PROPOSED SAND EXCAVATION

EXCAVATION and REHABILITATION MANAGEMENT PLAN

1370, Lot 226, Paterson Road, Nambeelup

Shire of Murray

June 2020

EXCAVATION and REHABILITATION MANAGEMENT PLAN

1370, Lot 226, Paterson Road, Nambeelup

Applicant

Chew Lan Sim as Trustee for King Street Trust

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Summary

King Street Trust is applying for Planning Consent and Extractive Industries Licence for sand on Lot 226, Paterson Road, Nambeelup, for a period of 10 years.

Lot 226 represents a small but significant regional sand resources in the Peel Region, because it is strategically located adjacent to the Nambeelup Industrial Area.

State Planning Policy No 2.4 Basic Raw Materials requires that identified sand resources are utilised prior to sterilisation, in line with State Planning Policy No 2.5, Agricultural and Rural Land Use Planning.

Whilst the site lies just outside the area covered by SPP 2.4 (2000) it will be incorporated under the umbrella of the draft SPP 2.4 (2018) when the policy is finalised and released.

The sand is anticipated to be mainly supplied into the Peel Region Scheme area.

Landform restoration and rehabilitation to improved parkland pasture is to progressively follow excavation.

The extraction of sand is seen as an interim use of the land prior to utilisation of the area as rural land.

The final land surface is compatible with the surrounding landform at an elevation of 0.5 metres above the highest known temporary perched water table, which is 2 metres above the regional groundwater table, in compliance with DWER Guidelines.

The proposal complies with the EPA Generic Buffer Guidelines to sensitive premises.

Hours of operation will be 6.00 am to 6.00 pm Monday to Saturday inclusive, excluding public holidays. This is similar to the operations of nearby quarries in the local area.

Perimeter fences and locked gates will be maintained to prevent illegal entry. Warning signs will be maintained as required by the Department of Mines, Industry Regulation and Safety and the Shire of Murray.

Site Summary

ASPECT	PROPOSAL CHARACTERISTIC
EXCAVATION	
Total area of excavation applied for	Proposed excavation – 24.5 hectares Current excavation – Nil Under rehabilitation - Nil
Rate of excavation based on average anticipated volumes.	50 000 to 150 000 tonnes per year depending on contracts with the potential for greater volumes of sand to be removed in a particular year depending on contracts. Maximum volume is around 500 000 tonnes.
Life of project	10 years
Area cleared per year	1 - 4 hectares but dependent on contracts won. Total clearing required, 12.7 hectares
Dewatering requirements	Nil
Maximum depth of excavations	1 - 5 metres below natural land surface.
PROCESSING	
Resources	No processing proposed at this stage. A screening plant remains a possibility to produce specialty sands if required.
Water requirements	Nil
Water supply source	Sump on site subject to Licence otherwise water will be brought to site.
INFRASTRUCTURE	
Total area of plant and stock	Only mobile equipment. No structures.
Fuel storage	No fuel storage
TRANSPORT	
Truck movements	Variable but approximately 6 – 25 laden trucks per day but up to 100 trucks for day for short period to fill large contracts if won.
Access	Access road to Paterson Road
WORKFORCE	
Construction	Access road only.
Operation	2 - 4 persons
Hours of operation	Hours of operation, will be 6.00 am to 6.00 pm Monday to Friday inclusive, excluding public holidays for processing and excavation. Loading and transport from site may commence at 6.00 am Monday to Friday inclusive, excluding public holidays

Management

The excavation, processing and environmental management proposed has been designed to reflect best practice and utilises Commonwealth and State Guidelines.

Safety Management

All quarries operate under the provisions of the *Mines Safety and Inspection Act 1994 and Regulations 1995*. These are administered by the Department of Mines Industry Regulation and Safety.

The regulation is achieved through the DMIRS Safety Regulations and Reporting Systems (SRS).

All quarries on commencement are required to register with the SRS system. As part of the registration a Project Management Plan is required to be produced and lodged online.

Officers from the Safety Division of the DMIRS regularly inspect the operations in relation to health and safety.

Environmental Management

The environmental management is designed to reflect best practise, outlined in particular in;

> Department of Resources, Energy and Tourism (Commonwealth), 2011, *A Guide to Leading Practice Sustainable Development in Mining*, and guidelines produced by Environmental Protection Authority, Department of Water, Environment Regulation, Department of Mines Industry Regulation and Safety, Western Australia Planning Commission and the Local Authority.

An Environmental Risk Assessment has been developed based on the EPA Environmental Factors which have been identified by the EPA as the factors to be considered when reviewing environmental impact and outcomes in Western Australia.

The EPA Factors have been used and added to in the following table, which provides for the environmental risk if not mitigated or managed and the assessed environmental risk when the proposed design and management procedures are effectively implemented.

All the EPA environmental factors, together with the other factors, are provided in the Environmental Risk Table to show that some are not relevant to this proposal. Leaving them out may lead to some uncertainty in a reviewer's mind.

The Environmental Risk Matrix was developed to the principles of AS/NZS ISO 140001:2004 (Environmental Management Systems) and AS/NZS ISO 19011:2014 (Guidelines for auditing Management Systems). The principles of AS/NZS 31000:2009 (Risk Management Guidelines) are also used when considering any risks.

The Risk Table includes references to the various parts of the document to enable easy review and provides a summary of the project and its management.

The risk assessment table also forms the basis of an auditable matrix.

Environmental Factor - Objective	Identified Issues and Commitments	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
FLORA and VEGETATION To maintain representation, diversity, viability and ecological function at the species, population and community level.	Vegetation communities and/or biodiversity may be significantly impacted by clearing, weeds and dieback.	D	2	Low	The site lies in an area of Generally Degraded Vegetation meets the general description of this vegetation complex which was found by PGV Environmental to most likely match FCT 21a and 21c, neither of which are listed as a Priority vegetation community (PGV Environmental; page 6). An "A" Class Reserve lies to the north. At the end of excavation a vegetation and wildlife corridor will be re-established in line with local biodiversity planning. As the sand is excavated it falls naturally to the floor of the pit where it is picked up by a loader. As such any risk of dieback of weeds is most unlikely because the seeds and disease material will have to travel up the high face which can be up to 20 metres High. The vegetation proposed to be cleared is *Kunzea glabrescens* regrowth over pasture and degraded native vegetation. In all 12.7 hectares will require a Clearing Permit, with 24.5 hectares already cleared.	PGV Environmental Flora and Fauna Report (attached). Figure 7	D	2	Low
	Threatened Communities may be impacted by inadvertent impacts.	E	1	Low	PGV Environmental found the vegetation to most likely match FCT 21a and 21c, neither of which are listed as a Priority vegetation community. *Banksia* Woodland is listed as a TEC under the EPBC Act 1999, but its area is too small to trigger consideration under the EPBC Guidelines for Management. All *Banksia* Woodland has been excluded from the proposed sand excavation.	PGV Environmental Flora and Fauna Report (attached). Figure 7.	E	1	Low
	Priority species may be affected by clearing,	D	2	Low	None recorded. A targeted species survey for Priority and Threatened	PGV Environmental Flora and Fauna Report (attached)	E	1	Low

	disturbance, weeds, dieback and other impacts.				species is proposed to be conducted in spring to support an application for a Clearing Permit				
	Threatened Species may be impacted by inadvertent impacts.	E	1	Low	None recorded. See above.	PGV Environmental Flora and Fauna Report (attached)	E	1	Low
	Weeds may become established and impact on the local and on site biodiversity	C	3	High	A weed management program is proposed and will be used in conjunction with normal farm management.	Section 11.5 Rehabilitation Procedures Weed Management	C	1	Low
	Dieback disease may be present and impact on the local and onsite vegetation.	D	2	Low	Dieback management procedures are proposed. See Weeds above.	Section 11.5 Rehabilitation Procedures Dieback Management	E	1	Low
	The developments may fragment communities, biodiversity and ecological linkages.	C	2	Mod	12.7 hectares of the proposed 24.5 hectare excavation area is cleared. The vegetation requiring clearing is *Kunzea glabrescens* regrowth over pasture and degraded native vegetation. That vegetation has previously been cleared and disturbed and is lesser vegetation condition. *Kunzea glabrescens* is a rapid and successful coloniser and is regrowing on the sand ridge. The topsoil will be recovered and respread at the end of excavation Previously cleared vegetation to the north of the pit has been allowed to re-establish. This is enhancing the conservation corridors rather than reducing them. A vegetation and wildlife corridor will be established at the end of excavation. See Figure 2. The amount of revegetation in the corridors will link the wetland in the north east to the existing *Banksia* Woodland then link through to the conservation area on the land to the north of the “A” Class Reserve on Lot 224. Compare Figures 1 and 2.	Figures 1 and 2.	D	2	Low

Environmental Factor - Objective	Identified Issues and Commitments	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
TERRESTRIAL FAUNA To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	Communities and fauna and/or biodiversity may be significantly impacted by clearing, weeds and dieback.	D	3	Mod	The site lies in an area of Generally Degraded Vegetation meets the general description of this vegetation complex which was found by PGV Environmental to most likely match FCT 21a and 21c, neither of which are listed as a Priority vegetation community (PGV Environmental; page 6). At the end of excavation a vegetation and wildlife corridor will be re-established in line with local biodiversity planning.	PGV Environmental Flora and Fauna Report (attached)	D	2	Low
	Threatened Faunal Communities may be impacted by inadvertent impacts.	E	1	Low	No Threatened Communities occur on site. See above.	PGV Environmental Flora and Fauna Report (attached)	E	1	Low
	Priority Fauna species may be affected by clearing, disturbance, weeds	D	2	Low	The property is rural and not a listed intensive land use. Parkland pasture and native vegetation will be returned. The key listed fauna are Black Cockatoos as considered above. The other is the Quenda. Quenda are versatile species that readily move ahead of clearing. There is significant vegetation habitat suitable for Quenda retained. A vegetation and wildlife corridor will be established at the end of excavation. See Figures 1 and 2.and Flora and Vegetation above..	PGV Environmental Flora and Fauna Report (attached) Figures 1 and 2.	D	2	Low
	Threatened Fauna Species may be impacted by inadvertent impacts.	D	3	Mod	The property is rural and not a listed intensive land use. Parkland pasture and native vegetation will be returned. Cockatoo habitat and significant trees have been assessed by PGV Environmental and have been excluded from the proposed sand excavation. The main Cockatoo feeding habitat locally is the *Banksia* Woodland which has been excluded. Most of the remaining feeding habitat has reduced or low feeding quality. Fauna will be considered in the Clearing Permit process.	PGV Environmental Flora and Fauna Report (attached)	D	1	Low

SUBTERRANEAN FAUNA To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	The development may have an impact on an isolated population of subterranean fauna.	E	1	Low	The site is deep sand with no subterranean cavities.	Section 10.4.	E	1	Low

Environmental Factor - Objective	Identified Issues and Commitments	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
LANDFORMS To maintain the variety, integrity, ecological functions and environmental values of landforms and soils.	The local landform may be altered to a form that is not compatible with the surrounding geomorphology.	D	2	Low	The site is lies on a small low sand ridge set back from Paterson Road. Most of the ridge will be retained, with only the southern portion being impacted by lowering between 1 and 4 metres. The general landform will not be altered as the vegetation ridges will almost all be retained. As compensation, a wildlife corridor will be enhanced.	8.0 Visual Management Figures 2 and 3	E	1	Low
	The final land surface should be fit for its required end use.	D	3	Mod	The end use will continued to be pasture and productive agricultural land as previously approved, plus the re-establishment of a wildlife linkage.	Section 11.0 Closure. Figure 7.	D	1	Low
	The development and final landform will not lead to significant visual impacts.	E	1	Low	The site is lies on a small low sand ridge set back from Paterson Road. The general landform will not be altered as the vegetation ridges will almost all be retained. As compensation, a wildlife corridor will be enhanced.	Figures 2 and 3	E	1	Low
	The final landform and soils may be subject to erosion by wind, water or other processes.	C	2	Mod	The sand excavation operations are designed to minimise erosion and dust. Drainage will be internal with no release of surface water.	See Dust Management Section 6.0 and Closure, Section 11.0	D	2	Low
	Acid soils are not exposed or are managed to ensure that there are no long term adverse effects.	E	1	Low	Not present	Section 4.7	E	1	Low

Environmental Factor - Objective	Identified Issues and Commitments	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
HYDRO - GEOLOGICAL PROCESSES To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.	The ecological functions of watercourses are to be maintained.	E	1	Low	There are no watercourses. Drainage will continue to be to the lower elevations by seeping into the base of the excavation with no release of surface water. Water Management Procedures are proposed.	Figure 2 Section 9.0 Water Management.	E	1	Low
	Groundwater may be impacted by changes to recharge, over-pumping, alterations to flow paths or lead to significant evaporation and water loss.	D	1	Low	The operations are based on the sand ridge only. Excavation will retain a minimum of 0.5 metre separation to the water table in compliance with DWER Policy. If the perched winter water table is intersected the floor of the pit will be backfilled to ensure 0.5 metre separation to the temporary perched winter water table. The floor of the pit will be 2.0 metres above the regional winter water table as provided by DWER mapping. Piezometers will be installed to verify the separations to the seasonal perched water table. Any exposure of the water table will be backfilled to ensure compliance with the 0.5 metre proposed separation. All water is retained on site in the base of the pit with the perimeter being slightly elevated.	Figure 5 and 7 Section 9.0 Water Management.	E	1	Low
	Wetlands may be altered by draining or flooding, potentially changing their ecological functions and biodiversity.	E	1	Low	There will be no impact on wetlands either which are excluded from excavation. The Resource Enhancement Wetland in the north eastern corner is up hydraulic gradient and is provided with a 50 metre setback which complies with DWER Guidelines. The winter wet pasture (palusplain) east of the resource also lies up hydraulic gradient (Figure 5) and in addition is provided with a 20 metre setback (Figure 2). The water regimes and recharge will not change.	Figures 2 and 5	E	1	Low
WATER QUALITY	Hydrocarbons, fuels and other chemicals are	C	2	High	Fuel and hydrocarbon management programs are in place. No fuel is to be stored on site.	Section 9.0 Water Management.	D	2	Low

To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	stored in a manner that they pose no risk to the environment.								
	Runoff from operations may carry sediment and any deleterious materials off site.	E	1	Low	All water is retained on site in the base of the pit. Runoff from operations is to be contained and all water is either retained or treated to removed sediment and any deleterious materials.	Section 9.0 Water Management.	E	1	Low
	Water quality during and after development and operations is not adversely affected or altered.	D	2	Low	See above. Fuel and hydrocarbon management programs are in place. No fuel is to be stored on site.	Section 9.0 Water Management.	D	2	Low

Environmental Factor - Objective	Identified Issues and Commitments	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
OFFSITE EMISSIONS To maintain representation, diversity, viability and ecological function at the species, population and community level.	Dust emissions may travel offsite.	D	1	High	Based on the nature of the sand, equipment used and excavation methods, the extraction of sand has potentially the lowest impact and a generic buffer of 300 metres is appropriate and could be less if significant impacts are confined. There are no residential properties within the application area, and the nearest residential site is located over 1000 metres away.	Figures 1, 2 and 3. Section 3.0 Section 6.0	E	1	Low
	Dust emissions may impact on local and on site personnel health or quality of life.	E	1	Low	See above. Complies with Department of Health Guidelines for dust management.	Section 6.0	E	1	Low
	Noise levels will comply with the *Environmental Protection (Noise) Regulations 1997.*	E	1	Low	Noise levels will comply with *Environmental Protection (Noise) Regulations 1997.* The site complies with the EPA Generic Buffer distances. The closest dwelling is over 1000 metres away.	Section 7.0	E	1	Low
	Noise levels and operational procedures will be used to protect on site personnel health and safety.	C	2	Mod	The operations are designed to minimise on site noise and the potential for offsite noise.	Section 7.0	D	2	Low
	Emissions gases and other materials potentially adverse to human health will not be used or will be managed.	D	2	Low	There are no gaseous or other potential harmful emissions from the operations.		D	2	Low
	Potential impacts from blasting will comply with the *Environmental Protection (Noise) Regulations 1997* and guidelines for ground vibration.			NA	There is no blasting.				NA

	Employ procedures and design the operations to minimise the risk of excessive greenhouse emissions.	E	1	Low	The excavation may provide a source of local sand for fill of the Nambeelup Industrial site and other local requirements, saving sand having to be transport much further distances and therefore helping to reduce greenhouse emissions.		E	1	Low

Environmental Factor - Objective	**Identified Issues and Commitments**	**Unmanaged Risk**			**Proposed Management**	**References**	**Managed Risk**		
		Likelihood	**Consequence**	**Risk**			**Likelihood**	**Consequence**	**Risk**
HERITAGE Known heritage sites will be protected.	Known aboriginal heritage sites will be protected.	E	2	Low	No archaeological or ethnographic sites are known from or recorded on Department of Planning, Land and Heritage databases.		E	2	Low
	Sites of European heritage will be protected.			NA	None known				NA
	Heritage sites uncovered during operations will be independently assessed and managed through communication with the community, Government and traditional owners.	D	2	Low	A commitment is made to this.	Section 2.5.3	D	2	Low

Environmental Factor - Objective	Identified Issues and Commitments	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
SOCIAL and HEALTH To minimise the impact on the local community	Human health is protected from adverse impacts of dust, noise, other emissions and chemicals.	E	1	Low	Sand grains such as this carry no known health impacts.		E	1	Low
	Transport may impact on local, and regional roads or school bus routes.	E	1	Low	Transport will be directly to Paterson Road.		E	1	Low
	The operations have been designed to provide sufficient buffers and visual protection.	E	1	Low	The site complies with the EPA Generic Buffer distances. The closest dwelling over 1000 metres away to the north west. A shed is located 700 metres to the south.		E	1	Low

Environmental Factor - Objective	Identified Issues and Commitments	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
CLOSURE AND REHABILITATION To ensure that premises are closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the State	At the end of excavation the created soils should be deep enough or of sufficient quality to be sustainable to meet the long term end use or ecological values.	B	3	High	A void is to be retained at the end of excavation and reformed to a swale in the landscape at a floor of around 0.5 above the highest known winter temporary perched water table and 2.0 metres above the regional water table, in compliance with DWER Guidelines Rehabilitation will be directed towards the final end land use of a return to pasture and productive agricultural land on the floor and local native vegetation on the batter slopes and wildlife corridors. Topsoil will be transferred directly from an area being cleared and spread across the surface of the areas to be rehabilitated If direct transfer is not possible, any material stored in dumps will be respread.	Section 11.0 Closure Figure 5	D	2	Low
	All infrastructure, roads, hardstand, non natural materials are to be removed from site progressively when not required and all removed at the end of the project.	C	2	Med	This is committed to. There is not proposed to be any infrastructure apart from the use of a serviced portable toilet during operations.	Section 11.0 Closure	D	2	Low
	No materials are to be left on site that may cause long term detrimental outcomes in terms of impacts to soils, water, heritage, vegetation health or other factors.	C	2	Med	This is committed to.	Section 11.0 Closure	D	2	Low
	All contaminated materials are to be removed from site prior to closure.	C	2	Med	All contaminated materials are to be removed from site prior to closure.	Section 11.0 Closure	D	2	Low

RISK MATRIX

			Effect / Consequence				
			1	2	3	4	5
Type			Insignificant	Minor	Moderate	Major	Severe
Environmental Impact			No discernible, adverse impact, individuals of species may be affected locally.	Discernible effect on the environment but no adverse impact, minor number of individuals of species may be affected locally	Minor adverse effect to the environment (including public amenity), moderate loss of individuals of species locally.	Moderate damage to ecosystem function, major loss of individuals of species locally, loss of public amenity.	Significant long-term damage/loss to ecosystem function, extinction of a species locally
Likelihood	A Almost Certain	Likely that the unwanted event could occur often (once per week) during the life of an individual item or system	Medium **11**	High **16**	High **20**	Very High **23**	Very High **25**
	B Likely	Likely that the unwanted event could occur several times per year during the life of an individual item or system.	Medium **7**	Medium **12**	High **17**	High **21**	Very High **24**
	C Possible	Likely that the unwanted event could occur sometime (once per year) during the life of an individual item or system.	Low **4**	Medium **8**	High **13**	High **18**	High **22**
	D Unlikely	Unlikely, but possible for the unwanted event to occur once in the life of an individual item or system.	Low **2**	Low **5**	Medium **9**	High **14**	High **19**
	E Rare	Highly unlikely that the unwanted event could ever occur in the life of an individual item or system.	Low **1**	Low **3**	Medium **6**	Medium **10**	High **15**

CONTENTS

1.0 INTRODUCTION

1.1 Background and Proposal

King Street Trust is applying for Planning Consent and Extractive Industries Licence for the extraction of sand on Lot 226, Paterson Road, Nambeelup, for a period of 10 years.

Lot 226 Paterson Road is approximately 155 ha in size. The proposed area of sand extraction is 24.5 ha of which approximately 12.9 ha contains native vegetation.

The sand is anticipated to be mainly supplied into the Peel Region Scheme area.

Landform restoration and rehabilitation to improved parkland pasture is to progressively follow excavation.

The extraction of sand is seen as an interim use of the land prior to utilisation of the area.

Rehabilitation will follow excavation, assisting in minimising the amount of open ground.

History of the Project Approvals

As far as is known there are no historic approvals for this land.

Land Assessments

Detailed land mapping was conducted by Lindsay Stephens of Landform Research on 7 March 2001 and 11 September 2002. The site was again inspected on 24 January 2019.

In September 2002 the assessments included vegetation surveys and detailed geotechnical assessment in support of a land capability assessment for a potential subdivision. Detailed soil mapping and determination of the water tables was made at multiple points across the subject land. Each point on the measured and interpreted mapping of the water table in September 2002 was a measured site assessment. In all around 50 soil test holes were provide using hand auger on 11 September 2002.

A Flora and Vegetation Survey was conducted by PGV Environmental on 12 February 2019 with follow up targeted Spring Survey and Cockatoo Survey completed on 31 July 2019.

1.2 Proponent

The application is made on behalf of the land owner.

Contact can be made through.

Applicant
Chew Lan Sim as Trustee for King Street Trust

Contact Nam H Teo
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teostreet@globaldial.com
Phone 0412 455 573

1.3 Location and Ownership

Lot 226 lies to the north of Paterson Road, near but south of the intersection of Lake Road and Nambeelup Brook.

The lot to the north forms a buffer to the Nambeelup Industrial Area and contains an "A" Class Reserve.

Lot 226, 1370 Paterson Road, Nambeelup, Volume 2061, Folio 155, Diagram 2087.

1.4 Project Objectives

The proposal is to provide a source of local sand in the Peel Region to assist in minimising the cost of construction in the local and wider area.

The aims of the proposal are to;

Provide a supply of white and yellow silica and fill sand.

- Provide a supply of sand for the construction industry to be used in the Peel Region.
- Maximise the use of basic raw materials in the local area, to enable greenhouse gases, transport, and other environmental issues associated with alternative resources, to be minimised.
- Help to keep the prices of local basic raw materials at the lowest possible levels, by maintaining small transport distances. This benefits the whole community.
- Comply with State Planning Policy No 2.5, Agricultural and Rural Land Use Planning 2016, which states that basic raw materials should be taken prior to sterilisation of the area by development.
- Comply with State Planning Policy No 2.4 Basic Raw Materials, and Rural Land Policies for the Metropolitan Area and Peel Region Scheme, all of which state that basic raw materials should be taken prior to sterilisation of the area by development. Note that the pit lies outside these Scheme areas but will supply most of the sand into the Scheme areas.
- Comply with the Peel Region Scheme Basic Raw Materials Policy.

Importance and Rationale

Although a small sand resource, Lot 226 represents a significant regional sand resource in the Murray Shire where sand resources are limited.

The reality is that the sand is only extracted for the community. If the community did not need the sand, for sand pads, concrete products and construction materials, there would be no extraction.

Perth and Peel @ 3.5million, developed by the Western Australian Planning Commission has determined that the Metropolitan Area will grow significantly between 2012 and 2050 by around 650 000 dwellings

The construction of dwellings needs sand for roads, in particular locally for the Peel Region, much of which is low lying, the Nambeelup Industrial Area, in addition to concrete and other products that include some sand.

The Chamber of Commerce and Industry estimated in 2008 that each dwelling required 155 tonnes of sand, which includes roads. Dwellings in low lying areas requiring fill can require significantly more sand.

In addition the nearby Nambeelup Industrial area will require in the order of 2 metres of fill sand across much of its area.

Not all sand has the same characteristics and the best deposits are valuable community assets. The sand on site is a particularly valuable community resource because it lies in an area where extraction can occur with minimal impact on the community, and therefore has very high community value as the Nambeelup Industrial Area.

The sand extraction is a recognised resource that, within the provisions of State Planning Policy 2.5 (December 2016), should be protected for the staged extraction of sand for the local community.

A summary of the documentation of basic raw materials is listed below.

- Western Australian Planning Commission, *State Planning Policy 2.4, 2000, Basic Raw Materials.* (superseded locally by SPP 2.5 but in turn to be superseded by Draft SPP 2.4, 2018

- Western Australian Planning Commission, *State Planning Policy No 2.5, Agricultural and Rural Land Use Planning 2016*.

- Department of Planning 2016, *Basic Raw Materials Fact Sheet*.

- Abeysinghe P B, 2003, *Silica Sand Resources of Western Australia, Geological Survey of Western Australia, Mineral Resources Bulletin 21.*

- Department of Planning 2009, *Basic Raw Materials – Applicants Manual, (*to be updated when SPP 2.4 is updated.

2.0 PLANNING ASSESSMENT

2.1 Current Land use

The site is currently rural land used for the rural purpose of grazing.

2.2 Proposed Land use

Sand extraction with an end use to parkland pasture with conservation corridors.

2.3 End Use

After sand excavation the land will be returned to productive agricultural land and conservation.

The contoured surface will therefore be restored slopes and form that match the adjoining land and land uses.

2.4 Land Zonings and Policies

2.4.1 State Government Policies and Planning Schemes

- ***State Planning Policy 1.0, State Planning Framework Policy***

The State Planning Policy Framework provides for the implementation of a planning framework through the recognition and implementation of Regional Planning Policies above Local Planning Schemes and Policies.

A number of State Policies have been released under the State Planning Framework Policy.

State Planning Policy 2.0, Environment and Natural Resources Policy
State Planning Policy 2.4, Basic Raw Materials
State Planning Policy No 2.5, Agricultural and Rural Land Use Planning
State Planning Policy No 4.1, State Industrial Buffer Policy

These are considered in turn.

A number of other key State Government Policies are also relevant to the local regional planning.

- ***State Planning Policy 2.0, Environment and Natural Resources Policy***

This policy provides for the protection of all natural resources under a number of sections;

5.1 General Measures
5.2 Water Quality including stormwater and wetlands
5.3 Air Quality
5.4 Soil and Land Quality
5.5 Biodiversity
5.6 Agricultural Land and Rangelands
5.7 Minerals Petroleum and Basic Raw Materials
5.8 Marine Resources and Aquaculture
5.9 Landscape

5.10 Greenhouse Gas Emissions and Energy Efficiency.

In addition to recognising the importance of protecting air quality, soil and land quality, water and wetlands and landscapes, the importance of Basic Raw Materials to the community is identified with reference to SPP 2.4 Basic Raw Materials, State Gravel Strategy 1998 and State Lime Strategy 2001.

Section 5.7 of SPP 2.0, deals with Minerals, Petroleum and Basic Raw Materials.

Part of Section 5.7 states;

> *Basic raw materials include sand, clay, hard rock, limestone and gravel together with other construction and road building requirements. A ready supply of basic raw materials close to development areas is required in order to keep down the cost of land development and the price of housing.*
>
> *Planning strategies, schemes and decision making should:*
>
> *Identify and protect important basic raw materials and provide for their extraction and use in accordance with State Planning Policy No 2.4; Basic Raw Materials.*
>
> *Support sequencing of uses where appropriate to maximise options and resultant benefits to community and the environment.*

The other factors of the natural environment are provided with the best protection possible, by this management plan, by selection of the site, operational staging and footprint and rehabilitation, bearing in mind the constraints of excavating and processing the resource.

- ***State Planning Strategy, 2050 (2014)***

State Planning Strategy 2050 comprises a range of strategies, actions, policies and plans to guide the planning and development of regional and local areas in Western Australia and assists in achieving a coordinated response to the planning challenges and issues of the future by State and Local Governments.

The approach in the strategy considers Basic Raw Materials as listed below.

ELEMENT	2050 OUTCOMES	MEASUREMENT	ASPIRATIONS
Basic raw material (BRM) supply	Accessible and affordable supplies of BRM are available close to demand	The cost of supplying basic raw materials to the building and construction industry	Appropriate polices are in place to manage existing and future BRM supplies over the long term. BRM are optimally used for their highest purpose. The securing of BRM sites is managed through robust strategic sequential land use planning and development control prior to final land use Demand for BRM is partly managed through compact settlement structures that contain high-density built form.

The environmental management of the quarry has been developed to minimise short and long term impacts on the local community and environment.

The operations have been designed to continue to provide good environmental management that minimises environmental change and enables continued rural land uses.

- ***State Planning Policy 2.4, Basic Raw Materials, 2000 – (Draft) 2018***

State Planning Policy 2.4 was released in 2000. In 2018 there was a new draft SPP 2.4 released, but this has not yet been released in final form. Many of the factors from SPP 2.5 (2016) are incorporated into the draft SPP 2.4.

State Planning Policy 2.4 recognises the site as a Priority Sand Resource. This is also recognised in the Metropolitan Rural Plan and The North West Structure Plan. Furthermore SPP 2.4 requires that resources be staged and taken prior to sterilisation by other land uses.

The need for sand is also recognised by the Chamber of Commerce and Industry in their comprehensive summary of Basic Raw Materials, (Managing the Basic Raw materials of the Perth and Outer Metropolitan Region, April 1996).

The Western Australian Planning Commission State Planning Policy 2.4, was released in July 2000. This site would fall under the provisions of IX 6.1.1. Section IX 6.3 provides some planning protection for the existing sand excavation by directing planning decisions to protect the resource.

The site is a very valuable community asset, as sand can continue to be extracted with minimal community inconvenience in the local region.

SPP 2.4 supports the principle that basic raw materials should be taken before they become sterilised by development. It provides guidelines to local government to recognise the importance of not permitting conflicting land uses to impinge on the operation and enable the resource to be taken in a staged manner.

This policy makes many statements on the intent and actions which local authorities should use to protect and manage basic raw materials.

Section 3.4 is very specific in explaining that basic raw materials need identification and protection because of increased urban expansion and conservation measures, (3.4.1), (3.4.2) and (3.4.4). Sections 3.4.5 and 3.4.6 recognise that environmental and amenity matters need to be considered.

> *There are specific provisions in Section 6.2 Local Planning Scheme Provisions, such as;*
>
> *No support for the prohibition of extractive industries in zones that permit broad rural land uses.*
>
> *Providing an appropriate P, D or A use.*

Not precluding the extraction of basic raw materials on land which is not identified as a Priority Resource Location, Key Extraction Area or Extraction Area (6.4.2).

- ***State Planning Policy No 2.5, Rural Planning, 2016***

SPP 2.5 Rural Planning predominantly deals with the continued rural use of suitable land and its protection for the future. The policy was updated in December 2016 and provides strong measures to identify, protect and use basic raw materials. SPP 2.5 does not cover this area but provides an indication of the factors considered in basic raw material extraction.

SPP 2.5 does reiterate the need to protect and use basic raw materials.

Basic Raw Materials are included in the definitions as;

Sand (including silica sand), clay, hard rock, limestone (including metalurgical limestone), agricultural lime, gravel, gypsum, and other construction materials. The materials may be of State, regional or local significance depending on the resource location, size, relative scarcity, value and demand for the product.

Amongst seeking to protect agricultural values, Policy Objective 4 (c) states

Outside the Perth and Peel Planning regions, secure significant basic raw material resources and provide for their extraction.

Section 5.9 deals with Basic Raw Materials and seeks to achieve the following in an environmentally acceptable manner;

Protect the resources until the resource is extracted (5.9.a)

Identify significant basic raw materials on sub-regional and local planning strategies, region and local planning schemes (5.9.b, 5.9.c, 5.9.d)

The extraction of basic raw materials should not be generally prohibited (5.9.e)

Provide for sequential land use (5.9.f)

Limit sensitive land uses to locations demonstrated to not limit existing or potential extraction of basic raw materials (5.9.g)

Provide for the consideration of native vegetation or significant biodiversity values and may require retention and protection of vegetation and environmental assets (5.9.h)

Have regard for the potential impacts of fragmentation and connectivity of native vegetation (5.9.i)

Maintain adequate buffers to protect water quality in public drinking water source areas (5.9j).

SPP 2.5 also supports preventing conflicting land uses (5.12.1), supports the generic buffers recommended by other Government documents such as the EPA Guidelines for separation distances (5.12.3), and seeks to restrict subdivision from impinging on basic raw material resources.

The Policy is also supported by Guidelines that seek to protect the Landscape and secure Transport Routes.

- ***State Planning Policy No 4.1, State Industrial Buffer Policy***

SPP 4.1 discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this. The development and processing of the resource has been designed to maintain maximum buffer distances. In situations where the buffers are less, actions such as the provision of perimeter bunding to provide visual and noise management, tree planting and operational procedures are used to mitigate and reduce impacts.

This is discussed further in Section 2.11 Surrounding Landuses and Buffers of this document.

- ***Peel Region Scheme 2002***

The Peel Region Scheme aims to provide long term planning to the Peel Region.

The Peel Region Scheme overrides the Town Planning Scheme (Planning and Development Act 2005 Part 9 123 (1 – 3). The Town Planning Scheme must be made consistent with the Peel Region Scheme (Planning and Development Act 2005 Part 9 123 (1 – 3).

Lot 226 will fall under the Peel Region Scheme Strategic Minerals and Basic Raw Materials Resource Policy dated October 2002. Section 5.0 of that Policy requires the town planning schemes to be consistent with the Peel Region Scheme Strategic Minerals and Basic Raw Materials Resource Policy where it is listed as a sand pit.

Section 4.0 Objectives of the Peel Region Scheme Strategic Minerals and Basic Raw Materials Resource Policy; to identify land within the Peel Region that contains basic raw materials of State or Regional Significance and to prevent them from being sterilised by incompatible development and land uses.

Lot 226 is listed as Rural under the Peel Region Scheme.

- ***Directions 2031 and Beyond (WAPC 2010)***

Directions 2031 and Beyond provides data on the land uses and growth of the Perth Metropolitan and Peel areas over the 20 years to 2031.

- ***Perth and Peel @ 3.5 million***

Perth and Peel @ 3.5 million EPA provides strong support for the need for basic raw materials for the growth of Perth.

Perth and Peel @ 3.5million, developed by the Western Australian Planning Commission has determined that the Metropolitan Area will grow significantly to 2050 by around 650 000 dwellings. In the South and Peel Regions this amounts to around 200 000 new dwellings

The large amounts of sand that have been used, and will be required, for the fill of residential lots in the Peel and the Nambeelup Industrial Area is significant.

2.4.2 Local Government Policies and Planning Schemes

- ***Shire of Murray Town Planning Scheme No 4***

The Shire of Murray Town Planning Scheme includes Lot 226 as “Rural” Zoned Land. Within the “Rural” Zone Extractive Industries are listed as an “SA” Use and may be approved by the Shire using their discretion.

- ***Shire of Murray Local Planning Strategy 1994-1997***

The Shire Murray Local Rural Strategy recognises the importance of basic raw materials in Section 2.4 Mineral, Resources and Extractive Material.

- ***Shire of Murray Extractive Industries Local Law 1982***

The proposed excavation has been designed to comply with the Local Law.

- ***Shire of Murray Local Biodiversity Strategy 2013***

This Strategy seeks to protect specific biodiversity features on rural and other land, protect natural areas on zoned lands, maximise retention of all Local Natural Areas, protect and enhance ecological connectivity and protect and manage Local Natural Areas on reserved land.

The project has been designed to comply with the strategy as best as possible under the constraints of extraction and the need for sand resource.

- ***Shire of Murray Biodiversity Protection Local Planning Policy 2018***

This policy seeks to identify and preserve significant trees and vegetation, mainly relating to subdivisions and other similar developments.

The proposed excavation retains the remnant vegetation and provides for the planting of additional local native vegetation.

This policy outlines the methods of planting and establishing trees, but relates to smaller rural living lots and landscape protection areas.

2.4.3 End Use – Sequential Planning

The extraction of sand is seen as an interim use prior to a return of the area to pasture.

No sequential land planning can be made because the future use is not known. Therefore the most appropriate end use is to restore the existing cleared and parkland pasture land with native vegetation around the perimeter and in wildlife corridors.

2.4.4 Legislative Framework - Stakeholders

There have been no significant changes to the scale and nature of the local land uses over the past few years. Lot 224 that adjoins to the north provides a buffer to the Nambeelup Industrial Area.

Table 1 Legislative Framework

Legislation	Environmental Factor regulated/affected	Discussion	Action
Aboriginal Heritage Act 1972	Aboriginal heritage sites	Recorded Heritage Sites A database search of DPLH has been conducted and no site recorded	A commitment is made to halt activities that may impact on a site if any is found during excavation, pending assessment by consultants.
Planning and Development Act 2005	Development approvals for on site constructions and any ensuing environmental impacts.	Planning Consent is required from the Shire of Murray and the WAPC.	An application for development approval is lodged.

Shire of Murray Extractive Industries Local Law 2013	The operations of the quarry are regulated by both the Planning Approval and Extractive Industries Licence	An Extractive Industries Licence is required.	An application for an Extractive Industry Licence is concurrently lodged with the Development Approval application.
Health Act 1911	Environmental and health impacts from waste water treatment and community health.	No matters of significance that would trigger this legislation have been identified.	The proposal complies with the Health Department Guideline for Dust separation. (See Dust Management) No waste materials will be disposed of on site.
Department of Planning, Land and Heritage Transport Impact Guidelines 2016	New developments may need to consider transport options.	This is a new operation feeding to Paterson Road, a significant local transport route that is suitable for truck traffic. Most traffic is anticipated to turn north to Lake Road and then west or east.	The transport routes are well defined routes that are widely used by truck traffic.
Western Australian Planning Commission Planning Bulletin 111/2016	New developments may need to consider fire risk and mitigation such as a bushfire policy and BAL attack document.	This is a new operation with no potential for increased fire risk as the pit will act as a fire break and prevent fire from spreading. The pit therefore acts as a fire management zone as it is devoid of vegetation.	No assessment is required because there are no significant changes to the fire risk. In fact the fire risk will reduce with the formation of the bare pit floor. There are no proposed structures.
Environmental Protection Act 1986 *Part IV* - Assessment	Referred to the EPA if the project is or may constitute a significant environmental impact.	This is a very small operation that will require a Clearing Permit under which assessment under the *Environmental Protection Act 1986* will be required for vegetation at least. If the sand is to be screened a Licence under *Part V of the Environmental Protection Act 1986* will also be required.	The proposal has been referred to the EPA by the Shire of Murray. Discussions have been held with the DWER (office of the EPA) with respect to the proposal.
Environmental Protection Act 1986 *Part V* – DWER Licence	Environmental factors that may be significantly impacted related to Prescribed Premises. Processing and Screening	If screening or even a crushing plant is to be in excess of 5 000 tonnes per year the operation will require a Department of Water Environment Regulation Licence.	At the moment, no Licence is anticipated to be required as > 5 000 tonnes of sand are not screened annually. A DWER Licence will be applied for prior to crushing and screening which triggers the "Prescribed Premises"; 5 000 tonnes of sand per annum.
Environmental Protection (Noise) Regulations 1997	Noise impacts.	The closest dwelling is 1200 metres to the north west. There is a shed located 700 metres to the south. The proposed excavation therefore complies with the EPA generic buffer guidelines.	Noted. See Noise Management.
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	Clearing and disturbance of native vegetation.	Clearing Permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* is required *under the Regulations*.	A Clearing Permit will be required under the Environmental Protection Clearing Regulations. The proposal has been designed to avoid clearing Black Cockatoo habit and *Banksia* Woodland as determined during the site mapping by PGV Environmental.
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Matters listed on the EPBC database.	The matters listed under the *EPBC Act 1999* which might apply to this site such as Black Cockatoo habitat and the potential for *Banksia* Woodland.	A Clearing Permit will be required under the Environmental Protection Clearing Regulations. As the proposal has been designed to avoid clearing Black Cockatoo habit

			and *Banksia* Woodland as determined during the site mapping by PGV Environmental no matters listed under the *EPBC Act 1999,* will be impacted.
Conservation and Land Management Act 1984	Parks and Reserves and issues relating to flora and fauna.	There are no issues that trigger this legislation.	Noted.
Biodiversity Conservation Act 2016	The legislation seeks to protect and manage biodiversity in all its forms through regulation, conservation and restoration.	The clearing of vegetation is covered under the *Environmental Protection (Clearing of Native Vegetation) Regulation.*	A Clearing Permit will be required under the Environmental Protection Clearing Regulations.
Heritage of Western Australia Act 1990	Heritage	No heritage matters are identified locally or on quarry footprint. DPLH databases were searched.	Noted.
Waterways Conservation Act 1976	Water quality and management of surface water	There are no watercourses on site.	A Water Management Plan has been prepared and is included.
Rights in Water and Irrigation Act 1914	Water quality and management of surface water	There are no watercourses on site.	Noted
Country Areas Water Supply (CAWS) Act 1947	Water supplies	The site does not lie within a surface or groundwater control area.	Noted
State Agreement Acts	Specific acts that relate to certain large projects that may impact on some locations.	Not applicable	
Contaminated Sites Act 2003	Contaminated materials that may arise from excavation or be used in excavation and processing.	The only factor that is likely to fall under this category is the storage and use of maintenance items and on site maintenance.	No materials are present or to be used which would trigger this legislation apart from normal fuel and maintenance. A Water Management Plan has been prepared that includes commitments to remove any contaminated soils or other material regularly and at the end of excavation as part of the closure actions.
Dangerous Goods Safety Act 2004	Potential for dangerous good to impact on the environment.	Refers to fuel, which is required and blasting under the *Dangerous Goods Safety (Explosives) Regulations 2007*.	The proponent will comply with the requirements for fuel through management plans that will be implemented. Fuel and Servicing Management Plans are included in the attached Water Management Plan.
Mines Safety and Inspection Act 1994	Safety and management of mining operations which in turn may impact on the environment.		***Mine Safety*** The site is registered under the SRS and a Project Management Plan, Risk Assessment and Emergency plans approved. The Project Management Plan addresses all aspects of mining. The SRS System addresses ongoing Health and Safety.

3.0 BUFFERS AND SOCIAL IMPACTS

3.1 Consideration of nearby sensitive premises

The quarry is designed to maximise the setbacks to the closest sensitive premises.

As part of the development of the management plans for the proposed quarry extensive analysis of the local landform, land uses and location of sensitive premises were made by Landform Research from the available sources of published information, aerial photography, historical aerial photography, site mapping, review of the nearby and surrounding land uses, local and regional planning and local and wider environmental attributes.

The main environmental issues identified in relation to buffers and setbacks to sensitive premises, in addition to those generally recognised by the various Government and Published guidance's are;

- Visual amenity
- Dust management
- Noise management
- Blasting
- Local amenity
- Cumulative impacts of quarries

3.2 Policies

Separation to Dwellings

A number of Government Policies relate to buffer distances and the protection of basic raw materials. *State Planning Policy No 4.1, State Industrial Buffer Policy, (draft July 2004)* discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this.

SPP 4.1 discusses the need to provide buffers both on site and offsite with respect to industry including extractive industries. It does not however specify any distance for the buffer, but notes that site specific studies should be prepared that will demonstrate that the extractive industry can operate in a manner compatible with nearby sensitive premises.

The State Industrial Policy 4.1 does not specify a set buffer distance, but notes that buffers are to be based on "scientific study" and are flexible. It further specifies the buffers by reference to other documentation such as the Environmental Protection Policies, EPA and DWER standards and DPLH Generic Industrial Buffer Guidelines; that is the EPA 1 000 metre generic buffer used in SPP 2.4 and SPP 2.5 that are used in the absence of supporting or scientific studies and information.

The buffer referred to can be both on site and offsite although in this case only on site buffers are required.

SPP 2.5 supports preventing conflicting land uses (5.12.1), supports the generic buffers recommended by other Government documents such as the EPA Guidelines for separation distances (5.12.3), and seeks to restrict subdivision from impinging on basic raw material resources.

The Policy SPP 2.5 is also supported by Guidelines that seek to protect the Landscape and secure Transport Routes.

EPA guidance *"Separation Distances between Industrial and Sensitive Land Uses",* June 2005 lists the generic buffers for sand quarries as 300 – 500 metres depending on the extent of processing.

The EPA issued *Draft Generic Buffer Guidelines 2015*, but these have been withdrawn.

A generic buffer relates to the distance at which there are unlikely to be any problems without some further investigations and does not mean that smaller buffers are not acceptable.

The issue of appropriate buffers is a matter of the distance and protection measures to prevent impact on adjoining land users. This applies mainly to noise, dust and visual impact, all of which are treated separately.

EPA Draft Environmental Assessment Guidelines 2015*, "Separation Distances between Industrial and Sensitive Land Uses", June 2005 DRAFT Environmental Assessment Guideline for Separation distances between industrial and sensitive land uses",* has not been implemented, with the 2005 guideline prevailing.

The draft EPA 2015 Guideline also enabled smaller separation distances based on site assessments and also listed the separation distances as 300 to 500 metres for sand, limestone and clay. Sand is at the lowest separation distances with the sand being only loaded to road trucks. The sand is readily excavated by a rubber tyred loader, whereas clay or limestone normally requires a bulldozer or excavator.

The smallest buffer applies even if screening of the sand is to be used to revive vegetation.

The walls of the pit, perimeter bunding and nature of the ridge landform will be used to reduce noise transmission. The main issues are the potential generation of dust and noise.

Excavation will be worked from inside out on the floor of the pit working below natural ground level.

Based on the nature of the sand, equipment used and excavation methods, the extraction of sand has potentially the lowest impact and a generic buffer of 300 metres is appropriate and could be less if significant impacts are confined.

The closest dwelling is 1200 metres to the north west. There is a shed located 700 metres to the south.

For comparison the majority of sand quarries across the State and within the Perth Metropolitan Area all have approvals and operate at much closer distances than 300 metres.

In sand excavation the only mobile plant is a loader and road trucks. The examples provided below show that the distances between the active pit and a dwelling on the proposed operation are consistent with operations in other locations.

Operator	**Location**	**Resource and buffer**
WA Limestone	Wattleup Road Hope Valley	Limestone and sand
Italia Stone Group	Wattleup, Hope Valley	Limestone
NLG Sand Supplies	Jandakot Road Jandakot	Sand 40 – 80 metres
Midland Brick	Wandena Road, Muchea	Clay 250 metres
NLG Sand Supplies	Coyle Road Oakford	40 metres
Cockburn Cement	Fancote Road, Munster	Sand and Limestone

		70 metres
WA Limestone	Kerosene Lane, Medina	Limestone, 150 metres

The sand pit therefore complies with the EPA Generic Buffer Guidelines.

"A" Class Reserve on Lot 224

The reserve will continue to be linked as the linkage will be re-established at the end of excavation through the wetland and with local native vegetation planting.

The access road will only travel along the fire break near the Reserve in the west. In the central and eastern part there will be a 20 metre vegetated buffer retained along the northern boundary.

Perimeter Buffers

A perimeter buffer of 20 metres will be retained along the northern and eastern boundaries with a 40 metre setback along the western boundary, in compliance with normal policies for extractive industries.

3.3 Community Consultation

The Proposal will be advertised to the local property owners as part of the consideration by the Shire of Murray.

3.4 Heritage

A search of the Department of Planning Land and Heritage and database does not reveal aboriginal sites on Lot 266.

The site has been an operating rural property for many years, with ongoing soil disturbances through that time, and is currently used for cattle grazing.

Should any archaeological site be uncovered, work will cease in that area pending an assessment of the site by an independent consultant, traditional owners and the Department of Planning Lands and Heritage as required.

3.5 Complaints Mechanism

The following complaints mechanism is proposed.

1. The contact details will be displayed at the entrance to the operations.

2. A complaints book will be provided and maintained.

3. Upon receipt of a complaint it will be investigated and action taken if the complaint is determined to be legitimate.

4. When a complaint is found to be legitimate, any reasonable actions to mitigate the cause of the complaint will be taken, to prevent a recurrence of the situation in the future.

5. Details of any complaints, the date and time, means by which the complaint was made, the nature of the complaint, the complainant, investigations and any resulting actions and the reasons, will be recorded in the Complaints Book.

6. The Shire of Murray will be informed of any complaint or any other report provided to a Government Department within 3 working days.

7. The complaints book will be made available for viewing or requested details made available to the Shire or any other official upon request.

4.0 PHYSICAL ATTRIBUTES

4.1 Geology and Geomorphology

The site is a relatively flat site with a low sand ridge in the north. The base land rises slowly from 8 metres AHD in the west to 10 metres AHD in the east.

The low sand ridges then extend up to 15 metres AHD generally along the northern edge of Lot 2267.

The site is a sand ridge of medium grained yellow Spearwood - Bassendean Sand. The location more fits with the Spearwood System but the resource itself is more related to Bassendean in form.

Sand from these sand ridges usually exhibit silica contents of greater than 98%. The sand can vary from white leached silica sand of high purity to yellow slightly earthy sand which contains approximately up to 2% clay and goethite coatings covering the sand grains.

The Spearwood and Bassendean Sands originated from coastal dunes that formed during the Pleistocene as calcareous and silica coastal sands. The differences being that the Bassendean System is older and further inland than the Spearwood System.

The sands of the Swan Coastal Plain have been well investigated over the years through exploration and more particularly during excavation. A summary, with analyses from various areas, is presented, (Abeysinghe 2003).

The exact volumes of each type of sand that will be available will depend on the amount of ground approved, and the permitted depth of excavation.

The site itself is underlain by alluvial soils of the North Dandalup River, Nambeelup Brook and the Serpentine – Murray Rivers. The deposited alluvial clays are overlain by the sheeted old sand dunes of the Spearwood – Bassendean Systems. The sand is deep but becomes clayey at depth as indicated by the excavation of the dam near the south western corner.

The sand ridges are deep sand. A small surface remnant of limestone marl lies in the south eastern corner, outside the proposed excavation. A good summary of the geology, soils and water features is included in Department of Water Environment Regulation 2011, *Hydrological and nutrient modelling of the Peel – Harvey Catchment Report WST 33.*

4.2 Regolith and Soils

The soils and excavation are deep leached sands which are well known from the many sand pits that have operated and currently operate across the Swan Coastal Plain.

