Iluka Resources Limited

South Capel Remediation Project

Preliminary Documentation

EPBC Act Referral: 2018/8250

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1 Introduction

On 5 July 2018, Iluka Resources Ltd (Iluka) referred the South Capel Remediation Project (SCRP) (Referral #2018/8250) to the Department of the Environment and Energy (the Department) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The purpose of the SCRP is to remediate point sources of groundwater contamination associated with historic by-product storage at the Capel Dry Plant (CDP) and South Capel sites. This remediation is being undertaken as part of Iluka's commitment to obligations under the WA *Contaminated Sites Act 2003*. All remediation activities are regulated by the WA Department of Water and Environmental Regulation (DWER).

The CDP commenced operation in the mid-1950s to process mineral sands. Historically, management of mineral sands processing undertaken at the CDP and at South Capel resulted in the storage of by-products on site. Mining and mineral separation commenced at South Capel in the mid-1950s and Synthetic Rutile (SR) processing commenced in 1968. The South Capel mining and processing areas have not supported production activities since operations ceased in 1999 and the CDP is also no longer in operation.

Iluka's groundwater monitoring has indicated there are levels of manganese and sulfate above environmental standards in the shallow groundwater directly underneath and adjacent to by-product storage areas at both CDP and South Capel. The levels do not pose a risk to human health, but may impact water quality with respect to aesthetics (taste/odour). The levels pose a potential risk to the environment if left unabated. Therefore, Iluka proposes to commence activities to consolidate and contain the material impacting this shallow groundwater to minimise the potential for further contamination, and to allow a natural attenuation of the currently elevated levels.

The remediation work proposed involves constructing an extension to a purpose-designed by-product storage facility at South Capel (the Hutton Road Containment Facility extension) and relocating quantities of process by-product from both South Capel and the CDP to this facility. Approximately 60,000 m^3 of historic by-products stored at CDP and approximately 407,000 m^3 from South Capel will be relocated to the purpose-built consolidated storage facility at South Capel. Uncontaminated fill will be sourced from an area known as the CMNE (Capel Mine Northern Extension) area. Figure 1 shows the locations covered by the controlled action area.

Further information regarding the project was requested by the Department on 15 August 2018, with a response provided by Iluka on 7 September 2018.

On 14 October 2018, Iluka received formal notification from the Minister's delegate (Gregory Manning, Assistant Secretary, Assessments (WA, SA, NT) and Post Approvals Branch) that the Project was a Controlled Action, to be assessed by Preliminary Documentation. The controlling provisions for the Controlled Action decision were:

- Listed threatened species and ecological communities (sections 18 & 18A of the EPBC Act).

The Department determined that the SCRP was likely to have a significant impact on Matters of National Environmental Significance (MNES). These included impacts on:

- several listed flora species; and
- Western Ringtail Possums (WRP) (*Pseudocheirus occidentalis*).

Subsequent advice received from Chris Videroni (Director, Major Projects West Section, Assessments (WA, SA, NT) and Post Approvals Branch) on 5 December 2018 outlined the specific information to be included in the Preliminary Documentation. This document provides the information requested as outlined in Table 1.

