitoring of receiving waters during a rainfall event which results in runoff

In addition, weekly, visual inspections should be undertaken. Aspects of rehabilitation to be reviewed include:

- Evidence of any erosion or sedimentation from areas with establishing vegetation cover;
- Success of any rehabilitation;
- Adequacy of drainage controls and any other installed surface water management feature;
- Presence/absence of weeds; and
- General stability of the rehabilitation site.

The purpose of undertaking monitoring during the operation is so rehabilitation methods can be improved as additional knowledge develops from the monitoring data collected through these programs. Where the revegetation success appears limited, maintenance activities will be initiated. These may include re-seeding and the application of specialised treatments as determined by soil analysis results.

No time limit has been placed on post-closure rehabilitation monitoring and maintenance. Maintenance will continue until such time as the objectives are met, although it is generally accepted that it will be at least five years beyond closure.

7 DECOMMISSIONING & CLOSURE

The following sections summarise the key aspects related to the decommissioning and closure of the site infrastructure, plant and buildings. It assumes that all buildings and other infrastructure are demolished and removed from the site despite the potential for them being used after quarrying (subject to the landholders requirements). It is considered likely that at least some aspects of the existing infrastructure will be used post quarrying, however they are not able to be identified at this time.

This section outlines the proposed commitments for each secondary domain under the scenario of ‘Imminent Closure’. These processes will be completed as part of ‘Planned Closure’.

A decommissioning and demolition strategy will form an integral part of the detailed closure planning for the operation. Although final land use for Eagleton Quarry has not yet been defined, it is likely decommissioning and demolition of infrastructure will occur at the time of closure. A detailed investigation of all structures will be completed to determine the appropriate techniques, equipment required and the sequence for decommissioning and removal to complete the demolition activities safely.

7.1 Investigation of the Site

A final agreement will be in place between Eagleton Rock Syndicate, the landowner and relevant government departments regarding which infrastructure is to remain post closure.

As part of any agreement, a site investigation will be completed to identify:

- The type, location and extent of underground services such as conduits, cables and pipe work;
- The location, type and extent of overhead services and structures such as power cables, light poles and pipe work, etc.;
- The location and condition of all tanks and vessels (with emphasis on remaining combustible materials and methods required for their removal);
- The presence of contaminated and hazardous materials and the classification and disposal of these materials; and
- Any infrastructure to remain (including roads and tracks) following decommissioning.

7.2 Investigation of Structures

When planning for decommissioning and demolition, an investigation of the structures will be completed to identify the following:

- The structures current condition with regard to their state of disrepair or deterioration; and
- Confined spaces and/or techniques required to be implemented in order to avoid entering such spaces.

7.3 Decommissioning of Infrastructure, Plant and Buildings

As outlined in **Section 7.1**, a final agreement will be in place between Eagleton Rock Syndicate, the landowner and relevant government departments regarding which infrastructure is to remain post closure.

Opportunities for the sale and/or re-use of assets and recycling of scrap steel will be maximised where possible.

Access tracks that are not required for post closure access or maintenance will be ripped, topsoiled and revegetated as soon as possible after they are no longer required for operations.

7.3.1 Site Services

All services including power, water, data and telephone on the site should be isolated, disconnected and terminated to make them safe. Generally all underground services should be made safe and left buried in the ground. Overhead power lines (where they are not used by others) should be removed and the materials (i.e. poles and wire) recovered for potential re-sale or recycling as applicable. It is proposed that 300 m of 11kva supply will be required to power to the processing, administration and maintenance areas.

7.3.2 Infrastructure and Buildings

All sumps will be de-watered and de-silted prior to the commencement of demolition. In addition all items of equipment will be de-oiled, degassed, depressurised and isolated and all hazardous materials (HAZMATs) removed from the site.

All infrastructure, including the office buildings, maintenance shed, parking areas, crushing plant, wash plant and product storage areas will be demolished and removed from the site. Where possible assets may be re-used or sold to other operations.

The remaining items will be demolished, removed and transported from the site as required. All recoverable scrap steel will be sold and recycled, with the remaining non-recyclable wastes being taken to a licenced landfill. Prior to disposal, all wastes will be assessed and classified in accordance with Waste Classification Guidelines (DECC, 2008).

All concrete footings and pads will be broken up to at least 1.5 m below the surface and removed. Options for the re-use of this material (for example, crushed and used for road and track stabilisation) will be investigated as the operation approaches closure. If re-use or recycling opportunities aren't available or viable, all "non-contaminated" waste material will be disposed of at a suitable location on site or taken off site to an approved waste management facility.

All remaining areas will then be reshaped, deep ripped, topsoiled and seeded in accordance with **Section 6** above.

