



ENVIRONMENTAL MANAGEMENT PLAN

LOT 1002 PRESTON BEACH ROAD NORTH, PRESTON BEACH

NOVEMBER 2021

Telephone 0418 950 852

info@accendoaustralia.com.au

PO Box 5178 West Busselton WA 6280

ABN 11 160 028 642

www.accendoaustralia.com.au

Document Control

Version	Date	Author	Reviewer
V1	04/10/2019	PN	KMT
V2	20/10/2020	PN	KMT
V3	10/09/2021	KMT	KMT
Filename	1923_Lot 1002 Preston Beach Road North Site EMP_V3		

EXECUTIVE SUMMARY

Doyle's Lime Services (the proponent) are proposing to develop a small limestone and sand extraction project (quarry) on Lot 1002 Preston Beach Road North, Preston Beach (herein referred to as the subject Site), within the Shire of Waroona. The subject site is located 30 km south of Mandurah and approximately 150 km south of Perth. It is located approximately 800 m south-west of Lake Pollard, 2 km west of Lake Clifton and 1.5 km north-west of Martin's Tank Lake, and lies immediately west of Yalgorup National Park.

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

The purpose of this Environmental Management Plan (EMP) is to describe procedures that will be implemented on behalf of the proponent. This will involve the following:

- Rehabilitation;
- Weed control;
- Surface and groundwater management;
- Flora and vegetation management;
- Fauna management;
- Dust management; and
- Noise management.

The EMP is a collaborative management tool that details the methods and procedures that will be applied in order to achieve the proponent's environmental commitments and regulatory obligations. A summary of the management actions associated with each management plan is provided below within **Table ES**.

Table ES: Summary of management actions.

Parameter	No.	Action	Timing
Groundwater and Surface Water Plan			
Groundwater	S1	Progressive rehabilitation will occur to mitigate any potential increase in groundwater recharge in the quarry as vegetation is cleared.	Revegetation
	S2	A 4m undisturbed profile between the pit floor and the maximum groundwater level will be maintained to avoid any potential risks associated with evaporative discharge.	At all times
	S3	Quarterly groundwater level and quality monitoring will be undertaken at bores DLMB1 to DLMB7 and DWER bore B2.	Quarterly
Water quality	S4	No servicing of vehicles or machines will be undertaken onsite.	At all times
	S5	No chemicals or fuels will be stored onsite.	At all times
	S6	In the event of a spill occurring the following actions will be taken: <ul style="list-style-type: none"> • Stop the spill immediately if it is safe to do so; • Contain the spill and prevent any contact with water bodies and drains; • Clean up spill by digging up the contaminated soil and dispose of contaminated soil at a licensed disposal site; • Replace excavated material with clean fill; Report incident to Quarry Manager.	In the event of a hydrocarbon spill
Stormwater	S7	Allow clean stormwater from non-process areas and access roads to infiltrate into the surrounding soil by constructing diversion banks upslope of areas to be disturbed.	At all times
	S8	Construct catch drains to capture runoff from disturbed areas and direct into the pit area to enable infiltration.	
Erosion Control	S9	Use existing access tracks or roads wherever possible rather than creating new ones.	
	S10	Stabilise disturbed land as soon as possible to minimise erosion.	
	S11	Level or gently sloping areas will be selected as stockpile sites to minimise erosion and potential soil loss where possible.	

Parameter	No.	Action	Timing
	S12	Appropriate sediment controls will be installed upslope of stockpiles to divert water around and downslope of the stockpiles to prevent soil loss.	
	S13	Provide adequate erosion control structures on sloping ground such as spur drains or contour banks at suitable intervals	
Revegetation Management Plan			
Landform	R1	All slopes will be contoured to achieve a maximum slope of 1:4 vertical to horizontal.	Prior to revegetation
	R2	The approved floor level of the excavation areas will be graded to an even surface.	
	R3	Surface drainage lines will be established to control surface run-off and minimise potential erosion.	
	R4	Deep rip (approximately 1m) on contours to reduce erosion, reduce flow velocities, promote water capture/infiltration, and promote soil binding. Carry out shallow ripping as required.	
	R5	Stockpiled topsoil will be re-spread to create a land surface that is safe and stable.	
Revegetation	R6	Undertake revegetation as per Section 3.2.2.4.	During revegetation
Maintenance	R7	Undertake maintenance measures as per Section 3.2.2.5.	
Monitoring	R8	Monitoring and reporting work are required to ensure that the revegetation objectives are achieved. Undertake monitoring as per Section 3.2.2.6.	
Weed Management Plan			
Surface Material	W1	Assess weed potential within topsoil material prior to removal and separate weed affected topsoil for treatment or disposal.	Prior to and during topsoil removal
	W2	Store significantly weedy surface material separately to clean surface material.	
	W3	Stockpile all surface materials in the general vicinity of its origin.	
Hygiene Measures	W4	Avoid moving surface material or fill material from weed infected areas to non-infested areas.	At all times
	W5	All earthmoving and ground engaging equipment will be cleaned of vegetation, mud and soil prior to entry and exit of the subject site.	
	W6	No soil and vegetation should be brought to the site apart from that to be used in rehabilitation and plants used in rehabilitation should be free of weeds and disease.	

Parameter	No.	Action	Timing
	W7	Control access within the quarry area to reduce the spread of weeds, especially off-road vehicle access.	
	W8	The battle-axe road between the property and the Yalgorup National Park will not be used as an access road. A 20-60m vegetative buffer to the battle-axe road and the excavation area will be provided.	
Weed control	W9	Chemical spraying is to be undertaken as per Section 3.2.3.1 .	As required
Monitoring	W10	Monitoring and reporting work are required to ensure that the revegetation objections are achieved.	
Vegetation Monitoring			
Vegetation	M1	Identify and demarcate 3 Impact sites and 3 Reference sites.	Prior to commencement of Proposal
	M2	Undertake baseline vegetation monitoring event of sites in spring.	
	M3	Undertake vegetation monitoring during Proposal in spring.	Every 2 years
	M4	Undertake vegetation monitoring post completion of Proposal in spring.	2 years post completion
Vegetation Management Plan			
Clearing of vegetation	V1	All site personnel will be inducted on the clearing controls for this project.	At all times
	V2	Ensure clearing does not exceed the authorised extent and is minimised where possible.	Prior to clearing
	V3	Vegetation clearing will be undertaken progressively with the amount of active disturbance minimised.	During clearing
	V4	Hygiene management measures outlined in Section 3.2.3.2 will be implemented.	At all times
	V5	Dust control will be implemented as outlined in Section 3.4.2.1 .	At all times
	V6	Surface water controls as outlined in Section 3.1.5 will be implemented to ensure that all surface water is contained within the excavation area.	At all times
	V7	Clearing will be restricted to the approved project footprint to avoid over-clearing and to minimise indirect impacts to adjacent remnant vegetation.	During clearing
	V8	No movement of vehicles or personnel within the vegetation retention areas will be allowed.	At all times
	V9	No stockpiling of topsoil or other material is to occur outside of the clearing boundary.	At all times

Parameter	No.	Action	Timing
Fauna Management Plan			
Vegetation clearing	F1	Clearing will be undertaken as per Table 10 .	During clearing
	F2	A pre-clearing survey for fauna will be required for all vegetation subject to clearing.	Prior to clearing
	F3	Clearing will be undertaken on a progressive basis to allow fauna to move away from clearing activities.	At all times
	F4	A fauna spotter will be onsite at all times during clearing to oversee clearing activities.	At all times
	F5	Vehicles and machinery on site will be restricted to one front end loader and a truck, and will be restricted to designated areas.	At all times
	F6	Speed limits for vehicles within the subject site will be restricted to 10km/hr.	Prior to clearing
	F7	Fauna injured during clearing or excavation works will be rehabilitated by a wildlife carer.	During clearing
Noise Management Plan			
Quarry design	N1	Overburden and interburden dumps will be positioned where they can form screening barriers.	During Excavation Activities
	N2	Haul road and hardstand surfaces will be maintained in good condition (free of potholes, rills and product spillages) and with suitable grades.	During Excavation Activities
Plant and equipment	N3	All plant will be maintained in good condition with efficient mufflers and noise shielding.	During Excavation Activities
	N4	Warning lights, rather than audible sirens or beepers, will be fitted on mobile equipment wherever possible.	During Excavation Activities
Truck movements	N5	No excavation works or truck movements will occur on Sunday or public holidays.	During Excavation Activities
	N6	Excavation and truck movement will be limited from December to April	During Excavation Activities
	N7	The use of engine braking on product delivery trucks will be avoided in built up areas.	During Excavation Activities

Parameter	No.	Action	Timing
Complaints procedure	N8	<ul style="list-style-type: none"> Erect on-site signage directing public to make complaints to the relevant person. Maintain a complaints register. A Complaints Register will be established for the site to record the date, nature, and resolution action of any complaints. Complaints will be directed to the site supervisor for resolution. If the complaint is verified as being due to a site source, remedial action will be undertaken within 2 hours. If a complaint cannot be resolved within the 2 hour response period, it may be necessary to cease operations. 	During Excavation Activities
Dust Management Plan			
Quarry Operations	D1	Stockpiles, where possible, will be limited to the anticipated cubic volume/vehicle movement for cartage on the following operating day.	During excavation activities
	D2	Stockpiles will be configured to accommodate easy access for watering/dust minimisation if required.	During excavation activities
	D3	Access roads and immediate extraction areas will be watered as required with water trucks.	During excavation activities
	D4	Topsoil stockpiles will be watered and stabilised as required. Stabilisation techniques that will be considered depending on environmental conditions will include hydro-mulching.	During excavation activities
	D5	Timing of earthworks (daily and seasonally) will coincide with periods of low wind velocity as far as practicable. This will especially need to be considered during summer with the prevailing easterly winds.	During excavation activities
Truck movements	D6	Truck loads to be covered by tarpaulins or similar.	During excavation activities
Monitoring and complaints	D7	Visual monitoring of dust will be undertaken daily. When dust emissions are observed, dust suppression measures (such as water sprays) will be implemented immediately.	During excavation activities
	D8	<ul style="list-style-type: none"> Erect on-site signage directing public to make complaints to the relevant person. Maintain a complaints register. A Complaints Register will be established for the site to record the date, nature, and resolution action of any complaints. Complaints will be directed to the site supervisor for resolution. If the complaint is verified as being due to a site source, remedial action will be undertaken within 2 hours. <p>If a complaint cannot be resolved within the 2 hour response period, it may be necessary to cease operations.</p>	During excavation activities
Preston Beach Road North Management			

