accendo AUSTRALIA

REHABILITATION AND CLOSURE PLAN

LOT 1002 PRESTON BEACH ROAD NORTH, PRESTON BEACH

NOVEMBER 2021

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1. INTRODUCTION

1.1. Purpose and Scope

Doyle's Lime Services (the proponent) are proposing to develop a small limestone and sand extraction project (quarry) on Lot 1002 Preston Beach Road North, Preston Beach (herein referred to as the subject site), within the Shire of Waroona (refer to **Figure 1**). The limestone resource comprises high-grade lime located just south of a resource previously identified as a regionally significant Basic Raw Material (Resource 61) by the Western Australian Planning Commission (WAPC) (WAPC 2012). The lime will be used primarily for agricultural purposes and road-base.

The Environmental Protection Authority (EPA) has determined that the proposal is to be assessed under Part IV of the *Environmental Protection Act 1986* (EP Act) and an Environmental Scoping Document (ESD) has been prepared to define the form, content, timing and procedure of the environmental review. Pursuant to Item No. 24 of the ESD, the following is required:

"*24. Prepare a Rehabilitation and Closure Plan consistent with the DMP and EPA (2015) Guidelines for Preparing Mine Closure Plans. The Plan should include but not be limited to:*

- *Closure objectives and completion criteria addressing post mining landforms and soil profile design, native vegetation and habitat for conservation significant flora and fauna and base the conclusions on the availability of suitable substrates*
- *Establish and measure vegetation and fauna reference and analogue sites to inform completion criteria.*"

This Rehabilitation and Closure Plan has been prepared in response to this requirement and has been developed in accordance with the ANZMEC/MCA *Strategic Framework for Mine Closure* (ANZMEC/MCA 2000) and refers to methodology outlined in the Department of Mines, Industry Regulation and Safety (DMIRS) (formerly Department of Mines and Petroleum (DMP)) and EPA's *Guidelines for Preparing Mine Closure Plans* (DMP and EPA 2015).

1.2. Project Summary

The limestone and sand pit will cover an area of approximately 14.74 hectares (ha) with a maximum natural elevation of 15 m Australian Height Datum (AHD). It will be excavated to about 5 to 6 m AHD in eight stages, each about 2 ha, over 20 years. It is anticipated that approximately 50,000 tonnes of limestone and 10,000 tonnes of sand will be extracted each year, depending on supply and demand. The proposal involves the screening and crushing of the limestone on site. Access to the property will be via the existing limestone road, Preston Beach Road North, and the sealed Preston Beach road that exits onto National Route 1, Forrest Highway. The quarry will only be operational for about four months of the year, from December to April. This is because lime products are only required in late summer and autumn for agricultural purposes. A site Environmental Management Plan (EMP) (Accendo 2021) has been developed which documents all environmental management measures relating to the quarry.

The planned end use of the quarry is to restore a natural soil and return the ridge to native vegetation along the buffer to the access road along the eastern boundary of Lot 1002, with pasture in the west, so there is no net loss of native vegetation.

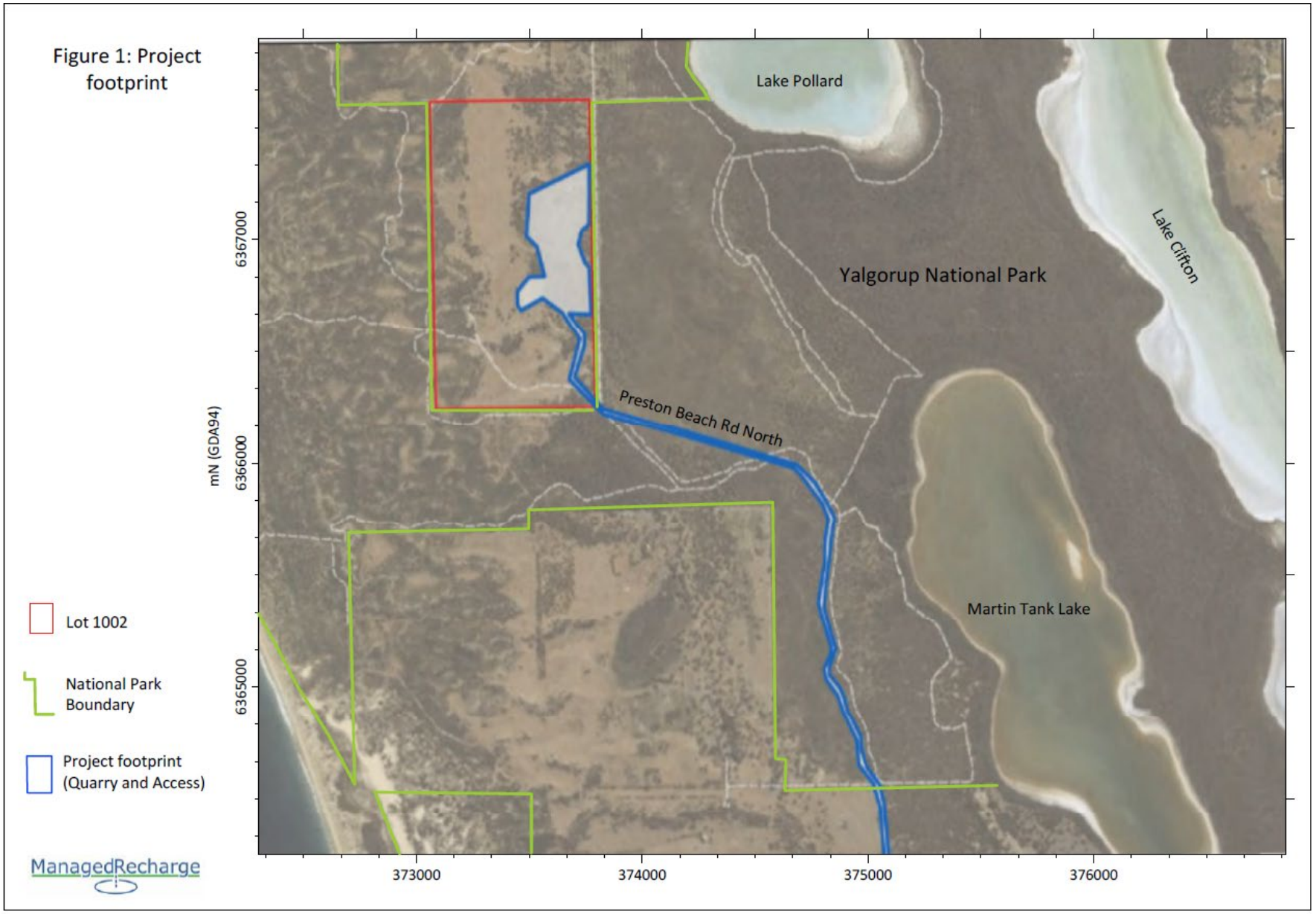
1.3. Document Version

This document version was prepared in response to the requirements of the ESD, with construction works yet to commence. Accordingly, this version of the Rehabilitation and Closure Plan is a conceptual

document prepared with all relevant available environmental and social information considered. The document is a preliminary version, intended for inclusion with the Environmental Review Document (ERD). It will be subject to comment by relevant stakeholders and therefore subsequent updates will be required.

The Rehabilitation and Closure Plan will be subject to review and amendments throughout the life of the proposed mine.

Figure 1: Project footprint



2. PROJECT OVERVIEW

2.1. Area of Disturbance

Lot 1002 and Preston Beach Road North are comprised of 96.5 ha and 14.52 ha, respectively. The proposed quarry within Lot 1002 consists of approximately 14.74 ha. The vegetation within the quarry has been assessed as being in a 'Degraded' to 'Good' condition, with the vegetation within the access road on Lot 1002 classified as 'Completely Degraded' to 'Degraded' (Natural Area 2019). Vegetation along Preston Beach Road North has been classified as being in a 'Degraded' to 'Very Good' condition. Works along Preston Beach Road North will consist predominantly of pruning/trimming of tree/shrub branches rather than complete clearing.

A summary of the clearing activities is provided below:

- Limestone/sand quarry:
    - Staged clearing (initially about 2 ha and then 0.5 to 1.0 ha per year) of vegetation in Degraded to Good condition, with a total vegetation clearing area of 13.9 ha.
    - Progressive native rehabilitation following completion of each stage.
- Access road on Lot 1002:
    - Clearing of 0.7 ha of scattered parkland pasture vegetation in Completely Degraded to Degraded condition.
- Preston Beach Road North Road:
    - 0.6 ha of predominately pruning/trimming of tree/shrub branches.

2.2. Mining Operations

Quarry operations are anticipated to commence in the fourth quarter of 2020, upon receipt of all the relevant approvals. It is anticipated that approximately 50,000 tonnes of limestone and 10,000 tonnes of sand will be extracted each year, depending on supply and demand.