7.3.3 Roadways, Car Parks and Hardstands

The roadways, car parks and hardstand areas around the processing and administration areas will be ripped up. The main haul road will remain for firefighting purposes.

All areas will then be reshaped, deep ripped, topsoiled and seeded in accordance with **Section 6** above.

7.4 Contamination

Prior to final closure, a preliminary investigation into potential sources of contamination including additional Phase 1 sampling and analysis will be undertaken. This will be used to determine whether a detailed assessment (for example, Phase 2 sampling and analysis) should be conducted to quantify the amount of contaminated material that may require remediation.

Where possible all identified sources of contamination will be remediated during the operational phase of the site. In some cases, this may not be possible and in these circumstances the remediation will be undertaken following closure and during the decommissioning phase.

7.5 Earthworks and Rehabilitation

7.5.1 Dams, Diversions and Surface Water Features

Sedimentation dams which assist in the water flow from the final rehabilitated surface will be retained following quarry closure. All dams will be assessed for structural integrity and upgrade works completed if the dam is to be retained. Any of the remaining dams that would not be required would be removed and the original drainage paths re-established wherever possible.

7.5.2 Quarry Void

With the completion of quarrying, the benches within the pit will remain (**Section 8)**. They will be spread with top dressing material and native tree and shrub species will be sown directly in these areas. The main aim will be to ensure that the pit is left geotechnically stable.

The pit floor will be levelled to allow water to drain away from the base of the highwall and spread with top dressing. This area will be seeded in a similar manner to the benches, using a mix of native tree species. As water will drain naturally away from the top of the highwall, surface water control structures will not be required in this area, however a safety bund and security fence will be constructed around the highwall.

The rehabilitation will involve the following:

- Prepare benches through one or more of the following where feasible:
  - Drilling of holes at the centre of the bench to 2-3m depth consistent with blast pattern while preparing for next blast.

- Ripping where material is sufficiently weathered to permit ripping.

- Surface preparation of the area by ripping;
- Placement of at least 100 mm of top dressing on a 12.5m wide area of the benches around the edge of the pit; and
- Application mulched vegetation blended with available topsoil, gravels and weathered rock from site to attain a growing medium depth of at least 0.3-0.5m (where material is weathered and can be ripped applied material can be reduced to a minimum of 0.1m). The highest and more exposed benches (i.e. those 85m and above) will have an available growing media depth of up to 1m of material to provide greater rooting depth.
- The quarry floor will be prepared similar to the benches, and may include undertaking of shallow blasts as required to improve water retention and vegetation growth. The quarry floor will be shaped to have very gradual slope to the east to reduce potential for broad areas of ponding.
- Planting of native shrubs and trees on the topsoiled bench. It is proposed to undertake some tree planting in the early stages of the project. These rehabilitated areas will assist in minimising the visual impacts of the quarrying activities from the adjacent landowners. By the time open pit operations have reached an advanced stage, these rehabilitated areas will be well established and these terraces will form part of the final landform. The proposed species to be planted on the benches will be shallow to medium rooted species as deep rooted species are unlikely to be able to penetrate the rock long term. Small bunds will be created on benches to reduce erosion associated with the rehabilitated landform and retain water for vegetation growth.

The site topography will allow for continued access to all benches.

At quarry closure, the final bench will be shaped and the pit floor will be re-profiled and revegetated with local plant species conducive to a wetland environment.

8 FINAL VOID MANAGEMENT

8.1 Objectives

The primary objectives of the Final Void Management section of this RCMP include the following:

- Propose mitigation measures to minimise potential off-site impacts associated with the final void; and
- Propose measures to be incorporated in the final landform which aim to minimise potential safety hazards to the general public.

8.2 Final Void Options

This section outlined potential final void options at Eagleton Quarry. These options have been successfully used at other mining and quarrying operations in Australia for a post operation void use. Any activities relating to the longterm management of the final void will be completed in accordance with the relevant statutory requirements and in consultation with government departments. The options considered at this stage include:

- Water Storage;
- Storage emplacement for a potential waste facility;
- Wetland or wildlife habitat;
- Recreation;
- Aquaculture;
- Backfilling.

Based on these potential options, the current preferred land use for the final void would be to rehabilitate the site into a wetland habitat. The potential benefits, include:

- Potential enhancement of water quality (if required);
- Potential increase in habitat and a subsequent increase in local biodiversity values;
- Enhancement of environmental and community values;
- Potential location of long term environmental studies; and
- This has been completed successfully at other mines sites and quarries in Australia and internationally.

8.3 Justification for Nature & Location of the Final Void

The layout of the quarry is largely dictated by the location of the resource. In this case, the resource is located along a ridgeline extending from east to the west, starting immediately to the west of Seven Mile creek and to the north of an existing tributary to Seven Mile Creek.