Parameter	No.	Action	Timing
Vegetation pruning	P1	<ul style="list-style-type: none"> All site personnel will be inducted on the pruning controls for this project. 	Pruning
	P2	<ul style="list-style-type: none"> Ensure pruning does not exceed the authorised extent and is minimised where possible. 	Pruning
	P3	<ul style="list-style-type: none"> A fauna spotter will be onsite at all times during pruning to oversee pruning activities. 	Pruning
Upgrade works	P4	<ul style="list-style-type: none"> Install signage and undertake road upgrade works as required. 	Prior to extraction
Road maintenance	P5	<ul style="list-style-type: none"> Road surface will be maintained in good condition (free of potholes, rills and product spillages) and with suitable grades during transportation periods. 	December - April
Trucks	P6	<ul style="list-style-type: none"> No truck movements will occur on Sunday or public holidays. 	At all times
	P7	<ul style="list-style-type: none"> Truck loads to be covered by tarpaulins or similar. 	At all times
	P8	<ul style="list-style-type: none"> Truck movement will be limited from December to April. 	December - April
	P9	<ul style="list-style-type: none"> The use of engine braking on product delivery trucks will be avoided in built up areas. 	At all times
Dust	P10	<ul style="list-style-type: none"> The road will be watered as required with water trucks. 	As required
Complaints procedure	P11	<ul style="list-style-type: none"> Erect on-site signage directing public to make complaints to the relevant person. Maintain a complaints register. A Complaints Register will be established for the site to record the date, nature, and resolution action of any complaints. Complaints will be directed to the site supervisor for resolution. If the complaint is verified as being due to a site source, remedial action will be undertaken within 2 hours. If a complaint cannot be resolved within the 2 hour response period, it may be necessary to cease operations. 	At all times

CONTENTS

EXECUTIVE SUMMARY	ii
1 INTRODUCTION.....	1
1.1 BACKGROUND.....	1
1.2 PURPOSE AND SCOPE.....	1
1.3 PROPOSED DEVELOPMENT	2
1.3.1 Limestone Extraction.....	2
1.3.2 Sand Extraction	3
1.3.3 Final Contours.....	3
1.3.4 Site Access.....	3
2 KEY ENVIRONMENTAL FACTORS.....	4
2.1 ENVIRONMENTAL FACTORS	4
2.2 RATIONALE AND APPROACH.....	6
2.2.1 Survey Findings	6
2.2.2 Management Approach	9
3 MANGEMENT PLANS	10
3.1 INLAND WATERS.....	10
3.1.1 Groundwater	10
3.1.2 Water Supply.....	10
3.1.3 Surface Water Protection.....	11
3.1.4 Erosion and Sediment Management.....	11
3.1.5 Management Measures.....	11
3.2 FLORA AND VEGETATION.....	13
3.2.1 Monitoring and Contingency Measures	13
3.2.1.1 Management Actions.....	14
3.2.2 Rehabilitation.....	14
3.2.2.1 Post-mining Land Use Objectives.....	14
3.2.2.2 Landform Design.....	14
3.2.2.3 Topsoil Management	15
3.2.2.4 Revegetation.....	15
3.2.2.5 Maintenance.....	17
3.2.2.6 Monitoring and Reporting.....	18
3.2.2.7 Scheduling.....	18

3.2.2.8	Management Actions	19
3.2.3	Weed Management	19
3.2.3.1	Weed Control	19
3.2.3.2	Weed Hygiene	20
3.2.3.3	Phytophthora Dieback	21
3.2.3.4	Management Actions	21
3.2.4	Vegetation Management	22
3.2.4.1	Impacts to Vegetation.....	22
3.2.4.2	Management Measures.....	22
3.3	TERRESTRIAL FAUNA	22
3.3.1	Loss of Habitat	23
3.3.2	Injury/Mortality of fauna	23
3.3.3	Management Measures	23
3.4	SOCIAL SURROUNDS.....	24
3.4.1	Noise Management.....	24
3.4.1.1	Mitigation and Management	24
3.4.2	Dust Management.....	25
3.4.2.1	Mitigation and Management	25
3.4.3	Preston Beach Road North Management	26
3.4.3.1	Management	27
4	ADAPTIVE MANGEMENT	28
	REFERENCES.....	29

Tables

Table ES. Summary of management plans.....	ii
Table 1. Summary of key environmental factors.....	4
Table 2. Summary of survey findings for key environmental factors.....	7
Table 3. Groundwater management objectives targets and performance indicators.....	10
Table 4. Monitoring to measure environmental outcome against threshold criteria.....	10
Table 5. Management actions for inland waters.....	11
Table 6. Monitoring actions for vegetation.....	14
Table 7. Management actions for rehabilitation.....	18
Table 8. Weed control treatment.....	19

Table 9. Management actions for weed control.....	20
Table 10. Management actions for flora and vegetation.....	21
Table 11. Management actions for fauna.....	22
Table 12. Management actions for noise control.....	24
Table 13. Management actions for dust control.....	26
Table 14. Preston Beach Road North management actions.....	28

Figures

Figure 1. Regional Location of the Subject Site

Figure 2. Monitoring Bore Locations

Figure 3. Vegetation Monitoring Sites

Figure 4. Rehabilitation Zones

Figure 5. Final Conceptual Contours

Appendices

Appendix A – Spill Procedure

1 INTRODUCTION

1.1 Background

Doyle's Lime Services (the proponent) are proposing to develop a limestone and sand extraction project (quarry) on Lot 1002 Preston Beach Road North, Preston Beach (herein referred to as the subject site), within the Shire of Waroona (refer to **Figure 1**). The subject site is located 30 km south of Mandurah and approximately 150 km south of Perth. It is located approximately 800 m south-west of Lake Pollard, 2 km west of Lake Clifton and 1.5 km north-west of Martin's Tank Lake, and lies immediately west of Yalgorup National Park.

The limestone and sand pit will cover an area of approximately 14.74 hectares (ha) with a maximum natural elevation of 15 m Australian Height Datum (AHD). It will be excavated to about 5 to 6 m AHD in eight stages, each approximately 2 ha, over 20 years. It is anticipated that approximately 50,000 tonnes of limestone and 10,000 tonnes of sand will be extracted each year, depending on supply and demand. The proposal involves the screening and crushing of the limestone on site. Access to the property will be via the existing limestone road, Preston Beach Road North, and the sealed Preston Beach Road that exits onto National Route 1, Forrest Highway. Additional trimming of vegetation, grading and maintenance of Preston Beach Road North will be required.

The planned end use of the quarry is to restore a natural soil profile and return the ridge to native vegetation (Zone 1) with pasture in the west (Zone 2), ensuring that there is no net loss of native vegetation.

1.2 Purpose and Scope

Following referral of the Proposal to the Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* (EP Act), the EPA determined on 28 September 2016 to set the level of assessment as Environmental Review Document (ERD). The proponent has prepared an ERD setting out the Proposal's potential environmental impacts and their assessment. As outlined in the ERD (Accendo 2020), this environmental management plan (EMP) provides the management and mitigation measures for residual environmental impacts identified within the ERD (Accendo 2020).

The purpose of this EMP is to describe procedures that will be implemented on behalf of the proponent. This will involve the following:

- Rehabilitation;
- Weed control;
- Surface and groundwater management;
- Flora and vegetation management;
- Fauna management;
- Dust management; and
- Noise management.

The EMP is a collaborative management tool that details the methods and procedures that will be applied in order to achieve the proponent's environmental commitments and regulatory obligations. The specific aims of the EMP are to:

- Detail the proposed revegetation measures including species and methodology;
- Provide weed control measures for the revegetation areas and the subject site;
- Document the proposed control measures associated with groundwater management and stormwater and erosion management;

- Document the proposed control measures to be implemented to ensure minimal impacts occur in relation to flora, vegetation and fauna due to quarrying activities; and
- Provide control measures to be implemented to reduce dust and noise levels within the quarry.

In addition to general references and relevant recommendations and guidelines, the following publications have also been utilised during the preparation of the EMP:

- *Environmental Management of Quarries* (DME 1991);
- *Environmental Code of Practice - Extractive Industries* (DEP 1990); and
- *Water Quality Protection Guidelines No. 6* (DoW 2000).

1.3 Proposed Development

1.3.1 Limestone Extraction

The limestone within the quarry is relatively soft and can be removed with an excavator or loader without the need for a bulldozer or blasting. It will then be screened to produce products of the correct size. A small mobile crusher is required to prepare the correct grainsize. A summary of the proposed limestone extraction activities is provided below:

- Prior to excavation commencing the site will be ground surveyed, the excavation footprint marked out and a 1 metre contour plan developed.
- Remove the vegetation cover by pushing it into windrows for use on the batters to minimise soil erosion and assist spreading on the final land surface as part of the final rehabilitation.
- Where practicable vegetation will be directly transferred to an area being rehabilitated. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable; for example on batter slopes of completed areas.
- All topsoil will be removed for spreading directly onto areas to be revegetated and screening or perimeter bunds. If direct spreading is not possible the topsoil will be stored in low dumps, for spreading at a later date.
- Soil and overburden, as yellow and brown sand and low grade limestone, will then be removed and either directly transferred to a rehabilitation area or stored in low dumps for later rehabilitation use.
- Limestone interburden, if encountered, will be incorporated into the overburden dumps for later use in re-contouring the land surface at the conclusion of excavation.
- An excavator or front-end loader will be used to dig and push the limestone down the excavation face and track roll the limestone in the process.
- The preliminary crushed limestone will then be picked up by a rubber tyred loader and fed to the mobile crusher.
- All static and other equipment, such as crushers and screens (where used), will be located on the floor of the quarry to provide visual and acoustic screening.
- Excavation will commence on the western ridge and then move to the eastern ridge, working on the floor of the pit towards the edges to minimise the potential visual impact. The face and walls of the pit will act as noise barriers.
- Upon completion of each section of quarry the section will be reformed and back filled, where subgrade material is available, to achieve the proposed final contours.
- At the end of excavation, the floor of the quarry will be deep ripped, covered by overburden and topsoil, and rehabilitated to a constructed soil.

1.3.2 Sand Extraction

Sand will be sourced by pushing the topsoil into perimeter bunds for later rehabilitation. Sand will then be excavated with a loader, loading directly to a road truck.

1.3.3 Final Contours

The slope of the final contours of the quarry will be an undulating surface at around 5 m AHD which is consistent with the adjoining land.

Slopes of the batters at the end of excavation will be retained at 1:4 vertical to horizontal. Sand excavation will cut to an elevation of 4 m AHD because the resource is thin.

A separation of 4 m between the final contours and the maximum groundwater elevation will be maintained.

1.3.4 Site Access

Access to the quarry will be along Preston Beach Road, which is sealed, and then to Preston Beach North Road which terminates at the property's south-eastern boundary gate.

The Preston Beach Road provides access to the Preston Beach township. It is associated with regular residential traffic in addition to tourist traffic during holiday periods and weekends. Conversely, Preston Beach North Road does not provide any direct access to other residential dwellings. It provides access to the Martin Tank's campsite for a variety of vehicles (caravans, motorhomes etc.)

From December to April, a maximum of 10 trucks per day is anticipated (depending on demand) which will equate to one to two trucks per hour.

2 KEY ENVIRONMENTAL FACTORS

2.1 Environmental Factors

The Environmental Scoping Document (ESD) identified four preliminary key environmental factors that are relevant to the Proposal. The following key environmental factors relevant to the Proposal which are addressed within this EMP are as follows:

- Inland waters
- Flora and vegetation
- Terrestrial fauna
- Social surroundings

A summary of these factors is provided below.

Table 1. Summary of key environmental factors.