The site consists of a slowly permeable clay substrate of alluvial materials that is exposed by deeper excavations. Overlying this is a thin sheet of sand across the areas of lower elevation. The sand ridges are formed where the overlying sheet of sand thickens to over 5 metres in elevation.

The sand ridges are never wet but parts of the low lying areas have temporarily water lying on them at times in winter when the vertical permeability rate of the underlying clays is exceeded by rainfall and evaporation rates are low. This is a temporary perched water table and does not reflect the regional water table.

The soil on the sand resource typically has a grey sand topsoil up to 300 mm thick over leached white silica sand of several metres. The white sand grades into cream and lighter yellow or brownish sands at depth.

4.3 Climate

The climate of the area is classified as Mediterranean with warm to hot summers and cool wet winters.

Temperatures are recorded at Mandurah, where the maximum temperatures in the hottest and coldest months, December to January and July, are 28 to 30 degrees C and 18 degrees C respectively. In winter the average minima drop to 9 degrees C in July.

Average annual rainfall for the area is 888 mm. Over 80% of the rain falls during the winter months April to October inclusive. Evaporation exceeds rainfall in all but the wetter months.

Wind direction is predominantly from the east in the morning and from the south west in the afternoon during the summer months. Wind speed exceeds 10 kph for 55 % of the time at 9.00 am and 74 % of the time at 3.00 pm.

During the winter months the directions are more variable due to the presence of winter lows.

Home › Climate › Mandurah Climate

Mandurah Climate

MANDURAH LONG-TERM AVERAGES

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean Max (°C)	29.5	29.8	27.8	24.1	21.1	18.6	17.4	18.1	19.0	21.9	24.8	27.0	*23.3*
Mean Min (°C)	19.0	19.4	18.1	15.8	13.5	11.5	10.6	11.0	11.7	13.5	15.6	17.1	*14.8*
Mean Rain (mm)	15.5	13.0	17.3	40.2	87.3	119.2	113.3	91.3	67.8	30.7	24.7	16.4	*626.5*
Median Rain (mm)	0.9	2.5	8.6	33.5	68.8	115.1	126.3	96.5	57.1	32.4	20.8	4.0	*617.1*
Mean Rain Days	3.1	2.4	4.0	8.3	12.3	14.9	17.9	16.3	15.1	8.6	5.9	3.9	*102.3*

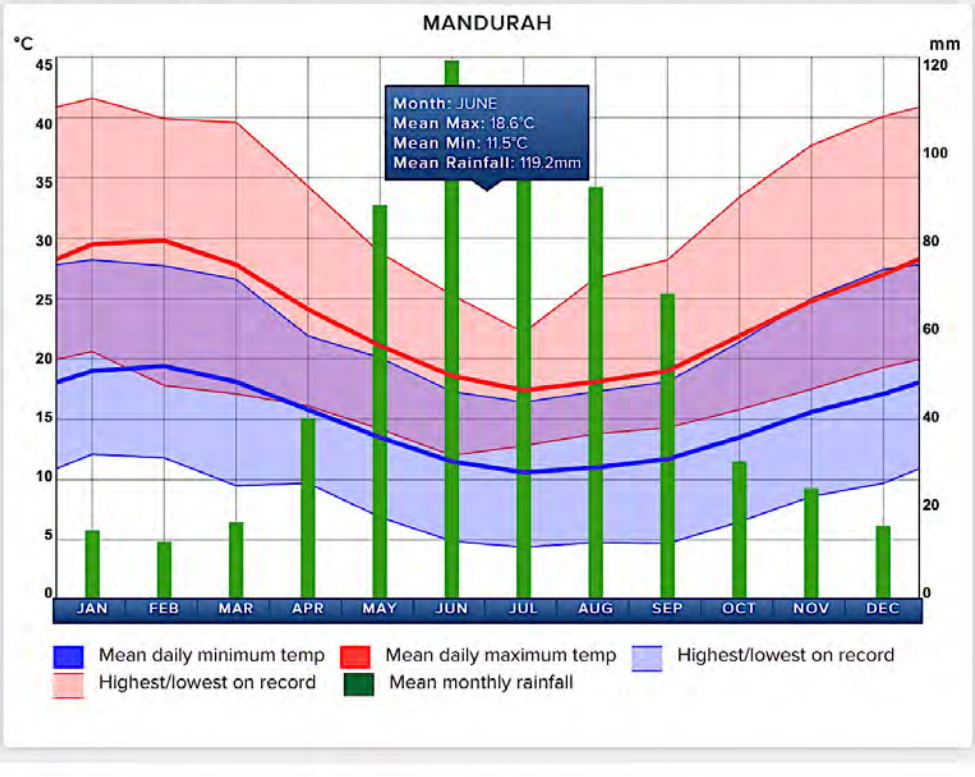
MANDURAH DAILY RECORDS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
High Max (°C)	41.6	39.9	39.6	34.3	28.8	25.3	22.2	26.7	28.2	33.4	37.7	40.1	*41.6*
Low Max (°C)	20.6	17.8	17.1	16.1	14.2	12.0	12.8	13.8	14.3	15.8	17.5	19.3	*12.0*
High Min (°C)	28.2	27.7	26.6	21.9	20.1	17.3	16.4	17.3	18.1	21.4	25.0	27.4	*28.2*
Low Min (°C)	12.1	11.8	9.5	9.7	6.9	4.9	4.4	4.8	4.7	6.5	8.6	9.7	*4.4*
High Rain (mm)	63.4	74.2	37.2	63.2	109.8	48.0	41.8	32.4	33.6	31.2	24.8	74.2	*109.8*

MANDURAH MONTHLY RECORDS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
High Mn. Max (°C)	31.8	33.0	29.7	26.0	22.4	19.7	18.4	19.8	20.8	24.4	27.1	29.0	*24.2*
Low Mn. Max (°C)	26.8	27.9	26.5	22.2	19.7	17.5	16.7	16.6	17.2	18.9	22.1	22.1	*21.9*
High Mn. Min (°C)	20.6	21.4	19.8	18.3	15.9	13.0	12.3	12.9	13.6	15.3	17.0	19.0	*15.7*
Low Mn. Min (°C)	17.4	18.0	16.9	13.8	11.4	10.0	9.4	9.2	9.3	12.2	13.8	15.0	*14.2*
High Rain (mm)	75.0	90.0	72.8	138.2	265.0	227.6	155.8	153.2	158.4	71.2	57.2	104.4	*915.2*
Low Rain (mm)	0.0	0.0	0.0	0.0	13.8	19.0	55.2	26.2	18.6	5.6	1.2	0.6	*434.8*

MANDURAH ANNUAL TEMPERATURES & RAINFALL



4.4 Hydrology

See Section 9.0 Water Quality Management

A good summary of the geology, soils and water features is included in Department of Water Environment Regulation 2011, *Hydrological and nutrient modelling of the Peel – Harvey Catchment Report WST 33.*

Surface Water

There is no surface runoff of water due to the porosity and permeability of the sand, with precipitation draining to the water table. Drainage is to the west and north west generally to Nambeelup Brook which drains to the Serpentine River and eventually the Peel Estuary.

Groundwater

Lindsay Stephens of Landform Research extensively determined the seasonal perched water table on 11 September 2002 for a subdivision that was investigated at that time. The investigation did not show the water table in metres AHD , but in depth of the water table below the land surface. Where temporary water was at the surface the separation is shown as O metres. Whilst thee elevation of the water table is not shown in metres AHD that elevation can be readily seen on the plan by subtracting the depth to water from the contour which is in AHD. Although some 18 year old the data is still valid and may be even more valid because rainfall in the winters around 2002 was higher than today. A photocopy from the 2002 report is attached as Figure 9.

What the study shows is the elevation of the temporary perched winter water table at or near the elevation of the surface of the sand clay.

Therefore here are two groundwater systems on site. There is the regional water table which is shown in the Perth Groundwater Atlas. That shows the elevation of the regional groundwater as rising from 5 metres AHD just west of Paterson Road to 10 metres AHD in the north eastern corner of Lot 226. The regional groundwater is around 2 metres below the natural land surface.

As the soils are deep leached sands over sandy clays of the Guildford Formation, in winter when rainfall exceeds the infiltration rate of the underlying sandy clays water perches on the surface for several months in winter to early spring. This is a temporary perched water table. See Figure 5.

The shallow gradients of the land and water, and the low lateral permeability means that any westwards flow of this temporary perched water is slow.

The temporary perched water eventually drops below the surface of the sandy clays as the spring rainfall decreases, and water is lost to evaporation and evapotranspiration.

The elevation of the temporary perched water rises from wetting the surface at 8 metres AHD in the west to 10 metres AHD in the east. See Figure 5.

The surface is generally at the same elevation as the surface of the sandy clays, with sometimes a minor rise by mounding under the centre of the sand ridge. ON the sandy clays around the sand ridge the winter seasonal perched water only forms a layer a few centimtres deep.

The regional groundwater is not exposed on Lot 226, with the exception of the excavated soak in the south western corner. This soak is an expression of the regional water table at that location. The land surface at that location is at an elevation of 7.5 metres AHD, with the regional winter water table rising to that elevation in winter but dropping to around 6.5 metres in summer.

All drainage from the active working areas and excavation is to the base of the excavation, and thus all surface water is retained on site.

The base of the sand pit is set at around 10.5 metres AHD which is 0.5 metres above the temporary seasonal perched water table and in turn around 2 metres above the regional water table.

4.5 Vegetation

Part of the resource area is cleared. The remainder has been degraded, or cleared and allowed to regrow.

PGV Environmental completed a flora and vegetation study in February 2019 with follow up targeted vegetation surveys and Cockatoo habitat surveys on 31 July 2019

PGV found that only a small area of *Banksia* Woodland was present and this has been excluded from the proposed extraction. The *Banksia* Woodland mapping can be seen at Figure 3 in the attached PGV Environmental report. The plant communities are identified and any that may classify as Banksia Woodland is lists as having a “B” in the name. PGV Environmental Figure 3 is repeated at Figure 7 with the proposed sand pit overlay (Red and yellow hatching) showing that the sand pit excludes all *Banksia* Woodland.

The vegetation on the sand pit site is either cleared to pasture or dominated by *Kunzea glabrescens* which is a very common coloniser of disturbed land, which is what is occurring on this site.

See Section 10.1 for a summary and Sections 10.1 and 10.6 for a summary of the proposed management.

A Clearing Permit will be required for the sand extraction footprint of 12.7 hectares.

A Clearing Permit will not normally be issued by DWER until all other approvals are in place. Hence the application is made for Planning Consent and an Extractive Industry Licence to enable the application for a Clearing Permit to be made and issued.

Even though the Local Authority Approvals will be issued it will be the approval to clear vegetation in the areas of native vegetation, which will be the ultimate determining process for the proposed sand pit.

4.6 Fauna

Possibly the most significant fauna are Black Cockatoos which have been recorded in the general area.

The fauna on site will already be significantly depleted by the partial clearing. Some fauna are likely to be present. PGV Environmental completed a Level 1 Fauna Assessment with a follow up Cockatoo habit survey on 31 July 2019. See Section 10.2 for a summary and the PGV report which is attached.

The cockatoo habitat and habitat trees are identified by PGV Environmental . The plan is repeated at Figure 8 with the overlay of the proposed sand pit by blue line. This shows that all cockatoo habitat trees are excluded. A 10 metre set back is proposed and will be provided in the field with the closest ress identified prior to excavation commencing.

Cockatoos and other fauna will be considered under the Clearing Permit process when an application is made for clearing.

4.7 Acid Sulfate

The most definitive survey procedure was produced by the Acid Sulfate Soil Management Advisory Committee NSW, 1998, in their Acid Sulfate Manual.

This Manual forms the basis for much of the assessment procedures in Australia, including those adopted by the Western Australian Planning Commission and the Department of Water, Environment Regulation. The Acid Sulfate Manual adopts the procedure of reviewing the published data followed up by field assessment, which has been completed for this site. If a geological risk is determined, then a Preliminary Acid Sulfate Assessment is conducted.

- Acid sulfate only becomes a potential risk when a number of circumstances are present.
- There is rock, soil or regolith present that is carrying sulfides.
- Sulfide carrying materials from below the water table are to be exposed to the atmosphere.
- Excavation below the water table is to be carried out exposing the sulfide carrying materials to oxygen in the atmosphere.
- Dewatering of the sulfide carrying materials is proposed, exposing them to oxygen.
- Regolith conditions are already highly acidic, below pH4, under which oxidation can occur through electron exchange without the need for the presence of oxygen.

The site is shown as yellow coloured, Moderate to Low Risk of acid sulfate conditions at depths of generally > 3 metres (yellow) , in WAPC Planning Bulletin 64 (Locate 2019). The yellow covers the sand ridge with no risk and the lower elevation areas as well

The wetland area is shown as red with a listed high risk with acid sulfate occurring within 3 metres of the surface. This is the north eastern corner on lower elevation that will not be impacted by excavation.

Materials at risk under reducing conditions are normally grey in colour or have been grey with no brown or red brown iron oxides. Where exposed to the atmosphere there is a change to brown iron oxides, with yellow jarosite and other alteration minerals that are distinctive.

The site has been inspected by Lindsay Stephens of Landform Research. None of the at risk parameters occur on site.

On site the soils are white and cream to brown sands that are oxidised and do not carry any risk of acid sulfate potential.

This concurs with *Nattaporn-Prakongkep, R J Gilkes, B Singh and S Wong, 2011, Mineralogy and chemistry of sandy soils in the Perth metropolitan area of the Swan Coastal Plain, Department of Environment and Conservation* who concluded that there is no risk of acid sulfate soils in sands unless there is peat or organoferricrete present and excavation proceeds below the water table. In such situations no testing would be required because there is no risk.

The soil auger holes conducted in 2002 show no presence of organoferricrete materials or peat that indicate prolonged reducing conditions. Also those conditions only occur below the water table. With no excavation within 2 metres of the water table there is no risk of acid sulfate conditions being intersected by excavation.

No drains or excavation are proposed to be cut below the water table.

Excavation will not occur below the water table so reduced materials will not be exposed to the atmosphere during excavation.

The base of the pit is at an elevation 0.5 metres above the highest known water table.

5.0 PROJECT DESCRIPTION

5.1 Construction

This proposal is for the development of a sand pit with a return to parkland pasture.

Construction Time

The access road needs to be formed. The construction time is anticipated to be 30 days.

5.2 Excavation

Table 2 Summary of Excavation

ASPECT	PROPOSAL CHARACTERISTIC
EXCAVATION	
Total area of excavation applied for	Proposed excavation – 24.5 hectares Current excavation – Nil Under rehabilitation - Nil
Rate of excavation based on average anticipated volumes.	50 000 to 150 000 tonnes per year depending on contracts with the potential for greater volumes of sand to be removed in a particular year depending on contracts. Maximum volume is around 500 000 tonnes.
Life of project	10 years
Area cleared per year	1 - 4 hectares but dependent on contracts won. Total clearing required, 12.7 hectares
Dewatering requirements	Nil
Maximum depth of excavations	1 - 5 metres below natural land surface.
PROCESSING	
Resources	No processing proposed at this stage. A screening plant remains a possibility to produce specialty sands if required.
Water requirements	Nil
Water supply source	Sump on site subject to Licence otherwise water will be brought to site.
INFRASTRUCTURE	
Total area of plant and stock	Only mobile equipment. No structures.
Fuel storage	No fuel storage
TRANSPORT	
Truck movements	Variable but approximately 6 – 25 laden trucks per day but up to 100 trucks for day for short period to fill large contracts if won.
Access	Access road to Paterson Road
WORKFORCE	
Construction	Access road only.
Operation	2 - 4 persons
Hours of operation	Hours of operation, will be 6.00 am to 6.00 pm Monday to Friday inclusive, excluding public holidays for processing and excavation. Loading and transport from site may commence at 6.00 am Monday to Friday inclusive, excluding public holidays

Exposure of the Resource

A Clearing Permit will be required for development of 12.7 hectares of the resource the resource and will be applied for. The remainder of the 24.5 hectare resource is pasture and does not require a clearing permit.

A loader will be used to remove any vegetation, pasture and topsoil cover by pushing it into windrows, for use on the batters to minimise soil erosion and spreading on the final land surface as part of the final rehabilitation.

Overburden – interburden, or subgrade sand, will be removed by pushing to the perimeter of the proposed pit to form perimeter bunding to the pit.

This bunding will be pushed to the perimeter of the footprint along the western edge and northern and southern edges to assist with visual protection.

Extraction

Environmental issues including dust, noise and traffic are not anticipated to be a significant risk or impact and can be managed in such a way to minimise or eliminate any potential impact on the local sensitive premises or adjoining land.

Excavation will be carried out as a sequence.

Sand will be excavated by loader, loading directly to road trucks.

Road trucks will enter from Paterson Road through Lot 226 along an access road formed on the existing fire break.

Sand is to be excavated to 0.5 metres above the highest known water table as measured in water monitoring bores and piezometres during excavation. See the attached Water Management in Section 9.0.

The depth of excavation will be 1 to 6 metres. The floor will be flat to gently sloping at 1 : 5 to 1 : 10 vertical to horizontal to enable a productive agricultural end land use with local native vegetation on buffers.

Water is unlikely to be used for dust suppression apart from the watering of internal access roads to enable road trucks to access the resource to be loaded. Water is unlikely to be required for the access road but is available to be used to dampen dust if required. See the attached Offsite Risks Management Plan for dust management.

5.3 Pit Design and Staging

To maintain this type of operation normal methods of open cut excavation will be used which will require a sufficiently large footprint to enable haul roads to extend to the floor at suitable grades to ensure efficient and safe excavation conducted in a manner that minimises environmental impact.

The development of the pit will depend on the internal haul roads and access, efficiency, safety and environmental management. The footprint of disturbed ground is not proposed to be enlarged after allowing for progressive rehabilitation.

A 20 metre buffer will be provide to the east and north and a 40 metres buffer to the west at Paterson Road.

Final Contours

The depth of excavation will be 1 to 4 metres. The floor will be flat to gently sloping at 1 : 5 to 1 : 10 vertical to horizontal to enable a productive agricultural end land use with local native vegetation on buffers.

The Concept Final Contours are shown in the attached plan.

Rehabilitation will be progressive, but because of the nature of the excavation will be restricted to completed faces. The majority of the pit will not be able to be rehabilitated until the completion of excavation. Batters will be rehabilitated when formed.

Wherever possible, rehabilitation will be continued as areas are completed to ensure that the amount of ground that is open at any one time is minimised.

Geotechnical parameters

The final profile of the excavated surface will be to *Mines Safety and Inspection Act 1994* as explained in documents such as *Guidelines on Safety Bund Walls Around Abandoned Open Pits (DOIR 1991).*

The sand pit has steeply sloping faces during excavation in compliance with the DMIRS face angles for sand excavation. These will be battered down to 1 : 4 vertical to horizontal as a geotechnically stable landform that can be used for agricultural purposes.

5.4 Processing

Much of the sand will be used as fill without any processing. Some sand may be screened for specialty uses but will normally be less than 5 000 tonnes per year.

A DWER Licence will be required under Part IV of the *Environmental Protection Act 1986* for screening if the annual volumes exceed 5 000 - 50 000 tonnes. (Category 70 Prescribed Premises).

5.5 Stockpiles

Stockpiles may be needed for sand if the white and coloured sand is taken separately, although no stockpiles are currently planned.

If required, two small stockpiles will be created on the floor of the pit for the types of sand with a maximum elevation of 4 metres.

5.6 Equipment

- No facilities are proposed for the site.
- Ablutions are to be a serviced portable system.
- A loader will excavate sand and load the trucks.
- The only other vehicles are the road trucks
- Refueling will be conducted from mobile tanker in the pit. There will be no fuel stored on site.

- Major maintenance will continue to be conducted offsite.
- It is not anticipated that a bore or water Licence will be required, because of the nature of the operations, the locality and the distances to sensitive premises.
- A mobile screen to sieve the sand may be used to improve the sand but at this stage is seen as unlikely to be required.

5.7 Hours of Operation

Hours of operation will be 6.00 am to 6.00 pm Monday to Saturday inclusive, excluding public holidays. This is similar to the operations of nearby sand pits in the Peel Region.

Transporting material on Saturday should not present a problem because of the high traffic volumes using local roads and low numbers of dwellings.

5.8 Access and Security

The access road from Paterson Road will be formed from limestone hard stand.

The site is to be secured by locked gates when it is not being actively worked. The boundary fencing will be maintained to prevent inadvertent and unauthorised entry.

Warning signs for trucks will continue to be used to alert road users to the entrance onto Paterson Road. Maintenance of signage will be undertaken through the Shire of Murray and Department of Mines Industry Regulation and Safety as required.

Signs will be erected at the gate showing contact numbers.

Transport

Truck access will be from Paterson Road to Lake Road and then east or west along Lake Road.

The number of truck movements will vary throughout the year depending on the size of contracts. To transport the required amount of sand a certain number of trucks must be used.

Road transport will use a variety of vehicles such as rigid trucks, semi-trailers or rigid (8) wheeler trucks to a 5 axle dog trailer.

In general an average of around 10 loads may be completed on each of the days when resource is transported, and for large contracts this may rise to 50 trucks laden truck movements per day, depending on the type, number of trucks available, the contracts being filled and the number of hours worked.

Such large numbers of trucks will be for limited times to fill specific contracts. On some days there is anticipated to be no activity on site between contracts.

Table 3 Seasonal Closure and Campaign Closure

	CLOSURE OBJECTIVE	**Completion Criteria**	**Actions for Care and Maintenance Greater than 12 months**
COMPLIANCE			
All legally binding conditions and commitments relevant to temporary closure and rehabilitation that can be undertaken will be met.			Prior to undertaking temporary closure. • Review the latest documentation and approvals. • Assess compliance with the conditions and commitments • Faces and the landform are to comply with DMIRS Guidelines and be stable for the long term.
SAFETY			
Make the site safe			Prior to vacating; • Secure the site and any plant or structures to be left. • Mobile plant and other equipment not required will be removed from site. • The site will be cleaned, structures will be removed. • Provide fencing, bunding, signage or other measures as required to provide a safe site, particularly above any faces. **Security** • Complete activities to make the site safe. • Provide bunding and warning signs above faces as required. • Provide locked gates or log access restraints as required or maintain staff on site. • Check and maintain perimeter fences. • Visual audit of completed ground, to verify compliance.
HYDROGEOLOGY			
Ensure that there are no materials that could cause pollution or environmental harm.			• Remove fuel service materials. • Remove any materials from which leaching may occur.
BIODIVERSITY			
Minimise the risk to on site or offsite biodiversity.			• Implement the Dieback Management Plan. • Implement the Weed Management Plan. • Inspect the site for Significant Environmental and Declared weeds. Treat accordingly • Inspect adjoining native vegetation and rehabilitation for edge weed effects. Treat accordingly. • Complete as much rehabilitation as possible.
STAKEHOLDERS			
Ensure stakeholder issues are considered.			• Prior to temporary closure, as necessary, consult with the relevant stakeholders to check whether the closure planning, where possible, considers their interests and carry them out as necessary. If care and maintenance continues modify procedures in response to changes in stakeholder position, policies or conditions.

5.9 Water Use

Water will not be required for dust suppression. This is discussed under Dust Management in the Offsite Impacts Management Plan.

However there is a contingency to use water from the sump to wet down the access road if required, if permitted through DWEWR Licensing. In general though dust suppression with sand excavation is not required. It is only the access road that generates dust and by locating this on pasture, capillary action from the soil will keep that moist for much of the year negating the need for wetting down. A cellulose road stabiliser can also be used to negate the need to wet down the access road.

5.10 Workforce

The workforce will vary, depending on the level of operation and market demands, but usually 2 – 4 persons will work on site plus truck drivers as they access the operations.

5.11 Safety

Excavation will be conducted to *Mines Safety and Inspection Act 1994 and Regulations 1995.* Excavation practices, and operations procedures are in compliance with the Act. Health and safety issues are overseen by the Department of Mines Industry Regulation and Safety.

Every morning prior to start there will be a daily briefing as applicable, or consideration of the potential hazards, any incidents such near misses, health and safety and any other relevant issues.

Site Safety

The operator will have procedures in place to manage safety, health, environmental impact, site completion and rehabilitation. All workers will be required to wear full protective safety and high visibility gear when on site.

All vehicles have two way radio capability. No light vehicles will be permitted on site without registering with mobile plant on site. Full personal protection is required for all persons on site at all times.

All personnel are provided with site induction, safety and environmental awareness training.

Emergency

The site is within mobile phone contact and all vehicles are equipped with two way radios.

- The loader will excavate from the face using an in – out movement, only approaching the face from a perpendicular movement which is the safe option. The face will be no higher than the reach of the bucket, unless the sand free falls at the angle of repose in which case the face can be higher. For higher faces, benches or an excavator will be used.

- Personal protection will be worn by all persons on site, with a minimum of hi – viz, safety boots, long clothing, hearing and eye protection and helmets when near the face or operating machinery.

- Road trucks are separated from the operating loader. Site warning signs and directions will be installed as required to maintain safety.

- Safety bunds or temporary fences will be used above any active vertical faces.

- Warning signs are maintained as required.

- Emergency preparedness plans will be developed and implemented.

- Staff and contractors are inducted and trained as necessary and have the relevant qualifications to fulfill the tasks they are assigned to.

- Where applicable Safe Operating Procedure Sheets are made available for hazards. Workers and staff on all sites are trained in the use of the procedures and all employees provided with site induction and training as necessary prior to commencing work on the site.

Fire Management

The excavation area will form a natural firebreak; the access road will also assist. Water available on site can be used for fire fighting.

The safety of workers is managed through a Safety Management Plan developed through the *Mines Safety and Inspection Act 1994 and Regulations 1995*.

Normally developments in bushfire areas are required to have fire management plans in place.

Western Australian Planning Commission Planning Bulletin 111/2016 provides for an exemption of a bushfire plan requirement because there will be no structures that will burn and the open ground will form a fire break.

The Department of Mines Industry Regulation and Safety, SRS and PMP systems, with the registration of all quarries, requires bushfire planning to be covered under that system. The PMP (Project Management Plan) will be required to be produced and approved prior to excavation being commenced.

The management actions that are used to minimise fire risk are summarised below.

- Vehicles will be restricted to operational area, particularly on high fire risk days.
- Diesel rather than petrol powered vehicles are used.
- Perimeter fire breaks will be maintained for Lot 226.
- The mobile plant on site will be available to assist with emergency fire management when safe to do so.
- Fire risk is addressed and maintained through the site Safety Management Procedures (Project Management Plan)
- Water supplies will be drawn from existing farm supplies with the proposed dam to supply water.
- The farm fire fighting unit is available for fire management.
- The site is secured from unauthorised access by maintaining the existing fencing and locked gates.
- Public access will not be permitted.
- An emergency muster area is provided.
- On site communications and worker induction and training will be provided.
- The site is within mobile phone range, the surrounding area is relatively flat and any bushfire smoke will readily be noticed.

6.0 DUST MANAGEMENT

6.1 Environmental Dust

Background

Excessive dust has the potential to impact on both the workers and the adjoining land, and its potential for generation must be taken in context.

There are a number of key aspects to dust impacts;

- What is the source of particles?
- What is the potential for the particles to be disturbed?
- What is the nature of the particles and how are they likely to behave?
- What types of impacts are the particles likely to have if they move?
- What management actions can be used to mitigate or reduce dust impacts?

Most dust on site will be generated during vehicle movements.

Commonly called "dust," scientists and regulators refer to the term particulate matter (or PM) to describe the range of particles that exists in the air breathed in.

Particulate matter exists naturally in the atmosphere, eg sea-salt spray and pollens. PM can be increased due to human activities such as vehicle exhaust, industrial processes, power stations, mining, farming and wood heaters, or smoke from bushfires.

Exposure to PM can be associated with health and amenity impacts if the exposure is excessive.

The likely risk of these impacts depends on a range of factors including the size, structure and composition of the PM and the general health of the person.

Particulate matter needs to be suspended in the air to carry any distance. The particles must be smaller than sand grains, which will only carry short distances because the grains are too large to move at any more than bouncing. The particles that are able to be suspended are called Suspended Particulate Matter and the total amount of that is referred to as TSP.

Little published data is available from general mining in Western Australia even though monitoring is undertaken at some sites. There is data specifically from mining, (predominantly coal) from New South Wales (NSW Health) where particulate levels have been measured to be;

PM <2.5 microns as 2 – 5% of emissions (One micron is 1 / 1000 of 1 mm).

PM< 2.5 are invisible and called “fine particles”. They are the main health issue and are caused by vehicle emissions whether they are along roads or on private land. Vehicle emissions will not occur at night or at other times when the site is not active.

PM 2.5 – PM10 microns as 15 – 45%

PM 10 (particles between 2.5 and 10 microns) are invisible and called “coarse particles”. They can be breathed in, but are removed by alveoli and mucous. (NSW Health). This dust may be generated when land is cleared and topsoil disturbed or the site is subject to traffic in summer.

PM>10 microns as 50 – 70%

PM>10 is visible dust and will, based on the resource, be the vast majority of the particles.

Normally all sizes of dust are generated together, and there will be visible dust being generated when invisible dust is being formed. Therefore any visible dust present is a good sign and early indicator of a dust risk. A summary of the sources and proportions of dust is shown in; NSW EPA and NSW Ministry of Health Environmental Health Branch 2015, Review of the health impacts of emission sources, types and levels of particulate matter air pollution in the ambient air in NSW.

This is backed up by occupational monitoring through the Department of Mines Industry Regulation and Safety. Unpublished data from those quarries shows quarries are compliant or can readily be made compliant with the health and safety and community standards through normal dust management practices.

Sand Quarries

Sand excavation is at the lowest risk from dust, producing very little dust material, with the exception of the vehicle dust generated from unsealed roads and the dust from fine clays within the sand that can be disturbed by vehicles movements when dry.

The main particles on site are large sand grains, which are not mobilised to the atmosphere and cannot be breathed in. The small amounts of fine clay and other particles from roads are “coarse particles” and do not provide a significant health risk even if generated.

For this operation the only sensitive premises is over 1 200 metres away and therefore there is a negligible risk to those dwellings as shown by the DWER assessment score. See Table 4 below.

Occupational dust associated with the quarrying processes falls under the *Mines Safety and Inspection Act 1994 and Regulations 1995* overseen by the Department of Mines Industry Regulation and Safety who will regularly inspect the site.

Tree Belt - Buffers

Dust particles are readily stopped by tree belts and distance, with which the site complies. Tree belts slow the wind and allow the dust to settle. See *Planning Guidelines Separating Agricultural and Residential Land Uses, Department of Natural Resources Queensland 1997(Pages 65 – 111) and Department of Health WA, 2012, Guidelines for Separation of Agricultural and Residential Land Uses* which uses the same criteria *(Pages 112 – 118).*

The Queensland Guidelines predominantly relate to agricultural spray drift, but based on particle size also relate to dust.

The Guidelines provide for a buffer of 300 metres for open agricultural land, dropping down to 40 metres where an effective tree belt is in place. The Western Australian Department of Health also uses the same guidelines.

The Guidelines are based on field studies and demonstrate the effectiveness of tree belts and distance in providing screening against particulate travel even though the trees are *Banksia* Woodland the open paddock separation of 300 metres is easily exceeded.

A minimum of 1 200 metre buffer distances is available which complies with the Guideline and the Queensland research.

6.2 Assessment of Dust Risk

Dust Guidelines

Dust management is an integral part of the extraction and processing of any basic raw material.

The most common form of disturbance is by mobile plant and vehicle impacts. In this local area dusty roads have the most potential to produce dust, such as the access road which is no different to any other local unsealed road.

The potential for dust emissions falls under the *Guidance for the Assessment of Environmental Factors, EPA, March 2000*. Assessments of the potential dust risk are normally made using the Land development sites and impacts on air quality, *Department of Environmental Protection and Conservation Guidelines, November 1996.*

These guidelines are still in place but are incorporated into the *DEC (DER) 2011 Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities.*

The DEC (DWER) in 2008 released a draft Guideline for the Development and Implementation of a Dust Management Plan.

Even so a dust risk assessment has been completed using the DEC (DWER) 2011 Guideline.

Table 4 Dust Risk Assessment from DWER (DEC)

PART A Number	**Item**	
		Score
1	Nuisance potential of the material	Low for excavated material and with dust control in place - 2
2	Topography and vegetation screening	Screened and sheltered - 1
3	Area of site activities	Active trafficked areas at any one time are 1 - 5 hectares in area - 3
4	Type of work being undertaken	The small scale of excavation is equivalent to partial earthworks - 6
	Summer total without dust measures	Maximum = 12

PART B Number	**Item**	
		Score
1	Distance to premises	Premises, 1 200 to the north west - 1
2	Effect of prevailing wind	Isolated premises affected by one wind direction The premises is not really affected, not in the path of prevailing winds which are easterly and south westerly - 1
	Total Part B	Maximum = 2

Activity	Calculated Score Part A x Part B	Allocated Risk of Dust
Excavation **with or without** dust suppression.	**Maximum** **Premises = 12 x 2 = 24**	**Classification 1** **Negligible Risk,** The actions and contingencies proposed are consistent with the DWER Policy Dust management will be required for pit best practice and worker environment.

The main dust risk is the access road or any hard stand that generates dust.

By locating the road and hard stand on pasture, capillary action from the soil will keep that moist for much of the year negating the need for wetting down.

A cellulose road stabiliser can also be used to negate the need to wet down the access road if dust becomes a potential issue. That stabilises the limestone of the road and is used on many mine sites. Being cellulose based it is a natural product derived from wood that is able to be used in all situations.

6.3 Buffers

The sand operations comply with the EPA Generic Buffers for sand excavation. See Section 3.0.

6.4 Occupational Dust

There is very low risk from occupational dust to workers on site, and if dust levels on site are low they are also low offsite.

6.5 Actions and Management

Table 5 Dust Management

ACTIVITY	POSSIBLE RISK SEVERITY and FREQUENCY	OPERATIONAL PROCEDURES AND COMMITMENTS	RISK AFTER MANAGEMENT
EARTHWORKS			
Land Clearing, construction earthworks and building the bund	Low - Occasionally to open new ground	• This involves removing the topsoil for use in revegetation and topping the screening bunds, followed by removal of the overburden. • The fine organic particles in the sand top soil are the only dust generating material. Clearing will be completed when the soils are moist. • Clearing will be conducted to only remove the area required for immediate mining to expose the resource and construct the operational features. • If winds are sufficiently strong, or other weather conditions are unacceptable to negate the effects of dust management, operations will cease until conditions improve and compliance can be achieved. • Visual monitoring of the visual dust is the best and fastest method of monitoring dust risk and dust generation and faster response can be achieved than alarms or monitors. If visual dust is significant then smaller particles may also be present.	Low
Land	Low	• Land restoration is infrequent and normally conducted only once	Low

restoration	- Once per year or less frequent	per year. • Scheduled activities such as ripping, overburden and topsoil spreading will be conducted at times of low dust risk	
EXCAVATION - PROCESSING			
Excavation	Low - Frequent	• The digging of sand does not generate dust. The dust risk is from traffic on hardstand and roads. • Excavation will be conducted on the floor of the pit to provide maximum shelter for dust protection. • The treed buffers to the north on the adjoining property provide compliance with Government Guidelines as does the distances to the only sensitive premises to the north west.	Low
Loading and stockpile creation	Low - Frequent and in campaigns	Few stockpiles will be used. Loading from the face produces little dust and is covered under excavation.	Low
TRANSPORT			
Road condition	Low - Frequent	• All loads for transport outside the pit are to be covered. • The access road and crossover are to be maintained in good condition (free of potholes, rills and product spillages). • The access road and any hard stand will be located on natural soil at low elevation to enable capillary action from the soils to keep the limestone moist for most of the year. That moisture will assist in crusting and hardening the limestone through reprecipitation of the calcium carbonate. • The use of approved cellulose road stabilisers will also be considered to minimise water use for dust suppression.	Low
Health and Amenity		• A readily auditable trigger of no visible dust to cross the property boundary in line with DWER Licence and best practice in WA. • The trigger for dust management is the generation of visual dust. • The loader operator will determine the amount of dust being generated and they are in the best position to assess dust generation and to direct remediation. • On site induction training will include observation and mitigation where possible of all dust emissions. • Occupational dust associated with the quarrying processes falls under the *Mines Safety and Inspection Act 1994 and Regulations 1995* overseen by the Department of Mines Industry Regulation and Safety who regularly inspect the site. • Included in the program are personal dust monitoring assessments. If on site dust is managed, offsite dust risk is also managed. • Operations will temporarily cease if conditions occur where dust cannot be managed. • The latest weather conditions to increase the awareness of dust risk.	
Complaints		• All complaints relating to dust are to be investigated immediately on receipt of a complaint. • A record of all dust complaints is to be maintained together with the mitigation measures to be used to reduce the dust impacts.	

Contingency		• Sand blowing will be treated by selecting the most appropriate method of stabilistation. A summary of the potential treatments is listed. • If sand is found to be blowing, it will be stabilised by increasing or installing cover crop of pasture, or in the conservation corridor by planting and seeding with native plants. • Wind fences and wind breaks will be installed. • Brushing with local native vegetation recovered from clearing. *Kunzea glabrescens* is highly suitable for this purpose, because it occurs in good lengths, carries seeds on the branches, is local and growing on site, and is an excellent colonising species. • Rehabilitation as soon as practicable after closure of each portion of completed land. • Direct respreading of topsoil. • Direct spreading of local native vegetation fragments on wildlife corridors and batter slopes. • Reducing activity in that location. • Ceasing operations until weather conditions stabilise and improve.	

6.6 Dust Monitoring

Most dust generated from processing and vehicle movements has a very large visible component.

The loader operator is in the best position to assess dust and implement management to mitigate or reduce the dust risk and generation.

Human monitoring can detect potential dust risks prior, and take action prior, to significant dust being generated. They notice dust immediately such as from tyres, whereas machine monitoring has to rely on significant dust being generated, travelling to the boundaries of the premises and triggering an alarm. The operators would be negligent if they let the dust get to that level of impact prior to taking action.

The auditable condition is visible dust crossing the boundary of the premises; the lot boundary. This is the condition used on Department of Water Environment Regulation Licences and all other quarries such as sand and hard rock quarries in Western Australia and has worked well in the past.

It is also the method used by the Department of Mines Industry Regulation and Safety to rapidly assess occupational dust on site.

All operators on site are instructed to be vigilant to dust generation and management and report any excessive dust or potential dust management issues.

Visual monitoring is even more effective when complemented by an extensive reporting and complaints process and this will be used.

7.0 NOISE MANAGEMENT

7.1 Operations

Noise Management is designed to comply with Best Practise, such as Institute of Quarrying Australia/Queensland Government, Noise Management.

7.2 Regulatory Framework

Noise can originate from a number of operations and may impact on onsite workers, or travel offsite and impact on external sensitive premises. Both potential noise impacts are addressed by reducing the noise generated from the quarrying and processing operations.

Offsite noise is governed by the *Environmental Protection (Noise) Regulations 1997*.

The Environmental Protection (Noise) Regulations 1997, require that sensitive premises including dwellings in non industrial and rural areas, are not subjected to general noise levels (excluding blasting), during the hours 7.00 am to 7.00 pm Monday to Saturday that exceed 45 dBA. Allowable noise to 55 dBA is permitted for up to 10% of the time and to 65 dBA for 1% of the time. Noise levels are not to exceed 65 dBA during normal working hours.

Between 9.00 am and 7.00 pm on Sundays and Public Holidays, and between 7.00 pm and 10.00 pm on all days, the base level is 40 dBA.

At night, between 10.00 pm and 7.00 am Mondays to Saturday, and before 9.00 am on Sundays and Public Holidays the permitted level drops to 35 dBA.

The 10% and 1% “time above” allowances apply at night and on Sundays and Public Holidays as well.

There are penalties for tonality of 5 dB, modulation 5 dB and 10 dB for impulsiveness, that are added to the permitted levels. That is, if the noise is tonal or modulated the permitted levels drop by 5 dB. Impulsiveness is not likely to be relevant for the quarry under normal circumstances.

The Noise Regulations provide for Construction Noise exemptions to enable construction of the site such as the building of the screening bund and opening the pits.

Influencing factors that raise the allowable noise levels are activities such as external industrial noise, some nearby land uses and busy roads. These are not relevant to this site.

Under Schedule 1 of the Noise Regulations the premises on which the extraction of basic raw materials are extracted, is classified as Industrial Land for the purposes of calculating influencing factors. This was defined as the whole cadastral boundaries in State Administrative Tribunal decision {2013} WASAT 139, Bushbeach v City of Mandurah. In this case the premises is quite small and approximates the area of disturbance and will have little impact on the influencing factors.

At a distance greater than 15 metres from the sensitive premises (eg dwelling), and commercial premises, a base level of 60 dBA applies at all times, with the 10% time permitted to be up to 75 dBA and the 1% permitted to be up to 80 dBA. For industrial premises the base level is 65 dBA at all times with the 10% time permitted to be up to 80 dBA and the 1% permitted to be up to 90 dBA.

7.3 Environmental Noise Management

The types of equipment proposed to be used are listed below. Not all plant will be on site at any one time and that provides for contingencies to reduce the operational noise on site if necessary at certain times.

Based on the experience of Landform Research and the operation of many other sand quarries the proposed sand excavation will easily be able to comply with the Noise Regulations at the closest dwellings.

Anticipated equipment required for the production of the various resources are.

Equipment	Sand Extraction
Rubber tyred loader (Komatsu WA 430 or similar)	Loading sand from the face
Semi trailer or other road trucks	Transporting product
Mobile screen	Small screen may be used to operate occasionally in the centre of the pit for screening sand for specialty uses although at this stage no screen is proposed to be used.

Table 6 Noise Management

General Noise Management		
OPERATIONAL PROCEDURES	**COMMITMENTS**	**MANAGED RISK**
• Comply with the *Environmental Protection (Noise) Regulations 1997.*	• The operator will commit to compliance with the Regulations. • The proposed operations comply with the EPA generic buffer distances.	Noted
• Maintain adequate buffers to sensitive premises.	• The operations comply with the EPA generic buffer distances of 300 to 500 metres for a sand pit. • The closest dwelling is to the north at a distance of 1 200 metres from the closest pit face and increasing as excavation proceeds.	Low
• Locate exposed features behind natural barriers and landform.	• Excavation is to be conducted on the floor of the pit behind the faces and natural landform to provide maximum noise screening. Perimeter bunding is to be used where overburden is available, to provide maximum noise screening and safety protection.	Low
• Maintain all plant in good condition with efficient mufflers and noise shielding.	• This will be used and is committed to. All plant is to be maintained in sound condition.	Low
• Maintain haul road and hardstand surfaces in good condition (free of potholes, rills and product spillages) and with suitable grades.	• The access road is proposed to occupy the same footprint as the fire break along the northern edge of Lot 226. • See dust management	Low
• Implement a site code outlining requirements for operators and drivers for noise management.	• A site code is to be implemented and is committed to provide site induction and training for all personnel for all parts of the	Low

	operations.	
• Shut down equipment when not in use.	• Shutdown is to be used to save fuel and maintenance costs in addition to noise minimisation.	Low
• Fit warning lights, rather than audible sirens or beepers, on mobile equipment wherever possible.	• Lights or low frequency frog beepers are to be used rather than high pitched beepers to restrict noise intrusion.	Low
• Provide a complaints recording, investigation, action and reporting procedure.	• A complaints recording and investigation procedure is proposed and will be implemented and maintained.	Low
• Provide all workers with efficient noise protection equipment.	• All personal noise protection equipment will be provided to staff as required.	Low
• Minimise and conduct at the least disruptive times.	• Quarrying is to be conducted during the approved working hours.	Low

7.4 Occupational Noise

Occupational noise associated with the quarrying processes falls under the *Mines Safety and Inspection Act 1994 and Regulations 1995.*

The management of occupational noise is normally handled by providing all necessary hearing protection, as well as conducting worker inductions and educational programs for all staff. Regular site audits of quarry and mining operations are normally conducted by the Department of Mines Industry Regulation and Safety.

As part of its commitments, the proponent – operator will implement noise management;

- by providing all necessary safety equipment such as ear protection,
- identifying sections of the plant where hearing protection is required, as well as,
- conducting induction and educational programs for its staff.

Warning signs are used to identify areas of potential noise associated with mobile plant.

The DMIRS conducts inspections of all quarries.

8.0 VISUAL MANAGEMENT

There are a number of management actions that can be taken in quarries to minimise visual impact and these will be used wherever possible. The general management actions are summarised below together with the visual impact issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise visual impact.

Guidance on visual impact is contained in *Department of Planning, 2007, Visual Landscape Planning in Western Australia (DPLH 2007).* Guidance can also be found in *Forest Commission of Victoria, undated, Landscape Types of Victoria.*

Visual Impact can occur in a number of circumstances, by the operation being set too high in the landscape, by being too close to neighbours and by insufficient visual protection.

The pit is set back 850 metres from Paterson Road behind a significant buffer of trees on the western sand ridge.

Even so there are a number of management actions that can be taken to minimise visual impact and these will be used wherever possible. The general management actions are summarised below and are used where applicable and as the opportunity presents to minimise visual impact.

- The quarry is located behind natural barriers of the western ridge and the intervening trees.
- Excavation is to occur on the floor of the pit below natural ground level.
- Excavation will be staged to work from east towards Paterson Road and in the east from the centre of the ridge to the east to minimise visibility
- The haul and access road are at low elevation along the northern boundary to minimise the visibility of truck movements.
- Overburden and interburden dumps are to be pushed into positions where they will form screening barriers.
- Progressive rehabilitation is to be completed, as completed ground becomes available.

9.0 WATER QUALITY MANAGEMENT

9.1 Water Source Protection Areas

The excavation on Lot 226 complies with DWER Guidelines for water management and separation to the groundwater of > 0.3 metres with a proposed separation of 0.5 metres.

9.2 Water Requirements

The pit is relatively small with short access roads and will be operated intermittently in campaigns.

The water requirements are anticipated to be minimal and sourced from farm supplies. In most cases dust suppression will not be required.

9.3 Water Quality Protection Guidelines

All facilities and procedures on site are designed to comply with the DWER – DMIRS Water Quality Protection Guidelines for Mining and Mineral Processing and are all complied with;

- Minesite stormwater
- WQPN 15 near sensitive water resources and 2019.
- *Department of Water Environment Regulation – South West Region Guideline – Water resource considerations for extractive industries.*

9.4 Surface Water

The location lies within an area of partially winter wet soils of the Pinjarra Plain within the Peel Harvey Catchment.

Surface water is confined to winter wet conditions where the low lying areas outside the proposed sand excavation have temporary perched water lying on parts for variable times following heavy or sustained winter rainfall.

This results from the sand above the underlying slowly permeable clays becoming saturated with water when the rate of rainfall exceeds the permeability of the underlying clays and evaporation rates are lower. This is a temporary perched water table and does not reflect the regional water table.

The sand ridges are never wet.

As the land surface is flat, with the lower elevations rising from 8 metres AHD in the west to 10 metres AHD in the east, there is potentially a very slow westerly flow of any winter perched surface water that winds itself around the sand ridges. Those flows are restricted by the sand ridges. There is also potentially a flow to the north west towards Nambeelup Brook through the sand ridges but this is very slow.

There is however no stream surface water flow locally on Lot 226 to Nambeelup Brook the north and west.

Surface water does not impact on excavation of the sand ridges.

9.5 Groundwater

See also Section 4.4 Hydrogeology.

There was extensive measurements of the temporary perched winter surface water on the lower elevated areas and under the sand ridges in September 2002 when the site was assessed for its capability to accept waste water systems.

The elevation of the temporary perched water rises from wetting the surface at 8 metres AHD in the west to 10 metres AHD in the east. The shallow gradients of the land and water, and the low lateral permeability, means that any westwards flow of this temporary perched water is slow. That perched temporary water table is explained in Section 4.4 Hydrogeology. It occurs for several months in winter and leads to the surface water forming on the sandy clay soils

The regional groundwater is not exposed on Lot 226 with the exception of the excavated soak in the south western corner. This soak is an expression of the regional water table at that location. The land surface at that location is at an elevation of 7.5 metres AHD, with the regional winter water table rising to that elevation in winter as a perched water table but dropping to around 6.0 metres in summer.

Department of Water Environment Regulation groundwater mapping show groundwater elevations as 5.5 metres AHD on the western boundary and 10 metres on the eastern boundary of Lot 226. See Figures 5 and 6.

Excavation will skim the sand from the ridges bringing the surface elevation of the ridges to 0.5 metres above the winter wet temporary water, but 1 – 2 metres above the regional groundwater elevation.

That will maximise the pasture potential of the excavated land.

The pit floor will maintain a 0.5 metre separation to the water table in compliance with Department of Water Environment Regulation *WQPN 15, Water Quality Protection Note "Basic Raw Materials - Extractive 2019*, and Department of Water Environment Regulation – *South West Region Guideline – Water resource considerations for extractive industries,* that provides guidelines for quarries within catchments.

The separation to the temporary winter perched water will be determined by Piezometers installed on the floor of the pit as the pit progresses forward.

The operator and application commits to minimising water impacts and will implement the measures outlined in Water Management Plan.

9.6 Salinity

Precipitation falling on the site is fresh.

9.7 Dewatering

No dewatering is proposed. All water will be retained in the pit and infiltrate into the sand.

9.8 Recharge

The area has no surface drainage because of the permeable and porous nature of the sand. There is no surface drainage from the excavation site. All excess water infiltrates the permeable sand.

There will be no alteration to drainage lines, and neither surface water nor ground water will be affected. On closure the surface will continue to be free draining to the water table.

Discussions of the recharge on sand and limestone areas can be found in Environmental Protection Authority in Bulletins 512, 788, 821 and 818, and whilst these do not specifically refer to the extraction of basic raw materials they do consider the impact of clearing, planting trees and rural residential developments.

The figure the EPA used for recharge from native vegetation was 10 – 15% rainfall, but in this case with degraded vegetation that figure is likely to be in the order of 20 – 25 % whereas cleared land had a recharge of 30 – 40 %.

The floor of the quarry will cleared and so there will not be any reduction in recharge to the site ,but a small increase in recharge by converting the vegetation to parkland pasture.

The site prior to excavation was pasture and will be returned to pasture even though it will be at a lower elevation. The change in recharge as a result of excavation is likely to be around 10% or equivalent to an increase in rainfall per annum of around 65 mm for the excavated areas. This will not be significant and will assist even in a small way of maintaining environmental flows in a drying climate.