Clearing and excavation activities will be undertaken on a staged basis, eight stages each of approximately 2 ha, over a total of 20 years. Progressive rehabilitation will occur following the completion of each stage. All pit operations will be confined within the proposed pit or on adjoining cleared land within Lot 1002. Limestone will be removed with an excavator or loader without the need for a bulldozer or onsite blasting. Screening and crushing will occur onsite with all required equipment being brought to the site as needed.

Vegetation cover will be removed by pushing it into windrows for use on the batters to minimise soil erosion and assist spreading on the final land surface as part of the final rehabilitation. Where practicable vegetation will be directly transferred to an area being rehabilitated. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable. If direct transfer is not possible the vegetation will be stored in dumps, mulched or swapped with a nearby operator to ensure that the material is not wasted. All topsoil will be removed and if not contaminated with weed species either used for direct spreading or stored in low dumps for spreading at a later date.

Soil and overburden, as yellow and brown sand and low grade limestone, will then be removed and either directly transferred to a rehabilitation area or stored in low dumps for later rehabilitation use where possible. Limestone interburden, if encountered, will be incorporated into the overburden dumps for later use in re-contouring the land surface at the conclusion of excavation.

Excavation will commence on the western ridge and then move to the eastern ridge, working on the floor of the pit towards the edges to minimise the potential visual impact (Landform Research 2016).

Limestone Extraction

Limestone will be excavated to a maximum depth of 4m above the groundwater table, therefore no dewatering will be required. A font-end loader will be used to dig and push the limestone down the excavation face and track roll the limestone in the process. The preliminary crushed limestone will then be picked up by the loader and fed to the mobile crusher. The limestone will then be loaded directly onto road trucks for offsite use. No blasting is proposed as a component of this proposal.

Sand Extraction

Sand will be excavated using a loader and will be loaded directly to a road truck. Sand extraction will be in the order of 5,000 to 10,000 tonnes per year. It is anticipated that it will be used predominantly for sand fill at Preston Beach and nearby.

2.3. Rehabilitation

During operations, the proponent will undertake progressive quarrying and rehabilitation. Following quarrying of each stage, rehabilitation works will be comprised of the following:

- The excavation is restored and reinstated as per the requirements of the guidelines (DMP and EPA 2015);
- All rubbish, debris, improvements or alterations effected by proponent associated with the excavation works are completely removed from the site;
- The stabilising coverage will be self-sustaining and will be comprised of agreed species;
- Weed control measures will be implemented; and
- The excavated area will be rehabilitated to a safe and stable landform that is resistant to erosion.

2.4. Support Facilities

Onsite facilities will be kept to a minimum and will work on the quarry floor to provide maximum sound and visual screening. The construction and operation activities are expected to utilise the equipment described within **Table 1**.

Table 1. Support facilities for the construction and operation activities.

Item	Description
Water tanker	A 10,000 L water tanker or similar will be used for dust suppression on the access road and working floors as required.
Loader	A loader will be used for the excavation and movement of limestone and sand and loading road trucks.
Portable crushing plant	A portable crushing plant will be used for the preparation of road base and agricultural lime.
Portable screening plant	A portable screening plant will be used for the preparation of limestone for road base.
Toilets	A portable toilet may be required onsite.

3. CLOSURE OBJECTIVES AND COMMITMENTS

Mine closure is subject to the requirements that arise from State and Commonwealth legislation, commitments made within environmental approval application documents, conditions on environmental approvals (such as Ministerial Statements, pollution licences and clearing permits) and any other commitments made to external stakeholders. Currently, the proponent has not received any approval conditions associated with the quarry.

The closure requirements for the quarry are identified in the following sections.

3.1. Legislative Requirements

The legislative obligations associated with the closure of the quarry are presented below in **Table 2**.

Table 2. State legislative closure requirements.

Legislation	Relevant Closure Requirement
Aboriginal Heritage Act 1978	Heritage sites are not to be altered, excavated, damaged, concealed or any portion of the site removed in anyway, unless approval is granted via Section 16 or 18 pursuant to the *Aboriginal Heritage Act 1978*.
Agriculture and Related Resources Protection Act 1976	Proponents are responsible for the control of declared plants and declared animals on and in relation to that land.
Contaminated Sites Act 2003	Proponents are responsible for reporting known or suspected areas of contaminated sites.
Environmental Protection (Controlled Waste) Regulations 2004	Disposal of controlled wastes is to occur at an appropriately licensed landfill/treatment facility via a licenced controlled waste contractor.
Environmental Protection Act 1986	The proponent shall not cause pollution or an unreasonable emission of noise, odour or electromagnetic radiation.
	The proponent shall not clear native vegetation without the relevant approval (e.g. clearing permit).
	The proponent shall not cause unauthorised discharges to the environment or undertake activities that will result in environmental harm.
Health Act 1911	Removal of sewerage systems is to be conducted in accordance with Local Government Law and by a licensed controlled waste contractor.
Soil and Land Conservation Act 1945	The proponent shall take adequate precautions to prevent or control soil erosion, salinity or flooding; or the destruction, cutting down or injuring of any tree, shrub, grass or any other plant on land where land degradation is occurring or likely to occur.
Wildlife Conservation Act 1950	A person may not take for any purpose protected fauna or flora without a licence, or rare and endangered flora without the written consent of the Minister.

3.2. Regulatory Guidelines

The DMIRS and EPA have issued the *Guidelines for Preparing Mine Closure Plans* (the Guidelines) (2015) to establish standards for closure plans being submitted to State Government.

The proponent recognises that the Guidelines provide a suitable format for development of mine closure plans, and this closure plan has been prepared to comply with the key elements and structure of the Guidelines.

Other key government and industry guidelines relevant to mine closure and rehabilitation include:

- *Strategic Framework for Mine Closure* (Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia 2000);
- *Enduring Value – The Australian Minerals Industry Framework for Sustainable Development* (Minerals Council of Australia 2004);
- *Mine Closure and Completion* (Department of Industry, Tourism and Resources 2006);
- *Mine Rehabilitation* (Department of Industry, Tourism and Resources 2006); and
- *Landform Design for Rehabilitation* (Environment Australia 2002).

3.3. Closure Obligations Summary

A summary of the key actions related to site-specific closure obligations is provided below within the Legal Obligations Register. These closure obligations arise from commitments in the ERD (Accendo 2021) and the management actions provided within the EMP (Accendo 2021). Accordingly, this Register will be updated upon receipt of the relevant approvals.

Some of the information and obligations identified may not be legally binding, however the purpose of the summary is to identify all existing obligations in addition to information and options that have been raised relating to closure. This information has been considered in defining closure objectives, strategies and indicative completion criteria employed in this closure plan.

Table 3. Legal obligations register.

Document	Aspect	Closure Requirement
ERD	Landform	The excavation area will be backfilled and reshaped utilising overburden that will be spread evenly over the excavated area and then profiled accordingly.
		Any final excavation face is left safe with all loose material removed and the side sloped to a batter of not more than 1m in 4m.
		The excavated area will be rehabilitated to a safe and stable landform that is resistant to erosion.
		Surface drainage lines will be established to control surface run-off and minimise potential erosion.
		The land surface will be a gently undulating floor with sloping batters at less than 1:4 vertical to horizontal and some at 1:2 at the steeper northern and southern edges of the ridge.
	Rehabilitation	The excavation is restored and reinstated in accordance with the rehabilitation program documented in the EMP.
		Native species that require minimal maintenance to be established in rehabilitated areas.
		The stabilising coverage will be self-sustaining and will be comprised of native species.
		Maintenance of the rehabilitated areas (i.e. infill planting and weed

Document	Aspect	Closure Requirement
		control) will be undertaken until the completion criteria is achieved.
	Decommissioning	All infrastructure and rubbish will be removed.

4. STAKEHOLDER CONSULTATION

The purpose of this Section is to identify the relevant stakeholders and include feedback/comments received relevant to the closure of the quarry. This Section will be continually updated as new stakeholders or concerns emerge.

4.1. Consultation Process

Mine closure consultation is conducted as a component of the environmental approvals process to resolve closure objectives, issues and closure strategies.

Consultation with State and Local Government stakeholders will occur as a component of the ERD process.

Consultation with other stakeholders will be conducted in a manner that is appropriate to the stakeholder and the specific issues requiring discussion.

The focus for discussion on closure will change as the project matures. A framework for closure consultation is provided within **Table 4**.

Table 4. Closure discussion framework.

Stage	Key Points
Prior to the commencement of operations	• Stakeholder identification and stakeholder mapping. • Commence closure-specific discussions with key stakeholders. • Agree key environmental, cultural and social values and closure objectives.
During operations	• Ensure closure objectives and indicative closure criteria remain relevant and appropriate. • Communicate outcomes of studies undertaken to improve the closure knowledge base, reduce closure risks or improve closure strategies. • Communicate proposed changes to the closure plan.
Prior to closure	• Final completion criteria consensus. • Discuss future use of infrastructure post-closure. • Commence workforce communication strategy.
Post closure	• Process to meet commitments. • Progress against completion criteria.