Inland Waters	
EPA objective	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.
Policy and guidance	<ul style="list-style-type: none"> • Environmental Factor Guideline – Inland waters (EPA 2018) • Environmental Factor Guideline – Flora and vegetation (EPA 2016) • Environmental Factor Guideline – Terrestrial fauna (EPA 2016) • EPA Report 1359 – <i>Strategic Environmental Advice on the Dawesville to Binningup Area</i> (EPA 2010)
Project activities	<ul style="list-style-type: none"> • Vegetation clearing (14.6 ha in total). • Limestone excavation to a depth of about 5 to 6 m AHD.
Potential impacts	<ul style="list-style-type: none"> • Change to groundwater quality and quantity within the Yalgorup Lake System; • Further decline of the Lake Clifton living microbialites due to decrease in water flow.
Residual impacts	No residual impacts expected as the Proposal is not expected to result in any changes to groundwater quality or quantity. However, groundwater monitoring is proposed to detect any changes in groundwater quality and quantity.
Flora and Vegetation	
EPA objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Policy and guidance	<ul style="list-style-type: none"> • Environmental Factor Guideline – Flora and vegetation (EPA 2016) • Environmental Factor Guideline – Terrestrial fauna (EPA 2016) • Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA and Department of Parks and Wildlife 2015) • EPA Report 1359 – <i>Strategic Environmental Advice on the Dawesville to Binningup Area</i> (EPA 2010) • Environmental Protection Bulletin No. 12 – Swan Bioplan – Peel Regionally Significant Natural Areas (EPA 2013) • Guidelines for Preparing Mine Closure Plans (DMP & EPA 2015)

	<ul style="list-style-type: none"> Guidance Statement No. 6 – Rehabilitation of Terrestrial Ecosystems (EPA 2006)
Project activities	<ul style="list-style-type: none"> Vegetation clearing (14.6 ha in total). Limestone excavation to a depth of about 5 to 6 m AHD.
Potential impacts	<ul style="list-style-type: none"> Clearing of vegetation will directly reduce the extent of vegetation communities, and may disturb conservation significant flora species or ecological communities. Spread of weeds and dieback from vehicle movements, introduced/imported material, earthworks or surface and/or subsurface water flow have the potential to introduce and spread weed species and dieback. Dust generation due to earthworks and vehicle movements has the potential to smother vegetation.
Residual impacts	<p>The following residual impacts are considered to be of minor significance at both a local and regional scale:</p> <ul style="list-style-type: none"> All cleared areas within the quarry will be progressively rehabilitated. The impacts of weeds on flora and vegetation is assessed as being low following the implementation of weed control measures. Dust impacts to flora and vegetation are anticipated to be minimal give the proposed management measures.
Terrestrial Fauna	
EPA objective	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
Policy and guidance	<ul style="list-style-type: none"> Environmental Factor Guideline – Terrestrial fauna (EPA 2016); Environmental Factor Guideline – Flora and vegetation (EPA 2016); Guidance Statement No. 56 – Terrestrial Fauna Surveys for Environmental Impact Assessment in WA (EPA 2004); Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA and Department of Parks and Wildlife 2015); Guidance Statement No. 20 – Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia (EPA 2009); Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010); and EPA Report 1359 – Strategic Environmental Advice on the Dawesville to Binningup Area (EPA 2010).
Project activities	<ul style="list-style-type: none"> Vegetation clearing (14.6 ha in total). Limestone excavation to a depth of about 5 to 6 m AHD. Transport corridor along Preston Beach Road North.
Potential impacts	<ul style="list-style-type: none"> Temporary loss of marginal quality fauna habitat from vegetation clearing. Injury/mortality of fauna. Degradation of adjacent fauna habitat. Disturbance to fauna from noise and vibrations. Introduction of weeds and disease.

Residual impacts	<p>Temporary loss of potential fauna habitat (14.6 ha in total) will occur from quarry operations. However, the quarry will be progressively rehabilitated and fauna species are not restricted to the quarry area. The vegetation does not provide habitat critical to the maintenance of fauna species of conservation significance.</p> <p>Implementation of the proposed management measures will reduce direct impacts to fauna. Impacts to fauna due to dust and noise are expected to be limited and are not expected to impact on the ability of fauna to persist in the long term.</p> <p>Weed management measures are anticipated to adequately manage potential impacts to fauna as a result of weeds.</p>
Social Surrounds	
EPA objective	To protect social surroundings from significant harm.
Policy and guidance	<ul style="list-style-type: none"> EPA Environmental Factor Guideline - Social surroundings (EPA 2016). Guidance Statement No. 3 – Separation Distance Between Industrial and Sensitive Land Uses (EPA 2005).
Project activities	<ul style="list-style-type: none"> Vegetation clearing (14.6 ha in total). Limestone excavation to a depth of about 5 to 6 m AHD. Transport corridor along Preston Beach Road North.
Potential impacts	<ul style="list-style-type: none"> Visual impacts to hikers using a portion of the loop trail option. Noise disturbance to hikers traversing the roads associated with the loop trail option from December to April. If not adequately controlled, dust can cause nuisance risks to hikers. Amenity and safety issues for hikers walking along Preston Beach Road North.
Residual impacts	<p>Views of the Proposal area from most potentially sensitive viewpoints are expected to be obscured by existing vegetation/topography. There are some locations along the walk trail/firebreak where the quarry will be visible. Screening vegetation will be planted to minimise impacts as far as practicable.</p> <p>No noise impacts are anticipated for sensitive receptors.</p> <p>Dust impacts to sensitive receptors are expected to be minimal with the implementation of suitable management measures.</p>

2.2 Rationale and Approach

2.2.1 Survey Findings

A brief summary of the findings for the surveys undertaken for the Proposal are provided in **Table 2** below.

Table 2. Summary of survey findings for key environmental factors.

Inland Waters	
Report	<i>Preston Beach Rd North – Hydrological Assessment. Report for Doyle’s Lime Service (Managed Recharge 2019).</i>
Findings	The investigation has shown that the site has no permanent surface drainage features, and that any overland flow, or interflow, that might occur following heavy rainfall events will drain internally to the swale located immediately west of the proposed excavation site.

	<p>Hence, any change to the local landforms will not impact surface flow in the adjacent Yalgorup National Park, or to the coastal lakes.</p> <p>The conceptual model is consistent with previous investigations and indicates local groundwater-recharge via rainfall infiltration has developed a fresh-water lens beneath the Quindalup and Spearwood dunes, with groundwater flow under a very low hydraulic gradient towards Lake Pollard, Lake Clifton and Martins Tank Lake, which act as regional groundwater sinks. There is no evidence of groundwater mounding beneath the limestone ridge in winter, which would be indicative of increased storage capacity, and groundwater levels beneath the ridge have been shown to be independent of topographic elevation, indicating groundwater flow to the lakes is not associated with the limestone ridge itself.</p> <p>While groundwater flow is toward the Yalgorup National Park and Ramsar listed wetlands, it is not anticipated that the regional water balance and environmental values will be significantly impacted, as any change to hydrogeological conditions relating to the proposal are likely to be minimal and well contained within the property boundaries.</p> <p>Any additional recharge relating to land clearing may be mitigated by a staged and continuous rehabilitation and revegetation program. No additional evapotranspiration is anticipated during or following development as the planned pit-floor is well above the inferred extinction depth (0 – 3 m), and the land will be revegetated with plants that have similar evapotranspiration characteristics to those currently present.</p>
Assumptions	<p>The assessment provides for a preliminary understanding of baseline conditions. Key assumptions include:</p> <ul style="list-style-type: none"> • The presented conceptual model is considered valid for the scale of assessment. • Groundwater flow at a local scale can be determined based on existing information.
Flora and Vegetation	
Report	<i>Level 2 Flora and Level 1 Fauna Survey, Lot 1002 and a Portion of Preston Beach Road North (Natural Area Consulting 2019).</i>
Findings	<p>The survey confirmed:</p> <ul style="list-style-type: none"> • 109 flora species, 82 of which were native species. No Declared Rare or Priority flora within disturbance footprint. • Six vegetation types, two of which are classified as Priority 3 under the <i>Biodiversity and Conservation Act 2016</i>. • A high similarity between quadrats and a low similarity to quadrats from other datasets, which could be due to survey timing. • Vegetation condition ranging from Completely Degraded to Very Good, with the majority of the survey area (79%) in Completely Degraded or Degraded Condition.
Assumptions	<ul style="list-style-type: none"> • Database searches only provide an indication of what flora species may be present, with on ground surveys required to confirm those present. • The differing databases are reliant on information submitted via various reporting mechanisms, so all records of a flora species or ecological community in a specified area may not be complete. • On-ground surveys indicate species present at the time of the assessment. • Not all species flower every year.

	Despite these limitations, Natural Area believes 80 – 90% of flora species were identified.
Terrestrial Fauna	
Report	<p><i>Level 2 Flora and Level 1 Fauna Survey, Lot 1002 and a Portion of Preston Beach Road North</i> (Natural Area Consulting 2019).</p> <p><i>Targeted Fauna Survey - Lot 1002 Preston Beach Road North and Preston Beach Road North</i> (Greg Harewood 2020).</p>
Findings	<p>A total of 75 conservation significant fauna were indicated to potentially occur on site, including threatened and priority species, and species otherwise protected under legislation and international agreements.</p> <p>The following conservation significant fauna species were detected within the subject site during the targeted fauna survey:</p> <ul style="list-style-type: none"> • Carnaby's Cockatoo <i>Catyporhynchus latirostris</i> (Endangered) - A small group of individuals were observed flying over the proposed extraction area on one occasion. • Quenda <i>Isoodon fusciventer</i> (Priority 4) - Several individuals recorded within the proposed extraction area. • South-western Brush-tailed Phascogale <i>Phascogale tapoatafa wambenger</i> (Conservation Dependent) - Several individuals recorded within the proposed extraction area. • Western Ringtail Possum <i>Pseudocheirus occidentalis</i> (Critically Endangered) - Recorded along the southern section of Preston Beach Road North. Appears to be absent for the proposed extraction area. • Western False Pipistrelle <i>Falsistrellus mackenziei</i> (Priority 4) - Recorded several times within the proposed extraction area. <p>Several other of the listed conservation significant fauna species may occur but were not detected. Habitat for most of these species within the proposed extraction area appears to be limited in extent and/or the species are generally uncommon so the probability of detection would have been low. Some species would not occur in the subject site (e.g. sharp-tailed sandpiper) due to a complete lack of suitable habitat.</p>
Assumptions	It is assumed that the surveys undertaken have accurately identified and mapped fauna habitat and recorded fauna occurrences.
Social Surrounds	
Report	<p><i>Preston Quarry Baseline Dust Survey</i> (Emission Assessments 2020).</p> <p><i>Acoustic Assessment. Lot 1002 Preston Beach Road – Limestone Quarry</i> (Herring Storer 2020).</p>
Findings	Ambient dust monitoring conducted will be used to set a baseline of representative normal conditions and levels of dust prior to any potential additional dust generated from proposed quarry activities. Further monitoring will be conducted over another 3-month period when the quarry is in normal operation to evaluate the potential changes to ambient dust levels at noted sensitive receivers. The change to prevailing winds to southerly indicates that the

	<p>potential dust increase would mainly impact locations 3 (residential dwelling) and 4 (Martins Tank campsite).</p> <p>The baseline existing noise environment has been characterised through noise monitoring. The baseline noise monitoring was carried out over the period 4th to 11th June 2020.</p> <p>Noise levels were predicted using the acoustic software “SoundPlan” for worst case wind conditions as per the DER ‘Draft Guideline on Environmental Noise for Prescribed Premises (May 2016)’ for day operation.</p> <p>The maximum predicted noise emission at the bird hide and Martins Tank campgrounds under conditions of maximum sound propagation is 36 dB(A). It is noted however, that during the extraction months December – April, prevailing winds are easterly or south westerly, therefore much of the extraction period noise emissions at these locations will be reduced.</p> <p>The acoustic modelling shows that the proposed sand and limestone extraction will comply with the requirements of the <i>Environmental Protection (Noise) Regulations 1997</i>.</p>
Assumptions	<p>It is assumed that the baseline dust and noise monitoring will provide representative normal conditions.</p> <p>It is assumed that the noise modelling accurately reflects the proposed operations.</p>

2.2.2 Management Approach

This EMP has been developed to address the key environmental factors identified in **Section 2.1**. A systematic approach has been utilised where the potential impacts associated with the Proposal were assessed, and mitigation measures applied accordingly (refer to ERD). For residual impacts, outcome based, and management bases provisions have been developed and are documented in this EMP.