As water for dust suppression is not anticipated to be required there is not anticipated to be any draw on the groundwater.

The proposed operation complies with all Government Policies and Guidelines.

9.9 Acid Sulfate Risk

As Discussed in Section 2.6 there is no identified acid sulfate risk and as there will be no excavation below the water table there will be no potential to impact on acid sulfate conditions even if they occurred. In addition, the lower wetter elevations are excluded from exaction.

9.10 Unauthorised Access and Illegal Dumping

- The potential for rubbish to be dumped relates to unauthorised access to the site. Access is restricted by current farm fencing and locked gates.

- Wastes generated from on site operational activities will be recycled wherever possible and periodically disposed of at an approved landfill site.

- Any illegally dumped materials are to be removed promptly to an approved landfill or other suitable site, depending on the nature of the material.

9.11 Wastewater Disposal

A serviced portable toilet is proposed to be in place while the site is operating. Serviced means they are pumped out by a licensed contractor.

9.12 Refuelling

Fuel management will be in accordance with the relevant guidelines. The methods to be used are summarised below.

Documents specific to the fuel and maintenance are the DOW – DMIRS Water Quality Protection Guidelines for Mining and Mineral Processing

- *WQPN 60 – Tanks for mobile fuel storage in PDWSAs.*
- *WQPN 15 – Basic Raw Materials, Extractive Industries 2019.*
- *Department of Water Environment Regulation – South West Region Guideline – Water resource considerations for extractive industries.*

Refuelling - Fuel Management Plan

- There will be no onsite fuel storage. The loader will continue to be refuelled on site from a mobile tank or tanker. This method is used on most mine and construction sites as well as many farming properties.

- Refuelling on site will occur in the active pit area to allow for containment if any spill did occur.

- The main risk of contamination is the minor drips that occur during the removal of hoses etc. Minor spills are quickly degraded by soil microbial matter.

- The only other risk is from a tanker t rupture, but tanks are designed to manage this eventuality and are normally double skinned and approved to the relevant standards.

- The operators of the mobile refuelling facilities are trained in re-fuelling duties including the management of any spills.

- In the event of a spill or adverse incident, activities will be stopped in that area until the incident is resolved.

- Spillage will be contained in plant and working areas by shutting down the plant or equipment (provided it is safe to do so). The sand will provide absorbency and will retain any spill.

- Soil contaminated by spills will be removed from the site to an approved disposal area.

- All significant adverse incidents (such as a fuel spill of >5 litres) in one dump, are to be recorded, investigated and remediated. A record is to be kept of incidents, and DWER, and Shire of Murray notified within 24 hours of an incident.

9.13 Servicing and Maintenance

Documents specific to the fuel and maintenance are the DWER Water Quality Protection Guidelines for Mining and Mineral Processing

- *WQPN 15 – Basic Raw Materials, Extractive Industries 2019.*

The main risk of contamination comes from tank or hose rupture on earth moving machines.

- All major servicing of vehicles will be conducted off site.

- The loader will be parked at a secure site at night and minor servicing will be conducted there if required.

- Regular inspections and maintenance of fuel, oil and hydraulic fluids in storages and lines will be carried out for wear or faults.

- In the event of a small service item being required during operations, such as lubricating and maintenance activities, these will be carried out in designated areas in the pit. Equipment for the containment and cleanup of spills is to be provided as required.

- Waste oil and other fluids derived from the routine maintenance of mobile machinery, will be transported off site and disposed off at an approved landfill site. Grease canisters, fuel filters, oil filters and top-up oils will be stored in appropriate containers in a shed or brought to the site as required.

- If any spillage occurs it will be contained in the plant and working areas by shutting down plant or equipment (provided it is safe to do so).

- Accidental spill containment and cleanup protocol will be implemented as necessary.

- Non essential or old operating plant and materials will be removed from the site. Locked gates and the existing fences will be maintained to prevent illegal dumping and contamination of water.

- There will be no waste disposal on site. Wastes generated will be recycled wherever possible and periodically disposed of at an approved landfill site. Any waste materials derived during routine maintenance activities will be stored in appropriate sealed containers within a designated storage area or taken from site and disposed of at an approved facility.

- Regular inspections (at least weekly) are to be conducted when operational to ensure no wastes, litter and the like are present in or around the excavation and processing area.

10.0 BIODIVERSITY MANAGEMENT

10.1 Flora

The excavation area is partially cleared, or consists of generally good to degraded vegetation as described in the attached Flora and Vegetation Study.

The vegetation was assessed by PGV Environment who found the vegetation to be part of the Bassendean Central and South vegetation complex which is described as ranging from "woodland of *Eucalyptus marginata – Allocasuarina fraseriana – Banksia* species to low woodland of *Melaleuca* species and sedgelands on the moister sites. This area includes the transition of *E. marginata* to *E. todtiana* in the vicinity of Perth" (Heddle et al., 1980). The vegetation on the site meets the general description of this vegetation complex which was found by PGV Environmental to most likely match FCT 21a and 21c, neither of which are listed as a Priority vegetation community (PGV Environmental; page 6.

Eight vegetation types were recorded by PGV Environmental on the site on dry sandy soils with two small areas containing vegetation types considered fringing wetland vegetation.

The vegetation on the highest parts of the site contained a mix of *Allocasuarina fraseriana/Eucalyptus marginata* Low Open Woodland with *Xylomelum occidentale* and occasional *Banksia menziesii* and *B. ilicifolia* also present as small trees. The lower and mid-slopes of the survey area were dominated by dense stands of Spearwood (*Kunzea glabrescens)* with *Jacksonia furcellata* also common. *Banksia attenuata, B. menziesii* and *B. ilicifolia* occurred on the mid-slopes among the dense Spearwood but never in abundance. The understorey in all vegetation types was very sparse with a low diversity of native species;

PGV found most of the vegetation to be in "Good" Condition with some "Degraded" areas.

The vegetation adjoins a newly created "A" Class Reserve to the north.

No Priority or Threatened flora species were recorded by PGV Environmental. To confirm this a spring targeted survey will be conducted in support of the Application for a Clearing Permit.

The land will be returned to pasture and productive agricultural land of pasture with clumps of trees and shrubs and local native shrubs on the steep batter slopes.

A Clearing Permit will be applied for and that process will further evaluate the loss of vegetation and restoration of the site.

From PGV Environmental mapping the6.9 hectare resource are has been selected to avoid Banksia Woodland and any cockatoo habitat trees.

A total 12.7 hectares of predominately *Kunzea glabrescens* dominated regrowth and disturbed vegetation contains native vegetation and will require a Clearing Permit.

The western ridge *Banksia* Woodland in better condition constitutes 10.0 hectares.

A vegetation and wildlife corridor will be established at the end of excavation. See Figure 2.

10.2 Fauna

Native fauna is likely to be significantly depleted on the existing pasture and reduced in other areas. The potential impacts on significant fauna are also considered during the assessment for a Clearing Permit.

The adjoining land to the north is identified as part of the buffer to the Nambeelup Industrial Area and will remain. A vegetation remnant occurs on that and is now classified as an "A" class Reserve.

The *Banksia* Woodland on the ridge in the west, which is in the best condition, is not proposed to be cleared.

PGV Environmental completed a fauna study of Lot 226 and found that the Open Woodland Habitat may provide some foraging habitat for Baudin's Black Cockatoos *Calyptorhynchus baudinii*), Carnaby's Black Cockatoos (Calyptorhynchus *latirostris*) and Forest Red- tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) as it has some tree species that are recognised foraging habitat (Valentine and Stock, 2008; Groom, 2011).

All *Banksia* Woodland and Cockatoo feeding habitat is excluded from the proposal.

Some trees with a diameter at breast height greater than 500mm were observed on the site. This tree is a potential breeding habitat tree. All habitat trees are excluded from the excavation and provided with over 10 metre setback from the edge of the drip line, to be surveyed and marked and fenced in the field prior to commencement of excavation.

The Southern Brown Bandicoot, Quenda (*Isoodon fusciventer*) (Priority 4) could potentially occur on the site. Dense vegetation suitable for Bandicoots is also present on the vegetated flat portion of the Lot that is not proposed for sand extraction as well as on the lot to the north. Bandicoots are very adaptable and can move rapidly away from small areas of land as it is cleared and readily adapt to human activities.

The potential for impacts on Black Cockatoos, Bandicoots and any other fauna are required to be and will be considered during the application for a Clearing Permit. A vegetation and wildlife corridor will be established at the end of excavation. See Figure 2.

10.3 Wetlands

The lower lying areas on site are classified as winter wet. A number of these have been previously nominated as wetlands (Hill et al, 1996, *Wetland Mapping, Classification and Evaluation, Wetland Atlas,* Water and Rivers Commission and Department of Environment Protection).

PGV Environmental noted the presence of two wetlands mapped on the lot but outside of the survey area. Most of the lot contains part of Multiple Use Palusplain Unique Feature Identifier (UFI) 15802 and part of a Resource Enhancement Sumpland UFI 5031. (PGV 2019 page 4).

The Resource Enhancement wetland in the north eastern corner is shown on Figures 7 and 8. The wetland is vegetated with *Melaleuca preissiana* and is protected. Even though it is up hydraulic gradient a 50 metre setback is provided, in compliance with DWER setback guidelines.

The wetlands are winter wet pasture with some having wetland species. As all of Lot 226 is a grazing property all such pasture is subject to itinerant grazing which concentrates on the pasture. The wet pasture east of the sand resource is provided with a 20 metre buffer even though it is pasture.

None of the wetlands will be impacted by excavation. The more significant areas will be provided with appropriate buffers, with the wet pasture areas remaining as summer pasture.

10.4 Stygofauna – Troglofauna – Short Range Endemics

Stygofauna, occur in caves and "are aquatic subterranean animals, found in a variety of groundwater systems". Troglofauna occur in air chambers in underground caves or smaller voids.

There is no thick limestone on the resource area and therefore no potential for stygofauna. Sand readily collapses and does not provide cavities and so there is no potential for Troglofauna.

The land system is part of an extensive system of similar geomorphology and biodiversity. Therefore there is no potential for short range endemic species to be restricted to or occur on Lot 226.

10.5 Weeds and Plant Diseases

Weed and plant disease management plans are included in the Closure Planning.

10.6 Conservation Areas

Shire of Murray Local Biodiversity Strategy 2013

The Shire of Murray Local Biodiversity Strategy 2013 seeks to protect specific biodiversity features on rural and other land, protect natural areas on zoned lands, maximise retention of all Local Natural Areas, protect and enhance ecological connectivity and protect and manage Local Natural Areas on reserved land.

The project has been designed to comply with the strategy as best as possible under the constraints of extraction and the need for sand resource.

The vegetation on site is classified as lying within Priority Two Vegetation Complex of Bassendean Central and South of which 3057.42 hectares or 22% remained in 2013.

Table 7 Compliance with Shire of Murray Biodiversity Strategy

Special Biodiversity Features	**Shire of Murray Protection Target (Relevant Targets only)**	**Proposed Actions - Compliance**
Rare and significant species of flora	All known "Threatened flora is to be protected. All natural habitat for Priority listed flora species are to be protected.	• PGV completed a vegetation study and targeted Spring survey. • No Threatened or Priority flora were recorded. • The *Banksia* Woodland has been excluded from the proposed development. • The pit will be surveyed and clearly marked prior to opening to ensure the *Banksia* Woodland is protected. See Figure 7.
Black Cockatoo Roosting Habitat	All breeding and roosting habitat in intensive zones of urban industrial and the like are to be protected.	• Cockatoos have considered and habitat trees and feeding habitat has been excluded from the proposed sand pit. • All habitat trees are provided with a minimum of 10 metre setback from the drip line of the trees. • The pit will be surveyed and clearly marked prior to opening to ensure the habitat trees are protected. • Cockatoos will be further assessed as part of the application for a Clearing Permit. • All habitat trees were identified and are retained. • See Figure 8.
Black Cockatoos foraging habitat.		• The property is rural and not a listed intensive land use. Parkland pasture and native vegetation will be

		returned. • Cockatoos have considered and habitat trees and feeding habitat has been excluded from the proposed sand pit. • The pit will be surveyed and clearly marked prior to opening to ensure the *Banksia* Woodland is protected.
Significant species of fauna or other specialty listed fauna.	Habitat for significant fauna are to be protected within intensive zones.	• The property is rural and not a listed intensive land use. Parkland pasture and native vegetation will be returned. • The key listed fauna are Black Cockatoos as considered above. • The other is the Quenda. Quenda are versatile species that readily move ahead of clearing. There is significant vegetation habitat suitable for Quenda retained. Much of the pit footprint is cleared and clearing will be conducted in stages allowing most larger fauna such as Quenda to move during the clearing. • A vegetation and wildlife corridor will be established at the end of excavation. See Figure 2.
Threatened Ecological Communities	These should be protected with suitable buffers.	• There are no on site Threatened Ecological Communities. *Banksia* Woodland is listed as a TEC under the *EPBC Act 1999*, It is excluded from excavation. See Figure 7.
Wetlands and wetland vegetation	Conservation category wetlands are to be protected.	• The wetlands on site are mainly palusplain. There are no conservation category wetlands. • There is a Resource Enhancement Wetland in the north eastern corner which is provided with a 50 metre set back that complies with DWER Guidelines • The low elevations of palusplain will not be impacted by the proposed extraction of sand. The closest area is east of the sand ridge where a buffer of 20 metres is provided. See Figures 7 and 9.
Waterways	Protect Riparian vegetation associated with natural watercourses.	• There are no watercourses on site, although Nambeelup Brook runs east west across the lot to the north.

Biodiversity Linkages

The Nambeelup Industrial Area proposes two biodiversity east west linkages.

It is not clear what status these have because the northern one crosses the runway of the airstrip and is not compatible with aircraft.

The southern linkage loops across Lot 224 adjoining to the north where *Banksia* Woodland is now classified as an “A” Class Reserve and then loops across the vegetation on Lot 226.

Much of that linkage covers the wetland vegetation on Lot 226 that will not be impacted. By planting local native vegetation along the north eastern edge of the wetland, as proposed, the linkage will be maintained. A vegetation and wildlife corridor will be established at the end of excavation. See Figures 1 and 2.

"A" Class Reserve on Lot 224

The reserve will continue to be linked as the linkage will be re-established at the end of excavation through the wetland and with local native vegetation planting. See Figure 2.

The access road will only travel along the fire break near the Reserve in the west. In the central and eastern part there will be a 20 metre vegetated buffer retained along the northern boundary.

11.0 CLOSURE

11.1 Background

The site is located on Lot 226Paterson Road, Nambeelup.

The land is zoned General Rural in the Shire of Murray Town Planning Scheme No 4.

11.2 End Use

The extraction areas will be returned to agriculture production as pasture and native vegetation.

At the end of excavation, any overburden will be used to backfill the site in compliance with the safety considerations of the *Mines Safety and Inspection Act 1994* and the requirements and guidelines of the Department of Mines Industry Regulation and Safety; For example *Guidelines on Safety Bund Walls Around Abandoned Open Pits 1991*.

The excavated floor will be flat to gently sloping at 1 : 10 vertical to horizontal at 0.5 metres to the water table to enable a productive agricultural end land use.

Pasture production is maximised by lowering the pasture land surface to a separation of 0.5 metres to the water table, capillary action will occur and the pasture will be able to gain soil moisture into summer. Capillary action allows for rises of soil moisture by 300 – 500 mm and, with root depth considered, land formed 0.5 metres above the temporary perched winter water table. The proximity to the groundwater will enable pasture to grow through summer, therefore providing significantly improved agricultural values. The floor of the excavation is 2 metres above the regional water table as determined by DWER mapping. Figures 5 and 6.

The sand resource and natural soils are leached white sand over pale coloured sand across most of the excavation footprint. With the removal of the leached upper layers of sand the remaining sand will have much higher phosphate retention which will assist with future rural land uses.

Measurements of the water table will be completed using the on site water monitoring bores and additional piezometers installed in the floor during excavation to verify the separation to the perched seasonal water table.

Any surface water exposed by excavation will be backfilled to ensure compliance with the 0.5 metre separation.

Concept final batter slopes and a contour plan are attached at Figures 4 and 6.

11.3 Mine Closure Considerations

The extraction of sand is an interim use prior to a return of the area to local native species, in areas of native vegetation with parkland pasture in previously cleared areas, enabling a final end use of rural living or alternative compatible use.

At this stage the most appropriate end use is to restore the surface to be visually compatible with the surrounding rural land surface.

Rehabilitation will be directed towards revegetation to parkland pasture and local native species.

Rehabilitation will contain Dieback and Weed Management in addition to monitoring and replanting failed areas.

Appropriate topsoil management is seen to be an important element in achieving successful rehabilitation and plant re-establishment on the restored surface.

Rehabilitation will progressively follow mining, with completed areas of the excavation being revegetated as soon as practicable.

Rehabilitation is to take place during the first winter months to minimise compaction effects.

The site specific issues that relate to this site are also listed to explain how this site compares to the general rehabilitation guidelines.

Table 8 Materials Inventory

Type	Comment	Treatment	Reference
Soil	Topsoil is natural and contains no detrimental materials.	None required. To be used in rehabilitation.	
Subsoils - Overburden	Subsoil sand is natural and contains no detrimental materials.	Non required. Generally taken as resource.	
Waste rock and non surface material and tailings	Not present. The pit bottoms in earthy yellow sand which is a natural material normally occurring on the surface.	None required.	
Saline surface water	The water quality is fresh.	No treatment necessary	
Saline ground water	The water quality is fresh.	No treatment necessary	
Acidic materials and drainage	Not present. The sand does not contain sulfides and there is no risk of acidic materials developing.	No treatment necessary.	Field geological examination by Landform Research
Sodic or dispersive materials	The water quality is fresh.		Field geological examination by Landform Research
Asbestos – asbestiform minerals	None present.		Field geological examination
Radioactive materials	Not present	The sand does not contain radioactive minerals.	Published WA Geological Survey radiometric mapping
Metallic or chemical materials	Not present	No metallic or sulfidic materials or minerals are present in the Spearwood/ Bassendean sands.	Field geological examination and experience and published information.
Tailings storage	Not required		
Ablutions waste		Serviced portable toilet system will be used.	Section 9.0 Water Quality Management
Dangerous Goods and Hazardous Materials	***None will remain on closure***.	There are normally no hazardous materials used for sand mining apart from fuel, and servicing. The only other materials are for tasks such as weed management and	

		are dealt with under those sections. The site will be checked at closure to ensure no such materials remain.	
	FUEL The various plant will be refueled from mobile tanker. ***None will remain on closure***.	Any soil or other materials with drips and spills will be removed offsite to an approved waste site or location.	Section 9.0 Water Quality Management
	SERVICE MATERIALS Only minor lubrication will be conducted on site All major servicing will be conducted offsite. ***None will remain on closure***	Any wastes will be collected and removed from site promptly to an approved recycling or waste disposal area. Only minor servicing will be conducted on site. All major servicing will be conducted offsite.	Section 9.0 Water Quality Management
General waste		Regularly removed from site to an approved disposal area. The site will be checked at closure to ensure no such materials remain.	Section 9.0 Water Quality Management

11.4 Rehabilitation Objectives

Rehabilitation will be directed towards revegetation to parkland pasture and local native species.

The land surface will be returned to a form that matches the surrounding land.

Rehabilitation will progressively follow mining, with completed areas of the excavation being revegetated as soon as practicable.

Minimise impacts on wildlife linkages.

Completion criteria

- Stable post-mining landscape, and the minimisation of wind erosion.
- Provide for the protection of the local groundwater resource in terms of both quality and quantity.
- Provide a self sustaining cover of pasture on the floor of the pit.
- Achieve weed species at levels not likely to threaten the native species on batter slopes.
- Completed pasture on the floor, at slopes of 1 : 10 vertical to horizontal.
- Pasture established at 0.5 metres above the highest known perched winter water table.
- Maintenance of wildlife linkages.

Parkland Pasture

Provide a self sustaining cover of parkland pasture on existing cleared areas, and local native groundcovers, shrubs and trees on areas of native vegetation to be cleared.

Achieve clumps and belts of trees and shrubs at 50 per hectare in the parkland pasture areas.

Native Vegetation – Wildlife Corridor (See Figure 2)

Achieve plant density of 1 native plant per 5 m^2 in native vegetation rehabilitation at three years.

Achieve a species richness of 5 native species per 100 m^2 in native vegetation rehabilitation at three years.

Provide a self sustaining cover of local native Banksia Woodland species that replicates Banksia Woodland on pre-mined areas of original native vegetation.

Depending on the success of rehabilitation, evolving community standards, and new research, the completion criteria may be adjusted to reflect emerging trends and also adjusted in terms of cover and species richness, depending on the results achieved and emerging technologies or techniques.

11.5 Rehabilitation Procedures

- ***Vegetation Clearing***

The site is a mixture of native vegetation and previously cleared areas and parkland pasture.

Pasture will be taken with the topsoil.

Seeds and other genetic material will be collected from native vegetation if suitable areas are available for rehabilitation. This will assist in the preservation of genetic material, such as on batter slopes and in green belts.

Where practicable vegetation will be directly transferred to a batter slope or other area being rehabilitated. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable, for example on the batter slopes of worked out areas. It will be laid on re-formed slopes to reduce wind and water erosion as well as provide a source of seeds for revegetation.

If direct transfer is not possible the vegetation will be stored in low dumps to 1 metre high or swapped with a nearby operator to try and ensure that the material is not wasted.

- ***Topsoil and Overburden Removal Replacement***

Where possible topsoil and overburden will be directly transferred from an area being cleared to an area to be rehabilitated. This will retain the organic carbon fraction, improving soil properties such as resistance to water and wind erosion and moisture retention.

Topsoil will be spread directly from an area being cleared where possible, otherwise reclaimed from a topsoil dump.

Overburden, when available, will be pushed to the perimeters to assist with visual and noise screening. From there it can be used for the rehabilitation process.

Where possible topsoil clearing and excavation will be undertaken in wetter months.

- ***Landform Reconstruction and Contouring***

Any temporary structures, fixtures, equipment and machinery associated with sand excavation will be removed from site on completion.

The floor will be retained as gently sloping, installed with a sediment settlement sump.

The floor will be deep ripped and formed at slopes of 1 : 10 vertical to horizontal.

The land surface will be formed to the requirements of the *Mines Safety and Inspection Act 1994 and Regulations 1995* as a final land surface.

A minimum of 100 mm of topsoil where available. will be spread over the surface where available to provide a substrate for agriculture.

Experience by Landform Research on sand rehabilitation on mining leases is that good revegetation can be achieved by planting into soft overburden and deep ripped sand floor, if suitable local species are used.

Vegetation Establishment

- ***Pre-Planting/Seeding Weed Control***

Pre-seeding weed control is only likely to be required where topsoils are used that contain weed species such as in the existing parkland pasture areas.

If required, this is normally only conducted after overburden and topsoil have been spread and any seeds have been allowed to germinate. Broadscale weed treatment can be detrimental to the germination and growth of native species but may be required if the weed load is to be reduced.

In May, after the first autumn rains, check for grass germination. Where grass has the potential to inhibit rehabilitation, such as areas to be returned to native vegetation, use a licensed contractor to spray with Fusillade or other suitable herbicide. In areas of parkland pasture, grass cover is desirable.

Any weeds likely to significantly impact on the rehabilitation will be sprayed with Roundup or similar herbicide or grubbed out, depending on the species involved. Weed affected topsoil and overburden will be buried. The Weed Management Plan will form the basis of weed treatment. Depending on the nature of the planting substrate, a broad spectrum spraying program may be used. In areas where grass only is a potential problem, grass specific sprays will be used. In some areas where topsoil from cleared native vegetation is available no spraying may be required.

See Weed and Dieback Management Procedures (following).

- ***Pasture and Parkland Areas***

The preferred method of revegetation is to use the pasture seed from existing topsoil on pasture areas. However this may be deficient and additional seed is likely to be required.

Topsoil will be spread to increase the total organic carbon fraction, improving soil properties such as resistance to water and wind erosion and moisture retention.

Topsoil provides a useful source of seed for rehabilitation when the correct handling of the topsoil is used, stripped and replaced dry (autumn direct return).

However if sufficient seed is not available or does not germinate then additional seed will be added. The establishment of pasture, including the selection of the pasture species is appended to this Management Plan. The documentation is produced by the Department of Primary Industries and Regional Development.

For pasture land in this situation 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 to loamy gravel soils. Suitable perennial legumes include Birdsfoot trefoil, Lucerne, Strawberry Clover, and Sulla. Perennial pasture includes Perennial Ryegrass, Phalaris, Cocksfoot, and Summer Active Tall Fescue, Kikuyu and Rhodes Grass. Annual pasture species include Italian Ryegrass, Serradella, 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.

Studies have shown that topsoil stripping and placement is best undertaken in summer for maximum germination, but this raises the potential for additional dust generation from the fine humus particles.

Any weeds likely to significantly impact on the rehabilitation are to be sprayed with Roundup or similar herbicide or grubbed out, depending on the species involved. Generally this has not been required in the past because the weed load is low. Pasture species may need to be sprayed with a grass specific spray such as Fusilade or a broad spectrum spray such as Glyphosate to reduce the competition with the revegetation.

If sufficient vegetation does not germinate from the respread top soil, the area will be seeded in early Autumn with a mixture of pasture species.

- ***Perimeter Native Vegetation Areas, Wildlife Corridor and Clumps***

A vegetation and wildlife corridor will be established at the end of excavation. See Figure 2.

Any recovered vegetation will be spread including leaf, root and organic matter collected from the land clearing procedures. This will increase the total organic carbon fraction, improving soil properties such as resistance to water and wind erosion and moisture retention. The difference in properties between existing topsoil and subsoils is not considered a major impediment to rehabilitation of native species in the area.

Topsoil will be re-distributed in rehabilitated areas to depths of 50 mm where available. Whilst burning is not always practicable the mixing of topsoil with ash and charcoal from burnt vegetation has shown a demonstrated improvement in the germination of local native species by triggering some species that do not normally germinate and by increasing germination rates.

Topsoil provides a useful source of seed for rehabilitation when the correct handling of the topsoil is used, stripped and replaced dry (autumn direct return). Maximum depth of 50 mm can be used to optimise revegetation of species-rich plant communities preferably spread before the end of February.

Studies have shown that topsoil stripping and placement is best undertaken in summer for maximum germination, but this raises the potential for additional dust generation from the fine humus particles.

Topsoil will be spread directly from an area being cleared where possible, otherwise reclaimed from a topsoil dump.

Rehabilitation will take place during the first winter months following the restoration earth works of each particular section of quarry. Leaving the completed earth works for one season will reduce the success of rehabilitation by at least 50%, due to compaction effects.

A combination of the three methods is always preferred by Landform Research and has proven to be the most versatile and successful. The amount and species of additional seed and tube stock depends on the quality and seed store within the topsoil, and may vary from stage to stage.

Seeds of indigenous species will be scattered during late summer at the rate of approximately 1 - 2 kg seeds per hectare if required.

Seeding conducted in summer will use scarified leguminous seeds that have been “dry smoked”. Seeding conducted in July to August will have the leguminous seeds heat treated and all seeds will be smoke treated by soaking in “smoke water” for 24 hours prior to seeding.

Seed spreading will be achieved either using mechanical seed dispersal equipment or using manual methods. Bulking with a spreading agent such as sawdust, vermiculite or sand is desirable.

Plant additional tube plants of local native species per hectare, at rates of 200 – 1 000 in June, in the areas of native vegetation, depending on the quality of the topsoil and its potential weed load.

Rehabilitation will progressively follow mining with completed areas of the excavation being revegetated as soon as practicable.

- ***Fertiliser***

Use a 10 g tree tablet or small handful of fertiliser beside each tube plant if required. Experience shows that this is not normally necessary.

Further investigation will be needed to determine suitable rates and the timing of fertilisation. It may be possible to integrate seed dispersal and fertilisation into a single pass. The fertiliser will need to supply macro-nutrients, phosphorus, nitrogen and potassium, and other micro-nutrients.

- ***Irrigation***

Experience by Landform Research has shown that, when completed well, there is no need for irrigation of the rehabilitation. It is cheaper to use additional seed than to install irrigation.

- ***Erosion Control***

Soil erosion occurs when soil is exposed and disturbed by wind or water. Erosion involves soil particles being detached from areas not adequately protected by vegetation, and moved down-slope or blown by the wind.

The soils are very permeable and runoff is normally minimal unless surface materials become non-wetting. Even so experience shows that there is minimal non wetting and surface particle movement under such conditions.

Water erosion on the batter slopes can be avoided by the permeability of the materials and by leaving the surface soft, rough and undulating, with the undulations running along contour on the batter slopes. The final machinery run should be along contour and not down slope.

Wind erosion will be controlled by rehabilitating the disturbed ground as soon as practicable and leaving the soils 0.5 metres above the winter temporary perched water level.

If wind erosion and soil stability become an issue measures will be taken to stabilise the soils. These could include but not be limited to fence wind breaks, spray mulching, cover crops, interim native vegetation or spreading mulch and vegetation.

For rehabilitation areas, revegetation will take place as soon as possible following landform and soil reconstruction.

Cleared vegetation will be transferred from an area being cleared, to protect against erosion, assist with habitat creation and provide a seed source.

Control of wind erosion potential will be assisted by spreading brush and vegetation across the topsoil on the batter slopes and reconstructed soils where local native vegetation is to be established.

- ***Monitoring***

During late summer an assessment of the success of the rehabilitation will be made to determine the rehabilitation requirements for the following winter.

Monitoring includes visual assessments and, where necessary, counts to determine the success of the rehabilitation and restoration, as follows;

- plant density
- species richness
- plant growth
- plant deaths
- regeneration
- weed infestation
- soil stability and resistance to erosion

As necessary steps will be taken to correct any deficiencies in the vegetation.

Rehabilitation of each stage will be monitored for a period of three years to ensure that the excavated site is stable and not subject to significant erosion.

Provide ongoing weed management to identify and treat significant environmental weeds or weeds likely to impact on the rehabilitation.

In areas of rehabilitation that do not meet the completion criteria measures are to be taken to increase the stem density to achieve the completion criteria. This could include but not be limited to;

- additional seeding,
- Planting additional tube plants
- Use of additional topsoil

Suggested Plant Species to be Used

The species identified in the Flora and Vegetation Study will be used. However not all of these will be commercially available and some will be returned through the use of local topsoil.

All species are suitable for seeding
# Indicates more suitable for low elevation and moist sites.

VEGETATION STRUCTURE	**HEIGHT**	**KEY SPECIES (to be overseeded or planted)**
Tree Overstorey	> 4 m	*Corymbia (Eucalyptus) calophylla* *Eucalyptus marginata (sandplain)* *Eucalyptus rudis #* *Eucalyptus todtiana*
Tall Shrub layer	3 – 6 m	*Acacia saligna* *Allocasuarina fraseriana* *Banksia attenuata* *Banksia menziesii* *Banksia ilicifolia* *Banksia litoralis #*
Lower Shrub Layer	0.5 – 3 m	*Viminea juncea* *Jacksonia furcellata* *Jacksonia sternbergiana* *Jacksonia floribunda* *Viminea juncea* *Kunzea glabrescens* *Allocasuarina humilis* *Melaleuca thymoides* *Adenanthos cygnorum*
Ground Cover Low Shrubs	<0.5 m	*Acacia pulchella and other small local Acacia* *Hardenbergia comptoniana* *Kennedia prostrata* *Gompholobium tomentosum* *Bossiaea eriocarpa* *Melaleuca trichophylla* *Eremaea pauciflora* *Hemiandra pungens* *Stirlingia latifolia* *Nemica reticulata* *Hypocalymma angustifolium* *Hypocalymma robustum* *Petropile linearis* *Petrophile monostachya* *Anigozanthos humilis* *Anigozanthos manglesii* *Patersonia occidentalis* *Other herbs, rushes and annuals*

PLANT PATHOGEN, WEED and DIEBACK MANAGEMENT

Plant Pathogens

Dieback of vegetation is often attributed to *Phytophthora cinamomi* even though there are other *Phytophthora* species and other diseases such as *Armillaria* that can cause dieback like symptoms. Microscopic soil-borne fungi of the genus *Phytophthora* kill a wide range of native plants and can cause severe damage to many vegetation types, particularly those from the families Proteaceae, Epacridaceae, Xanthorrhoeaceae and Myrtaceae.

In most cases dieback is caused by a pathogen which infests the plant and causes it to lose vigour, with leaves dying, and overtime may kill the plant. As such the management of Dieback is essentially related to plant hygiene when coming onto a site and within a site.

There are several guides to the management of Dieback.

- Department of Biodiversity Conservation and Attractions *Phytophthora* Dieback Management Manual, Forest and Ecosystem Management , October 2017.
- Department of Biodiversity Conservation and Attractions *Phytophthora* Dieback Management Plan, October 2017.
- Dieback Working Group 2005, Management of Phytophthora Dieback in Extractive Industries.
- Dieback Working Group, 2000, Managing *Phytophthora* Dieback, Guidelines for Local Government.

Jarrah Dieback (*Phytophthora cinnamomi*) is widespread throughout this part of the State, but in many cases such as this site the vegetation is not interpretable because of the levels of disturbance.

It is unclear whether dieback or other pathogens already occur on site. With the level of disturbance, previous activities and the degree of disturbance to vegetation it is likely that pathogens already exist on site.

However as part of normal best practice, plant disease management actions will be used, therefore the following general principles are applied to Dieback management.

The aim of dieback management during excavation is to minimise the risk of entry of any additional plant pathogens to the site.

In many ways the management of the site for dieback is similar to that for the management of weeds, and the two management practices are considered together.

There is very little risk of the operations spreading dieback onto vegetation on adjoining properties as there is no access to those properties and they are cleared.

On the other hand good management practices are used as part of the ongoing normal quarry operations.

Not all potential impacts apply to all parts of the proposed quarry operations.

- DBCA 2017 and Dieback Working Group 2005, Guidelines will be followed.
- Vehicles are to be prohibited from entering vegetation ahead of excavation, apart from normal travel along made firebreaks and roads for normal security and maintenance activities.
- Dieback diseases are more likely to be transported under moist soil conditions.
- All vehicles and equipment used during land clearing or land reinstatement, will be clean and free from soil or plant material when arriving at site.
- When removing topsoil and clearing, vehicles will run around the perimeter and then push inwards where possible.
- Remnant vegetation ahead of the stage to be excavated is proposed to be quarantined where possible to minimise vehicles from entering.

- No soil and vegetation is to be brought to the site apart from that to be used in rehabilitation and that which is dieback free.
- Plants to be used in rehabilitation are to be certified as from dieback free sources.
- Unwanted access to vegetated areas is discouraged through reduced tracks, signage, site marking and or fencing as appropriate.
- Excavation vehicles will be restricted to the excavation area apart from clearing land.
- Rehabilitated surfaces will be free draining and not contain wet or waterlogged conditions.
- Illegally dumped rubbish is to be removed promptly.
- When clearing land or firebreaks vehicles are to work from disturbed areas towards the pit; or, in situations where dieback interpretation is not possible, from areas of higher quality vegetation to areas of lower quality vegetation.
- Roads are to be maintained as free draining and hard surfaced.
- A split operation will be worked where practicable, where the road transport vehicles only access one side of the stockpile or processing area and excavation vehicles operate on the other side of the stockpiles and processing, reducing the risk of contamination from road transport.
- DBCA has determined that material such as sand, taken from deeper in the regolith profile where there is no organic and other plant matter, carries low risk of spreading dieback. (DEC/DWER 2004).
- The Weed Management Policy will be complied with.
- Quarry traffic is restricted to the designated access roads, pit and stockpile areas apart from clearing land and maintaining fire breaks.
- Normally transport trucks run along the bitumen roads to their destination and return. This run is considered low risk for dieback and trucks will not require cleaning during the transport phase.

Weed Management

Weed management is to be used to minimise impact on site remnant vegetation and on adjoining properties. Good management practices are to be used as part of the ongoing normal quarry operations.

The management of weeds is essentially similar to that for plant diseases. The impact of weeds is really the impact within the local area and the more they are controlled the better. It is desirable that the site does not become a haven for environmental weeds and therefore a management and control program is warranted at all sites.

Weeds can be declared under the *Agriculture and Related Resources Protection Act 1976* which requires that Declared Weeds are eradicated. Other weeds are not Declared but may be classified as Environmental Weeds because they are well known for impacting on vegetation.

Generally if the actions taken for Dieback are applied they will also control weeds. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

Weed management will be used to minimise impact on site and on adjoining properties. Good management practices will be used as part of the ongoing normal quarry operations.

This plan utilises the most appropriate on ground measures to minimise the risk of spread of Declared and Environmental weeds. The information provided here summarises the key points of the on ground management.

There is a significant amount of exotic vegetation on site including pasture and other species that can be classified as weeds to bushland. During the vegetation studies a number of exotic species were recorded. A number of these are weed species.

Weeds are most likely to impact on;

- Disturbed areas such as overburden dumps, topsoil stockpiles.
- Edges of access roads.
- Edges of firebreaks adjacent to surrounding vegetation.
- Locations accessible to the public on which rubbish is dumped.
- The main sources of weeds are;
- Naturally occurring in topsoil. There is a very high exotic plant seed load with most of the vegetation being pasture and exotic species.
- Weeds from edge effects from access and local roads.
- Gradual creep of weeds along access roads.
- Rubbish dumped by the public.
- Materials or waste brought to site by employees.
- Soil and seeds from vehicles arriving at site. This often applies to trucks that have carried something else such as grain, or vehicles to be used in earthworks.
- Wind blown seed from surrounding land.
- Birds and other vectors. This is more common than is often given credit for. eg Solanum species.

Weed Management will consist of, but not be limited to, the following actions.

- The Dieback Management Actions will be used to assist weed management.
- Inspections are to be conducted to monitor the presence and introduction of Environmental and Declared Weeds on an annual or more frequent basis. On identification, Declared and significant environmental weeds will either be removed, buried, or sprayed with a herbicide.
- Large plants such as Castor Oil plants and Declared Weeds are to be periodically grubbed out or spot sprayed with a herbicide.

- Rehabilitation of the final land surface will be to interim revegetation for soil stabilisation. This will not involve the elimination of exotic species, but rather provide an interim cover that stabilises the soil. Weeds that impact on that interim cover will be treated.

- Areas of grass can be sprayed with Fusilade or similar grass selective herbicide if required. This can occur over the top of rehabilitated areas without significantly setting back the broad leafed species.

- All vehicles and equipment to be used during land clearing or land reinstatement, are to be clean and free from soil or plant material when arriving at site.

- No soil and vegetation will be brought to the site apart from that to be used in rehabilitation.

- Plants to be used in rehabilitation are to be free from weeds.

- Vegetated areas ahead of excavation will be quarantined to excavation vehicles until required.

- Unwanted access to vegetated areas is to be discouraged through signage, marking, a lack of tracks, perimeter bunding and/or external fencing.

- Weed affected top soils may need to be taken offsite, used in weed affected areas, buried by 500 mm soil/overburden or taken offsite.

- Illegally dumped rubbish is the major source of weeds and will be removed promptly.

- No weed contaminated or suspect soil or plant material is to be brought onto the site.

- When clearing land or firebreaks vehicles will work in conjunction with dieback principles and push from areas of better vegetation towards areas of lower quality vegetation.

- Weeds are to be sprayed with broad spectrum spray prior to planting or seeding in weed affected soils as required.

- Weed management will work from the least affected areas to most affected.

- Ongoing monitoring of weeds should be undertaken at least annually in autumn, prior to winter rains.

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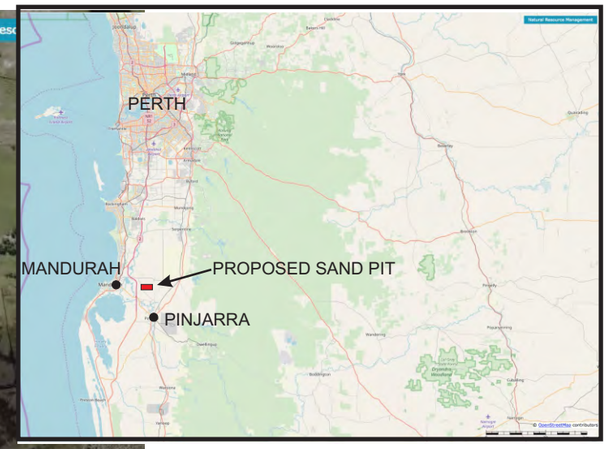

LOCATION

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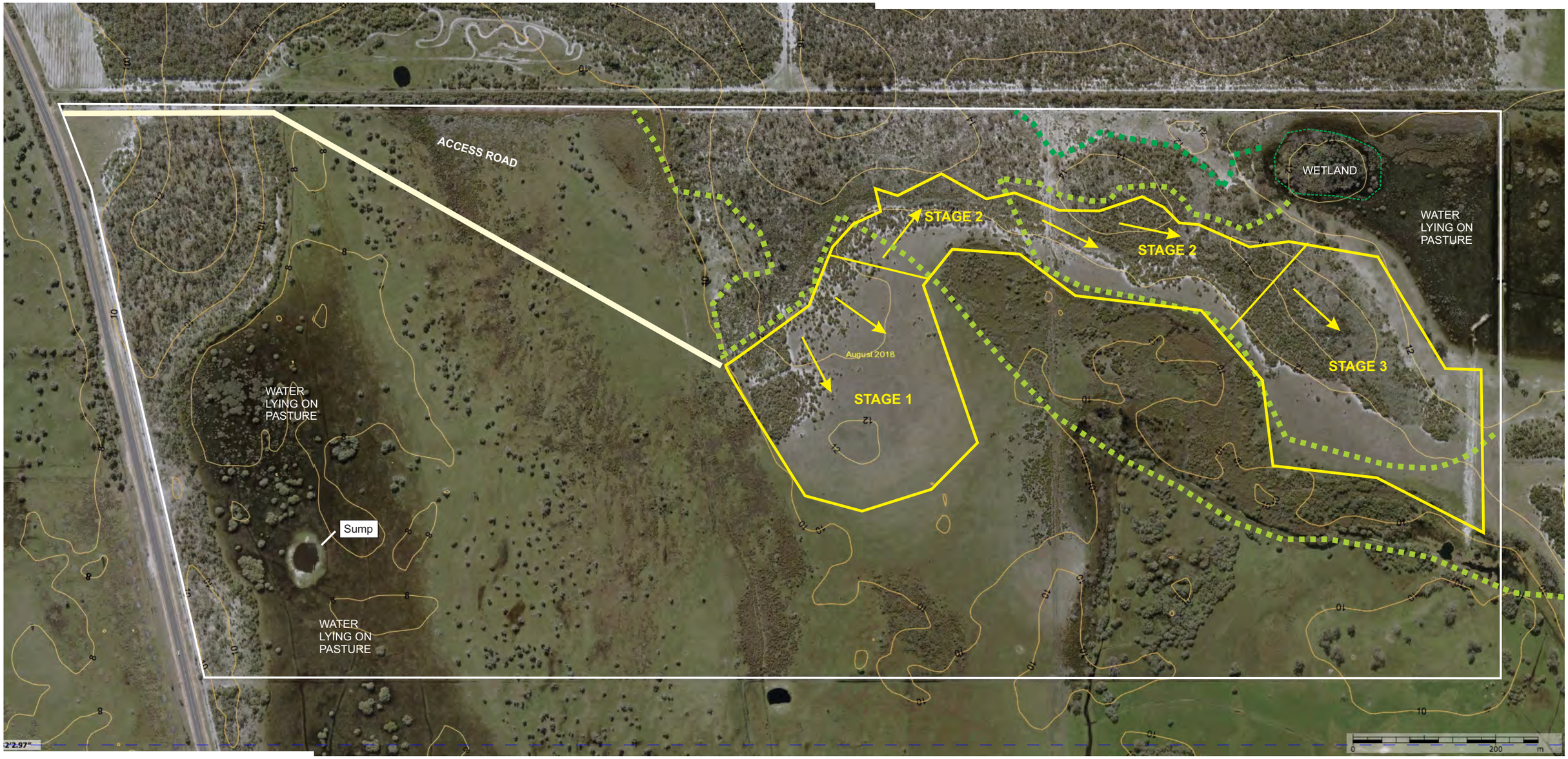
SURROUNDING LAND USES
LOT 226 PATERSON ROAD NAMBEELUP

Landform Research
Quarries - Land Systems - Environment - Geology
ABN 29 841 445 694

2020 - 03 - 20

Figure 1



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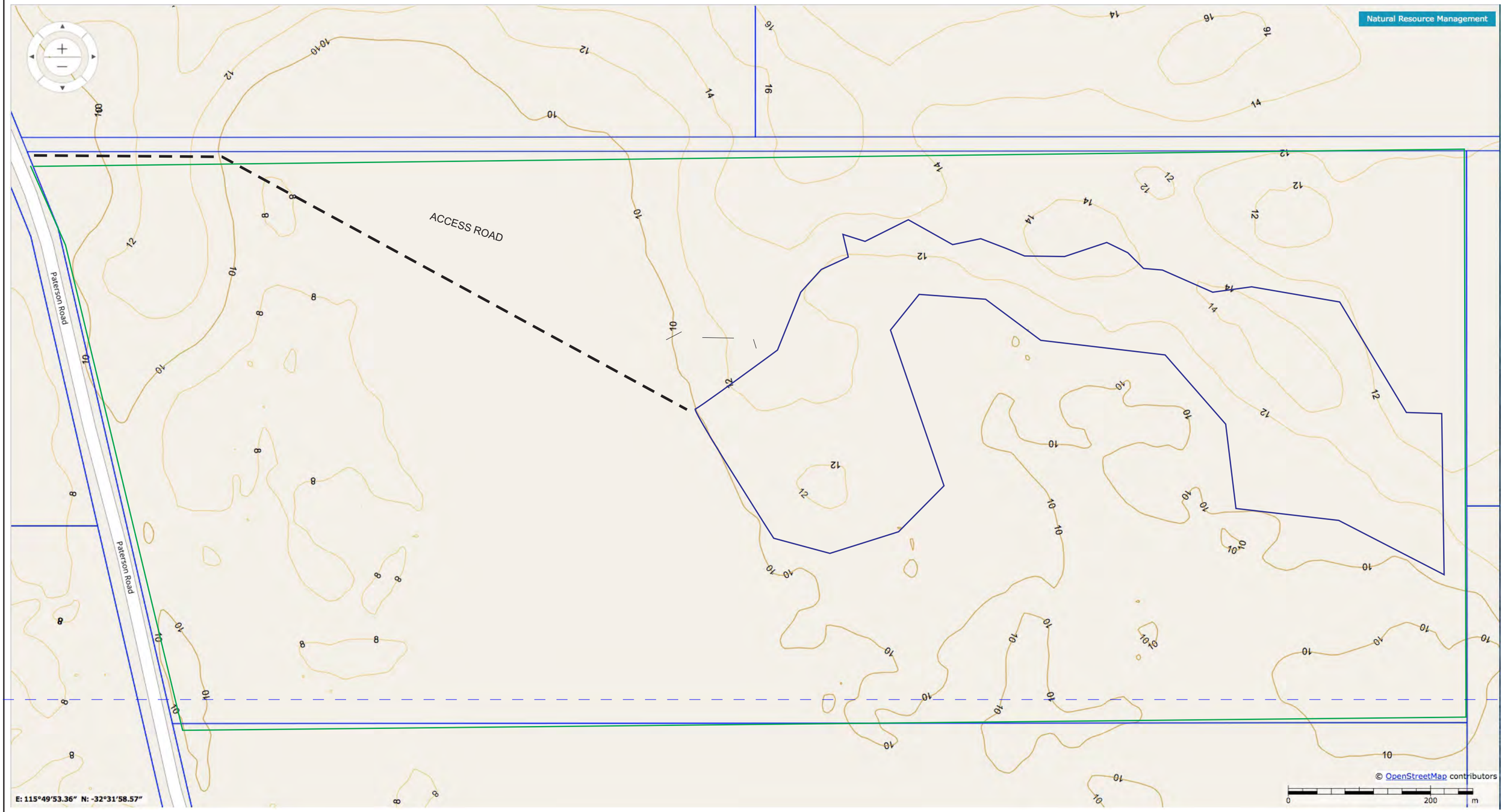
2020 - 03 - 20

Vegetation and wildlife corridor to be established at the end of excavation

Pit footprint

PROPOSED EXCAVATION AND STAGING
LOT 226 PATERSON ROAD NAMBEELUP

Figure 2



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Quarries - Land Systems - Environment - Geology
ABN 29 841 445 694

2020 - 03 - 20

N

PROPOSED EXCAVATION
EXISTING CONTOURS

LOT 226 PATERSON ROAD NAMBEELUP

Figure 4

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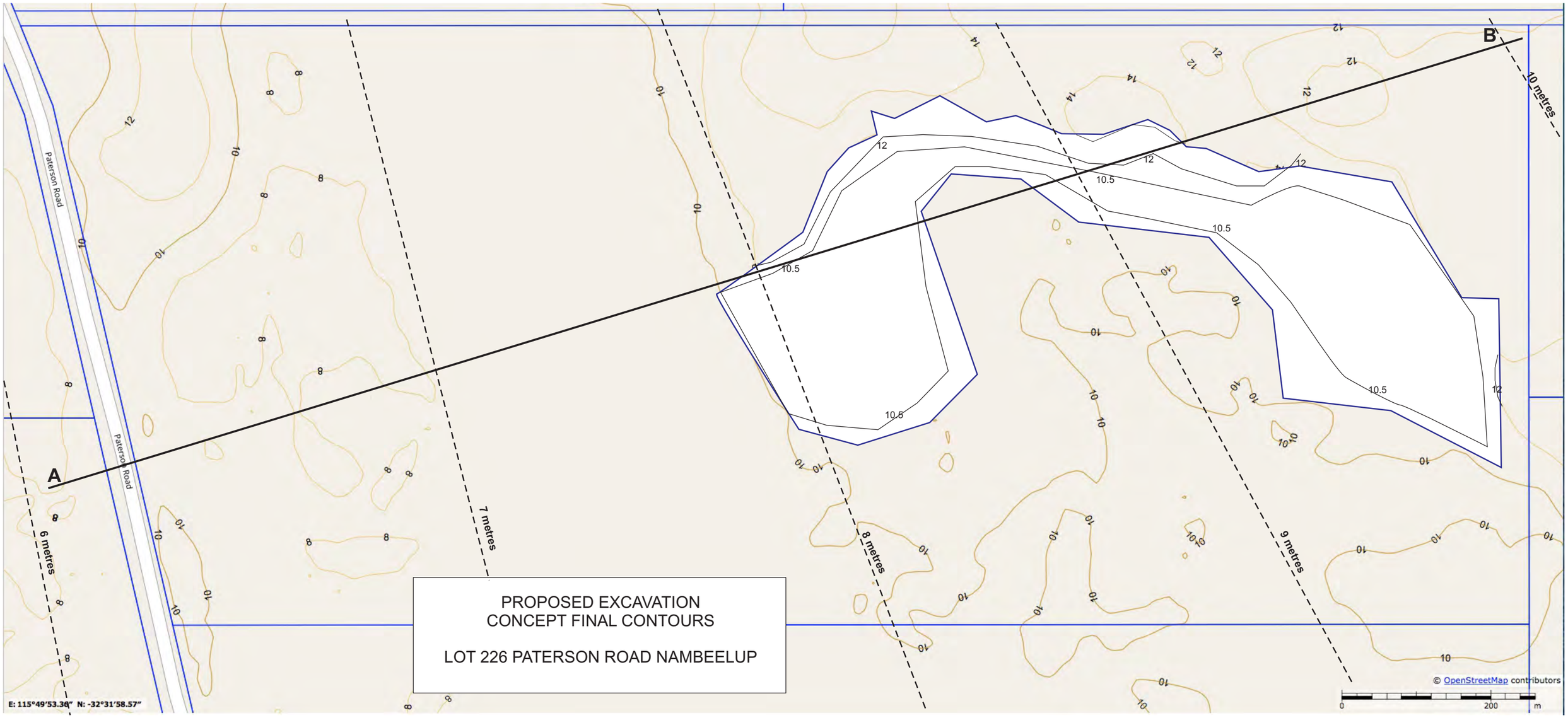
2020 - 03 - 20

PROPOSED EXCAVATION FOOTPRINT
LOT 226 PATERSON ROAD NAMBEELUP

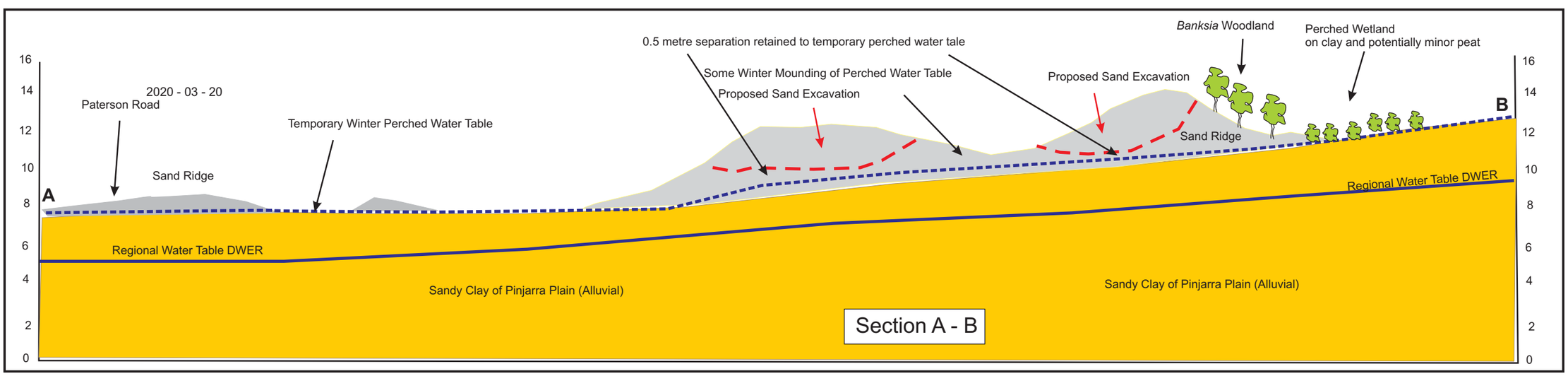
N

Figure 3



PROPOSED EXCAVATION
CONCEPT FINAL CONTOURS

LOT 226 PATERSON ROAD NAMBEELUP



Section A - B

N

Figure 5

5 metres

Regional Water Table
DWER Groundwater Atlas

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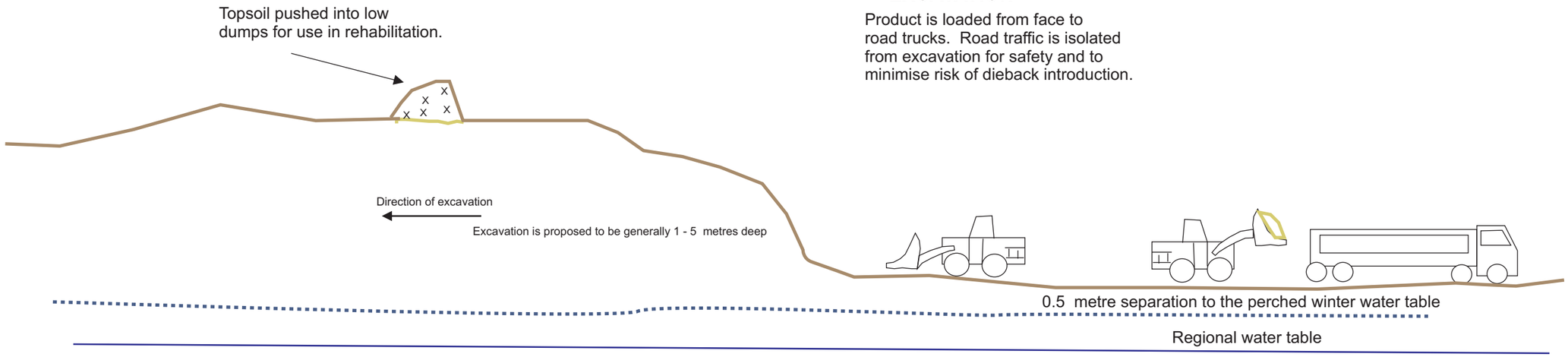
EXCAVATION

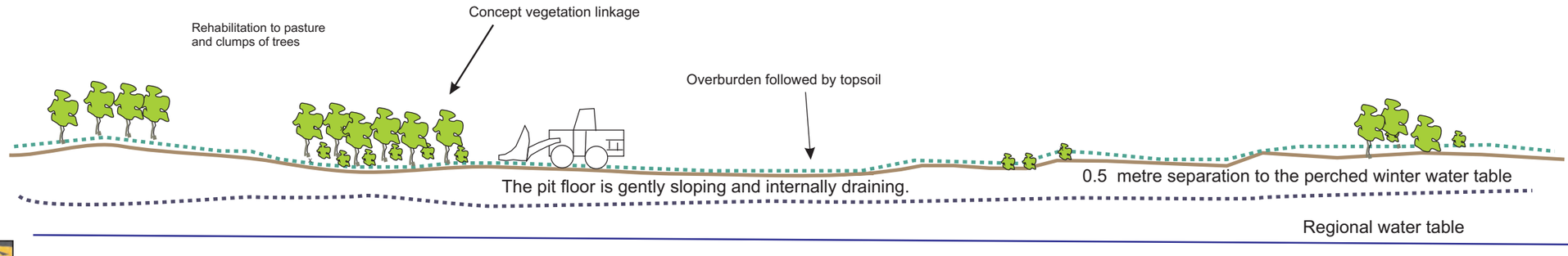
Product is loaded from face to road trucks. Road traffic is isolated from excavation for safety and to minimise risk of dieback introduction.