4.2. Key Stakeholders

The key stakeholders identified throughout the initial planning phase for the quarry are listed below:

- Department of Biodiversity Conservation and Attractions (DBCA);
- Department of Water and Environmental Regulation (DWER);
- Shire of Waroona; and
- Local community.

4.3. Consultation Register

A register of stakeholder consultation undertaken throughout the ERD process will be formulated and included in this Closure Plan.

4.4. Ongoing Consultation

Continuing consultation will become more closure oriented towards the end of the project life. This consultation register will be updated in future revisions of the Closure Plan, for the purposes of tracking stakeholder concerns, and ensuring closure will be completed in an appropriate manner.

5. POST MINING LAND USE AND CLOSURE OBJECTIVES

5.1. History

The land has been cleared and used for grazing with intense winter grazing by cattle occurring within Lot 1002. Historically the site was used as an airstrip for the aerial spreading of fertiliser and seed on local farming properties (Landform Research 2016). The site is surrounded by the Yalgorup National Park.

5.2. Post-mining Land Use

The planned end use of the site it to restore a natural soil profile and establish self-sustaining native vegetation.

Due to the preliminary nature of the proposal at the time of development of this Plan, final landforms have the potential to change over the life of the project. Any proposed changes to the intended final land use will be determined prior to the final decommissioning plan, preceded by a review of the Closure Plan, and conducted in consultation with relevant stakeholders.

5.3. Closure Objectives

The overarching closure objective is to establish safe, physically and chemically stable landforms, with a self-sustaining and resilient vegetative cover similar to that of the surrounding landscape. Specific closure objectives are listed in **Table 5**.

Table 5. Closure objectives

Aspect	Objective
Compliance	• All legal and stakeholder obligations relevant to closure of the quarry are achieved.
Landforms	• Construction of landforms that are stable, free draining, non-polluting, aesthetically compatible with the surrounding landscape and capable of supporting the end land use. • Attain stable landforms with conditions suitable for the natural establishment of a self-sustaining vegetation community.
Revegetation	• To establish self-sustaining ecological communities in better condition than pre-mining.
Water	• Ensure that the local and regional surface and groundwater hydrological regimes are not compromised.
Visual amenity	• Final landforms integrate with the natural surroundings as far as practical.
Safety	• Ensure that the resultant landform is safe and stable.

6. COMPLETION CRITERIA

6.1. Development Process

Completion criteria are the checklist by which the stakeholders verify that the quarry is presented in a condition suitable for relinquishment. Stakeholder feedback will be sought during the quarry life so that the completion criteria may be reviewed at each closure plan update, and may be refined accordingly. Stakeholder agreement on the completion criteria will be negotiated as a component of this Plan.

The proponent recognises that the process of developing criteria needs to commence early in the planning process to enable baseline information to be collected, provide clear performance goals for progressive rehabilitation conducted during the quarry's operational phase, and provide sufficient time for measurement methodologies and technologies to be developed, reviewed and agreed with stakeholders.

6.2. Indicative Completion Criteria

The indicative completion criteria associated with the closure objectives are provided below within **Table 6**. These criteria are subject to ongoing review and updates.

To support the development and communication of the final completion criteria, indicative measurement processes and supporting data (evidence and/or metrics) have been provided. The final, agreed completion criteria are expected to contain significantly greater detail than the indicative completion criteria.

Table 6. Indicative completion criteria.

Closure Objectives	Indicative Completion Criteria	Measurement Tool
Compliance		
All legal and stakeholder obligations relevant to closure and completion of the site are met.	Completed checklist and evidence demonstrating compliance with all legal and stakeholder obligations.	Obligations Checklist EPA and Shire acceptance of rehabilitation
The quarry is successfully relinquished for final land use.	Agreement with stakeholder regarding final land use.	Sign off on rehabilitation and closure completion criteria.
Landform		
Construction of landforms that are stable, free draining, nonpolluting, aesthetically compatible with the surrounding landscape and capable of supporting the end land use.	The land surface will be a gently undulating floor with sloping batters at less than 1:4 vertical to horizontal and some at 1:2 at the steeper northern and southern edges of the ridge.	Physical survey, visual inspection and monitoring results.
	The approved floor level of the excavation area is graded to an even surface.	
	Surface drainage lines will be established to control surface run-off and minimise potential erosion.	
	No contaminated sites (as defined by the *Contaminated Sites Act 2003*) requiring ongoing management.	
Revegetation		
Plant and maintain native vegetation to stabilise the landform.	Weed species are not unduly prevalent on rehabilitated areas.	Monitoring included in the Environmental Management Plan (EMP)
	Native seed used in rehabilitation is of local provenance.	
	The native vegetation will be self-sustaining.	
	Trees/shrub species providing preferential habitat for black cockatoos and western ringtail possums will be included in native seed mixes.	
	An adequate density, species richness and cover has developed based on the following:	

Closure Objectives	Indicative Completion Criteria	Measurement Tool
	• A native density of approximately 1 plant/2m^2; • No less than 10 species of tree, shrub and herbs; and • Reduce weed cover to less than 15%.	
Water		
Changes to surface water flows or groundwater quality are within acceptable limits.	The minimum buffer distance between the excavation level and the groundwater level is at least 4m.	Monitoring bores.
	Drainage lines flow in the same direction and to the same catchments as they did pre-mining.	Visual inspection and site audit
	Groundwater level results do not indicate any unexpected to changes.	Groundwater monitoring results (pre, during and post-closure).
Decommissioning		
No infrastructure left on site unless agreed to by regulators and post-mining land managers/owners.	No mining and processing equipment present on site.	Visual inspection and photographic record.
	Waste disposed of at appropriately licenced waste disposal facilities.	Visual inspection and site audit.
Heritage		
Preserve, protect and manage the cultural heritage values of the area in cooperation with the Traditional Owners and other stakeholders.	No sites are disturbed without appropriate permissions/ permits (both site-specific and legislative permissions and permits).	No buried material identified as having Aboriginal heritage significance identified.
Public Safety		
Site is left in a condition where the risk of adverse effects is reduced to acceptable level. stakeholders.	Fencing, signage and rubbish are removed.	Visual inspection and photographic record.
	Excavations are filled.	

7. COLLECTION AND ANALYSIS OF CLOSURE DATA

7.1. Purpose of this Section

This section of the Closure Plan provides a summary of the current available data on aspects of the physical and biological environment of the quarry and surrounds.

Baseline and predictive assessments conducted to date are summarised below. As closure planning progresses, based on gaps in closure data, additional assessments relating to closure will be identified and implemented. Closure domains, information gaps, and closure risks will be updated, where required, in each revision of the Closure Plan.

7.2. Geology

The quarry lies on the western margin of the Swan Coastal Plain, which consists of Pliocence to Quaternary sediments (superficial formations) that were deposited on a gently seaward-sloping unconformity surface on top of Mesozoic sedimentary rocks (Bettany *et al.* 1960). The upper formations include the Leederville Formation and the Yarragadee Formation. The Swan Coastal Plain is transected by the Bassendean dunes, the oldest, lowest and most leached of the series; and the calcareous Quindalup dunes (Bettany *et al.* 1960). The superficial formations (including sands, sandstone and limestone) support Perth's major aquifers, namely the Gnangara mound and the Jandakot mound.

In accordance with the Geological Survey of Western Australia (Gozzard 1987), the quarry is comprised of the Cainozoic (Czc) geological unit, described as '*undifferentiated consolidated Cainozoic sedimentary rocks; sandstone, limestone, conglomerate, siltstone; commonly ferruginised, silicified or poorly consolidated*'.

The quarry is situated at the contact between the Quindalup Dunes (safety Bay Sand) and Spearwood Dunes (Tamala Coastal Limestone and Sand). The Safety Bay Sand is of Holocene age and comprises unlithified, calcareous- sand unconformably overlying the Tamala Limestone. The Tamala Limestone comprises limestone, calcarenite and sand with minor clay and shell beds. It unconformably overlies Cretaceous sediments in the west and the Ascot Formation along its eastern margin. It has a maximum thickness of about 90m and extends to about -28 m AHD along the coast (Managed Recharge 2018).

7.3. Soils and Soil Profile

According to the *NationalMap* database (Department of the Prime Minister and Cabinet 2017), nine soil types are associated with the project footprint. The soil types are a reflection of the transition between the Quindalup dune system to the west and the Spearwood dune system to the east, with the Vasse soil system present in areas close to the lakes (refer to **Table 7**) (Natural Area 2019).

Table 7. Soil types within the project footprint.

