WARTON ROAD MINING PROPOSAL

Mining Tenements M70/1142 and M70/1088, Banjup





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Mining Tenements M70/1142 and M70/1088, Banjup

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Disclaimer

EXECUTIVE SUMMARY

Sand Extraction Proposal

Rocla Quarry Products (Rocla) is seeking approval to extract sand within Lot 467 which is located at the corner of Jandakot Road and Warton Road (Figure 1).

The Department of Mines and Petroleum (DMP) in August 2010 granted endorsement for tenements M70/1142 and M70/1088 to Rocla (Appendix 1). These mining tenements are located within Lot 467 (Figure 2).

Rocla's proposed sand excavation area is 9.56 hectares (ha) in total. The 9.56 ha sand excavation area consists of 5.63 ha of historically mined areas and 3.93 ha of native vegetation.

In regards to the Warton Road Mining Proposal Rocla is seeking an environmental and mining approval in accordance with the *Mining Act 1978*. Rocla considers that the environmental impacts of the proposal can be managed to the requirements of a native vegetation clearing approval under the *Environmental Protection Act 1986* (EP Act). The DMP has the authority to grant clearing approvals under delegation from the Department of Environment Regulation in accordance with the provisions of the EP Act and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

The proposed sand excavation area aligns with the State Planning Policy (SPP) 2.4 "Basic Raw Material" (WAPC 2000) identified "Priority Sand Resource" location. The sand excavation (within the Priority Sand Resource location) would be undertaken in a single stage over an anticipated mine life of three years.

Sand extraction has been undertaken at Rocla's adjacent mining tenement M70/357 (Lot 140 Armadale Road) since early 2000. It is proposed to create an internal access road linking mining tenement M70/1142 and M70/1088 within Lot 467 to Rocla's existing site M70/357 within Lot 140 Armadale Road.

The extracted sand will be primarily utilised by concrete plants in Perth's southern and south-eastern corridors. Historically, Rocla's and Readymix's sand extraction operations in the Jandakot region supplied the concrete plants in Canningvale, Kwinana, Armadale and Rockingham areas. However, these historically locally available sand resources are now exhausted. As a result, Rocla transports concrete sand from its Gaskell Avenue operations, located in the northern suburb of Ellenbrook 55 kilometres (km) north of Jandakot, to the southern concrete plants.

This outcome has resulted in an additional 1.76 million truck kilometres (km) being travelled at the cost of an estimated 2,640 tonnes of additional greenhouse gases being omitted. The additional greenhouse gas emissions are non-compliant with Rocla's and the state/ Commonwealth's policies and objectives for minimising these emissions.

Perth's southern corridors have undergone significant expansion over the past decade, substantially driven by urban growth. The resultant outcome is a demand for concrete products (therefore concrete sand) that exceeds the regional supply, a situation which is forecast to continue. The Western Australian Planning Commission's (WAPC) Directions 2031 (WAPC 2010) growth estimates for the south-east subregion states it will need to accommodate an additional 35,000 dwellings. Further, it is estimated that by 2031 the population of the south-west subregion will have grown by 34 per cent to 278,000.

Rocla has historically extracted priority sand resource from nearby Lot 136 Armadale Road which was leased from the then Department of Housing and Works. Sand extraction within this lease was forced to stop (without consultation or consent from Rocla) when the Department of Housing and Works offered the site to Main Roads WA as an offset to its clearing of native vegetation (including rare orchids) as part of the Roe Highway Stage 7 works. This offset of Lot 136 Armadale Road was approved by the Minister for the Environment.

Purpose of this Mining Proposal Report

This document outlines the key environmental issues identified and scopes the assessment methodology.

The purpose of this document is to:

- Identify the relevant environmental issues and factors raised by the sand extraction proposal.
- Identify the potential environmental impacts.
- Outline preliminary environmental management strategies that are recommended to minimise potential adverse impacts from sand extraction.

Site Context

Lot 467 Jandakot Road is located approximately 14 km to the south-east of the Perth Central Business District in the suburb of Banjup which is located within the City of Cockburn. The Jandakot Airport is situated approximately 1.5 km to the north of the lot with larger rural style lifestyle blocks, situated to the north-west and north-east, in between Lot 467 and the Airport. The areas to the south consist of mixed rural pursuits with forested tracts of bushland remaining on private lands.

Policy Context

Bush Forever and State Planning Policy 2.8

The proposed sand excavation area is within Bush Forever Site No. 390. Acknowledging the project site's importance as an identified "Priority Resource Location" in SPP 2.4 "Basic Raw Material", the Bush Forever Policy site recommendation is for a "Negotiated Planning Solution" (NPS).

Appendix 1 of State Planning Policy 2.8 – "Bushland Policy for the Perth Metropolitan Region" (WAPC 2010) outlines the impact assessment process. The statement of environmental effects shall include, but is not limited to, the following information requirements:

- Provide evidence and demonstrate that a proposal or decision is consistent with this policy, in particular the planning assessment criteria.
- Describe and provide a rationale and planning context for the proposal.
- Describe the impacted area's bushland values and environmental attributes (to be consistent with the information sets in Bush Forever and with reference to the site descriptions and Environmental Protection Authority Guidance Statements 51 and 56 (EPA 2003b and 2003c).
- Demonstrate that all reasonable steps have been taken to avoid or minimise any likely adverse impacts consistent with the requirements of this policy, including a review of reasonable alternatives and details of any bushland-sensitive design measures to be adopted.
- Provide an evaluation of and justification for any likely adverse impacts.
- Provide an environmental and/or bushland management plan, where appropriate, and details of proposed conservation management measures to be adopted; or, where agreed, the environmental and/or bushland management plan or related measures may be a requirement through the statutory planning process.
- Provide details of proposed long-term protection, management, offset measures and implementation commitments to be adopted.

State Planning Policy 2.4 – Basic Raw Material

The Jandakot area has been identified as a significant sand resource location that requires appropriate protection for numerous years. The mining tenements M70/1088 and M70/1142 (which are located within the Jandakot area) are identified as a "Priority Sand Resource Location" in WAPC's State Planning Policy (SPP) 2.4 "Basic Raw Material".

These identified "Priority Sand Resource Location" are known areas of high quality sand suitable for use in the construction industry and to accommodate Perth's planned growth. Therefore the sand resource locations were identified for this purpose and should be held available for current and future extraction in accordance with SPP 2.4. This mining proposal deliberately focuses on the 9.56 ha mapped "Priority Sand Resource Location" as defined in SPP 2.4 "Basic Raw Material" (Figure 2).

Both the 2.4 – "Basic Raw Material" and State Planning Policy 2.8 – "Bushland Policy for the Perth Metropolitan Region", which are assumed to hold equal policy weighting, provide for negotiated outcomes in areas where potential conflicts occur.

Previous Environmental Investigations and Assessment

The following environmental investigations have been undertaken on Lot 467, which were completed in order to advance the environmental approvals for mining leases M70/1088 and M70/1142:

- Fauna Survey (M.J Bamford 1996)
- Declared Rare Flora Survey (BBG 2002)
- Notice of Intent – Proposed Sand Excavation Mining Tenement M70/1088 and M70/1142 (RPS 2005).

The Environmental Protection Authority (EPA) considered the Notice of Intent Report did not adequately address the EPA's objectives for protection of biodiversity, particularly the protection of remnant vegetation within a Bush Forever site. The proposal was subsequently withdrawn from the EPA assessment at this time; however Rocla advised they would undertake further vegetation survey work.

In advancing the environmental approval Rocla commissioned the following additional studies:

- An additional Priority Flora search in spring 2006. No Declared Rare Flora, particularly *Caladenia huegelii* which are known to occur in the Jandakot region were found on the site.
- Level 2 Flora and Vegetation Survey and report (RPS 2010).

These subsequent investigations are intended to form part of a revised environmental approvals application.

Key Project Characteristics

Key project characteristics of the sand extraction within Lot 467 project site are summarised in Table 1.

Table 1: Lot 467 Sand Extraction Proposal – Key Characteristics

Aspect	Proposal Characteristic
Site Location	
Lot 467 Jandakot Road, Banjup	40.29 ha
Mining tenements areas ▪ M70/1088 ▪ M70/1142	 ▪ 10.1 ha ▪ 28.3 ha

Aspect	Proposal Characteristic
Excavation	
Total Area of Sand Excavation Area	9.56 ha (of which 5.63 ha has been historically cleared)
Native Vegetation to be Cleared	3.93 ha
Total Estimated Amount of Sand Resource	300,000 tonnes
Life of the Project	Approximately 3 years
Dewatering Requirements	Nil
Finished levels	RL 29.2m to 29.5 m AHD
Remnant vegetation remaining with Lot 467 (outside of the sand extraction area)	28.29 ha
Processing	
Sand	Dry screening of sand only
Water requirements	Nil
Infrastructure	
Fuel Storage	Nil
Transport	
Internal Access Road Total Area ▪ Access road from Lot 467 to Lot 140 ▪ Access road through Lot 140 (existing cleared area)	**1.11 ha** 0.16 ha (0.10 ha will require clearing) 0.95 ha
Truck Movements	Variable but approximately 3–5 per hour
External Site Access	Existing route along Armadale Road.
Restoration Areas	
Rehabilitation of the Sand Excavation Area	9.56 ha (this includes the 5.63 ha historically cleared area)
Additional Rehabilitation Area outside of the Sand Excavation Area	1.75 ha (or a total of 7.38 ha of historically disturbed areas restored i.e. 1.75 ha + 5.63 ha)
Total Area for Restoration	**11.31 ha (9.56 ha + 1.75 ha)**

Environment Setting

A summary of the key elements of the existing environment is provided below.

Soil

The sand unit at the project site include Bassendean Sands (S_8) and Bassendean Sand over Guildford Formation (S_{10}). The proposed sand extraction area is within the Bassendean Sand soil complex.

Groundwater

The site is located within a Priority 1 Source Protection Area of the Jandakot Underground Water Pollution Control Area. The estimated average annual maximum groundwater level beneath the project site is approximately 28 metres (m) Australian Height Datum (AHD).

Wetlands

Two wetlands are located within Lot 467. No wetlands are within the 9.56 ha sand excavation area.

A Resource Enhancement (RE) management category wetland (UFI 183328) is located approximately 50 m west of the sand extraction area. The wetland located approximately 40 m the east of the sand extraction area is classified as a Conservation Category Wetland (CCW).

Vegetation

Lot 467 is within Bush Forever Site No. 390. The vegetation was generally described for Site No. 390 as upland Banksia woodland with significant areas of wetland and associated vegetation, predominantly in the western and eastern boundaries. Much of the vegetation at the site was considered to be in "Good or better" condition, with the remainder of the site (approximately one third) considered as being in "degraded" condition.

The proposed sand extraction area occurs within two major vegetation complex units. These are:

- Southern River Complex: Open woodland of *Corymbia calophylla – Eucalyptus marginata* and *Banksia* spp with fringing woodland of *Eucalyptus rudis – Melaleuca rhaphiophylla*

- Bassendean Complex - Central and South: Woodland of *Eucalyptus marginata – Casuarina fraseriana – Banksia* Spp.

The majority of the vegetation at the site is mapped as part of the Southern River Complex, with the vegetation in the south-western corner mapped as part of the Bassendean Complex – Central and South.

Summary of Potential Environmental Impacts

The key potential environmental impacts of the proposal (requiring a fuller assessment than other applicable factors) are listed below according to the following headings:

- flora and vegetation
- fauna
- water drainage and management
- acid sulfate soils
- revegetation.

Scope of Works

A summary of the key investigations and / or scope of works which has been or will be undertaken as part of the environmental impact assessment of the sand extraction proposal are provided below:

- Level 2 Vegetation and Flora Survey
- Desktop Fauna Study.

