

# LOT 4 AND 5 KING ROAD, OLDBURY

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## ENVIRONMENTAL MANAGEMENT PLAN

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The logo for PGV Environmental is displayed in white text on an orange background. The letters 'PGV' are in a large, bold, sans-serif font, with the 'G' being particularly prominent. Below 'PGV', the word 'ENVIRONMENTAL' is written in a smaller, all-caps, sans-serif font. The background of the logo area features a series of thin, white, curved lines that sweep across the orange field.

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## SUMMARY OF ACTIONS

Factor	No.	Management Action
Induction	<b>M1</b>	An induction package will be presented to all personnel prior to the commencement of works outlining the objectives, procedures and management actions in the Environmental Management Plan.
Visual Impact	<b>M2</b>	Topsoil dumps will be placed to be least visible from King Road and will be spread onto the fill area or completed areas as soon as possible
	<b>M3</b>	Stockpiles of product will be stored on the floor of the extraction area
	<b>M4</b>	Machinery and plant will be stored on the floor of the extraction area
	<b>M5</b>	The sand extrication operation will not be undertaken at night and security lighting will be restricted to the site facilities and machinery storage area, if required.
	<b>M6</b>	Security lighting will be angled away from King Road
	<b>M7</b>	The haul and access road will be on the southern boundary.
	<b>M8</b>	Progressive rehabilitation will be undertaken when the cut and fill reach finished levels
	<b>M9</b>	The fill area will be seeded as soon as possible after the sand and topsoil has been spread
Weeds	<b>M10</b>	Pre-clearing targeted treatment for Castor Oil Plant as per treatment notes in Florabase (DBCA, 2021)
	<b>M11</b>	Management of any WoNS, Declared Pests or Environmental Weeds as per treatment notes in Florabase (DBCA, 2021) if recorded during monitoring
Clearing Permit	<b>M12</b>	The rehabilitation as required under the Clearing Permit approval will be implemented as per Condition 7.
Rehabilitation	<b>M13</b>	Use of topsoil to improve the quality of the area to be rehabilitated
	<b>M14</b>	Rehabilitation to be undertaken the first winter after spreading or topsoil to avoid compaction
	<b>M15</b>	Areas to be rehabilitated will be planted with pasture seeds, including perennial legumes, perennial pasture and annual pasture
	<b>M16</b>	The rehabilitation areas to be seeded at a rate of 2-5kg/ha, species dependent
	<b>M17</b>	Fertiliser to be used will be low nitrogen, phosphorous and potassium with trace elements
	<b>M18</b>	Red-legged earth mites and blue oat mites will be managed with insecticide if required
	<b>M19</b>	Completion is when: <ul style="list-style-type: none"> <li>- 90% coverage by pasture species</li> <li>- Likelihood that the pasture will be self-sustaining; and</li> <li>- No WoNS, Declared Pests or Castor Oil Plant present on the site.</li> </ul>
	<b>M20</b>	Bare Areas Greater than 5m <sup>2</sup> after one year will be reseeded

Factor	No.	Management Action
Dieback	<b>M21</b>	Clearing works will be scheduled as much as possible in drier conditions.
	<b>M22</b>	Soil in the footprint will be stabilised so it is not prone to water erosion and being washed into adjoining bushland areas.
	<b>M23</b>	No soil from works will be pushed into surrounding bushland.
	<b>M24</b>	No contours will be created that will allow surface water drainage into the surrounding bushland.
	<b>M25</b>	Stockpiles will be constructed to ensure no soil transfer occurs to the surrounding vegetation
	<b>M26</b>	Hygiene protocols will be enforced such as ensuring there is no visible dirt on shoes, clothes or equipment and all machinery, tools and equipment will be cleaned of soil and sterilised with a 70% solution of methylated spirits.
Environmental Attributes	<b>M27</b>	Clearly identify the location and limit of clearing of vegetation within all work areas on site (surveyed and pegged) and delineated on appropriate plans.
Surrounding Land Uses	<b>M28</b>	All operations will be undertaken in accordance with a Dust and Noise Management Plan to be prepared as part of the extractive industry licence.
	<b>M29</b>	Complaints register to be maintained for the site
	<b>M30</b>	All complaint to be addressed within five business days with actions communicated to the complainant.
Monitoring	<b>M31</b>	Visual inspection of seeded pasture areas on a quarterly basis.
	<b>M32</b>	Monthly review of the hygiene register
	<b>M33</b>	Random checks of vehicles for dust, mud and dirt
	<b>M34</b>	Monthly review of the complaints register
Reporting	<b>M35</b>	Annual monitoring report detailing activities and monitoring results compared to Completion Criteria to be submitted to the Shire of Serpentine Jarrahdale until completion criteria are met.

## 1 INTRODUCTION

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### 1.1 Background

Lots 4 and 5 King Road, Oldbury are located in the Shire of Serpentine-Jarrahdale approximately 33km south-south-east of the Perth Central Business District (Figure 1). The lots are 14.25 ha and 14.26 ha in size and are bounded by King Road and rural land to the west and an existing sand quarry to the south and rural land to the north and east (Figure 2).

The eastern half of Lot 4 has previously been mined for sand and the remaining resource is proposed to be extracted. The mining footprint on Lot 4 is shown in Appendix 1. The extraction is proposed to extent into the western part of Lot 5 totalling 9.12ha as shown in Appendix 2.

The EMP was initially prepared as a condition of the Development Application (DA) for Extractive Industry for Lot 4 and was approved on 20 September 2021 (Appendix 3).

The EMP has been updated in 2023 to include the western area on Lot 5 that is proposed to be part of a separate DA for extractive industry on this part of the lot. The EMP has also been updated to reflect the conditions of the Clearing Permit (CPS 9406/1) for the vegetation clearing on Lot 4 (Appendix 4).