Excavating sand from a face similar to the proposed operation

Loading to a road truck in a typical sand operation

LAND RESTORATION AND REHABILITATION



Landform Research
Quarries, Land Systems, Environment, Geology
ABN 29 841 445 694

2020 - June

CONCEPTUAL PROPOSED SAND EXCAVATION - Lot 226 Paterson Road Nambeelup

Figure 6

390500 000000 | 391000 000000 | 391500 000000 | 392000 000000

6400000 000000 | 6399500 000000 | 6399000 000000

Kg1 | EmAf | PR1 | Cleared | 6 400 000mN | PATERSON | 210 | Kg1 | Cleared | 3 | 8 | PR2

Kg1 | BaBmBiKg | PR3 | EmAfXo | PR4 | AfEmBiKg | Kg1 | Cleared | PR8 | Er | PR7 | Mp | Kg2 | PR6 | Cleared | PR5 | Kg1 | Cleared | Lot 226 | Kg1 | PR9 | Cleared | 304 | Cleared

ROAD | 209 | 301 | 303 | 302 | 6 399 000mN

N

0 60 120 240 360 480 Meters

Legend

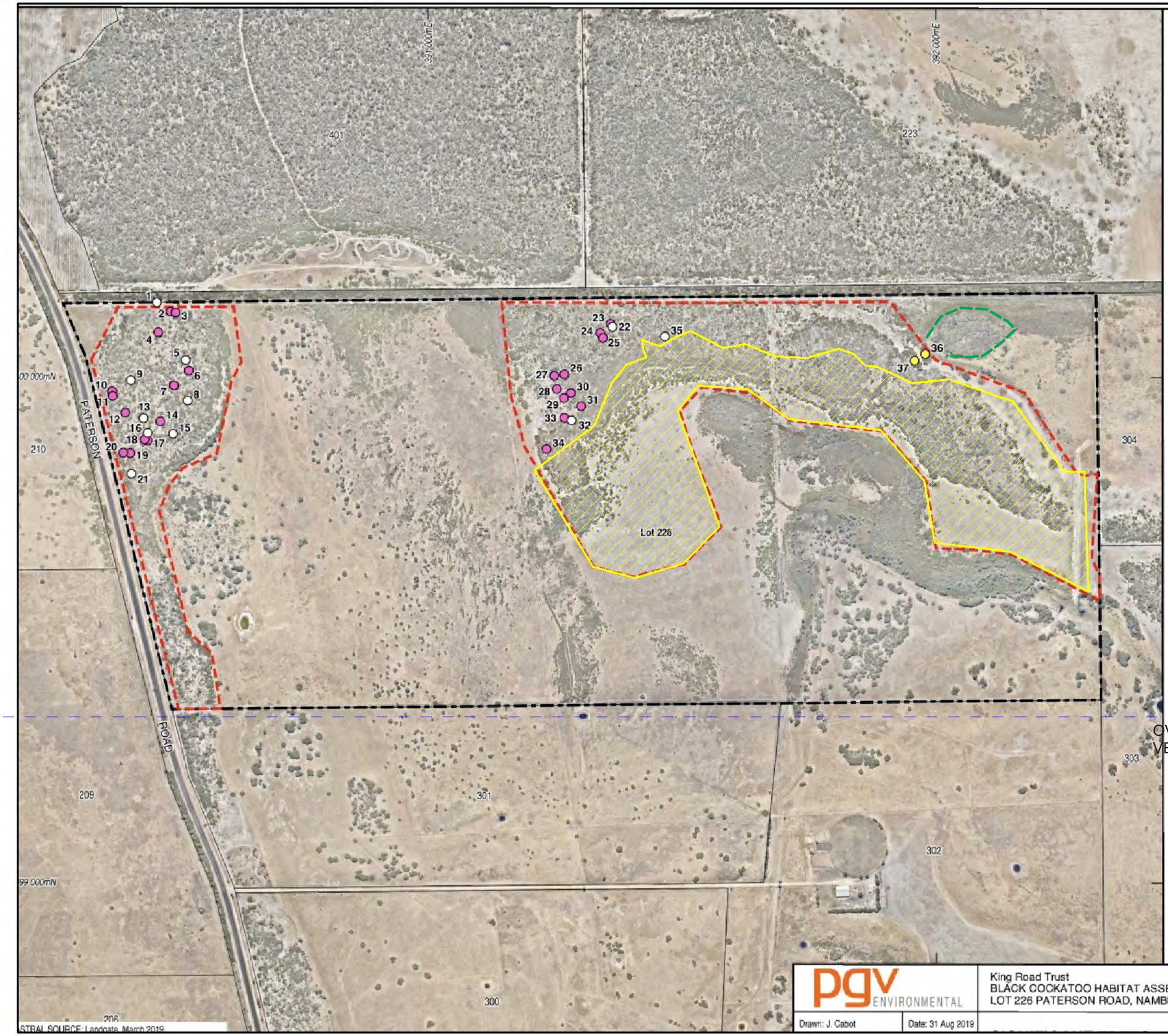
Nambeelup Proposed Clearing - 12.7 ha

NAMBEELUP SAND PIT 2020 - 24.5 ha

Wetland

PROPOSED SAND EXCAVATION - LOT 226. PATERSON ROAD, NAMBEELUP

Figure 7



N

0 50 100 150 200 250m

SCALE 1 : 7 500 at A3 (MGA)

Legend

- Site Boundary
- Lot 226 Boundary
- Cadastral Boundary
- Easement Boundary

Significant Trees

- Flooded Gum (*Eucalyptus rudis*)
- Jarrah (*Eucalyptus marginata*)
- Standing Dead Tree
- 15 Tree Number
- Wetland

OVERLAY OF PROPOSED CLEARING ON VEGETATION AND COCKATOO SURVEY

Legend

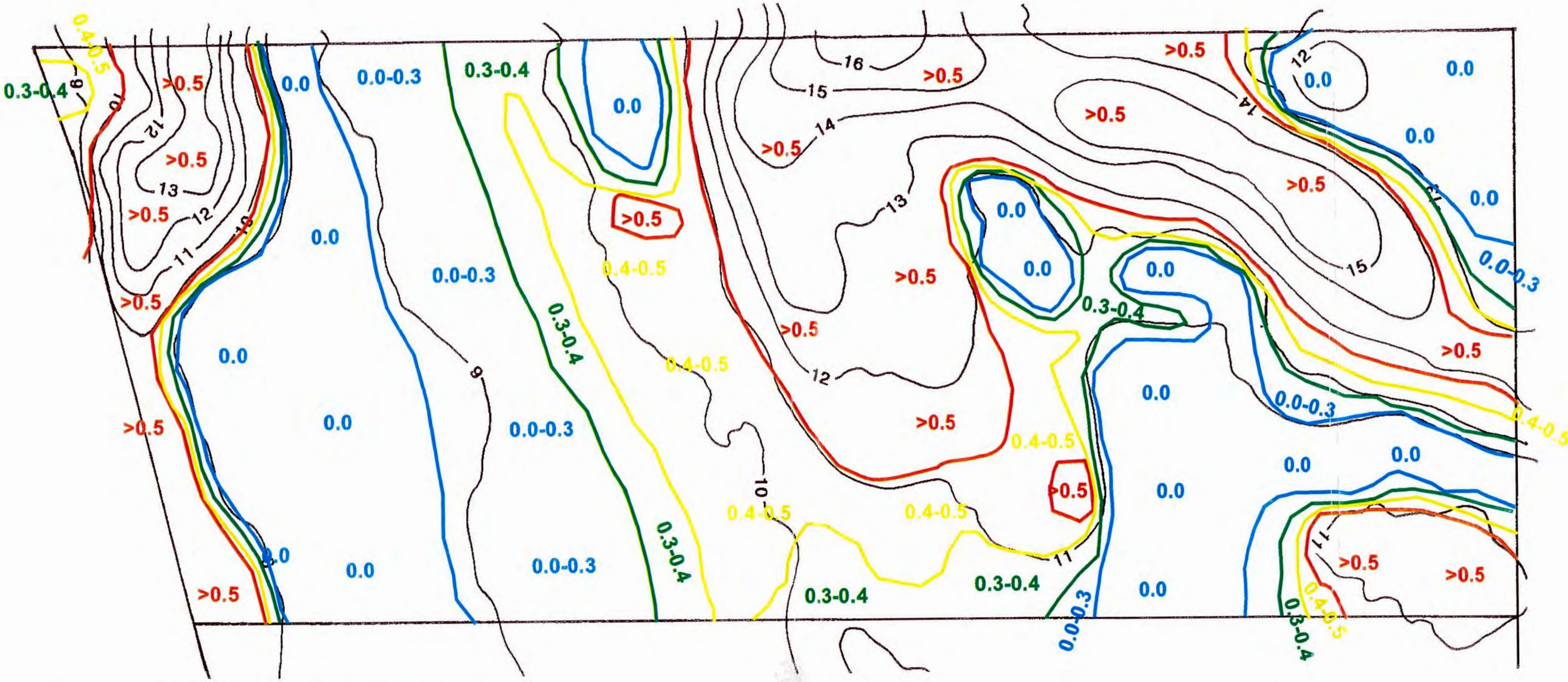
- NAMBEELUP SAND PIT 2020 - 24.5 ha

Figure 8

pgv ENVIRONMENTAL

King Road Trust
BLACK COCKATOO HABITAT ASSESSMENT
LOT 226 PATERSON ROAD, NAMBEELUP

Drawn: J. Cabot | Date: 31 Aug 2019



MEASURED AND INTERPRETED DEPTH TO HIGHEST KNOWN WATER TABLE
(11 SEPTEMBER 2002)

0.0	Seasonally wet and waterlogged soils. Soils are generally darker organic, coloured sands over brown sands with minor ferricrete development.
0.0-0.3	Soils where the land surface is undulating with the highest known water table varying between 0.0 and 0.3 metres below the land surface. . Grey and white sands or light brown sands.
0.3-0.4	Soils where the highest known water table is generally 0.3 - 0.4 metres below the land surface. Contains small undulating areas which are wetter and have the water table closer than 0.3 metres and small ridges with separations exceeding 0.4 metres. Small low rises could have a small amount of fill placed on them to achieve the 0.5 separation required for Alternative Waste Water Systems. Grey sands over white or light brown sands.
0.4-0.5	Soils where the highest known water table is between 0.4 and 0.5 metres from the surface. Has small low rises which exceed 0.5 metres separation and comply with the sewerage guidelines for Alternative Systems and in occasional places small depressions that are less than 0.4 metres separation. A small amount of fill can be used to raise building envelopes as necessary. Grey sands over white or light brown sands.
>0.5	Sand ridges where the highest seasonal water table is more than 0.5 metres below the ground surface. Complies with the guidelines for Alternative Systems. Leached white sands to depth.
NOTE	All soils require Alternative Waste Water Systems to reduce the potential loss of nutrients. These units require the use of 150 - 300 mm of amended soils, which will raise the soil and increase the separations to the highest known water tables.

Lindsay Stephens
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Mem Aust Geomechanics Society
Mem WA Env Cons Assoc
LANDFORM RESEARCH
Quarries - Land Systems
08 9397 5145

Scale 1 : 10 000
DOLA AIR PHOTO FEBRUARY 2002

MEASURED AND INTERPRETED WATER TABLE SEPARATIONS
and SOILS

LOT 226, PATERSON ROAD. NAMBEELUP

Figure 9

Pasture and resource with *Kunzea glabrescens* regrowth on resource in the rear.

Kunzea glabrescens regrowth on resource

Banksia - Jarrah Woodland to be retained. Jarrah Cockatoo habitat tree

Banksia - Jarrah Woodland to be retained

Kunzea glabrescens regrowth on resource

Figure 10

SAND RESOURCE RIDGE - LOT 226 PATERSON ROAD, NAMBEELUP

LOT 226 PATERSON ROAD, NAMBEELUP

FLORA AND VEGETATION SURVEY AND LEVEL 1 FAUNA ASSESSMENT

Prepared for:	King Street Trust
Report Date:	18 November 2019
Version:	2
Report No.	2019-437

pgv ENVIRONMENTAL

CONTENTS

LIST OF ATTACHMENTS

Tables

Plates

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1 INTRODUCTION

1.1 Background

Lot 226 Paterson Road, Nambeelup (the site) is located in the Shire of Murray, approximately 64km south of the Perth Central Business District (Figure 1). The site is bound by Paterson road to the west, unconstructed road reserve and rural land to the north and rural land to the east and south.

The site is generally flat but contains some higher areas that contain a sand resource that is proposed to the extracted for use in the future Peel Business Park (Figure 2). These higher areas contain native vegetation. Lot 226 Paterson Road is approximately 155ha in size. The proposed area of sand extraction is around 48.0ha of which approximately 34.5ha contains native vegetation.

PGV Environmental was commissioned by King Street Trust to undertake a Flora and Vegetation survey and Level 1 Fauna Survey of the site as part of an application to extract sand from the site.

1.2 Scope of Works

The Flora, Vegetation and Fauna Survey report includes a description of the following:

- Physical characteristics including:
  - Landform;
  - Drainage and water bodies; and
  - Geological, hydrogeological and hydrological characteristics;
- Recent and present land use including:
  - Surrounding land uses; and
  - Assessment of current and historical activities on the subject site and surrounding areas which have the potential to result in contamination issues at the site;
- A Reconnaissance and Detailed Flora and Vegetation Survey including:
  - Desktop search and review of the Department of Biodiversity, Conservation and Attractions (DBCA) Declared Rare and Priority Flora database and Threatened Ecological Communities databases;
  - Desktop search of publicly available databases such as Naturemap and the Protected Matters Search Tool;
  - Examination of recent aerial photography and contour maps to provisionally identify vegetation types and condition;
  - A site walkover to assess the vegetation and undertake a targeted survey for Threatened and Priority species that are determined to be possibly present on the site;
  - Advice on the potential for significant species identified in the desktop searched to be present on the site; and
  - A spring survey sampling from quadrats as well as a thorough walk through the site.
- A Level 1 Fauna Survey including:
  - A search of the DBCA Databases and NatureMap for the general area for Threatened and Priority Species;

  - A search of the Commonwealth Government's Protected Matters Search Tool to identify species potentially occurring within the area that are protected under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999 or international migratory bird agreements (JAMBA/CAMBA); and
  - A description of the fauna habitats present on the site from the site walkover; and
  - An assessment of the significance of the site for conservation significant species in a local and regional context.
- Implications, if any, under Western Australian policies and legislation such as the *Environmental Protection Act 1986* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

2 EXISTING ENVIRONMENT

2.1 Land Use

The site has been part of a rural property for many years and as shown in the earliest available on-line aerial photography from 1979 the lot is largely cleared apart from the higher areas subject of this report which largely remain vegetated (Plate 1).

Plate 1: Historical Aerial Photography from 1979 (Landgate, 2019)

The area subject of the surveys remains mostly vegetated with some areas having regenerated since the 1979 aerial (Plate 2). The whole of Lot 226 is being used for grazing livestock. Any fencing on the site does not preclude livestock from entering the areas of native vegetation.

Plate 2: NearMap Aerial Photography from 2018

2.2 Topography

The survey area is gently undulating between a low of at around 11m Australian Height Datum (AHD) up to 16mAHD (Figure 2).

2.3 Geology and Soils

The site is mapped as part of the Bassendean System and consists of very low relief, leached, grey siliceous Pleistocene sand dunes, intervening sandy and clayey swamps and gently undulating plains (Bolland, 1998). These soils are very leached, infertile and mildly acidic (DPIRD, 2019).

Two Phases of the Bassendean soils are mapped on the site by the Department of Primary Industries Regional Development (DPIRD) as follows:

> Bassendean B1 Phase (212Bs_B1) which are extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2m. This soil type describes most of the area that to be mined for sand (DPIRD, 2019).
>
> Bassendean B4 Phase (212Bs_B4) which are broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5m by clay or less frequently a strong iron-organic hardpan (DPIRD, 2019).

2.4 Hydrology

Groundwater is at approximately 5 to 10mAHD and flows to the west (DWER, 2019). Groundwater is approximately 5 to 24m below ground surface (National Map, 2019) in the survey area. Aerial photographs indicate that groundwater is likely to be higher than 5m below ground surface in the lowest parts of the survey area winter and early spring. Some areas on the lot adjoining the survey area contain above-ground water in wet years.

2.5 Wetlands

Two wetlands are mapped on the lot but outside of the survey area. Most of the lot contains part of Multiple Use Palusplain Unique Feature Identifier (UFI) 15802 and part of a Resource Enhancement Sumpland UFI 5031 (Plate 3) (National Map, 2019).

Plate 3: Wetland Mapping on the site (National Map, 2019)

The proposed area of mining does not contain any wetlands.

3 FLORA AND VEGETATION

3.1 Methodology

3.1.1 Reconnaissance Survey

A Reconnaissance and Detailed Flora and Vegetation Survey was undertaken in accordance with EPA Technical Guidance *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016a). Desktop studies including database searches were undertaken to identify potential threatened species and communities that may occur on the site. A site reconnaissance survey was conducted by Dr Paul van der Moezel from PGV Environmental on 12 February 2019 to provisionally map vegetation types and condition and to determine whether any conservation significant species could occur on the site.

3.1.2 Detailed Survey

Two follow-up surveys were conducted, the first on 31 July 2019 to target the Glossy-leaved Hammer Orchid (*Drakaea elastica*) which had potential to occur on the site and is best surveyed when the leaves are most apparent. The second Detailed Spring Survey was undertaken on 25 September 2019. The detailed survey included sampling from nine 10m x 10m quadrats located within the different vegetation types as well as a thorough walk through the survey area to record all plant species, vegetation types and vegetation condition.

3.1.3 Survey Conditions

The conditions that the survey was undertaken in are presented in Table 1 in order to assess the adequacy of the survey. In summary, there were no constraints to the survey.

Table 1: Statement of Botanical Survey Conditions

Issue	Constraints (Y/N)*	Comment
Competency/experience of the consultant conducting the survey	No	Dr Paul van der Moezel has previous survey experience on the site
Proportion of the flora identified^	No	The timing of the survey in July for *Drakaea elastica* and September for the Detailed Survey was optimal to record most of the native species.
Sources of information (historic/recent or new data)	No	Previous survey reports for the site were reviewed.
Proportion of the task achieved and further work that may need to be undertaken	No	No follow-up survey required as surveys were done in three seasons and no Threatened Flora expected to occur in other seasons.
Timing/weather/season/cycle	No	The spring survey was optimal for most flora species. 2019 was an average year for rainfall in Jun- Sep
Disturbances (Fire)	No	The fire age of the vegetation was greater than 5 years in most areas
Intensity of survey (e.g. In retrospect was the intensity adequate)	No	A total of 3 field days spent on the site.

Issue	Constraints (Y/N)*	Comment
Completeness (e.g. was relevant area fully surveyed)	No	
Resources (e.g. degree of expertise available for plant identification)	No	Experienced botanist undertook most plant identifications on site with some identification in the office or Perth Reference Herbarium
Remoteness and/or access problems	No	Accessible site accessed by a short walk from nearby 4WD tracks
Availability of contextual (e.g. bioregional) information for the study area.	No	IBRA Vegetation Mapping

*Constraints have been rated as Significant, Moderate or No constraints

^Fungi and nonvascular flora (e.g. algae, mosses and liverworts) were not specifically surveyed for during the survey.

3.2 Desktop Studies

3.2.1 Flora Database Searches

A search of the DBCA Threatened Flora Databases: the WA Herbarium database (WAHerb and the Threatened (Declared Rare) and Priority Flora Species List (TFPL) (Appendix 1), Naturemap (Appendix 2) (DBCA, 2019) and the EPBC Act Protected Matters Search Tool (Appendix 3) (DoEE, 2019) indicates that a number of species that are listed as Endangered, Threatened or Priority are identified as potentially being located the site. The results from these database searches are shown in Table 2.

Table 2: Conservation Significant Flora known to occur near the Site

Scientific Name	Common Name	Conservation Status (WA)	Status under EPBC Act
Caladenia huegelii	King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid	Schedule 1	Endangered
Drakaea elastica	Glossy-leafed Hammer Orchid	Schedule 1	Endangered
Eucalyptus x balanites	Cadda Road Mallee	Schedule 1	Endangered
Synaphea sp. Fairbridge Farm (D Papenfus 696)	Selena's Synaphea	Schedule 1	Critically Endangered
Synaphea sp. Serpentine (G.R Brand 103)		Schedule 1	Critically Endangered
Synaphea stenoloba	Dwellingup Synaphea	Schedule 1	Endangered
Diuris micrantha	Dwarf Bee-orchid	Schedule 2	Vulnerable
Diuris purdiei	Purdie's Donkey-orchid	Schedule 2	Endangered
Synaphea sp. Pinjarra Plain (A.S George 17182)		Schedule 2	Endangered
Andersonia gracilis	Slender Andersonia	Schedule 3	Endangered
Diuris drummondii	Tall Donkey Orchid	Schedule 3	Vulnerable
Drakaea micrantha	Dwarf Hammer-orchid	Schedule 3	Vulnerable
Tetraria australiensis	Southern Tetraria	Schedule 3	Vulnerable
Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)		Priority 1	

Scientific Name	Common Name	Conservation Status (WA)	Status under EPBC Act
Acacia benthamii		Priority 2	
Grevillea manglesii subsp. *ornithopoda*		Priority 2	
Johnsonia pubescens subsp. *cygnorum*		Priority 2	
Phyllangium palustre		Priority 2	
Amanita drummondii	Drummond's Grisette	Priority 3	
Blennospora doliiformis		Priority 3	
Boronia capitata subsp. *gracilis*		Priority 3	
Chamaescilla gibsonii		Priority 3	
Cyathochaeta teretifolia		Priority 3	
Dillwynia dillwynioides		Priority 3	
Eryngium sp. Ferox (G.J. Keighery 16034)		Priority 3	
Jacksonia gracillima		Priority 3	
Myriophyllum echinatum		Priority 3	
Schoenus benthamii		Priority 3	
Schoenus pennisetis		Priority 3	
Stylidium aceratum		Priority 3	
Caladenia speciosa	Sandplain White Spider Orchid	Priority 4	
Drosera occidentalis	Western Sundew	Priority 4	
Eucalyptus rudis subsp. *cratyantha*		Priority 4	
Jacksonia sericea	Waldjumi	Priority 4	
Microtis quadrata	South Coast Mignonette Orchid	Priority 4	
Ornduffia submersa		Priority 4	
Parsonsia diaphanophleba		Priority 4	
Rumex drummondii		Priority 4	
Stylidium longitubum	Jumping Jacks	Priority 4	
Tripterococcus sp. Brachylobus (A.S. George 14234)		Priority 4	
Trithuria australis		Priority 4	

Definitions of the Conservation Codes are in Appendix 4.

Based on the Reconnaissance survey Table 3 lists the species that have potential to occur on the site.

Table 3: Likelihood of Identified Significant Flora Species Occurring on the Site

Scientific Name	Conservation Status (WA)	Habitat*	Likelihood to occur on the site
Caladenia huegelii	Schedule 1	The Grand Spider-orchid prefers sand or clay loam. This species generally does not survive in disturbed areas.	Unlikely - This species may occur in the areas of better condition vegetation, however unlikely due to the very open understorey
Drakaea elastica	Schedule 1	The Glossy-leafed Hammer Orchid prefers low-lying situations adjoining winter-wet swamps. This species does not survive in disturbed areas.	Possible – The survey area contains low-lying habitat adjoining winter-wet swamps. However, the understorey is mostly disturbed thus reducing its likelihood.
Eucalyptus x balanites	Schedule 1	The Cadda Road Mallee prefers sandy soils with lateritic gravel.	Highly Unlikely – the site is not in the known species range and there is no lateritic gravel.
Synaphea sp. Fairbridge Farm (D Papenfus 696)	Schedule 1	Selena's Synaphea occurs in sandy with lateritic pebbles near winter-wet flats, in low woodland with weedy grasses.	Highly Unlikely – The site does not contain lateritic pebbles near winter-wet flats
Synaphea sp. Serpentine (G.R Brand 103)	Schedule 1	*Synaphea* sp. Serpentine occurs in brown sandy clay.	Highly Unlikely – the soils are sand with very little clay
Synaphea stenoloba	Schedule 1	Dwellingup Synaphea grows in sandy or sandy clay soils on winter-wet flats, granite.	Highly Unlikely – The site is not low-lying habitat and is outside the known range.
Diuris micrantha	Schedule 2	The Dwarf Bee-orchid is usually found on cleared firebreaks or open sandy patches that have been disturbed with in Jarrah Banksia woodland or thickets of Spearwood (*Kunzea ericifolia/ glabrescens*) (Williams *et al*., 2001).	Potentially occurs on the site
Diuris purdiei	Schedule 2	Purdie's Donkey Orchid occurs in grey-black sand in moist winter-wet swamps.	Highly Unlikely – The site does not contain any moist winter-wet swamps

Scientific Name	Conservation Status (WA)	Habitat*	Likelihood to occur on the site
Synaphea sp. Pinjarra Plain (A.S George 17182)	Schedule 2	*Synaphea* sp. Pinjarra Plain occurs in grey sandy loam or clay, grey-brown clayey sand, brown clayey loam, laterite on flats, seasonally wet areas, railroad reserves often with wet depressions or drains.	Highly Unlikely – The site is not low-lying habitat
Andersonia gracilis	Schedule 3	Slender Andersonia occurs in white/grey sand, sandy clay, gravelly loam in winter-wet areas, near swamps.	Highly Unlikely – The site is not low-lying habitat
Diuris drummondii	Schedule 3	The Tall Donkey Orchid grows in low-lying depressions, swamps.	Highly Unlikely – The site is not low-lying habitat
Drakaea micrantha	Schedule 3	Dwarf Hammer-orchid occurs in grey sands over dark, grey to blackish, sandy clay-loam substrates in winter wet depressions or swamps.	Highly Unlikely – The site is not low-lying habitat
Tetraria australiensis	Schedule 3	Southern Tetraria occurs in grey sand over clay; also described as yellow and sandy or clayey lateritic soils favouring winter-wet swampy depressions, drainage lines or rises surrounding swamps.	Highly Unlikely – The site is not low-lying habitat
Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)	Priority 1	This variant of *Acacia lasioc*arpa occurs in grey or black sand over clay in swampy areas, winter wet lowlands.	Highly Unlikely – The site is not low-lying habitat
Acacia benthamii	Priority 2	*Acacia benthamii* grows on sand, typically on limestone breakaways	Highly Unlikely – The site is not limestone
Grevillea manglesii subsp. *ornithopoda*	Priority 2	*Grevillea manglesii* subsp. *ornithopoda* grows amongst medium trees, or low trees, or tall (sclerophyll) shrubland, or low (sclerophyll) shrubland; in gravelly soil, or sand, or clay; occupying along creek beds.	Highly Unlikely – The site is not low-lying habitat
Johnsonia pubescens subsp. *cygnorum*	Priority 2	*Johnsonia pubescens* subsp. *cygnorum* occurs on grey-white-yellow sand on flats on seasonally-wet sites	Highly Unlikely – The site is not low-lying habitat

Scientific Name	Conservation Status (WA)	Habitat*	Likelihood to occur on the site
Phyllangium palustre	Priority 2	*Phyllangium palustre* occurs in clay on winter-wet claypans, low-lying seasonal wetlands.	Highly Unlikely – The site is not low-lying habitat
Amanita drummondii	Priority 3	Drummond's Grisette is solitary to gregarious in leaf litter in association with *Agonis flexuosa*, *A. theiformis*, *Allocasuarina fraseriana*, *Corymbia calophylla*, *Eucalyptus marginata*, *E. patens, E. staeri, Jacksonia furcellata, Kunzea glabrescens*, *Melaleuca* sp., *Podocarpus drouynianus*, *Taxandria parviceps*. (Davidson *et al*., 2015) growing in sandy soil (Amanitaceae Org, 2015).	Highly Unlikely – The vegetation on the site is not the preferred habitat of this species
Blennospora doliiformis	Priority 3	*Blennospora doliiformis* grows in grey or red clay soils over ironstone on seasonally-wet flats.	Highly Unlikely – The site is not low-lying habitat
Boronia capitata subsp. *gracilis*	Priority 3	*Boronia capitata* subsp. *gracilis* occurs in white/grey or black sand on winter-wet swamps, hillslopes.	Highly Unlikely – The site is not low-lying habitat
Chamaescilla gibsonii	Priority 3	*Chamaescilla gibsonii* grows in clay to sandy clay on winter-wet flats, shallow water-filled claypans.	Highly Unlikely – The site is not low-lying habitat
Cyathochaeta teretifolia	Priority 3	*Cyathochaeta teretifolia* occurs in grey sand, sandy clay on swamps, creek edges.	Highly Unlikely – The site is not low-lying habitat
Dillwynia dillwynioides	Priority 3	*Dillwynia dillwynioides* occurs in sandy soils in winter-wet depressions.	Highly Unlikely – The site is not low-lying habitat
Eryngium sp. Ferox (G.J. Keighery 16034)	Priority 3	*Eryngium* sp. Ferox (G.J. Keighery 16034) grows in grey to brown loamy to sandy clay, brown cracking clay on winter-wet flats, swamps, dried claypans, ridges.	Highly Unlikely – The site is not low-lying habitat
Jacksonia gracillima	Priority 3	*Jacksonia gracillima* occurs in grey and brown well-drained sand.	Potentially occurs on the site
Myriophyllum echinatum	Priority 3	*Myriophyllum echinatum* grows in clay on winter-wet flats.	Highly Unlikely – The site is not low-lying habitat
Schoenus benthamii	Priority 3	*Schoenus benthamii* prefers white, grey sand, sandy clay in winter-wet flats, swamps.	Highly Unlikely – The site is not low-lying habitat

Scientific Name	Conservation Status (WA)	Habitat*	Likelihood to occur on the site
Schoenus pennisetis	Priority 3	*Schoenus pennisetis* occurs in grey or peaty sand, sandy clay in swamps, winter-wet depressions.	Highly Unlikely – The site is not low-lying habitat
Stylidium aceratum	Priority 3	*Stylidium aceratum* occurs in sandy soils in swamp heathland.	Highly Unlikely – The site is not low-lying habitat
Caladenia speciosa	Priority 4	Sandplain White Spider Orchid occurs in white, grey or black sand.	Potentially occurs on the site
Drosera occidentalis	Priority 4	The Western Sundew occurs in sandy and clayey soils in swamps and wet depressions.	Highly Unlikely – The site is not low-lying habitat
Eucalyptus rudis subsp. *cratyantha*	Priority 4	*Eucalyptus rudis* subsp. *cratyantha* grows in loam on flats, hillsides.	Potentially occurs on the site although the soils are not loamy
Jacksonia sericea	Priority 4	Waldjumi grows in calcareous and sandy soils.	Potentially occurs on the site
Microtis quadrata	Priority 4	South Coast Mignonette Orchid occurs on clay based coastal flats (Brown et al., 2013).	Highly Unlikely – The soils are not clay
Ornduffia submersa	Priority 4	*Ornduffia submersa* grows in freshwater 0.05-0.6 m deep. Pools, lakes, swamps, winter-wet depressions, claypans.	No – there is no permanent water on the site
Parsonsia diaphanophleba	Priority 4	*Parsonsia diaphanophleba* occurs in alluvial soils along rivers.	Highly Unlikely – The site is not low-lying habitat
Rumex drummondii	Priority 4	*Rumex drummondii* occurs in winter-wet disturbed areas.	Highly Unlikely – The site is not low-lying habitat
Stylidium longitubum	Priority 4	Jumping Jacks prefer sandy clay, clay in seasonal wetlands.	Highly Unlikely – The site is not low-lying habitat
Tripterococcus sp. Brachylobus (A.S. George 14234)	Priority 4	*Tripterococcus* sp. Brachylobus occurs in grey, black or peaty sand winter-wet flats	Highly Unlikely – The site is not low-lying habitat
Trithuria australis	Priority 4	*Trithuria australis* occurs in granite, clay in shallow pools, seasonal swamps.	Highly Unlikely – The site is not low-lying habitat

* sourced from Florabase, DBCA database searches and SPRAT (DoEE, 2018) unless otherwise denoted

Of the 41 species identified in the database search there is the potential for 2 Threatened (Scheduled) and 4 Priority species to occur on the site.

3.2.2 TEC/PEC Database Searches

A search of DBCA's Threatened (TEC) and Priority Ecological Communities (PEC) database was conducted within a radius of 5km around the site (24-0219EC) (Appendix 5). Two conservation significant Ecological Communities were identified (Table 4).

Table 4: TEC and PECs identified in database searches within 5km of the site

Number	Description	Conservation Status in WA	Status under the EPBC Act
Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered
Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	Priority 3	Vulnerable

3.3 Vegetation

3.3.1 Vegetation Complex

The vegetation is part of the Bassendean Central and South vegetation complex which is described as ranging from "woodland of *Eucalyptus marginata – Allocasuarina fraseriana – Banksia* species to low woodland of *Melaleuca* species and sedgelands on the moister sites. This area includes the transition of *E. marginata* to *E. todtiana* in the vicinity of Perth" (Heddle *et al.,* 1980). The vegetation on the site meets the general description of this vegetation complex.

3.3.2 Vegetation Types

Vegetation types are described using the structure (eg. woodland, shrubland) and dominant species in each structure. The vegetation type level of description is used to map the vegetation at the small scale such as in this survey.

Eight vegetation types in the survey as shown on Figure 3 and described in Table 5. Quadrat data is in Appendix 6.

3.3.3 Floristic Community Type

Floristic Community Types (FCTs) are another way of describing vegetation and is based on the composition of the whole flora of a site rather than the dominant species. FCTs are used to identify most of the Threatened and Priority Ecological Communities on the Swan Coastal Plain.

The FCT was assessed by comparing the species composition from the quadrats with Table 22 of Gibson *et al.* (1994). The results gave a very close match with FCT 21a 'Central *Banksia attenuata* - *Eucalyptus marginata* woodlands' for all quadrats. The *Kunzea glabrescens* dominated vegetation and small patch of *Eucalyptus rudis* also matched closely with FCT 21a although they lack the signature species *Banksia attenuata* and *Eucalyptus marginata*.

Table 5: Vegetation Types on the Site

Vegetation Type	Description	Photograph
EmAf *Eucalyptus marginata/Allocasuarina fraseriana* Low Open Woodland over *Kunzea glabrescens* Tall Shrubland over *Conostylis aculeata/Desmocladus flexuosus* Low Open Shrubland	Occurs on the highest part of the western section of the survey area. *Eucalyptus marginata* (Jarrah) and *Allocasuarina fraseriana* (Sheoak) were 6-8m high and sparse with occasional *Kunzea glabrescens* (Spearwood) and *Banksia menziesii* to 3m. The understorey was very open and contained few native species. *Conostylis aculeata* and *Desmocladus flexuosus* were the most common shrub species with *Gompholobium tomentosum* also common. Common weed species included *Avena fatua* (Wild Oats), *Briza maxima* and *Ehrharta longiflora* (Annual Veldtgrass). The soils are greyish-brown sand. Quadrat PR1 is representative of this vegetation type.	
EmAfXo *Eucalyptus marginata/Allocasuarina fraseriana/Xylomelum occidentale* Low Open Woodland over *Kunzea glabrescens* Tall Shrubland over *Conostylis aculeata/Desmocladus flexuosus* Low Open Shrubland	Similar to the EmAf unit but contained Woody Pear (*Xylomelum occidentale*) as a common small tree 3-4m high. *Kunzea glabrescens* was regenerating to 2m after a recent fire. Banksia trees were absent. The understorey was very similar to the EmAf unit with a very sparse cover of *Conostylis aculeata* and *Desmocladus flexuosus*. Other native species included *Macrozamia riedlei, Opercularia echinocephala* and *Corynotheca micrantha*. The soils are grey sand. Quadrat PR3 is representative of this vegetation type.	

Vegetation Type	Description	Photograph
AfEmBiKg *Allocasuarina fraseriana/Eucalyptus marginata/Banksia ilicifolia* Low Open Woodland over *Kunzea glabrescens* Tall Open Scrub over *Conostylis aculeata* Low Open Shrubland	This vegetation type occurred on the narrow ridge of the eastern section of the survey area. *Allocasuarina fraseriana, Eucalyptus marginata* and *Banksia ilicifolia* are scattered trees 4-6m high over a fairly dense layer of *Kunzea glabrescens* and some *Jacksonia furcellata* 1-3m and up to 25% cover. Common shrub species include *Conostylis aculeata, Scholtzia involucrata, Dasypogon bromeliifolius* and *Calytrix flavescens*. The soils are grey sand. Quadrat PR8 is representative of this vegetation type.	
BaBmBiKg *Banksia attenuata/B. menziesii/B. ilicifolia/Kunzea glabrescens* Tall Open Scrub over *Conostylis aculeata/Desmocladus flexuosus* Low Open Shrubland	A small stand of this vegetation type occurs on slightly sloping ground in the eastern survey area. The vegetation is recovering from a recent fire. Pre-fire the trees (*Banksia attenuata, B. menziesii, B. ilicifolia*) would have been up to 6m high. *Kunzea glabrescens* and *Jacksonia furcellata* form a dense shrub layer up to 2m high. The understorey is very open with common native species *Conostylis aculeata, Desmocladus flexuosus* and common weed species *Briza maxima* and *Vulpia myuros.* The soils are greyish-brown sand. Quadrat PR4 is representative of this vegetation type.	

Vegetation Type		Description	Photograph
Kg1	*Kunzea glabrescens* Tall Open Scrub over *Conostylis aculeata/Corynotheca micrantha* Low Open Shrubland	This is the most common vegetation type on both the western and eastern sections of the survey area, occurring on the middle and lower parts of the low sand ridges. *Kunzea glabrescens* (Spearwood) is typically 1-2m high but can be up to 4m high in areas that have not been burnt over a longer timeframe. *Jacksonia furcellata* is often a very tall shrub in this unit. Common understorey species include *Conostylis aculeata, Corynotheca micrantha, Acacia pulchella, Xanthorrhoea preissii* and *Acacia huegelii*. Common weed species include *Briza maxima, Ursinia anthemoides, Ehrharta longiflora* and *Vulpia myuros.* The soils are grey-black sand. Quadrat2 PR2, 5 and 9 are representative of this vegetation type.	
Kg2	*Kunzea glabrescens* Tall Shrubland over pasture	This vegetation type has regrown on the Multiple Use wetland flats within the survey area. The Spearwood shrubs are up to 3m high and can be dense, up to 40% but no native understorey species were present. The soils are black sand under a white sand veneer. Quadrat PR6 is representative of this vegetation type.	

Vegetation Type		Description	Photograph
Er	*Eucalyptus rudis* Low Open Woodland over *Kunzea glabrescens* Tall Open Scrub	A very small patch of *Eucalyptus rudis* (Flooded Gum) Low Open Woodland occurred in the eastern section of the survey area on the lower slopes of the ridge, in close proximity to the RE wetland in the north-east corner of the site. The *E. rudis* trees were 10-12m high and less than 30% cover over a sparse cover of *Kunzea glabrescens* and *Jacksonia furcellata* to 4m high. The understorey was predominantly weed species with very few native plants. The soils are grey sand. Quadrat PR7 is representative of this vegetation type.	
Mp	*Melaleuca preissiana* Low Woodland over pasture	A very small patch of *Melaleuca preissiana* (Paperbark) trees occurred in the western part of the eastern survey area on lower slopes of the ridge. The *M. preissiana* trees were up to 5m high. The understorey was all pasture weed species. The soils are grey sand.	

3.3.4 Vegetation Condition

The condition of the vegetation was assessed according to the system devised by Keighery and described in Bush Forever (Government of Western Australia, 2000) (Table 6).

Table 6: Vegetation Condition Rating Scale.

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Source: Government of Western Australia, 2000.

The condition of the vegetation ranged from Good to Completely Degraded (Figure 4). No areas of Very Good or Excellent vegetation were recorded. The absence of native vegetation in Very Good to Excellent condition is likely due to the prevalence of livestock and potentially kangaroos grazing significantly on the understorey, reducing it to a sparse cover. Fires may have also altered the understorey and tree canopy structure as evidence by many dead trees, particularly in the eastern part of the survey area.

The areas of Good condition vegetation were located in most of the western survey area and about half of the eastern survey area.

3.4 Flora

The site contains vegetation mostly in Good condition with a range of vegetation types that are mostly on upland sandy soils with a small area on a section of Multiple Use wetland. A total of 120 flora species were recorded during the three survey dates. The total included 95 native and 25 introduced species (Appendix 7).

The plant Families most represented on the site were the Fabaceae (Wattle and Pea Family – 18 species including 13 native and 5 introduced), Asteraceae (Daisy Family – 13 species, 8 native, 5 introduced), Myrtaceae (Myrtle Family - 9 species, all native), Poaceae (Grass Family – 9 species, one native, 8 introduced) and Proteaceae (Banksia Family – 8 species, all native).

The July targeted survey for the Glossy-leaved Hammer Orchid (*Drakaea elastica*) was undertaken along transects spaced approximately 10m apart through the site. No distinctive leaves of the orchid were observed.

One Priority 3 species, *Jacksonia gracillima*, was recorded on the site in the detailed spring survey. A total of 11 plants were recorded in two locations close to each other in open *Kunzea glabrescens* Tall Open Scrub at the western end of the site close to Paterson Road (Figure 3).

Jacksonia gracillima is a low shrub (Plate 4) up to 0.5m high and 1m wide that occurs on sandy soils on the Swan Coastal Plain from north of Perth to Dunsborough.

Plate 4: *Jacksonia gracillima* on the site

3.5 Conservation Significance of Flora and Vegetation

3.5.1 Vegetation

Vegetation Complex

The vegetation on the site is part of the Bassendean - Central and South Vegetation Complex. There is approximately 10,919ha (24%) of the pre-European extent of the Bassendean Complex-Central and South remaining on the Swan Coastal Plain portion of the Perth Metropolitan Region (WALGA, 2013). The percentage protection is above the 10% minimum criteria for vegetation complexes in the Perth Metropolitan Region Constrained Area.

Floristic Community Type

Most of the Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) on the southern Swan Coastal Plain are based on the Floristic Community Type level of vegetation description (Gibson *et al*., 1994).

The vegetation on the site was assessed as closely matching FCT 21a.

FCT21a is not a TEC or PEC at State or Commonwealth level. However, both FCT 21a and 21c are sub-units of the Banksia Woodlands of the Swan Coastal Plain ecological community which is listed as a Threatened Ecological Community under the Commonwealth EPBC Act and a Priority Ecological Community at State level.

An assessment of the potential for any vegetation types on the site meeting the requirements of the Banksia Woodland TEC is contained below in Section 3.6.

Banksia Woodland TEC

The Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (Banksia Woodland TEC) is listed as an Endangered TEC under the EPBC Act. The *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community* (Conservation Advice) describes the Banksia Woodland TEC as follows:

> *The ecological community is a woodland associated with the Swan Coastal Plain of southwest Western Australia. A key diagnostic feature is a prominent tree layer of Banksia, with scattered eucalypts and other tree species often present among or emerging above the Banksia canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The ecological community is characterised by a high endemism and considerable localised variation in species composition across its range*.

Table 7 assesses the vegetation types on the site against the Banksia Woodland TEC criteria contained in the Conservation Advice.