3 MANGEMENT PLANS

3.1 Inland Waters

3.1.1 Groundwater

The key objectives, targets and associated assessment methods relating to the management of groundwater are detailed in **Table 3** below.

Table 3. Groundwater management objectives targets and performance indicators.

Objective	Target	Assessment Method
Protect groundwater quality	Groundwater quality within the range of pre-mining background values	Monitoring water quality
Maintain natural groundwater levels	Groundwater levels within the range of pre-mining background levels	Monitoring water levels
Minimise the impacts of groundwater drawdown on Groundwater Dependent Ecosystems	No significant decline in vegetation health as a result of the Proposal	Monitor vegetation health (refer to Section 3.2.1)

The purpose of monitoring is to inform, through the environmental criteria, if the condition environmental outcome is being achieved and when trigger level actions or threshold contingency actions will be implemented.

The proposed groundwater monitoring program will entail the following:

- Quarterly groundwater level monitoring at bores DLMB1 to DLMB7 and DWER bore B2 (refer to **Figure 2**); and
- Quarterly pH and salinity monitoring at bores DLMB1 to DLMB7 and DWER bore B2.

A number of threshold contingency actions that would be implemented if the associated threshold criterion signals that the environmental outcome is exceeded (refer to **Table 4**) have been developed.

Table 4. Monitoring to measure environmental outcome against threshold criteria.

Indicator	Method	Location	Frequency	Actions
A 1 m decrease in groundwater levels beyond seasonal trends	Quarterly groundwater level measurements	DLMB1 to DLMB7 and DWER bore B2	Quarterly	Undertake analysis of groundwater and climate data to investigate cause. Report to DWER.
A 25% variance from baseline results beyond seasonal trends.	Quarterly pH and salinity monitoring			
A 20% decline in the species composition or the health / stress attributes of the Impact Sites against the Reference Sites	Monitor vegetation health	Refer to Section 3.2.1	Refer to Section 3.2.1	

3.1.2 Water Supply

Water will only be required for dust suppression, which will be carried out as required during drier weather. A water tanker will be used to water the access road and the pit floor whenever necessary to minimise dust generation from transport and during crushing. Normally only small volumes of water will be used for a quarry of this type. This water will be sourced offsite and carted to the property in summer.

3.1.3 Surface Water Protection

During quarrying operations, rainfall and surface water collected in the active quarry area will infiltrate the sandy soils. No discharge of surface water from the active quarry area is anticipated. Quarrying operations will have minimal impact on stream flow within the local catchment area due to the high infiltration capacity of the sandy soils and the relatively small disturbance footprint. Therefore, no stream flow impacts to any surface water features are anticipated due to the high infiltration rate of the sandy soils. Diversion drains will be constructed around the excavation and hardstand areas to divert clean water away from the quarry whilst containing any potentially sediment laden surface waters within the work area.

No surface water quality impacts due to increased sedimentation during operations are likely to occur, as all rainfall and surface runoff will be collected in the active quarry area. The active quarry area will act as a detention pond collecting rainfall and surface runoff and releasing it to the local groundwater system through infiltration.

Surface water contamination may occur through spills or leaks of hydrocarbons (although noting that there will be no storage of fuels or chemicals onsite). However, the proponent will ensure that their companywide *Hydrocarbon Spill Management Procedure* (refer to **Appendix A**) is implemented within the quarry, as required.

3.1.4 Erosion and Sediment Management

The principal objective for stormwater management for the quarry is to ensure that there is no uncontrolled discharge of water from the extraction area that results in erosion or sedimentation. This objective is intrinsic to erosion and sedimentation designs and controls for the quarry, and will be achieved by implementing the following principles:

- Adopting appropriate land clearing procedures for all proposed disturbance areas;
- Containing sediment-laden runoff within the quarry area for infiltration;
- Constructing the internal roads and working quarry face with effective surface drainage; and
- Implementing an effective revegetation and maintenance program for the site.

The principal design aspects of the quarry will be the diversion of uncontaminated water and containment of contaminated water within the extraction / quarry area to enable onsite infiltration.

3.1.5 Management Measures

The following management plan has been formulated to ensure protection of inland waters.

Table 5. Management actions for inland waters.

Parameter	No.	Action	Timing
Groundwater	S1	Progressive rehabilitation will occur to mitigate any potential increase in groundwater recharge in the quarry as vegetation is cleared.	At all times
	S2	A 4m undisturbed profile between the pit floor and the maximum groundwater level will be maintained to avoid any potential risks associated with evaporative discharge.	At all times
	S3	Quarterly groundwater level and quality monitoring will be undertaken at bores DLMB1 to DLMB7 and DWER bore B2.	At all times
Water quality	S4	No servicing of vehicles or machines will be undertaken onsite.	At all times
	S5	No chemicals or fuels will be stored onsite.	At all times

Parameter	No.	Action	Timing
	S6	<p>In the event of a spill occurring the following actions will be taken:</p> <ul style="list-style-type: none"> • Stop the spill immediately if it is safe to do so; • Contain the spill and prevent any contact with water bodies and drains; • Clean up spill by digging up the contaminated soil and dispose of contaminated soil at a licensed disposal site; • Replace excavated material with clean fill; • Report incident to Quarry Manager. 	In the event of a hydrocarbon spill
Stormwater	S7	Allow clean stormwater from non-process areas and access roads to infiltrate into the surrounding soil by constructing diversion banks upslope of areas to be disturbed.	At all times
	S8	Construct catch drains to capture runoff from disturbed areas and direct into the pit area to enable infiltration.	At all times
Erosion control	S9	Use existing access tracks or roads wherever possible rather than creating new ones.	At all times
	S10	Stabilise disturbed land as soon as possible to minimise erosion.	At all times
	S11	Level or gently sloping areas will be selected as stockpile sites to minimise erosion and potential soil loss where possible.	At all times
	S12	Appropriate sediment controls will be installed upslope of stockpiles to divert water around and downslope of the stockpiles to prevent soil loss.	At all times
	S13	Provide adequate erosion control structures on sloping ground such as spur drains or contour banks at suitable intervals	At all times

3.2 Flora and Vegetation

3.2.1 Monitoring and Contingency Measures

A Vegetation Monitoring Program has been designed to enable the detection of a decline in vegetation condition as a result of changes in hydrology. This will be achieved by using species composition and vegetation health attributes as measurement parameters.

A total of three Impact Sites will be established within vegetation adjacent to the Proposal as shown in **Figure 3**. Three Reference Sites on Crown land or road reserves located in proximity to the Impact Sites will be identified (refer to **Figure 3** for approximate location of reference sites). The purpose of Reference Sites is to enable comparison of potential Impact Site data with data from sites located away from the Proposal Area and to assist in determining whether any impacts have resulted from Proposal implementation. Reference and impact vegetation monitoring sites require comparative features to be useful – i.e. same vegetation type, same location in the landscape and same ecological processes. This will be considered during selection of monitoring sites.

The monitoring program will include photo monitoring points at each quadrat. The dimensions of the monitoring quadrats will be approximately five metres by five metres and will be pegged on each corner and their locations geo-referenced (recorded using a handheld GPS). The following characteristics will be assessed:

- Site conditions including vegetation cover;
- Species present in each structural layer;
- An estimate of cover and abundance;
- Weed species present and overall cover;
- Herbivory; and
- Other factors affecting plant survival, such as water stress and disease.

The monitoring will be undertaken by a qualified botanist at the following frequencies:

- Once in spring prior to commencement of the Proposal;
- Once every two years in spring during the Proposal; and
- Once for two years in spring post completion of the Proposal.

Vegetation changes associated with weeds and hydrology will be gradual over a 12 month period. At best, statistical differences in vegetation condition will only be identifiable on a biannual or annual basis.

Data collected from monitoring is to be entered into electronic spreadsheets to be analysed for trends in vegetation health. Photographs from each transect will be appropriately labelled and stored for comparison.

During the monitoring program, the implementation of contingency actions is required where monitoring shows a 20% decline in the species composition or the health / stress attributes of the Impact Sites against the Reference Sites. Where this occurs, the following actions shall be implemented:

- Cease groundwater abstraction.
- Investigate cause of decline in consultation with the DBCA.
- Report findings to EPA / DBCA and implement management actions if impacts attributable to the Proposal are detected.

3.2.1.1 Management Actions

A summary of the management/monitoring actions associated with the vegetation monitoring program is provided below in **Table 6**.

Table 6. Monitoring actions for vegetation.

Parameter	No.	Action	Timing
Vegetation	M1	Identify and demarcate 3 Impact sites and 3 Reference sites.	Prior to commencement of Proposal
	M2	Undertake baseline vegetation monitoring event at sites in spring.	
	M3	Undertake vegetation monitoring during Proposal in spring.	Every 2 years
	M4	Undertake vegetation monitoring post completion of Proposal in spring.	2 years post completion

3.2.2 Rehabilitation

Progressive quarrying and rehabilitation will be undertaken during operations. Following quarrying of each stage, rehabilitation works will be comprised of the following:

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

3.2.2.1 Post-mining Land Use Objectives

The subject site is classified into two post-mining land uses, with specific objectives for each land use. The planned post-mining land use and their relevant objectives are described below and the spatial location of where they apply are illustrated in **Figure 4**.

Due to the preliminary nature of the proposal at the time of development of this Plan, final landforms have the potential to change over the life of the project. Any proposed changes to the intended final land use will be determined prior to the final decommissioning plan.

Land use – Native Revegetation (Zone 1)

The objective is to revegetate a stabilised area with native vegetation to create a diverse, self-sustaining vegetation community. This will include direct seeding and the implementation of a weed control program.

Land use – Agriculture (Zone 2)

The objective is to return the land to a condition capable of supporting agricultural activities, with pasture production rates equivalent to or better than pre-mining production rates. This will include dryland pasture with a variety of species.

3.2.2.2 Landform Design

Topsoil is an integral part of rehabilitation as it contains organic matter and a seed bank which assists in establishing vegetation when respread on disturbed areas. Topsoil at the quarry will be stripped and

stockpiled separately, prior to commencing excavation. The soils will be stripped in a dry state to preserve soil structure and stripping will be undertaken in relatively still weather conditions, where possible.

Rehabilitation earthworks will be undertaken to develop a stable landform that is compatible with the local area and is sustainable in the long term. The ends of the two dunes will be reshaped down to the elevation of the intervening swale and the main ridge line along the western side of Lake Pollard will be maintained. **Figure 5** provides the final conceptual contours for the quarry.