### 1.2 Proposed Extraction

The sand will be extracted to a final level at around 19.2m AHD (Appendix 2). Approximately 300,000m<sup>3</sup> of the sand resource will be extracted. The final land surface will be contoured to be compatible with the existing natural landform of the area with maximum batters of 1:2 on parts of the northern and eastern boundaries of the lots.

### 1.3 Relevant Policies

#### 1.3.1 Local Planning Policy 4.10: Extractive Industries

The Shire's Local Planning Policy 4.10 *Extractive Industries (Including Extraction of Mineral Sand and Other Minerals)* (LPP4.10) (SSJ, 2018a) sets out a series of policy objectives when it comes to extractive industries. LPP4.10 requires that development should result in the following objectives being met:

- *Extractive industries do not adversely affect the environment or amenity of the locality during or after extraction.*
- *Extractive industries are located in the most appropriate areas of the Shire.*
- *Extractive industries are sited and operated to meet the varied needs of the community.*
- *Extraction occurs where the available haulage routes and road hierarchy are satisfactory or can be upgraded to support an extractive industry without affecting the sustainability of the transport resource.*
- *To maintain a general presumption against the extraction of minerals including mineral sands within the Shire of Serpentine Jarrahdale, unless the proponent has demonstrated that net social, economic and environmental benefits will be delivered in the short, medium and long term.*



- *To clearly outline the matters that are required to be addressed by proponents that are seeking approval for general extraction and more detailed matters for mineral extraction within the Shire.*
- *To ensure that the assessment of mineral extraction proposals is comprehensive and consistent with orderly and proper planning principles.*
- *To provide clarity of the development assessment process for proponents and the broader community.*
- *To inform the community/stakeholders of the importance of a rigorous assessment process and the reasoning for the Shire's policy stance.*

The Policy includes matters that are required to be addressed in an application for an Extractive Industry License.

Table 1 of the policy includes a series of 'Performance Criteria' and 'Acceptable Development' provisions against which applications are to be assessed (LPP4.10-Table 1). The performance criteria come under the following headings:

- Amenity;
- Environmental;
- Buffers;
- Visual Impact; and
- Transport.

The 'Acceptable Development' provisions specify measures and requirements that would result in a proposed extractive industry being considered more appropriate for approval.

Appendix B of the policy sets out the requirements to be addressed within a proposal for an extractive Industry License. The Environmental Management Plan will address the measures as outlined in the scope of works and provide management measures that meet the 'Acceptable Development' provisions.

### **1.3.2 Local Planning Policy 4.13: Rehabilitation**

Local Planning Policy 4.13: Rehabilitation (SSJ, 2018b) sets out the overarching principles of Rehabilitation within the Shire. The policy requires rehabilitation to be undertaken as per best practice and with consideration to the scope and purpose. The rehabilitation of the proposed extraction areas is detailed in the Environmental Management Plan with regard to the measures as outlined in the policy.

### **1.3.3 WAPC Visual Landscape Planning**

In 2007, WAPC released the Visual Landscape Planning in Western Australia – A manual for evaluation, assessment, siting and design. The manual is an acknowledgement of the community's interest in the preservation of landscapes and the need to integrate the evaluation of the landscape into the planning process.

The manual provides a methodology for visual landscape evaluation and visual impact assessment and considers land uses and developments that may give rise to potential impacts on different landscapes and measures to address these impacts.

## 1.4 Scope of Work

The EMP addresses the following environmental management issues as required by LPP 4.10 (SJJ, 2018):

- Visual impact;
- Detailed Rehabilitation Plan;
- Dieback management techniques;
- Management to address potential conflict with surrounding land uses and protection of environmental attributes;
- Noise management; and
- Climate Change impact.

The EMP addressed the management of the following environmental issues as required by Appendix B of LPP 4.10, being:

- Soil types and potential for ASS;
- Groundwater Hydrology;
- Location and description of nearby wetlands;
- Description and map of existing flora and vegetation to be cleared and retained;
- Description and map of fauna habitat; and
- Aboriginal and European heritage

The EMP has been prepared to undertake the rehabilitation in accordance with best practice as per LPP 4.13 and includes an assessment of the visual landscape, impacts of the proposed mining and management measures as per the WAPC Visual Landscape Planning manual. The visual amenity methodology in *Visual Landscape Planning in Western Australia* (WAPC, 2007) includes:

1. Definition of the scope of the Visual Landscape Evaluation and setting the context. This entails determining the site boundary, planning context and baseline visual and landscape context.
2. Description of the visual landscape character. This step identifies, maps and describes individual Landscape Character Units. Landscape Character Units are areas comprised of relative homogenous characteristics in terms of factors such as landform, soil types, vegetation, built form and/or land use.
3. Evaluate the way the visual landscape character is viewed, experienced and valued. This step is a visual analysis that identifies 'how' the landscape is viewed and experienced by others. The key outputs from this analysis are key views from and to the Study Area and determination of the significance of the view.
4. Identify landscape and visual sensitivities and develop strategies for managing visual landscape character. This step assesses the constraints and opportunities affecting the Study Area and develops a landscape management framework to address the opportunities and constraints identified.

## 2 EXISTING ENVIRONMENT

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### 2.1 Land Use

#### 2.1.1 Historic Land Use

The earliest available historic aerial photograph on-line from 1953 shows that the site is largely vegetated to the east and cleared in the west (Plate 1) (Landgate, 2021).

**Plate 1: Aerial Photograph 1953 (Landgate, 2021)**



The aerial photograph from 1974 shows the site has been extensively cleared (Plate 2) (Landgate, 2021). A wetland is apparent in the south-west corner of lot 4.