Table 1 Regulatory conditions fulfilled by the preparation of the closure plan

Item	Additional Information Requested by the Department	Section
1	**Listed Threatened Species and Ecological Communities**	
1a	Several EPBC Act listed flora and fauna species, or suitable habitat for them, are likely or have the potential to occur within the proposed action area: • Swamp Honeypot (*Banksia nivea subsp. uliginosa*) - Endangered; • Bussell's Spider-orchid (*Caladenia busselliana*) - Endangered; • Royce's Waxflower (*Chamelaucium sp. S coastal plain* (R. D. Royce 4872)) - Vulnerable; • Tall Donkey Orchid (*Diuris drummondii*) - Vulnerable; • Dwarf Bee-orchid (*Diuris micrantha*) - Vulnerable; • Glossy-leafed Hammer Orchid (*Drakaea elastica*) - Endangered; • Selena's Synaphea (*Synaphea sp. Fairbridge Farm* (D.Papenfus 696)) - Critically Endangered; • Long-stalked Featherflower (*Verticordia densiflora var. pedunculata*) - Endangered.	N/A Information only
1b	The flora and vegetation surveys provided in the referral package did not cover the whole of the area at the South Capel site that will be impacted by the proposed action. The Department requires a vegetation survey to be undertaken, including a targeted flora survey for (at least) each of the above flora species, covering the entirety of the South Capel site impacted by the proposed action. Targeted species surveys must be in accordance with the Draft survey guidelines for Australia's threatened orchids (Department of the Environment, 2013).	Section 2.1 Section 2.1.1 Section 2.1.2 Appendix 1
1c	The preliminary documentation must include the following: • Demonstrate that the surveys have been undertaken in accordance with the guidelines identified above and the Recovery Plans and Conservation Advices identified in this Attachment A; • The results of the surveys;	Section 2.1 Section 2.1.1 Section 2.1.2 Section 2.2 Appendix 1
1d	The Preliminary Documentation must include the following: • Identify all direct and indirect impacts likely to arise from the proposed action; • Identify all measures proposed to avoid or mitigate the likely impacts; • An analysis of the effectiveness of proposed avoidance and mitigation measures;	Section 2.1 Section 2.2 Table 2
1e	• If revegetation is going to be undertaken following completion of the remediation, please be specific about the species to be planted, the methodology to be applied, and the standard to be met;	Section 2.4 Table 4 Table 5
1f	• A description of the actions to be taken on the land following completion of remediation, including the intended use of the land (if known).	Section 2.3
2	**Environmental Offsets**	
2a	In the event that impacts cannot be avoided or mitigated, provide details of offsets proposed to compensate for residual impacts on EPBC listed species, including the following: • The type of offsets proposed; • The extent to which the proposed offset actions correlate to, and adequately compensate for, the impacts to EPBC listed species; • For proposed land-based offsets, the suitability of the location of proposed offset sites, including the current land tenure and method of securing and managing the offset for the life of the impact; • For non-land-based offsets, details of the proposed offset and how it will compensate for the proposal's residual significant impacts *(not applicable)*; • The conservation gains to be achieved by the offset (for example, positive management strategies that improve the site, or how the future loss, degradation or damage of the protected matter will be averted or mitigated); • The time it will take to achieve the proposed conservation gains; • The level of certainty that the proposed offset will be successful;	Section 2.4 Table 3 Table 6 Table 7 Table 8 Section 2.3
2b	• How the proposed offset meets the principles of the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (DSEWPC 2012) (http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy).	Section 2.4.9 Table 8

Item	Additional Information Requested by the Department	Section
3	**Threat Abatement Plans and Recovery Plans** Demonstrate that the proposed action is not inconsistent with a relevant recovery plan or threat abatement plan, including the following: • Department of Parks and Wildlife (2017). Western Ringtail Possum (*Pseudocheirus occidentalis*) Recovery Plan. Wildlife Management Program No. 58. Department of Parks and Wildlife, Perth. WA. • Department of Environment and Conservation (2009). Swamp Honeypot (*Banksia nivea* subsp. *uliginosa*) Recovery Plan. Department of Environment and Conservation, Western Australia. • Patten, J., A. Webb & A. Batty (2008). Bussell's spider orchid (*Caladenia busselliana*) Recovery Plan. Department of Environment and Conservation, Western Australia. • Department of Environment and Conservation (2009). Glossy-leafed Hammer Orchid (*Drakaea elastica*) Recovery Plan. Department of Environment and Conservation, Western Australia. • Department of the Environment (2014). Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi*. Canberra, ACT: Commonwealth of Australia. • Commonwealth of Australia (2015). Threat abatement plan for predation by feral cats. Canberra, ACT: Department of the Environment. • Commonwealth of Australia (2016). Threat abatement plan for competition and land degradation by rabbits. Canberra, ACT: Department of the Environment and Energy. • Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). Threat abatement plan for predation by the European red fox. DEWHA, Canberra.	Section 3
4	**Conservation Advices** Demonstrate that the above actions were undertaken having regard to the following conservation advices: • Threatened Species Scientific Committee (2018). Conservation Advice *Pseudocheirus occidentalis* Western ring tail possum. Canberra: Department of the Environment and Energy. • Department of the Environment (2014). Approved Conservation Advice for *Chamelaucium* sp. C Coast Plain (Royce's Waxflower). Canberra: Department of the Environment. • Department of the Environment, Water, Heritage and the Arts (2008). Approved Conservation Advice for *Diuris drummondii* (Tall Donkey Orchid). Canberra: Department of the Environment, Water, Heritage and the Arts. • Department of the Environment, Water, Heritage and the Arts (2008). Approved Conservation Advice for *Diuris micrantha* (Dwarf Bee-orchid). Canberra: Department of the Environment, Water, Heritage and the Arts. • Department of the Environment, Water, Heritage and the Arts (2009a). Approved Conservation Advice for *Synaphea* sp. Fairbridge Farm (D. Papenfus 696) (Selena's Synaphea). Canberra, ACT: Department of the Environment, Water, Heritage and the Arts. • Department of the Environment, Water, Heritage and the Arts (2008). Approved Conservation Advice for *Verticordia densiflora var. pedunculata* (Long-stalked Featherflower). Canberra: Department of the Environment, Water, Heritage and the Arts.	Section 4
5	**Economic and Social Matters** Provide further details on the social and economic costs and benefits of undertaking the proposed action, including the following: • The basis for estimations of costs and benefits; • The potential employment opportunities expected to be generated at each phase of the proposed action; • The benefits to the local and wider community as a result of the proposed action; • Details of public and stakeholder consultation, and the outcomes of this consultation, including consultations undertaken with local Indigenous communities and traditional owners of the Aboriginal freehold and Indigenous Protected Areas that will or may be impacted by the proposed action.	Section 5