A number of alternative quarry layouts have been investigated for the site – these being a sequence of conceptual quarry plans which were modified over time to take into account the characteristics of the site including topography, timing and staging of development, and environmental features/constraints arising from site investigations.

The current design is intended to operate the quarry with maximum efficiency and minimal environmental footprint, by concentrating quarry activities, and avoiding where possible double handling of material, the potential for off-site impacts will be minimised. The following design and environmental criteria were considered when determining the treatment of the final void.

These include:

- Minimising the area of disturbance;
- Diverting clean water around disturbed areas to ensure that water collected within the pit is minimised as much as possible;
- Designing site batters to minimise erosion and enhance rehabilitation opportunities both during operation and post closure;
- Minimising water, noise, and visual impacts generated by the operation;
- Progressively rehabilitating disturbed areas; and
- Rehabilitation of the site in a manner that guarantees the long term environmental, ecological and aesthetic integrity of the area.

8.4 Minimisation of Adverse Impacts from the Final Void

8.4.1 Void Water Quality and Surface Flow

Water will only be permitted to accumulate in the void if it maintains a quality that does not compromise its intended final use or surrounding groundwater systems. The aim is to provide a biologically viable water resource for the surrounding environment. The following aspects need to be considered with respect to managing final void water quality:

- Concentration of elements resulting from the quarrying of material;
- Control of surface flow into the void;
- Rainfall and evaporation; and
- The proposed post-quarrying land use of the void is a wetland that will receive direct rainfall and local runoff from the pit walls, which will pond in the void. The benches within the pit will be reseeded using native tree species.

Post closure, a water monitoring program will need to remain in place to closely monitor any changes to chemistry within the void.

8.4.2 Void Slope Stability

To ensure the safety of the final void, the surrounding final slopes should be left in a condition where the risk of slope failure is minimised. This may require the benches to be battered back from the vertical to enable a stable overall slope angle.

The following will need to be considered when assessing the geotechnical stability of highwalls:

- Long term final void water levels;
- Height and inclination of slope and number and spacing of intermediate benches;
- Shear strength of the highwall soils and rocks;
- Density and orientation of fractures, faults, bedding planes, and any other discontinuities, and the strength along them; and
- The effects of the external factors, such as surface runoff.

Prior to closure, investigations will be undertaken to confirm the criteria above.

8.4.3 Safety

At quarry closure, one of the main priorities for the void will be to render it safe in terms of access by humans, livestock and wildlife. The following will be considered at the time of closure to ensure that the void is left in a safe manner. These include:

- Instability of the high wall can induce failures or mass movement. All high walls are to be left geo-technically stable;
- A barrier at a safe distance from the perimeter of the void to prevent human access will be constructed. The highwall areas will be secured by the construction of a trench and a safety berm, as well as a security fence along the entire length of the remaining high wall. This is to provide an engineered barrier between the pit and the surrounding area. The trench and berm is to be constructed in such a way that it will physically stop most vehicles;
- Suitable signs, clearly stating the risk to public safety and prohibiting public access will be erected at 50 m intervals outside the safety fence;
- Surface runoff from land surrounding the void will be diverted from entering the void so as to prevent the instability of the walls; and
- Shrub and/or tree planting along the outside edge of the bund wall will be implemented where practicable to lessen the visual impact of the wall, and will be in accordance with the agreed post-quarrying rehabilitation criteria and land use.

8.4.4 Monitoring and Management

After decommissioning works have been undertaken, whether progressive or final, a monitoring program will be designed to demonstrate that the completion criteria have been met and that the site is not resulting in any off site effects.

This period should also be used to plan for remedial action where monitoring demonstrates completion criteria are unlikely to be met. If progressive rehabilitation has been successful, with stabilisation and revegetation meeting completion criteria this last phase of closure may be shortened. It is, however, unlikely to be less than five years in duration (ANZMEC/MCA 2000).

The post closure monitoring and measurement program will be similar to that undertaken during operation of the quarry (**Table 9**) only scaled back to focus on those aspects of the site that have the potential to cause pollution or is being used as an indicator to verify the success or failure of the rehabilitation works (e.g. noise monitoring will not be required once all decommissioning and rehabilitation activities at the quarry have ceased).

8.5 Final Void Rehabilitation

As discussed above in **Section 3**, it is proposed to re-establish a native woodland vegetation cover to the majority of the post-quarrying landform. Native woodland vegetation will largely be established using directly applied seed and from the seed store within re-spread topsoil. Supplementary native pasture and/or tubestock seeding will be undertaken where specific species combinations are required.