**Plate 2: Aerial Photograph 1974 (Landgate, 2021)**



The aerial photograph from 1985 shows the vegetation has regrown from the past clearing and sand mining has started in the south-eastern corner of the site (Plate 3).

**Plate 3: Aerial Photograph 1985 (Landgate, 2021)**



Sand mining continued progressively over the next few years and the limit of the mining operation was reached in 2008 (Plate 4). The footprint of the mining operations extended into Lot 5 to the north of the site.

**Plate 4: Aerial Photograph 2008 (Landgate, 2021)**



### **2.1.2 Surrounding Land Use**

The surrounding area is a rural character. The site shares the western boundary with King Road, the only public road on the boundary of the site. The remaining boundary is firebreaks and fence-lines with other properties. There are three residences within 500m of the proposed footprint. One residence is to the west of King Road and north of Anderson Road, one is to the north and one is to the south-west across King Road. There are plantations/orchards to the east and existing active sand mine to the south.

### **2.1.3 Zoning**

The site is zoned 'Rural' under the Metropolitan Region Scheme (MRS) and the Shire of Serpentine-Jarrahdale Local Planning Scheme No. 2 (WAPC, 1989).



## 2.2 Topography

The site is almost flat at the western end at around 21m Australian Height Datum (AHD). The topography of the eastern two-thirds has been significantly altered due to the past mining activity. The area previously mined is flat at around 22m AHD. The excavated area batters up to the natural surface level to the west (25m AHD) and east (29m AHD) (Figure 2).

## 2.3 Visual Amenity

A Visual Landscape Evaluation was undertaken in accordance with *Visual Landscape Planning in Western Australia* (WAPC, 2007).

The topography on the site is sloping and contains two types of visually different vegetation, therefore the vegetation is what defines the Landscape Character Units. The bushland on the uplands of the site and the rural paddock on the lowlands on the site are the only two Landscape Character Units.

The site is largely hidden from public view due to there being only one boundary that can be viewed from a public road and four residences that are screened from the site by vegetation. The vegetation along King Road is a sparse low shrubland and the low-lying area can be viewed from the road (Plate 5). The road is a designated local road and does not have high volumes of traffic associated with tourism.

**Plate 5: Vegetation along King Road**



In a visual and landscape context there are no outstanding topographical and/or environmental features on the site and the visual amenity on the site is limited. The site is of rural character and surrounded by varied rural land uses.

## 2.4 Geology and Soils

### 2.4.1 Geology

The site is mapped as part of the Bassendean System, the oldest of the three dune systems on the Swan Coastal Plain (Bolland, 1998). The Bassendean System consists of very low relief, leached, grey siliceous Pleistocene sand dunes, intervening sandy and clayey swamps and gently undulating plains.

These occur immediately west of, and partly overlies, the Pinjarra Plain. These soils are very leached, infertile and mildly acidic (DPIRD, 2021a).

#### **2.4.2 Soils**

The soils on the site have been described by the Department of Primary Industry and Regional Development (DPIRD) as:

- Bassendean B1 Phase (212Bs\_B1) mapped on it 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 2 m (DPIRD, 2020). These soils occur in the eastern part of the site; and
- Bassendean B6 Phase (212Bs\_B6) which is described as sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands (DPIRD, 2021a). These soils occur on the western part of the site.

#### **2.4.3 Acid Sulphate Soils**

Acid sulphate soils (ASS) are wetland soils and unconsolidated sediments that contain iron sulphides which, when exposed to atmospheric oxygen in the presence of water, form sulphuric acid. ASS form in protected low energy environments such as barrier estuaries and coastal lakes and commonly occurs in low-lying coastal lands such as Holocene marine muds and sands. When disturbed, these soils are prone to produce sulphuric acid and mobilise iron, aluminium, manganese and other heavy metals. The release of these reaction products can be detrimental to biota, human health and built infrastructure (WAPC, 2009).

The ASS Risk on the site has been mapped by the Department of Water and Environmental Regulation (DWER) as being Moderate to Low (<3m from the surface) (National Map, 2021).

### **2.5 Hydrology**

Groundwater is at approximately 16 to 18m AHD and is 5 to 10m below the surface level, and generally flows to the south-east (DWER, 2023). Surface water flows are likely to be limited with stormwater being infiltrated on the site.

### **2.6 Wetlands**

The western part of the site contains a small area of a large Multiple Use Wetland (Unique Feature Identifier (UFI) 14704) that extends for 277ha over a wide area to the west and north-west of the site. The MU wetland is shown on Plate 6 as the blue area on the site. The wetland is classified as Dampland although the extent of the wetland indicates to PGV Environmental that it should more accurately be classified as a Palusplain wetland.

Resource Enhancement Palusplain, UFI 14860, is mapped approximately 175 m to the east as shown in light green on Plate 6. The Conservation Category Palusplain, UFI 7300, is shown in dark green on Plate 6 and is approximately 180 m to the east (National Map 2021).

**Plate 6: Multiple Use Wetland Mapped on the Site**



## 2.7 Flora

A Reconnaissance Flora and Vegetation Survey was undertaken in accordance with EPA Technical Guidance *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016a) by PGV Environmental (2021) on 3 March 2021 (PGV Environmental, 2021). A Detailed Flora and Vegetation Survey in accordance with the EPA guidance was undertaken on Lot 4 in 2021. A total of 108 plant species were recorded on Lot 4 (PGV Environmental, 2022a). The total includes 81 native and 27 introduced species (25%). A Detailed Flora and Vegetation Survey in accordance with the EPA guidance was undertaken on Lot 5 in 2021 (PGV Environmental, 2022b).

No Threatened or Priority plant species were recorded on the site.