3.2.2.3 Topsoil Management

The soils will be stripped in a dry state to preserve soil structure and stripping will be undertaken in relatively still weather conditions. Management of the topsoil will involve the following:

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

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

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

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

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

3.2.2.4 Revegetation

Prior to the commencement of revegetation, a 3m wide limestone firebreak will be established between the native revegetation and pasture area (refer to **Figure 4**). This will provide fire control and access between the two areas in addition to ameliorating the spread of weeds from the pasture to the revegetation areas.

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

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

Zone 1 – Native Revegetation

Zone 1 is approximately 14.5 ha in size (refer to **Figure 4**). It is proposed to return this area to native vegetation along the buffer to the access road on the eastern boundary of the Lot. Seed mixes for rehabilitation will be of local provenance. Specific seed mixes will be selected to provide a range of species appropriate to the desired habitat, taking into consideration landscape position and slope. In areas where erosion risks are identified, seed mixes may be modified to include or increase the portion of species that provide rapid cover. Based on the results of the flora and vegetation survey (Natural Area Consulting 2019), the following key species will be included within the revegetation program:

- *Acacia truncate*
- *Acacia pulchella* var. *pulchella*
- *Acacia applanate*
- *Acacia cyclops*
- *Agonis flexuosa*
- *Banksia dallanneyi*
- *Banksia sessilis*
- *Conostylis setigera*
- *Comesperma confertum*
- *Desmocladius flexuosus*
- *Eremaea glabra*
- *Eucalyptus decipiens*
- *Eucalyptus foecunda*
- *Eucalyptus gomphocephala*
- *Eucalyptus petrensis*
- *Grevillea vestita*
- *Hakea lissocarpha*
- *Hakea prostrata*
- *Hakea trifurcate*
- *Hardenbergia comtoniana*
- *Hibbertia* spp.
- *Kennedia prostrata*
- *Kunzea glabrescens*
- *Leucopogon parviflorus*
- *Lepidosperma longitudinale*
- *Lomandra* spp.
- *Macrozamia riedlei*
- *Melaleuca systema*
- *Myoporum insulare*
- *Olearia axillaris*
- *Olearia rudis*
- *Pelargonium littorale*
- *Pimelea rosea*
- *Phyllanthus calycinus*
- *Spyridium globulosum*
- *Templetonia retusa*
- *Xanthorrhoea preissii*
- *Xanthosia huegelii*

Seed will be broadcast uniformly within the marked areas in overlapping passes using portable hand-held equipment to allow for complete and even seed coverage of the pre-prepared area. Seed will be mixed with a bulking agent such as vermiculite, clean sand or sawdust in a ratio of 2 parts bulking agent to 1 part seed. If deemed necessary, seed will be covered by very light harrowing, scarifying, bagging, dragging or light raking of the seeded area as soon as practical and within the same day of seeding.

Recommended sowing rates to ensure successful revegetation are based on up to 400 to 1000 grams of seed per hectare. There can be differences in the germination rate between species, so the following guide for species mixes is recommended:

- Eucalypt species: 50 - 100 grams;
- Acacia and large seeded species: 50 – 100 grams; and
- Other species: 25 – 50 grams.

Zone 2 – Pasture

It is proposed to return Zone 2, approximately 1.3 ha, to pasture in accordance with the historical and post-mining land use for the subject site. Ripping will be undertaken within the completed cells to reduce the potential for surface erosion and promote a seed bed for establishing pasture species. During this process a number of measures will be utilised to ensure maximum efficiency with minimal disturbance. Any ripping that occurs along slopes will have regular contour banks built across the tracks to prevent erosion from water runoff.

As far as possible, topsoil will be placed along the contour to help reduce erosion. Placing the topsoil in such a manner will reduce the down slope flow of water and increase water storage. The final landform will resemble the pre-mining landform where practicable (minus the excavated material). The overburden storage area will take into consideration the surrounding landform and as far as practicable match the surrounding features.

While no specific soil preparation is anticipated, the requirement for the application of lime and/or fertiliser can be determined by soil testing once the landform has been rehabilitated.

For pasture revegetation it is essential that the species are matched to the soil types and rainfall. The location falls into the “High Rainfall Coastal” planting regime with sandy soils. Suitable perennial legumes include birdsfoot trefoil, lucerne, strawberry Clover and sulla. Perennial pasture includes perennial ryegrass, phalaris, cocksfoot and Rhodes grass. Annual pasture species include ryegrass, serradella and subterranean clover.

The actual species used will be determined by the individual season, nature of the rainfall in the preceding months and stocking/hay production proposed by the landholder which may change from time to time.

Seeding rates are 2 – 5 kg/ha depending on the species used; for example, ryegrass is seeded at 3 kg/ha whereas Rhodes grass is seeded at 4 kg/ha. Seed will be broadcast uniformly within the marked areas in overlapping passes using mechanical equipment to allow for complete and even seed coverage of the pre-prepared area. Seed will be mixed with a bulking agent such as vermiculite, clean sand or sawdust in a ratio of 2 parts bulking agent to 1 part seed. If deemed necessary, seed will be covered by very light harrowing, scarifying, bagging, dragging or light raking of the seeded area as soon as practical and within the same day of seeding.

3.2.2.5 Maintenance

Maintenance will be undertaken following seeding with all activities to be conducted in response to the maintenance inspections and monitoring (as discussed below). The key elements associated with

maintenance works will include suppression of smothering weeds and infill planting. The requirement to implement revegetation maintenance and infill planting measures will be determined following each monitoring event.

3.2.2.6 *Monitoring and Reporting*

A program of monitoring of the revegetation works is required to ensure that the objectives are achieved.

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

During these monitoring events Zone 2 will also be assessed to determine pasture and weed coverage within areas that have been rehabilitated.

Completion Criteria

To achieve the objectives of the Management Plan and ensure that future management is minimised, the measurable goals for the site are as follows:

- Zone 1
 - Weed cover is not greater than 15% cover and no new weeds to be introduced into the site;
 - Native seed used in rehabilitation is of local provenance;
 - Declared weed cover must be less than 5%;
 - All plant material used in rehabilitation sourced from within 40 km of the site.
 - Trees/shrub species providing preferential habitat for black cockatoos and western ringtail possums will be included in native seed mixes;
 - An adequate density, species richness and cover has developed based on the following:
 - A native density of approximately 1 plant/2 m²;
 - No less than 10 species of tree, shrub and herbs.
- Zone 2
 - Less than 5% bare ground; and
 - Reduce weed cover to less than 10% (noting that the pasture is not considered a 'weed' in this zone).

To demonstrate compliance with the abovementioned completion criteria, monitoring of randomly selected quadrats within completed cells will be undertaken. This will include photo monitoring points at each quadrat. An average of the revegetation success will be determined based on the results from the monitoring quadrats.

Maintenance will continue to be undertaken as required until this criterion has been achieved or as otherwise agreed with the Shire of Waroona. Following the successful completion of the revegetation program, the Shire will, upon application from the owner, refund the bond lodged against the implementation of the Plan.

3.2.2.7 *Scheduling*

Revegetation will be undertaken on a progressive basis and will be dependent on market demand. Accordingly, a definitive timeline for rehabilitation is not prescribed, but rather a commitment to undertake seeding during the first winter months following the stabilisation of the landform for each cell.

An indicative rehabilitation schedule is provided below:

1. Spring/summer:
 - Excavated area to be graded to levels and contours conforming to the adjacent unaffected areas minus the thickness of the excavated material.
 - Deep ripping along the contour at 1 m intervals.
 - Embankment batters will be cut to no more than 1 in 4.
 - Stockpiled topsoil will be spread over the shaped surface.
2. Autumn:
 - Pre-seeding weed control.
3. Autumn/winter:
 - Seeding with appropriate seed mix.
 - If sufficient vegetation does not germinate following initial seeding, the area will be re-seeded.
4. Spring:
 - Maintenance inspections to determine extent of maintenance requirements.
 - Monitoring will be undertaken in areas that have been rehabilitated.

3.2.2.8 Management Actions

A summary of the management actions associated with rehabilitation is provided below in **Table 7**.

Table 7. Management actions for rehabilitation.

Parameter	No.	Action	Timing
Landform	R1	All slopes will be contoured to achieve a maximum slope of 1:4 vertical to horizontal.	Prior to revegetation
	R2	The approved floor level of the excavation areas will be graded to an even surface.	
	R3	Surface drainage lines will be established to control surface run-off and minimise potential erosion.	
	R4	Deep rip (approximately 1m) on contours to reduce erosion, reduce flow velocities, promote water capture/infiltration, and promote soil binding. Carry out shallow ripping as required.	
	R5	Stockpiled topsoil will be re-spread to create a land surface that is safe and stable.	
Revegetation	R6	Undertake revegetation as per Section 3.2.2.4.	During revegetation
Maintenance	R7	Undertake maintenance measures as per Section 3.2.2.5.	
Monitoring	R8	Monitoring and reporting work are required to ensure that the revegetation objectives are achieved. Undertake monitoring as per Section 3.2.2.6.	

3.2.3 Weed Management

The invasion of weeds and disease is a key threat to the conservation values of the subject site and the surrounding vegetated areas within the Yalgorup National Park. Subsequently, the implementation of measures to limit or control weed infestation and the spread of disease is necessary.

3.2.3.1 Weed Control

Based on the previous flora and fauna survey (Natural Area 2019), several weed taxa were recorded within the subject site. In particular, *Gomphocarpus fruticosus* (Narrowleaf Cotton bush) and *Moraea flaccida*

(One-leaf Cape Tulip) were recorded in the site and are classified as Declared Pests under the *Biosecurity and Agriculture Management Act 2007*. *Gomphocarpus fruticosus* is assigned Category 3 management whereby all identified plants should be treated and destroyed. *Moraea flaccida* has not been assigned a management category.

The weed species primarily consist of introduced understorey species. The works have the potential to introduce new weed species to the subject site and adjacent vegetation.

The primary objective of a weed control program is to prevent weed species competing with native plants for light, nutrients and moisture. The two methods of weed control are chemical and non-chemical. Chemical controls can be applied by water spraying (from small backpacks to large machinery operated systems), wiping and pasting (used in conjunction with manual cutting of woody weeds). Methods of non-chemical weed control include using steam, manual removal (mainly for woody weeds using either machinery or hand implements), soil scalping, soil cultivation and mulching.

Herbicides will be selected for the target species, taking into account the surrounding environment and the constraints this may present. Amongst remnant native vegetation, selective herbicides (i.e. grass or broadleaf-specific) will be favoured over general knockdown herbicides to keep off-target damage to a minimum. In consideration of the identified weed species, the most suitable method for weed control is chemical spraying.

Based on the location and species of weeds present, the recommended weed treatments are detailed in **Table 8**. Weed control should be undertaken in autumn and spring.

Table 8. Weed control treatment.