Environmental Management Strategies

The focus of the environmental management strategy is to demonstrate a net environmental benefit through the implementation of following core initiatives:

1. Retention.
2. Rehabilitation.

Retention

The sand extraction works will include buffers to the wetlands which maximise the value of the sand resource but also maintains their environmental values.

Banksia Woodland Restoration

The Banksia woodland restoration will be undertaken by Rocla and Kings Park Botanical Gardens and Park Authority (BGPA) to agreed success criteria targets. Rocla has committed to the restoration of the Banksia Woodland and monitoring of the retained conservation areas. Following completion of the sand extraction and Banksia restoration work the site will remain as a Bush Forever reserve vested for conservation purposes to the WAPC.

In partnership with BGPA, Rocla has invested over $5.6 million in research and rehabilitation techniques focused on Banksia Woodland. The research and rehabilitation works undertaken to date have provided beneficial scientific and on-ground outcomes, however, the information and knowledge gained has the potential for much broader application and environmental benefit.

Rocla are proposing to commit to a significant long-term investment in conservation and rehabilitation as part of current and future operations on the Swan Coastal Plain. Accordingly, Rocla would put together a package of conservation activities and rehabilitation approaches that will benefit the restoration of Banksia Woodland (and therefore black cockatoo habitat). Key aspects of the package are:

- a "no net loss" long term through complete rehabilitation and restoration of all sand extraction areas (or equivalent area) to a high species diversity and vegetation cover (as per scientifically derived success criteria)

- securing of restored areas or equivalent in perpetuity for conservation purposes

- should the success rates for rehabilitation not be achieved Rocla will compensate for any net loss through off-site conservation offsets

- Rocla will continue to invest in a range of collaborative research projects that will further improve Banksia habitat restoration and success. This includes the continued funding of BGPA and ARC industry partnership grant. Current value of approximately $1.23 million.

Rocla will restore the Banksia Woodland within the sand excavation area, a total of 9.56 ha. Sand excavation / mining was previously undertaken within the sand excavation area a portion of Lot 467 in the 1980s, but has been left un-rehabilitated by the previous operators. This historically cleared area totals 5.63 ha.

Outside of the sand excavation area Rocla will restore an additional 1.75 ha. This 1.75 ha was historically mined but not rehabilitated after mining. In summary, Rocla proposes to restore Banksia woodland across 7.38 ha. This consists of 5.63 ha historically mined and 1.75 ha of abandoned excavation areas within Lot 467.

Noting 3.93 ha of native vegetation is proposed to be cleared within the mining footprint; the total restoration work area is 11.31 ha. This represents an approximate 200% increase in the area that will be restored resulting in a net increase of Banksia woodland vegetation within Lot 467.

Rocla Environmental Offsets

Rocla's environmental offset principles comprise "Direct Offsets" and "Contributing Offsets".

Direct Offsets directly counterbalancing the reduction of native vegetation include:

- Rocla's commitment to a 1:1 Banksia restoration to independently benchmarked completion standards audited at years 1 and 5
- a financial bank guarantee in the event Rocla does not meet the agreed benchmarked outcomes
- rehabilitation of an additional 7.38 ha resulting in an approximate 200% additional area being revegetated when compared to the proposed sand excavation area. The total proposed rehabilitation is 11.31 ha.

Contributing Offsets to complement and enhance the direct offsets include:

- BGPA funding of $20,000 per year until the resource is exhausted.

Key Benefits:

- The environmental offsets will provide a net gain in Banksia woodland vegetation and improve the condition of the natural environment, and Carnaby's cockatoo habitat reinstatement.
- The environmental offsets will be clearly defined, documented and audited by an independent third party.
- The environmental offsets will ensure both a short and long-term benefit.
- BGPA will be involved in the design, assessment and monitoring of the environmental offsets.

Summary of Commitments

Clearing and Hydrology

- Clearing will be undertaken in accordance with this Mining Proposal.
- Excavation will not impact any wetland.
- The buffer to the wetland boundary will be clearly marked and fenced to prevent access.
- A monitoring bore will be installed at the site, adjacent to the CCW to monitor groundwater levels throughout the duration of the proposed sand extraction.
- Groundwater abstraction will not be undertaken at the project site.
- The finished batters will be used to integrate the mined surface with the surrounding natural topography of the site.

Restoration

- Progressive restoration will be undertaken by BGPA following sand extraction.
- Rehabilitation of 7.38 ha of historically cleared areas, resulting in an approximately additional 200% of area being restored.
- Weed management will be undertaken in the restoration areas.
- Completion criteria for the Banksia woodland restoration will be to the satisfaction of the Bush Forever office and the Department of Parks and Wildlife (DPaW).

General

- Fuels and chemicals will not be stored on site.
- Management measures will be undertaken to prevent and / or minimise dust and noise, as detailed in this Mining Proposal.

Conclusion

Having regard to the "significance test" in the EPA's Environmental Assessment Guideline 9, Rocla considers that the mining proposal is not likely to have a significant impact on the environment. This is because the mining proposal is:

- a modest and short-term change to the environment

- the character of the receiving environment is for the most part an existing mined area
- the area of vegetation clearing is small (3.93 ha) and more than adequately offset by the rehabilitation of a further area of 7.38 ha
- there are no threatened or priority flora species or ecological communities identified as occurring in the proposal area
- there are no wetlands in the proposal area
- there is little public interest in the environmental issues likely to be associated with the proposal.

Furthermore, Rocla notes that under the EPA's Environmental Assessment Guideline 9, "duplication of assessment and approval processes will be avoided where the EPA has confidence that an alternative regulatory process can ensure the environmental objective for the factor would be met". In this case, Rocla considers that the EPA's environmental objectives can be adequately regulated through the mining proposal and clearing permit approval processes managed by Department of Mines and Petroleum.

Rocla considers that on a risk-based assessment of impacts, the environmental significance of the mining proposal is low. The operation of SPP 2.4 – Basic Raw Material and the offsets proposed by Rocla are such that impacts can be satisfactorily managed, but with a positive offset ratio consistent with the EPA Position Statement where restoration criteria are not met.

Rocla is seeking **temporary use of the land**, in order to extract a resource of benefit to the community, and post-completion of the proposed sand extraction activities will revegetate the mining tenements with a net result being that a larger area of land will be revegetated than the area from which the sand resource will be removed.

There are additional sustainability benefits from the project being:

- **a reduction in greenhouse gas emissions through reduced cartage**
- **a net increase in vegetation coverage upon the mining tenements**
- **utilisation of an important sand resource**.

TABLE OF CONTENTS

Page

TABLES

(contained within report text) **Page**

FIGURES

(compiled at rear of report)

APPENDICES

1.0 INTRODUCTION

Rocla Quarry Products (Rocla) is seeking approval to extract sand within Lot 467 Jandakot Road and extend an internal road through to Lot 140 Armadale Road, Banjup Figure 1).

Mining tenements M70/1088 and M70/1142 are located within Lot 467 and total 10.1 hectares (ha) and 28.3 ha in area (Figure 2).

The Department of Mines and Petroleum (DMP) in August 2010 granted endorsement for tenements M70/1142 and M70/1088 to Rocla (Appendix 1).

Sand extraction has been undertaken at Rocla's adjacent mining tenement M70/357 (Lot 140 Armadale Road) since early 2000. It is proposed to create an internal access road linking mining tenement M70/1142 and M70/1088 within Lot 467 to Rocla's existing site M70/357 within Lot 140 Armadale Road.

The DMP tenement endorsement is subject to specific conditions including environmental requirements in particular regards to mining in proximity to wetlands, removal of vegetation, permission from the Department of Water (DoW) to operate within a priority water resource area and the submission of a plan of the proposed operations and measures to safeguard the environment prior to the commencement of works (i.e. this mining proposal).

1.1 Sand Extraction in the Jandakot Region

Sand is used for the construction industry as both concrete sands and fill sand. While sand is very common, much of the sand on the Swan Coastal Plain is less suitable for concrete production, because of its non-ideal grain size and degree of rounding. In addition the majority of the Swan Coastal Plain has now been sterilised for urban development, rural living subdivisions and the various Conservation Estates. This has led to a situation where there are few sand resources suitable for concrete production within the Perth Metropolitan Region.

It is important to note that sand is only extracted for the community. If the community did not need the sand there would be no extraction. Almost all sand is used on public works projects and for structural works, such as footings, structural walls in subdivisions and for building materials.

The sand proposed to be extracted from Lot 467 Jandakot Road, Banjup will be primarily utilised by concrete plants in Perth's southern and south-eastern growth corridors. Historically, Rocla's and Readymix's sand extraction operations in the Jandakot region supplied the concrete plants in the Canningvale, Kwinana, Armadale and Rockingham areas. However, these historically locally available sand resources are now

exhausted. As a result, Rocla transports concrete sand from its Gaskell Avenue operations, located in the northern suburb of Ellenbrook 55 km north of Jandakot, to the southern concrete plants. This outcome has resulted in an additional 1.76 million truck kilometres being travelled at the cost of an estimated 2,640 tonnes of additional greenhouse gases being omitted.

Perth's southern corridors have undergone significant expansion over the past decade, substantially driven by urban growth. The resultant outcome is a demand for concrete products (therefore concrete sand) that exceeds the regional supply, a situation which is forecast to continue. The Western Australian Planning Commission's (WAPC) Directions 2031 (WAPC 2010) growth estimates for the south-east subregion states it will need to accommodate an additional 35,000 dwellings. Further, it is estimated that by 2031 the population of the south-west subregion will have grown by 34% to 278,000.

The Jandakot area has been identified as a significant sand resource location that requires appropriate protection for numerous years. The mining tenements M70/1088 and M70/1142 (which are located with the Jandakot area) are identified as a "Priority Sand Resource Location" in WAPC's State Planning Policy (SPP) 2.4 "Basic Raw Material".

These identified "Priority Sand Resource Location" are known areas of high quality sand suitable for use in the construction industry and to accommodate Perth's planned growth. Therefore the sand resource locations were identified for this purpose and should be held available for current and future extraction in accordance with SPP 2.4.

Rocla was previously extracting sand from the adjacent Lot 136 Armadale Road which was leased from the then Department of Housing and Works. Sand extraction within this lease was forced to stop (without consultation or consent from Rocla) when the Department of Housing and Works offer the site to Main Roads WA as an offset to its clearing of native vegetation (including rare orchids) as part of the Row Highway Stage 7 works. This offset of Lot 136 Armadale Road was approved by the Minister for the Environment.

1.2 Sand Extraction Proposal

This proposal is to enable Rocla to extract sand from Lot 467 which is a listed "Priority Sand Resource Location" under the WAPC's SPP 2.4.

The objectives of SPP 2.4 policy are to:

- Identify the location and extent of known basic raw material resources.

- Protect "Priority Resource" locations, key extraction areas and extraction areas from being developed for incompatible land uses that could limit future exploitation.

- Ensure that the use and development of land for the extraction of basic raw materials does not adversely affect the environment or amenity in the locality of the operation during or after extraction.

- Provide a consistent planning approval process for extractive industry proposals including the early consideration of sequential land uses (WAPC 2000).

Lot 467 is vested in the Western Australian Police Department (WAPD). Rocla has been granted approval by WAPD to extract sand within the mining tenements M70/1142 and M70/1088. The holders of the mining tenement M70/1088 have assigned Power of Attorney to Rocla.

This proposal aims to enable Rocla to meet their continued production requirements whilst strategically facilitating the staged use of sand resources for concrete production in the Jandakot area to supply Perth's southern and south-eastern growth corridors in order to satisfy long-term community demand.

1.3 Proposal Overview

The sand extraction of 9.56 ha within Lot 467 will involve the progressive clearing of approximately 3.93 ha of native vegetation for the following reasons:

- The proposed regeneration project will result in staged replacement of habitat that can be aligned to the progressive clearing.

- Rocla will allow for the orderly and manageable salvage of topsoil, mulch, plant material and seed collection to align with the regeneration project.