2 Threatened Species and Ecological Communities

2.1 Impacts to listed flora

Vegetation and flora surveys covering the CDP and South Capel areas were supplied to the Department as part of the referral information. A targeted habitat and flora survey at South Capel was requested by the Department (see Item 1b in Table 1), the results of which were to be provided in the Preliminary Documentation (this document). A targeted habitat and flora survey was not requested for the CDP as sufficient information had been supplied with the referral.

Ecoedge (2018) undertook a targeted habitat and flora survey at South Capel to determine if any of the listed species outlined in Item 1a of Table 1 above were present within the controlled action area. The survey report outlines the methodology used during the surveys, confirming the *Draft survey guidelines for Australia's threatened orchids (Department of the Environment, 2013)* were used. In addition, the Recovery Plans and Conservation Advices outlined in Attachment A to the letter received by the Department were reviewed. Whilst the Recovery Plans and Conservation Advice documents do not provide guidance for fieldwork methodology, they provide relevant descriptions of the species, their habitat and distribution. This information was used by the survey team to familiarise themselves with the species and direct them to potentially suitable habitat in the field (Ecoedge 2018).

No listed species outlined in Item 1 of Table 1 above were found during the 2018 survey, the results of which are in Appendix 1. Four records of the Threatened Glossy-leaved Hammer Orchid (*Drakaea elastica*) were located in the adjacent vegetation at South Capel in 2013 (Endemic 2013), greater than 400 m east of the controlled action area. Therefore, no direct or indirect impacts to listed species are anticipated from the SCRP.

2.1.1 Flora survey methodology

As specified in the request (see Item 1b in Table 1), the targeted species surveys were to be conducted in accordance with the *Draft survey guidelines for Australia's threatened orchids* (Department of the Environment, 2013). In Section 4 of the guidelines, the following is stated:

"Given the cryptic nature of terrestrial orchids and their often rare, scattered appearance in bushland, quadrat-based surveys or meandering searches alone are not considered to be an adequate survey technique. However, a random 'meander' survey may be conducted initially during the flowering period to ascertain the presence of the orchid species. This is to cover large areas of potential habitat if the species has not been detected previously at the site. Records are taken using GPS and on-ground markers along transects where the target species is located. A more thorough search should then be undertaken in the vicinity of plants detected using area search and targeted parallel transects."

Based on the above, it was determined by Ecoedge (2018) that the meander method was the appropriate method to use given the large area to be covered and given the targeted orchid species had not previously been recorded within the survey area.

During the survey, two botanists recorded the tracks taken during the survey and this is captured in Figure 3 of the Ecoedge (2018) report (Appendix 1). One botanist captured tracks via the "Track Log" and one via "Waypoints" as shown on Figure 3 of Ecoedge (2018), demonstrating sufficient coverage over the survey area to identify the target species, should they have been present.