Treatment	Suggested Constituents	Target Species
Glyphosate spray	2% Glyphosate including Pulse®, wetting agent and Chlorsulfuron	Broadleaf species e.g. <i>Euphorbia terracina</i>
Selective grass spray	Fusilade and approved adjuvant (e.g. Pulse®)	Grass species e.g. <i>Ehrharta longifolia</i>

3.2.3.2 Weed Hygiene

The following management actions to mitigate potential impacts associated with weeds and pathogens will be employed:

- All earthmoving and ground engaging equipment will be inspected and cleaned of vegetation mud and soil prior to entry and exit of the quarry to ensure that weed seeds and propagules are not transported to this area;
- All weed plant material containing seed heads, weeds that have allopathic properties and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules will be disposed of to an appropriate waste management facility. Local council should be contacted for a list of disposal facilities within the local area;
- Spot spraying and hand pulling of emergent weed species within the site will be carried out annually to gradually deplete seed stocks and reduce or eliminate any new colonies. Weed control will target *Gomphocarpus fruticosus* (Narrowleaf Cotton bush) and *Moraea flaccida* (One-leaf Cape Tulip);
- Pre-seeding weed control may be required after any potential weed seeds have been allowed to germinate; and
- Any weeds likely to significantly impact on the rehabilitation are to be sprayed with broad spectrum spray or grass specific spray depending on the species involved.

3.2.3.3 *Phytophthora Dieback*

Phytophthora dieback is caused by the plant pathogen, *Phytophthora cinnamomi*, which kills susceptible plants by attacking their root systems.

The proposed quarry is located on the Spearwood and Quindalup dune system. In the context of *Phytophthora dieback*, this is significant because typically, *Phytophthora cinnamomi* does not ‘express’ on these alkaline soils associated with this dune system (CALM 2003).

This inability to establish an actual disease syndrome is a direct result of the unfavourable pH levels associated with these soil types. The *Phytophthora cinnamomi* management manual states that a “No apparent disease at all” syndrome will occur on Spearwood and Quindalup dune systems of the Swan Coastal Plain (CALM 2003).

This means the pathogen has no capacity to impact upon the vegetation. In addition, those plant species that most reliably indicate the presence of *P. cinnamomi* are generally in much lower abundance, or absent on these dunes, further increasing the difficulty associated with disease detection (CALM 2003).

In consideration of the above information, the implementation of hygiene management measures, as prescribed in **Section 3.2.3.2** is considered adequate for the management of *Phytophthora dieback*.

3.2.3.4 *Management Actions*

The following weed and disease controls will be implemented within the subject site to assist in the control of invasive species and enhance the outcomes of the proposed rehabilitation works.

Table 9. Management actions for weed control.

Parameter	No.	Action	Timing
Surface Material	W1	Assess weed potential within topsoil material prior to removal and separate weed affected topsoil for treatment or disposal.	Prior to and during topsoil removal
	W2	Store significantly weedy surface material separately to clean surface material.	
	W3	Stockpile all surface materials in the general vicinity of its origin.	
Hygiene Measures	W4	Avoid moving surface material or fill material from weed infected areas to non-infested areas.	At all times
	W5	All earthmoving and ground engaging equipment will be cleaned of vegetation, mud and soil prior to entry and exit of the subject site.	At all times
	W6	No soil and vegetation should be brought to the site apart from that to be used in rehabilitation and plants used in rehabilitation should be free of weeds and disease.	At all times
Access	W7	Control access within the quarry area to reduce the spread of weeds, especially off-road vehicle access.	At all times
	W8	The battle-axe road between the property and the Yalgorup National Park will not be used as an access road. A 20-60m vegetative buffer to the battle-axe road and the excavation area will be provided.	At all times
Weed Control	W9	Chemical spraying is to be undertaken as per Section 3.2.3.1.	

Parameter	No.	Action	Timing
Monitoring and Reporting	W10	Monitoring and reporting work are required to ensure that the revegetation objections are achieved.	During revegetation

3.2.4 Vegetation Management

3.2.4.1 Impacts to Vegetation

The quarry activities will result in an initial loss of vegetation, most of which, is in a Degraded or Completely Degraded condition (Natural Area 2019). No conservation significant flora species will be impacted.

The primary threatening processes that have the potential to indirectly impact surrounding native vegetation are the introduction and/or spread of weed species. *Phytophthora* dieback is not considered a significant risk as discussed in **Section 3.2.3.3**. Management measure to mitigate the spread of weed and disease have been discussed in **Section 3.2.3.4**.

3.2.4.2 Management Measures

The following management measures have been designed in accordance with the hierarchy of avoid, minimise and rehabilitate to ensure impacts arising from quarry activities on flora and vegetation are as low as reasonably practicable.

Table 10: Management actions for vegetation.

Parameter	No.	Action	Timing
Clearing of vegetation	V1	All site personnel will be inducted on the clearing controls for this project.	Prior to clearing
	V2	Ensure clearing does not exceed the authorised extent and is minimised where possible.	During clearing
	V3	Vegetation clearing will be undertaken progressively with the amount of active disturbance minimised.	At all times
	V4	Hygiene management measures outlined in Section 3.2.3.2 will be implemented.	At all times
	V5	Dust control will be implemented as outlined in Section 3.4.2.1 .	At all times
	V6	Surface water controls as outlined in Section 3.1.5 will be implemented to ensure that all surface water is contained within the excavation area.	At all times
	V7	Clearing will be restricted to the approved project footprint to avoid over-clearing and to minimise indirect impacts to adjacent remnant vegetation.	At all times
	V8	No movement of vehicles or personnel within the vegetation retention areas will be allowed.	At all times
	V9	No stockpiling of topsoil or other material is to occur outside of the clearing boundary.	At all times

3.3 Terrestrial Fauna

Quarrying activities have the potential to directly and indirectly impact on terrestrial fauna as follows:

- Temporary loss of marginal quality fauna habitat from vegetation clearing.
- Injury/mortality of fauna.

- Degradation of adjacent fauna habitat.
- Disturbance to fauna from noise and vibrations.
- Introduction of weeds and disease.

3.3.1 Loss of Habitat

Clearing of native vegetation will result in impacts on fauna and their associated habitat. Individual losses of fauna may occur during the staged clearing activities with less mobile species being particularly vulnerable. The quarry area does not contain any habitat that is unique and/or uncommon in the locality and all habitats and vegetation types are well connected within the local area, allowing fauna movement to occur freely between the subject site and the adjacent Yalgorup National Park.

3.3.2 Injury/Mortality of fauna

Injury and mortality of fauna can result from both direct and indirect impacts. This includes:

- Fauna being injured/killed by collisions with earthmoving equipment and/or vehicles during clearing and excavation works.
- Vegetation clearing, which reduces the extent of fauna habitat and may result in the loss of individual fauna.
- Ground disturbance activities, which may result in the direct removal of fauna.
- Noise generated by machinery during construction may disrupt fauna behaviour.

3.3.3 Management Measures

The following management measures will be implemented to ensure impacts on fauna within the project footprint are minimised as far as practicable.

Table 11: Management actions for fauna.

Parameter	No.	Action	Timing
All operations	F1	Clearing will be undertaken as per Table 10 .	During clearing
	F2	A pre-clearing survey for fauna (including black cockatoos using a pole camera as required by DBCA) will be required for all vegetation subject to clearing. Capture and relocation of fauna to an area where those species are known to be present will be undertaken if required. The fauna handler/spotter will have a Section 40 'authorisation to disturb or handle threatened fauna', pursuant to the <i>Biodiversity and Conservation Act 2016</i> .	Prior to clearing
	F3	Clearing will be undertaken on a progressive basis to allow fauna to move away from clearing activities.	During clearing
	F4	A fauna spotter will be onsite at all times during clearing to oversee clearing activities.	During clearing
	F5	Vehicles and machinery on site will be restricted to one front end loader and a truck, and will be restricted to designated areas.	At all times
	F6	Speed limits for vehicles within the subject site will be restricted to 10km/hr.	At all times
	F7	Fauna injured during clearing or excavation works will be rehabilitated by a wildlife carer.	At all times

3.4 Social Surrounds

3.4.1 Noise Management

The construction and operation works at the quarry will involve the use of machinery and equipment that will generate noise during operation. Sources of noise from the subject site will include:

- Machinery noise from equipment use.
- Noise from safety equipment (beepers on machinery).
- Noise from screening/crushing machinery.
- Noise from trucks departing the site.

Separation distances from the quarry to sensitive receptors are as follows:

- Residential dwelling – 1 km east of Lake Clifton.
- Lake Pollard bird hide – 1 km east of the quarry.
- Original Lake Pollard walk trail – 800 m east of the quarry.
- Loop trail option which traverses a rural road and Preston Beach Road North – 20 m east from the quarry.
- Martin’s Tank campground – 2 km south-east of the quarry.
- Martin’s Tank campground – 400 m from Preston Beach Road North.

Given the significant distance to the nearest residential dwelling, there are not expected to be any noise impacts to local residences.

Furthermore, in consideration of the setbacks to Lake Pollard, the original walk trail and Martin’s Tank campground, there are not expected to be any significant noise impacts to receptors at these locations.

Recreational users of the Lake Pollard loop trail will experience increased noise emissions from trucks and excavation operations when walking on designated roads during weekdays. The Preston Beach Road North is a public road which is traversed by recreational vehicles (including caravans and motorhomes) and the general public.

3.4.1.1 Mitigation and Management

The topography of the quarry lends itself to reducing any noise emissions to hikers to the east. The high ridges on the eastern sides will act as noise bunds reducing any noise travelling excessively in those directions.

In addition, the following management measures are proposed to further reduce potential noise emissions.

Table 12: Management actions for noise.

Parameter	No.	Management Measure	Timing
Quarry design	N1	Overburden and interburden dumps will be positioned where they can form screening barriers.	During excavation
	N2	Haul road and hardstand surfaces will be maintained in good condition (free of potholes, rills and product spillages) and with suitable grades.	During excavation
Plant and equipment	N3	All plant equipment will be maintained in good condition with efficient mufflers and noise shielding.	During excavation

Parameter	No.	Management Measure	Timing
	N4	Warning lights, rather than audible sirens or beepers, will be fitted on mobile equipment wherever possible.	During excavation
Truck movements	N5	No excavation works or truck movements will occur on Sunday or public holidays.	During excavation
	N6	Excavation and truck movement will be limited from December to April.	During excavation
	N7	The use of engine braking on product delivery trucks will be avoided in built up areas.	During excavation
Complaints procedure	N8	<ul style="list-style-type: none"> Erect on-site signage directing public to make complaints to the relevant person. Maintain a complaints register. A Complaints Register will be established for the site to record the date, nature, and resolution action of any complaints. Complaints will be directed to the site supervisor for resolution. If the complaint is verified as being due to a site source, remedial action will be undertaken within 2 hours. If a complaint cannot be resolved within the 2 hour response period, it may be necessary to cease operations. 	During excavation

3.4.2 Dust Management

The proposed construction and operation activities will involve the disturbance of large quantities of soil and earthen material. Specifically, this may include the following activities:

- Earthworks during construction and operation;
- Vegetation clearing and topsoil stripping;
- Pit excavations and stockpiling;
- Loading and transportation of material;
- Vehicle movement within the subject site; and
- Wind erosion of exposed surfaces.

These activities have the potential to generate dust that, if not adequately controlled, can cause nuisance and safety risks. Site development activities prior to excavation can also generate substantial amounts of dust.

Excavation of the sand and limestone itself is not expected to be a significant source of dust emissions given the relatively coarse composition of the material. In-pit operations also tend to generate less dust than surrounding activities due to the reduced airflow within the pit. The removal and replacement of topsoil material has the highest risk associated with dust generation due to the large volumes of material involved and generally lower levels of soil moisture.

3.4.2.1 Mitigation and Management

In order to minimise safety and amenity risks to onsite personnel, dust suppression measures will be implemented during construction and operation activities, as provided within **Table 13**.