## 2.8 Weeds

There are 32 *Weeds of National Significance* (WoNS) which are listed by the Federal Government based on their invasive tendencies, impacts, potential for spread and impact on socioeconomic and environmental values.

A *Declared Pest* is a plant that impacts on individual people, agricultural production and the community. These are plants declared under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and all landholders are obliged to control these on their properties according to the rankings and information provided by the Department of Primary Industry and Regional Development (DPIRD) (DPIRD, 2021b).

An *Environmental Weed* is an introduced plant that is established in a natural ecosystem and adversely modifies natural processes, resulting in decline of invaded communities (EPA, 2009).

No WoNS or Declared Pests have been recorded from the site, however there is also a possibility that Declared Pest species such as Narrow-leaf Cotton Bush (*Gomphocarpus fruticosus*) and Cape Tulip (*Moraea flaccida*) may be present in the surrounding environment. The clearing and filling of the site could provide open areas that could be colonised by this species.

Castor Oil Plant (*Ricinus communis*) has been recorded on the site. This species forms monospecific stands which can displace native plant species and can invade neglected farmland and pasture. The seeds are poisonous if they are chewed and ingested, although seeds that are not chewed are likely to be harmless. The foliage is only slightly toxic (Lusweti *et al.*, 2021). This species is not desirable in a future pasture and although not a Declared Pest is an invasive species in Australia (Randall, 2007) and is considered to be an Environmental Weed.

## 2.9 Vegetation

### 2.9.1 Vegetation Complex

Vegetation Complexes are a broad level of vegetation description which is based on the underlying geomorphology and rainfall (Heddle *et al.*, 1980). The vegetation over most of the site is part of the Bassendean Complex – Central and South which is described as:

Bassendean Complex-Central and South - Vegetation ranges from woodland of Jarrah (*Eucalyptus marginata*) – Sheoak (*Allocasuarina fraseriana*) – Banksia (*Banksia* spp.) to low woodland of Paperbark (*Melaleuca* spp.), and sedgeland on moister sites (Heddle *et al.*, 1980).

### 2.9.2 Vegetation Type

Four native vegetation types were described and mapped on the site:

- BaBm** *Banksia attenuata*/*B. menziesii*/*Kunzea glabrescens* Low Open Woodland over *Adenanthos cygnorum* Tall Open Scrub over *Scholtzia involucrata* Open low Heath;
- Kg** *Kunzea glabrescens* Tall Shrubland to Closed Tall Scrub;
- Ac** Rehab *Adenanthos cygnorum* Tall Shrubland; and
- Er** *Eucalyptus rudis* Open Woodland (PGV Environmental 2021).

Additionally vegetation on Lot 5 in the Extraction Footprint is described as Scattered Trees and Shrubs being:

- Er** *Eucalyptus rudis* tree
- Mp** *Melaleuca preissiana* plants
- Af** *Allocasuarina fraseriana* trees
- Ex** Exotic plants (PGV Environmental, 2022b).

The Kg, Ac and Er vegetation is not considered to be representative of a Threatened or Priority Ecological Community (TEC or PEC). The small area of Banksia woodland in the central part of the Lot 4 is not of sufficient size or condition to be part of the Banksia Woodlands of the Swan Coastal Plain ecological community which is listed as Priority 3 in Western Australia and Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (PGV Environmental, 2021). The eastern area of *Banksia attenuata*/*B. menziesii*/*Kunzea glabrescens* Low Open Woodland is around 1.05ha and is part of a 'patch' of Banksia vegetation. The mapped TEC is outside of the extraction footprint.



### 2.9.3 Vegetation Condition

The condition of the vegetation was assessed according to the system of Keighery as described in Bush Forever (Government of Western Australia, 2000) (Table 1).

**Table 1: 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 to 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.

The condition of the vegetation was mostly rated as Degraded to Completely Degraded due to the past clearing and sand mining. A part of the Banksia woodland in the eastern end of the site was rated as Good due to the presence of a more diverse native understorey species (PGV Environmental, 2021).

### 2.10 Dieback

Part of the site contains a number of native plant species that are listed as susceptible to *Phytophthora cinnamomi* (Jarrah Dieback). Dieback is caused by the genus of water mould *Phytophthora* that infects the roots of vulnerable species, limiting the roots' ability to take up water, thereby weakening or killing the host plant. The spores of *Phytophthora* Dieback are transported by water and in soil (Dieback Working Group, 2005).

In sloping areas *Phytophthora* dieback spreads quickly in surface and sub-surface water flows. It spreads slower up-slope and on flat ground because it is restricted to movement by root-to-root contact (Dieback Working Group, 2005).

The most common species is *Phytophthora cinnamomi* (Jarrah Dieback), which generally infects proteaceous species, *Xanthorrhoea*, Jarrah and a number of other species. *Phytophthora* is commonly spread from site to site by:

- The transfer of soil on machinery;
- Human transfer in soil on shoes and equipment;
- Downhill movement of water;
- Use of infected tubestock or plants from another source;
- Use of fill and mulch from infected sources; and
- Use of water for irrigation/watering from infected sources (Dieback Working Group, 2005).

The assessment of the *Phytophthora* Dieback disease status of the vegetation within the site can be mapped as three categories of vegetation, being Uninfested (no apparent *Phytophthora* Dieback disease), Infested (*Phytophthora* Dieback disease present), and Unmappable (unable to determine Dieback disease presence) (DEC, 2003). Each category requires effective management to mitigate the spread of the existing Infested areas. Definitions of the categories are in Table 2 (DEC, 2003).