- Progressive clearing will allow for the orderly and manageable salvage of topsoil, mulch, plant material and seed collection to align with the regeneration project.

- To negate the requirement of watering of and fire risks associated with large mulch stockpiles.

Rocla will initially harvest native Banksia spp and mari seeds (and use topsoil if available) and focus the first phase of rehabilitation on previously mined areas. Rocla proposes to commence the rehabilitation of 1.75 ha area outside of the proposed sand excavation area in advance of the proposed clearing and sand extraction. This outcome will assist both in restoring native vegetation to a cleared area (a net environmental benefit) but also with dust control.

At the completion of the sand extraction Kings Park Botanical Gardens and Parks Authority (BGPA) would commence the restoration of Banksia Woodland.

The sand extraction project time frame is three years. The Banksia Woodland restoration work would continue five year's post-sand extraction work.

Sand extraction has been undertaken at Rocla's adjacent mining tenement M70/357 (Lot 140 Armadale Road) since early 2000. It is proposed to create an access road linking mining tenement M70/1142 and M70/1088 within Lot 467 to Rocla's existing site M70/357 – Armadale Road Operations.

Lot 467 would be used for sand extraction only. Sand is to be screened on site using a mobile screening plant. Trucks will be loaded with the screened sand for transport to the southern area concrete plants. This will occur in Lot 140 Armadale Road. No additional processing is proposed.

Approved infrastructure currently in use at Rocla's existing Lot 140 Armadale Road operation would be utilised to minimise sand extraction footprint within Lot 467.

The summary of the key project characteristics are detailed in Table 1 in the Executive Summary.

1.4 Background and Previous Environmental Assessments

Lot 467 was previously mined for sand by another operator in the 1980s. The previous operator did not undertake any rehabilitation of their sand extraction area. This has resulted in a legacy of a two cleared sites (north and south of Lot 467) totalling 8 ha (Figure 2).

A Notice of Intent was prepared for Lot 467 Jandakot Road (M70/1088 and M70/1142) in 2005, and submitted to the then Department of Industry and Resources. The sand extraction proposal was innovative and included the mining of the cleared and approximately 9.8 ha of vegetated areas to the water table and rehabilitating the site as wetlands. The Notice of Intent report was forwarded by the Department of Industry and Resources to the EPA for comment.

The EPA advised based upon its initial review to set a level of assessment, it would recommend the level be set at "Proposal Unlikely to be Environmentally Acceptable". This was primarily due to the Lot 467 inclusion in Bush Forever (Bush Forever site 390). Based on this advice from the EPA, Rocla withdrew the referral at this time and advised they would undertake further vegetation survey work.

1.5 Project Need and Justification

The mining tenements M70/1142 and M70/1088 are located within an identified "Priority Sand Resource Location" under SPP 2.4.

Historically locally available sand resources are now exhausted. Perth's southern and south-eastern corridors are undergoing significant growth. This has resulted in a significant increase in the demand for concrete sand.

1.6 Purpose of this Mining Proposal

This document outlines the key environmental issues identified and scopes the assessment methodology.

The purpose of this document is to:

- Identify the relevant environmental issues and factors raised by the sand extraction proposal.
- Identify the potential environmental impacts.
- Outline preliminary environmental management strategies that are recommended to minimise potential adverse impacts.

1.7 Identification of the Proponent

Rocla have mined high grade sand resources from Western Australia since the early 1980s and has built up a significant enterprise providing a range of sand products to the construction industry.

Rocla is an industry leader in basic raw materials extraction and in Western Australia is particularly well known for their sand operations within the Gnangara Pine Plantation at Gaskell Road. In that operation Rocla works closely with the Forests Products Commission and the Department of Parks and Wildlife (DPaW) to ensure that the pine resource is utilised and that the land is returned to local native vegetation in line with Government Policy for the Gnangara Groundwater Mound. An essential part of the soil restoration and rehabilitation to native vegetation is working with Kings Park to achieve best industry outcomes. The establishment of this sand mine site in Banjup will create an additional southern Perth operation, in particular servicing the urban and industrial areas of the Canning Vale, Kwinana, Armadale and Byford and will facilitate the short-term supply of high quality sand for Perth's continued expansion of its southern and south-eastern corridors and related construction industries.

The key Rocla contact is detailed below:

Contact Person: Vern Newton
Position: Resource and Development Manager
Phone: (08) 9475 2500
Fax: (08) 9477 2633

2.0 ENVIRONMENTAL ASSESSMENT PROCESS

2.1 Western Australia

2.1.1 Western Australian Legislation

2.1.1.1 *Mining Act 1978*

The Department of Mines and Petroleum (DMP) Environment Division (ED) is responsible for assesses mineral, petroleum and geothermal exploration and development applications made within Western Australia.

The DMP is responsible under the *Mining Act 1978* to assess, audit and inspect mineral, petroleum and geothermal activities (which includes sand mining proposals) to ensure their operation is consistent with the principles of responsible and ecologically sustainable exploration and development.

In regards to the Warton Road Mining Proposal Rocla is seeking an environmental and mining approval in accordance with the *Mining Act 1978*. Rocla considers that the environmental impacts of the proposal can be managed to the requirements of a native vegetation clearing approval under the *Environmental Protection Act 1986* (EP Act). The DMP has the authority to grant clearing approvals under delegation from the Department of Environment Regulation in accordance with the provisions of the EP Act and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

Having regard to the "significance test" in the EPA Environmental Assessment Guideline 9, Rocla considers this mining proposal is not likely to have a significant impact on the environment. This is because the Warton Road mining proposal is:

a. A modest and short-term change to the environment.

b. The character of the receiving environment is for the most part an existing mined area.

c. The area of vegetation clearing is small (3.93 ha) and more than adequately offset by the rehabilitation of a further area of 7.38 ha.

d. There are no threatened or priority flora species or ecological communities identified as occurring in the proposal area.

e. There are no wetlands in the proposal area.

f. There is little public interest in the environmental issues likely to be associated with the proposal.

Furthermore, Rocla notes that under the EPA's Environmental Assessment Guideline 9, "duplication of assessment and approval processes will be avoided where the EPA has confidence that an alternative regulatory process can ensure the environmental objective for the factor would be met". In this case, Rocla considers that the EPA's environmental objectives can be adequately regulated through the mining proposal and clearing permit approval processes managed by DMP.

Rocla notes that the EPA's practice over the last 12 or so months has been to decline the assessment of clearing proposals that are adequately regulated under each of the *Mining Act 1978* and Part V of the EP Act.

Rocla considers that on a risk-based assessment of impacts, the environmental significance of the mining proposal is low. Furthermore, there does not appear to be any cumulative impacts represented by this mining proposal with any other proposals in the area.

2.1.1.2 *Environmental Protection Act 1986* (EP Act)

The EP Act specifies some of the procedures for assessment, including responsibilities and functions of the Minister and appeal processes. It also provides for the preparation of environmental protection policies, which are legally binding and may be directly relevant to the assessment of the proposed project. The EP Act is the most important legal document for environmental assessment in Western Australia and prevails over other legislation. During the assessment process, the proponent and stakeholders must comply with the EP Act.

The EP Act establishes the EPA and lists its functions. One such function is to conduct environmental impact assessments. Under Part IV of the EP Act, the EPA is required to decide whether to assess the proposed project, which has been referred to the EPA under s38 of the Act. The EP Act regulates:

- pollution and environmental harm offences
- clearing of native vegetation
- prescribed premises
- works approvals and licences
- assessment of flora, fauna, wetlands, Aboriginal heritage and other environmental factors.

2.2 Commonwealth Legislation

2.2.1 *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection Biodiversity and Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places; defined in the Act as Matters of National Environmental Significance (NES).

2.3 Other Regulatory Requirements

Regulatory requirements relevant or potentially relevant to the proposed project are presented in Table 2.

Table 2: Applicable Legislation

Legislation	Requirements
Commonwealth	
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	Protects significant Aboriginal areas and objects considered to hold particular significance in accordance with Aboriginal tradition.
National Greenhouse and Energy Reporting Act 2007	Mandatory reporting and dissemination of information about greenhouse gas emissions and energy use.
Native Title Act 1993	Recognises and protects native title and provides for land use agreements.
State	
Aboriginal Heritage Act 1972	Provides a mechanism for recognising Aboriginal heritage and considering the impacts of developments on Aboriginal heritage values. Requires submission of a request for Section 18 consent to disturb registered sites that cannot be avoided.
Land Administration Act 1997	Governs the administration of state land in Western Australia.
Rights in Water and Irrigation Act 1914	Provides for planning and allocation of water in Western Australia.
Wildlife Conservation Act 1950	Provides for the conservation and legal protection of threatened flora and fauna, especially rare species.
Heritage of Western Australia Act 1990	Provides for the conservation of places of significance to the cultural heritage of the state.
Metropolitan Water Authority Act 1982	Regulates drainage, water supply and sewerage.
Water and Rivers Commission Act 1995	Provides for the conservation, protection and management of state water resources.
Planning and Development Act 2005	Provides for the preparation and amendment of local and regional planning schemes, interim development orders and state planning policies.

The EPA and other decision making authorities issue guidance and policy statements that are also relevant to the environmental factors associated with this project and will be considered within the context of the proposed project. These are provided in Table 3.

Table 3: Relevant Policy and Guidance Policies

Policies
Environmental Protection (Swan Coastal Plain Lakes) Policy 1992
Bush Forever and State of Planning Policy 2.8: Bushland Policy for the Perth Metropolitan Region (WAPC 2004a).
Environmental Protection (Swan Coastal Lakes) Policy, 1992
Guidance Statement
Guidance Statement 6: Rehabilitation of terrestrial ecosystems (EPA 2006)
Guidance Statement 12: Minimising greenhouse gas emissions
Guidance Statement 19: Environmental Offsets
Guidance Statement 51: Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia
Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes, May 2009
Draft Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes, January 2009
National Environment Protection Measure standards for ambient air quality
Carbon Pollution Reduction Scheme, Commonwealth Department of Climate Change

3.0 SAND EXTRACTION PROPOSAL

The site contains deposits of Bassendean Sand, which is suitable for use as construction and fill sand. Extraction of sand at this site will facilitate the continued supply of specialised sand for concrete products and engineering fill for projects in the Perth's southern and south-eastern corridors. It is estimated that there is approximately 300,000 tonnes of sand available for excavation within the 9.56 ha excavation area which will support mining for an estimated three years.

Land based sand extraction involves a sequence of operations as follows:

1. Vegetation clearing.
2. Topsoil removal.
3. Extraction operations.
4. Distribution.
5. Rehabilitation.

3.1 Project Description

3.1.1 Pre-excavation Works

The 3.93 ha of native vegetation clearing and topsoil will be removed as part of the proposed sand excavation.

All clearing will be conducted using a tracavator. The topsoil removed from cleared areas will be retained for use in the rehabilitation program. The topsoil will be stockpiled in an appropriate area on site or directly transferred to the area for native vegetation rehabilitation works. The first section of topsoil will be recovered allowing for the best seed retention at a later date. This technique will utilise the best available research into Banksia re-establishment that Rocla has been conducting in partnership with the BGPA since 1994.

3.1.2 Excavation Method

Sand will be mined from the excavation area over a single stage. Rehabilitation will commence after completion of the excavation.

The extraction pit will be designed to maintain a buffer of greater than 2 m between the maximum depth of extraction and the Likely Future Maximum Groundwater Table (LFMGT) height.

It is estimated the 9.56 ha sand excavation area will support sand mining for three years.

The sequence in the extraction of sand from the site is outlined below:

1. Prior to excavation, vegetation will be cleared, topsoil will be removed using a landplane and stored for use in rehabilitation, or directly transferred to a rehabilitation site.

2. Overburden will be removed and stored for future land rehabilitation through backfill and placement.

3. The sand resource is typically screened using a portable screening plant to remove any organic material and stockpiled prior to tipping directly into road trucks for transportation to stockpile areas.