Map unit	Name	Description	Lot 1002	Access Road
211Qu_Qd	Quindalup South Qd Phase	Small gently undulating plains (deflation basins) enclosed by discrete parabolic dunes with moderately deep to very deep calcareous sands over limestone	X	
211Qu_Qp2	Quindalup South Qp2 Phase	Long walled discrete parabolic dunes with moderate to steep slopes and uniform calcareous sands showing variable depths of surface darkening.	X	

Map unit	Name	Description	Lot 1002	Access Road
211Sp_S1a	Spearwood S1a Phase	Dune ridges with shallow to moderately deep siliceous yellow-brown sands, very common limestone outcrop and slopes up to 15%.	X	X
211Sp_S1c	Spearwood S1c Phase	Dune ridges with deep bleached grey sands with yellow-brown subsoils and slope up to 15%.		X
211Sp_S2b	Spearwood S2b Phase	Lower slopes (1-5%) of dune ridge with shallow to deep siliceous yellow-brown sands and common limestone outcrop.	X	X
211Sp_S4a	Spearwood S4a Phase	Flat to gently undulating sandplain with deep, pale and sometimes bleached, sands with yellow-brown subsoils.	X	
211Sp_S4b	Spearwood S4b Phase	Flat to gently undulating sandplain with shallow to moderately deep siliceous yellow-brown and grey-brown sands with minor limestone outcrops.	X	X
211Va_V4	Vasse V4 Phase	Low level storm beach ridges and terraces with shallow to moderately deep uniform, alkaline black sandy loams to loams overlaying unconsolidated shell beds or clayey marl.		X
211Va_V6	Vasse V6 Phase	Upper level sandy terrace and gently undulating beach ridges with deep grey or bleached pale brown siliceous sands overlaying soft shelly limestone.		X

The quarry consists predominantly of two of the above soil types, the Spearwood S4b Phase and the Quindalup Qd Phase. The Tamala limestone is covered by shallow, yellow-brown calcareous loamy sands that have originated as a result of weathering of the limestone on the central ridge. Landform Research (2016) outlines a typical soil profile from the limestone ridge as provided within **Table 8**.

Table 8. Typical soil profile.

Soil Horizon	Depth	Description
O-A	0- 10 mm	Weakly developed, leaf litter and decomposing organic matter.
B	10 – 500 mm	Dark brown siliceous sandy soils that become lighter with depth. In some locations the soils can be 2 metres beep but in others only 100 mm.
C	>500 mm	Cream recrystallised limestone.

7.3.1. Acid Sulfate Soils

Acid Sulfate Soils (ASS) is the common name given to naturally occurring soil and sediment containing iron sulfides. They have become a potential issue in land development projects on the Swan Coastal Plain when the naturally anaerobic conditions in which they are situated are disturbed and they are exposed to aerobic conditions and subsequently oxidise. When oxidised, ASS produce sulfuric acid, which can result in a range of impacts to the surrounding environment. ASS that has oxidised and resulted in the creation of acidic conditions are termed "Actual ASS" (AASS), and those that have acid generating potential but remain in their naturally anaerobic conditions are termed "Potential ASS" (PASS).

Mapping prepared by the Department for Planning and Infrastructure (DPI) to support the WAPC's Planning Bulletin 64: *Acid Sulfate Soils* (WAPC 2007) indicates that the quarry is classified as having "*no known risk of ASS, generally occurring at a greater depth than 3 metres*".

During excavation of the test pits, no soil or groundwater characteristics associated with ASS or the formation of ASS were identified.

7.4. Hydrology

7.4.1. Surface Water

The quarry does not contain any surface water drainage features which can be attributed to the porosity and permeability of the sand and limestone. Most rainfall is likely to be infiltrated directly to the ground, however in high rainfall events water may flow over-ground or as sub-surface flow into the north-south trending swale to the west of the site before infiltrating to the groundwater. It is possible, therefore, that the swale acts as a local groundwater recharge area (Managed Recharge 2019). All precipitation received onsite infiltrates directly into the groundwater table.

The *Geomorphic Wetlands of the Swan Coastal Plain* dataset indicates that the quarry is located approximately 800 m south-west of Lake Pollard, 2 km west of Lake Clifton and 1.5 km north-west of Martins Tank Lake (Managed Recharge 2018).

7.4.2. Groundwater

The superficial formations, which consist predominantly of clay and sand to the east of the Swan Coastal Plain and of sand and limestone to the west, form an unconfined aquifer extending westwards from the Darling Scarp to the Coast (Managed Recharge 2018).

At the quarry, the superficial aquifer is shallow and unconfined and occurs within the Safety Bay Sand and Tamala Limestone. The aquifer is confined at the base by low permeability sediments within the Osborne and/or Leederville Formations. East of Lot 1002, groundwater is present within the Tamala Limestone, Bassendean Sand, Guildford Sand and Ascot Formation, with hydraulic connection between the shallow sediments and the lagoonal and swamp deposits of the coastal lakes and wetlands (Managed Recharge 2018).

Groundwater recharge in the area is via direct rainfall infiltration, with infiltrated rainfall likely to reach the water table within days due to high vertical hydraulic conductivities (CyMod, 2009). Discharge from the superficial aquifer in this region is predominantly from the coastal lake system via evaporation. Groundwater west of the groundwater divide beneath the Quindalup Dunes will flow to the ocean. Minimal abstraction occurs in the area (Managed Recharge 2018).

The water-table elevation in the superficial aquifer generally falls from east to west and follows the topography except within the Spearwood Dunes. The presence of watercourses, lakes and inlets has resulted in the formation of complex groundwater-flow regimes in the region, which includes a number of groundwater divides (Deeney 1989), or flow boundaries whose positions may be inferred from the water table configuration (Commander 1988).

Commander (1988) identified six groundwater flow systems between Harvey and Leschenault Inlets, one of which is “Martins Tank” an internal flow system covering a relatively small area of about 20 km^2 discharging to Martins Tank and other lakes including Lake Pollard. The quarry lies within this flow system. It is noted that the eastern divide of the Martin Tank flow system is inferred to lie between Lake Pollard-Martins Tank and Lake Clifton and so groundwater from the quarry will not reach Lake Clifton if/when this divide is present (Managed Recharge 2018).

Long-term water level monitoring for DWER monitoring bore B2, located approximately 200 m west of Martin Tank Lake, which was drilled and constructed as part of the Lake Clifton Project (Commander 1988) indicated a period of gradually declining groundwater levels between about 1979 and 1999, which

appears to have stabilised over the last 20 years. Groundwater levels in the bore generally range from about -0.2 to 0.4 m AHD, with variations likely reflecting the amount of rainfall received in the area. It is noted that groundwater levels fall below sea level for two to three months each year in response to evaporation losses from the coastal lakes (Managed Recharge 2018).

7.5. Vegetation and Flora

7.5.1. Vegetation

Bioregions are large, geographically distinct areas of land with common characteristics such as physiography, climate, vegetation and animal communities. They represent a regional order of resolution between different flora and fauna habitats. There are 89 bioregions and 419 sub-regions in Australia which are described in the *Biodiversity Audit for Western Australia* (DEC 2002).

Mapping for the Interim Biogeographic Regionalisation for Australia (IBRA) programme indicates that the quarry lies within the Perth subregion of the Swan Coastal Plain bioregion which is described as a low-lying coastal plain, predominately covered with woodlands. It is dominated by banksia or tuart on sand soils, *Casuarina obesa* on outwash plains, and paperbark in swampy areas. The outwash plains, once dominated by *C. obesa* – Marri woodlands and Melaleuca shrublands, are extensive only in the south (Mitchell *et al*. 2002).

Six vegetation types have been identified within the project footprint (Natural Area 2019). The dominant vegetation type, 'Tuart and Peppermint Woodlands' comprised 44.9%, or 16.8 ha of the area surveyed. All other vegetation types occurred in small patches, with the total area of these vegetation types between 1.8 ha and 7.9 ha (refer to **Table9**).

Table 9. Summary of vegetation types identified in the project footprint

Vegetation Type	Description	Size (ha)	Quarry	Access Road	Preston Beach Rd North
Banksia Jarrah Woodland	*Banksia attenuata* and *Eucalyptus marginata* Woodland over *Xanthorrhoea preissi* shrubland and a weedy understorey of *Trachyandra divaricata*.	1.8			x
Eucalyptus decipiens Woodland	*Eucalyptus decipiens* Woodland over *Xanthorrhoea preissii* shrubland.	6	x		x
Tuart and Peppermint Woodland	*Eucalyptus gomphocephala* and *Agonis flexuosa* Woodland over *Spyridium globulosum* or *Xanthorrhoea preissii* shrubland.	16.8	x	x	x
Coastal Shrubland	Shrubland of *Acacia cyclops*, *Melaleuca systena*, *Hibbertia racemosa* and *Spyridium globulosum* over a weedy understorey of *Trachyandra divaricarta*.	2.5			x
Grasstree Shrubland	Shrubland of *Xanthorhoea preissii*, *Melalueca systena* and *Banksia dallanneyi* over *Lepidosperma gladiatum* in the herb layer.	7.6	x		
Trachyandra	Herb layer of *Trachyandra divaricata*, *Euphorbia peplus*, *Crassula glomerata* and *Lysimachia*	2.7	x	x	x

Vegetation Type	Description	Size (ha)	Quarry	Access Road	Preston Beach Rd North
Herbland	*arvensis*; *Eucalyptus gomphocephala* and *Agonis flexuosa* are associated with this vegetation type by comprise less than 2% of the canopy.				