As the meander method did not detect any of the listed orchid species, a more thorough search was not subsequently conducted, in line with the Department (2013) guideline.

Therefore, the methodology used was appropriate as per the Department guidelines (2013) and the area surveyed provided adequate coverage.

2.1.2 Timing of orchid survey

The targeted flora survey report (Ecoedge 2018 – Appendix 1) addresses survey limitations in Section 2.3, Table 1. With regards to "completeness of the survey", Ecoedge considered there to be no constraint as explained by the comment that *"The 2018 spring season was ideal for the species because of relatively high winter rainfall. Rainfall over three winter months was slightly above average, and September was also above average.*"

Additionally, in Section 4, the report states that "*the presence of the common native orchids indicate that the seasonal conditions and survey timing were ideal for locating the target species should they have been present"* (Ecoedge 2018).

Hence, the timing of the orchid survey was appropriate.

2.2 Impacts to listed fauna

Harewood (2018a and 2018b) identified impacts to WRPs resulting from the SCRP were limited to the following direct impacts:

- expected temporary loss of a total of 8.44 ha of WRP habitat, consisting of 7.1 ha at South Capel and 1.34 ha at Capel Dry Plant (CDP); and
- possible death of WRPs during remediation works.

In addition, the following indirect impacts could potentially be experienced during construction works:

- dust impacts; and
- noise impacts.

Table 2 outlines the impacts and measures to avoid and mitigate these impacts, as well as an assessment of the anticipated effectiveness of those measures. Note that a reference to "revegetation" in this document refers to the revegetation of WRP habitat.

Table 2 Measures to avoid and mitigate impacts to WRPs

Impact	Measures to avoid impacts	Measures to mitigate impacts	Effectiveness
Direct Impacts			
Temporary loss of 7.1 ha of WRP habitat at South Capel	• Redesigning the diversion drain to the east of the facility to avoid clearing of good to very good condition remnant vegetation; • Modifying (narrowing) the design of the Hutton Road Containment Facility Extension on the western side to reduce clearing of WRP habitat; and • Modifying the design to avoid WRP habitat at the downstream end of the facility where surface water leaves the facility.	• WRPs to be relocated prior to clearing to areas approved by Department of Biodiversity, Conservation and Attractions (DBCA). A Fauna Taking (Relocation) Licence, issued by DBCA, will be required for this activity; • Earthmoving machinery and other vehicles will be required to remain within disturbed areas and existing tracks in order to prevent impacts to surrounding habitat; • Vehicles and machinery will be required to be free of weed and seed material prior to mobilisation to site in order to protect the surrounding vegetation; and • 14.6 ha of WRP habitat will be revegetated at South Capel to mitigate and offset the loss of habitat at both CDP and South Capel.	• Redesigning and modifying the containment facility has avoided 2.9 ha of WRP habitat at South Capel; • Redefining the disturbance area at CDP has avoided 0.2 ha of WRP habitat; • Relocation of WRPs is expected to reduce the likelihood of deaths. See Section 2.2.1; • The Iluka internal clearing permit system is a robust process which ensures that clearing and disturbance boundaries are strictly adhered to; • Standard hygiene measures are expected to be effective in the management of dieback and to avoid introduction of new weeds to surrounding habitat; • WRP habitat to be revegetated will be of a better quality and provide improved linkages to adjacent WRP habitat than the patchy degraded habitat being cleared; and • Regular inspections, internal audits, active management and an ongoing monitoring program will ensure WRP habitat is achieving the desired rehabilitation outcomes. See Section 2.4.6.
Temporary loss of 1.34 ha of WRP habitat at CDP	• Avoiding vegetation on the west side of the action area; and • Avoiding vegetation on the north side of the action area currently providing a link to the rail reserve to the east.		