4. Reforming of the land is normally carried out using a bulldozer.

5. Topsoil will be replaced between 50 mm and 100 mm using a land plane.

6. On completion, the land surface will be graded to ensure the final slopes will not exceed 1 in 3 vertical to horizontal.

7. Rehabilitation will progressively follow excavation wherever possible.

3.1.3 Finished Levels

Excavation proposes to lower natural surface topography following the east–west ridgeline by between 20 m to 2 m to a finished floor level of approximately 29.2 m to 29.5 m Australian Height Datum (AHD). The floor level is proposed to be above the 2 m separation required between the finished levels and the LFMGT.

In accordance with the *Mines Safety and Inspection Act 1994* the final profile of the batters / faces used to integrate mined surfaces with the natural remaining topography of the site, equates to the final batters being 1 in 3 vertical to horizontal or less.

Working batters on the mine face will be left in a slumped condition at the end of each day and over weekends for safety.

3.1.4 Hours of Operation

Hours of operation will be from 7.00 am to 5.00 pm, Monday to Saturday inclusive.

The flexibility of a six day week operation is necessary to maintain efficiency because not all parts of the site can be excavated at all times of the year. Although the sand will be transported throughout the year, excavation will be discontinuous and dependent upon the demand for this particular sand type, and to avoid very wet conditions. It is more efficient to excavate sand material to produce on-site stockpiles from which sand can be transported in the intervening times as this maximises the use of mobile plant equipment.

3.2 Infrastructure and Access

3.2.1 Haulage

An internal access road will be created to link Rocla's existing within Lot 140 Armadale Road with the adjacent Lot 467 sand extraction area. The road will be completely with Rocla's mining tenement areas. The access road will not be located within any wetland areas.

Figure 2 illustrates the proposed location of the internal access road. Between Lot 467 and Lot 140 the access road has been deliberately sited, where practical, along an existing cleared track to minimise impact on the vegetation.

The proposed access road between Lots 467 and 140 is 0.16 ha in total with 0.10 ha native vegetation to be cleared.

The internal access road through Lot 140 to Armadale Road is through historically cleared areas.

The number of trucks entering the site will vary throughout the year depending upon the demand for the sand resource. However, it is anticipated that between two to four trucks per hour will access the site per day. Truck payload size will vary depending whether they are semitrailers or rigid wheeler trucks. Trucks will only be entering and exiting the site between the hours of 7.00 am and 5.00 pm.

The main haulage route is anticipated to be along Armadale Road which is listed as a heavy vehicle route, with a maximum load of 87.5 tonnes and a maximum length of vehicle of 27.5 m. Alternatively, the existing access road from the original sand mining operations in the 1980s onto Warton Road is still maintained and therefore may be used.

3.2.2 Site Infrastructure

Sand extracted from Lot 467 mining tenements M70/1088 and M70/1142 will be screened on site prior to sale. No additional processing is undertaken on site.

Site infrastructure will not be located with Lot 467. The extraction operations will make use of the existing adjacent facilities at Rocla's Armadale Road sand operations within the neighbouring Lot 140. The site infrastructure at Rocla's Armadale Road operations includes:

- transportable site office
- weighbridge
- vehicle/equipment compound
- toilet
- refuelling facility (5000 litre (maximum) self-bunded diesel above ground tank).

3.3 Safety

3.3.1 Operations

All excavation, mining practices and operations procedures will comply with the following legislation:

- *Mines Safety and Inspection Act 1994*
- Mines Safety and Inspections Regulations 1995
- *Occupational Health and Safety Act 1984*
- Occupational Health and Safety Regulations 1996.

Rocla has developed procedures and work practices to manage safety, environmental impact, site management and rehabilitation. All personnel are trained to industry standards. All personnel are provided with site induction, safety and environmental awareness training. All workers are required to wear full-time protective safety and high visibility work gear when on site.

3.3.2 Signage

Rocla will place a sign not less than 1.8 m high and not less than 1 m wide which states "Danger Excavations Keep Out".

The signs will also indicate operation hours and contact details of the site manager.

4.0 ENVIRONMENTAL SETTING

Investigations have been conducted to identify the local and regional environmental features and values of the project site.

This section presents the existing conditions of the physical, biophysical and social environments, as well as cultural heritage values represented within the project area.

The main features within the project area include:

- wetlands
- groundwater
- vegetation
- fauna
- Aboriginal heritage.

4.1 Study Area

4.1.1 Climate

The Jandakot area experiences a Mediterranean climate, which predominates in the south-west of Western Australia, and is characterised by cool wet winters and hot dry summers. Average maximum and minimum temperatures in the summer season (October–March) range from 22 °C to 31 °C and 9 °C to 18 °C respectively. In the winter months, maximum and minimum temperatures range from 18 °C to 25 °C and 7 °C to 12 °C respectively (BOM 2010).

4.1.2 Topography

The site has a central ridge line located in the middle of Lot 467 and runs north-east with a maximum elevation of approximately 38 m AHD. The land falls in the west and east direction towards the wetlands (abutting the eastern and western boundary) to a height of approximately 30 m AHD (Figure 4).

4.1.3 Geology and Soils

The Jandakot area is underlain by Bassendean Sands derived from the Bassendean Dune System. Bassendean dunes are characterised as pale grey, white, medium grained, moderately sorted quartz sand with little or no calcium carbonate content. Bassendean dunes (located in the eastern portion of the project area) tend to be acidic, highly leached and nutrient poor (Bolland 1999).

4.1.4 Acid Sulfate Soils

Acid Sulfate Soils (ASS) is a collective term used to describe naturally occurring soils and sediments containing iron sulfides. These soils typically form in wet and oxygen limited horizons such as those found around wetlands. When ASS are exposed to air, the iron sulphides may react with oxygen and water to produce a variety of iron compounds and sulphuric acid. Initially a chemical reaction, the process is accelerated by soil bacteria. The resulting acid can cause environmental damage on its own, but can also leach substances (i.e. heavy metals) from the soil, which may in turn be released into surrounding water environments.

The Lot 467 sand excavation area is mapped as a "moderate to low" risk classifications for potential ASS occurring (Figure 5).

The proposed excavation area is set within soils of predominantly aeolian origins. The presence of ASS materials is expected to be limited to the low-lying alluvial wetland area excluded from the extraction area.

As the soil extraction operations are not proposed to breach a 2 m vertical buffer between excavations and the water table, and no dewatering is proposed, the oxidative effects of groundwater level modification can be discounted, and the risk of acid generation would hence be considered low, as all soils above the water table would potentially already have been exposed to oxidative effects.

It is important to note that these wetland features will have a buffer from soil extraction operations, wetlands which maximise the value of the sand resource but also maintains their environmental values.

4.1.5 Groundwater

Based on regional groundwater data and mapping, the estimated average annual maximum groundwater level beneath the site is around 28 m ADH. The regional groundwater contour data, the groundwater flow is south-east from the site. The 2007 Perth Groundwater Atlas indicates that groundwater beneath the site migrates in a south to south-east direction (DoW 2009).

Historical groundwater monitoring of Rocla's adjacent sand mine was undertaken by Rockwater in 1998. Rockwater using local and regional monitoring bores (and data from 1980 to 1998) estimated the Average Annual Maximum Groundwater Level to range from 27.7 m AHD near Armadale Road to 27.2 m AHD along Jandakot and Warton Road. Subsequently in adjacent sand mining areas a base level of the quarry was set at around 27.5 m AHD.

Lot 467 is located within the Priority 1 Jandakot Underground Water Pollution Control Area (UWPCA). Sand extraction within the UWPCA must be in accordance with Statewide Policy No 1 – Policy and Guidelines and Silica Mining in Public Water Source Areas (WRC 1999).

4.1.5.1 Groundwater Separation

The maximum depth of soil extraction activities will not exceed a minimum 2 m vertical buffer distance from the water table, which is consistent with Rocla's adjacent mining tenement M70/357 within Lot 140 Armadale Road. The basis of the 2 m separation distance is premised upon the separation distance that was applied to Rocla's Gaskell Avenue operations in Lexia. Rolca's Gaskell Avenue operations were the subject of a Public Environmental Review (PER). As a result of the PER the Minister for Environment issued a statement stating that the proposal may be implemented (pursuant to the provisions of the *Environmental Protection Act 1986*) subject to conditions. The issue of water management were carefully considered during the assessment of the proposal as the project area was located above an important groundwater resource.

Condition 1 from the Ministerial Statement indicates that the proposal must fulfil the commitment given for environmental management. The environmental management commitments relating to the management of groundwater were as follows:

- Detailed "Working Arrangements" will be prepared in conjunction with CALM ("now DPaW") which will define management techniques to be adhered to during the mining operation. These will include rehabilitation of excavated pits. Plans for rehabilitation trials are already in progress and there is ongoing discussion with CALM personnel.

- In general terms the objectives of the rehabilitation program will be
  - stabilisation of the surface sand against erosion
  - minimisation of disturbance to the hydrological balance within the proposed sand extraction area - noting of the proposed sand excavation area of 9.56 ha 5.63 ha has been historically cleared
  - establishment of a diverse, effective and permanent vegetation cover capable of plant succession and regeneration to suit the present priority land use of water production.

- Conduct routine monitoring of groundwater levels and report results to the Water Authority of Western Australia on a regular basis.

Water Quality Protection Note "Extractive Industries within Public Drinking Water Source Areas" (WRC 2000) states that in Priority 1 source protection areas:

> the Commission requires a minimum of 3 metres of undisturbed soil / rock profile as a buffer between the base level of the excavated area and the maximum anticipated water table. In special circumstances, this buffer may be reduced to a minimum of 2 metres, if the operator can demonstrate effective risk management measures and acceptable rehabilitation to a final 3 metre buffer.

Rocla has extensive experience mining in Priority Groundwater Protection Areas with major sand extraction sites located in Gnangara (Priority 1 Source Protection Area) and Banjup (Priority 2 Source Protection Area).

DPaW and the DMP annually audits operations at the Gnangara site and no groundwater related issues have been identified. Rocla will take all precautions necessary to ensure groundwater is not adversely impacted by extraction operations.

Rocla are committed to the following:

- survey control of quarry floor to ensure accurate recording of separation distance
- monthly monitoring of the groundwater via piezometer
- rehabilitation program undertaken in partnership with BGPA.

These key commitments are characteristic of the DPaW's reporting requirements for Rocla's sand extraction operations within Priority Water Source Protection Areas. Additionally it is important to note that any refuelling will occur off site, at the existing facility, on the adjacent Rocla mining tenement M70/357. Appendix 2 is Water and Rivers Commission Statewide Policy No. 1 – Policy and Guidelines for Construction and Silica Sand Mining in Public Drinking Water Source Areas.

4.1.5.2 Surface Drainage

Drainage on the site is towards the wetlands in the east and west of the site. Water run-off from incident rainfall percolates through the highly permeable sandy soils within the site. No direct drainage to the southern wetlands will occur by way of a defined channel.

4.1.6 Wetlands

A search of the Geomorphic Wetlands Database (Landgate 2009) indicates there are two mapped wetlands within Lot 467 (Figure 5).

The wetland on the eastern edge of tenement M70/1088 is listed as a Resource Enhancement (RE) management category. The wetland on the eastern side of M70/1142 is classified as a Conservation Category Wetland (CCW). The wetland categories and their respective management objectives are presented in Table 4.