The vegetation condition within the project footprint ranged from 'Completely Degraded' to 'Very Good'. The majority of the quarry was classified as 'Degraded' or 'Completely Degraded' (79%), with limited areas along Preston Beach Road North classified as 'Very Good' condition (Natura Area 2019).

7.5.1.1. Threatened Ecological Communities

The Banksia Jarrah Woodland vegetation type identified during the flora and vegetation survey (Natural Area 2019) is classified as Priority 3 pursuant to the *Biodiversity Conservation Act 2016* (BC Act) and Endangered under the EPBC Act. However, the minimum patch size for national legislative protection is 2 ha for an area in Good condition. The area of Banksia Woodland that may be subject to some pruning is 1.8 ha in size. Therefore, the area is not protected under the EPBC Act.

Tuart Woodlands of the Swan Coastal Plain is classified as a Priority 3 ecological community under the BC Act and Critically Endangered under the EPBC Act. All patches of the Tuart and Peppermint Woodland within the quarry are less than 0.5 ha and do not exceed the condition classes and patch size of 1 ha. An area of Tuart Peppermint Woodland on Preston Beach Road North exceeds the 1 ha size limit at 1.3 ha for Very Good condition, however this area is not subject to clearing.

7.5.2. Flora

The flora and vegetation survey (Natural Area 2019) identified a total of 109 flora species from 45 families, including 82 native and 27 introduced (weed) species. Of the flora species recorded, there was one Cyad (Cyadopsida), 27 Monocotyledons (Lillopsida) and 81 Dicotyledons (Magnoliopsida).

No evidence of conservation significant flora was identified during the survey (Natural Area 2019).

Due to historical anthropogenic disturbances, a significant number of exotic understorey species were recorded within the survey area. This includes the following weed species:

Briza maxima
Briza minor
Bromus diandrus
Centaurea melitensis
Centaurium erythraea
Centaurium tenuiflorum
Crassula glomerata
Cuscuta epithymum
Dischisma arenarium
Ehrharta longiflora
Euphorbia terracina
Gomphocarpus fruiticosus
Hypochaeris radicata
Lagurus ovatus
Lolium rigidum
Lotus subbiflorus
Lupinus cosentinii
Lysimachia arvensis
Melilotus indicus
Moraea flaccida
Parentucellia latifolia
Petrorhagia dubia
Solanum nigrum
Sonchus aleraceus

Trachyandra divaricata *Trifolium campestre*

7.6. Fauna

During the level 1 fauna survey, a total of 18 species of fauna were recorded. This included six arthropods (insects and spiders), five birds, two mammals and five reptile species. Species identification was based on visual observations or positively identified from foraging evidence, scats, tracks, skeletons or calls, within the project footprint during the survey period (Natural Area 2019).

A subsequent targeted survey was undertaken from April to May 2020 (Harewood 2020) to identify species of conservation with potential to occur in the subject site.

The following conservation significant fauna species were detected within the subject site during the course of the fauna survey (Harewood 2020).

- Carnaby's Cockatoo *Catyptorhynchus latirostris* (Endangered)
  A small group of individuals were observed flying over the proposed extraction area on one occasion.
- Quenda *Isoodon fusciventer* (Priority 4)
  Several individuals recorded within the proposed extraction area.
- South-western Brush-tailed Phascogale *Phascogale tapoatafa wambenger* (Conservation Dependent)
  Several individuals recorded within the proposed extraction area.
- Western Ringtail Possum *Pseudocheirus occidentalis* (Critically Endangered)
  Recoded along the southern section of Preston Beach Road North. Appears to be absent for the proposed extraction area.
- Western False Pipistrelle *Falsistrellus mackenziei* (Priority 4)
  Recorded several times within the proposed extraction area.

7.6.1. Short Range Endemic Invertebrate Fauna

The isolation of invertebrates in specific habitats or bioregions, such as ability and opportunity to disperse, life history, physiology, habitat requirements and habitat availability, leads to endemism at various spatial scales. Short Range Endemic (SRE) invertebrates are species with restricted distributions, arbitrarily defined in Western Australia as less than 10,000 km^2 (Harvey 2002).

Based on general condition of the quarry as a result of historical agricultural land uses, no SRE invertebrates would be restricted to the area, as none of the habitats present would provide habitat isolates. All the vegetation units are laterally continuous within the region and are not limited to the quarry. Furthermore, adjoining habitat is of superior quality attributed to the absence of recent and historical anthropogenic disturbances.

A desktop review indicated that only one invertebrate species of conservation significance has the potential to occur within the project footprint, this being the graceful sun moth (*Synemon gratiosa*).

The graceful sun moth is listed as Priority 4 by the DBCA. While no individuals have been identified, marginal quality habitat is contained within the quarry (i.e. low vegetation containing a small number of *Lomandra hermaphrodita* and *L. maritima*). The *Xanthorrhoea preissi* Shrubland is the only habitat type subject to clearing which contains species of *Lomandra* at very low densities (i.e. 0.3%).

7.7. Social Environment

7.7.1. Aboriginal Heritage

All Aboriginal sites in Western Australia are provided protection under the *Aboriginal Heritage Act 1972* in which it is an offence for anyone to excavate, damage, destroy, conceal or in any way alter an Aboriginal site without the Minister's permission.

An online search for relevant Aboriginal heritage information was undertaken using the Department of Planning Lands and Heritage (DPLH) Aboriginal Heritage Inquiry System that incorporates both the heritage site register and the heritage survey database (DPLH 201). The Aboriginal Heritage Site Register is maintained pursuant to Section 38 of the *Aboriginal Heritage Act 1972* and contains information on over 22,000 listed Aboriginal sites throughout Western Australia.

Results of the DPLH database search revealed that no Aboriginal heritage sites are present within the quarry. Nonetheless, it is important to note that Aboriginal heritage sites may still exist in or adjacent to the quarry that are not yet known to DPLH, or may not yet been listed on the Aboriginal Heritage Register.

7.7.2. Surrounding Land Use

The quarry is situated adjacent to the Yalgorup National Park which is managed by the DBCA. There are no known dwellings within 1 km of the quarry.

7.7.3. Conservation Areas

The Yalgorup National Park protects a wetland system that has achieved international recognition (Ramsar Convention) as an important area for migratory waterbirds and it supports several threatened plant and animal species. The Park includes the Lake Clifton Thrombolites, and several lakes which provide important habitat for conservation significant waterbirds.

7.7.4. Setbacks

Generic separation distances between sensitive and industrial land uses have been developed by the EPA in recognition that a site-specific study to determine a buffer may not always be necessary. These are referred to as Guidance Statement No. 3 *Separation Distances between Industrial and Sensitive Land Uses* (2005) (herein referred to as EPA 2005) and were developed based on the experience of the DWER's and other regulatory authorities, and limited site-specific quantitative scientific assessment. A site-specific technical study to determine separation distances is generally only expected in the case of a major heavy industrial estate, or a general industrial estate where emissions may result in cumulative impacts (EPA 2005).

In accordance with EPA 2005, the recommended separation distance between an extractive industry and a sensitive receptor is 300-500 m. Separation distances from the quarry to sensitive receptors are provided below follows:

- Residential dwelling – 1 km east of Lake Clifton;
- Lake Pollard bird hide – 1 km east of the quarry;
- Original Lake Pollard walk trail – 800 m east of the quarry;
- Loop trail option which traverses a rural road and Preston Beach Road North – 20 m east from the quarry; and
- Martin's Tank campground – 2 km south-east of the quarry.
- Martin's Tank campground – 509 m from Preston Beach Road North.

The separation distances from sensitive receptors to the extraction area boundary comply with EPA 2005, excluding a portion of the loop trail option. However, the loop trail option traverses designated roads immediately adjacent to private property, and road users are not deemed sensitive receptors pursuant to the EPA Guidance Statement (2005). Accordingly, no specific dust and/or noise monitoring is required.

7.7.5. Noise

Lot 1002 is a mixed-use pastoral enterprise including grazing of cattle and growing fodder crops. Periodically during the year there are different activities undertaken on the farm including ploughing, using seed drills, harvesting and feeding out. All the activities involve the use of heavy machinery.

The baseline existing noise environment has been characterised through noise monitoring. The baseline noise monitoring was carried out over the period 4th to 11th June 2020.

Weather conditions were obtained from the Bunbury Bureau of Meteorology (BOM) web site, this being the nearest available weather monitoring site.

The monitoring period covered a range of wind conditions, including low windspeed conditions, which typically are the wind conditions where greatest sound propagation occurs and also the condition when background noise is lowest. The lower background noise levels associated with low wind speeds are because wind induced noise generated by the tree canopy are minimized (Herring Storer Acoustics 2020).