Impact	Measures to avoid impacts	Measures to mitigate impacts	Effectiveness
Possible deaths during clearing	• Relocation of WRPs prior to clearing; • Prior to clearing, no-go areas and working areas shall be defined / delineated and will be communicated to all site personnel undertaking the clearing activities; • Any clearing to be undertaken shall be appropriately geo-surveyed and demarcated. Demarcation (survey flagging tape, etc.) that identifies clearing boundaries shall be unique to this activity and not easily confused with other markers used on site. The proposed clearing boundary shall be installed prior to clearing commencing; and • Clearing will be undertaken during daylight hours to ensure maximum visibility. WRPs are docile during the day; however, daylight hours will assist in observing any potential WRP movements.	• Fauna spotter on site during clearing activities to observe and move WRPs and any other fauna at risk from clearing activities. The fauna spotter will inspect trees and hollow logs immediately prior to clearing and will allow fauna the opportunity to evacuate (i.e. if within a tree being felled); • A clearing pattern that encourages the movement of fauna to adjacent native habitats will be adopted; and • All relocation activities regulated under the *Biodiversity Conservation Act 2016* and the *Biodiversity Conservation Regulations 2018* (effective 1 January 2019), ensuring individuals are moved in accordance with regulated standards to an approved location.	• Removing WRPs prior to clearing is expected to prevent WRP deaths during clearing; and • The use of a fauna spotter is expected to be effective as works will cease if required and the fauna removed prior to works recommencing.
Indirect Impacts			
Dust during remediation	The disturbance footprint has been minimised as much as possible, therefore reducing the exposed area.	Once the contractor has been selected, they will be required to develop a Construction Environmental Management Plan which will include procedures for managing dust. It is expected that water carts will be used for dust suppression as a key management measure.	Water carts are a standard management measure (e.g. water carts are used at all Iluka mine sites) and dust is not expected to be an issue given the relatively small area to be disturbed by the action. Dust has been assessed by the State government through the works approval for South Capel and determined to be low risk.
Noise during remediation	Works will be limited to daylight hours where noise will be a deterrent to WRPs moving into the disturbance area. No noise impacts to WRPs resulting from the project will be experienced at night when WRPs are active.	Daytime noise is unavoidable for the duration of the remediation works. However, standard noise management will be undertaken, including contractors using reversing squawkers instead of beepers.	Limiting works to daytime will be effective in ensuring no noise impacts during the night when WRPs are active. Noise has been assessed by the State government through the works approval and determined to be low risk. WRPs have persisted in the area with current background noise levels, including Bussell Hwy traffic.

2.2.1 Effectiveness of relocation

Studies (Clarke, 2011; Thompson & Thompson, 2009; de Tores, P. et al., 2004) have demonstrated that WRP survival rates are better when managed in-situ or relocated to nearby or adjacent areas than when they are translocated to other sites far away from the disturbance area. The Approved Conservation Advice for *Pseudocheirus occidentalis* (western ringtail possum) (Threatened Species Scientific Committee 2018) also identifies minimising the impact of land developments on WRPs through in-situ conservation as a Local Priority Action. Therefore, WRPs within the disturbance footprint will be relocated to nearby vegetation or other suitable sites as determined by a fauna specialist and in consultation with the Department of Biodiversity, Conservation and Attractions (DBCA).

DBCA mapping shows suitable habitat adjacent to the South Capel site (Shedley and Williams 2014) and the survey by Harewood (2018b) found both dreys and WRPs located on the edges of the SCRP disturbance boundary at South Capel, indicating the adjacent vegetation is likely to provide suitable habitat.

The relocation of WRPs will be managed by a Fauna Taking (Relocation) Licence issued by DBCA under the *Biodiversity Conservation Act 2016*.

2.3 End land use

The SCRP is part of ongoing rehabilitation and closure activities for the CDP and South Capel sites. The areas disturbed by the SCRP at South Capel will ultimately comprise the Hutton Road Containment Facility Extension, revegetated areas as per offset requirements and pasture areas. The revegetated offset areas shown in Figure 2 will be placed under a conservation covenant established under Section 30B of the *Soil and Land Conservation Act 1945* (SLC Act) to ensure protection of this WRP habitat.

A conservation covenant established under the SLC Act is irrevocable and protects the conservation values of the land through registration of an agreement (covenant) between the land owner and the Commissioner of Soil and Land Conservation. The agreement defines appropriate management practices to ensure the land is managed in a manner which will not degrade its conservation values. The term of this covenant is usually specified for perpetuity and, once finalised, the Commissioner does not have statutory authority to vary or discharge these covenants (DPIRD 2019).