Table 4: Wetland Management Categories

Management Category	General Description	Management Objectives	No. of Wetlands for this Site
Conservation	Wetlands support a high level of ecological attributes and functions	Highest priority wetlands. Objective is preservation of wetland attributes and functions through various mechanisms including: ▪ reservation in national parks, Crown reserves and state-owned land ▪ protection under Environmental Protection Policies ▪ wetland covenanting by landowners. These are the most valuable wetlands and WRC will oppose any activity that may lead to further loss or degradation. No development.	1
Resource Enhancement	Wetlands that may have been partially modified but still support substantial ecological attributes and functions	Priority wetlands. Ultimate objective is for management, restoration and protection towards improving their conservation value. These wetlands have the potential to be restored to conservation category. This can be achieved by restoring wetland structure, function and biodiversity. Protection is recommended through a number of mechanisms.	1
Multiple Use	Wetlands with few important ecological attributes and functions remaining	Use, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through land care. Should be considered in strategic planning (e.g. drainage, town/land use planning).	0

Source: adapted from Water and Rivers Commission 2001

It is acknowledged in the Guideline for the Determination of Wetland Buffer Requirements (WAPC 2005) that separation distances for both RE and CCW wetlands and management measures are recommended on the basis of potential threats in order to mitigate likely impacts of the surrounding land use. Separation measures are required to mitigate only those threats that are present.

An approximate 50 m buffer from 9.56 ha (of which 5.63 ha has been historically cleared) the RE and a 40 m buffer from the CC wetlands is proposed to maximise the value of the sand resource and maintains their environmental values will be implemented.

4.1.7 Vegetation and Flora

A Level 2 Flora and Vegetation Survey was undertaken in spring 2010 to identify the type and condition of the vegetation present in the project area (Appendix 3).

4.1.7.1 Objectives

The specific objectives of the 2010 spring flora and vegetation survey were to:

- Identify all vascular plant species present within the survey area.
- Review the conservation status of the vascular plant species by reference to current literature and current listings by the DPaW (2006a and 2006b) and the Department of the Environment and Heritage website under the EPBC Act 1999.
- Compare the plant communities at each site with those defined by Gibson et al. (1994) to aid in assessing their local and regional significance.
- Produce a report summarising the findings.

4.1.7.2 Methods

The proposed mining area was surveyed for rare and priority flora in October 2010. Additional searching for rare orchid species was undertaken by Arthur Weston in 2006.

No rare flora, e.g. orchids were identified by either investigation.

All plant specimens collected during the field survey were handled and identified in accordance with the requirements of the Western Australian Herbarium.

4.1.7.3 Heddle Mapping

The majority of the proposed sand extraction area within Lot 467 is located in the Southern River Vegetation Complex with areas in close proximity to the wetland located within the Bassendean – Central and South vegetation complex. The Southern River Vegetation and Bassendean – Central and South Complexes as defined by Heddle are outlined below:

- an open woodland of Marri–Jarrah–Banksia on the elevated areas and a fringing woodland of *E. rudis-M. rhaphiophylla* along the streams (Heddle et al. 1980)
- woodland of Jarrah–Sheoak–Banksia on the sand dunes to a low woodland of *Melaleuca* spp. and sedgelands on the low-lying depressions and swamps (Heddle et al. 1980).

A 7.38 ha area within Lot 467 was historically cleared of vegetation in the 1980s to facilitate sand extraction. After sand extraction, these areas were left in an un-rehabilitated (cleared) state by the previous owner.

4.1.7.4 Threatened and Priority Flora

Threatened Flora (TF) are flora that have been adequately surveyed and are considered to be in danger of extinction, rare or otherwise in need of special protection within Western Australia. TF are protected under the *Wildlife Conservation Act 1950* (as amended).

Additionally in Western Australia there are four categories of Priority Flora, which are not specifically covered under current legislation, but their conservation status warrants some protection. Three categories of Priority Flora are allocated to species that are poorly known (Priority 1 to 3). These require more information to be assessed for inclusion as TF. The categories are arranged to give an indication of the priority for undertaking further surveys based on the number of known sites, and the degree of threat to those populations. A fourth category of "Priority" (Priority 4) is included for those species that have been adequately surveyed and are considered to be rare but not currently threatened.

No Threatened or Priority Flora species were identified as occurring within the sand extraction or surrounding area.

4.1.7.5 Regional Significance and Species of Interest

The EPA (2004) in Guidance Statement 51 stated that species, subspecies, varieties, hybrids and ecotypes may be significant other than as Threatened or Priority Flora, for a variety of reasons, including:

- a keystone role in a particular habitat for threatened species, or supporting large populations representing a significant proportion of the local regional population of a species
- relic status
- anomalous features that indicate a potential new discovery
- being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- the presence of restricted subspecies, varieties, or naturally occurring hybrids
- local endemism / a restricted distribution
- being poorly reserved.

Two plant species considered to have regional significance, *Hensmania turbinata* and *Pultenaea ochreata*, were identified as occurring within the survey area by the Level 2 Flora and Vegetation survey undertaken in spring 2010.

Two taxa, *Leucopogon* sp. Murdoch (M. Hislop 1037) and *Hibbertia huegelii sens. lat.* recorded in the spring 2010 survey can be considered to be "Species of Interest". Further information regarding these two species is contained in Appendix 2.

4.1.7.6 Threatened and Priority Ecological Communities

Communities are described as "Threatened Ecological Communities" (TECs) if they have been defined by the Western Australian Threatened Ecological Communities Scientific Advisory Committee and found to be Presumed Totally Destroyed (PD), Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). For definitions of TEC categories and criteria refer to English and Blyth (1997) and DEC (2006c). Selected plant communities have also been listed as "Threatened Ecological Communities" under the EPBC Act. The TECs at the national level are defined on the Environment Australia website (www.deh.gov.au).

Possible TECs that do not meet survey criteria or that are not adequately defined are added to Department of Environment and Conservation's Priority Ecological Community List under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as TECs. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened (P1, 2 or 3), or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in Priority 5.

No Threatened or Priority Ecological Communities were identified as occurring within the survey area by the Level 2 Flora and Vegetation Survey undertaken in spring 2010. One identified vegetation unit, *Banksia ilicifolia* woodlands, was shown to have some affinity with Floristic Community Type No. 22, which is a Priority 2 Ecological Community.

4.1.7.7 Bush Forever

Bush Forever is a 10 year strategic plan which formally commence in 2000 to protect approximately 51,200 ha of regionally significant bushland within around 290 Bush Forever sites, representing, where achievable, a target of at least 10 per cent of each of the original 26 vegetation complexes of the Swan Coastal Plain portion of the Perth Metropolitan Region (WAPC 2000).

The proposed sand extraction area is within Bush Forever Site No. 390, as shown in Figure 3.

4.1.8 Terrestrial Fauna

4.1.8.1 Previous Biological Studies

As a result of recent development in the areas surrounding Jandakot Airport, several surveys have been undertaken in the vicinity of the current project area. The most recent of these are:

- Fiona Stanley Hospital Fauna Assessment (GHD 2006)
- Roe Highway Stage 7 Extension Review of Fauna Investigations (Bamford 2003b)
- Champion Lakes Master Plan Fauna (Bamford 2003a)
- Fauna Survey of Jandakot Airport (Bamford 2002)
- Vertebrate Fauna of Ken Hurst Park (Dell & Cooper 1992).

4.1.8.2 Expected Fauna

Species are protected formally and informally by various legislative and non-legislative measures, which are as follows:

- *Environment Protection and Biodiversity Conservation Act 1999*
- *Wildlife Conservation Act 1950*
- *Environmental Protection Act 1986*
- DEC Priority lists
- informal recognition of locally significant populations.

Commonwealth – Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act aims to protect matters of national environmental significance.

Under the EPBC Act, lists threatened species and Threatened Ecological Communities in certain categories determined by criteria set out in the Act (www.environment.gov.au/epbc/index.html).

The EPBC Act provides for a national environmental assessment and approvals process for proposed actions likely to affect the prescribed matters of national environmental significance.

State

Taxa under the provisions of the *Wildlife Conservation Act 1950* (WC Act) are protected and classified as Schedule 1–Schedule 4 according to their need for protection. The Act makes it an offence to "take" threatened species without an appropriate licence. There are financial penalties for contravening the Act.

Fauna Priority Lists

DPaW produces a list of "Priority" species that have not been assigned statutory protection under the WC Act. Priority Fauna are under consideration as "scheduled" fauna, but are in urgent need for further survey or require regular monitoring, and although not currently threatened may become so in the future.

4.1.8.3 Potentially Occurring Fauna

Species of conservation importance under the EPBC Act Matters of National Environmental Significance and priority fauna species that are listed as may be occurring in the project area are discussed in the following section.

Mammals

1. The chuditch (western quoll) (*Dasyurus geoffroii*) is listed as Vulnerable under the EPBC Act and as a Schedule 1 species under the WC Act. This species once occurred over 70% of Australia, but it has been reduced to a patchy distribution throughout the jarrah and mixed forests of the south-west of Western Australia (DEC 2008a). The chuditch is found in a wide range of habitats, including woodlands, dry sclerophyll forests and riparian vegetation that contain hollow bearing trees and logs. Numbers have decreased because of habitat alteration, removal of suitable den logs and dens, and competition for food and predation by foxes and cats (DEC 2008a). Considering the current distribution of the species, the urban nature of the site, and the presence of foxes and cats on the site, it is unlikely this species occurs within Lot 467.

2. The southern brush-tailed phascogale (*Phascogale tapoatafa*) is listed as Schedule 1 under the WC Act. The distribution of this species is believed to have been reduced to approximately 50% of its former range (DEC 2008a).This subspecies has been observed in dry sclerophyll forests and open woodlands containing hollow-bearing trees but a sparse ground cover. Habitat destruction, the loss of hollow-bearing trees and predation by feral animals are thought to be the major threats to surviving populations (DEC 2008a). None have previously been found in the area, and none are known from within approximately 10 km of the site from WA Museum records. Therefore it is unlikely that the southern brush-tailed phascogale occurs at the site.

3. The quokka (*Setonix brachyurus*) is listed as Vulnerable on the EPBC Act and as Schedule 1 by the DEC. It is found in the south-west regions of WA, mostly in densely vegetated swamps, tea tree thickets on sandy soils along creek lines and dense heath on slopes. Quokka numbers have declined because of predation by foxes and the clearing and burning of swamp habitats. This species is very rare on the mainland. This species has not been previously recorded on the Jandakot region. It is therefore highly unlikely to occur at Lot 467.

4. The greater long-eared bat (*Nyctophilus timoriensis*) is listed as a Priority 4 species by the DEC. This species is considered widespread across southern Australia, but it is uncommon and localised. The greater long-eared bat inhabits areas of tall forest in the south-west, roosting in tree hollows and under loose bark (Strahan 1995). The greater long-eared bat preferred habitat is not found with Lot 467. This species has not been previously recorded on the Jandakot region. It is therefore highly unlikely to occur at Lot 467.

Birds

1. Carnaby's Black-Cockatoo's (*Calyptorhynchus latirostris*), preferred habitat is woodlands and scrubs of semiarid interior of Western Australia, in non-breeding season wandering in flocks to coastal areas, especially pine plantations (Johnstone & Storr 1998). Food includes seeds of Banksia species, Dryandra species, Hakea species, Eucalyptus species, Grevillea species and Pinus species; also fruiting almonds (Johnstone & Storr 1998).Occurs in south-west north to lower Murchison and east to Nabawa, Wilroy, Waddi Forest, Manmanning, Durokoppin, Lake Cronin and just east of Condingup. Endemic to Western Australia (Johnstone & Storr 1998). Considering the habitat present on the site, this species potentially occurs there.