In conclusion, none of the vegetation types was assessed as meeting the requirements of the Banksia Woodland TEC.

Table 7: Assessment of the Banksia Woodland of the Swan Coastal Plain TEC.

Feature	Characteristic	Vegetation Type		
		BaBmBiKg	**EmAf, EmAfXo, AfEmBiKg**	**Kg1, Kg2, Er,Mp**
Banksia Species	The patch must include at least one of the following diagnostic species: • *Banksia attenuata* (Candlestick Banksia) • *Banksia menziesii* (Firewood Banksia) • *Banksia prionotes* (Acorn Banksia) • *Banksia ilicifolia* (Holly-Leaved Banksia).	Contains *Banksia attenuata, B. menziesii, B. ilicifolia*	Contains *Banksia attenuata, B. menziesii, B. ilicifolia*	Does not contain any of the required Banksia species
Vegetation Structure	• A distinctive upper sclerophyllous layer of low trees (occasionally large shrubs more than 2 m tall), typically dominated or codominated[3] by one or more of the *Banksia* species (*B. attenuata, B. menziesii, B. ilicifolia, B. prionotes*); • An emergent tree layer of medium or tall (>10 m) height *Eucalyptus* or *Allocasuarina* species may sometimes be present above the *Banksia* canopy. • An understory that is often highly species-rich consists of: – A layer of sclerophyllous shrubs of various heights; and, – A herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, that sometimes includes grasses. The development of a ground layer may vary depending on the density of the shrub layer and disturbance history.	Vegetation regenerating from recent fire but likely to regenerate to a Low Woodland structure with Banksia trees as the dominant layer.	Banksia trees are very sparse to absent from large parts of these vegetation types.	Vegetation structure does not contain an upper layer of Banksia trees.

Feature	Characteristic	Vegetation Type		
		BaBmBiKg	**EmAf, EmAfXo, AfEmBiKg**	**Kg1, Kg2, Er,Mp**
Vegetation Condition	An area of Banksia woodland needs to be at least in Good condition to be considered the TEC.	Good condition	Good condition	All areas in Good condition apart from Mp which is Degraded
Patch Size	The Banksia woodland TEC needs to meet a minimum 'patch' size depending on its condition to qualify as the TEC, as follows: • 'Pristine' – no minimum patch size • 'Excellent' – 0.5ha • 'Very Good' – 1ha • 'Good' – 2ha	Approximately 1.3ha	EmAf - More than 2ha EmAfXo – More than 2ha AfEmBiKg - More than 2ha	N/A
Conclusion		Does not meet the requirements for the TEC as the patch size is below the requirement for vegetation in Good condition.	Does not meet the requirements for the TEC as Banksia trees are not a dominant tree canopy.	Does not meet the requirements for the TEC as Banksia trees are absent.

3.5.2 Flora

A total of 41 conservation significant species were identified as having been recorded within 10km of the site. One Priority species, *Jacksonia gracillima,* was recorded at the western end of the site on a low sand ridge containing *Kunzea glabrescens* vegetation. The other potential species are considered to not occur on the site given none were found during the three surveys.

4 FAUNA

4.1 Methodology

The Level 1 Fauna Survey was undertaken in accordance with EPA Technical Guidance *Fauna Surveys for Environmental Impact Assessment* (EPA, 2016b). Desktop studies were undertaken to identify habitats and potential threatened species that may occur on the site. An assessment of the fauna habitats on the site was conducted by PGV Environmental on 12 February 2019.

4.2 Desktop Studies

Desktop studies were undertaken to identify conservation significant species potentially present on the site. A search of the DBCA Database (Appendix 8), Naturemap database (Appendix 2) and the EPBC Act Protected Matters Search Tool (Appendix 3) identified threatened species of fauna listed as potentially occurring within a 5km radius of the site (Table 8).

Table 8: List of Fauna Species Identified from Fauna Database Searches

Scientific Name	Common Name	Conservation Status, WA	Status under EPBC Act
Calidris ferruginea	Curlew Sandpiper	Schedule 1 - CR	Critically Endangered
Diomedea dabbenena (Diomedea exulans dabbenena)	Tristan Albatross	Schedule 1 - CR	Endangered
Limosa lapponica menzbieri	Bar-tailed Godwit (northern Siberian)	Schedule 1 - CR	Marine/ Migratory
Numenius madagascariensis	Eastern Curlew	Schedule 1 - CR	Critically Endangered
Pseudocheirus occidentalis	Western Ringtail Possum, Ngwayir	Schedule 1 - CR	Critically Endangered
Diomedea amsterdamensis (Diomedea exulans amsterdamensis)	Amsterdam Albatross	Schedule 1 - CR Schedule 5 - IA	Endangered
Anous tenuirostris melanops	Australian Lesser Noddy	Schedule 2 - EN	Vulnerable/ Marine
Botaurus poiciloptilus	Australasian bittern	Schedule 2 - EN	Endangered
Calidris canutus	Red Knot	Schedule 2 - EN	Marine/ Migratory
Calyptorhynchus baudinii	Baudin's Black Cockatoo	Schedule 2 - EN	Endangered
Calyptorhynchus latirostris	Carnaby's Black Cockatoo	Schedule 2 - EN	Endangered
Myrmecobius fasciatus	Numbat, Walpurti	Schedule 2 - EN	Endangered
Rostratula australis (Rostratula benghalensis australis)	Australian Painted Snipe	Schedule 2 - EN	Endangered Marine/ Migratory

Scientific Name	Common Name	Conservation Status, WA	Status under EPBC Act
Thalassarche melanophris	Black-browed Albatross	Schedule 2 - EN Schedule 5 - IA	Vulnerable/ Migratory/ Marine
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	Schedule 3 - VU	Vulnerable
Dasyurus geoffroii	Chuditch, Western Quoll	Schedule 3 - VU	Vulnerable
Leipoa ocellata	Mallee Fowl	Schedule 3 - VU	Vulnerable
Limosa lapponica baueri	Bar-tailed Godwit (western Alaskan)	Schedule 3 - VU	Marine/ Migratory
Neophoca cinerea	Australian Sea-lion	Schedule 3 - VU	
Setonix brachyurus	Quokka	Schedule 3 - VU	Vulnerable
Westralunio carteri	Carter's Freshwater Mussel	Schedule 3 - VU	Vulnerable
Diomedea epomophora	Southern Royal Albatross	Schedule 3 - VU Schedule 5 - IA	Vulnerable
Diomedea exulans	Wandering Albatross	Schedule 3 - VU Schedule 5 - IA	Vulnerable
Thalassarche cauta cauta (Thalassarche cauta sensu stricto)	Shy Albatross	Schedule 3 - VU Schedule 5 - IA	Marine/Migratory
Thalassarche cauta steadi	White-capped Albatross	Schedule 3 - VU Schedule 5 - IA	Vulnerable/ Migratory/ Marine
Thalassarche impavida (Thalassarche melanophris impavida)	Campbell Albatross	Schedule 3 - VU Schedule 5 - IA	Vulnerable/ Migratory/ Marine
Actitis hypoleucos (Tringa hypoleucos)	Common Sandpiper	Schedule 5 - IA	Marine/ Migratory
Anous stolidus	Common Noddy	Schedule 5 - IA	
Apus pacificus	Fork-tailed Swift	Schedule 5 - IA	Marine/Migratory
Calidris acuminata	Sharp-tailed Sandpiper	Schedule 5 - IA	Marine/ Migratory
Calidris melanotos	Pectoral Sandpiper	Schedule 5 - IA	Marine/ Migratory
Calidris ruficollis	Red-necked Stint	Schedule 5 - IA	Marine/ Migratory
Calidris subminuta	Long-toed Stint	Schedule 5 - IA	Marine/ Migratory
Chlidonias leucopterus (Sterna leucoptera)	White-winged Black tern, White-winged Tern	Schedule 5 - IA	Marine/ Migratory
Diomedea sanfordi	Northern Royal Albatross	Schedule 5 - IA	Endangered/ Migratory/ Marine
Hydroprogne caspia (Sterna caspia)	Caspian Tern	Schedule 5 - IA	Marine/ Migratory
Limosa lapponica	Bar-tailed Godwit	Schedule 5 - IA	Marine/ Migratory
Limosa limosa	Black-tailed Godwit	Schedule 5 - IA	Migratory/ Marine
Macronectes giganteus	Southern Giant Petrel	Schedule 5 - IA	Endangered/ Migratory/ Marine
Macronectes halli	Northern Giant-Petrel	Schedule 5 - IA	Vulnerable/ Migratory/ Marine
Motacilla cinerea	Grey Wagtail	Schedule 5 - IA	Migratory/ Marine

Scientific Name	Common Name	Conservation Status, WA	Status under EPBC Act
Pandion cristatus (Pandion haliaetus)	Osprey	Schedule 5 - IA	Marine/ Migratory
Philomachus pugnax	Ruff	Schedule 5 - IA	Marine/ Migratory
Plegadis falcinellus	Glossy Ibis	Schedule 5 - IA	Marine/Migratory
Thalasseus bergii (Sterna bergii)	Crested Tern	Schedule 5 - IA	Marine/ Migratory
Tringa glareola	Wood Sandpiper	Schedule 5 - IA	Marine/ Migratory
Tringa nebularia	Common Greenshank	Schedule 5 - IA	Marine/ Migratory
Tringa stagnatilis	Marsh Sandpiper, Little Greenshank	Schedule 5 - IA	Marine/ Migratory
Ardea alba (Ardea modesta)	Great Egret, White Egret		Marine
Ardea ibis	Cattle Egret		Marine
Haliaeetus leucogaster	White-bellied Sea-eagle		Marine
Merops ornatus	Rainbow Bee-eater		Marine
Pachyptila turtur subsp. subantarctica	Fairy Prion (southern)		Vulnerable
Isoodon fusciventer	Southern Brown Bandicoot, Quenda	Priority 4	
Oxyura australis	Blue-billed Duck	Priority 4	
Thinornis rubricollis (Charadrius rubricollis)	Hooded Plover	Priority 4	Marine

Fauna are classified under five different Priority codes and rare and endangered fauna are classified under the *Wildlife Conservation (Specially Protected Fauna) Notice 2014* into five schedules of taxa. These are outlined in Appendix 4.

4.3 Fauna Habitat

Three fauna habitats were described on the site as follows:

- Low Open Woodland Habitat (Plate 5);
- Shrubland Habitat (Plate 6); and
- Grassland Habitat (Plate 7).

The Open Woodland Habitat corresponds to most of the areas of native vegetation dominated by Eucalypts, Sheoaks and Banksias as mapped in Figure 3. The shrubland habitat is dominated by Spearwood with a mostly weedy understorey and the Grassland habitat is cleared pastureland.

Plate 5: Open Woodland Habitat

Plate 6: Shrubland Habitat

Plate 7: Grassland Habitat

Fauna habitat can be assessed using a number of factors including, the size of the habitat, the level of habitat connectivity, availability of specific resources (e.g. tree hollows) and overall vegetation quality. The habitat was assessed according to the following categories:

High Quality Fauna Habitat – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.

Very Good Fauna Habitat - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally affected by disturbance.

Good Fauna Habitat – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.

Disturbed Fauna Habitat – These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, contain weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.

Highly Degraded Fauna Habitat – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Faunal assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance. (Coffey Environments, 2009).

The Open Woodland Habitat has vegetation in Degraded to Good condition with the structure of the vegetation impacted by grazing and fire. The vegetation has some limited linkage to other areas of bushland therefore the habitat is considered to be Disturbed Fauna Habitat. The Shrubland Habitat is Good to Degraded and the Grassland Habitat does not retain any native vegetation. both fauna habitats are considered to be Highly Degraded Fauna Habitat.

4.4 Conservation Significant Species

Outlined below in Table 9 is a short description of the preferred habitat for each of the species that were identified in the DBCA Database Search (Appendix 8), NatureMap Species Report (Appendix 2) and the EPBC Protected Matters Search Tool (Appendix 3) in Table 7. The preferred habitat has been compared to the habitats on the site described above and the likelihood of each species to be present was determined.

Table 9: Preferred Habitat of Conservation Significant Fauna Species

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Calidris ferruginea	Curlew Sandpiper	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	No – not coastal habitat
Diomedea dabbenena (Diomedea exulans dabbenena)	Tristan Albatross	The Tristan Albatross is a marine, pelagic seabird and forages in open water.	No – this species is marine and pelagic
Limosa lapponica menzbieri	Bar-tailed Godwit (northern Siberian)	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh.	No – not coastal habitat
Numenius madagascariensis	Eastern Curlew	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets.	No – not coastal habitat
Pseudocheirus occidentalis	Western Ringtail Possum, Ngwayir	The Western Ringtail Possum is a medium sized nocturnal marsupial. This species occurs in and near coastal Peppermint Tree (Agonis flexuosa) forest and Tuart (Eucalyptus gomphocephala) dominated forest with a Peppermint Tree understorey.	No – no suitable habitat on the site

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Diomedea amsterdamensis (Diomedea exulans amsterdamensis)	Amsterdam Albatross	The Amsterdam Albatross is a marine, pelagic seabird. It nests in open patchy vegetation on Amsterdam Island.	No – this species is marine and pelagic
Anous tenuirostris melanops	Australian Lesser Noddy	The Australian Lesser Noddy usually occupies coral-limestone islands that are densely fringed with White Mangrove (*Avicennia marina*).	No – not island habitat
Botaurus poiciloptilus	Australasian bittern	The Australasian Bittern occurs mainly in densely vegetated freshwater wetlands and, rarely, in estuaries or tidal wetlands.	No – not wetland habitat
Calidris canutus	Red Knot	In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs.	No – not coastal habitat
Calyptorhynchus baudinii	Baudin's Black Cockatoo	Baudin's Black-Cockatoo mainly occurs in eucalypt forests, especially Jarrah (*Eucalyptus marginata*), Marri (*Corymbia calophylla*), also Karri (*E. diversicolor*) forest, often feeding in the understorey on proteaceous trees and shrubs, especially banksias (SEWPaC, 2012).	Potentially occurs intermittently on the site
Calyptorhynchus latirostris	Carnaby's Black Cockatoo	Carnaby's Cockatoo is found in the south-west of Australia from Kalbarri through to Ravensthorpe. It has a preference for feeding on the seeds of B*anksia, Hakea, Eucalyptus, Grevillea, Pinus* and *Allocasuarina* spp. It is nomadic often moving toward the coast after breeding. It breeds in tree hollows that are 2.5 - 12m above the ground and have an entrance 23-30cm with a depth of 1-2.5m. Nesting mostly occurs in smooth-barked trees (e.g. Salmon Gum, Wandoo, Red Morrell) (SEWPaC, 2012)	Potentially occurs intermittently on the site
Myrmecobius fasciatus	Numbat, Walpurti	Numbats occur in eucalypt forests and woodlands dominated by *Eucalyptus marginata, Corymbia calophylla* and *Eucalyptus wandoo*.	Highly Unlikely – the site doesn't contain the preferred habitat and the species hasn't been recorded since 1974

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Rostratula australis (Rostratula benghalensis australis)	Australian Painted Snipe	The Australian Painted Snipe has been recorded at wetlands in all states of Australia but is most common in eastern Australia. It generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. It also uses inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include a cover of vegetation, including grasses.	No – not wetland habitat
Thalassarche melanophris	Black-browed Albatross	The Black-browed Albatross is a marine species that inhabits terraces of coastal cliffs, slopes of nearby hills, summits of rocky islets or on flat or gently-sloping ground.	No – not coastal habitat
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	Forest Red-tailed Black Cockatoos frequent the humid to sub-humid south-west of Western Australia from Gingin in the north, to Albany in the south and west to Cape Leeuwin and Bunbury (SEWPaC, 2012). It nests in tree hollows with a depth of 1-5m, that are predominately Marri (Corymbia calophylla), Jarrah (Eucalyptus marginata) and Karri (E. diversicolor) and it feeds primarily on the seeds of Marri.	Possible intermittent visitor to the site
Dasyurus geoffroii	Chuditch, Western Quoll	The Chuditch have been known to occupy a wide range of habitats including woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. They are opportunistic feeders, and forage on the ground at night, feeding on invertebrates, small mammals, birds and reptiles.	Highly unlikely due to site disturbance
Leipoa ocellata	Mallee Fowl	Mallee fowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards in mallee bushland.	No – no mallee habitat
Limosa lapponica baueri	Bar-tailed Godwit (western Alaskan)	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh.	No – not coastal habitat
Neophoca cinerea	Australian Sea-lion	Marine/Shore	No – not coastal habitat

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Setonix brachyurus	Quokka	Quokkas were originally very common on the Swan Coastal Plain, however, their distribution is now limited to Rottnest Island and a few isolated areas in the south-west of WA. On the mainland, they prefer densely vegetated areas around wetlands and streams, whereas on Rottnest Island they inhabit low scrubby coastal vegetation where water is not readily available year-round.	Highly Unlikey – thought to be locally extinct
Westralunio carteri	Carter's Freshwater Mussel	Carter's Feshwater Mussel is South-West Western Australia's only freshwater mussel (Murdoch University & SERCUL, 2012). Carter's Freshwater Mussel occurs in freshwater streams, rivers, reservoirs and lakes (ICUN, 2015b) and is intolerant to dehydration for more than three days and salinity (Murdoch University & SERCUL, 2012).	No – no permanent water on the site
Diomedea epomophora	Southern Royal Albatross	The Southern Royal Albatross is marine and pelagic and does not nest on the mainland.	No – this species is marine and pelagic
Diomedea exulans	Wandering Albatross	The Wandering Albatross is marine, pelagic and aerial. In the Australasian region, it occurs inshore, offshore and in pelagic waters. It flies within 15 m of the sea surface, using the updraft from wave fronts for lift. It circles over breeding islands to heights of at least 1500 m. On breeding islands, it nests on coastal or inland ridges, slopes, plateaux and plains, often on marshy ground. Nests are sited on moss terraces, in dense tussocks, and often in loose aggregations on the west (windward) side of islands. It prefers open or patchy vegetation (tussocks, ferns or shrubs), and it requires nesting areas that are near exposed ridges or hillocks so that it can take off.	No – this species is marine and pelagic

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Thalassarche cauta cauta (Thalassarche cauta sensu stricto)	Shy Albatross	The Shy Albatross is a marine species occurring in subantarctic and subtropical waters, reaching the tropics in the cool Humboldt Current off South America. In the southern Indian Ocean the species has been observed over waters of 6.4-13.5°C. It has been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, it occurs over continental shelves around continents. The species occurs both inshore and offshore and enters harbours and bays. The birds are scarce in pelagic waters. The species flies low to moderately high, using updraft from wave fronts for lift. It nests on level or gently sloping ledges, summits, slopes and caves of rocky islets and stacks, usually in broken terrain with little soil and vegetation.	No – this species is marine and pelagic
Thalassarche cauta steadi	White-capped Albatross	The White-capped Albatross is a marine species and occurs in subantarctic and subtropical waters. It reaches tropical areas associated with the cool Humboldt Current off South America. In the southern Indian Ocean it has been observed in waters of 6.4–13.5 °C. It has been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, birds have been observed over continental shelves around continents. The species occurs both inshore and offshore and enters harbours and bays. The species is scarce in pelagic waters. Birds gather to scavenge at commercial fishing grounds. It nests on slopes vegetated with tussock and succulents on Auckland Island.	No – this species is marine and pelagic

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Thalassarche impavida (Thalassarche melanophris impavida)	Campbell Albatross	The Campbell Albatross is a marine sea bird inhabiting sub-Antarctic and subtropical waters from pelagic to shelf-break water habitats. It tolerates sea surface-temperatures from 0–24 °C, but are mainly found in the sub-Antarctic. In December, the subspecies southern limit in the Ross Sea is at the 1.0 °C isotherm and in January at the 0.0 °C isotherm. In breeding and non-breeding seasons, they are specialised shelf feeders, concentrating around breeding islands or over adjacent submarine banks. In winter, they are commonly found in the coastal waters of continents, over up-wellings or boundaries of currents. It breeds on Campbell Island. They make their nests on tussock-covered ledges and terraces of cliffs, slopes and hills, overlooking the sea or valleys, and on the summits of rocky islets.	No – this species is marine and pelagic
Actitis hypoleucos (Tringa hypoleucos)	Common Sandpiper	The Common Sandpiper is mostly found around muddy margins or rocky shores. Generally the species forages in shallow water and on bare soft mud at the edges of wetlands.	No – not wetland habitat
Anous stolidus	Common Noddy	The Common Noddy feeds on small fish, squid, pelagic molluscs, insects and even Pandanus fruit. Most items are skimmed from the surface of the ocean by dipping and breeds on islands (Birdlife Australia, 2014).	No – not coastal habitat
Apus pacificus	Fork-tailed Swift	The Fork-tailed Swift is almost exclusively aerial and is not known to breed in Australia. They are seen in inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. *Apus pacificus* subsp. *pacificus* is the only subspecies to migrate to Australia.	No – not coastal habitat – possibly could fly over the site but unlikely to land
Calidris acuminata	Sharp-tailed Sandpiper	The Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	No – not wetland habitat

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Calidris melanotos	Pectoral Sandpiper	The Pectoral Sandpiper prefers shallow fresh to saline wetlands and is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	No – not wetland habitat
Calidris ruficollis	Red-necked Stint	The Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores.	No – not coastal habitat
Calidris subminuta	Long-toed Stint	The Long-toed Stint prefers shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire.	No – not wetland habitat
Chlidonias leucopterus (Sterna leucoptera)	White-winged Black tern, White-winged Tern	In Australia, the species mostly inhabits fresh, brackish or saline, and coastal or subcoastal wetlands.	No – not wetland habitat
Diomedea sanfordi	Northern Royal Albatross	The Northern Royal Albatross is marine, pelagic and aerial and does not nest on the mainland	No – this species is marine and pelagic
Hydroprogne caspia (Sterna caspia)	Caspian Tern	The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred.	No – not coastal habitat
Limosa lapponica	Bar-tailed Godwit	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	No – not coastal habitat
Limosa limosa	Black-tailed Godwit	The Black-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh.	No – not coastal habitat

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Macronectes giganteus	Southern Giant Petrel	The Southern Giant-Petrel is a marine bird that occurs in Antarctic to subtropical waters. In summer it mainly occurs over Antarctic waters.	No – this species is marine and pelagic
Macronectes halli	Northern Giant-Petrel	The Northern Giant-Petrel is marine and oceanic. It mainly occurs in sub-Antarctic waters, but regularly occurs in Antarctic waters of the southwestern Indian Ocean, the Drake Passage and west of the Antarctic Peninsula. The range of the Northern Giant-Petrel extends into subtropical waters mainly between winter and spring. It frequents both oceanic and inshore waters near breeding islands and in the non-breeding range. It is attracted to land at sewage outfalls, and scavenges at colonies of penguins and seals. It breeds on sub-Antarctic islands. Its breeding range extends into the Antarctic zone at South Georgia. It nests in coastal areas where vegetation or broken terrain offers shelter, on sea-facing slopes, headlands, in the lee of banks, under or against vegetation clumps, below cliffs or overhanging rocks, or in hollows. Tussock-grass (Poa) is widespread at many breeding sites. Its nests are built in secluded, coastal sites, sheltered by heavy vegetation.	No – this species is marine and pelagic
Motacilla cinerea	Grey Wagtail	The Grey Wagtail is mostly recorded in coastal areas in Western Australia (ALA, 2015) however is widespread. There is non-breeding habitat only in Australia and the species has a strong association with water, particularly rocky substrates along water courses but also lakes and marshes.	No – not coastal or wetland habitat
Pandion cristatus (Pandion haliaetus)	Osprey	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They feed on fish, especially mullet where available, and rarely take molluscs, crustaceans, insects, reptiles, birds and mammals.	No – not coastal or wetland habitat
Philomachus pugnax	Ruff	The Ruff is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges and is found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands.	No – not wetland habitat

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Plegadis falcinellus	Glossy Ibis	The Glossy Ibis is the smallest ibis known in Australia. This species preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation but do not breed in South-west Western Australia..	No – not wetland habitat
Thalasseus bergii (Sterna bergii)	Crested Tern	The Crested Tern occurs in coastal areas (Birdlife Australia, 2018).	No – not coastal or wetland habitat
Tringa glareola	Wood Sandpiper	The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially Melaleuca and River Red Gums Eucalyptus camaldulensis and often with fallen timber.	No – not wetland habitat
Tringa nebularia	Common Greenshank	The Common Greenshank is a wader and does not breed in Australia. This species can be found in many types of wetlands and has the widest distribution of any shorebird in Australia. This species typically feeds on molluscs, crustaceans, insects, and occasionally fish and frogs.	No – not wetland habitat
Tringa stagnatilis	Marsh Sandpiper, Little Greenshank	The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks.	No – not coastal or wetland habitat
Ardea alba (Ardea modesta)	Great Egret, White Egret	The Eastern Great Egret has been reported in a wide range of wetland habitats and usually frequents shallow waters. This species feeds on fish, insects, crustaceans, molluscs, frogs, lizards, snakes and small birds and mammals.	No – not wetland habitat

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Ardea ibis	Cattle Egret	The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands with breeding in Western Australia recorded in the far north in Wyndham in colonies in wooded swamps such as mangrove forest. This species forages away from water on low lying grasslands, improved pastures and croplands generally in areas that have livestock eating insects, frog, lizards and small mammals.	Highly Unlikely – not the preferred habitta of this species
Haliaeetus leucogaster	White-bellied Sea-eagle	The White-bellied Sea-Eagle is found in coastal habitats with large areas of open water, especially those close to the sea-shore. This species feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal.	No – not coastal or wetland habitat
Merops ornatus	Rainbow Bee-eater	Populations of the Rainbow Bee-eater that breed in northern Australia are considered to be resident, and in many northern localities the Rainbow Bee-eater is present throughout the year. The Rainbow Bee-eater nests in a burrow dug in the ground. It is found across the better-watered parts of WA including islands preferring lightly wooded, sandy country near water.	Possible intermittent visitor to the site
Pachyptila turtur subsp. subantarctica	Fairy Prion (southern)	The southern subspecies of the Fairy Prion is a marine bird, found mostly in temperate and subantarctic seas. The species' oceanic distribution is poorly known. The Fairy Prion sometimes forages over continental shelves and the continental slope, but it can come close inshore in rough weather. It breeds on islands and rock stacks. It burrows in soil, or uses crevices and caves in cliffs or rock falls. The subspecies can also nest in scrub, herbland, tussock or pasture.	No – not coastal or wetland habitat
Isoodon fusciventer	Southern Brown Bandicoot, Quenda	Southern Brown Bandicoots are small grey marsupials that prefer dense scrub (up to one metre high). Their diet includes invertebrates (including earthworms, adult beetles and their larvae), underground fungi, subterranean plant material, and very occasionally, small vertebrates (DEC, 2012).	Possibly occur on the site

Scientific Name	Common Name	Habitat*	Likelihood of occurring on the site
Oxyura australis	Blue-billed Duck	The Blue-billed Duck is found on terrestrial wetlands in temperate regions, that are freshwater to saline, and may be natural or artificial. It nests in rushes, sedges, Lignum *Muehlenbeckia cunninghamii* and paperbark Melaleuca (Birdlife International, 2015). The species is almost completely aquatic, and is seldom seen on land. Non-breeding flocks, often with several hundred individuals, congregate on large, deep open freshwater dams and lakes in autumn. The daylight hours are spent alone in small concealed bays within vegetation or communally in large exposed rafts far from the shore (Birds in Backyards, 2015).	No – there is no open water on the site
Thinornis rubricollis (Charadrius rubricollis)	Hooded Plover	The Hooded Plover primarily inhabits sandy, ocean beaches, with the highest densities on beaches with large amounts of beach-washed seaweed that are backed by extensive open dunes. In Western Australia the species also inhabits inland and coastal salt lakes (Birdlife International 2014)	No – not coastal or wetland habitat

* Habitat descriptions from DoEE (2016) SPRAT Database unless otherwise denoted

A black Cockatoo Habitat assessment of the site was undertaken by PGV Environmental in 2019 (PGV Environmental, 2019). The assessment recorded around 10ha of foraging habitat for Baudin's Black Cockatoos, Carnaby's Black Cockatoos and Forest Red-tailed Black-Cockatoo in the Woodland vegetation types that contain Jarrah, Sheoak and Banksia trees (Valentine and Stock, 2008; Groom, 2011).

A total of 37 potential breeding habitat trees were recorded on the site in the Black Cockatoo Habitat Assessment, including 24 Jarrah, 2 Flooded Gums and 11 Standing Dead Trees. No evidence of current or past breeding was observed in any of the trees.

The level 1 fauna survey identified that the Southern Brown Bandicoot, Quenda (*Isoodon fusciventer*) (Priority 4) could potentially occur on the site. Dense vegetation suitable for Bandicoots is also present on the vegetated flats portion of the site that is not proposed for sand extraction. The property to the north is vegetated and provides some connection for any fauna that could utilise the site as habitat.

The Cattle Egret (*Ardea ibis*) and Rainbow Bee-eater (*Merops ornatus*), listed Marine under the EPBC Act, may potentially utilise some sections of the site as part of a much larger home range though only likely to occur infrequently.

4.5 Pest Fauna

The site shows signs of use by rabbits. Feral cats, foxes, rats and mice are also likely to be present.

4.6 Biodiversity Value

The EPA's (2002) *Terrestrial Biological Surveys as an Element of Biodiversity Protection Position Statement No. 3* indicated an ecological assessment of a site must consider its biodiversity value at the genetic, species and ecosystem levels; and its ecological functional value at the ecosystem level. The ecosystem on the site has been disturbed and the fauna assemblage would be greatly modified. There is likely to be a high percentage of introduced feral species such as foxes and rabbits and increased domestic predators such as cats.

5 SUMMARY AND CONCLUSIONS

5.1 Flora and Vegetation

The Flora and Vegetation survey found the following:

- The 48ha survey area contains approximately 34.5ha of native vegetation;
- Eight vegetation types were recorded on the site on dry sandy soils with two small areas containing vegetation types considered fringing wetland vegetation. The vegetation on the highest parts of the site contained a mix of *Allocasuarina fraseriana/Eucalyptus marginata* Low Open Woodland with *Xylomelum occidentale* and occasional *Banksia menziesii* and *B. ilicifolia* also present as small trees. The lower and mid-slopes of the survey area were dominated by dense stands of Spearwood (*Kunzea glabrescens*) with *Jacksonia furcellata* also common. *Banksia attenuata, B. menziesii* and *B. ilicifolia* occurred on the mid-slopes among the dense Spearwood but never in abundance. The understorey in all vegetation types was very sparse with a low diversity of native species;
- The native vegetation is mostly in Good condition with some Degraded and Completely Degraded vegetation on areas that have regrown since previous clearing;
- A total of 41 Threatened (Declared Rare) or Priority Flora species were identified as having been recorded in proximity to the survey area. Of these, 2 Threatened (Declared Rare) species and 4 Priority species have the potential to occur on the dry sandy soil type vegetation;
- The Detailed survey in spring recorded 120 species on the site, including 95 native and 25 introduced flora;
- No Threatened flora species were recorded on the site;
- One Priority 3 flora species, *Jacksonia gracillima,* was recorded in low numbers at the western end of the site;
- The vegetation types were assessed as being representative of Floristic Community Type FCT21a 'Central *Banksia attenuata - Eucalyptus marginata* woodlands'. FCT 21a is not listed as Threatened or Priority Ecological Communities at State or Commonwealth level; and
- None of the vegetation types were assessed as being part of the Commonwealth listed Banksia Woodlands of the Swan Coastal Plain TEC due either to the absence or low density of the key Banksia species, or the size of a patch of Banksia woodland being too small for the condition of the patch.

5.2 Fauna

The Level 1 Fauna Survey found the following:

- There are three fauna habitats on the site:
  - Open Woodland Habitat;
  - Shrubland Habitat; and
  - Grassland Habitat.
- The Open Woodland Habitat is restricted to the areas of remnant native vegetation containing Sheoak, Jarrah and occasional Banksia and is considered to be Disturbed Fauna Habitat:

- The Shrubland and Cleared Grassland habitat are considered to be Highly Degraded Fauna Habitat due to the degree of disturbance and previous clearing having impacted on the fauna assemblage;
- The Open Woodland Habitat contains vegetation foraging habitat and potential breeding habitat suitable for the following listed species under State and Federal legislation:
    - Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) (Endangered);
    - Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) (Endangered); and
    - Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) (Vulnerable);
- The site also contains habitat for the Southern Brown Bandicoot, Quenda (*Isoodon fusciventer*) (Priority 4);
- The Listed Marine species under the EPBC Act that may intermittently visit the site is the Cattle Egret (*Ardea ibis*) and the Rainbow Bee-eater (*Merops ornatus*); and
- Pest fauna likely to occur on the site are rabbits, feral cats, rats, mice and foxes.

5.3 Conclusion

The vegetation types recorded in the survey area are not considered to have significant conservation values at State or Commonwealth level. One Priority 3 plant species, *Jacksonia gracillima*, was recorded in low numbers and should be retained as far as possible in future sand mining of the site.

The fauna habitat on the site has been impacted by fire and grazing. The site contains habitat for conservation significant Black Cockatoos species including foraging and potential breeding habitat.

Clearing of the vegetation for sand extraction will require a clearing permit under State legislation. Referral under the Commonwealth EPBC Act may be required if the impact on Black Cockatoo habitat is considered likely to be significant.

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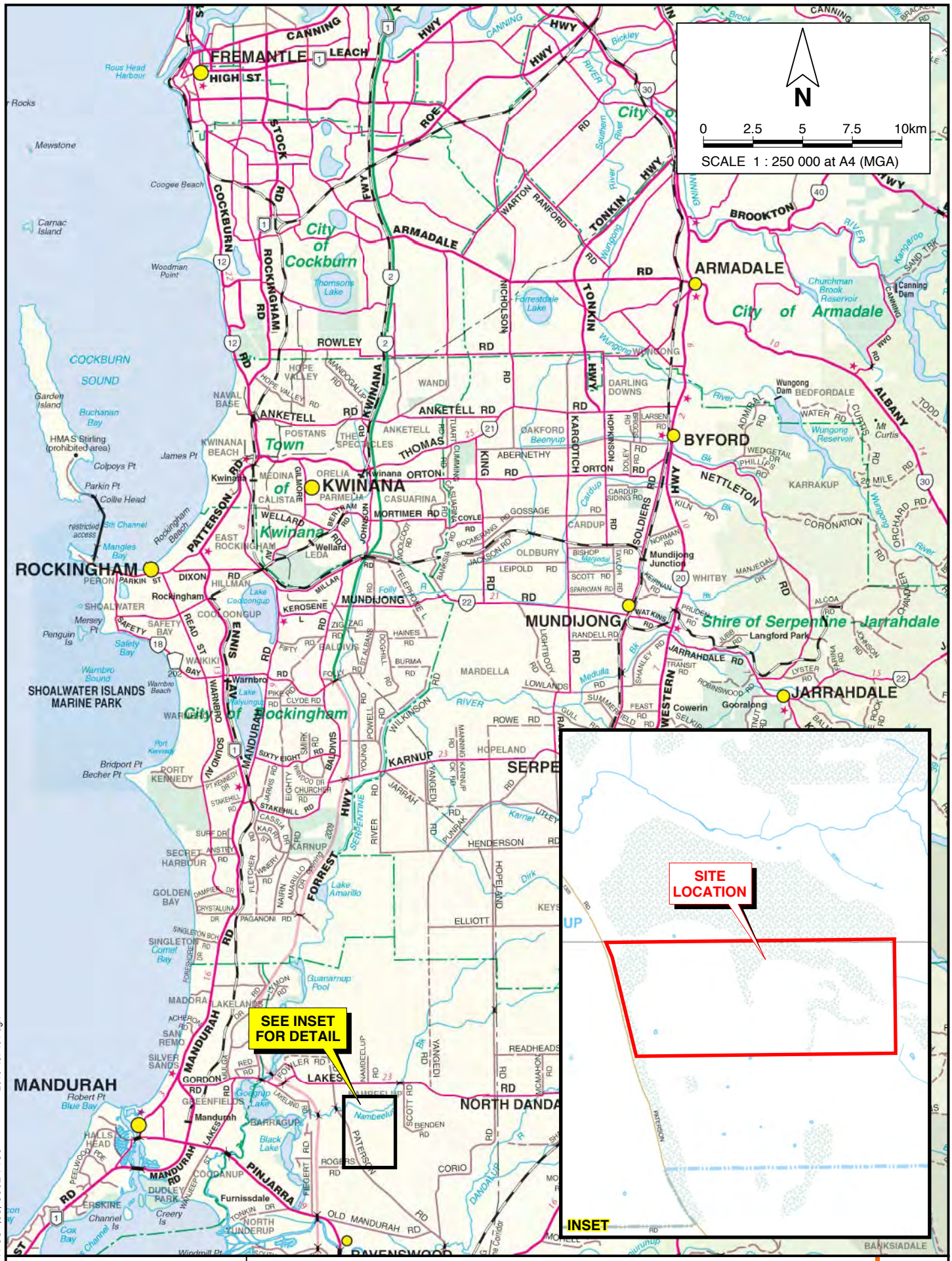
FIGURES



PINPOINT CARTOGRAPHICS (08) 9562 7136 2019-437-f01.dgn

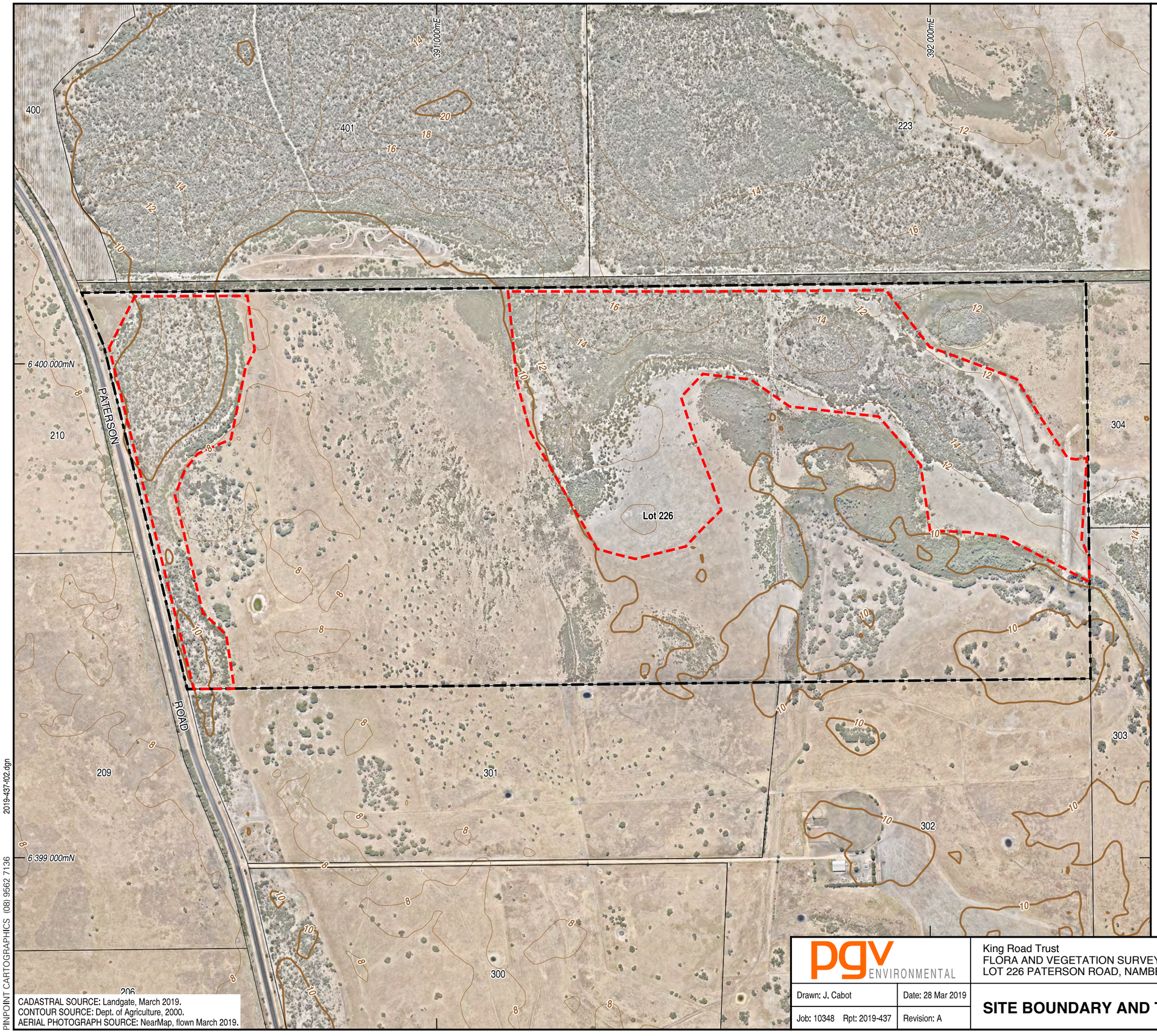
pgv ENVIRONMENTAL

Drawn: J. Cabot	Date: 28 Mar 2019
Job: 10348 Rpt: 2019-437	Revision: A

King Road Trust
FLORA AND VEGETATION SURVEY & LEVEL 1 FAUNA ASSESSMENT
LOT 226 PATERSON ROAD, NAMBEELUP

SITE LOCATION

Figure 1



CADASTRAL SOURCE: Landgate, March 2019.
CONTOUR SOURCE: Dept. of Agriculture, 2000.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown March 2019.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2019-437-f02.dgn

pgv ENVIRONMENTAL

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FLORA AND VEGETATION SURVEY & LEVEL 1 FAUNA ASSESSMENT
LOT 226 PATERSON ROAD, NAMBEELUP

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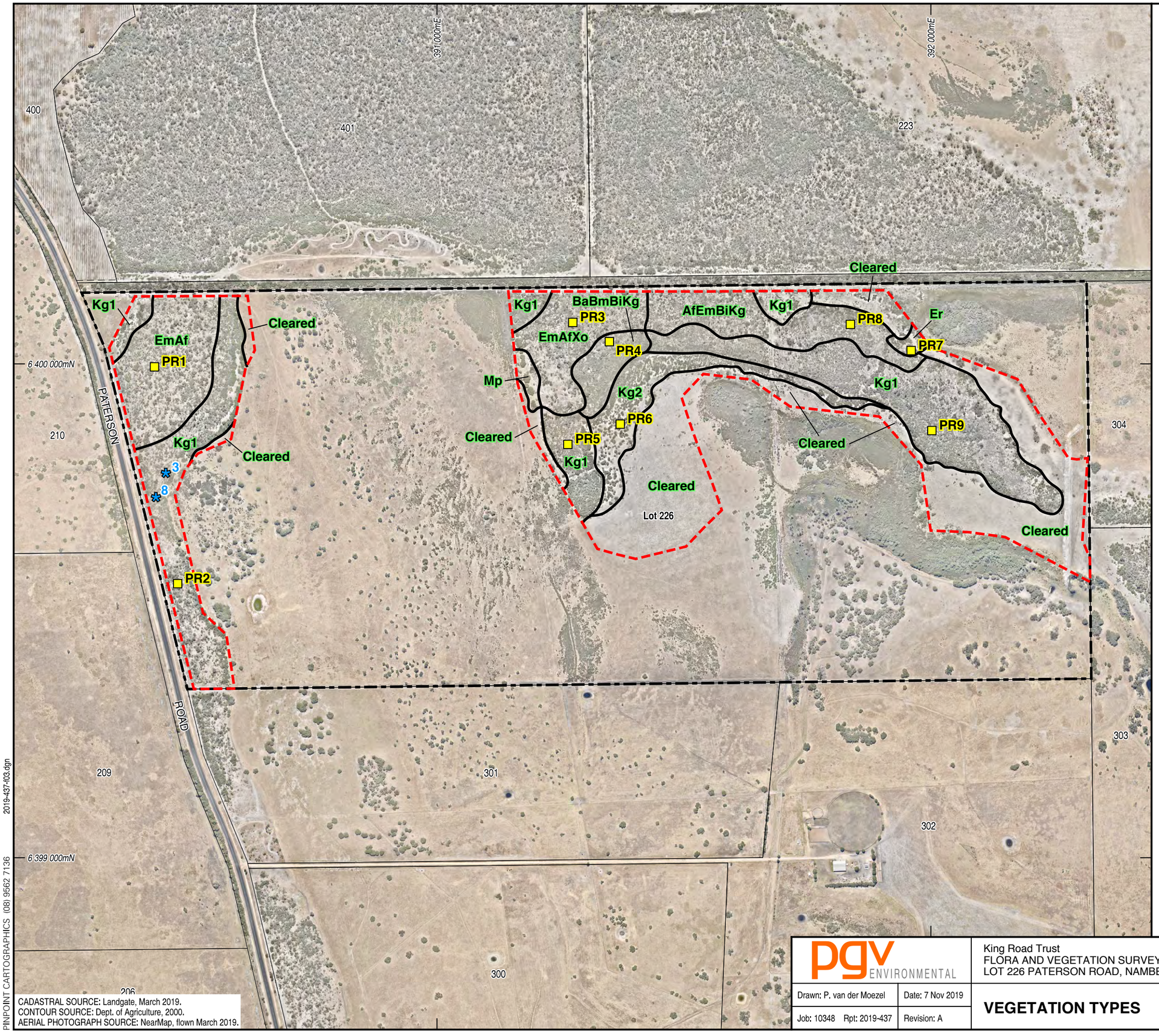
Job: 10348 Rpt: 2019-437	Revision: A

SITE BOUNDARY AND TOPOGRAPHY

Figure 2



N

0 50 100 150 200 250m

SCALE 1 : 7 500 at A3 (MGA)

Legend

- Site Boundary
- Lot 226 Boundary
- Cadastral Boundary
- Easement Boundary
- Quadrat Location
- Vegetation Type Boundary
- **EmAf** Vegetation Type

Priority Flora

- *Jacksonia gracillima* P3
- 3 Number of Plants

Vegetation Types

EmAf
Eucalyptus marginata/*Allocasuarina fraseriana* Low Open Woodland over Kunzea glabrescens Tall Shrubland over *Conostylis aculeata* Low Open Shrubland

EmAfXo
Eucalyptus marginata / *Allocasuarina fraseriana* / *Xylomelum occidentale* Low Open Woodland over *Kunzea glabrescens* Tall Shrubland over *Conostylis aculeata* / *Desmocladus flexuosus* Low Open Shrubland

AfEmBiKg
Allocasuarina fraseriana/*Eucalyptus marginata*/*Banksia ilicifolia* Low Open Woodland over *Kunzea glabrescens* Tall Open Scrub over *Conostylis aculeata* Low Open Shrubland

BaBmBiKg
Banksia attenuata/*B. menziesii*/*B. ilicifolia*/*Kunzea glabrescens* Tall Open Scrub over *Conostylis aculeata*/*Desmocladus flexuosus* Low Open Shrubland

Kg1
Kunzea glabrescens Tall Open Scrub over *Conostylis aculeata*/*Corynotheca micrantha* Low Open Shrubland

Kg2
Kunzea glabrescens Tall Shrubland over pasture

Er
Eucalyptus rudis Low Open Woodland over *Kunzea glabrescens* Tall Open Scrub

Mp
Melaleuca preissiana Low Woodland over pasture

pgv ENVIRONMENTAL

Drawn: P. van der Moezel | Date: 7 Nov 2019
Job: 10348 Rpt: 2019-437 | Revision: A

King Road Trust
FLORA AND VEGETATION SURVEY & LEVEL 1 FAUNA ASSESSMENT
LOT 226 PATERSON ROAD, NAMBEELUP

VEGETATION TYPES

Figure 3

2019-437-f03.dgn
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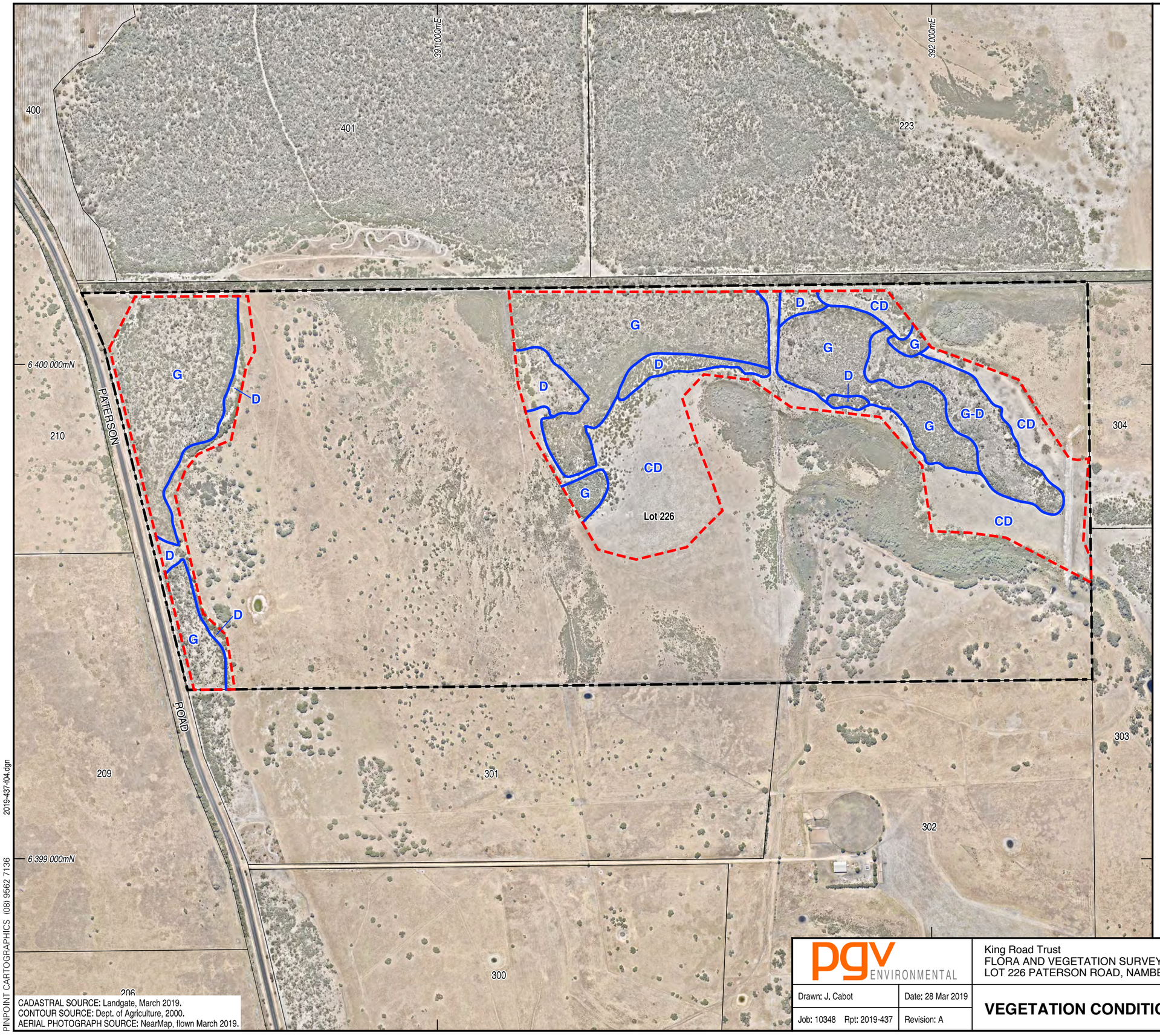

CADASTRAL SOURCE: Landgate, March 2019.
CONTOUR SOURCE: Dept. of Agriculture, 2000.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown March 2019.