**Table 2: Categories of Dieback Infestation Mapping**

Mappability	Diagnosis	
Unmappable Areas that are sufficiently disturbed so that Dieback disease occurrence mapping is not possible at the time of inspection	Further categorisation may be possible after variable regeneration periods for different types of disturbance	
Mappable Natural undisturbed vegetation. Dieback disease occurrence mapping is possible. Three categories may result.	Infested	Determined to have plant disease symptoms (Dieback disease) consistent with the presence of the pathogen.
	Uninfested	Areas that are determined to be free of plant disease symptoms ( <i>Phytophthora</i> Dieback disease) that indicate the presence of the pathogen.
	Uninterpretable	Areas where indicator plants are absent or too few to determine the presence or absence of disease caused by <i>P. cinnamomi</i>

There are indicator species that are present on the site within the Banksia vegetation types that do not appear to be showing signs of being impacted by dieback, therefore, the area is considered to be 'Uninfested'. The remainder of the site does not contain indicator species but have been cleared in the past, so these areas are considered to be 'Uninterpretable'.

## 2.11 Fauna

PGV Environmental (2021) undertook a Level 1 Fauna Survey in accordance with EPA Technical Guidance *Fauna Surveys for Environmental Impact Assessment* (EPA, 2016b). PGV Environmental identified three fauna habitats on the site as follows:

- Tall shrubland habitat;
- Open woodland habitat; and
- Cleared habitat.

The habitat on the site has been highly modified with large, cleared areas, tracks and degraded vegetation. The areas of native vegetation generally have limited internal connectivity and form discrete areas on the site. Therefore, the site is considered to be Disturbed Fauna Habitat. The cleared parts of the site are classified as Highly Degraded Fauna Habitat (PGV Environmental, 2021).

The habitat on the site was considered to be suitable for seven Conservation Significant species including:

- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) (Endangered);
- Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) (Endangered);
- Cattle Egret (*Ardea ibis*) (Marine);
- Rainbow Bee-eater (*Merops ornatus*) (Marine);
- Perth Slider, Lined Skink (*Lerista lineata*) (Priority 3);
- Black-striped Snake (*Neelaps calonotos*) (Priority 3);
- Southern Brown Bandicoot, Quenda (*Isodon fusciventer*) (Priority 4) (PGV Environmental, 2021).

## 2.12 Heritage

### 2.12.1 Aboriginal Heritage

There are no listed Aboriginal Heritage Sites or Aboriginal Heritage Places mapped on the site (Appendix 2) (DPLH, 2021).

### 2.12.2 European Heritage

Heritage sites can be listed under the following lists/registers:

- World Heritage Sites;
- National Heritage Sites;
- Commonwealth Heritage Sites;
- Sites on the register of the National Estate;
- Sites on the Western Australian Heritage Council Register; and
- Sites listed in the City of Kwinana Municipal Heritage Inventory List.

There are no listed Heritage Sites or Interim Heritage Sites on the site (National Map, 2021; Heritage Council of Western Australia, 2021; DAWE, 2021).

### 3 SAND EXTRACTION MANAGEMENT

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#### 3.1 Site Induction

##### 3.1.1 Objective

To ensure all construction personnel are familiar with and comply with the Environmental Management Plan.

##### 3.1.2 Induction Package

The induction package will be presented to all construction personnel and will include:

- Location and identification of the areas of vegetation to be retained;
- Procedures for clean-on-entry and exiting the development area;
- Information on the cause and effect of dust on the environment;
- Required record keeping, including incident reporting; and
- Requirements to comply with any management actions in the Environmental Management Plan.

##### 3.1.3 Management Actions

**M1** An induction package will be presented to all personnel prior to the commencement of works outlining the objectives, procedures and management actions in the Environmental Management Plan.

#### 3.2 Visual Impact

##### 3.2.1 Objective

To minimise the visual impact of the proposed sand extraction as viewed from King Road.

##### 3.2.2 Management of Visual Impact

The proposed extraction and the fill sand to be installed on the low-lying area will have a visual impact from King Road.

There are several management actions that can be taken in quarries to minimise visual impact. 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.

The visual impact of topsoil dumps will be managed by pushing the soil into positions where they will be least visible from King Road and will be respread as soon as possible, firstly onto the fill area and then onto the cut area as the extraction progresses. Stockpiles of products will be retained on the floor of the cut area to reduce visual impact, as will any plant or machinery left on the site overnight.

It is not proposed that the facility will operate at night therefore light overspill from operations will not impact on visual amenity. The only lighting that might be required at night could be security lighting. Security lighting is located to minimise light visibility from roads and will be restricted to the site facilities and any equipment that is parked or located within the floor of the extraction area. In each case the lighting will be angled back into the site to minimise the light impacts.

The haul and access road are to be on the southern boundary on the existing access from King Road to the working area, at the low elevation to minimise the visibility of truck movements.

Progressive rehabilitation of all completed cut and fill areas is proposed when sufficient ground is available. The main area of visual impact, being the fill area on the western part of the site, will be rehabilitated as soon as possible after the sand and topsoil has been spread.

### 3.2.3 Management Actions

- M2** Topsoil dumps will be placed to be least visible from King Road and will be spread onto the fill area or completed areas as soon as possible
- M3** Stockpiles of product will be stored on the floor of the extraction area
- M4** Machinery and plant will be stored on the floor of the extraction area
- M5** The sand extrication operation will not be undertaken at night and security lighting will be restricted to the site facilities and machinery storage area, if required.
- M6** Security lighting will be angled away from King Road
- M7** The haul and access road will be on the southern boundary.
- M8** Progressive rehabilitation will be undertaken when the cut and fill reach finished levels
- M9** The fill area will be seeded as soon as possible after the sand and topsoil has been spread

## 3.3 Weeds

### 3.3.1 Objective

To manage Declared Pests and Environmental Weeds to prevent the:

- Introduction of new weed species to the area;
- Spread of weeds via heavy plant, vehicles and equipment within and between properties; and
- Increase in existing weed infestations through disturbance caused by clearing of native vegetation and soil disturbance.