Table 13. Dust management actions

Parameter	No.	Management Measure	Timing
Quarry Operations	D1	Stockpiles, where possible, will be limited to the anticipated cubic volume/vehicle movement for cartage on the following operating day.	At all times
	D2	Stockpiles will be configured to accommodate easy access for watering/dust minimisation if required.	At all times
	D3	Access roads and immediate extraction areas will be watered as required with water trucks.	At all times
	D4	Topsoil stockpiles will be watered and stabilised as required. Stabilisation techniques that will be considered depending on environmental conditions will include hydro-mulching.	At all times
	D5	Timing of earthworks (daily and seasonally) will coincide with periods of low wind velocity as far as practicable. This will especially need to be considered during summer with the prevailing easterly winds.	At all times
Truck Movements	D6	Truck loads to be covered by tarpaulins or similar.	At all times
Monitoring	D7	Visual monitoring of dust will be undertaken daily. When dust emissions are observed, dust suppression measures (such as water sprays) will be implemented immediately.	At all times
Complaints procedure	D8	<ul style="list-style-type: none"> Erect on-site signage directing public to make complaints to the relevant person. Maintain a complaints register. A Complaints Register will be established for the site to record the date, nature, and resolution action of any complaints. Complaints will be directed to the site supervisor for resolution. If the complaint is verified as being due to a site source, remedial action will be undertaken within 2 hours. If a complaint cannot be resolved within the 2 hour response period, it may be necessary to cease operations. 	At all times

3.4.3 Preston Beach Road North Management

Lime products are to be transported from the quarry from December to April along Preston Beach Road North. This will involve the use of semi-trailer truck or rigid (8) wheeler trucks to a 5 axle dog trailer. It is calculated that “as of right” 19 m long semitrailer combinations with approximately 30 tonne payloads would equate to 1563 loads from quarry. That is a maximum of 10 loads per day which equates to a maximum of two movements per hour.

In order to determine the suitability of the Preston Beach Road North as a transport corridor associated with the Proposal, Greenfield Technical Services was commissioned to undertake a road assessment in June 2014. The assessment determined that a road network upgrade is required for Preston Beach Road North to enable the necessary increase in truck traffic, including grading of the road, trimming of roadside vegetation to improve sight-lines, 50 m realignment of a public walking trail (if the DBCA agree to this approach), and intersection and signage upgrades.

Furthermore, utilisation of the Road for transportation will entail ongoing management, such as dust suppression and road maintenance works.

3.4.3.1 Management

In order to ensure that the Preston Beach Road North is appropriately managed during construction and operation activities, the following management measures are proposed (as provided within **Table 14**).

Table 14. Preston Beach Road North management actions

Parameter	No.	Management Measure	Timing
Vegetation pruning	P1	All site personnel will be inducted on the pruning controls for this project.	Pruning
	P2	Ensure pruning does not exceed the authorised extent and is minimised where possible.	Pruning
	P3	A fauna spotter will be onsite at all times during pruning to oversee pruning activities.	Pruning
Upgrade works	P4	Install signage and undertake road upgrade works as required.	Prior to extraction
Road maintenance	P5	Road surface will be maintained in good condition (free of potholes, rills and product spillages) and with suitable grades during transportation periods.	December - April
Trucks	P6	No truck movements will occur on Sunday or public holidays.	At all times
	P7	Truck loads to be covered by tarpaulins or similar.	At all times
	P8	Truck movement will be limited from December to April.	December - April
	P9	The use of engine braking on product delivery trucks will be avoided in built up areas.	At all times
Dust	P10	The road will be watered as required with water trucks.	As required
Complaints procedure	P11	<ul style="list-style-type: none"> Erect on-site signage directing public to make complaints to the relevant person. Maintain a complaints register. A Complaints Register will be established for the site to record the date, nature, and resolution action of any complaints. Complaints will be directed to the site supervisor for resolution. If the complaint is verified as being due to a site source, remedial action will be undertaken within 2 hours. If a complaint cannot be resolved within the 2 hour response period, it may be necessary to cease operations. 	At all times

4 ADAPTIVE MANGEMENT

Adaptive management of the EMP will be implemented in consideration of the outcomes of the mitigation measures, monitoring and evaluation against trigger and threshold criteria, to meet the conditioned environmental outcome more effectively.

This will involve the following:

- Monitoring data will be systematically evaluated and compared to baseline and reference site data on a regular basis in a process of adaptive management to verify predictions.
- The effectiveness and relevance of trigger level and threshold contingency actions will be evaluated on an annual basis to determine if any changes to management actions are required.
- Increased understanding of the hydrological regimes based on the ongoing monitoring program will be incorporated into the management approach.

REFERENCES

- Australia Soil Resource Information System (ASRIS). 2014. Accessed at <http://www.asris.csiro.au/about.html>.
- Beard J. S. (1981). *Plant life of Western Australia*. Perth: Kangaroo Press.
- Bureau of Meteorology (BoM) (2019): <http://www.bom.gov.au/climate/data/>.
- CALM. 2003. *Phytophthora cinnamomi and disease caused by it. Volume 1-Management Guidelines*. Department of Conservation and Land Management, Government of Western Australia. http://www.calm.wa.gov.au/projects/pdf_files/DBmanual2003.pdf.
- Commander, D. P. 1988. *Geology and Hydrogeology of the Superficial Formations and Coastal Lakes between Harvey and Leschenault Inlets (Lake Clifton Project)*. s.l. : Geological Survey of Western Australia. Professional Papers, Report 23., 1988.
- CyMod. 2009. *Construction and Calibration of the Lake Clifton Groundwater Flow and Solute Transport Models*. s.l. : Unpublished report by CyMod Systems Pty Ltd to ENV Australia. September, 2009.
- Deeney, A.C. 1989. *Geology and Groundwater Resources of the Superficial Formations between Pinjarra and Bunbury, Perth Basin*. s.l. : Geological Survey of Western Australia, Report 26, Professional Papers, p 31-57., 1989.
- Department of Biodiversity, Conservation and Attractions (DBCA) .2019. *NatureMap*, viewed October 2019 <http://naturemap.dpaw.wa.gov.au/default.aspx>.
- Department of Environment and Conservation (DEC) (2002). *A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002*. http://www.dec.wa.gov.au/pdf/science/bio_audit/pilbara04_p581-594.pdf (accessed April 2015).
- Department of Minerals and Energy (1991), *Environmental Management of Quarries: Development, Operation and rehabilitation Guidelines*. DOIR Perth
- Department of Mines and Petroleum and Environmental Protection Authority (DMP & EPA), (2015). *Guidelines for Preparing Mine Closure Plans*, Perth WA.
- Department of Primary Industries and Regional Development WA. 2018. *NRInfo Portal – Natural Resource Management: Soils and Contours*, viewed August 2019 from: <https://maps.agric.wa.gov.au/nrm-info/>.
- Geological Survey of Western Australia (1980). *Geology and mineral resources of Western Australia, memoir 3*. Geological Survey of Western Australia, Perth, WA.
- Gozzard J R. (1987). *Limesand and Limestone Resources between Lancelin and Bunbury*, Geol Surv WA, Record 1987/5.
- Hedde, EM, Loneragan, OW and Havel, JJ (1980). Darling Systems – Vegetation Complexes' in *Atlas of Natural Resources Darling System, Western Australia*, Department of Conservation and Environment, Perth.
- Keighery B.J (1994). *Bushland Plant Survey, A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc), Nedlands, Western Australia.
- Landform. 2016. *Excavation and Rehabilitation Management Plan. Lot 1002 Preston Beach Road North, Preston Beach*. s.l. : Unpublished report to Doyle's Lime Service by Landform Research. May, 2016.

Landform Research. 2016. *Excavation and Rehabilitation Management Plan, Doyles Lime Service, Proposed Preston Beach Pit*. s.l. : Unpublished report to Doyle's Lime Service, May, 2016.

Managed Recharge. 2018. *Preston Beach Road North - Preliminary Hydrogeological Investigation*. s.l.: Unpublished report to Doyle's Lime Services, July, 2018.

Managed Recharge. 2019. *Preston Beach Road North – Hydrological Assessment*. Unpublished.

Natural Area. 2019. *Level 2 Flora and Level 1 Fauna Survey, Lot 1002 and a Portion of Preston Beach Road North*. Unpublished Report.

Schoknegt. N. (2004). *Soil landscape mapping in south-western Australia*. Western Australia: Department of Agriculture.

Shedley E and Williams K. 2014. *An assessment of habitat for western ringtail possum (Pseudocheirus occidentalis) on the southern Swan Coastal Plain*. Unpublished report for the Department of Parks and Wildlife, Bunbury, Western Australia.

Thackway, R, and Cresswell, ID, (Eds) 1995, *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0*. Australian Nature Conservation Agency, Canberra.

FIGURES



Figure 1. Regional location of the Proposal.

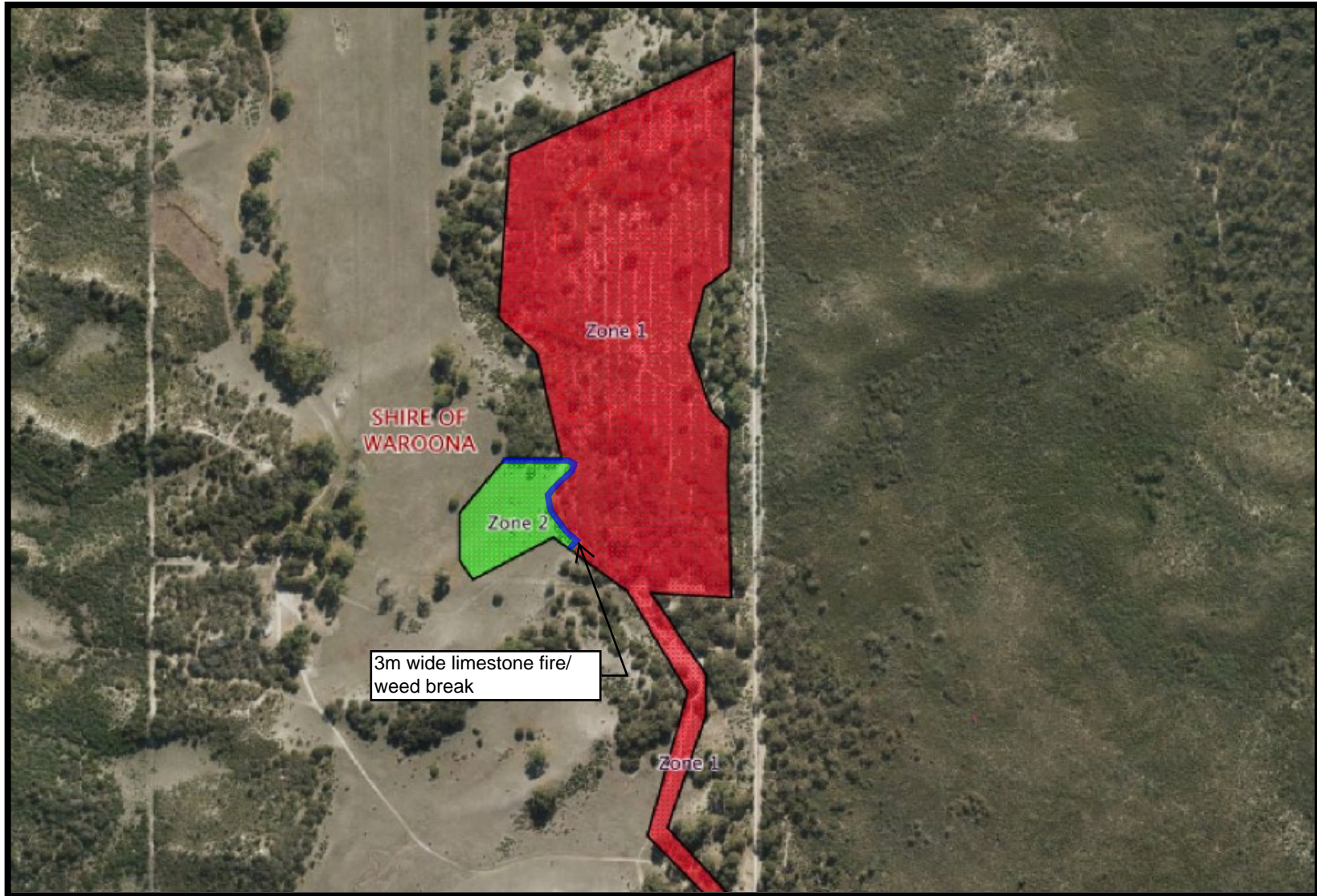


Figure 2. Revegetation zones.