2. Baudin's cockatoo (*Calyptorhynchus baudinii*), is listed as Vulnerable by the EPBC Act, as Schedule 1 by the WC Act, and is considered locally significant. This species is distributed through the south-western humid and subhumid zones, from the northern Darling Range and adjacent far east of the Swan Coastal Plain (south of the Swan River), south to Bunbury and across to Albany (Johnstone & Storr 1998). Baudin's cockatoo rarely occurs in Perth or anywhere along the coast south to approximately Mandurah. It usually occurs in small flocks of up to 30, occasionally up to 50, or rarely in aggregations of up to 1200 (Johnstone & Kirkby 2008). This species forages primarily in eucalypt forest, where it feeds primarily on marri (*Corymbia calophylla*) seeds, flowers, nectar and buds (Johnstone & Kirkby 2008). It also feeds on a wide range of seeds of Eucalyptus, Banksia, Hakea and Dryandra, as well as fruiting apples and pears and persimmons, as well as pines, and beetle larvae from under the bark of trees (Johnstone & Kirkby 2008, Johnstone & Storr 1998). This black cockatoo species is not regularly observed in the Jandakot area. The existing vegetation within Lot 467 is not Baudin's cockatoo preferred foraging and roosting habitat it is unlikely that it potentially occurs there.

3. The rainbow bee-eater (*Merops ornatus*) is a migratory species listed under the EPBC Act, which migrates to south-western Australia to breed in spring and summer. The rainbow bee-eater is a common and widespread species in Western Australia. It occurs throughout Western Australia except the drier interior of the State and the far south-west (Johnstone & Storr 1998). It occurs in lightly-wooded often sandy country, preferring areas near water. The rainbow bee-eater feeds on airborne insects, and nests throughout its range in Western Australia in burrows excavated in sandy ground or banks, often at the margins of roads and tracks (Johnstone & Storr 1998). The rainbow bee-eater is common in Perth in summer. It is likely this species forages at the site, and possibly breeds there.

4.1.9 Aboriginal Heritage

An Aboriginal Sites database search was made of the Department of Indigenous Affairs' (DIA) Aboriginal Heritage Inquiry System on 1 February 2011 for mining tenements M70/1088 and M70/1142.

No records of Registered Aboriginal Sites were recorded in either mining tenement. One record of an "Other Heritage Place" was recorded as occurring within the boundaries of both the mining tenements (Site – 3301 Banjup: Calsil.) Information relating to this site and the Aboriginal Heritage Inquiry System search has been included in Appendix 4.

The majority of the proposed mining footprint (including the proposed rehabilitation area outside of the mining footprint) is within the boundary of a "Heritage Place". Rocla will confirm with the DIA if there is an area of concern with regard this specific site and if rehabilitation of the previously mined area can occur.

4.1.10 Non-Aboriginal Heritage

A database search was made of the Heritage Council of Western Australia's Places database. No places were recorded as occurring on Lot 467 Jandakot Road, Banjup.

5.0 POTENTIAL IMPACTS AND MANAGEMENT MEASURES

5.1 Key Issues, Objectives and Principles

As previously outlined in this mining proposal, Rocla considers that the environmental impacts of the proposal can be managed to the requirements of a native vegetation clearing approval under the EP Act. The DMP is able to assess this clearing application under delegated authority.

The critical or key factors affected by the proposed project are identified in order to ensure the proponent complies with the following principles, as described by EPA:

- precautionary principle
- principle of intergenerational equity
- principle of conservation of biological diversity and ecological integrity
- principles relating to improved valuation, pricing and incentive mechanisms
- principle of waste minimisation (EPA 2009b).

Rocla will apply the principles set forth in the Principles of Environmental Protection (EPA 2002b) and the proposed project will be implemented within a sustainable framework.

Key factors for the proposed project are vegetation, wetlands, groundwater, fauna, aboriginal heritage, noise and visual amenity.

The key issues, factors and objectives are presented in Table 5.

Table 5: Key Issues, Factors and Objectives

Issue	Factor	Objective
Ecological Systems and Biodiversity	Vegetation	To maintain abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
	Fauna	To maintain abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
	Soils and Water	To maintain the integrity, ecological functions and environmental values.
Amenity	Dust	To protect the amenity of nearby residents and visitors to the recreation reserve from dust impacts resulting from activities associated with the proposal by ensuring the dust levels meet statutory requirements and acceptable standards.
	Noise	To protect the amenity of nearby residents and visitors to the recreation reserve from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.

Issue	Factor	Objective
	Visual Amenity	To ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape.
Heritage	Aboriginal	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.

This section details the potential environmental impacts and how these will be managed. Each environmental topic is addressed in the same format using a series of subheadings as follows.

Background: the environmental topic is placed in context for Lots 467 and 140 Jandakot Road, Banjup.

Legislation, Policy and Guidelines: outlines the relevant government policy or guidelines applied to noise, dust and visual amenity.

Potential Impacts: describes the identified potential dust, noise and visual environmental impact that might arise from the proposed sand mining.

Management Response: proposed management responses are detailed.

5.2 Vegetation Clearing

5.2.1 Background

A total of 3.93 ha of remnant vegetation is proposed to be cleared.

Both the spring flora and vegetation surveys identified that the condition of the remnant vegetation across the proposed sand extraction area varies depending on disturbance and weeds. All three lots support portions of predominantly *Banksia* (*Banksia attenuata* and *Banksia menziesii* woodland) vegetation in Good or Better condition.

5.2.2 Legislation, Policy and Guidelines

Relevant legislation, policy and guidelines for vegetation and flora include:

- Guidance Statement for Rehabilitation of Terrestrial Ecosystems Final Guidance Statement No. 6 (EPA 2006)
- Level of Assessment for Proposals Affecting Natural Areas within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region Final Guidance Statement No 10 (EPA 2006)
- Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia Final Guidance Statement No. 49 (EPA 2006).

5.2.3 Potential Impacts

The important factors associated with the clearing of native vegetation include:

- loss of biodiversity (species and species assemblage)
- sedimentation and increased turbidity of local wetlands
- soil erosion
- reduced habitat for native fauna
- encourage the spread of weeds
- impacts on lifestyle opportunities.

5.2.4 Management Response

Rocla has committed to the following measures to protect and restore key native vegetation and flora:

- 28.29 ha of native vegetation remain outside of the sand extraction area. The excavation area will be clearly defined through a site survey and marked out on the ground at each stage.

- provision of a buffer from the sand extraction area to the RE and CC wetlands which maximise the value of the sand resource but also maintains the environmental values of the wetlands.

- rehabilitation in collaboration with BGPA to utilise over eighteen years of research into Banksia Woodland restoration. Rocla proposes the staged rehabilitation of the 9.56 ha sand extraction area (which includes the 5.63 ha of historically cleared area). Rocla also proposes to restore an additional 1.75 ha of historically cleared area outside of the proposed sand extraction area. The total native vegetation rehabilitation area is 11.31 ha. This represents an approximate 200% net increase in black cockatoo foraging habitat

- stockpiling or direct transfer of topsoil for use in regeneration of *Banksia* woodlands

- provision of the site to be used in future Banksia Woodlands rehabilitation research trials by BGPA

- dieback prevention measures in accordance with Dieback Working Group best practice guidelines

- weed control measures during and after sand mining.

5.3 Dieback and Weed Management

5.3.1 Background

The proposal creates a potential risk for the introduction or spread of weeds and / or dieback (*Phytophthora cinnamomi*).

5.3.1.1 Weeds

A weed survey was undertaken as part of the Level 2 vegetation and flora survey in spring 2008 (RPS 2008).

There was one weed species found within the study area that is listed as a Declared Plant for the whole of the state; *Zantedeschia aethiopica* (arum lilly).

5.3.1.2 Dieback

Dieback is a plant disease caused by the introduced soil-borne pathogen *Phytophthora*, which is a water mould spread by the movement of soil. There are several species of *Phytophthora* present in native vegetation but by far the most widespread and destructive is *Phytophthora cinnamomi* (CALM 2003).

Evidence of dieback (*Phytophthora cinnamomi*) was not witnessed during the Level 2 flora and vegetation survey or by BGPA site review of the *Banksia* Woodlands.

5.3.2 Legislation, Policy and Guidelines

Relevant legislation, policy and guidelines include:

- *Agriculture and Related Resources Protection Act 1976* – declared weed control
- best practice guidelines for management of *Phytophthora* have been published by the Dieback Working Group.

5.3.3 Potential Impacts

Potential impacts as a result of sand mining include:

- spread of dieback due to sand mining activities which contributes to the reduction of flora and vegetation biodiversity and fauna habitats
- the spread and / or introduction of weeds during or after sand mining which contributes to the loss of biodiversity.

5.3.4 Proposed Management

The proposed management of weeds and dieback *(Phytophthora cinnamomi)* is detailed below:

- Prevention
  - Undertake a baseline weed status survey prior to excavation works.
  - Implement a weed control program which includes spraying during the spring flowering season and ongoing monitoring.
  - If required, intra-project hygiene boundaries will be established to prevent the spread of weeds and dieback within the project area. These boundaries will be clearly demarcated on site and equipped with clean down facilities.
  - Sand excavation equipment will be cleaned to remove soil, vegetation, rock and debris prior to arrival at site.
- Mobilisation Hygiene Certificate
  - Internal approval for earth moving equipment to mobilise to site will be dependent on completion of hygiene requirements, i.e. dieback free.
  - Any equipment or vehicle considered to have been working in a weed or dieback risk area will be cleaned down before remobilising.
  - Key Rocla and site personnel (e.g. site manager) will be made aware of dieback issues, identification of weed species / reporting of infestations and hygiene procedures. These key personnel will be responsible for the implementation of the weed control program and dieback management.
- Weed Control
  - A weed control program will be implemented for project areas where introduced species are present. Where required, infestations will be controlled by spot spraying or manual removal.
- Monitoring
  - Weed infestation status inspections will be conducted by the Site Manager as part of regular site inspections.
  - A targeted weed survey will be conducted at the completion of each sand-extraction stage area (prior to rehabilitation works commencing) and repeated again within 12 months.
- Contingencies

– Any new weed populations that arise in the project area as a result of the construction works will be removed.

– Incidents relating to a failure in hygiene processes will be reported investigated and rectified to prevent recurrence.

5.3.5 Fauna

5.3.5.1 Background

Table 6 details the potential occurrence of each protected matters species based on habitat requirements, habitat suitability on site, and general feeding / breeding requirements of the species.

Table 6: EPBC Act Protected Matters

Species	Description	Likelihood of Occurrence	Likelihood Justification
Birds			
Calyptorhynchus baudinii (Baudin's black-cockatoo, long-billed black-cockatoo)	Preferred habitat is southern eucalypt forests. Feeds on seeds of *Corymbia calophylla* (marri), *Banksia*, *Hakea* and fruiting apples and pears, also strips bark from dead trees in search of insects, mainly beetle and borer larvae (Johnstone & Storr 1998). Occurs in south-western humid and subhumid zones, north to Gidgegannup, east to Mt Helena, Wandering, Quindanning, the Perup River, Lake Muir and King River, and west to eastern strip of Swan Coastal Plain including West Midland, Byford, North Dandalup, Yarloop, Wokalup and Bunbury also the Stirling and Porongurup Ranges. It is endemic to Western Australia. (Johnstone & Storr 1998).	Unlikely	*Banksia* is a known foraging species. The vegetation unit BaBm has some Banksia species (*Banksia attenuata and Banksia menziesii*) present.
Calyptorhynchus latirostris (Carnaby's Black-Cockatoo, short-billed black-cockatoo)	Preferred habitat is woodlands and scrubs of semiarid interior of Western Australia, in non-breeding season wandering in flocks to coastal areas, especially pine plantations (Johnstone & Storr 1998). Food includes seeds of Banksia species, Dryandra species, Hakea species, Eucalyptus species, Grevillea species and Pinus species; also fruiting almonds (Johnstone & Storr 1998). Occurs in south-west north to lower Murchison and east to Nabawa, Wilroy, Waddi Forest, Manmanning, Durokoppin, Lake Cronin and just east of Condingup. Endemic to Western Australia (Johnstone & Storr 1998).	Possible	*Banksia* is a known foraging species.