### 3.3.2 Weed Management

Weed management will be required ahead of mining. The purpose of weed management in the pre-mining phase is to limit the volume of weed seeds present in topsoil. Pre-clearing targeted treatment for Castor Oil Plant prior to clearing should be undertaken. This should be as per the treatment notes in Florabase (DBCA, 2021):

*Hand pull seedlings and small plants, ensuring roots are removed. Cut and paint using 50% glyphosate or apply 250 ml Access® in 15 L of diesel to base 50 cm of trunk. Foliar spray seedlings and small plants using 1% glyphosate.*

The rehabilitated areas will initially be devoid of all vegetation and therefore will have no weeds. Once the areas have been planted as pasture, they will be monitored for the presence of any WoNS, Declared Pests, any reoccurrence of Castor Oil Plant or any priority weeds species as designated as Priority Weeds in the Swan Natural Resource Management Region as per Table 3 (Bettink, and Keighery, 2008).

**Table 3: Priority Weeds in the Swan Natural Resource Management Region**

Scientific name	Common name
<i>Acacia</i> spp. (incl. <i>longifolia</i> , <i>pycnantha</i> , <i>dealbata</i> )	
<i>Asparagus asparagoides</i>	Bridal creeper
<i>Carduus pycnocephalus</i>	Slender thistle
<i>Cenchrus ciliaris</i>	Buffel grass
<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	Boneseed
<i>Colocasia esculenta</i>	Taro
<i>Cortaderia selloana</i>	Pampas grass
<i>Cynodon dactylon</i>	Couch
<i>Ehrharta calycina</i>	Perennial veldt grass
<i>Euphorbia terracina</i>	Geraldton carnation weed
<i>Ferraria crispa</i>	Black flag
<i>Freesia alba x leichtlinii</i>	Freesia
<i>Gladiolus undulatus</i>	Wavy gladiolus
<i>Hydrocotyle ranunculoides</i>	Robust pennywort
<i>Hyparrhenia hirta</i>	Tambookie grass
<i>Isolepis hystrix</i>	Club rush
<i>Juncus acutus</i>	Sharp rush
<i>Lachenalia reflexa</i>	Yellow soldier
<i>Leptospermum laevigatum</i>	Victorian tea tree
<i>Moraea flaccida</i>	One-leaf cape tulip
<i>Myriophyllum aquaticum</i>	Parrots feather
<i>Retama raetam</i>	White weeping broom
<i>Rubus</i> spp.	Blackberry
<i>Salvinia molesta</i>	Salvinia
<i>Schinus terebinthifolius</i>	Brazilian pepper
<i>Sparaxis bulbifera</i>	Sparaxis
<i>Tribolium uniolae</i>	Haas grass, Tribolium
<i>Typha orientalis</i>	Typha, bulrush
<i>Watsonia meriana</i> var. <i>bulbillifera</i>	Bulbil watsonia
<i>Zantedeschia aethiopica</i>	Arum lily

### 3.3.3 Management Actions

- M10** Pre-clearing targeted treatment for Castor Oil Plant as per treatment notes in Florabase (DBCA, 2021)
- M11** Management of any WoNS, Declared Pests or Environmental Weeds as per treatment notes in Florabase (DBCA, 2021) if recorded during monitoring

## 3.4 Rehabilitation under Clearing Permit

### 3.4.1 Clearing Permit Conditions

There is an area as specified in CPS 9460/1 that will be rehabilitated in accordance with Condition 7 of approval of the Clearing Permit (Appendix 4) being:

- (a) *The permit holder must retain the vegetative material and topsoil removed by clearing authorised under this permit and stockpile the vegetative material and topsoil in an area that has already been cleared;*
- (b) *within three months following completion of extraction activities, revegetate and rehabilitate, the area cross hatched red on Figure 2 of Schedule 1 by:*
  - (i) *re-shaping the surface of the land so that it is consistent with the surrounding five (5) metres of uncleared land;*
  - (ii) *ripping the ground on the contour to remove soil compaction;*
  - (iii) *ripping the pit floor and contour batters within the extraction site;*
  - (iv) *laying the vegetative material and topsoil retained under condition 7(a) on the cleared area(s);*
  - (v) *deliberately direct seeding and/or planting tube stock that will result in suitable black cockatoo species foraging habitat including Banksia attenuata and Banksia menziesii.*
  - (vi) *ensuring only local provenance seeds and propagating material are used to revegetate and rehabilitate the area;*
- (c) *water planted vegetation at the optimal time for the first two years post planting, as required;*
- (e) *implement hygiene protocols by cleaning earth-moving machinery of soil and vegetation prior to entering and leaving the site;*
- (f) *Within 24 months of direct seeding and/or planting tube stock in accordance with condition 7(b)(v) of this Permit:*
  - (i) *engage an environmental specialist to determine the likelihood of the survival of the Banksia attenuata and Bankia menziesii that has been direct seeded and/or planted; and*
  - (ii) *where, in the opinion of an environmental specialist, that the direct seeded and/or planted Banksia attenuata and Banksia menziesii will not survive, revegetate the area by deliberately planting and/or direct seeding native vegetation that will result in suitable black cockatoo species foraging habitat including Banksia attenuata and Banksia menziesii persisting within the area cross hatched red on Figure 2 of Schedule 1.*
- (g) *Where additional planting or direct seeding of native vegetation is undertaken in accordance with condition 7(e)(ii) of this permit, the permit holder shall repeat condition 7(e)(i) and 7(e)(ii) within 24 months of undertaking the additional planting or direct seeding of native vegetation.*

The rehabilitation as required under the Clearing Permit approval will be implemented as per Condition 7.