From the statistical monitoring, it is evident that the subject site is a relatively quiet location, with the typical range of noise levels during the lower wind-speed conditions being:

- LA90 20 – 25 dB(A)
- LA10 30 – 35 dB(A)

The main sources of background noise are wind induced tree noise, fauna and insects, coastal wave noise and traffic noise from Forrest Highway (Herring Storer Acoustics 2020).

7.7.6. Dust

Emission Assessments Pty Ltd undertook an investigation into baseline ambient dust levels at the subject site and surrounding sensitive receptors from 04/06/2020 to 11/09/2020.

These sensitive receptor locations include:

1. Martins Tank Camp Site
2. Pollard Lake Bird Hide
3. Residential Dwelling South
4. Site boundary of Lot 1002

The monitoring program was initiated to quantify the level of ambient dust at these premises over a period of three months (90 days) between the following dates:

- Thursday 4th June 2020 – Friday 3rd July 2020
- Monday 13th July 2020 – Thursday 13th August 2020
- Thursday 13th August 2020 – Monday 11th September 2020

Monitoring was undertaken in accordance with '*AS/NZ 3580.10.1:2003 - Determination of Particulate Matter - Deposited matter - Gravimetric method*.' A Standard Dust Deposition Gauge was used for the dust deposition rate measurements over defined exposure periods of 30 ± 4 days (Emission Assessments 2020).

The gauge was comprised of an open-faced gauge positioned in an upwards orientation and mounted on a tripod stand so that the top of the deposition gauge is situated at a height of 2.0m ±0.2m. The gauge comprises a wide-mouth collection funnel mounted on a collection vessel. Prior to commencement of sampling a measured 10.0mL aliquot of copper sulphate solution was added to the collection vessel to prevent algal growth which may affect the measured results (Emission Assessments 2020).

Airborne particles entrained in the local ambient air are deposited in the gauge via natural processes (wind, rainfall etc.) and are passively collected in a bottle along with any accumulated rainwater.

Upon completion of each monitoring period the inside surfaces of the funnel were rinsed with deionised water to remove any dust collected. This was combined with the contents of the collection vessel, which was then stoppered and labelled with a unique identification number. The bottles were then submitted to MPL Laboratories, a NATA accredited laboratory, for analysis of total solids. The total solids results are expressed as a deposition rate of grams per square meter per month (g/m2/month) and total grams per sample (g) (Emission Assessments 2020).

The prevailing wind direction during the sampling period was westerly. It should be noted that the proposed operations intend to operate between the drier months of December to April, during which the prevailing wind direction changes to southerly and rainfall is significantly less (Emission Assessments 2020).

Monitoring conducted during this period in 2020 is used to set a baseline of representative normal conditions and levels of dust prior to any potential additional dust generated from proposed quarry activities (Emission Assessments 2020).

8. IDENTIFICATION AND MANAGEMENT OF CLOSURE ISSUES

8.1. Assessment Process

In order to determine the level of consequential risk associated with the closure of the quarry, a risk assessment has been undertaken. The scope of this risk assessment has been to consider all aspects that affect effective closure and is not restricted to an assessment of environmental impacts. **Appendix A** provides details associated with the assessment.

Closure risks were identified for each general closure item and closure domain and assessed according to the proposed supporting facilities, quarrying activities that will be undertaken at the quarry, and guidance (DMP and EPA 2015).

To underpin the risk assessment, project-specific likelihood and consequence matrices were developed, and a risk ranking matrix established. Potential risks were ranked to determine inherent risk (the level of risk arising from a potential impact prior to the implementation of mitigation/management measures). Potential mitigation measures were identified for each potential impact, then a residual risk rating (risk level after implementation of mitigation/management measures) was assigned to each risk, based on a consideration of elements such as the number and detail of studies completed and feedback from relevant authorities.

8.2. Assessment Outcomes

During the assessment, inherent risks were identified as 'Moderate'. With the implementation of suitable management measures, a residual risk rating of 'Low' was obtained for all aspects.

8.3. Knowledge Gaps

8.3.1. Methodology

A process for evaluating and managing issues has been developed which involves:

1. Identifying work that has been undertaken on each aspect, as it pertains specifically to the quarry. This may include baseline studies, stakeholder consultation, research and impact assessment studies. This review is used to identify any knowledge gaps;
2. Identifying the controls that are in place to manage each issue. This may include management plans / procedures, work practice guidelines etc. This review is used to identify any management gaps;
3. Reviewing the information in relation to identified gaps. This is undertaken to determine if the gaps are in the process of being closed, e.g. through ongoing knowledge development in line with the quarry development, or if the gap constitutes a closure issue, requiring dedicated resources; and
4. Establishing actions needed to resolve the issue, time to complete the task, and associated accountability.

8.3.2. Status of Closure Issues

The current status of closure issues for the quarry are summarised in **Table 10**.

Table 10. Status of closure issues.

Aspect	Issue	Action	Timing
Environmental Management	An Environmental Management Plan (EMP) has been prepared.	Obtain comments during ERD public review and update as required	Prior to construction works.
Species mix for rehabilitation.	Determine appropriate seed mixed for rehabilitation and include in EMP.		
Rehabilitation monitoring	Determine locations and scale of rehabilitation monitoring program.		

9. CLOSURE IMPLEMENTATION

9.1. Closure Domains

A review of each closure domain has been undertaken, incorporating all available knowledge and knowledge gaps to determine potential closure risk. The following three "domains" have provisionally been defined for the purpose of closure planning:

- Landform design;
- Revegetation; and
- Supporting infrastructure.

9.1.1. Landform Design

Topsoil is an integral part of rehabilitation as it contains organic matter and seed bank which assists in establishing vegetation when respread on disturbed areas. Topsoil at the quarry will be stripped and stockpiled separately, prior to commencing excavation. The soils will be stripped in a dry state to preserve soil structure and stripping will be undertaken in relatively still weather conditions, where possible.

Topsoil and Subsoil Stripping

The following procedures are applied to topsoil and subsoil stripping:

- Records of topsoil and subsoil removal and storage locations shall be maintained;
- Planning shall endeavour to facilitate the direct placement of topsoil and subsoil from disturbed areas to areas scheduled for rehabilitation;
- Stockpiles will be located sufficiently distant from quarrying operations so that they will not be disturbed prior to being used in rehabilitation;
- Topsoils will be stripped and stockpiled separately from sand stockpiles;
- Topsoils should be stripped to a depth of approximately 150 mm. In some areas, topsoil depth may differ due to the topography of the quarry;
- Where practicable, soil will be stripped and returned directly to a rehabilitation area;
- Soil stripping should be avoided during wet conditions;
- Where necessary the stockpiles will be covered with polymer agents to reduce erosion and discourage weeds.

Topsoil Replacement

It is preferable not to stockpile topsoil for extended periods and therefore the proponent will be quarrying and rehabilitating on a progressive basis. This will ensure that topsoil is respread relatively soon after stripping.

To alleviate any compaction caused by the movement of heavy machinery, all quarried areas will be ripped. Ripping requirements will be tailored to suit specific rehabilitation areas.

Water spraying and/or other appropriate measures shall be used for dust control during the placement of topsoil and subsoil. Under high wind conditions, topsoil and subsoil placement may have to cease.

The limestone extracted from a ridge and will result in the ends of the two dunes being reshaped down to the elevation of the intervening swale. The main ridge line will be maintained.

Landform Design

Rehabilitation earthworks will be undertaken to develop a stable landform that is compatible with the local area and is sustainable in the long term. The ends of the two dunes will be reshaped down to the elevation of the intervening swale and the main ridge line along the western side of Lake Pollard will be maintained. **Figure 2** provides the final conceptual contours for the quarry.

9.1.2. Revegetation

Following the completion of a cell, deep ripping will occur at 1m intervals in two directions should low permeability soils be encountered at the base of the pit. Subsequently, topsoil will be respread using a front-end loader.

The final land surface will be smoothed and sloped to be compatible with the existing natural landform of the area. Revegetation will be undertaken during the first winter months upon completion of the restoration works for each particular stage.

Seed mixes for rehabilitation will be of local provenance. Specific seed mixes will be selected to provide a range of species appropriate to the desired habitat, taking into consideration landscape position and slope. In areas where erosion risks are identified, seed mixes may be modified to include or increase the portion of species that provide rapid cover.

Weed Management

The proposed management actions to mitigate potential impacts associated with weeds and pathogens include:

- All earthmoving and ground engaging equipment will be inspected and cleaned of vegetation, mud and soil prior to entry and exit of the quarry;
- Monitor spread of weeds onsite by controlling germination of weeds;
- Spot spraying and hand pulling of emergent weed species within the quarry will be undertaken to gradually deplete seed stocks and reduce or eliminate any new colonies;
- Pre-seeding weed control may be required after any potential weed seeds have been allowed to germinate;
- Any weeds likely to significantly impact on the rehabilitation are to be sprayed with broad spectrum spray or grass specific spray depending on the species involved.