This statutory covenant binds each person who has consented in writing to the covenant and a memorial will be registered over the property's Certificate of Title, binding successive landowners. Thereby any potential future landowners must also respect the covenant and the values that are being protected.

Outside of the offset areas, the post-mining land uses for the CDP and South Capel sites are still under consideration. However, areas not comprising the HRCF facility or offset areas are likely to be returned to pasture in the first instance at both sites as this was the pre-mining landuse. Any future land use adjacent to offset areas that have the potential to impact upon MNES will be subject to consideration under the EPBC Act.

2.4 Environmental offsets

The SCRP will impact upon 8.44 ha of WRP habitat that Iluka proposes to offset through revegetation as discussed below.

2.4.1 Type of offset proposed

The Western Ringtail Possum (*Pseudocheirus occidentalis*) Recovery Plan (DPaW 2017) identifies habitat loss and fragmentation as one of the principle factors threatening WRPs. As such, Iluka proposes to offset the temporary loss of habitat by recreating WRP habitat and improving linkages

between existing WRP habitat areas as identified by the DBCA WRP suitability mapping (Shedley and Williams 2014) and on-site fauna surveys (Harewood 2018b).

A total of 14.6 ha will be planted with native vegetation species (detailed in Section 2.4.3) known to be preferred by WRPs as outlined in Harewood (2018a and 2018b) and other literature. The EPBC Act Offsets Assessment Guide (DSEWPC 2012a) was used to determine the adequacy of the area of habitat to be created (see Section 2.4.7). This area will be more consolidated and provide better linkages to adjacent WRP habitat than the current fragmented habitat patches within the controlled action area.

2.4.2 Location

The proposed offset areas are located on land held by Iluka as shown in Table 3.

Table 3 Offset Area Tenure

Land Description	Tenure	Holder	Security
Lot 2039 on Plan 140224; Wellington Location 2039	Freehold	Iluka Resources Ltd	Conservation Covenant to be placed over offset area
Lot 7 on Diagram 26769	Freehold	Iluka Resources Ltd	Conservation Covenant to be placed over offset area

Figure 2 identifies the area to be revegetated with WRP habitat post remediation. The offset area has been determined based on the following:

- its location within areas that will not require further works once the SCRP has been executed;
- its ability to enhance linkages between existing WRP habitat areas as shown in Figure 3;
- powerline setback requirements;
- firebreak requirements; and
- access requirements.

If during the project implementation phase any further constraints or opportunities are revealed, Iluka will ensure that the total area of native vegetation to be included in the offset area remains 14.6 ha. This may involve minor spatial changes to the area proposed to be revegetated; however, will ensure linkages are still established as per Section 2.4.4.

Once revegetation works have been undertaken, the offset area will be monitored and maintained to ensure the conservation gains are realised as outlined in Section 2.4.6.

The offset area will also be placed under a Conservation Covenant under the *Soil and Land Conservation Act 1945* to ensure protection in perpetuity as described in Section 2.3.

2.4.3 Revegetation species

Native plant species known to provide habitat for WRPs have been selected for inclusion within offset areas, with preference being for those species within the SCRP currently providing habitat for WRPs.

These include, but are not limited to, the species shown in Table 4. The species listed provide the following functions, noting that an individual species can provide for more than one function:

- foraging – 14 species;
- canopy – 13 species; and
- ground protection – 16 species.

A minimum of 15 species will be used from the list as per completion criteria (Table 5).

Table 4 identifies the WRP habitat functions each species provides, as well as factors taken into consideration when deciding if the species was suitable at the South Capel location. In selecting these species, consideration has been given to:

- providing both trees and shrubs to ensure continuity of canopy cover and protective understorey;
- providing preferred foraging species;
- suitability of soil types;
- whether the species is found locally;
- preferred growth position in the landscape;
- inclusion of dieback resistant species; and
- ensuring fast growing species are included (such as the Acacias).