### **3.4.2 Management Action**

**M12** The rehabilitation as required under the Clearing Permit approval will be implemented as per Condition 7.

## **3.5 Rehabilitation Plan**

### **3.5.1 Rehabilitation Objectives**

The remaining area to be rehabilitated will be the balance of the mining footprint. The remaining area will be reinstated with pasture. The pasture will provide soil stabilisation as well as a grazing resource

for livestock and will be visually compatible with the surrounding rural landholdings. The current site includes pasture at the western end and a rehabilitated mine footprint and some native vegetation at the eastern end. No sequential land planning can be made because the future use is not known. The end land use after mining over most of the site is proposed to be pasture.

The pasture aims to:

- Stabilise the post-mining landscape, and the minimisation of wind erosion;
- To have no invasive weeds or Declared pests established on the site; and
- Provide a self-sustaining cover of pasture.

### 3.5.2 Topsoil and Overburden Removal Replacement

Appropriate topsoil management is seen to be an important element in achieving successful rehabilitation and plant re-establishment on the restored surface. 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. Rehabilitation will progressively follow mining, with completed areas of the excavation being rehabilitated with pasture as soon as practicable.

### 3.5.3 Rehabilitation Planting

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

The preferred method of rehabilitation 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. For pasture in this situation, it is essential that the species are matched to the soil types and rainfall. The site falls into the “High Rainfall Coastal” planting regime with sandy soils. Suggested species to be used in the planting are outlined in Table 4.

**Table 4: Species for Rehabilitation**

Type	Scientific name	Common name
Perennial Legumes	<i>Lotus corniculatus</i>	Birdsfoot Trefoil
	<i>Medicago sativa</i>	Lucerne
	<i>Trifolium fragiferum</i>	Strawberry Clover
Perennial Pasture	<i>Lolium perenne</i>	Perennial Ryegrass
	<i>Phalaris sp.</i>	Phalaris
	<i>Dactylis glomerata</i>	Cocksfoot
	<i>Festuca arundinacea</i>	Summer Active Tall Fescue
	<i>Chloris gayana</i>	Rhodes Grass
Annual Pasture	<i>Festuca perennis</i>	Italian Ryegrass
	<i>Ornithopus sp.</i>	Serradella
	<i>Trifolium subterraneum</i>	Subterranean Clover

The species used will be determined by the individual season and nature of the rainfall in the preceding months.

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.



### 3.5.4 Fertiliser

Fertiliser is not always required and will add nutrients to the ground water. If used a fertiliser containing low nitrogen, phosphorous and potassium, and trace elements, is recommended to be spread at rates of up to 100 kg/hectare, applied to rehabilitation areas in the year of planting. Nitrogen is provided by using leguminous seed in the seed mix.

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.

### 3.5.5 Pests

Red-legged earth mites (RLEM) and blue oat mites can potentially impact on the establishment of the pasture. During the following few weeks after seeding, monitoring will be undertaken for red-legged earth mites and blue oat mites, which will be hatching when the maximum day temperature drops below 20°C (DPIRD, 2021b). These will be treated with insecticides as necessary.

### 3.5.6 Irrigation

Irrigation is not proposed for the pasture planning.

### 3.5.7 Completion Criteria

The rehabilitation is considered to be complete when the following have been achieved:

- 90% coverage by pasture species
- Likelihood that the pasture will be self-sustaining; and
- No WoNS, Declared Pests or Castor Oil Plant present on the site.

### 3.5.8 Contingency Plan

If there are areas the first year after seeding that do not meet the completion criteria infill planting of pasture species will be undertaken in any bare areas greater than 5m<sup>2</sup>.

### 3.5.9 Management Actions

- M13** Use of topsoil to improve the quality of the area to be rehabilitated
- M14** Rehabilitation to be undertaken the first winter after spreading or topsoil to avoid compaction
- M15** Areas to be rehabilitated will be planted with pasture seeds, including perennial legumes, perennial pasture and annual pasture
- M16** The rehabilitation areas to be seeded at a rate of 2-5kg/ha, species dependent
- M17** Fertiliser to be used will be low nitrogen, phosphorous and potassium with trace elements
- M18** Red-legged earth mites and blue oat mites will be managed with insecticide if required
- M19** Completion is when:
  - 90% coverage by pasture species
  - Likelihood that the pasture will be self-sustaining; and
  - No WoNS, Declared Pests or Castor Oil Plant present on the site.

**M20** Bare Areas Greater than 5m<sup>2</sup> after one year will be reseeded

### **3.6 Dieback**

#### **3.6.1 Objective**

To ensure that dieback is not spread due to the mining activity to the surrounding vegetation.

#### **3.6.2 Dieback Management**

Due to much of the site being 'Uninterpretable' hygiene protocols will be implemented as if these areas are potentially infested.

The spread of *Phytophthora* Dieback is more prevalent in the winter months when the soil is wet and overland flows can spread the disease quickly. Initial clearing works will be scheduled as much as possible in drier conditions. To prevent transfer of potentially infected soil into the surrounding vegetation deemed to be 'Uninfested' there will be no access to the buffer areas and surrounding vegetation and no soil will be pushed into these areas. Earthworks will ensure that no contours are created that drain surface water from the development area to the bushland. Stockpiles of soil and mulch will be:

- Located in sheltered areas
- Limited in height and steepness;
- Piled lengthways to prevailing winds; and
- Stabilised if required.

All soils or mulch to be imported to the site during works will be disease and pathogen free, including seedlings and any building materials will be free from soil.

Hygiene management procedures will be implemented on the site with signage erected at all access points to the development area. The signs should include the following procedures:

- Vehicle inspection protocols to ensure the vehicle is free from soil/organic material prior to entry and exit;
- Brush down of contaminated vehicles and machinery in dry weather
- Wash down of contaminated vehicles and machinery used in clearing with suitable disinfectant such as bleach dilution, methylated spirits or an approved product such as Phytoclean during wet weather.