9.1.3. Supporting Infrastructure

The key supporting infrastructure developed and installed within the subject site as a component of the proposal will include:

- Access roads;
- Hard stand areas; and
- Fencing.

Decommissioning is anticipated to commence at the cessation of quarrying activities, as most areas of the quarry, quarry equipment and infrastructure will be fully utilised until the end of the quarry life. However, as with progressive rehabilitation, opportunities to decommission areas in advance and facilitate rehabilitation will be reviewed through the planning process.

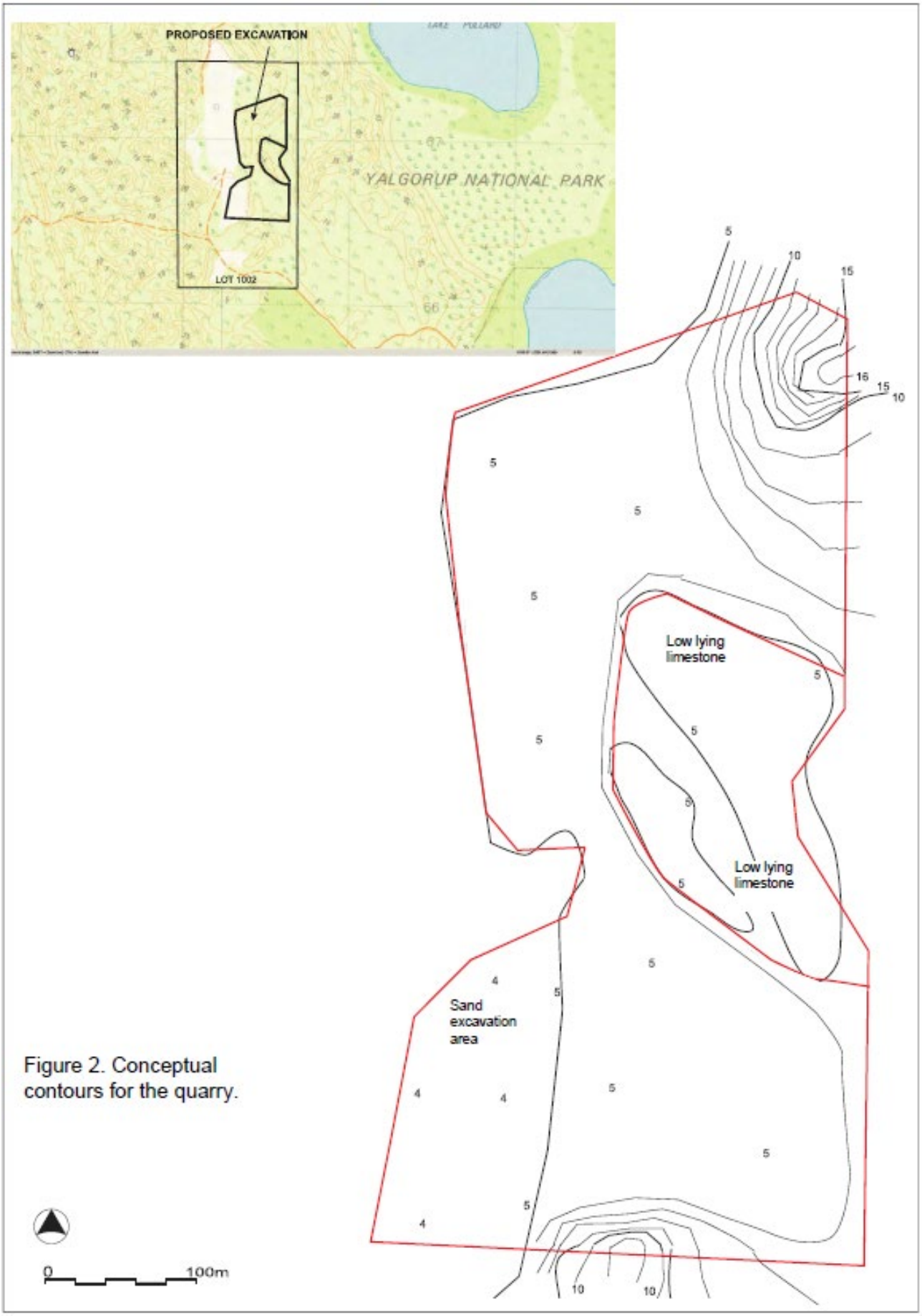


Figure 2. Conceptual contours for the quarry.

All supporting infrastructure constructed and installed by the proponent will be removed at the end of quarrying operations. This will involve the re-contouring of final landforms to meet the agreed completion criteria, in particular to provide geotechnically stable landforms with the ability to support revegetation targets.

9.2. Progressive Rehabilitation

The proponent proposes to progressively rehabilitate sections of the quarry, as they become available. This will reduce the long-term closure liability and is expected to be cost effective, as earthworks can be completed while equipment is on site. Other benefits of progressive rehabilitation include:

- Reduction in the overall un-rehabilitated footprint of the quarry;
- Reduced opportunity for entrainment of wastes during extreme storm events;
- Opportunity to trial various rehabilitation treatments; and
- Demonstrating that the company is committed to undertake rehabilitation and closure.

9.3. Unplanned Closure

In the event of a temporary or unplanned closure, the proponent will notify all relevant authorities. Measures will be undertaken to transfer the quarry from operations into a care and maintenance or decommissioning regime. A Care and Maintenance Plan or Decommissioning Plan will be developed prior to closure which will demonstrate how on-going environmental and social obligations associated with the quarry will continue to be met. Furthermore, should a change in mining status occur, this Closure Plan will be updated with any relevant changes including the applicable details from either a Decommissioning or Care and Maintenance Plan.

9.4. Closure Schedule

A summary of the closure actions and proposed timing is provided below within **Table 11**. These actions may be updated as the project progresses, with more definitive timing applied.

Table 11. Closure implementation summary and schedule.

Aspect	Requirement	Closure Actions	Timing
Landform Design	Retain and re-use topsoil.	• Records of topsoil and subsoil removal and storage locations shall be maintained; • Stockpiles will be located sufficiently distant from quarrying operations so that they will not be disturbed prior to being used in rehabilitation; • Topsoils should be stripped to a depth of approximately 150 mm; • Where practicable, soil will be stripped and returned directly to a rehabilitation area; • Soil stripping should be avoided during wet conditions.	Prior to excavation of each stage.
	Establish a safe and stable landform.	• The excavation area will be backfilled and reshaped utilising overburden that will be spread evenly over the excavated area; • Any final excavation face is left safe with all loose material removed and the side sloped to a batter of not more than 1m in 4m; and • The excavated area will be rehabilitated to a safe and stable landform that is resistant to erosion.	Following completion of each stage.
Revegetation	Prevent the introduction of new weed species and spread of existing populations.	• All earthmoving and ground engaging equipment will be inspected and cleaned of vegetation, mud and soil prior to entry and exit of the site; • Monitor spread of weeds onsite by controlling germination of weeds; • Spot spraying and hand pulling of emergent weed species within the site will be carried out annually to gradually deplete seed stocks and reduce or eliminate any new colonies; • Pre-seeding weed control may be required after any potential weed seeds have been allowed to germinate; • Any weeds likely to significantly impact on the rehabilitation are to be sprayed with broad spectrum spray or grass specific spray depending on the species involved.	Weed control is to be conducted annually and prior to revegetation.
	Plant self-sustaining, native groundcover species to stabilise the	• Deep ripping will occur at 1m intervals in two directions should low permeability soils be encountered at the base of the pit; • Topsoil will be respread using a front-end loader; • The final land surface will be smoothed and sloped to be compatible with the existing natural landform of the area; • Revegetation will be undertaken during the first winter months upon completion of the restoration	First winter months following stabilisation of the landform of each stage.

Aspect	Requirement	Closure Actions	Timing
	landform	works for each particular stage; • Local provenance seeds are to be purchased from commercial seed collectors. The species selected for revegetation will be documented within the EMP.	
Supporting infrastructure	Remove all infrastructure	All supporting infrastructure constructed and installed by the proponent will be removed at the end of quarrying operations. This will involve the re-contouring of final landforms to meet the agreed completion criteria, in particular to provide geotechnically stable landforms with the ability to support revegetation targets.	Quarry closure

10. CLOSURE MONITORING AND MAINTENACE

10.1. Monitoring

To ensure closure activities are undertaken in accordance with agreed closure objectives, criteria and implementation, closure performance monitoring throughout progressive rehabilitation and post-closure is required.

Monitoring for native species establishment, invasive species, and erosion will be undertaken in spring, every seven years, by a qualified botanist. The frequency of formal monitoring has been developed in consideration of the variable germination rates between species and the typically long establishment times associated with direct seeding. Given that annual maintenance inspections will be undertaken to determine the requirement for maintenance measures (i.e. weed management), the formal monitoring schedule is considered suitable.