Species	Description	Likelihood of Occurrence	Likelihood Justification
(Merops ornatus) rainbow bee-eater	Migratory species listed under the EPBC Act, It occurs in lightly-wooded often sandy country, preferring areas near water. The rainbow bee-eater feeds on airborne insects, and nests throughout its range in Western Australia in burrows excavated in sandy ground or banks, often at the margins of roads and tracks (Johnstone & Storr 1998). The rainbow bee-eater is common in Perth in summer.	Possible	
Mammals			
Dasyurus geoffroii (chudtich, western quoll)	Chuditch are known to have occupied a wide range of habitats from woodlands, dry sclerophyll (leafy) forests, riparian vegetation, beaches and deserts. The chuditch now has a patchy distribution through the jarrah forest and mixed karri/marri/jarrah forest of south-west Western Australia (DEWHA 2011a).	Unlikely	The site is predominantly Banksia woodland, with few Eucalypts species on site. Habitat is therefore not suitable.
Phascogale tapoatafa (southern brush-tailed phascogale)	The southern brush-tailed phascogale inhabits wandoo and sheoak woodlands. They show a preference for habitat that has not been disturbed for a substantial amount of time with continuous canopy as well as tree hollows (DEWHA 2011b).	Unlikely	The site is predominantly cleared with remnant Banksia woodland, with no wandoo and few sheoak species on site. Habitat is therefore not suitable.
Setonix brachyurus (quokka)	Occurs on islands offshore from southern Western Australia. Some small populations are found on the mainland in dense vegetated swamps and tea tree thickets (DEWHA 2009c). Feeds mainly on a variety of grasses.	Unlikely	No *Lepidosperma spp.* (tea tree) species are found within the site. Habitat is therefore not suitable.
Flora			
Darwinia sp Muchea (muchea bell)	Muchea bell is known to occur in three populations north of Perth in swampy, seasonally wet habitat (DEWHA 2009b).	Unlikely	Not located in known habitat range.
Drakaea elastica (glossy-leaved hammer orchid, praying virgin)	Known to occur in the Stirling Ranges (near Albany) and north-east of Boyup Brook (Phillimore and Brown 2001).	Unlikely	Not located in known habitat range.
*Hemigenia ramosissima (*branched hemigenia)	Slender shrub that occurs on grey, loamy clay in open mallee shrubland composed of *Eucalyptus spathulata* (swamp mallet) over heath of *Melaleuca uncinata* (broombush) and *M. acuminata* (Phillimore and Brown 2003)	Unlikely	The site contains no clay soils, and no open mallee shrubland.

Species	Description	Likelihood of Occurrence	Likelihood Justification
*Lasiopetalum sp serpentine (*wing fruited lasiopetalum)	It grows in deep sandy soil in mixed jarrah (*Eucalyptus marginata*) and Banksia (*Banksia attenuata*) woodland (Hoffman and Brown 1998).	Unlikely	Preferred habitat on site, but not located during Level 2 flora survey.
Lepidosperma rostratum (beaked lepidosperma)	Associated with Marsh Banksia (*Banksia telmatiaea*) and hairy clawflower (*Calothamnus hirsutus*) and grows in wet swamp conditions (Brown et al. 1998). Known from four populations east of Perth.	Unlikely	Both species associations where not found during the Level 2 flora survey, additionally, the proposed clearing site is not permanently damp or wet.

5.3.6 Legislation, Policy and Guidelines

Relevant legislation, policy and guidelines to fauna and fauna management include:

- Protection of Specially Protected Fauna is managed by the DPaW under the *Wildlife Conservation Act 1950*.

- Proposes impacts on species / communities listed as nationally threatened under the Commonwealth's EPBC Act are subject to the Commonwealth Department of the Environment (DotE) environmental assessment process.

5.3.7 Potential Impacts

The important factors associated with the clearing of native vegetation include:

- loss of biodiversity (species and species assemblage)
- reduced habitat for native fauna
- encourage the spread of weeds
- impacts on lifestyle opportunities.

5.3.8 Management Response

The sand mining proposal will be referred to the DotE for determination on whether there was a potential for significant impact on a Matter of National Environmental Significance.

Rocla have committed to the rehabilitation (to *Banksia spp – Eucalyptus marginata* woodland) in collaboration with the BPGA of the site after extraction works.

Based on the proposal, Rocla will implement the following general measures to avoid or reduce impacts to the black cockatoos:

- the sand extraction proposal is a temporary land use. Rocla proposes to restore Banksia woodland across the sand extraction area of 9.56 ha, noting 5.63 ha of this was historically cleared. Rocla will also restore an additional 1.75 ha of historically cleared areas outside of the sand extraction area. The total native vegetation rehabilitation area is 11.31 ha. This represents an approximate 200% net increase in black cockatoo foraging habitat

- maintaining 28.29 ha vegetated buffer outside of the sand extraction area. The excavation area will be clearly defined through a site survey and marked out on the ground

- provision of the site to be used in future Banksia Woodland rehabilitation research trials by BGPA

- avoid damage to any habitat outside of the prescribed clearing area

- provision of a 50 m and a 40 m buffer from the sand extraction area to the RE and CC wetlands which maximise the value of the sand resource and maintains the environmental values of the wetlands.

5.4 Surface and Groundwater Protection

5.4.1 Background

Due to the high porosity of the sandy soils and being sandy at the site, run-off from the excavation areas is not anticipated and infiltration will remain the predominant drainage process. As the base of the excavation will be 2 m above the LFMGT, no dewatering will be required.

Water infiltrating within the quarry will be direct rainfall run-off and is not expected to contain any potential contaminants. There is no vehicle refuelling to be conducted at the site.

5.4.2 Legislation, Policy and Guidelines

The EP Act is a legislative tool for achieving environmental resource protection and implementing the National Water Quality Management Strategy and State Water Quality Management Strategy in Western Australia.

The DoW implements its water allocation decisions and regulates the use of water through the powers assigned to it under the *Rights in Water and Irrigation Act 1914*.

5.4.3 Potential Impacts

Potential impacts upon surface and groundwater as a result of sand mining include:

- removal of the native vegetation in the proposed sand mining area can potentially increase the amount of groundwater recharge in these areas, resulting in rising groundwater levels which in turn can cause waterlogging or increase discharge of groundwater into the RE and CCW
- erosion and sedimentation of waterways are strongly linked with the loss of fringing vegetation, catchment clearing and flood plain degradation. Erosion and sedimentation are caused by changes in flow regimes and channel accommodation changes
- the contamination of surface / groundwater resources from "point sources" such as fuel spills.

5.4.4 Proposed Management

As a precaution, infrastructure, e.g. the refuelling station, will be located at Rocla's existing Armadale Road operation, which is a 500 m separation distance away from the wetlands and the proposed excavation area. Given the separation distances, and that the risk of contaminant generation is low, water quality impacts on the wetlands and are not anticipated.

While water quality impacts are not anticipated, Rocla proposes that the following management measures be undertaken.

5.4.4.1 Surface Water

- Provision of a 50 m and a 40 m buffer from the sand extraction area to the RE and CC wetlands which maximises the value of the sand resource and maintains the environmental values of the wetlands.
- Maintain the final land surface with a separation distance of 2 m to the LFMGT.
- Clearing and progressive rehabilitation of the site to minimise the exposed areas.
- Rehabilitation will be undertaken in collaboration with BGPA.
- Maintain all plant equipment in good condition.
- Maintain all haul road and hardstand surfaces in good condition and with suitable grades.

5.4.4.2 Groundwater

Rocla will monitor groundwater levels at the site for the duration of the clearing program. Due to the nature of the soils at the site, run-off from the excavation areas is not anticipated rather, infiltration will remain the predominant drainage process.

The base of the excavation will be at a minimum 2 m above the LFMGT. No dewatering will be required.

5.5 Dust Management

5.5.1 Background

Dust can be generated when the wind velocity and frequency is sufficiently strong enough to lift sand particles from the ground surface. The susceptibility of the soil particles to lift is a function of how exposed the ground surface is which includes whether there is any ground cover, level of compaction and the moisture content of the soil. Dust is measured as Total Suspended Particles (TSP) which refers to particles that can remain suspended in the atmosphere but not necessarily inhaled.

The potential for dust generation may occur during topsoil stripping, sand extraction, stockpiling and sand transport.

5.5.2 Potential Impacts

Dust resulting from operations has the potential to affect:

- human health and amenity
- natural environment
- social pursuits.

The potential for dust generation may occur during topsoil stripping, sand extraction, stockpiling and sand transport. Dust can originate from a number of operations and may impact on the on-site workers or travel off site.

5.5.3 Policies and Guidelines

The proposed measures to control dust during the proposed excavation works and have been designed in consideration the following applicable guidelines for air quality:

- National Environmental Protection (Ambient Air Quality) Measures (NEPM 2003)

- EPA Guidance Statement 18 – Prevention of air quality impacts from land development sites (March 2000).

5.5.4 Proposed Management

There are a number of management actions that can be taken to minimise dust generation or travel and these will be used whenever possible. Key dust management measures are detailed below.

5.5.4.1 Dust from Traffic on Unsealed Roads

- Minimise the width and length of internal roads.
- Restrict vehicle movements to defined roads and operational areas.
- Avoiding disturbance of non-operational areas of the site.
- Use of water as appropriate to wet down roads and trafficked areas.
- Use of dust suppressants where appropriate (either mixed with water to enhance dust suppression and vegetation cover, or applied periodically to specific areas).
- Limit the speed of vehicles on the site.
- Maintain haul road surface in a good condition and with suitable grades.
- Enforce the requirement that all vehicles leaving the site have covered loads.

5.5.4.2 Dust from Operational and Non-operational Areas of the Site

- Extract topsoil extracted in months and conditions which minimise the potential for dust generation.
- Use of water carts to dampen dust prone areas.
- Commence the *Banksia* spp and *Eucalyptus marginata* woodland re-vegetation in the 1.75 ha historically cleared area outside of the sand extraction area prior to sand mining.
- Application of surface treatments (e.g. mulch) to stabilise any bare areas which might be prone to wind erosion.
- Define "no go" buffer areas of the site to avoid any unnecessary disturbance of stabilised surfaces or vehicle traffic.
- Cease operational activities until conditions improve and compliance can be achieved.

5.6 Noise Management

5.6.1 Background

Noise can originate from a number of operations and impact on external sensitive premises. Noise impacts are addressed by reducing the noise generated from the sand excavation and processing operations.

5.6.2 Potential Impacts

Excessive exposure to noise can negatively impact upon people's health, amenity and the natural environment, in particular native fauna.

5.6.3 Legislation, Policies and Guidelines

Offsite noise is governed by the Environmental Protection (Noise) Regulations 1997, and the EPA Guidance for the Assessment of Environmental Factors provides guidelines on noise from developments and other activities.

5.6.4 Proposed Management

There are a number of further management actions that will be undertaken to minimise noise generation. The general management actions are summarised below:

- Comply with the Environmental Protection (Noise) Regulations 1997.
- Retain and establish vegetation between the mine site and the adjacent land holdings to provide a physical separation barrier.
- Maintain noise suppression devices in good condition on all operational machinery.
- Shut down equipment when not in use.
- Operate machinery within the designated hours of operation, 7.00 am to 5.00 pm, Monday to Saturday. Some operation may occur on a Sunday if required by project demand.
- Schedule activities to minimise the likelihood of noise nuisance.
- Use the dedicated transport route.
- Record and follow up any complaints received regarding noise disturbance immediately to minimise the cause, to the greatest possible extent.

5.7 Visual Amenity

5.7.1 Background

Visual impacts can occur in a number of circumstances typically if a proposed operation is located too close to neighbours and by insufficient visual protection.

5.7.2 Possible Impacts

The lack of visual harmony between the sand mining area and the surrounding rural and regional open space landscape.

5.7.3 Legislation, Policy and Guidelines

Under the EP Act, the definition of environment includes the community's aesthetic surroundings to the extent that those surroundings are affected by the physical or biological environment. The definition of environmental value includes aesthetic enjoyment of the environment.