#### **3.6.3 Management Actions**

**M21** Clearing works will be scheduled as much as possible in drier conditions.

**M22** Soil in the footprint will be stabilised so it is not prone to water erosion and being washed into adjoining bushland areas.

**M23** No soil from works will be pushed into surrounding bushland.

**M24** No contours will be created that will allow surface water drainage into the surrounding bushland.

- M25** Stockpiles will be constructed to ensure no soil transfer occurs to the surrounding vegetation
- M26** Hygiene protocols will be enforced such as ensuring there is no visible dirt on shoes, clothes or equipment and all machinery, tools and equipment will be cleaned of soil and sterilised with a 70% solution of methylated spirits.

### **3.7 Environmental Attributes**

#### **3.7.1 Objective**

To ensure that the environmental attributes to be retained on the site are protected during extraction

#### **3.7.2 Clearing Management**

The extraction footprint retains a 20m buffer between the native vegetation on Lots 4 and 5. The buffer strip is Banksia woodland that is contiguous with bushland on Lot 5 and has value as fauna habitat. To avoid inadvertent clearing, the limit of clearing will be shown on all plans issued to contractors and will be pegged on site prior to those works commencing.

#### **3.7.3 Management Action**

- M27** Clearly identify the location and limit of clearing of vegetation within all work areas on site (surveyed and pegged) and delineated on appropriate plans.

### **3.8 Surrounding Land Uses**

#### **3.8.1 Objectives**

To minimise the potential for conflict with surrounding land uses.

#### **3.8.2 Management of Surrounding Land Use**

The EPA Guidance Statement No. 3 *Separation Distances Between Industrial and Sensitive Land Uses* (EPA, 2005) was superseded in 2016 by Environmental Factor Guidelines. The relevant EFG for impacts such as noise and dust is “Environmental Factor Guideline – Social Surroundings”. The EFG does not specify certain separation distances. Instead it encourages proponents to engage expert technical consultants to avoid or mitigate potential issues.

Lot 51 King Road is located to the north of Lot 5. The house on Lot 51 is 100m from the nearest point of the sand mining operations proposed on Lot 5. The quarry will need to be operated in such a manner that reduces the level of noise and dust moving off-site. Putting in monitoring at the property boundaries will assist in managing noise and dust. Furthermore, Lot 51 contains four sheds that are used for rearing poultry. Guidance Statement 3 indicates that the recommended separation distance to poultry farms is 300-1000m with the relevant impacts being noise, dust and odour. The house on Lot 51 is 120m from the nearest shed. Therefore, the house on Lot 51 is at a similar distance to potential noise and dust (and odour) sources than the proposed sand quarry on Lot 5.

Lot 423 King Road is located to the south of Lot 4 and is further separated from Lot 4 by Lot 422. The house on Lot 423 is 490m from the nearest point of the sand mining operations proposed on Lot 4. It should be noted that the lot between Lot 4 and Lot 423 has an existing sand quarry operated by Cook Industrial Minerals. In addition, the house on Lot 423 is closer to the old sand quarry to the west of King Road on Lot 713 than to the proposed quarry on Lot 4. The closest point between the house and

the quarry on Lot 713 at the time of operation was 360m. Examination of historic aerial photography shows that the house on Lot 423 was present when the quarrying on Lot 713 commenced. Therefore, the quarry on Lot 713 must have been approved with this distance in mind. The distance between the house and the proposed quarry on Lot 4 is greater and therefore should not pose any noise or dust constraints.

The mined area to the south and plantations to the east are not likely to conflict with the proposed sand extraction.

Prior to commencement there will be the provision of informative material to the surrounding residents regarding the sand mining operation and ongoing community monitoring and a complaints register. All complaints will be addressed within 5 business days and proposed actions to address the complaint will be communicated to the complainant.

### **3.8.3 Management Actions**

**M28** All operations will be undertaken in accordance with a Dust and Noise Management Plan to be prepared as part of the extractive industry licence.

**M29** Complaints register to be maintained for the site.

**M30** All complaint to be addressed within five business days with actions communicated to the complainant.

## **3.9 Monitoring**

Monitoring will be undertaken to determine whether the environmental objectives specified in this Environmental Management Plan are being achieved in accordance with the performance indicators, and whether the management actions require remedial action.

Three visual inspection points will be established within the planted pasture once seeding has been completed on a quarterly basis until completion. The following parameters will be recorded including:

- Invasive weed species;
- Invasive weed density (% cover), if present;
- Pasture health; and
- Pasture coverage.

On a monthly basis the hygiene register will be reviewed to ensure protocols and hygiene requirements are met. There will also be random inspections of vehicles to ensure that they are free of dirt. The complaints registered will be reviewed on a monthly basis to ensure all complaints have been appropriately dealt with.

**M31** Visual inspection of seeded pasture areas on a quarterly basis.

**M32** Monthly review of the hygiene register

**M33** Random checks of vehicles for dust, mud and dirt

**M34** Monthly review of the complaints register

### **3.10 Implementation**

Aigle Royal has overall responsibility to implement the Environmental Management Plan. The Environmental Management Plan will be considered to be fully implemented at the completion of extraction once all management actions are undertaken and any remedial actions have been completed and the rehabilitation has met the completion criteria.

### **3.11 Reporting**

Monitoring results will be provided to the Shire of Serpentine Jarrahdale for information and advice on an annual basis at the end of each calendar year, unless otherwise required, until Completion Criteria are met.

**M35** Annual monitoring report detailing activities and monitoring results compared to Completion Criteria to be submitted to the Shire of Serpentine Jarrahdale until completion criteria are met.

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