Monitoring for native species establishment, invasive species, and erosion will be undertaken annually in spring. These inspections will be undertaken to determine the requirement for maintenance measures (i.e. weed management, infill planting, pest control etc.).

10.2. Maintenance

Maintenance inspections will be undertaken by the proponent to determine the requirement for maintenance measures.

In the event that monitoring targets are not being achieved, contingency actions will be fully developed (in consultation with relevant stakeholders) and implemented. A summary of the preliminary maintenance measures is provided below within **Table 12**.

Table 12. Preliminary maintenance measures for closure.

Aspect	Trigger	Action
General	Breach of conditions relevant to closure.	Undertake the following: 1. Investigate cause. 2. Determine remedial action. 3. Implement remedial action. 4. Report issue to relevant authority. 5. Monitor outcome. 6. Revise procedures as appropriate. 7. Continue from Step 1 if outcome not satisfactory.
Landform design	Significant areas of erosion and/or sedimentation identified.	Implement erosion protection measures including bunding, applying polymer, re-contouring land and installing drains.
Revegetation	Revegetation growth lower than targets.	Investigate cause (soil quality, seed viability etc.) and implement corrective actions. These could include fertilisers, more seed, better quality topsoil, etc.
Weeds	New weed species identified and/or overpopulation of weed species.	Increase frequency of weed control to bi-annually and immediately target problematic populations.

On completion of mining activities, an audit will be undertaken to determine the environmental condition of the quarry. The monitoring and maintenance regime will be updated with each successive version of the Closure Plan, as required.

10.3. Managament of Information and Data

The proponent recognises that environmental performance is an important factor in its business performance and is a measure of its professionalism. The company commits to continually improving environmental performance by increasing environmental awareness and responsibility through education of its employees and contractors.

In addition, the proponent's Quality Management System has been developed to ensure that legislative and social obligations associated with the quarry will be achieved.

11. FINANCIAL PROVISION FOR CLOSURE

11.1. Costing Methdololgy

The amount recognised for closure at any given time will be determined by using the best and most recent estimate of the expected cost at that time. The closure cost estimation methodology will be based on the proponent's internal procedures and from experience with similar projects.

Information gaps currently exist around closure activities. The proponent will update costs as information becomes available. Specifically, the cost estimates will consider the following:

- Decommissioning (i.e. removal of infrastructure);
- Final landform construction;
- Rehabilitation management (including weed control and revegetation);
- Workforce management (i.e. training costs);
- Monitoring costs;
- Costs associated with ongoing updates to this Closure Plan;
- Allowance for failed rehabilitation that may necessitate rework of rehabilitation areas; and
- A contingency allowance.

Note that for commercial reasons the actual estimate is not documented in this Closure Plan.

11.2. Financial Provisions

In addition, adequate financial provisions to fund the implementation of closure commitments and obligations form part of the proponent's financial and accounting requirements under Australian legislation.

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APPENDIX A. RISK ASSESSMENT

Table A1. Impact risk assessment descriptors.

Likelihood		
Level	**Description**	**Criteria**
1	Rare	The environmental event may occur or one or more conservation significant species or communities may be present in exceptional circumstances.
2	Unlikely	The environmental event could occur or one or more conservation significant species or communities may be present in exceptional circumstances.
3	Moderate	The environmental event should occur or one or more conservation significant species or communities should be present at some time.
4	Likely	The environmental event will probably occur or one or more conservation significant species or communities will be present in most circumstances.
5	Almost certain	The environmental event is expected to occur or one or more conservation significant species or communities is expected be present in most circumstances.
Consequences		
Level	**Description**	**Criteria**
1	Insignificant	Insignificant impact on species or communities of conservation significance or regional biodiversity, and the loss will be insignificant in the context of the availability of similar flora, vegetation or fauna in the area.
2	Minor	Impact on flora, vegetation or fauna will be localised and no significant impact on species or communities of conservation significance in the project area. Loss of species or communities at the local scale.
3	Moderate	An appreciable loss of flora, vegetation or fauna in a regional context or limited impact on species or communities of conservation significance in the project area.
4	Major	Significant impact on conservation significant flora, vegetation or fauna or their habitat in the project area and/or regional biodiversity and/or a significant loss in the biodiversity at the landscape scale.
5	Catastrophic	Loss of species or communities at the regional scale and/or a significant loss of species categorised as 'vulnerable' or 'endangered' under the EPBC Act at a regional scale.
Acceptability of Risk		
Level of Risk	**Management Action Required**	
1 to 4	**Acceptable, no action required**	
5 to 6	**Moderate, avoid if possible, routine management with internal audit and review of monitoring results annually**	
7 to 8	**High, externally approved management plan to reduce risks, monitor major risks annually with external audit and review of management plan outcomes annually. May require**	

	referral to the Commonwealth under the EPBC Act
9 to 10	**Extreme, unacceptable, project should be redesigned or not proceed. Requires a referral to the Commonwealth under the EPBC Act**

Table A2. Level of acceptable risk.

		Likelihood				
		Rare or very low (1)	Unlikely or low (2)	Moderate (3)	Likely (4)	Almost certain (5)
Consequences	Insignificant	2	3	4	5	6
	Minor	3	4	5	6	7
	Moderate	4	5	6	7	8
	Major	5	6	7	8	9
	Catastrophic	6	7	8	9	10

Table A3. Site closure risk assessment.

Risk	Potential Issues	Impact	Before Management			Management Actions	With Management		
			Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Significance
Compliance	1. Failure to meet legal obligations. 2. Failure to implement / undertake legal obligations. 3. Failure to understand, or difference in interpretation, of obligations.	1. Prosecution with associated penalties. 2. Delay to relinquishing land tenure, involving management time and cost. 3. Cost of rework. 4. Deterioration of public reputation. 5. Failure to get bonds released.	Low	Major	Moderate	1. Legal obligations and commitments identified and included within Closure Plan. 2. Closure Plan includes tracking of how obligations and commitments are being met. 3. 'Decision making stakeholder' review and acceptance of how obligations are being met, prior to closure. 4. Monitoring report includes discussion on closure and rehabilitation.	Rare	Major	Low
Landform design	Land is not geotechnically stable.	1. Cost of rework to correct landform design. 2. Compensation (cost) to future land users if structures fail.	Unlikely	Major	Moderate	1. Proposed landform design is prepared in consultation with stakeholders. 2. Geotechnical assessment is undertaken as required. 3. Monitoring is undertaken to identify any issues post landform contouring.	Rare	Moderate	Low
	Evidence of sedimentation and/or erosion on rehabilitated areas.	1. Increased siltation within drainage channels. 2. Rills and gullies within rehabilitated areas. 3. Stability of landform is compromised.	Unlikely	Moderate	Moderate	1. Apply erosion protection agents (e.g. hydromulch) where required. 2. Monitor mine pits for erosion and maintain landforms where necessary.	Rare	Moderate	Low
Revegetation	Rehabilitated vegetation does not meet proposed rehabilitation criteria.	1. Creates unstable landform that is subject to erosion. 2. Promotes weed infestation. 3. Cost of rework.	Moderate	Moderate	Moderate	1. Suitable species are selected for revegetation. 2. Dieback management measures are implemented. 3. Weed control measures are implemented. 4. Monitoring is undertaken to identify potential issues before closure.	Unlikely	Moderate	Low
	Weed infestation and/or presence of declared weed species.	1. Cost of control. 2. Compliance (declared weeds, revegetation composition). 4. Competition from weeds results in failure of revegetation.	Moderate	Moderate	Moderate	1. Undertake re-disturbance surveys and inspections. 2. Undertake annual removal and spraying of weeds throughout the site. 3. Implement weed control and monitoring in revegetation areas.	Unlikely	Minor	Low
Contaminated Sites	Contamination results from a hydrocarbon spill or leak.	1. Cost of control. 2. Soil and/or groundwater contamination.	Unlikely	Major	Moderate	1. No storage of chemicals or hydrocarbons onsite. 2. Maintain a spill kit on site at all times.	Unlikely	Moderate	Low
Supporting infrastructure	Failure to completely remove all supporting infrastructure and rehabilitate site.	Delay in handover / relinquish of land resulting in ongoing cost incursion.	Unlikely	Moderate	Moderate	1. Closure cost estimates and provisioning includes removal of infrastructure. 2. Closure cost estimates and provisioning is reviewed and updated on annual basis. 3. Ongoing liaison with stakeholder regarding expectations associated with onsite infrastructure.	Rare	Moderate	Low
Financial Provision	Inadequate financial provisions for rehabilitation.	1. State government pursues Doyle's Lime Service owners for costs. 2. Deterioration of public reputation.	Unlikely	Major	Moderate	1. Annual review of Closure Plan and cost estimates, with continual improvement in the level of detail contained. 2. Feedback from actual rehabilitation expenditure is utilised in updates to rehabilitation cost estimates and provisioning. 3. Assumptions used in cost estimates to be included within the Closure Plan and reviewed annually.	Rare	Moderate	Low