N

0 50 100 150 200 250m

SCALE 1 : 7 500 at A3 (MGA)

Legend

- Site Boundary
- Lot 226 Boundary
- Cadastral Boundary
- Easement Boundary
- Quadrat Location
- Vegetation Condition Boundary
- G Vegetation Condition

Vegetation Condition
(SOURCE: Bush Forever, Govt. of W.A., 2000)

P - Pristine
Pristine or nearly so, no obvious signs of disturbance.

Ex - Excellent
Vegetation structure intact, disturbance affecting individual species and weeds are non aggressive species.

VG - Very Good
Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

G - Good
Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

D - Degraded
Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

CD - Completely Degraded
The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

Cl - Cleared
No native vegetation remaining.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2019-437-f04.dgn

pgv ENVIRONMENTAL

King Road Trust
FLORA AND VEGETATION SURVEY & LEVEL 1 FAUNA ASSESSMENT
LOT 226 PATERSON ROAD, NAMBEELUP

Drawn: J. Cabot | Date: 28 Mar 2019
Job: 10348 Rpt: 2019-437 | Revision: A

VEGETATION CONDITION

Figure 4

APPENDIX 1

DBCA Flora Database Search

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
699	5206820	3237	Acacia benthamii	'2	Erect, compact shrub 1.5 cm high x 1.2 cm wide. Flowers yellow.	Plain. Brown loam.			Abundance: occasional. 80% of population flowering.	Junction Redhead and Hoplands Roads, ca 6 km NW North Dandalup	GPS	1	29/09/1998
705	7308388	3237	Acacia benthamii	'2	Perennial shrub 1 m high x spreading 2 m wide. Yellow flowers. Few flowers, new growth.	Plain. Wetland. Reserve. Grey wet.	Medium trees and low shrubland with Melaleuca rhaphiophylla, Corymbia calophylla, Pericalymma ellipticum, Xanthorrhoea preissii, Hakea ceratophylla, Daviesia incrassata.	rare.		Pinjarra Nature Reserve	GPS	1	16/10/2005
709	8128073	3237	Acacia benthamii	'2		Seasonal wetland.	Open shrubland; Melaleuca rhaphiophylla, Pericalymma ellipticum, Xanthorrhoea preissii, Hakea ceratophylla, Calothamnus lateralis, Hibbertia stellaris.	common in limited area.	This specimen is mounted with PERTH 07580738.	Pinjarra Nature Reserve	GPS	0	4/09/2006
710	8008388	3237	Acacia benthamii	'2	Shrub to 1.5 m.	Flat. Brown some gravel.	Corymbia calophylla, weeds, Xanthorrhoea preissii.			On W side of Hopeland Road, ca 200 m N of the intersection with Readhead Road, North Dandalup	GPS	1	7/01/2009
2605	190713	14932	Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)	'1						6.5 miles W of North Dandalup	AUTO	3	17/09/1967
5546	7575238	45013	Amanita drummondii	'3						Culeenup Is., Yunderup	TOPO	3	16/05/1974
10726	3262065	20026	Blennospora doliiformis	'3	Small annual herb to 5 cm.	Small seasonal wetland between sand ridges. Soil brown sandy clay turning to clay at depth.	Melaleuca uncinata / Melaleuca viminea shrubland to 2 m height over a rich herb layer.	common.		Austin Bay Nature Reserve, along northern boundary, west of t-junction (plot austb07)	MAN	0	29/10/1993

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
10730	8893500	20026	Blennospora doliiformis	'3	Annual herb to 5 cm.	Small seasonal wetland between sand ridges. Soil brown sandy clay turning to clay at depth.	Melaleuca uncinata, M. viminea shrubland to 2 m high over a rich herb layer.		Vegetation condition: excellent to very good. Claypan TEC, communities 7 & 8.	Plot Austb 07. Austin Bay Nature Reserve, northern boundary	GPS	1	5/11/2013
10847	8277079	11612	Boronia capitata subsp. gracilis	'3	Perennial shrub 0.6 m high x 0.6 m wide. Pink flowers. Delicate spindly weeping shrub.	Plain. Grey sand. Collection site: road verge.	Medium trees. With Eucalyptus marginata, Kunzea glabrescens, Nuytsia florabunda, Regelia ciliata, Adenanthos sygnorum, Hibbertia varginata. Characteristic species: Hypocalymma angustifolium, sedges and rushes. Other alien species: few (1-3).	7 plants.	Other alien species: few (1-3).	Nambeelup Road and new Pipeline Road - 50-100 metres from corner on the left	TOPO	3	2/09/2010
12181	870374	1596	Caladenia huegelii	T						Ravenswood	MAN	3	16/10/1920
12373	1829963	13862	Caladenia speciosa	'4	Erect tuberous herb to 60 cm high. Flowers creamy-white with pendulous segments and a small labellum for the species.	Gently undulating terrain and white sand.	Eucalyptus marginata, banksia attenuata, B. ilicifolia and Casuarina fraseriana woodland over dieback affected scrub.		Abundance: 15 plants seen.	Hopelands road on the SE corner of Hopelands farm, W of North Dandalup	MAN	0	25/09/1990
13772	7908822	19338	Chamaescilla gibsonii	'3		Aspect: flat. Moist brown sand. Granite derived soil over limestone. Seasonally wet. Land status: private.	(Muir's): (Myrtaceae heath), Kunzea micrantha subsp. micrantha Closed Heath over Calothamnus lateralis and Astartea affinis ms Shrubland over Meeboldina roycei Very Open Sedgeland. With Astartea affinis ms, Brachyscome ? pusilla, Calothamnus lateralis, C	1 mature plant seen.	Condition of population: healthy. Salinity and increased public access (weeds).	Austin Bay between Yunderup townsite and Austin Bay Nature Reserve, between Mandurah and Pinjarra	GPS	1	4/10/2006

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
15847	6511872	16245	Cyathochaeta teretifolia	'3	Tufted perennial herb to 1.5 m.	Seasonal Wetland; flat, black sandy peat over ?sand. Poor drainage, wet during winter/spring.	Associated species: Melaleuca preissiana, Melaleuca rhaphiophylla, Eucalyptus rudis.			System 6 Update quadrat raven 02. Subm 280 Ravenswood Speedway	GPS	1	18/12/1995
18061	4494911	3863	Dillwynia dillwynioides	'3	Shrub 1.5m.	Soil: Grey sand. Topography/drainage: Seasonally wet flat. Geomorphology: Alluvial deposits (pinjarra plain).	Vegetation: Pericalymma floribunda, Hakea varia Dense Heath B over Schoenus rodwayanus Low Sedges.			Paganoni block E of Mandurah Rd, 11 km NNE of Mandurah (plot paga-3).	GPS	1	2/10/1992
18063	720771	3863	Dillwynia dillwynioides	'3						Yunderup	MAN	0	/12/1965
18065	720798	3863	Dillwynia dillwynioides	'3						Yunderup	MAN	0	/12/1965
18069	720801	3863	Dillwynia dillwynioides	'3	Slender shrub up to 4 ft. Flowers orange, red.	Swampy roadside.				Mandurah - North Yunderup	AUTO	3	3/10/1965
18071	6146813	3863	Dillwynia dillwynioides	'3	Erect shrub, 2 m high. Flowers yellow and orange, crowded in a short terminal raceme.	Swamp and estuarine wetland deposits during Holocene Period. Moderate litter cover, less than 5%. Black sandy loam over aeolian and marine deposits.	Salt marsh vegetation with fringing estuarine forest. Sarcocornia quinqueflora, with Casuarina obesa, Melaleuca rhapiophylla, Eucalyptus rudis.	common in the wet area.		Goegrup Lake, N end of Caponi Road	MAN	3	/10/2001

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
18072	5890608	3863	Dillwynia dillwynioides	'3	Erect shrub 1 m high.	Swamp and estuarine wetland deposits during Holocene period. Moderate litter cover less than 5%. Black sandy loam over aeolian and marine deposits.	Salt marsh vegetation with fringing estuarine forest. Sarcacornia quinqueflora, Casuarina obesa, Melaleuca rhaphiophylla, Eucalyptus rudis.	occasional.		Goegrup Lake, N end of Caponi Road,	MAN	3	/09/2001
18075	6097340	3863	Dillwynia dillwynioides	'3	Slender erect shrub 1.5 m high. Flowers orange-yellow, wings-keel red. Largely post flowering.	Winter damp. Black sandy clay.	Melaleuca preissiana, Mel. viminea low woodland over tall shrubland.	rare.		Jeegarnyeejip Island, Murray River Delta	GPS	1	16/11/2000
18079	7745508	3863	Dillwynia dillwynioides	'3		Grey, indundated, saline sand. Edge of lake on flat, low plain near fire break. Fire break appears to have been pushed through middle of fire break.	Samphire flats under mixed Melaleauca species, Regelia ciliata, Kunzea micrantha , K. ericifolia, Acacia saligna and Eucalyptus rudis.	3 mature plants, several seedlings over an area of 5 x 5 m.	Potential threats are weeds, salinity and firebreaks.	Private Wetlands, N Yunderup, Peel-Swan Coastal regoin	UNK	2	11/07/2007
18080	7745494	3863	Dillwynia dillwynioides	'3		Grey, inundated, saline, clay sand. On lake edge on flat, low plain near firebreak.	Mixed Melaleuca over samphire species, Calothamnus lateralis, Hakea varia, Melaleuaca incana ssp. incana, M. osullivanii, Watsonia, Melaleuca cuticularis.	1 mature plant, 3 seedlings over area of 1 x 1 m.	Potential threats include firebreaks, weeds and salinity.	Private Wetlands, N Yunderup, Peel-Swan Coastal regoin	UNK	2	9/07/2007

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
18085	6084370	3863	Dillwynia dillwynioides	'3	Erect shrub 2 m high. Flowers yellow and orange, crowded in a short terminal raceme.	Swamp and estuarine wetland deposits during Holocene Period. Moderate litter cover less than 5%. Black sandy loam over aeolian and marine deposits.	Salt marsh vegetation with fringing estuarine forest. Sarcacornia quinqueflora, Casuarina obesa, Melaleuca rhaphiophylla, Eucalyptus rudis.	common in the wet area.		Goegrup Lake, N end of Caponi Road	MAN	3	/10/2001
18184	917575	10796	Diuris drummondii	T		Edge of swamp.	Paperbarks			Russel Road, Peel Estate	MAN	3	30/11/1956
18211	9016066	10796	Diuris drummondii	T		Swamp flats.				Pinjarra	MAN	3	/11/1932
18212	9016082	10796	Diuris drummondii	T		Swampy ground.				Pinjarra	MAN	3	/11/1932
18243	8891672	1637	Diuris purdiei	T						Pinjarra, 2 km W along Pinjarra Road from South West Highway, area bounded by Pinjarra Road, Philips Road & Sutton Street	MAN	3	18/10/1984
18246	8891656	1637	Diuris purdiei	T	Yellow within, brownish without; mid-lobe of labellum suberect not conduplicate.	In damp sand.				Pinjarra	MAN	3	16/10/1920
18247	8891591	1637	Diuris purdiei	T						Pinjarra	MAN	3	/10/1926
18248	8891621	1637	Diuris purdiei	T						Pinjarra	MAN	3	/10/1926
18249	8891613	1637	Diuris purdiei	T		Wet ground, sandy soil.				Pinjarra	MAN	3	/10/1926
18250	8891605	1637	Diuris purdiei	T						1 miles from Pinjarra on the Pinjarra - Mandurah Road	MAN	3	26/09/1937
18251	8891583	1637	Diuris purdiei	T						Pinjarra	MAN	3	27/09/1937
18398	231231	1639	Drakaea elastica	T						Ravenswood, near Pinjarra	MAN	3	16/10/1920
18401	231223	1639	Drakaea elastica	T						Ravenswood	MAN	3	16/10/1920

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
18406	1829971	1639	Drakaea elastica	T	Erect tuberous herb to 26 cm high. Leaves shiny light green.	Gently undulating terrain and white sand.	Eucalyptus marginata, Banksia attenuata, B. ilicifolia and Casuarina fraseriana woodland over dieback affected scrub and thickets of Kunzea ericifolia.		Abundance: One colony of six plants seen in bud.	Hopelands road near the SE corner of Hopelands farm, ca 600 metres N of the S boundry	MAN	0	25/09/1990
18411	7439857	1639	Drakaea elastica	T		Low plain. Moist grey sand.	Thicket with associated vegetation: Kunzea sp.	10 mature plants in area ca 200 m x 200 m.	Healthy population. Plants are scattered through bushland on proposed road alignment. Bushland appears in excellent condition. Roadworks are potential threat.	Lot 907 Fowler road, Stake Hill	GPS	1	12/09/2006
20489	7908768	41803	Eryngium sp. Ferox (G.J. Keighery 16034)	'3		Aspect: flat. Moist brown clay. Granite derived soil over limestone. Seasonally wet. Land status: private.	(Muir's): Closed Tall Scrub over Open Sedgeland over Herbland and Grassland. With Astartea affinis, Kunzea micrantha subsp. micrantha, Melaleuca osullivanii, Meeboldina roycei, Austrodanthonia occidentalis, Lachnagrostis filiformis, Sowerbea laxiflora, T	mature ca 50 seen.	Condition of population: healthy. Salinity and increased public access (weeds).	Austin Bay between Yunderup townsite and Austin Bay Nature Reserve, between Mandurah and Pinjarra	GPS	1	6/10/2006
23348	1505548	13512	Eucalyptus rudis subsp. cratyantha	'4	Bark thin, grey, shortly fibrous, with shallow longitudinal fissures, thicker and sometimes tessellated with age.		With E. calophylla and Melaleuca preissiana.			Murray River flats between Pinjarra and Mandurah	MAN	0	13/08/1979

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
23355	6101232	13512	Eucalyptus rudis subsp. cratyantha	'4	Erect, spreading tree 7-8 m high x 3-4 m wide. Rough bark, light grey. Leaves petiolate.	Swamp and estuarine wetland deposits during holocene period. Moderate litter cover less than 5%. Black sandy loam over aeolian and marine deposits.	Salt marsh vegetation with fringing estuarine forest. Salt marsh Sarcocornia quinqueflora with Casuarina obesa, Melaleuca rhaohiophylla, Eucalyptus rudis.			Geogrup Lake - N end of Caponi Road	MAN	3	24/01/2002
23358	7908733	13512	Eucalyptus rudis subsp. cratyantha	'4		Riverbank. Aspect: flat. Moist brown loam/clay. Land status: private.	(Muir's): Low Open Forest over Tall Shrubland over Very Open Sedgeland and Very Open Herbland. With Eucalyptus rudis subsp. rudis, Melaleuca rhaphiophylla, Astartea affinis, Juncus kraussii subsp. australiensis and Lobelia alata.	mature 1 seen.	Condition of population: healthy. Salinity and increased public access (weeds).	Austin Bay between Yunderup townsite and Austin Bay Nature Reserve, between Mandurah and Pinjarra	GPS	1	10/11/2006
26836	7857438	19630	Grevillea bipinnatifida subsp. pagna	'1	Multistemmed low spreading shrub 30/40 cm high x 50 cm wide. Flowers red; in flower. Leaves narrow, green.	Winter wet flats. Grey sandy clay.	Eucalyptus calophylla low woodland over dense sedgeland.	scattered.		Pinjarra Nature Reserve; W of Pinjarra, No. 41184	GPS	3	5/10/2006
28089	6097375	13452	Grevillea manglesii subsp. ornithopoda	'2	Slender erect shrub 2 m high x 1 m wide. Flowers white, in flower.	Dune. White sand, clay.	Melaleuca viminea - Kunzea ericifolia shrubland.	rare.		Little Yunderup Island, Yunderup Delta	GPS	1	15/11/2000
32653	1131214	20462	Jacksonia gracillima	'3					Checked in W.E. Blackall's collecting book. Not recorded. - M.A. Lewington 17/7/2009.	Peel Estate, in Mandurah-Pinjarra area	MAN	3	/08/1939
32807	1131753	4027	Jacksonia sericea	'4		Deep grey sand.	Banksia woodland, beneath B. attenuata and B. ilicifolia stand.			Location 14, Pinjarra-Mandurah road	MAN	3	21/02/1966

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
32808	1131745	4027	Jacksonia sericea	'4		Deep grey sand.	Banksia woodland, beneath B. attenuata and B. ilicifolia.			Location 14, Pinjarra-Mandurah road	MAN	3	21/02/1966
32822	7577907	4027	Jacksonia sericea	'4		Slope. Dry red-brown sand with limestone rock.	Low shrubland. Associated species: Allocasuarina humilis, Santalum acuminatum, Acacia rostellifera, Grevillea vestita, Rhagodia baccata, Hakea trifurcata, H. prostrata, Conostylis aculeata.	20+ mature plants.	Condition of population: moderate.	Possible city reserve, Meadow Springs, Mandurah	GPS	1	22/01/2007
32837	8341036	4027	Jacksonia sericea	'4	Perennial, prostrate 0.5 m high x 2 m wide. Flowers yellow-orange.	Plain, grey sand,	Low shrubland, bare areas. Banksia attenuata, Acacia pulchella, Acacia cyclops, Grevillea crithmifolia, Scaevola crassifolia.	over 50 plants.	Percentage of population flowering 90%.	Railway Reserve, Mandurah Station	GPS	1	24/11/2011
32931	3138321	19272	Johnsonia pubescens subsp. cygnorum	'2			Banksia woodland.			Nambeelup Road	AUTO	4	16/11/1992
32933	6632335	19272	Johnsonia pubescens subsp. cygnorum	'2	Herb, 15 cm.	Grey sand with thin litter layer.	Banksia attenuata, B. menziesii, B. ilicifolia low woodland over scattered Adenanthos cygnorum ssp. cygnorum over Allocasuarina humilis, Melaleuca thymoides open shrubland over Leucopogon conostephioides, Calytrix flavescens, Scholtzia involucrata, Stirl			From Site A. SW corner of Lot 1 Elliott Road, Shire of Serpentine - Jarrahdale (Keysbrook)	MAN	2	26/10/1999
37703	792802	33742	Microtis quadrata	'4		Sandy clay loam. Flat terrain, swamp.	Growing in Melaleuca, Nuytsia, Eucalyptus calophylla very open low woodland over heath.	1000+ plants in full flower.		2.3 km W of Pinjarra on Mandurah Road, W side of Pinjarra caravan park	MAN	3	10/10/1984
38084	8893276	6193	Myriophyllum echinatum	'3	Annual herb to 3 cm.	Small seasonal wetland between sand ridges. Soil brown sandy clay turning to clay at depth.	Melaleuca uncinata, M. viminea shrubland to 2 m high over a rich herb layer.		Vegetation condition: excellent to very good. Claypan TEC, communities 7 & 8.	Plot Austb 07. Austin Bay Nature Reserve, N boundary	GPS	1	5/11/2013

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
38619	7908792	36200	Ornduffia submersa	'4		Aspect: flat. Moist brown clay. Granite derived soil over limestone. Seasonally wet. Land status: private.	(Muir's): Scattered E. rudis amongst Tall Open Scrub over Closed Sedgeland. With Eucalytpus rudis subsp. rudis, Melaleuca lateritia, M. rhaphiophylla, Schoenus natans, Meeboldina roycei, Villarisa albiflora, V. capitata, Triglochin calyptrata, T. lineari	1 mature plant seen.	Condition of population : healthy. Salinity and increased public access (weeds).	Austin Bay between Yunderup townsite and Austin Bay Nature Reserve, between Mandurah and Pinjarra	GPS	1	5/10/2006
38826	7329601	6573	Parsonsia diaphanophleba	'4	Vine 10 m high. Flowers pale pink; largely post flowering.	Riverine floodplain. Semi-saline clay.	Casuarina obesa low forest.	uncommon.		Serpentine Nature Reserve; Serpentine River, 1.5 km N of Lakes Road, off Fowler	GPS	1	5/01/2006
38827	6513042	6573	Parsonsia diaphanophleba	'4	Creeper.	River spit, brown loam.	Eucalyptus rudis Forest over mixed Thicket.	scattered, plants inconspicuous as they festoon higher branches of Eucalyptus rudis trees.		Spit in the Murray River, S of the Ravenswood Drag Strip. Old Mandurah Road, Ravenswood	GPS	1	31/08/1995
39769	4551591	17366	Phyllangium palustre	'2	Small annual herb, 0.5 cm high.	Low-lying seasonal wetland.	Species rich herbland.		Abundance: abundant.	Clay flats along N boundary of Austin Bay Nature Reserve, ca 2 km S of Yunderup (between plots AustB 6 & 7)	GPS	1	29/10/1993
42104	7908784	2435	Rumex drummondii	'4		Aspect: flat. Winter wet, oxbow lake edges. Granite derived soil over limestone. Land status: private.	(Muir's): Woodland/Low closed Forest/Shrubland/Sedgeland. With Eucalyptus rudis subsp. rudis, Melaleuca rhaphiophylla, Astartea affinis ms, Baumea vaginalis, Juncus draussii subsp. australiensis, Lepidosperma longitudinale, Lobelia alata, Isolepis cernua		Condition of population: healthy. Salinity and increased public access (weeds).	Austin Bay between Yunderup townsite and Austin Bay Nature Reserve, between Mandurah and Pinjarra	GPS	1	4/10/2006

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
42372	6388442	974	Schoenus benthamii	'3	Tufted rush 15 cm high. Spikelets terminal. 2 involucral bracts present.	Seasonal wetland. Damp, grey clayey sand.	Open shrubland. Melaleuca rhaphiophylla, Pericalymma ellipticum, Xanthorrhoea preissii, Hakea ceratophylla, Daviesia incrassata.	few.		Pinjarra Industrial Area	MAN	3	24/10/2002
42539	7702531	1008	Schoenus pennisetis	'3		Low plain on private land. Grey sandy clay.	Low heath C of Pericalymma ellipticum, Anigozanthos viridis, Astartea scoparia, Cyathochaeta avenacea, Pattersonia occidentalis, Synaphea stenuloba, Schoenus rigens.	ca 50 mature plants.	Potential threat; industrial development.	Lot 504 Field road, Pinjarra	GPS	1	30/08/2007
44080	6388477	18564	Stylidium aceratum	'3	Annual herb 10 cm high. Leaves basally rosetted. Petal paired vertically. Petals white with red spot.	Seasonal wetland. Damp, grey clayey sand.	Open shrubland. Melaleuca rhaphiophylla, Pericalymma ellipticum, Xanthorrhoea preissii, Hakea ceratophylla, Daviesia incrassata.	common.		Pinjarra Industrial Area	MAN	3	31/10/2002
44087	8543089	18564	Stylidium aceratum	'3	Annual herb 4-8 cm high; corolla lobes paired vertically, white or pale pink with pink-red markings, white basally (especially on lower lobes); throat appendages subulate; column lacking an appendage.	Winter-wet swamp; brown clay loam.	Low heath with Viminaria juncea; Stylidium spp.	locally frequent.		Reserve at corner of Moores Road and Phillips Road, Pinjarra	GPS	1	6/11/2007
44737	4495403	7756	Stylidium longitubum	'4	Delicate annual herb.	Soil: Peaty sand. Topography/drainage: Seasonally wet poorly drained flat adjacent to river channel. Geomorphology: Alluvial deposits (pinjarra plain).	Vegetation: Eucalyptus rudis Low Forest A over Hakea varia, Melalueca raphiophylla Thicket over Leptocarpus aff. roycei Tall Sedges.			Paganoni block E of Mandurah Rd, 11 km NNE of Mandurah near Serpentine River (adj. to plot paga-2).	GPS	1	4/11/1992

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
44751	6388469	7756	Stylidium longitubum	'4	Perennial herb 10 cm high. Leaves occasional ons tem. Flowers in panicle - pink.	Seasonal wetland. Damp, grey clayey sand.	Open shrubland. Melaleuca rhaphiophylla, Pericalymma ellipticum, Xanthorrhoea preissii, Hakea ceratophylla, Daviesia incrassata.	common.		Pinjarra Industrial Area	MAN	3	24/10/2002
44752	6388450	7756	Stylidium longitubum	'4	Annual herb 10 cm high. Flowers bright pink.	Seasonal wetland. Damp, grey clayey sand.	Open shrubland. Melaleuca rhaphiophylla, Pericalymma ellipticum, Xanthorrhoea preissii, Hakea ceratophylla, Daviesia incrassata.	very common.		Pinjarra Industrial Area	MAN	3	21/11/2002
46330	8569053	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	Sprawling shrub 80 x 50 cm.	Flat. Grey sandy loam.	Sparse Corymbia calophylla woodland. With Jacksonia sp. ?, Melaleuca sp. ?, Calothamnus sp. ?, Veldt grass.			Private Property Lot 19. Ca 1.5 km N along the South Western Highway, E side from the Fairbridge Farm entrance. N of Pinjarra. Plant is ca 3 m from fenceline dividing Lot 19 and 20	GPS	1	30/08/2013
46333	5297249	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	Compact shrub 50 cm high x 40 cm wide. Flowers yellow. Growth phase: active. Immature fruits present on new growth. Seeds shed.	Plain. Grey clayey sand.		occasional.	80+% of population flowering.	5 km NE of Pinjarra,	GPS	1	8/10/1998
46334	5892473	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	Compact perennial shrub 45 cm high x 45 cm wide. Active growth phase. Flowers yellow. Fruits present.	Grey clayey sand. Edge of seasonal swamp.	Scrubland. Growing with Synaphea sp. Pinjarra.	locally frequent.	80+% of population flowering.	ca 8 km NE of Pinjarra on E side of rail line,	MAN	3	/10/2001
46344	7463634	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	Dense, clumped subshrub. Leaves highly divided with fine ultimate lobes. Inflorescences erect, rachis straight. Perianth ascending, finely pubescent.	Rail reserve. Gently sloping land between seasonally wet area and upper slope, and low land near railway line. Grey-brown sandy loam on lower slopes.	Wet and dry heath, showing a preference for more exposed, sparsely vegetated areas. With Xanthorrhoea preissii, Anigozanthos manglesii, Adenanthos meisneri, Mesomelaena tetragona and Conostylis sp., plus weed invasion by Eragrostis curvula and Briza maxi	66 living plants, 1 dead plant.		ca 2 km S along rail access track from deviation of Shanns Road, SW of North Dandalup, E side of railway line	GPS	1	11/09/2003

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
46349	7469209	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	Dense, clumped subshrub. Leaves highly divided with fine ultimate lobes. Inflorescences erect, rachis straight. Perianth ascending, finely pubescent.	Moist, grey - brown, sandy loam on a winter wet low plain.	Narrow strip of Pericalymma ellipticum and Melaleuca sp. dense shrubland with Xanthorrhoea preisii, Adenanthos meisneri, Acacia applanata, Dryandra nivea, Conostylis sp., Watsonia bulbillifera and weedy grasses.			1.8 km S along rail access track from Shanns road deviation, rail reserve between rail service track and private property, W side of rail line	GPS	1	7/09/2003
46351	7212984	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	Dwarf shrub, sprawling over rocks, 65 x 80 cm. Leaves with a regular pattern of division. Rachis and peduncle green. Flowers opening narrowly. Stigma with broad lateral lobes (not emarginate or with horns).	Edge of drainage channel between lateritic and granitic rocks. Moist grey-brown sand.	Degraded, very open Corymbia calophylla woodland with sparse, very low Hibbertia, Acacia, Conostylis, Kennedia and weed species, including Watsonia meriana var. bulbillifera and Arctotheca calendula.	rare, scattered plants along drainage fence line.		South Western Highway, c. 1.2 km N of South Dandalup River	GPS	1	17/10/1998
46352	4958128	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	Dense, clumped shrub 30 cm high x 40 cm wide. Upright racemes of bright yellow flowers.	Plain. Dry but close to winter wet area. Sandy with lateritic pebbles.	Low Woodland A with weedy grasses, Marri and Jarrah.	infrequent, localised.		Between 300-950 m N of South Dandalup River bridge, N of Pinjarra	GPS	1	13/10/1997
46371	5206359	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Compact shrub 40 cm high x 50 cm wide. Flowers yellow. Active growth phase.	Swamp. Grey clayey sand.	With Eragrostis.		Abundance: occasional. 80+% of population flowering.	E side of rail line, 3.1 km S of South Street along Shanns Road, 3.1 km S of Dandalup	GPS	1	22/09/1998
46373	5892503	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Compact, perennial shrub 45 cm high x 40 cm wide. Flowers yellow. Range of age fruits present.	Grey clayey sand. Edge of seasonal swamp.	Scrubland.	locally frequent.	80+% of population flowering. Northern limit of population.	ca 10 km NE of Pinjarra on W side of rail line,	MAN	3	/10/2001

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
46375	7463553	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical. Small leaves with rounded apices on short, pilose petioles. Small, crowded flowers in long, undulating spikes.	Moist, dark grey sandy loam.	Wet heath composed of Pericalymma ellipticum, Xanthorrhoea preissii, Kingia australis, Adenanthos meisneri and species of Conostylis, Drosera and Hibbertia, frequently with high levels of Watsonia meriana var. bulbillifera, Eragrostis curvula and Homeria	locally common.		Between 1.4-2.9 km S of Shanns Road deviation; E side of rail line and E side of unmade shire road	GPS	1	17/09/2003
46376	7463545	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical looking specimen. Smaller leaves and flowers than others at this site.	Wet depression to the west of drainage channel near to access track. Grey clayey sand.	Low shrubland comprised of Pericalymma ellipticum, Regelia ciliata and Taxandria sp. with Xanthorrhoea preissii, Stirlingia latifolia and Restionaceae species, Watsonia meriana var. bulbillifera, Eragrostis curvula, Sonchus oleraceus and Avena barbata.	rare.		Rail reserve, 3.6-3.65 km S of Shanns Road deviation; W side of rail-line; W side of rail access track, NE Pinjarra	GPS	1	7/09/2003
46377	8031436	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T		Near fence and adjacent to the track on W side of Rail.	Amongst native shrubs.			Along railway reserve S of Shanns Road, turn east	GPS	3	/08/2008
46378	8031975	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T				1 near rail road.		Along railway reserve S of Shanns Road, turn east	GPS	3	/08/2008
46379	8031932	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T		E side of railway line.				Along railway reserve S of Shanns Road, turn east	GPS	3	/08/2008
46380	8031444	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T				3 plants in enclosure.		Along railway reserve S of Shanns Road, turn east	GPS	3	/08/2008

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46381	7836465	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical. Small leaves with rounded apices on short, pilose petioles. Small, crowded flowers in long undulating spikes.	Edge of inundated area in small marri woodland remnant. Moist dark grey sandy loam.	Corymbia calophylla open woodland with an understorey of Xanthorrhoea preissii and Restionaceae species, Synaphea sp. Pinjarra Plain. Weed invasion by Watsonia bulbillifera and Eragrostis curvula.	locally common.		Between 1.4-2.9 km S of Shanns Road deviation, E side of rail line and E side of unmade shire road, SW North Dandalup	UNK	2	17/09/2003
46382	7836473	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical. Small leaves with rounded apices on short, pilose petioles. Small, crowed flowers in long undulating spikes.	Moist dark grey sandy loam.	Wet heath composed of Pericalymma ellipticum, Xanthorrhoea preissii, Kingia australis, Adenanthos meisneri and species of Conostylis, Drosera and Hibbertia, frequently with high levels of Watsonia bulbillifera, Eragrostis curvula and Homeria flaccida inv	locally common.		Between 1.4-2.9 km S of Shanns Road deviation, E side of rail line and E side of unmade shire road, SW North Dandalup	UNK	2	17/09/2003
46383	7836600	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical. Small leaves with rounded apices on short, pilose petioles. Small crowded flowers in long undulating spikes.	Moist, dark grey sandy loam.	Wet heath composed of Pericalymma ellipticum, Xanthorrhoea preissii, Kingia australis, Adenanthos meisneri and species of Conostylis, Drosera and Hibbertia, frequently with high levels of Watsonia bulbillifera, Eragrostis curvula and Homeria flaccida inv	locally common.		Between 1.4-2.9 km S of Shanns Road deviation, E side of rail line and E side of unmade shire road	UNK	2	17/09/2003
46384	7836589	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical. Small leaves with rounded apices on short, pilose petioles. Small crowed flowers in long undulating spikes.	Moist dark grey sandy loam.	Wet heath composed of Pericalymma ellipticum, Xanthorrhoea preissii, Kingia australis, Adenanthos meisneri and species of Conostylis, Drosera and Hibbertia frequently with high levels of Watsonia bulbillifera, Eragrostis curvula and Homeria flaccida inva	locally common.		About 2.8 km S along rail access track from Shanns Road deviation, E side of track, SW of North Dandalup	UNK	2	17/09/2004

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46385	7836597	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical. Small leaves with rounded apices on short, pilose petioles. Small, crowded flowers in long undulating spikes.	Moist, dark grey sandy loam.	Wet heath composed of Pericalymma ellipticum, Xanthorrhoea preissii, Kingia australis, Adenanthos meisneri and species of Conostylis, Drosera and Hibbertia, frequently with high levels of Watsonia bulbillifera, Eragrostis curvula and Homeria flaccida inv	locally common.		About 2.8 km S along rail access track from Shanns Road deviation, E side of railway line, E side of track, SW North Dandalup	UNK	2	17/09/2003
46386	7836503	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Small pale green leaves with long lobes and rounded apices on short, pilose petioles. Small, crowded flowers in long undulating spikes.	Moist dark grey sandy loam.	Wet heath composed of Pericalymma ellipticum, Xanthorrhoea preissii, Kingia australis, Adenanthos meisneri and species of Conostylis, Drosera and Hibbertia, frequently with high levels of Watsonia bulbillifera, Eragrostis curvula and Homeria flaccida inv	locally common.		About 2.8 km S along rail access track from Shanns Road deviation, E side of railway line, E side of track, SW North Dandalup	UNK	2	17/09/2003
46387	7836511	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical looking specimen. Smaller leaves and flowers than others at this site.	Wet depression to the west of drainage channel near to access track. Grey clayey sand.	Low shrubland comprised of Pericalymma ellipticum, Regelia ciliata and Taxandria sp. with Xanthorrhoea preissii, Stirlingia latifolia and Restionaceae species plus Watsonia bulbillifera, Eragrostis curvula, Sonchus oleraceus and Avena barbata.	rare.		Rail reserve 3.6-3.65 km S of Shanns Road deviation, W side of rail-line, W side of rail access track, NE Pinjarra	UNK	2	7/09/2003
46390	7836481	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical. Small leaves with rounded apices on short, pilose petioles. Small, crowed flowers in long undulating spikes.	Moist dark grey sandy loam.	Wet heath composed of Pericalymma ellipticum, Xanthorrhoea preissii, Kingia australis, Adenanthos meisneri and species of Conostylis, Drosera and Hibbertia, frequently with high levels of Watsonia bulbillifera, Eragrostis curvula and Homeria flaccida inv	locally common.		Between 1.4-2.9 km S of Shanns Road deviation, E side of rail line and E side of unmade shire road, SW North Dandalup	UNK	2	17/09/2003

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46391	7212992	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Dwarf shrub, 50 x 70 cm. Leaves short with broad, rounded lobes. Leaves pale green with fine, shallow reticulation. Rachis green, peduncle red and green.	Seasonally wet lowland by side of railway. White-grey clayey sand over granite.	Pericalymma ellipticum dominated low shrubland with Hakea, Xanthorrhoea, Lambertia, Dasypogon between areas of Corymbia calophylla/Allocasuarina woodland.	locally frequent in swampy area.		3.2 km SW along Shanns Road from crossing at North Dandalup, 100 m along rail service track; E side of railway line	GPS	1	19/10/1998
46392	5892481	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	45 cm high x 45 cm wide. Active growth phase. Flowers yellow. Range of age fruits present.	Grey sand. Edge of seasonal swamp.	Scrubland.	locally frequent.	80+% of population flowering. Southern limit of population.	ca 8 km NE of Pinjarra on E side of rail line,	MAN	0	/10/2001
46393	7836627	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical. Small leaves with rounded apices on short, pilose petioles. Small crowded flowers in long undulating spikes.	Moist, dark grey sandy loam.	Wet heath composed of Pericalymma ellipticum, Xanthorrhoea preissii, Kingia australis, Adenanthos meisneri and species of Conostylis, Drosera and Hibbertia, frequently with high levels of Watsonia bulbillifera, Eragrostis curvula and Homeria flaccida inv	locally common.		Between 1.4-2.9 km S of Shanns Road deviation, E side of rail line and E side of unmade shire road	UNK	2	17/09/2003
46394	7836538	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	Typical looking specimen. Smaller leaves and flowers than others at this site.	Wet depression to the W of drainage channel near to access track. Grey clayey sand.	Low shrubland comprised of Pericalymma ellipticum, Regelia ciliata and Taxandria sp. with Xanthorrhoea preissii, Stirlingia latifolia and Restionaceae species plus Watsonia bulbillifera, Eragrostis curvula, Sonchus olearaceus and Avena barbata.	rare.		Rail reserve, 3.6-3.65 km S of Shanns Road deviation, W side of rail-line, W side of rail access track, NE Pinjarra	UNK	2	7/09/2003

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46416	7463863	30751	Synaphea sp. Pinjarra Plain (A.S. George 17182)	T	Clumped sub-shrub 60-70 cm tall. Leaves dark green with linear-oblanceolate ultimate lobes, mid-vein raised, venation prominent. Petioles glabrous; sheathing base yellow-green. Very long inflorescences; peduncle and rachis thick; peduncle green and red,	Dark grey, moist, sandy loam.	Corymbia calophylla woodland remnant with low shrubland understorey comprising Pericalymma ellipticum, Xanthorrhoea preissii, Synaphea sp. Pinjarra (R. Davis 6578), Restionaceae with Eragrostis curvula and Watsonia meriana var. bulbillifera.	uncommon.		1.4 km S along rail access track from Shanns Road, E side of railway line, E side of track; SW of North Dandalup	GPS	1	17/09/2003
46510	7702523	16749	Synaphea stenoloba	T		Flat on private land. Moist grey sandy loam.	Open woodland B of Corymbia calophylla over thicket of Jacksonia sternbergiana, over low sedges. Associated vegetation: Hypolaena exsulca, Astartea scoparia, Cyathochaeta avenacea, Dasypogon bromeliifolius, Mesomelaena tetragona, Stackhousia monogyna, Ph	less than 100 plants.	Healthy population scattered over entire block.	Lot 504 Field road, Pinjarra	GPS	1	30/08/2007
46520	5297257	16749	Synaphea stenoloba	T	Erect compact shrub, 60 cm high x 40 cm wide. Flowers yellow. Growth phase: active.	Brown sandy clay. Swamp.	Pericalymma.	occasional.		12.5 km S of Dandalup, entrance to Alcoa Pinjarra,	GPS	1	22/09/1998
46525	5788390	16749	Synaphea stenoloba	T	Undershrub, fine lobed leaf, spreading. Possibly a resprouter. Fruit held on long old flowering spike.	Flat. Dark brown sandy loam.	Woodland over grass. Associated species: Eucalyptus calophylla, Banksia grandis, Verticordia plumosa, Jacksonia sp., Hibbertia sp., Dryandra sp., grasses.			Entrance to Fairbridge Farm, 600 m E of South West Highway, on road reserve near farm,	GPS	1	15/12/1999

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46527	6533973	16749	Synaphea stenoloba	T	Low shrub to 0.3 m by 0.3 m, flowers yellow.	Edge of seasonal wetland, flat, brown sandy loam over light brown loamy clay, poor drainage, wet during winter/spring.	Associated species: Xanthorrea preissii.	occassional by roadside.		SW corner Phillips and Moores Roads, W Pinjarra S of Pinjarra Road, Shire of Murray (adjacent to System 6 Update quadrat pind01)	GPS	1	31/08/1995
46534	7463057	16749	Synaphea stenoloba	T	Inflorescences exceeding leaves; leaves with concave ultimate lobes; flowers glabrous; stigma with slender apical lobes.	Reserve in good condition. Heath between woodland margin and edge of small lake. Moist grey-black clay (heath) to grey sand (woodland).	Heath with Pericalymma ellipticum, Dryandra nivea, Synaphea petiolaris, Thysanotus, Drosera spp., Hakea, Boronia, Daviesia, Patersonia, Microtis, Restionaceae, Asteraceae.	115 mature and 45 immature plants across reserve.	Very low weed invasion.	CALM Nature Reserve at intersection of Moores Road and Phillips Road, behind caravan park; W of Pinjarra township	GPS	1	12/10/2003
46536	7463111	16749	Synaphea stenoloba	T	Large plant 1 m x 0.9 m. Many mature stems from base. Numerous stems arising from nodes; internodes long. Flowers glabrous, crowded in inflorescence; peduncle thick, infused with red. No pilose hairs on petiole. Very narrow leaf lobes; lobing irregular,	Very narrow rremnant between rail access track and paddock fence. Depressed, swampy area to W of drainage ditch. Inundated, grey-brown, clay-loam.	Growing with tall Taxandria sp. shrubs through dense, low shrubland of ?Melaleuca, Stirlingia latifolia, Acacia alata, Adenanthos meisneri, Pericalymma ellipticum, Dryandra nivea, Hypocalymma angustifolium.	1 mature plant.		3.4 km S along rail access track from Shanns Road, W side of railway line, SW of North Dandalup	GPS	1	7/09/2003

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46544	7463162	16749	Synaphea stenoloba	T	Inflorescences exceeding leaves; leaves with concave ultimate lobes; flowers glabrous; stigma with slender apical lobes.	Grey brown clay loam in lower areas, upland marri woodland on white-grey sand. Large areas severley degraded by motocross riding. Numerous sites of waste dumping. Small lakes throughout area.	Low heath areas with Pericalymma ellipticum, Synaphea petiolaris, Hakea varia, Hibbertia stellaris, Conostylis, Drosera spp., Restionaceae, Asteraceae, etc.	120 mature plants.		Shire land adjacent to Pinjarra Industrial Estate, intersection of Moores Road and Phillips Road, W of Pinjarra township	GPS	1	12/10/2003
46545	7841329	16749	Synaphea stenoloba	T	Perennial shrub to 0.4 m high spreading to 0.6 m wide with yellow flowers. Scale covering the whole plant.	Coastal plain seasonal wetland with Bassendean sand over clay.	Low shrubland including Melaleuca incana, Jacksonia sternbergiana, Calothamnus lateralis, Hypolaena exsulca, Stylidium roseoalatum.	occasional.		Reserve 34033, Phillip-Moore Road, Pinjarra	GPS	1	29/11/2007
46552	8147957	16749	Synaphea stenoloba	T	Inflorescences exceeding leaves; leaves with concave ultimate lobes; flowers glabrous; stigma with slender apical lobes.	Dark grey inundated clay. Reserve in very good condition.	Heath near roadside bounded by more inundated heathland. With Pericalymma ellipticum, Dryandra nivea, Synaphea petiolaris, Thysanotus, Drosera spp., Hakea, Boronia, Daviesia, Pagtersonia, Microtis, Restionaceae, Asteraceae. Area bounded by low wet heath	115 mature and 45 immature plants across reserve.		CALM Nature Reserve at intersection of Moores Road and Phillips Road, behind caravan park; W of Pinjarra township	GPS	1	12/10/2003
46554	8114021	16749	Synaphea stenoloba	T	Dwarf shrub 50 cm tall. Inflorescence exceeding leaves. Leaves with elongate, linear ultimate lobes. Rachis and peduncle green. Flowers opening widely.	Low lying winter wet flat. Brown-black loam.	Sparse Melaleuca, Nuytsia floribunda, Kingia australis woodland with shrubland of Leptospermum, Xanthorrhoea preissii, Stirlingia latifolia, Sphaerolobium medium, Conostylis, Cyperaceae.	occasional, area not thoroughly searched.		Swampy area on E side of Alcoa refinery access road, off South Western Highway, N of Pinjarra	GPS	1	27/10/1997

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geocode_Me	Precision	Date
46555	8147949	16749	Synaphea stenoloba	T	Inflorescences exceeding leaves; leaves with concave ultimate lobes; flowers glabrous; stigma with slender apical lobes.	Dark grey inundated clay. Reserve in very good condition.	Heath near roadside bounded by more inundated heathland. With Pericalymma ellipticum, Dryandra nivea, Synaphea petiolaris, Thysanotus, Drosera spp., Hakea, Boronia, Daviesia, Pagtersonia, Microtis, Restionaceae, Asteraceae. Area bounded by low wet heath	115 mature and 45 immature plants across reserve.		CALM Nature Reserve at intersection of Moores Road and Phillips Road, behind caravan park; W of Pinjarra township	GPS	1	12/10/2003
46556	8147922	16749	Synaphea stenoloba	T	Clumped, sprawling plant. Inflorescences greatly exceeding leaves; somewhat undulating along length. Leaves with irregular lobing, ultimate lobes broader than seen in plants from the Alcoa access road.	Highly degraded roadside area; small dips and mounds. Moist, grey-brown clay-loam.	Corymbia calophylla woodland remnant over Acacia pulchella, Adenanthos cygnorum, Synaphea sp. Fairbridge Farm (D. Papenfus DP 696), Stirlingia latifolia, Patersonia, Xanthorrhoea preissii, Grevillea, Kennedia prostrata, Mesomelaena tetragona and Eragrost	1 plant.		800 m N of Fairbridge Road on South Western Highway, W side of road; N of Pinjarra	GPS	1	20/09/2003
49094	8125619	44444	Tripterococcus sp. Brachylobus (A.S. George 14234)	'4	Annual herb 0.6 m high with green flowers.	Reserve. Plain, wetland with wet gray clay.	Low/tall shrubland with Xanthorrhoea preissii, Hypocalymma angustifolia, Dasypogon bromoliifolius, Melaleuca thymoides, Hibbertia stelbris.	200 plants.	Population structure: 90% flowering. Burnt January 2007. Many alien species.	Pinjarra Nature Reserve, reserve number 41184	GPS	1	19/11/2009
49122	7514220	33019	Trithuria australis	'4	Small caespitose aquatic herb. Plants in flower dioecious.	In flooded track along N boundary, grey clay.		occasional.		Along N boundary of Austin Bay Nature Reserve (A4990), c. 1 km S of Yunderup	TOPO	0	8/10/2004
49130	7514166	33019	Trithuria australis	'4	Small aquatic herb.	Growing on track in water to 10cm deep on clayey sand.		occasional.		Austin Bay Nature Reserve, on track junction along N boundary of the reserve	GPS	0	4/11/2005

FID	PopId	Nameid	Taxon	ConsStatus	WARank	PopNumber	SubPopCode	Location	District	Vesting	Purpose1	Purpose2	CountDate	Method	MatureCoun	JuvenileCo	SeedlingCo	LiveTotal	PlantTypeC	AreaOccupi	inFlower	Population
296	86277	3237	Acacia benthamii	'2		3		Junction of Redhead and Hopelands Roads, ca. 6km NW North Dandalup. Land tenure unknown - WAHERB record only.	SWAN COASTAL	UNKNOWN	UNKNOWN		29/09/1998 0:00		0			0			N	
301	86282	3237	Acacia benthamii	'2		8		Lot 203 Stock Rd. Stakehill	SWAN COASTAL	PRI			31/03/2005 0:00	ESTMT	0			20			N	
302	86283	3237	Acacia benthamii	'2		9		Pinjarra Nature Reserve, adjacent to Moore & Phillips Rd within reserve. Population extends over approx 400x300m stip adjacent to Philips Rd.	SWAN COASTAL	CC	NRE		20/11/2006 0:00	ESTMT	0			250			N	
893	92885	14932	Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)	'1		3		Ca 500m SW of the junction of Scott Rd and Lakes Rd.	PERTH HILLS	UNKNOWN			17/09/1967 0:00		0			0			N	
3753	94968	20026	Blennospora doliiformis	'3		10		Austin Bay Nature Reserve (No. 4990), along N boundary, W of t-junction (Plot austb07). Small seasonal wetland between sand ridges.	SWAN COASTAL	CC	CFF		29/10/1993 0:00		0			0			N	
4784	91482	13862	Caladenia speciosa	4		12		SE corner of Hopelands Farm, Hopelands Rd.	SWAN COASTAL	PRI			25/09/1990 0:00	ACT_IND	15			15			N	
6230	93204	16245	Cyathochaeta teretifolia	'3		2		Private Property. SW corner of Lot 52 Mandurah Rd, Ravenswood. Drag Strip. 1 km S of Mandurah Rd, at 2.7 km E of the junction with Pinjarra Rd. Murray.	SWAN COASTAL	PRI			18/12/1995 0:00		0			0			N	
7016	86754	3863	Dillwynia dillwynioides	'3		2		Austin Bay Nature Reserve, near the northern boundary.	SWAN COASTAL	CC	CFF	NRE	15/06/1995 0:00		0			0			N	
7020	86766	3863	Dillwynia dillwynioides	'3		6		Wetland in Paganoni block, 11 km ENE of Mandurah. W side of Stock Route Rd, at ca 2.5 km S of Paganoli Rd.	SWAN COASTAL	SPC			15/06/1994 0:00		0			0			N	