Figure 3. Vegetation monitoring sites.

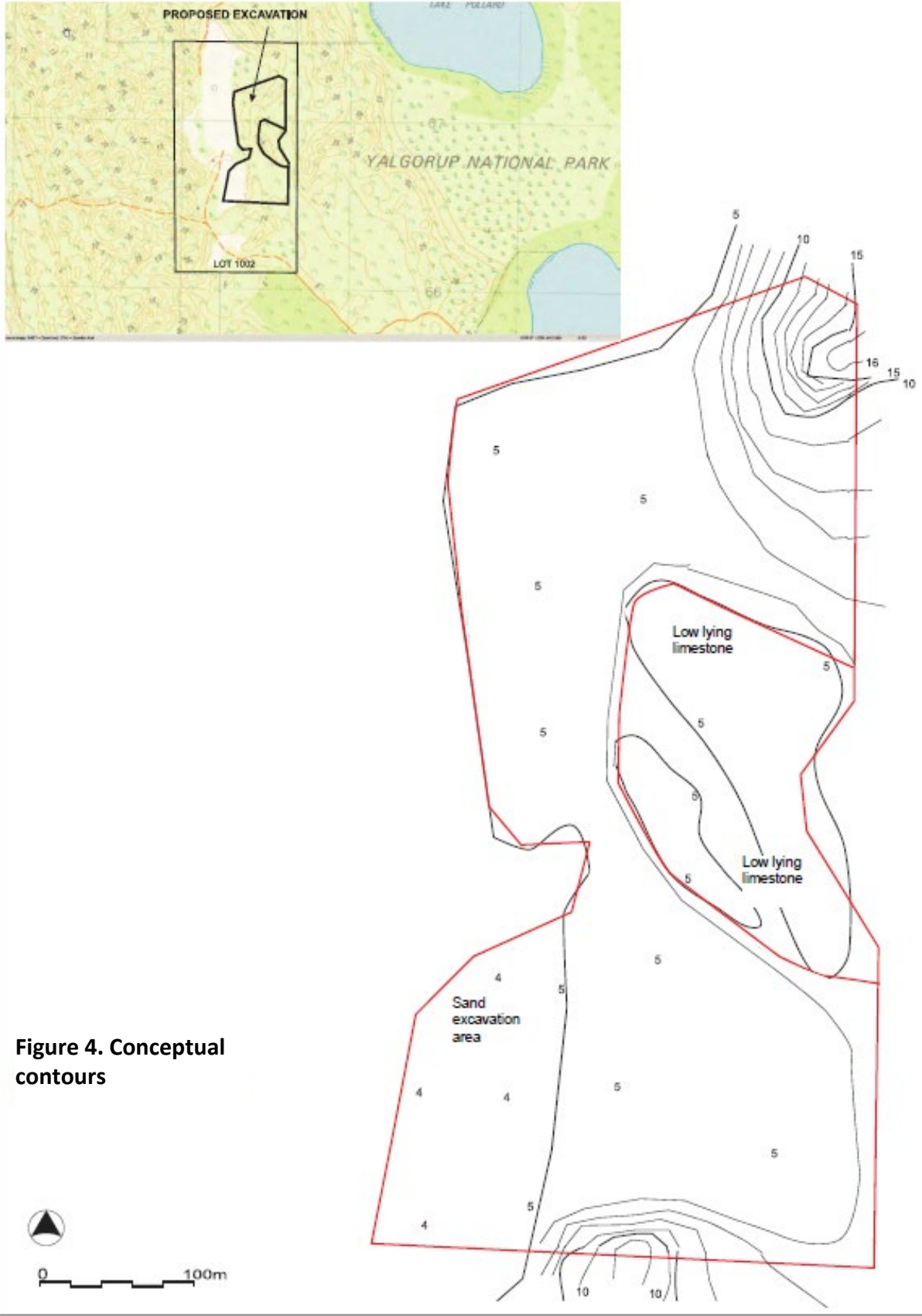


Figure 4. Conceptual contours

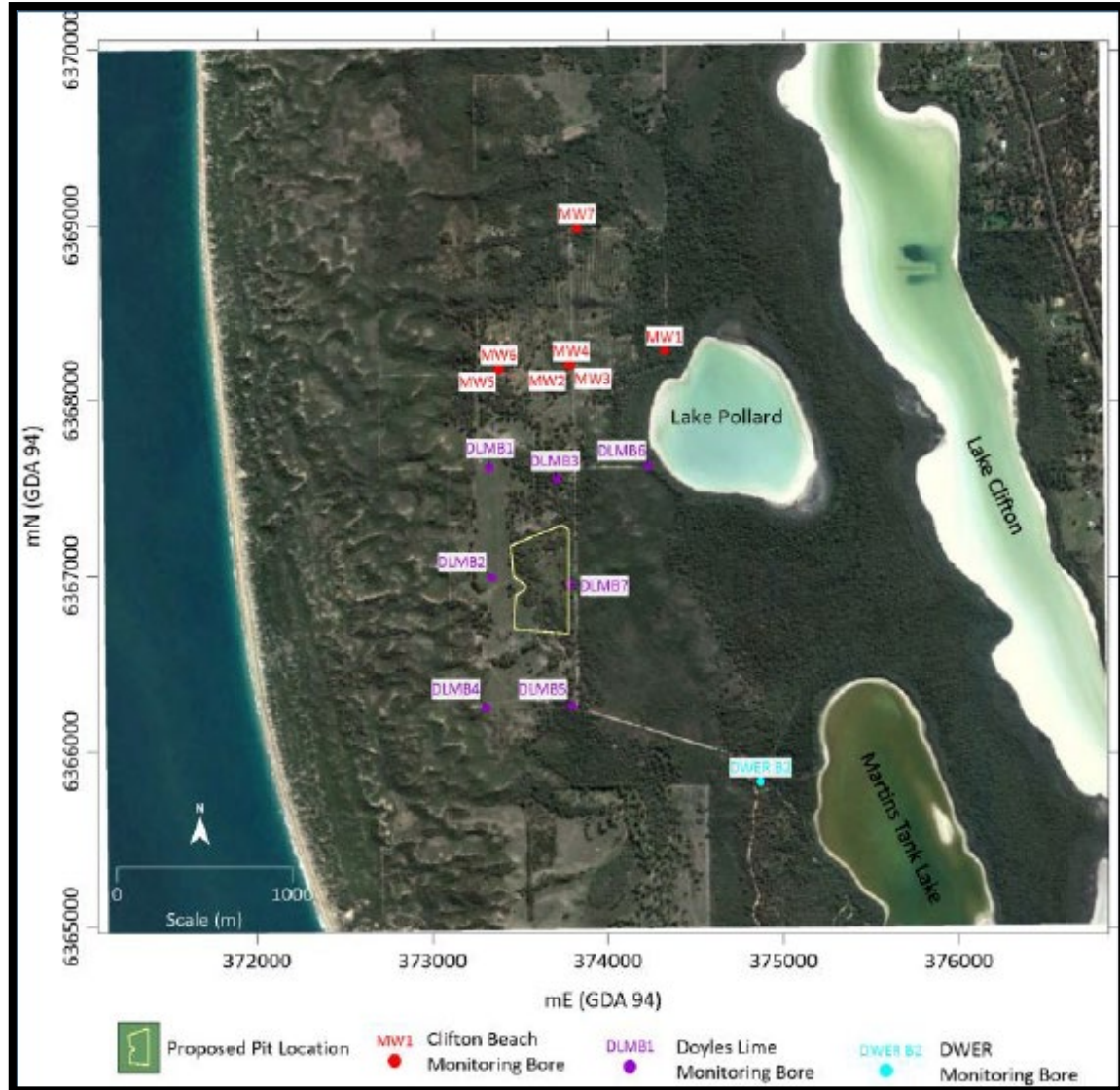


Figure 5. Monitoring bore locations

APPENDIX A – SPILL PROCEDURE

SPILL RESPONSE PROCEDURE

Pollutant	MSDS	Emission Control Equipment	PPE	Clean-up Method
Fuel	Yes	Sand, earth, vermiculite	Gloves, safety glasses, goggles, steel cap gumboots, respirator mask	<p><u>Large Spill</u></p> <ol style="list-style-type: none"> 1) Contact relevant personnel including site manager, Shire and DWER. 2) Stop leak without risk. 3) Move containers from spill area. 4) Approach the release from upwind 5) Prevent entry into water courses. 6) Wash spillages into an effluent treatment plant or proceed as follows. 7) Contain and collect spillage with noncombustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place into a container according to local legislation. 8) Use spark-proof tools and explosive proof equipment. Dispose of via a licensed waste disposal contractor. 9) Contaminated absorbent material may pose the same hazard as the spilt product. 10) In the case of spillage on water, prevent the spread of product by the use of suitable barrier equipment. 11) Recover product from the surface <p><u>Minor Spill</u></p> <ol style="list-style-type: none"> 1) Stop leak without risk. 2) Move containers from spill area 3) Absorb with an inert material and place in appropriate waste disposal container. 4) Use spark-proof tools and explosion-proof equipment. 5) Dispose of via a licensed waste disposal contractor.
Vehicle fluids	Yes	Sand, earth, vermiculite	PVC Gloves, safety glasses	<p><u>Large Spill</u></p> <ol style="list-style-type: none"> 1) Contact relevant personnel including site manager, Shire and DWER. 2) Stop leak without risk. 3) Move containers from spill area. 4) Approach the release from upwind.

Pollutant	MSDS	Emission Control Equipment	PPE	Clean-up Method
				<p>5) Prevent entry into water courses. 6) Wash spillages into an effluent treatment plant or proceed as follows. 7) Contain and collect spillage with noncombustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place into a container according to local legislation. 8) Contaminated absorbent material may pose the same hazard as the spilt product.</p> <p><u>Minor Spill</u> 1) Stop leak without risk. 2) Move containers from spill area. 3) Dilute with water and mop up, or absorb with an inert dry material and place in appropriate waste disposal container. 4) Dispose of via a licensed waste disposal contractor.</p>