Rehabilitation of the final void will be undertaken once extraction has been completed. As the surface quarry progresses, 12.5m wide benches will be left every 12.5m of depth to provide a horizontal platform on which native flora species will be established.

The revegetation program ("terrace landscaping") will progressively re-establish a woodland ground cover and will stabilise reshaped and benched areas. Benches will be deep ripped to actively promote infiltration of water which will enhance soil moisture requirements for direct tree seeding and minimise surface runoff to underlying benches and the pit floor dirty water control system. Revegetation will also visually screen disturbed areas and will re-establish habitat for native fauna.

On completion of quarrying, the pit floor will be re-shaped and revegetated with wetland plant species to form a wetland environment.

9 TRIGGER ACTION RESPONSE MANAGEMENT PLAN

The following Trigger Action Response Plan (TARP) (**Table 10**) for rehabilitation has been developed to identify the required management actions in the event of impacts to rehabilitation, or where rehabilitation outcomes are not achieved.

This rehabilitation TARP is used to judge the performance of and guide the implementation of development of management measures. Triggers are indicators of average/poor rehabilitation, with actions implemented to improve the quality of rehabilitation.

Table 10 Trigger Action Response Plan

Aspect	Trigger	Action/Response
Post Closure Land Use	Activities not completed in accordance with the Post Closure Land Use.	• Finalise the post closure land use prior to completing any rehabilitation.
	Failure to reach an agreement with stakeholders regarding the Post Closure Land Use.	• Ensure adequate attention/consultation with stakeholders prior to commencing rehabilitation.
Services	Failure to remove all services from the site at closure.	• Currently planned to remove infrastructure, with some dams and roads to remain post closure. • The management of services will be outlined in the Detailed Rehabilitation and Closure Plan.
Hydrocarbon	Hydrocarbon contamination remaining on site post closure.	• Phase 1 and 2 contamination assessment required prior to closure.

Aspect	Trigger	Action/Response
Rehabilitation Criteria	Revegetation works not meeting final rehabilitation criteria, for example erosion, insufficient vegetation cover etc. DP&I not returning rehabilitation bond.	• Rehabilitation monitoring. • Additional revegetation work if required.
Slopes	Slopes Greater than 10 degrees at closure.	• Undertake a review of the landform design including survey if required. • Undertake re-grading and revegetation of the area if required.
Water Management	Release of contaminated water from the site during rehabilitation and closure activities.	• Detailed Water Management Plan to be developed prior to closure. • Water monitoring whilst Eagleton Rock Syndicate manages the site.
Screening	Visual screen is not commensurate to long-term screening.	• Additional maintenance if required.

10 REPORTING AND REVIEW

10.1 Roles & Responsibilities

The Quarry Manager (or their nominated representative) is responsible for overseeing the implementation of this RCMP, including:

- Delegating tasks associated with this RCMP where necessary;
- Providing adequate resources to implement this RCMP; and
- Providing adequate training to employees and contractors regarding their requirements under this RCMP.

Table 11 outlines the responsible positions and accountable tasks.

Table 11 Roles and Responsibilities

Position	Accountable Task
Eagleton Quarry Manager	• Ensure all relevant personnel are aware of rehabilitation procedures. • Ensure all rehabilitation procedures are followed. • Ensure sufficient resources are available to meet rehabilitation criteria and schedule. • Coordinate progressive rehabilitation. • Ensure all rehabilitation is undertaken in accordance with the rehabilitation procedures presented in this Plan. • Review and analyse rehabilitation monitoring and advise on rehabilitation maintenance. • Conduct regular review of this Plan.
Equipment Operators	• Ensure clearing remains within the area nominated by the Manager and identified on plans. • Vehicles to remain on established roads and tracks unless otherwise authorised. • Notify Site Manager or Environment and Community Coordinator of any disturbance in native vegetation or rehabilitated sites.

10.2 Reporting

The rehabilitation status at the Eagleton Quarry will be reported in the Annual Review. The Annual Review will include details of any rehabilitation completed as well as any results of rehabilitation monitoring. Rehabilitation performance will be assessed by Eagleton Rock Syndicate through the review of rehabilitation monitoring results and through environmental inspections. Proposed changes/improvements to the rehabilitation program are outlined in the Annual Review.

10.3 Review of the Plan

The quarry operation has a life of approximately 30 years, during which time the quarry plan may be changed or altered depending on operational circumstances, with the hope of extending the life of the quarry beyond 30 years. An internal audit and review of the conceptual RCMP will be completed every five years to capture these quarry plan changes, unless required earlier. Five years prior to quarry closure the RCMP will be reviewed addressing the final quarry plan and any changes that may have occurred since the previous Plan.

11 REFERENCES

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