FID	PopId	Nameid	Taxon	ConsStatus	WARank	PopNumber	SubPopCode	Location	District	Vesting	Purpose1	Purpose2	CountDate	Method	MatureCoun	JuvenileCo	SeedlingCo	LiveTotal	PlantTypeC	AreaOccupi	inFlower	Population
7024	86745	3863	Dillwynia dillwynioides	'3		10		Walk track adj. to Serpentine River (W side), N side of Pinjarra Rd. Between St.Ives Retirement Village and Serpentine River (i.e. end of 2nd boardwalk).Lot 123.	SWAN COASTAL	PRI			30/10/2006 0:00	ESTMT	850			850			Y	
7025	86746	3863	Dillwynia dillwynioides	'3		11		Coodanup-Serpentine Rd (West), Track N from riverside. Lot 440.	SWAN COASTAL	PRI			30/10/2006 0:00	UNKNOWN	300			300			Y	
7027	86748	3863	Dillwynia dillwynioides	'3		13		Water Corp, Un-Named Reserve (ID: 38749), N of Austin Bay.	SWAN COASTAL	WAT	OTH		14/11/2006 0:00	UNKNOWN	16			16			Y	
7028	98817	3863	Dillwynia dillwynioides	'3		14	A	Private Property, Lot 548. Austin Bay, between Yunderup townsite and Austin Bay Nature Reserve (Between Mandurah and Pinjarra).	SWAN COASTAL	PRI			12/10/2006 0:00	ESTMT	600			600			Y	
7029	98818	3863	Dillwynia dillwynioides	'3		14	B	Crown Reserve 50025 (Conservation, Recreation). Austin Bay, between Yunderup townsite and Austin Bay Nature Reserve (Between Mandurah and Pinjarra).	SWAN COASTAL	RDL	REC		12/10/2006 0:00		0			0			Y	
7030	86749	3863	Dillwynia dillwynioides	'3		15		Serpentine River Reserve, Bridal trail off Caponi Rd (Possibly un-named reserve, ID:46501).	SWAN COASTAL	UNKNOWN	UNKNOWN		19/02/2007 0:00	ESTMT	100			100			N	
7034	86753	3863	Dillwynia dillwynioides	'3		19		Goegrup Lake, N end of Caponi Rd. Lot 442.	SWAN COASTAL	PRI			1/10/2001 0:00		0			0			N	
7042	86760	3863	Dillwynia dillwynioides	'3		26		Un-Named National Park (ID: 20215). Jeegarnyeejip Island, Murray River Delta.	SWAN COASTAL	LGA			16/11/2000 0:00		0			0			N	
7069	89507	10796	Diuris drummondii	T	VU	6		Private Property, Lots 172, 173, 174, 175 and 176 (previously R 12081). On SE corner of junction of Wilson Rd & Pinjarra-Mandurah Rd.	SWAN COASTAL	PRI			3/12/1999 0:00	ACT_IND	15			15			Y	

FID	PopId	Nameid	Taxon	ConsStatus	WARank	PopNumber	SubPopCode	Location	District	Vesting	Purpose1	Purpose2	CountDate	Method	MatureCoun	JuvenileCo	SeedlingCo	LiveTotal	PlantTypeC	AreaOccupi	inFlower	Population
7117	107482	10796	Diuris drummondii	T	VU	42		'Murrayfield Air Park' Reserve 50750, approximately 900 metres East of Nambeelup Rd, and 170m in the reserve; north east of Mandurah	SWAN COASTAL	CC	CFF		16/12/2009 0:00	ACT_IND	236			0	PLANTS		Y	HEALTHY
7131	90604	12938	Diuris micrantha	T	VU	3		Cooleenup Island, Yunderup. On Reserve 23016 (Camping and Recreation Ground).	SWAN COASTAL	LGA	REC	CAM	24/10/1992 0:00	ESTMT	20			20			Y	
7151	85054	1637	Diuris purdiei	T	EN	7		Pinjarra NR (R 41184), Lot 348. Pinjarra Rd, between Sutton Rd & Phillips Rd. [E side of reserve]. Shire of Murray.	PERTH HILLS	CC	CFF		18/09/2008 0:00		30			30			Y	
7325	97404	1639	Drakaea elastica	T	CR	36	A	Private Property, 601 Lakes Road, East Greenfields (Stake Hill).	SWAN COASTAL	PRI			9/09/2009 0:00	ACT_IND	64			64			N	
7326	97405	1639	Drakaea elastica	T	CR	36	B	Main Roads vested, Lot 907 Fowler Road, Stake Hill. N off Lakes Road. Near junction with Lakelands Road. East of Private property Lot 601. Access road has been rehab'd and the eastern portion fenced. Plants mostly in SE cnr of lot.	SWAN COASTAL	MRD	GVT		17/08/2010 0:00	ESTMT	62			62			N	
7327	97407	1639	Drakaea elastica	T	CR	37	A	Main Roads vested, Lot 212 Lymon Rd, Stake Hill. Between Stock Rd and Paganoni Reserve. Along edge of firebeak on W side of road reserve for future Kwinana Fwy extention. Population has been cleared for freeway extension.	SWAN COASTAL	MRD			1/09/2010 0:00	ACT_IND	0			0			N	

FID	PopId	Nameid	Taxon	ConsStatus	WARank	PopNumber	SubPopCode	Location	District	Vesting	Purpose1	Purpose2	CountDate	Method	MatureCoun	JuvenileCo	SeedlingCo	LiveTotal	PlantTypeC	AreaOccupi	inFlower	Population
7329	97409	1639	Drakaea elastica	T	CR	37	C	Private Property, Lot 519 Stock Rd, Stake Hill. North-eastern boundary of the property. [Adjacent to the west side of the Kwinana Freeway extension].	SWAN COASTAL	PRI			6/09/2010 0:00	ACT_IND	4	30		0	PLANTS	1200	N	MODERATE
7331	97411	1639	Drakaea elastica	T	CR	38	A	Lot 50. Western side of Serpentine River, in WAPC land bounded by Stock, Lakes and Fowler Roads. Edge of Perth to Bunbury Hwy. Shire of Murray. Adjacent to Serpentine River NR, W side of bike path near SW cnr of reserve.	SWAN COASTAL	SPC			3/08/2010 0:00	ESTMT	104			104			N	
7332	97412	1639	Drakaea elastica	T	CR	38	B	Unnamed Nature Reserve (44986), Lot 4157. Near southern boundary of Reserve 44986 on the west side of Serpentine River. Occurs on N & S sides of central sandy track through reserve and scattered throughout vegetation in small clumps. Shire of Murray.	SWAN COASTAL	CC	CFF		23/07/2010 0:00	ACT_IND	420			420			N	
7333	97413	1639	Drakaea elastica	T	CR	38	D	Lot 50. Western side of Serpentine River, in WAPC land bounded by Stock and Lakes Roads and Forrest Hwy. South-Western side of Kwinana Freeway (freeway bisects Lot 50). Shire of Murray.	SWAN COASTAL	SPC			3/08/2010 0:00	ESTMT	92			92			N	
7347	109313	1639	Drakaea elastica	T	CR	49		Freehold (WAPC Owned) Vacant Residential Lot 193. North end of Fiegert Road, East of Mandurah. Approx 400-500m North of Pinjarra Road. WAPC Reserve, 70m South West of Population.	SWAN COASTAL	SPC	UCL		22/07/2014 0:00	ACT_IND	0	3	6	0	PLANTS	15	N	HEALTHY

FID	PopId	Nameid	Taxon	ConsStatus	WARank	PopNumber	SubPopCode	Location	District	Vesting	Purpose1	Purpose2	CountDate	Method	MatureCoun	JuvenileCo	SeedlingCo	LiveTotal	PlantTypeC	AreaOccupi	inFlower	Population
7348	109909	1639	Drakaea elastica	T	CR	50		Jubata Reserve (CR 49425), Lot 1995, Dudley Park 6210. City Of Mandurah.	SWAN COASTAL	LGA	PAR		8/10/2015 0:00	ACT_IND	14	2		0	PLANTS	3500	Y	HEALTHY
7350	113829	1639	Drakaea elastica	T	CR	52		Private Property. Lot 223 Lakes Rd, Nambeelup. NW corner of the porperty. Population extends 100m NW of GPS coords.	SWAN COASTAL	PRI			13/10/2017 0:00	ACT_IND	24	50		0	PLANTS	1026	Y	HEALTHY
7441	90840	3115	Drosera occidentalis	4		6		E corner of Lot 21, S side of Mandurah-Pinjarra Rd, Ravenswood.	PERTH HILLS	MRD	OTH		5/10/1989 0:00		0			0			N	
7453	101635	3115	Drosera occidentalis	4		18	A	Reserve No 34033, Moores Rd, Pinjarra. 150 m W of Phillips Rd, at 64 m N of SEC pole No.11	SWAN COASTAL	LGA	REC		9/08/1990 0:00	ESTMT	1700			1700			N	
7454	101636	3115	Drosera occidentalis	4		18	B	Reserve No, 34033, Moores Rd, Pinjarra. 350 m W of Phillips Rd, at 60 and 90 m N of the powerlines.	PERTH HILLS	LGA	REC		9/08/1990 0:00	ACT_IND	336			336			N	
10626	90994	13452	Grevillea manglesii subsp. ornithopoda	'2		3		'Yunderp Island' site is possibly developed,3.6km south of Furnisdale.	SWAN COASTAL	UNKNOWN	UNKNOWN		15/11/2000 0:00		0			0			N	
11955	94660	19272	Johnsonia pubescens subsp. cygnorum	'2		2		Nambeelup Rd., ENE of Mandurah	SWAN COASTAL	LGA	VER		16/11/1992 0:00		0			0			N	
13507	96563	33742	Microtis quadrata	4		1		Nature Reserve 41184. Mandurah-Pinjarra Rd, 2.3 km NW of Pinjarra, on the W side of Pinjarra Caravan Park.	PERTH HILLS	CC	CFF		10/10/1984 0:00		0			0			N	
13669	88365	6193	Myriophyllum echinatum	'3		1		Austin Bay Nature Reserve. Ca 0.65 km W and 0.15 km S from the NE corner of the reserve.	PERTH HILLS	CC	CFF	NRE	15/06/1994 0:00		0			0			N	
14045	88789	6573	Parsonsia diaphanophleba	4		2		E bank of the Murray River, adjoining the SW corner of Lot 41 Old Mandurah Rd.	SWAN COASTAL	LGA	REC		31/08/1995 0:00		0			6			N	

FID	PopId	Nameid	Taxon	ConsStatus	WARank	PopNumber	SubPopCode	Location	District	Vesting	Purpose1	Purpose2	CountDate	Method	MatureCoun	JuvenileCo	SeedlingCo	LiveTotal	PlantTypeC	AreaOccupi	inFlower	Population
14046	88790	6573	Parsonsia diaphanophleba	4		3		Fringing the W bank of Serpentine River. E of Ibis Retreat. Benara Farm, Lot 2 of Pt Lot 42, Cockburn Sound Location 16.	PERTH HILLS	UNKNOWN			15/06/1983 0:00		0			0			N	
15616	89309	7756	Stylidium longitubum	4		5		Un-named Reserve (ID:34033), Pinjarra Industrial Area.	PERTH HILLS	LGA	REC		21/11/2002 0:00		0			0			N	
15623	89293	7756	Stylidium longitubum	4		11		Un-named Reserve (ID: 44986), Paganoni block E of Mandurah Rd, 11km NNE of Mandurah near Serpentine River (adj. to plot paga-2).	SWAN COASTAL	CC	CFF		4/11/1992 0:00		0			0			N	
15625	89295	7756	Stylidium longitubum	4		13		Austin Bay Nature Reserve (ID: 4990), swale WSW of Grey Rd (plot austb-3).	SWAN COASTAL	CC	CFF		29/10/1993 0:00		0			0			N	
15962	103961	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	CR	1	A	South Western Hwy, west side. 800m north along the South Western Hwy, west side, from the 'Fairbridge Farm' entrance. North of Pinjarra.	SWAN COASTAL	MRD	VER		21/09/2010 0:00	ACT_IND	7			0	PLANTS	95	Y	POOR
15963	103962	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	CR	1	B	South Western Hwy. 1.2-1.5km north along the South Western Hwy, east side, from the 'Fairbridge Farm' entrance. North of Pinjarra.	PERTH HILLS	MRD	VER		18/10/2010 0:00	ACT_IND	3			0	PLANTS	490	Y	HEALTHY
15964	103963	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	CR	1	C	Private Property Lot 20. 1.2-1.5km north along the South Western Hwy, east [south] side, from the 'Fairbridge Farm' entrance; plants then extend into Fairbridge Farm property. North of Pinjarra.	PERTH HILLS	PRI			18/10/2010 0:00	ACT_IND	2	2		0	PLANTS		Y	HEALTHY
15965	107942	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	CR	1	D	Private Property Lot 19 ~1.5km north along the South Western Hwy,east side, from the 'Fairbridge Farm' entrance. North ofPinjarra. Plant is ~3m from fenceline dividing Lot 19 and 20 and ~5m fromPP/Gas pipeline gate	PERTH HILLS	PRI	PAS		30/08/2013 0:00	ACT_IND	1			0	PLANTS	1	Y	HEALTHY

FID	PopId	Nameid	Taxon	ConsStatus	WARank	PopNumber	SubPopCode	Location	District	Vesting	Purpose1	Purpose2	CountDate	Method	MatureCoun	JuvenileCo	SeedlingCo	LiveTotal	PlantTypeC	AreaOccupi	inFlower	Population
15966	94504	18590	Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	CR	2		Rail reserve, both sides of railway line between 1.8-2.45km south along rail service track from Shanns Road. Plants located on west side ca. 1.8km. Remaining plants on east side at ca. 2.0-2.15km and 2.35-2.45km in association with swampy areas.	SWAN COASTAL	RAI	RRE		23/09/2010 0:00	ACT_IND	159		14	0	PLANTS	1176	Y	HEALTHY
15983	94551	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	CR	1		3.1km south along Shanns Road (including access track) from rail crossing at South Street, both sides of access track and on the easter side of the railway line. SW of North Dandalup.	SWAN COASTAL	RAI	RRE		11/09/2003 0:00	ACT_IND	140		171	311			Y	
15984	94552	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	CR	2		Rail Reserve 1.4km to 2.9km south from the westward deviation of Shanns Road. Located on the east and west sides of the railway line, and the east and west sides of a track. N extent: 32* 32' 51` S & 115* 56' 00` E.	SWAN COASTAL	RAI	RRE		11/08/2008 0:00		0			0			Y	
15986	94554	19055	Synaphea sp. Pinjarra (R. Davis 6578)	T	CR	4		Rail reserve between 3.6 to 4.1km south of the westward deviation of Shanns Road, along the east and west sides of the railway line and west side of a track.	SWAN COASTAL	RAI	RRE		7/09/2003 0:00	ACT_IND	151		108	259			Y	
15991	107447	30751	Synaphea sp. Pinjarra Plain (A.S. George 17182)	T	EN	2		Unknown Road reserve, pop located 4.44 Km S of South St/Railway Ave intersection on an unmade road reserve on the E of the railway, North Dandalup. All plants are E of the track.	SWAN COASTAL	LGA	VER		14/09/2012 0:00	ACT_IND	2	0	0	0	PLANTS	10	Y	HEALTHY
16046	103386	16749	Synaphea stenoloba	T	CR	4	C	South West Highway, W verge. Located 800m N of Fairbridge Road. NE of Pinjarra.	SWAN COASTAL	MRD	VER		29/08/2013 0:00	ACT_IND	5			0	PLANTS	20	Y	MODERATE

FID	PopId	Nameid	Taxon	ConsStatus	WARank	PopNumber	SubPopCode	Location	District	Vesting	Purpose1	Purpose2	CountDate	Method	MatureCoun	JuvenileCo	SeedlingCo	LiveTotal	PlantTypeC	AreaOccupi	inFlower	Population
16049	103389	16749	Synaphea stenoloba	T	CR	6	A	Private Property, Lot 600 (previously part of Lot 504), 31 Fields Street, Pinjarra. Throughout property, going onto drainage R 31656 to the south.	SWAN COASTAL	PRI			7/10/2010 0:00	ACT_IND	143			0		1590	Y	POOR
16050	103390	16749	Synaphea stenoloba	T	CR	6	B	Recreation Reserve (34033), Lot 323. Adjacent to the Pinjarra Industrial Estate, at the intersection of Phillips Road and Moores Road, Pinjarra. [W of intersection, N of Moores Rd].	SWAN COASTAL	LGA	REC		7/10/2010 0:00	ACT_IND	38			0	PLANTS	####	Y	POOR
16051	103391	16749	Synaphea stenoloba	T	CR	6	C	Recreation Reserve (34033), Intersection of Moores and Phillips Road [E of intersection, N side of Moores Rd]. Behind Pinjarra Caravan Park on Pinjarra Rd. Plants are in 4 patches within the reserve.	SWAN COASTAL	LGA	REC		7/10/2010 0:00	ACT_IND	150			0	PLANTS	2658	Y	POOR
16052	106321	16749	Synaphea stenoloba	T	CR	6	D	Private Property, Lot 601 (previously part of Lot 504 - Pop 6A), 29 Fields Street, Pinjarra. Throughout property, going onto drainage R 31656 to the south.	SWAN COASTAL	PRI			7/10/2010 0:00	ACT_IND	0			0			N	POOR
16059	93404	16749	Synaphea stenoloba	T	CR	12		Railway Reserve, W side. 3.4 km S along rail access track from Shanns Rd.	SWAN COASTAL	RAI	RRE		23/09/2010 0:00	ACT_IND	0			0	PLANTS		N	
16130	84539	1033	Tetraria australiensis	T	VU	12	A	Railway Reserve. West side of rail line. 3.8 km S along access track from Westward deviation of Shanns Rd, North Dandalup. [Adjacent to PTA owned PP Lot 50].	SWAN COASTAL	RAI	RRE		12/11/2009 0:00	ESTMT	120			120			N	HEALTHY
16131	106342	1033	Tetraria australiensis	T	VU	12	B	Lot 50 on Plan 3765 west side of rail reserve. 3.8 km S along access track from Westward deviation of Shanns Rd, North Dandalup. [PTA owned]	SWAN COASTAL	PRI			12/11/2009 0:00		0			0			N	

FID	PopId	Nameid	Taxon	ConsStatus	WARank	PopNumber	SubPopCode	Location	District	Vesting	Purpose1	Purpose2	CountDate	Method	MatureCoun	JuvenileCo	SeedlingCo	LiveTotal	PlantTypeC	AreaOccupi	inFlower	Population
16138	108105	1033	Tetraria australiensis	T	VU	17		Unnamed Shire road reserve, 4.3-5.1km S of Lakes Road, north Dandalup, on the unmade road reserve E of the Railway. Plants occur on the east of the track within the unmade road reserve.	SWAN COASTAL	LGA	VER		14/09/2012 0:00	ACT_IND	16			0	PLANTS	36		HEALTHY
16139	108106	1033	Tetraria australiensis	T	VU	18		Unnamed road reserve SW of North Dandalup along the rail reserve which parallels the northen end of Shanns Rd. The plants are located 3.2 km south of Lakes Rd along the rail access track on the eastern side of the railway line.	SWAN COASTAL	LGA	VER		28/09/2010 0:00	PART_CNT	2			0	CLUMPS		N	
16573	93726	44444	Tripterococcus sp. Brachylobus (A.S. George 14234)	4		14		Recreation Reserve 34033, Pinjarra Industrial Site. N side of Moores Rd, ca 1.5 km E from the junction with Curtis Rd.	PERTH HILLS	LGA	REC		17/11/1995 0:00		0			0			N	
16581	96435	33019	Trithuria australis	4		4		Austin Bay NR (4990). On track along N boundary of NR. Ca. 1km S of Yunderup. Murray.	SWAN COASTAL	CC	CFF		4/11/2005 0:00		0			0			N	

APPENDIX 2

Naturemap Report

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 08/03/2019

Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 50' 27" E,32° 32' 08" S
Buffer 5km
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	146	1519
Priority 1	1	2
Priority 2	1	2
Priority 3	1	1
Priority 4	2	10
Protected under international agreement	16	99
Rare or likely to become extinct	7	53
TOTAL	**174**	**1686**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
2.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
3.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
4.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
5.	10796	*Diuris drummondii (Tall Donkey Orchid)*		T	
6.	1639	*Drakaea elastica (Glossy-leaved Hammer Orchid)*		T	
7.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
Protected under international agreement					
8.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
9.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
10.	24786	*Calidris melanotos (Pectoral Sandpiper)*		IA	
11.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
12.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
13.	41332	*Chlidonias leucopterus (White-winged Black Tern, white-winged tern)*		IA	
14.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
15.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
16.	25741	*Limosa limosa (Black-tailed Godwit)*		IA	
17.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
18.	24802	*Philomachus pugnax (Ruff, reeve)*		IA	
19.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
20.	48597	*Thalasseus bergii (Crested Tern)*		IA	
21.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
22.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
23.	24809	*Tringa stagnatilis (Marsh Sandpiper, little greenshank)*		IA	
Priority 1					
24.	14932	*Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)*		P1	
Priority 2					
25.	19272	*Johnsonia pubescens subsp. cygnorum*		P2	
Priority 3					
26.	11612	*Boronia capitata subsp. gracilis*		P3	
Priority 4					
27.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
28.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
Non-conservation taxon					
29.	16975	*Acacia decurrens*	Y		
30.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
31.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
32.	24262	*Acanthiza inornata (Western Thornbill)*			
33.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
34.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
35.	25536	*Accipiter fasciatus (Brown Goshawk)*			
36.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
37.	48320	*Amanita eucalypti*			
38.	24310	*Anas castanea (Chestnut Teal)*			
39.	24312	*Anas gracilis (Grey Teal)*			
40.	24315	*Anas rhynchotis (Australasian Shoveler)*			
41.	24316	*Anas superciliosa (Pacific Black Duck)*			
42.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
43.	11434	*Anigozanthos humilis subsp. humilis*			
44.	24561	*Anthochaera carunculata (Red Wattlebird)*			
45.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
46.	25558	*Ardea ibis (Cattle Egret)*			
47.	41324	*Ardea modesta (great egret, white egret)*			
48.	24340	*Ardea novaehollandiae (White-faced Heron)*			
49.	24341	*Ardea pacifica (White-necked Heron)*			
50.	1264	*Arnocrinum preissii*			
51.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
52.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
53.	6334	*Astroloma pallidum (Kick Bush)*			
54.	2471	*Atriplex prostrata (Hastate Orache)*	Y		
55.	24318	*Aythya australis (Hardhead)*			
56.		*Barnardius zonarius*			
57.	24319	*Biziura lobata (Musk Duck)*			
58.	6341	*Brachyloma preissii (Globe Heath)*			
59.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
60.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
61.	19309	*Calectasia narragara*			
62.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
63.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
64.		*Carassius auratus*			
65.	25625	*Carduelis carduelis (Goldfinch, European Goldfinch)*	Y		
66.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
67.	43380	*Chelodina colliei (South-western Snake-necked Turtle)*			
68.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
69.		*Cherax quinquecarinatus*			
70.	24980	*Christinus marmoratus (Marbled Gecko)*			
71.		*Chroicocephalus novaehollandiae*			
72.	24288	*Circus approximans (Swamp Harrier)*			
73.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
74.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
75.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
76.	25592	*Corvus coronoides (Australian Raven)*			
77.	25595	*Cracticus tibicen (Australian Magpie)*			
78.	25596	*Cracticus torquatus (Grey Butcherbird)*			
79.	25027	*Ctenotus australis*			
80.	24322	*Cygnus atratus (Black Swan)*			
81.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
82.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
83.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
84.	2504	*Dysphania plantaginella*			
85.		*Egretta garzetta*			
86.		*Egretta novaehollandiae*			
87.		*Elanus axillaris*			
88.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
89.		*Eolophus roseicapillus*			
90.	24567	*Epthianura albifrons (White-fronted Chat)*			
91.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
92.	3872	*Euchilopsis linearis (Swamp Pea)*			
93.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
94.	25623	*Falco longipennis (Australian Hobby)*			
95.	25727	*Fulica atra (Eurasian Coot)*			
96.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
97.	34028	*Galaxias occidentalis (Western Minnow)*			
98.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
99.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
100.	25530	*Gerygone fusca (Western Gerygone)*			
101.	24443	*Grallina cyanoleuca (Magpie-lark)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
102.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
103.	24295	*Haliastur sphenurus (Whistling Kite)*			
104.	25410	*Heleioporus eyrei (Moaning Frog)*			
105.	5134	*Hibbertia huegelii*			
106.	5172	*Hibbertia stellaris (Orange Stars)*			
107.	5176	*Hibbertia vaginata*			
108.	47965	*Hieraaetus morphnoides (Little Eagle)*			
109.	25734	*Himantopus himantopus (Black-winged Stilt)*			
110.	24491	*Hirundo neoxena (Welcome Swallow)*			
111.	3966	*Hovea pungens (Devil's Pins, Puyenak)*			
112.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
113.	24511	*Larus novaehollandiae subsp. novaehollandiae (Silver Gull)*			
114.	7574	*Lechenaultia floribunda (Free-flowering Leschenaultia)*			
115.	5850	*Leptospermum laevigatum (Coast Teatree)*	Y		
116.	1085	*Lepyrodia glauca*			
117.	6374	*Leucopogon conostephioides*			
118.	6451	*Leucopogon tenuis*			
119.	25661	*Lichmera indistincta (Brown Honeyeater)*			
120.	25388	*Litoria moorei (Motorbike Frog)*			
121.	1244	*Lomandra sonderi*			
122.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
123.	25654	*Malurus splendens (Splendid Fairy-wren)*			
124.	25758	*Megalurus gramineus (Little Grassbird)*			
125.	25184	*Menetia greyii*			
126.	24598	*Merops ornatus (Rainbow Bee-eater)*			
127.		*Microcarbo melanoleucos*			
128.	25191	*Morethia lineoocellata*			
129.		*Nannoperca vittata*			
130.	24738	*Neophema elegans (Elegant Parrot)*			
131.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
132.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
133.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
134.	25682	*Pardalotus striatus (Striated Pardalote)*			
135.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
136.	48061	*Petrochelidon nigricans (Tree Martin)*			
137.	25697	*Phalacrocorax carbo (Great Cormorant)*			
138.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
139.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
140.	25699	*Phalacrocorax varius (Pied Cormorant)*			
141.	24409	*Phaps chalcoptera (Common Bronzewing)*			
142.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
143.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
144.		*Phytophthora cinnamomi*			
145.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
146.	25720	*Platycercus icterotis (Western Rosella)*			
147.	25704	*Podiceps cristatus (Great Crested Grebe)*			
148.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
149.	2419	*Polygonum aviculare (Wireweed)*	Y		
150.	25722	*Polytelis anthopeplus (Regent Parrot)*			
151.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
152.	24771	*Porzana tabuensis (Spotless Crake)*			
153.	1676	*Prasophyllum hians (Yawning Leek Orchid)*			
154.		*Pterostylis sp.*			
155.	4177	*Pultenaea ochreata*			
156.		*Purpureicephalus spurius*			
157.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
158.	48096	*Rhipidura albiscapa (Grey Fantail)*			
159.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
160.	38836	*Russula erumpens*			
161.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
162.	30948	*Smicrornis brevirostris (Weebill)*			
163.	25597	*Strepera versicolor (Grey Currawong)*			
164.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
165.	48293	*Styphelia ciliosa*			
166.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
167.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
168.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
169.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
170.	1036	*Tetraria octandra*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
171.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
172.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
173.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
174.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

APPENDIX 3

Protected Matters Search Tool Report

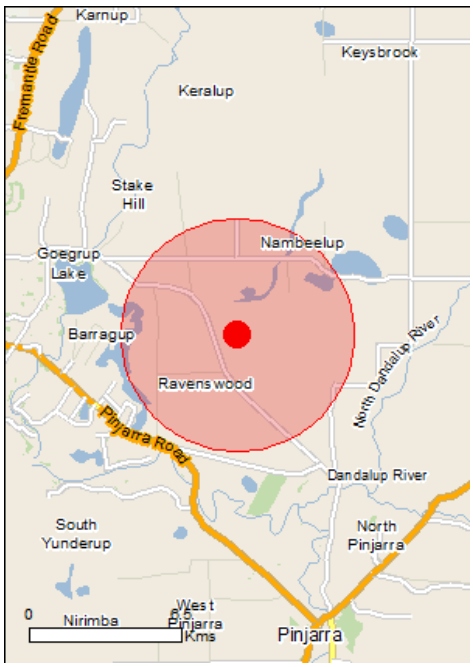
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

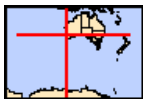
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 08/03/19 16:43:58



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	43
Listed Migratory Species:	29

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	36
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	3
Regional Forest Agreements:	None
Invasive Species:	38
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Peel-yalgorup system	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Other		
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat may occur within area
Synaphea stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area

Name	Threatened	Type of Presence
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Mammals		
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Unnamed WA35283	WA
Unnamed WA50750	WA
Unnamed WA51946	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Feral deer		
Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Funambulus pennantii		
Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus		
Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus		
Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides		
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica		
Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris		
Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera		
Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera		
Boneseed [16905]		Species or species habitat likely to occur within area
Eichhornia crassipes		
Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana		
Broom [67538]		Species or species habitat may occur within area
Lantana camara		
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum		
African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea		
Olive, Common Olive [9160]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.5356 115.84265

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX 4

Conservation Codes

Conservation Codes for Western Australian Flora and Fauna

Specially protected fauna or flora are species* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

Categories of specially protected fauna and flora are:

T Threatened species – Schedules 1-4

Published as Specially Protected under the *Wildlife Conservation Act 1950,* and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

- ***Threatened fauna*** is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act.
- ***Threatened flora*** is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species – Schedule 1

Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EN Endangered species – Schedule 2

Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

VU Vulnerable species - Schedule 3

Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EX Presumed extinct species - Schedule 4

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.

IA Migratory birds protected under an international agreement - Schedule 5

Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.

CD Conservation dependent fauna - Schedule 6

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.

OS Other specially protected fauna - Schedule 7

Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

2 Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

3 Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare: Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened: Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

A list of the current rankings can be downloaded from the Parks and Wildlife Threatened Species and Communities webpage at http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities

Commonwealth of Australia Conservation Codes

Threatened fauna and flora may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in any one of the following six categories:

Extinct

A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.

Extinct in the wild

A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time:

a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.

Critically endangered

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

Endangered

A taxon is Endangered when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing a very high risk of extinction in the wild.

Vulnerable

A taxon is Vulnerable when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing a high risk of extinction in the wild.

Conservation dependent

A native species is eligible to be included in the conservation dependent category at a particular time if, at that time:

a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or
b) the following subparagraphs are satisfied:
    i. the species is a species of fish;

ii. the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised;
iii. the plan of management is in force under a law of the Commonwealth or of a State or Territory;
iv. cessation of the plan of management would adversely affect the conservation status of the species.

The EPBC Act does not provide for listing in a data deficient category. Where sufficient data (evidence) is unavailable to allow assessment by the Threatened Species Scientific Committee against the criteria for listing, the species are found to be ineligible. A recommendation is made to the Minister to not include the species in any category under the EPBC Act. For reasons of transparency and to inform future research, the Threatened Species Scientific Committee publishes the names of those species found to be data deficient. As data deficient is not a listing category under the EPBC Act, this has no statutory implications and the species is not considered to be listed under the EPBC Act.

APPENDIX 5

TEC/PEC Database Search

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
108890	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03172		200	105889	18093
108891	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03173		200	105890	18094
108892	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03174		200	105891	18095
108893	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03175		200	105892	18096
108894	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03176		200	105893	18097
108895	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03177		200	105894	18098
108896	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03178		200	105895	18099
108897	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03179		200	105896	18100
108898	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03180		200	105897	18101
108899	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03181		200	105898	18102
108900	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03182		200	105899	18103
108901	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03183		200	105900	18104
108902	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03184		200	105901	18105
108903	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03185		200	105902	18106
108904	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03186		200	105903	18107
108905	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03187		200	105904	18108
108906	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03188		200	105905	18109
108907	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03189		200	105906	18110
108908	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03190		200	105907	18111
108909	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03191		200	105908	18112
108910	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03192		200	105909	18113
108911	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03193		200	105910	18114
108913	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03195		200	105912	18116
108914	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03196		200	105913	18117
108920	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03202		200	105919	18123
108921	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03203		200	105920	18124
108923	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03205		200	105922	18126
108924	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03206		200	105923	18127
108925	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03207		200	105924	18128
108932	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03214		200	105931	18135
108933	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03215		200	105932	18136
108934	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03216		200	105933	18137
108935	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03217		200	105934	18138
108936	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03218		200	105935	18139
108937	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03219		200	105936	18140
108938	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03220		200	105937	18141
108940	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03222		200	105939	18143
108941	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03223		200	105940	18144
108942	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03224		200	105941	18145
108943	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03225		200	105942	18146
108944	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03226		200	105943	18147
108945	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03227		200	105944	18148
108946	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03228		200	105945	18149
108948	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03230		200	105947	18151
108949	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03231		200	105948	18152

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
108950	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03232		200	105949	18153
108951	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03233		200	105950	18154
108952	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03234		200	105951	18155
108953	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03235		200	105952	18156
108954	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03236		200	105953	18157
108955	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03237		200	105954	18158
108963	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03245		200	105962	18166
108966	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03248		200	105965	18169
108967	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03249		200	105966	18170
108973	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03255		200	105972	18176
108974	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03256		200	105973	18177
108975	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03257		200	105974	18178
108976	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03258		200	105975	18179
108977	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03259		200	105976	18180
108978	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03260		200	105977	18181
108979	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03261		200	105978	18182
108981	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03263		200	105980	18184
108984	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03266		200	105983	18187
108986	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03268		200	105985	18189
108987	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03269		200	105986	18190
108988	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03270		200	105987	18191
108989	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03271		200	105988	18192
108990	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03272		200	105989	18193
108991	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03273		200	105990	18194
109000	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03282		200	105999	18203
109002	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03284		200	106001	18205
109003	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03285		200	106002	18206
109004	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03286		200	106003	18207
109005	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03287		200	106004	18208
109006	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03288		200	106005	18209
109055	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03337		200	106054	18258
109056	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03338		200	106055	18259
109057	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03339		200	106056	18260
109058	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03340		200	106057	18261
109061	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03343		200	106060	18264
109062	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03344		200	106061	18265
109063	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03345		200	106062	18266
109071	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03353		200	106070	18274
109073	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03355		200	106072	18276
109074	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03356		200	106073	18277
109075	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03357		200	106074	18278
109076	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03358		200	106075	18279
109077	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03359		200	106076	18280
109078	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03360		200	106077	18281
109079	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03361		200	106078	18282

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109082	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03364		200	106081	18285
109083	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03365		200	106082	18286
109084	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03366		200	106083	18287
109086	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03368		200	106085	18289
109087	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03369		200	106086	18290
109088	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03370		200	106087	18291
109089	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03371		200	106088	18292
109090	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03372		200	106089	18293
109091	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03373		200	106090	18294
109092	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03374		200	106091	18295
109093	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03375		200	106092	18296
109094	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03376		200	106093	18297
109095	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03377		200	106094	18298
109096	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03378		200	106095	18299
109097	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03379		200	106096	18300
109098	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03380		200	106097	18301
109099	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03381		200	106098	18302
109101	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03383		200	106100	18304
109102	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03384		200	106101	18305
109103	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03385		200	106102	18306
109104	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03386		200	106103	18307
109105	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03387		200	106104	18308
109106	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03388		200	106105	18309
109109	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03391		200	106108	18312
109110	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03392		200	106109	18313
109111	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03393		200	106110	18314
109166	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03448		200	106165	18369
109169	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03451		200	106168	18372
109170	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03452		200	106169	18373
109171	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03453		200	106170	18374
109172	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03454		200	106171	18375
109175	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03457		200	106174	18378
109185	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03467		200	106184	18388
109186	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03468		200	106185	18389
109187	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03469		200	106186	18390
109189	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03471		200	106188	18392
109190	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03472		200	106189	18393
109191	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03473		200	106190	18394
109202	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03484		200	106201	18405
109206	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03488		200	106205	18409
109209	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03491		200	106208	18412
109210	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03492		200	106209	18413
109211	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03493		200	106210	18414
109216	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03498		200	106215	18419
109218	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03500		200	106217	18421

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109219	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03501		200	106218	18422
109220	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03502		200	106219	18423
109221	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03503		200	106220	18424
109222	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03504		200	106221	18425
109223	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03505		200	106222	18426
109224	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03506		200	106223	18427
109225	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03507		200	106224	18428
109235	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03517		200	106234	18438
109236	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03518		200	106235	18439
109243	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03525		200	106242	18446
109252	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03534		200	106251	18455
109253	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03535		200	106252	18456
109254	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03536		200	106253	18457
109255	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03537		200	106254	18458
109256	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03538		200	106255	18459
109257	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03539		200	106256	18460
109258	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03540		200	106257	18461
109260	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03542		200	106259	18463
109261	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03543		200	106260	18464
109262	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03544		200	106261	18465
109263	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03545		200	106262	18466
109264	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03546		200	106263	18467
109265	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03547		200	106264	18468
109266	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03548		200	106265	18469
109267	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03549		200	106266	18470
109268	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03550		200	106267	18471
109269	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03551		200	106268	18472
109270	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03552		200	106269	18473
109271	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03553		200	106270	18474
109272	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03554		200	106271	18475
109273	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03555		200	106272	18476
109274	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03556		200	106273	18477
109275	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03557		200	106274	18478
109276	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03558		200	106275	18479
109277	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03559		200	106276	18480
109279	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03561		200	106278	18482
109280	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03562		200	106279	18483
109281	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03563		200	106280	18484
109282	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03564		200	106281	18485
109283	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03565		200	106282	18486
109284	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03566		200	106283	18487
109285	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03567		200	106284	18488
109286	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03568		200	106285	18489
109287	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03569		200	106286	18490
109288	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03570		200	106287	18491

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
109289	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03571		200	106288	18492
109293	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03575		200	106292	18496
109294	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03576		200	106293	18497
109295	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03577		200	106294	18498
109296	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03578		200	106295	18499
109297	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03579		200	106296	18500
109298	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03580		200	106297	18501
109299	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03581		200	106298	18502
109303	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03585		200	106302	18506
109304	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03586		200	106303	18507
109305	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03587		200	106304	18508
109306	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03588		200	106305	18509
109308	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03590		200	106307	18511
109309	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03591		200	106308	18512
109322	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03604		200	106321	18525
109323	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03605		200	106322	18526
109324	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03606		200	106323	18527
109325	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03607		200	106324	18528
109326	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03608		200	106325	18529
109327	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03609		200	106326	18530
109328	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03610		200	106327	18531
109329	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03611		200	106328	18532
109330	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03612		200	106329	18533
109331	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03613		200	106330	18534
109339	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03621		200	106338	18542
109340	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03622		200	106339	18543
109341	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03623		200	106340	18544
109343	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03625		200	106342	18546
109347	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03629		200	106346	18550
109348	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03630		200	106347	18551
109349	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03631		200	106348	18552
109351	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03633		200	106350	18554
109352	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03634		200	106351	18555
109353	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03635		200	106352	18556
109354	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03636		200	106353	18557
109355	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03637		200	106354	18558
109356	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03638		200	106355	18559
109361	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03643		200	106360	18564
109362	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03644		200	106361	18565
109363	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03645		200	106362	18566
109364	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03646		200	106363	18567
109365	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03647		200	106364	18568
109366	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03648		200	106365	18569
109367	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03649		200	106366	18570
109368	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03650		200	106367	18571

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109370	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03652		200	106369	18573
109371	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03653		200	106370	18574
109372	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03654		200	106371	18575
109373	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03655		200	106372	18576
109374	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03656		200	106373	18577
109375	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03657		200	106374	18578
109378	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03660		200	106377	18581
109379	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03661		200	106378	18582
109380	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03662		200	106379	18583
109381	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03663		200	106380	18584
109382	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03664		200	106381	18585
109383	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03665		200	106382	18586
109384	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03666		200	106383	18587
109385	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03667		200	106384	18588
109386	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03668		200	106385	18589
109392	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03674		200	106391	18595
109395	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03677		200	106394	18598
109396	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03678		200	106395	18599
109397	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03679		200	106396	18600
109398	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03680		200	106397	18601
109399	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03681		200	106398	18602
109400	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03682		200	106399	18603
109401	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03683		200	106400	18604
109409	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03691		200	106408	18612
109410	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03692		200	106409	18613
109412	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03694		200	106411	18615
109413	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03695		200	106412	18616
109414	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03696		200	106413	18617
109418	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03700		200	106417	18621
109460	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03742		200	106459	18663
109465	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03747		200	106464	18668
109466	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03748		200	106465	18669
109467	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03749		200	106466	18670
109468	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03750		200	106467	18671
109469	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03751		200	106468	18672
109470	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03752		200	106469	18673
109471	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03753		200	106470	18674
109472	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03754		200	106471	18675
109473	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03755		200	106472	18676
109476	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03758		200	106475	18679
109477	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03759		200	106476	18680
109478	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03760		200	106477	18681
109479	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03761		200	106478	18682
109481	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03763		200	106480	18684
109485	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03767		200	106484	18688

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109498	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03780		200	106497	18701
109499	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03781		200	106498	18702
109500	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03782		200	106499	18703
109501	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03783		200	106500	18704
109505	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03787		200	106504	18708
109506	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03788		200	106505	18709
109507	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03789		200	106506	18710
109508	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03790		200	106507	18711
109509	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03791		200	106508	18712
109510	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03792		200	106509	18713
109516	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03798		200	106515	18719
109520	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03802		200	106519	18723
109521	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03803		200	106520	18724
109522	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03804		200	106521	18725
109523	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03805		200	106522	18726
109524	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03806		200	106523	18727
109525	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03807		200	106524	18728
109526	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03808		200	106525	18729
109527	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03809		200	106526	18730
109528	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03810		200	106527	18731
109529	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03811		200	106528	18732
109530	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03812		200	106529	18733
109531	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03813		200	106530	18734
109532	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03814		200	106531	18735
109535	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03817		200	106534	18738
109536	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03818		200	106535	18739
109537	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03819		200	106536	18740
109538	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03820		200	106537	18741
109540	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03822		200	106539	18743
109542	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03824		200	106541	18745
109543	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03825		200	106542	18746
109545	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03827		200	106544	18748
109550	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03832		200	106549	18753
109551	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03833		200	106550	18754
109552	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03834		200	106551	18755
109553	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03835		200	106552	18756
109554	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03836		200	106553	18757
109557	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03839		200	106556	18760
109563	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03845		200	106562	18766
109587	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03869		200	106586	18790
109588	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03870		200	106587	18791
109589	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03871		200	106588	18792
109590	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03872		200	106589	18793
109591	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03873		200	106590	18794
109592	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03874		200	106591	18795

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
109596	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03878		200	106595	18799
109597	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03879		200	106596	18800
109598	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03880		200	106597	18801
109599	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03881		200	106598	18802
109600	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03882		200	106599	18803
109601	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03883		200	106600	18804
109602	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03884		200	106601	18805
109603	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03885		200	106602	18806
109604	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03886		200	106603	18807
109605	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03887		200	106604	18808
109606	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03888		200	106605	18809
109607	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03889		200	106606	18810
109612	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03894		200	106611	18815
109613	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03895		200	106612	18816
109614	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03896		200	106613	18817
109620	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03902		200	106619	18823
109621	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03903		200	106620	18824
109622	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03904		200	106621	18825
109623	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03905		200	106622	18826
109624	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03906		200	106623	18827
109625	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03907		200	106624	18828
109626	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03908		200	106625	18829
109655	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03937		200	106654	18858
109656	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03938		200	106655	18859
109657	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03939		200	106656	18860
109658	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03940		200	106657	18861
109659	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03941		200	106658	18862
109660	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03942		200	106659	18863
109661	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03943		200	106660	18864
109662	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03944		200	106661	18865
109663	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03945		200	106662	18866
109669	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03951		200	106668	18872
109670	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03952		200	106669	18873
109671	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03953		200	106670	18874
109786	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04068		200	106785	18989
109787	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04069		200	106786	18990
109788	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04070		200	106787	18991
109789	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04071		200	106788	18992
109790	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04072		200	106789	18993
109791	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04073		200	106790	18994
109792	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04074		200	106791	18995
109793	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04075		200	106792	18996
109794	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04076		200	106793	18997
109795	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04077		200	106794	18998
109796	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04078		200	106795	18999

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
109797	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04079		200	106796	19000
109798	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04080		200	106797	19001
109799	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04081		200	106798	19002
109800	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04082		200	106799	19003
109801	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04083		200	106800	19004
109802	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04084		200	106801	19005
109803	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04085		200	106802	19006
109804	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04086		200	106803	19007
109805	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04087		200	106804	19008
109806	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04088		200	106805	19009
109807	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04089		200	106806	19010
109809	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04091		200	106808	19012
109812	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04094		200	106811	19015
109813	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04095		200	106812	19016
109814	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04096		200	106813	19017
109815	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04097		200	106814	19018
109816	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04098		200	106815	19019
109817	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04099		200	106816	19020
109818	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04100		200	106817	19021
109819	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04101		200	106818	19022
109820	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04102		200	106819	19023
109821	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04103		200	106820	19024
109822	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04104		200	106821	19025
109826	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld04108		200	106825	19029
121425	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15707		200	118424	30623
121432	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15714		200	118431	30630
121435	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15717		200	118434	30633
121436	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15718		200	118435	30634
121437	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15719		200	118436	30635
121438	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15720		200	118437	30636
121442	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15724		200	118441	30640
121443	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15725		200	118442	30641
121446	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15728		200	118445	30644
121447	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15729		200	118446	30645
121448	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15730		200	118447	30646
121449	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15731		200	118448	30647
121452	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15734		200	118451	30650
121453	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15735		200	118452	30651
121454	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15736		200	118453	30652
121455	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15737		200	118454	30653
121456	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15738		200	118455	30654
121457	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15739		200	118456	30655
121458	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15740		200	118457	30656
121459	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15741		200	118458	30657
121460	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15742		200	118459	30658

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
121462	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15744		200	118461	30660
121467	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15749		200	118466	30665
121474	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15756		200	118473	30672
121475	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15757		200	118474	30673
121476	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15758		200	118475	30674
121480	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15762		200	118479	30678
121481	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15763		200	118480	30679
121484	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15766		200	118483	30682
121521	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15803		200	118520	30719
121525	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15807		200	118524	30723
121527	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15809		200	118526	30725
121528	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15810		200	118527	30726
121662	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15944		200	118661	30860
121663	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15945		200	118662	30861
121664	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15946		200	118663	30862
121665	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15947		200	118664	30863
121703	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15985		200	118702	30901
121736	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16018		200	118735	30934
121737	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16019		200	118736	30935
121794	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16076		200	118793	30992
121796	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16078		200	118795	30994
121797	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16079		200	118796	30995
121798	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16080		200	118797	30996
121799	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16081		200	118798	30997
121800	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16082		200	118799	30998
121801	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16083		200	118800	30999
121802	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16084		200	118801	31000
121803	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16085		200	118802	31001
121804	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16086		200	118803	31002
108912	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03194		200	105911	18115
108939	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03221		200	105938	18142
109350	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld03632		200	106349	18553
121434	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld15716		200	118433	30632
5706	Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	Priority 3	Vulnerable	1	GoegrupLake01		500	3392	2901
5735	Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	Priority 3	Vulnerable	1	BlackLake01		500	3420	2929
5736	Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	Priority 3	Vulnerable	1	BlackLake02		500	3421	2930

APPENDIX 6

Quadrat Data

QUADRAT PR1

50 390428 E 6399994 N

Vegetation: *Eucalyptus marginata/Allocasuarina fraseriana/ Banksia menziesii/B. ilicifolia* Low Woodland over *Hibbertia hypericoides/Desmocladus flexuosus* Low Open Shrubland

Condition: Good

Soil Type: Grey-brown sand

Landform: Top of low rise

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus marginata	6	10
Banksia menziesii	6	10
Allocasuarina fraseriana	6	5
Banksia ilicifolia	6	5
Leucopogon propinquus	0.6	2
Hibbertia hypericoides	0.5	5
Opercularia hispidula	0.4	4
Sowerbaea laxiflora	0.4	<1
Burchardia congesta	0.4	<1
Lepidosperma leptostachyum	0.4	<1
Lepidosperma squamatum	0.4	1
**Briza maxima*	0.3	5
Conostylis aculeata	0.3	<1
Hovea trisperma	0.3	<1
Corynotheca micrantha	0.3	<1
Orthrosanthus laxus	0.3	<1
Gompholobium tomentosum	0.3	<1
Desmocladus flexuosus	0.2	20
**Ursinia anthemoides*	0.2	1

SPECIES	HEIGHT (m)	COVER (%)
Caladenia flava	0.2	<1
**Lolium perenne*	0.2	<1
**Lotus subbiflorus*	0.1	1
**Ornithopus compressus*	0.1	<1
Dianella revoluta var. *divaricata*	0.1	<1
**Hypochaeris glabra*	Flat	<1
Drosera erythrorhiza	Flat	<1
Hardenbergia comptoniana	Climber	<1

* introduced species

QUADRAT PR2

50 390475 E 6399555 N

Vegetation: *Kunzea glabrescens* Tall Shrubland over *Conostylis aculeata* Low Open Shrubland
Condition: Good
Soil Type: Grey sand
Landform: Top of small rise

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Kunzea glabrescens	4	25
Acacia pulchella	0.5	2
Conostylis aculeata	0.4	2
Acacia huegelii	0.4	1
Burchardia congesta	0.4	<1
Gompholobium tomentosum	0.4	<1
**Ehrharta longiflora*	0.3	1
Corynotheca micrantha	0.3	<1
Lomandra hermaphrodita	0.3	<1
Desmocladus flexuosus	0.2	5
**Ursinia anthemoides*	0.2	1
**Briza maxima*	0.2	1
Dasypogon bromeliifolius	0.2	<1
Caladenia flava	0.2	<1
**Vulpia myuros*	0.1	20
Microtis media	0.1	<1
Trachymene pilosa	0.1	<1

SPECIES	HEIGHT (m)	COVER (%)
**Ornithopus compressus*	0.1	<1
Quinetia urvillei	<0.1	<1
**Hypochaeris glabra*	Flat	2
Drosera erythrorhiza	Flat	<1
Thysanotus patersonii	Climber	<1
Drosera menziesii	Climber	<1

* introduced species

QUADRAT PR3

50 391275 E 6400084 N

Vegetation: *Eucalyptus marginata/Allocasuarina fraseriana/Xylomelum occidentale* Low Open Woodland over *Kunzea glabrescens* Tall Shrubland over *Hibbertia hypericoides* Low Open Shrubland