5.7.4 Proposed Management

There are a number of management actions that will be employed to minimise the visual impacts. The general management actions are summarised below and these will be used wherever possible.

- Retain and establish vegetation between the mine site and the adjacent land holdings to provide a physical separation barrier.
- Rehabilitation to provide visual protection of excavation areas.

5.8 Social Environment

5.8.1 Aboriginal Heritage

5.8.1.1 Background

Aboriginal heritage may be relevant when it is directly linked to the physical or biological attributes of the natural environment and where those attributes maybe threatened as a result of development.

Other Heritage Place Site 3301, Banjup: Calsil, which in accordance with the Aboriginal Sites Database is an "artefact/scatter and camp" site, has been identified as occurring on part of Lot 467 Jandakot Road, Banjup.

5.8.1.2 Possible Impacts

It may be possible that during the excavation activities occurring on Lot 467 Jandakot Road, Banjup that artefact or other items of cultural Aboriginal significance may be unearthed.

5.8.1.3 Legislation, Policy and Guidelines

Aboriginal Heritage is governed by the *Aboriginal Heritage Act 1972*.

5.8.1.4 Proposed Management

Should an evidence of Aboriginal significance be uncovered over the natural life of the quarry, development will be stopped pending an assessment by a recognised consultant.

5.9 Summary of Potential Impacts and Proposed Management Strategies

Issue	EPA Objective	Possible Impacts	Further Investigations	Proposed Management
Vegetation Clearing	To maintain abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	Loss of Biodiversity (species and species assemblage); Sedimentation and increased turbidity of local wetlands; Soil erosion; Reduced habitat for native fauna; Encourage the spread of weeds; Impacts on lifestyle opportunities	▪ Spatial mapping of *Banksia* to inform Black Cockatoo habitat.	▪ Avoid disturbance of native vegetation outside of the sand extraction area ▪ Provision of a buffer from the sand extraction area to the RE and CC wetlands which maximise the value of the sand resource but also maintains the environmental values of the wetlands ▪ Stockpiling of topsoil ▪ Rehabilitation in collaboration with BGPA to utilise over 18 years of research into Banksia Woodland restoration. Rocla proposes to undertake the restoration of the 9.56 ha sand, which includes 5.63 ha of historically cleared area and an additional 1.75 ha outside of the sand excavation area. The total native vegetation rehabilitation area is 11.31 ha. This represents a 200% net increase in black cockatoo foraging habitat ▪ Provision for site to be used in future trails by BGPA ▪ Dieback prevention measures ▪ Weed control during and post-sand mining.
Dieback and Weed Management	To maintain abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	Spread of dieback; Spread and / or introduction of weeds	▪ Weed surveys to be conducted at the completion of each sand extraction stage area. ▪ Baseline study and investigation of potential impacts of project on Phytophthora dieback.	▪ Undertake prevention activities ▪ Require Mobilisation Hygiene Certification ▪ Undertake Weed Control ▪ Undertake regular Monitoring ▪ Implement Contingency actions.

Issue	EPA Objective	Possible Impacts	Further Investigations	Proposed Management
Fauna	To maintain abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	Loss of Biodiversity (species and species assemblage); Reduced habitat for native fauna; Encourage the spread of weeds; Impacts on lifestyle opportunities	▪ Assessment of potential impacts of the project on fauna. ▪ Determination of measures to avoid, minimise or mitigate impacts on fauna.	▪ Avoid disturbance of native vegetation outside of the sand extraction area. ▪ Provision of a buffer from the sand extraction area to the RE and CC wetlands that maximise the value of the sand resource but also maintains the environmental values of the wetlands. ▪ Stockpiling of topsoil. ▪ Rehabilitation in collaboration with BGPA to utilise over 18 years of research into Banksia Woodland restoration. Rocla proposes to undertake the restoration of the 9.56 ha sand, which includes 5.63 ha of historically cleared area and an additional 1.75 ha outside of the sand excavation area. The total native vegetation rehabilitation area is 11.31 ha. This represents a 200% net increase in black cockatoo foraging habitat ▪ Provision for site to be used in future trails by BGPA.
Surface and Ground Water Protection	To maintain the integrity, ecological functions and environmental values	Increased ground water recharge leading to water logging or increased discharge into wetlands; Erosion and sedimentation associated with loss of riparian vegetation; Contamination water resources from point sources	▪ Ongoing survey control of quarry floor to ensure accurate recording of separation distance. ▪ Ongoing ground water monitoring.	▪ Provision of a 50 m and a 40 m buffer from the sand extraction area to the RE and CC wetlands which maximise the value of the sand resource but also maintains the environmental values of the wetlands ▪ Maintain finished level with a separation distance of 2 m to the LFMGT ▪ Maintain all plant in good condition; Maintain all road and hardstand surfaces in good condition ▪ Monitoring of groundwater levels at the site for the duration of the clearing program.
Dust	To protect the amenity of nearby residents and visitors to the recreation reserve from dust impacts resulting from activities associated with the proposal by ensuring the dust levels meet statutory requirements and acceptable standards.	Human health and amenity; Natural environment; Social pursuits	None Required	▪ Implement identified best practice protocols to reduce dust from traffic on unsealed roads and from operational and non-operational areas of the site ▪ Commence the Banksia spp and *Eucalyptus marginata* woodland re-vegetation in the 7.05 ha historically cleared area (Area B) prior to sand extraction.

Issue	EPA Objective	Possible Impacts	Further Investigations	Proposed Management
Noise	To protect the amenity of nearby residents and visitors to the recreation reserve from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.	Human health and amenity; Natural environment; Social pursuits	Monitoring of existing noise.	▪ Comply with the Environmental Protection (Noise) Regulations 1997 ▪ Retain and establish vegetation between the mine site and the adjacent land holdings to provide a physical separation barrier ▪ Maintain noise suppression devices in good condition on all operational machinery ▪ Shut down equipment when not in use ▪ Operate machinery within the designated hours of operation ▪ Schedule activities to minimise the likelihood of noise nuisance ▪ Use the dedicated transport route ▪ Record and follow up any complaints received regarding noise disturbance immediately to minimise the cause.
Visual Amenity	To ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape.	Loss of visual amenity and natural environment.	None Required	▪ Retain and establish vegetation between the sand extraction area and the adjacent land holdings to provide a physical separation barrier
Aboriginal	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	Loss of Cultural Heritage.	▪ Identification of interested Aboriginal Stakeholders. ▪ Consultation with relevant Aboriginal Stakeholders. ▪ Commissioning of a cultural heritage survey adherent to requirements of Section 18 of *Aboriginal Heritage Act 1972*.	▪ Stop quarrying activities should any Aboriginal artefacts be uncovered;

6.0 REHABILITATION AND DECOMMISSIONING

Rocla have committed to, the staged rehabilitation (to *Banksia* spp and *Eucalyptus marginata* woodland) in collaboration with the BGPA to maximise the regeneration of natural bushland.

6.1 Rehabilitation

Rehabilitation will commence with the establishment of topographic contours. The final contours are anticipated to be visually compatible with other parts of the local landscape. A commitment will be made to ensure that the final slopes are similar to those in the local area on the slopes and that the excavation will be left in a safe manner in conformity with the *Mines Safety and Inspection Act 1994*.

The proposed excavation has been designed to comply with the objectives of the zoning and to return the landform to its current existing pre-excavation form and rehabilitate the disturb land with native vegetation.

The main objective for the rehabilitation of the site is to restore native *Banksia* woodland to the site. The methodology adopted for the rehabilitation is based on fifteen years of experience at other Rocla sand extraction sites and rehabilitation as well as research conducted into the ecology of native *Banksia* woodland areas. The rehabilitation completion criteria are as follows:

- a landform compatible with the surrounding contours
- a self-sustaining cover of native vegetation
- weed species at levels not likely to threaten the native species.

In 1995, Rocla approached the BGPA with the aim of returning post-sand extraction mine sites back into former *Banksia* woodland. Rocla sought the assistance of the Science Directorate at BGPA to undertake research into the ecology and restoration of *Banksia* woodland and have now subsequently built a long-term scientific relationship. This research resulted in Rocla and BGPA being awarded the Golden Gecko environmental award by the Department of Mines and Petroleum in 2008, the most prestigious environmental award in the state.

As a result of this partnership Rocla have successfully restored over eight former sand extraction sites back to *Banksia* woodland on the Swan Coastal Plain.

The objective of the Lots 467 site rehabilitation program is:

- Undertake rehabilitation to minimise the open excavation area at any one time.
- Stabilise the surface sands against erosion.

The proposed rehabilitation program will consist of application of topsoil and overburden to a depth of up to 10 cm to the rehabilitation areas and seeding with native species. Topsoil is proposed to be directly transferred from the cleared areas to the rehabilitation areas. Topsoil will also be managed and protected to maximise regeneration.

Brushing with larger logs (remaining following regrowth clearing) will occur on the perimeter of rehabilitation sites to decrease the potential for erosion and vehicle movement.

6.1.1 Rehabilitation Methodology

The stages involved in the site rehabilitation program are summarised as follows:

- Rocla will initially will harvest native Banksia spp and mari seeds (and use topsoil if available) and focus the first phase of rehabilitation on the 1.75 ha previously mined areas located outside of the proposed sand excavation area. Rocla proposes to commence the rehabilitation of this area in advance of the proposed clearing and sand extraction. This outcome will assist both in restoring native vegetation to a cleared area but also with dust control.

- Rocla will undertake the *Banksia* spp and *Eucalyptus marginata* woodland rehabilitation for the sand extraction area which are proposed to occur in autumn each year.

- The proposed rehabilitation program will consist of application of topsoil to a depth of up to 10 centimetres to the rehabilitation areas and seeding. Where possible topsoil and overburden will be directly transferred from an area being cleared to an area to be rehabilitated. Where this is not possible, the topsoil and overburden will be stored in low piles for future use in rehabilitation.

- The levelled topsoil will be ripped to a depth of 50 to 80 cm with wing shaped tynes. This is intended to eliminate the compaction created in the soil profile during the excavation process.

- A supplementary seed mix containing species which do not regenerate readily from the replaced topsoil will be distributed over the rehabilitation area by hand.

- Slopes are shaped and battered with retained topsoil. These will then be spread with vegetative debris, which acts as a barrier to wind erosion and maximises microhabitats.

- Assessment of the success of the rehabilitation works will be undertaken annually with additional supplementary seeding, planting or re-broadcasting of seed applied in the subsequent winter if considered necessary by the BGPA and Rocla.

- Brushing with larger logs (remaining following regrowth clearing) will occur on the perimeter of rehabilitation sites to decrease the potential for erosion and vehicle movement.

Rocla will undertake, manage and fund the rehabilitation program until the completion criteria outlined below are met. Table 7 presents a provisional schedule of all programmed monitoring activities.

Table 7: Monitoring Schedule

Issue	Parameter	Frequency	Time Frame	Responsibility
Rehabilitation	Finalise topography levels.	Once	Prior to site works.	Rocla.
	Finalise native species list for re-vegetation.	Once	Prior to the commencement of rehabilitation works.	Rocla (in collaboration with BGPA).
	Undertake topsoil replacement.	Once a year for life of mine	Every year for the duration of mining.	Rocla.
	Undertake supplementary seed planting.	Once a year	Post-application of topsoil	BGPA.
	Undertake planting (if required).	Once a year	Post-application of topsoil	BGPA.
	Weed Control. Weeds sprayed with an appropriate herbicide or weeded by hand in accordance with the DoW's Herbicide use in Wetlands (WRC 2001).	As required	Two years from initial planting.	Rocla and Rocla.
	Establish two quadrats (2 m × 2 m) plots.	Once	When first year of rehabilitation has been completed.	Rocla.
	Survey quadrats.	Annually (spring)	Five years.	Rocla.
	Assess the success of the re-establishment of vegetation planted.	Annually	Five years.	Rocla.

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