Condition: Very Good, recovering from fire

Soil Type: Grey sand

Landform: Top of low rise

Quadrat (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus marginata	5	5
Allocasuarina fraseriana	4	2
Xylomelum occidentale	3	4
Kunzea glabrescens	2	1
Leucopogon propinquus	0.5	2
Hibbertia hypericoides	0.4	5
Bossiaea eriocarpa	0.4	2
Conostylis aculeata	0.4	1
Lepidosperma pubisquameum	0.4	1
Opercularia hispidula	0.4	<1
Acacia stenoptera	0.4	<1
Corynotheca micrantha	0.3	4
**Ursinia anthemoides*	0.3	2
Burchardia congesta	0.3	<1
Sowerbaea laxiflora	0.3	<1
Desmocladus flexuosus	0.2	10
**Briza maxima*	0.2	10
Brachyloma preissii	0.2	<1

Drosera stolonifera	0.2	<1
Lomandra hermaphrodita	0.2	<1
Gompholobium tomentosum	0.2	<1
Hemiandra pungens	0.1	2
Caladenia flava	0.1	<1
Kennedia prostrata	0.1	<1
Poranthera microphylla	<0.1	<1
**Hypochaeris glabra*	Flat	5
Drosera erythrorhiza	Flat	1

* introduced species

QUADRAT PR4

50 391349 E 6400045 N

Vegetation: *Banksia attenuata/B. ilicifolia/B. menziesii* Low Woodland over *Kunzea glabrescens* Open Heath over *Conostylis aculeata/Desmocladus flexuosus* Open Low Heath

Condition: Very Good

Soil Type: Grey-brown sand

Landform: Upper slope

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Banksia attenuata	5	10
Banksia ilicifolia	4.5	5
Jacksonia furcellata	2	10
Kunzea glabrescens	1.6	30
Melaleuca thymoides	1.3	2
Conostylis aculeata	0.4	1
Bossiaea eriocarpa	0.4	<1
Burchardia congesta	0.4	<1
Corynotheca micrantha	0.3	<1
Hibbertia hypericoides	0.3	<1
Hibbertia huegelii	0.3	<1
**Ursinia anthemoides*	0.3	<1
Acacia huegelii	0.3	<1
Desmocladus flexuosus	0.2	40
**Romulea rosea*	0.2	<1
Conostylis juncea	0.2	<1
Leucopogon polymorphus	0.2	<1
**Briza maxima*	0.2	<1

SPECIES	HEIGHT (m)	COVER (%)
Gompholobium tomentosum	0.2	<1
Brachyloma preissii	0.1	<1
Caladenia flava	0.1	<1
Lomandra hermaphrodita	0.1	<1
Lagenophora huegelii	0.1	<1
Kennedia prostrata	0.1	<1
**Trifolium campestre*	0.1	<1
Conostylis setigera	0.1	<1
**Ornithopus compressus*	0.1	<1
Dodonaea sp	0.1	<1
**Lotus subbiflorus*	<0.1	<1
Chamaescilla corymbosa	<0.1	<1
Trachymene pilosa	<0.1	<1
**Hypochaeris glabra*	Flat	1
Drosera erythrorhiza	Flat	1
Pyrorchis nigricans	Flat	<1

* introduced species

QUADRAT PR5

50 391265 E 6399837 N

Vegetation: *Kunzea glabrescens* Tall Open Scrub
Condition: Degraded
Soil Type: Dark grey sand
Landform: Flat

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Kunzea glabrescens	1.5-2	60
Conostylis aculeata	0.4	<1
**Ursinia anthemoides*	0.2	<1
**Vulpia myuros*	0.1	1
**Ehrharta longiflora*	0.1	<1
Crassula colorata	<0.1	<1
**Arctotheca calendula*	Flat	<1
**Hypochaeris glabra*	Flat	<1

* introduced species

QUADRAT PR6

50 391371 E 6399878 N

Vegetation: *Kunzea glabrescens* Tall Shrubland
Condition: Degraded
Soil Type: Black sand
Landform: Flat

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Kunzea glabrescens	3.5	20
Pultenaea reticulata	2.5	5
**Romulea rosea*	0.2	<1
**Ornithopus compressus*	0.1	1
**Disa bracteata*	0.1	<1
**Ursinia anthemoides*	0.1	<1
**Hypochaeris glabra*	Flat	<1

* introduced species

QUADRAT PR7

50 391960 E 6400027 N

Vegetation: *Eucalyptus rudis* Low Woodland over *Kunzea glabrescens* Low Shrubland over weeds
Condition: Degraded
Soil Type: Grey sand
Landform: Lower slope

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus rudis	10	25
Kunzea glabrescens	0.7	10
**Solanum nigrum*	0.4	<1
**Lolium perenne*	0.3	40
Opercularia hispidula	0.3	1
Jacksonia furcellata	0.3	<1
**Bromus diandrus*	0.2	10
Desmocladus flexuosus	0.2	1
Tetragonia decumbens	0.2	<1
**Sonchus oleraceus*	0.2	<1
Caladenia flava	0.2	<1
**Ursinia anthemoides*	0.2	<1
**Trifolium campestre*	0.1	1
**Romulea rosea*	0.1	<1
**Lotus subbiflorus*	0.1	<1
Cotula australis	0.1	<1
Homalosciadium homalocarpum	<0.1	<1
**Hypochaeris glabra*	Flat	1
**Taraxacum officinale*	Flat	<1
**Arctotheca calendula*	Flat	<1

* introduced species

QUADRAT PR8

50 391837 E 6400080 N

Vegetation: *Allocasuarina fraseriana/Banksia ilicifolia* Low Open Woodland over *Kunzea glabrescens* Tall Open Scrub over *Desmocladus flexuosus* Low Shrubland

Condition: Good

Soil Type: Grey sand

Landform: Upper slope of small rise

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Allocasuarina fraseriana	8	5
Banksia ilicifolia	7	5
Kunzea glabrescens	2-4	40
Jacksonia furcellata	2.5	4
Leucopogon propinquus	0.5	1
Lyginia imberbis	0.4	1
Dasypogon bromeliifolius	0.4	1
Conostylis aculeata	0.4	<1
Patersonia occidentalis	0.4	<1
**Ursinia anthemoides*	0.3	1
Scholtzia involucrata	0.3	<1
Podotheca gnaphalioides	0.3	<1
Brachyloma preissii	0.3	<1
Desmocladus flexuosus	0.2	20
**Briza maxima*	0.2	1
Caladenia flava	0.2	<1
Lomandra hermaphrodita	0.2	<1
Conostylis juncea	0.2	<1

SPECIES	HEIGHT (m)	COVER (%)
Bossiaea eriocarpa	0.1	<1
**Ornithopus compressus*	0.1	<1
**Trifolium campestre*	0.1	<1
**Hypochaeris glabra*	Flat	1
Drosera erythrorhiza	Flat	<1
Drosera menziesii	Climber	<1

* introduced species

QUADRAT PR9

50 392002 E 6399865 N

Vegetation: *Kunzea glabrescens/Jacksonia furcellata* Tall Open Scrub over weeds
Condition: Good
Soil Type: Black sand
Landform: Flat

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Kunzea glabrescens	3	50
Jacksonia furcellata	2.1	4
Calytrix fraseri	0.5	<1
**Ursinia anthemoides*	0.3	1
Brachyloma preissii	0.3	<1
**Briza maxima*	0.3	<1
Podotheca gnaphalioides	0.2	<1
Caladenia flava	0.2	<1
Trachymene pilosa	0.1	1
**Arctotheca calendula*	0.1	<1
**Ornithopus compressus*	0.1	<1
**Aira caryophyllea*	0.1	<1
Rhodanthe citrina	0.1	<1
Quinetia urvillei	<0.1	<1
**Lotus subbiflorus*	<0.1	<1
Crassula colorata	<0.1	<1
**Hypochaeris glabra*	Flat	2
Drosera erythrorhiza	Flat	<1
Drosera menziesii	Climber	<1

* introduced species

APPENDIX 7

Flora Species List

Lot 226 Paterson Road, Nambeelup Species List – (February, July and September 2019)

GYMNOSPERMS

CYCADACEAE
Macrozamia riedlei

MONOCOTYLEDONS

ANARTHRIACEAE
Lyginia barbata

ASPARAGACEAE
Laxmannia squarrosa
Lomandra hermaphrodita
Sowerbaea laxiflora
Thysanotus patersonii

COLCHICACEAE
Burchardia congesta

CYPERACEAE
Ficinia marginata
Lepidosperma leptostachyum
Lepidosperma squamata

DASYPOGONACEAE
Dasypogon bromeliifolius

HAEMODORACEAE
Conostylis aculeata
Conostylis juncea
Conostylis setigera
Phlebocarya ciliata

HEMEROCALLIDACEAE
Arnocrinum preissii
Corynotheca micrantha
Dianella revoluta var. *divaricata*
Johnsonia lupulina

IRIDACEAE
**Gladiolus caryophyllaceus*
**Moraea flaccida*
Orthrosanthus laxus
Patersonia occidentalis

ORCHIDACEAE
Caladenia flava
**Disa bracteata*
Elythranthera brunonis
Pterostylis ?pyramidalis
Pterostylis vittata
Pyrorchis nigricans

POACEAE
**Aira caryophyllea*
Amphipogon turbinatus
**Avena fatua*
**Briza maxima*
**Bromus diandrus*
**Ehrharta longiflora*
**Lolium perenne*
**Vulpia bromoides*
**Vulpia myuros*

RESTIONACEAE
Desmocladus flexuosus

XANTHORRHOEACEAE
Chamaescilla corymbosa
Xanthorrhoea brunonis
Xanthorrhoea preissii

DICOTYLEDONS

APIACEAE
Homalosciadium homalocarpum

ARALIACEAE
Trachymene pilosa

ASTERACEAE
**Arctotheca calendula*
**Cotula australis*
**Hypochaeris glabra*
Lagenophora huegelii
Podolepis gracilis
Podotheca angustifolia

Podotheca chrysantha
Podotheca gnaphalioides
Quinetia urvillei
Rhodanthe citrina
Senecio pinnatifolius
**Taraxacum officinale*
**Ursinia anthemoides*

CARYOPHYLLACEAE
**Minuartia mediterranea*
**Petrorhagia dubia*

CASUARINACEAE
Allocasuarina fraseriana

DILLENIACEAE
Hibbertia huegelii
Hibbertia hypericoides
Hibbertia subvaginata

DROSERACEAE
Drosera erythrorhiza
Drosera glanduligera
Drosera menziesii
Drosera stolonifera

ERICACEAE
Brachyloma preissii
Conostephium pendulum
Leucopogon conostephioides
Leucopogon polymorphus
Leucopogon propinquus

FABACEAE
Acacia huegelii
Acacia pulchella
Acacia saligna
Acacia stenoptera
Bossiaea eriocarpa
Gastrolobium capitatum
Gompholobium tomentosum
Hardenbergia comptoniana
Hovea trisperma
Jacksonia furcellata
Jacksonia gracillima **P3**
Kennedia prostrata
**Lotus subbiflorus*
**Ornithopus compressus*
**Ornithopus sativus*
Pultenaea reticulata
**Trifolium campestre*
**Trifolium glomeratum*

GOODENIACEAE
Dampiera linearis

LAMIACEAE
Hemiandra pungens

LAURACEAE
Cassytha racemosa

LORANTHACEAE
Nuytsia floribunda

MACARTHURIACEAE
Macarthuria australis

MYRTACEAE
Calytrix flavescens
Calytrix fraseri
Eremaea ebracteata
Eucalyptus marginata
Eucalyptus rudis
Kunzea glabrescens
Melaleuca preissiana
Melaleuca thymoides
Scholtzia involucrata

OROBANCHACEAE
**Orobanche minor*

PHYLLANTHACEAE
Poranthera microphylla

PROTEACEAE
Adenanthos cygnorum
Banksia attenuata
Banksia grandis
Banksia ilicifolia

Banksia menziesii
Petrophile linearis
Stirlingia latifolia
Xylomelum occidentale

RUBIACEAE
Opercularia hispidula

RUTACEAE
Boronia crenulata

SAPINDACEAE
Dodonaea sp

SOLANACEAE
**Solanum nigrum*

STYLIDIACEAE
Stylidium brunonianum

VIOLACEAE
Hybanthus calycinus

APPENDIX 8

DBCA Fauna Database Search

NAME_SCI	NAME_COM	CLASS	CONS_CODE	Date	DAY	MONTH	YEAR	SOURCE_ID	SOURCE	CERTAINTY	METHOD	TYPE	COUNT	LOCALITY	SITE	ACCURACY_M
Calidris acuminata	sharp-tailed sandpiper	BIRD	IA	28/02/2003	28	2	2003	291053|163	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	STAKE HILL	Geogrup Lane	500
Calidris acuminata	sharp-tailed sandpiper	BIRD	IA	25/09/2009	25	9	2009	770723|163	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Nambellup Ponds	500
Calidris acuminata	sharp-tailed sandpiper	BIRD	IA	22/10/2010	22	10	2010	5106898|163	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Settlement Ponds, Custom Compos	100
Calidris acuminata	sharp-tailed sandpiper	BIRD	IA	12/02/2012	12	2	2012	5099211|163	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Nambellup compost ponds	100
Calidris ferruginea	curlew sandpiper	BIRD	CR & IA	22/10/2010	22	10	2010	5106898|161	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Settlement Ponds, Custom Compos	100
Calidris ruficollis	red-necked stint	BIRD	IA	28/02/2003	28	2	2003	291053|162	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	STAKE HILL	Geogrup Lane	500
Calidris ruficollis	red-necked stint	BIRD	IA	22/10/2010	22	10	2010	5106898|162	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Settlement Ponds, Custom Compos	100
Calidris ruficollis	red-necked stint	BIRD	IA	12/02/2012	12	2	2012	5099211|162	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Nambellup compost ponds	100
Calidris subminuta	long-toed stint	BIRD	IA	22/10/2010	22	10	2010	5106898|965	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Settlement Ponds, Custom Compos	100
Calidris subminuta	long-toed stint	BIRD	IA	12/02/2012	12	2	2012	5099211|965	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Nambellup compost ponds	100
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	28/01/2006	28	1	2006	22464	TFAUNA	Certain	Targeted survey	Day sighting	0	Stake Hill		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22307	TFAUNA	Certain	Targeted survey	Day sighting	0	Nambeelup		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22308	TFAUNA	Certain	Targeted survey	Day sighting	0	Ravenswood		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22465	TFAUNA	Certain	Targeted survey	Day sighting	14	Barragup		1000

NAME_SCI	NAME_COM	CLASS	CONS_CODE	Date	DAY	MONTH	YEAR	SOURCE_ID	SOURCE	CERTAINTY	METHOD	TYPE	COUNT	LOCALITY	SITE	ACCURACY_M
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22466	TFAUNA	Certain	Targeted survey	Secondary sign	0	Ravenswood		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22467	TFAUNA	Certain	Targeted survey	Secondary sign	0	Ravenswood		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22468	TFAUNA	Certain	Targeted survey	Secondary sign	0	Ravenswood		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22469	TFAUNA	Certain	Targeted survey	Secondary sign	0	Ravenswood		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22486	TFAUNA	Certain	Targeted survey	Secondary sign	0	Ravenswood		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22487	TFAUNA	Certain	Targeted survey	Secondary sign	1	Ravenswood		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22488	TFAUNA	Certain	Targeted survey	Secondary sign	0	Ravenswood		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22489	TFAUNA	Certain	Targeted survey	Secondary sign	0	Ravenswood		1000
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	VU	6/02/2006	6	2	2006	22490	TFAUNA	Certain	Targeted survey	Secondary sign	0	Ravenswood		1000
Calyptorhynchus latirostris	Carnaby's cockatoo	BIRD	EN	28/02/2003	28	2	2003	291053|794	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	STAKE HILL	Geogrup Lane	500
Dasyurus geoffroii	chuditch, western quoll	MAMMAL	VU	1/01/1992	1	1	1992	979	TFAUNA	Certain	Opportunistic sighting	Day sighting	1	CORIO SWAMP SYSTEM		1000
Dasyurus geoffroii	chuditch, western quoll	MAMMAL	VU	1/06/2016	1	6	2016	82182	TFAUNA	Moderately certain	Opportunistic sighting	Dead	1	Nambeelup		1000
Isoodon fusciventer	quenda, southwestern brown bandicoot	MAMMAL	P4	25/05/2012	25	5	2012	68428	TFAUNA	Certain	Community survey	Day sighting	4	NAMBEELUP		1000
Myrmecobius fasciatus	numbat, walpurti	MAMMAL	EN	1/01/1974	1	1	1974	96496	TFAUNA	Certain	Survey	Caught or trapped	1	Mandurah		10000
Numenius madagascariensis	eastern curlew	BIRD	CR	15/02/1997	15	2	1997	3178	TFAUNA	Certain	Survey	Day sighting	5	Mandurah		10000
Numenius madagascariensis	eastern curlew	BIRD	CR	15/02/1997	15	2	1997	3178	TFAUNA	Certain	Survey	Day sighting	5	Mandurah		10000

NAME_SCI	NAME_COM	CLASS	CONS_CODE	Date	DAY	MONTH	YEAR	SOURCE_ID	SOURCE	CERTAINTY	METHOD	TYPE	COUNT	LOCALITY	SITE	ACCURACY_M
Numenius madagascariensis	eastern curlew	BIRD	CR	15/02/1997	15	2	1997	3178	TFAUNA	Certain	Survey	Day sighting	5	Mandurah		10000
Numenius madagascariensis	eastern curlew	BIRD	CR	15/02/1997	15	2	1997	3178	TFAUNA	Certain	Survey	Day sighting	5	Mandurah		10000
Oxyura australis	blue-billed duck	BIRD	P4	13/11/1999	13	11	1999	62039|216	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	BARRAGUP	Goegrup Lake	500
Tringa glareola	wood sandpiper	BIRD	IA	25/09/2009	25	9	2009	770723|154	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Nambellup Ponds	500
Tringa glareola	wood sandpiper	BIRD	IA	22/10/2010	22	10	2010	5106898|154	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Settlement Ponds, Custom Compos	100
Tringa glareola	wood sandpiper	BIRD	IA	12/02/2012	12	2	2012	5099211|154	BIRDATLAS2	Moderately Certain	Observational	Sighting	1	NAMBEELUP	Nambellup compost ponds	100

LOT 226 PATERSON ROAD, NAMBEELUP

BLACK COCKATOO HABITAT ASSESSMENT

Prepared for:	King Street Trust
Report Date:	18 November 2019
Version:	1
Report No.	2019-459

pgv ENVIRONMENTAL

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1 INTRODUCTION

1.1 Background

Lot 226 Paterson Road, Nambeelup (the site) is located in the Shire of Murray, approximately 64km south of the Perth Central Business District (Figure 1). The site is bound by Paterson road to the west, unconstructed road reserve and rural land to the north and rural land to the east and south.

The site is generally flat but contains some higher areas that contain native vegetation. Lot 226 Paterson Road is approximately 155ha in size, of which approximately 34.5ha contains native vegetation (Figure 2).

An Environmental Features Survey undertaken by PGV Environmental (PGV, 2019) identified habitat on the site that was suitable for three species of Black Cockatoo listed under both Western Australian and Federal legislation being:

- Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) (Endangered);
- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) (Endangered); and
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) (Vulnerable).

PGV Environmental was commissioned by King Street Trust to undertake a Black Cockatoo Habitat Assessment of the site.

1.2 Scope of Works

The Black Cockatoo Habitat Assessment was undertaken to:

- Describe the Black Cockatoo habitat on the site;
- Determine the impact of potential development on Black Cockatoos if the site was to be cleared; and
- Assess the clearing in the context of the significance of the impact on Black Cockatoos.

2 BLACK COCKATOOS

2.1 Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)

Carnaby's Black Cockatoo is found in the south-west of Australia from Kalbarri through to Ravensthorpe. It has a preference for feeding on the seeds of *Banksia, Hakea, Eucalyptus, Grevillea, Pinus* and *Allocasuarina* spp. It is nomadic, often moving toward the coast after breeding. It breeds in tree hollows that are 2.5 – 12m above the ground and have an entrance of 23-30cm with a depth of 1-2.5m. Nesting mostly occurs in smooth-barked trees (e.g. Salmon Gum, Wandoo, Red Morrell). Eggs are laid from July to October, with incubation lasting 29 days (DoE, 2014).

The site is inside the boundary of the modelled distribution and breeding range for Carnaby's Black Cockatoos (SEWPaC, 2012), but is not within a confirmed breeding area (National Map, 2019).

2.2 Baudin's Black Cockatoo (*Calyptorhynchus baudinii*)

Baudin's Black Cockatoo is most common in the far south-west of Western Australia. It is known to breed from the southern forests north to Collie and east to near Kojonup. Baudin's Black Cockatoo is typically found in vagrant flocks and utilises the taller, more open Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) woodlands where it feeds mainly on Marri seeds and various Proteaceous species (Johnstone and Kirkby, 2011).

The site is inside the modelled distribution for Baudin's Black Cockatoos (SEWPaC, 2012). Baudin's Black Cockatoo predominantly lives in the south-west, Darling Range and Scarp.

2.3 Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)

Forest Red-tailed Black Cockatoos are endemic to the humid to sub-humid south-west of Western Australia (SEWPaC, 2012). The range of Forest Red-tailed Black Cockatoos is bound by Gingin in the north to Mt Helena, Christmas Tree Well, West Dale, North Bannister, Mt Saddleback, Kojonup, Rocky Gully, upper King River and Green Range (east of Albany) (SEWPaC, 2012; DoE, 2014). It nests in tree hollows with a depth of 1-5m, that are predominately Marri, Jarrah and Karri (*E. diversicolor*) and it feeds primarily on the seeds of Marri and Jarrah (Johnstone and Kirkby, 2011).

The site is inside the modelled distribution for Forest Red-tailed Black Cockatoos (SEWPaC, 2012).

3 BLACK COCKATOO HABITAT

3.1 Habitat Survey

PGV Environmental undertook a Black Cockatoo habitat assessment on 31 July 2019 in accordance with the *EPBC Act referral guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii Forest red-tailed Black Cockatoo (vulnerable) Calyptorhynchus banksii naso* (SEWPaC, 2012) (Black Cockatoo Referral Guidelines) and the methodology that is outlined in the SPRAT Database for each of the Black Cockatoo species for Black Cockatoo Habitat Assessments.

The site was traversed on foot and information on Black Cockatoo foraging, roosting and breeding habitat was assessed. The extent, type and quality of the vegetation present, including the presence and extent of plants known to be used by Black Cockatoos was investigated.

3.2 Foraging Habitat

Foraging habitat species that have been recorded on the site are shown in Table 1 (Valentine and Stock, 2008; Groom, 2011).

Table1: Foraging Species for Black Cockatoos on Lot 226 Paterson Road

Scientific Name	Common Name
Allocasuarina fraseriana	Sheoak
Banksia attenuata	Candlestick Banksia
Banksia grandis	Bull Banksia
Banskia menziesii	Firewood Banksia
Eucalyptus marginata	Jarrah

Foraging habitat is concentrated in the uplands on the site, with the remaining areas dominated by Spearwood (*Kunzea glabrescens*), Paperbark (*Melaleuca preissiana*) and Flooded Gum (*Eucalyptus rudis*) (Figure 3).

The total area that contains foraging habitat is approximately 9ha. The Black Cockatoo Referral Guidelines refer to the quality of the foraging habitat as an important characteristic in determining the significance of the impact. However, there is no guidance as to how the quality is determined in the Black Cockatoo Referral Guidelines other than specifying that 'quality' foraging habitat refers to the use of the habitat by Black Cockatoos rather than the overall quality of the vegetation which would normally be described using understorey as well as tree canopy.

Banksia and Jarrah trees are considered to be a High Resource for Black Cockatoos and therefore the foraging habitat on the site is considered to be 'quality' foraging.

There was no evidence recorded of foraging on the site during the site survey.

3.3 Roosting Habitat

The site is not mapped as a confirmed roost site by the Department of Biodiversity, Conservation and Attractions (DBCA) (National Map, 2019). There was no evidence of roosting recorded during the assessment of the site.

3.4 Breeding Habitat

Black Cockatoos are known to breed in hollows of large eucalypts. The site is not known as a breeding site for Black Cockatoos (DoP, 2011; Peck *et al.,* 2018; National Map, 2019). No evidence of breeding by Black Cockatoos was observed on the site by PGV Environmental during the assessment.

The Black Cockatoo Referral Guidelines define trees of certain species with a Diameter at Breast Height (DBH) of 500mm or greater as breeding habitat regardless of the presence or not of hollows. The theory behind this definition is the concept that while the trees may not currently contain hollows, they are mature enough that in the next 50 years or so a hollow might form and be of use to Black Cockatoos for the purposes of breeding.

The Black Cockatoo habitat assessment measured all trees on the site with a DBH greater than 500mm. In addition, the trees were photographed and assessed for the presence of hollows or spouts.

A total of 37 potential breeding habitat trees were recorded on the site. The total included 24 Jarrah (*Eucalyptus marginata*), 11 Standing Dead Trees and two Flooded Gums (*Eucalyptus rudis*) (Appendix 1). The trees ranged in DBH from 510mm up to 1900mm (Appendix 1). There were 11 trees that had a DBH greater than 1000mm. The details of the significant trees on the site are contained in Appendix 1 and Appendix 2 and the locations are shown on Figure 4.

There were 12 trees were recorded as containing a potential hollow or spout, however these were recorded from the ground and their suitability as Black Cockatoo breeding habitat was not able to be determined. Other hollows may not be visible from the ground. The potential hollows and/or spouts were recorded in eight of the Standing Dead trees with and four recorded in the live Jarrah trees

The tree on the site have all been impacted by fire with several being hollowed out at the base and 14 out of the 24 Jarrahs on the site in Poor or Very poor condition.

There was also some termite activity recorded in one of the Standing Dead trees (Appendix 1).

3.5 Regional Context

To assist in determining the significance of any impact on Black Cockatoo habitat on the site an assessment of Black Cockatoo habitat within the vicinity of the site was undertaken. There are very few areas in the vicinity of the site that contain native vegetation within 10km (Figure 5) which contain habitat for Black Cockatoos. Therefore the site is unlikely to be able to sustain a breeding pair. There is one small area to the north that is in better condition and is likely to provide better foraging habitat for migrating birds.

4 BLACK COCKATOO REFERRAL GUIDELINES

The *EPBC Act referral guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii Forest red-tailed Black Cockatoo (vulnerable) Calyptorhynchus banksii naso* (SEWPaC, 2012) (Black Cockatoo Referral Guidelines) contain several steps to determine whether or not a referral is required. These steps are:

1. The definition of habitat (breeding, roosting and foraging – Table 1 in the Black Cockatoo Referral Guidelines);
2. A description of the type of action that may have a high or low risk of being a significant impact and therefore require referral (Table 3 in the Black Cockatoo Referral Guidelines);
3. Formulation of a mitigation strategy to reduce the scale of impact; and
4. A flowchart to assist in decision making on whether or not an action should be referred.

Step 1 Black Cockatoo Habitat

There is approximately 9ha of native vegetation containing foraging habitat for Carnaby's Black Cockatoos, Baudin's and Forest Red-tailed Black Cockatoos. There are 37 trees that are considered to be potential breeding trees under the definition provided by the DoEE. There is no recorded roosting on the site.

Step 2 Level of Impact

Foraging

The site contains approximately 9ha of vegetation that is suitable foraging habitat. In accordance with the Referral Guidelines clearing greater than 1ha of quality foraging habitat may constitute a significant impact.

Roosting

The Black Cockatoo Referral Guidelines consider the clearing of a known roosting site as a high risk of being a significant impact. There are no records of roosting on the site.

Breeding

According to Table 3 in the Black Cockatoo Referral Guidelines the clearing of any known nesting tree has a high risk of being a significant impact. A known nesting tree is defined in the Black Cockatoo Referral Guidelines as any existing tree in which breeding has been recorded or suspected. There are no known nesting trees that occur on the site and therefore there is no risk of a significant impact on known breeding habitat of Black Cockatoos.

The Black Cockatoo Referral Guidelines also consider that the clearing or degradation of any part of a vegetation community known to contain breeding habitat is likely to have a high risk of a significant impact. In Table 1 of the Black Cockatoo Referral Guidelines breeding habitat is defined as woodlands, forests or isolated trees that contain or consist of live or dead trees of certain species with either a

DBH of or greater than 500mm or the presence of suitable nest hollows. The site contains 37 Jarrah, Flooded Gums and Standing Dead Trees with a DBH of or greater than 500mm.

The Black Cockatoo Referral Guidelines state that breeding habitat predominantly applies to those areas within the breeding range of the Black Cockatoo species as shown in the maps attached to the Black Cockatoo Referral Guidelines. The site is within the breeding range of Carnaby's Black Cockatoos. The breeding range of Forest Red-tailed Black Cockatoos is not specified within the map attached to the Black Cockatoo Referral Guidelines, however the site is within the mapped distribution range. Clearing any of the potential breeding habitat trees may be considered a significant impact according to the Black Cockatoo Referral Guidelines.

Step 3 Mitigation

Mitigation in this case could be the avoidance of area of significant trees and foraging habitat to take the impact under the threshold of the referral guidelines.

Step 4 Referral Advice

The Decision-Making flowchart in Figure 1 of the Black Cockatoo Referral Guidelines was applied if more than 1ha of foraging and/or any significant trees are impacted:

1. Could the impacts of your action occur within the modelled distribution of the black cockatoos? – YES
2. Could the impacts of your action affect any black cockatoo habitat or individuals? - YES
3. Have you surveyed for black cockatoo habitat using the recommended methods? – YES
4. Could your action have an impact on black cockatoos or their habitat? – YES
5. Is your impact mitigation best practice so that it may reduce the significance of your impacts on black cockatoos? Prioritise impact avoidance over impact minimisation – YES

The result of the assessment using the Black Cockatoo Referral Guidelines is that clearing of a significant tree and/or 1ha of the foraging habitat could have a high risk of a significant impact and therefore referral is recommended.

5 SUMMARY AND CONCLUSION

Lot 226 Paterson Road, Nambeelup contain habitat for three species of listed black cockatoos including:

- Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) (Endangered);
- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) (Endangered); and
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) (Vulnerable).

The habitat on the site is approximately 9ha of foraging habitat consisting primarily of Sheoak, Banksias and Jarrah trees.

There was no evidence of recent roosting at the site was observed during the assessment, and no previous records of roosting on the site.

The site contained a total of 37 trees that had a diameter at breast height of 500mm or greater that are considered potential future breeding habitat, including 24 Jarrah (*Eucalyptus marginata*), 11 Standing Dead Trees and two Flooded Gums (Eucalyptus rudis).

Assessment of clearing using the Black Cockatoo Referral Guidelines indicates that clearing more than 1ha of quality foraging habitat and/or a potential breeding habitat trees has a high likelihood of leading to a significant impact and Referral under the EPBC Act is recommended.

6 REFERENCES

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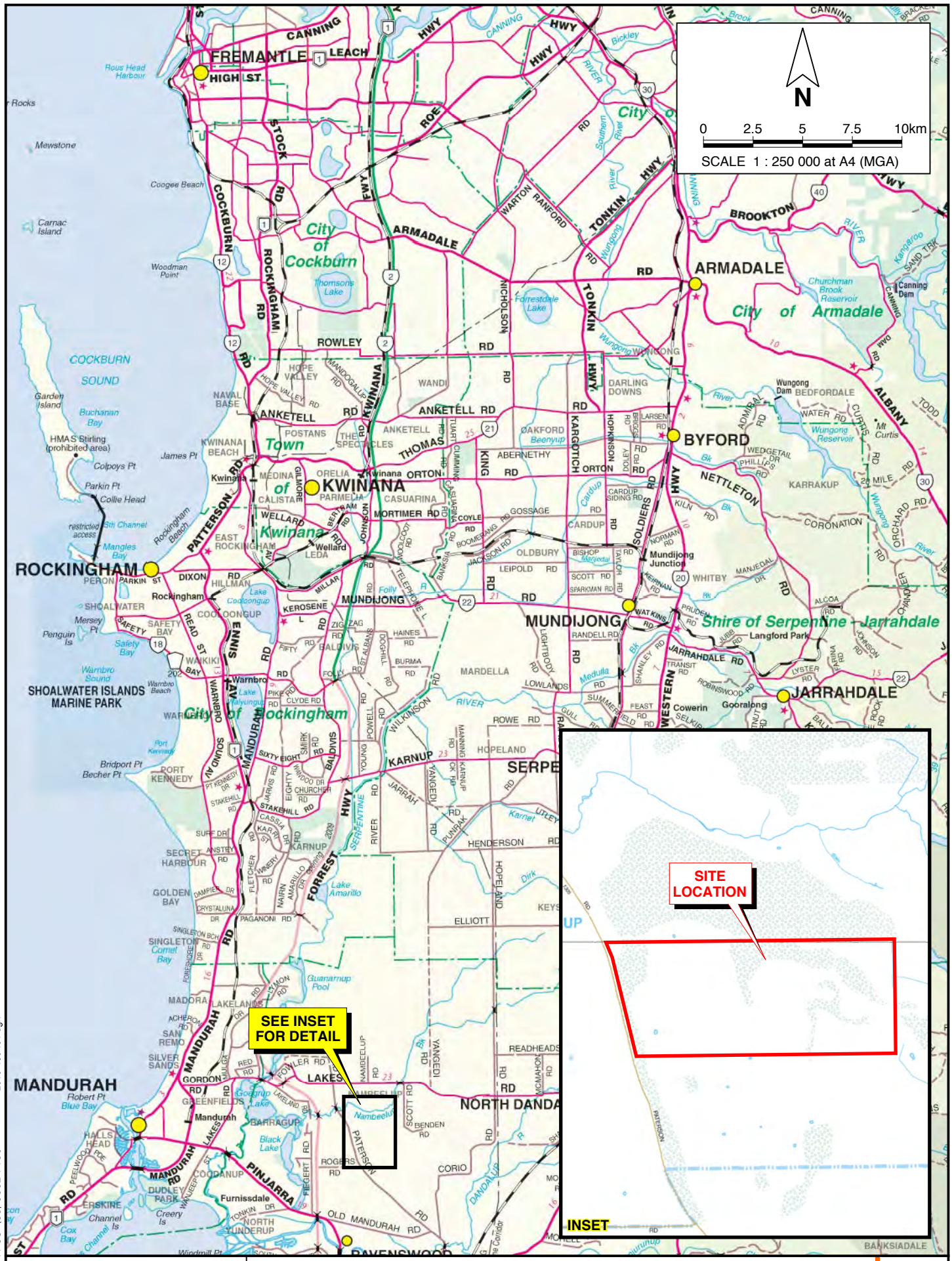
FIGURES



PINPOINT CARTOGRAPHICS (08) 9562 7136 2019-459-f01.dgn

pgv ENVIRONMENTAL

King Road Trust
BLACK COCKATOO HABITAT ASSESSMENT
LOT 226 PATERSON ROAD, NAMBEELUP

Drawn: J. Cabot	Date: 31 Aug 2019
Job: 10348 Rpt: 2019-459	Revision: A

SITE LOCATION

Figure 1

391 000mE

392 000mE

6 400 000mN

6 399 000mN

400

401

223

210

209

206

304

303

302

301

300

PATERSON ROAD

Lot 226

N

0 50 100 150 200 250m

SCALE 1 : 7 500 at A3 (MGA)

Legend

- Site Boundary
- Lot 226 Boundary
- Cadastral Boundary
- Easement Boundary
- Topographic Contour

CADASTRAL SOURCE: Landgate, March 2019.
CONTOUR SOURCE: Dept. of Agriculture, 2000.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown March 2019.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2019-459-f02.dgn

pgv ENVIRONMENTAL

King Road Trust
BLACK COCKATOO HABITAT ASSESSMENT
LOT 226 PATERSON ROAD, NAMBEELUP

Drawn: J. Cabot | Date: 31 Aug 2019

Job: 10348 Rpt: 2019-459 | Revision: A

SITE BOUNDARY AND TOPOGRAPHY

Figure 2

391 000mE

392 000mE

400

401

223

6 400 000mN

PATERSON

210

304

Lot 226

ROAD

209

301

303

302

6 399 000mN

300

206

N

0 50 100 150 200 250m

SCALE 1 : 7 500 at A3 (MGA)

Legend

- Site Boundary
- Lot 226 Boundary
- Cadastral Boundary
- Easement Boundary
- Foraging Habitat

CADASTRAL SOURCE: Landgate, March 2019.
CONTOUR SOURCE: Dept. of Agriculture, 2000.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown March 2019.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2019-459-f03.dgn

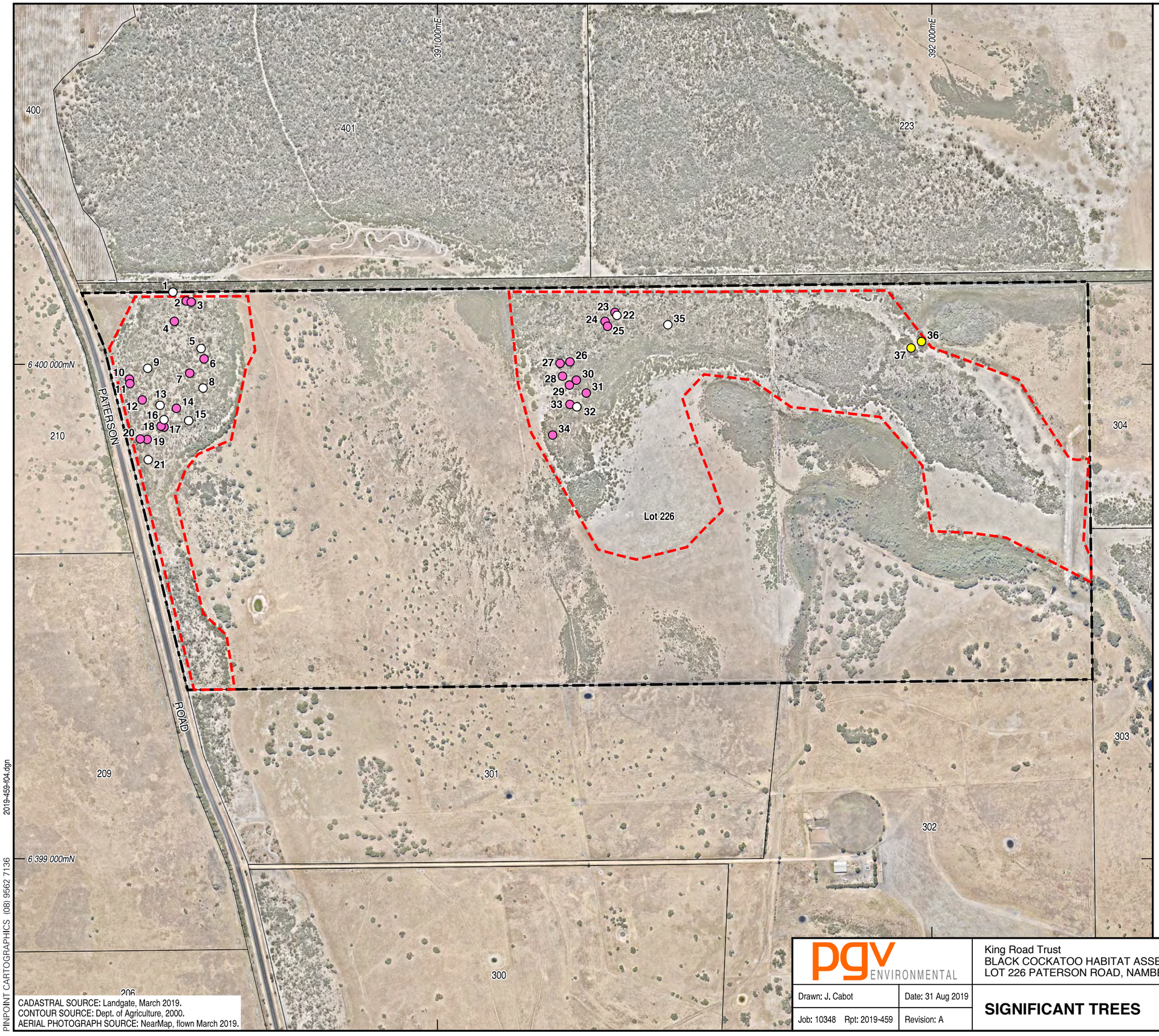
pgv ENVIRONMENTAL

King Road Trust
BLACK COCKATOO HABITAT ASSESSMENT
LOT 226 PATERSON ROAD, NAMBEELUP

Drawn: J. Cabot | Date: 31 Aug 2019
Job: 10348 Rpt: 2019-459 | Revision: A

FORAGING HABITAT

Figure 3



Legend

- Site Boundary
- Lot 226 Boundary
- Cadastral Boundary
- Easement Boundary

Significant Trees

- Flooded Gum (*Eucalyptus rudis*)
- Jarrah (*Eucalyptus marginata*)
- Standing Dead Tree
- **15** Tree Number

CADASTRAL SOURCE: Landgate, March 2019.
CONTOUR SOURCE: Dept. of Agriculture, 2000.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown March 2019.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2019-459-f04.dgn

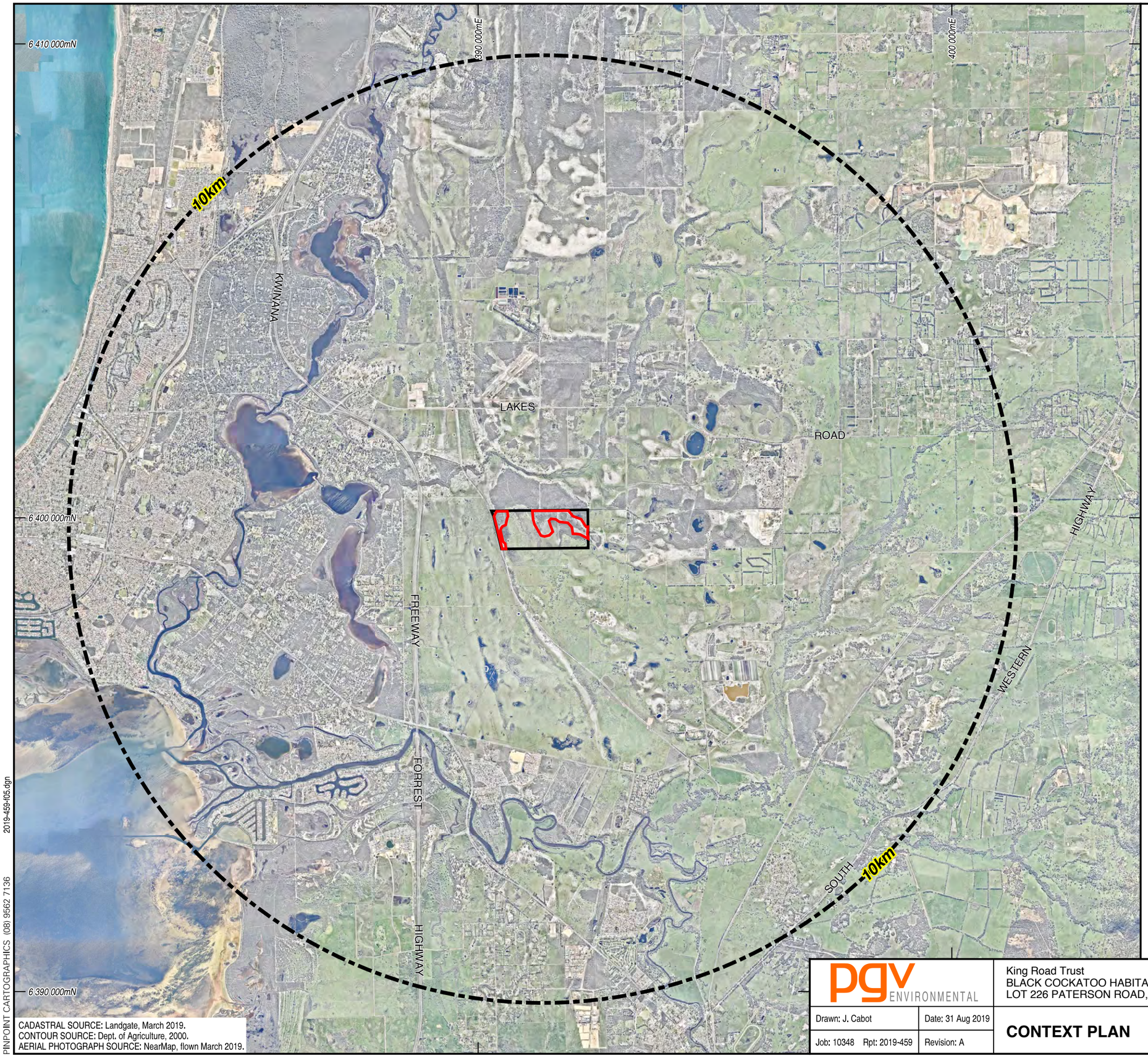
pgv ENVIRONMENTAL

King Road Trust
BLACK COCKATOO HABITAT ASSESSMENT
LOT 226 PATERSON ROAD, NAMBEELUP

Drawn: J. Cabot | Date: 31 Aug 2019
Job: 10348 Rpt: 2019-459 | Revision: A

SIGNIFICANT TREES

Figure 4



CADASTRAL SOURCE: Landgate, March 2019.
CONTOUR SOURCE: Dept. of Agriculture, 2000.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown March 2019.

N

0 5 10 15 20 25km

SCALE 1 : 80 000 at A3 (MGA)

Legend

- Site Boundary
- Lot 226 Boundary

pgv ENVIRONMENTAL		King Road Trust BLACK COCKATOO HABITAT ASSESSMENT LOT 226 PATERSON ROAD, NAMBEELUP
Drawn: J. Cabot	Date: 31 Aug 2019	**CONTEXT PLAN**
Job: 10348 Rpt: 2019-459	Revision: A	**Figure 5**

PINPOINT CARTOGRAPHICS (08) 9562 7136 2019-459-I05.dgn

APPENDIX 1

Significant Tree Survey Results

Lot 226 Paterson Road, Nambeelup Potential Black Cockatoo Breeding Tree Data

Tree Number	Species	Easting MGA zn50	Northing MGA zn50	Height (m)	Diameter (mm)			Notes (hollows, bees etc.)
					DBH1	DBH2	DBH3	
1	Standing Dead Tree	390465	6400146	9	760			Small potential hollow
2	Jarrah (*Eucalyptus marginata*)	390492	6400128	9	620			Very poor condition, no hollows
3	Jarrah (*Eucalyptus marginata*)	390502	6400126	10	1890			Fair condition, hollow at base, potential spout
4	Jarrah (*Eucalyptus marginata*)	390468	6400087	12	1160			Good condition, no hollows
5	Standing Dead Tree	390522	6400032	7	1540			Hole at base, potential hollow/spout
6	Jarrah (*Eucalyptus marginata*)	390528	6400011	11	640			Poor condition, no hollows
7	Jarrah (*Eucalyptus marginata*)	390499	6399982	9	510			Very poor condition, no hollows
8	Standing Dead Tree	390526	6399952	9	730			Potential hollow/spout
9	Standing Dead Tree	390414	6399992	11	1600			Potential hollow/spout
10	Jarrah (*Eucalyptus marginata*)	390377	6399970	10	950			Poor condition, no hollows
11	Jarrah (*Eucalyptus marginata*)	390378	6399961	8	650			Poor condition, no hollows
12	Jarrah (*Eucalyptus marginata*)	390403	6399928	6	1400			Poor condition, potential spout and hollow
13	Standing Dead Tree	390439	6399917	8	680			Potential hollow/spout
14	Jarrah (*Eucalyptus marginata*)	390472	6399911	10	960			Good condition, no hollows
15	Standing Dead Tree	390497	6399886	9	1250			Potential hollow/spout
16	Standing Dead Tree	390447	6399888	9	1900			Potential hollow/spout
17	Jarrah (*Eucalyptus marginata*)	390447	6399873	11	570			Poor condition, no hollows
18	Jarrah (*Eucalyptus marginata*)	390441	6399875	12	520			Good condition, no hollows
19	Jarrah (*Eucalyptus marginata*)	390413	6399848	9	680			Fair condition, no hollows
20	Jarrah (*Eucalyptus marginata*)	390399	6399849	11	670			Poor condition, no hollows
21	Standing Dead Tree	390415	6399807	7	890			Potential hollow/spout
22	Standing Dead Tree	391363	6400099	9	820			No hollow/spout
23	Jarrah (*Eucalyptus marginata*)	391359	6400105	8	1060			Mostly dead, very poor condition, no hollows
24	Jarrah (*Eucalyptus marginata*)	391339	6400087	9	590	560		Mostly dead, very poor condition, no hollows
25	Jarrah (*Eucalyptus marginata*)	391344	6400077	11	650			Fair condition, no hollows
26	Jarrah (*Eucalyptus marginata*)	391268	6400005	8	720			Fair condition, no hollows
27	Jarrah (*Eucalyptus marginata*)	391248	6400002	10	600			Fair condition, no hollows
28	Jarrah (*Eucalyptus marginata*)	391253	6399976	8	520			Poor condition, sprouting, no hollows
29	Jarrah (*Eucalyptus marginata*)	391267	6399958	9	760			Poor condition, sprouting, no hollows
30	Jarrah (*Eucalyptus marginata*)	391281	6399968	11	990			Sprouted at base, poor condition, no hollows
31	Jarrah (*Eucalyptus marginata*)	391301	6399942	12	1090			Hollow at base, potential hollow/spout
32	Standing Dead Tree	391282	6399914	9	1170			Termite, potential hollow/spout
33	Jarrah (*Eucalyptus marginata*)	391268	6399919	11	860			Fair condition, hollow at base, no hollows
34	Jarrah (*Eucalyptus marginata*)	391233	6399857	8	820			Very poor condition, Potential hollow/spout
35	Standing Dead Tree	391466	6400080	8	540			No hollow/spout
36	Flooded Gum (Eucalyptus rudis)	391979	6400046	11	1210	1170		Good condition, no hollows
37	Flooded Gum (Eucalyptus rudis)	391958	6400033	11	610	480	220	Good condition, no hollows

APPENDIX 2

Significant Tree Photos

Lot 226 Paterson Road, Nambeelup

Tree 1

Tree 2

Tree 3

Tree 4

Tree 5

Tree 6

Tree 7

Tree 8

Tree 9

Lot 226 Paterson Road, Nambeelup

Tree 10

Tree 11

Tree 12

Tree 13

Tree 14

Tree 15

Tree 16

Tree 17

Tree 18

Lot 226 Paterson Road, Nambeelup

Tree 19

Tree 20

Tree 21

Tree 22

Tree 23

Tree 24

Tree 25

Tree 26

Tree 27

Lot 226 Paterson Road, Nambeelup

Tree 28

Tree 29

Tree 30

Tree 31

Tree 32

Tree 33

Tree 34

Tree 35

Tree 36

Lot 226 Paterson Road, Nambeelup

Tree 37