Table 4 Revegetation Species

Species Characteristics						Suitability		
Scientific Name	**Common Name**	**Naturalised Status[1]**	**Soils[2]**	**Height[3]**	**Photo[4]**	**Local Provenance Species (Yes/No)[5]**	**Preferred Growth Position in the Landscape[6]**	**Possum Habitat (Foraging, Ground Protection, Canopy)[7]**
Trees								
Acacia saligna	Orange Wattle	Native	Various	1.5 to 9 m		Yes (found in Endemic 2013, Ecoedge 2015, Ecosystem Solutions 2017).	Variety of habitats and soil conditions. Tends to grow wherever soil has been disturbed.	**Foraging**: a high quality food source for WRPs, WRP feed on new shoots, flowers, leaves and/or fruiting bodies. **Ground Protection**: a fast growing species (grows over 1m per year when young), seeds germinate readily and spread by ants, has a short trunk thereby increasing the level of ground cover. **Canopy**: a dense and spreading tree, provides a weeping canopy cover and can grow up to 9 m.
Agonis flexuosa	Peppermint	Mixed (Native in Part of Range, Naturalised Elsewhere)	White or grey sand, sandy soils, laterite, limestone.	6 to 15 m		Yes (found in Endemic 2013, Ecoedge 2015, Ecosystem Solutions 2017, Ecoedge 2018).	Coastal sand dunes, granite outcrops, limestone areas.	**Foraging**: a high quality food source for WRPs, peppermint leaves comprise the major component of their diet. **Canopy**: a primary tree used for drey building (nests), a weeping tree canopy, the number of trees can be maximised by 'clumping', i.e. planting 3 or more trees about 1.5m apart, good for habitat.
Allocasuarina fraseriana	Sheoak	Native	Lateritic soils, white, grey or yellow sand.	5 to 15 m		Yes (found in Ecosystem Solutions 2017).	Jarrah forest, sand dunes.	**Foraging**: prolific nuts and needle like leaves, WRP feed on new shoots, flowers, leaves and/or fruiting bodies. **Canopy:** can offer canopy connectivity if grown near other plant species, WRP are known to build nests in these trees and have been utilised for travel/connection in wildlife corridors and bushland areas.

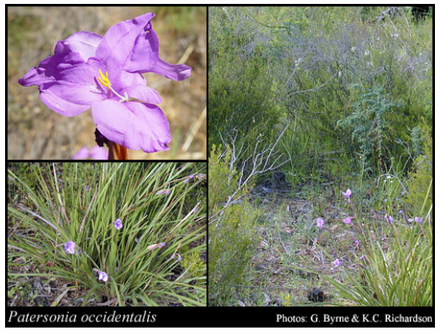
Species Characteristics						Suitability		
Scientific Name	**Common Name**	**Naturalised Status[1]**	**Soils[2]**	**Height[3]**	**Photo[4]**	**Local Provenance Species (Yes/No)[5]**	**Preferred Growth Position in the Landscape[6]**	**Possum Habitat (Foraging, Ground Protection, Canopy)[7]**
Corymbia calophylla	Marri	Native	Red-brown clay loam, orange-brown sandy clay, gravel, grey sand over limestone, granite, laterite.	40 to 60 m		Yes (found in Endemic 2013, Ecoedge 2015, Ecosystem Solutions 2017, Ecoedge 2018).	Flats, hills, slopes, breakaways, wetlands, fringing salt marches, beside drainage lines. Will grow on relatively poor soil.	**Foraging**: New growth, large nuts/seeds and flowers are a high quality food source for WRPs, propagated readily from seeds. **Canopy:** WRP friendly, provide height from predators and can offer canopy connectivity if grown near other plant species, usually dominates in the upper storey.
Eucalyptus rudis	Flooded Gum	Native	Sandy or loam soils.	5 to 20 m		Yes (found in Endemic 2013, Ecoedge 2015, Ecoedge 2018).	Wetter parts of south-western WA, flats, hillsides. Grows in remediated areas with moderate levels of salinity.	**Foraging**: New growth and flowers are a high quality food source for WRPs, WRP feed on new shoots, flowers, leaves and/or fruiting bodies. **Canopy:** WRP friendly, has a spreading crown, provide height from predators and can offer canopy connectivity if grown near other plant species.
Melaleuca viminea	Mohan	Native	Sandey or clayey soils.	0.6 to 5 m		Yes (found in Endemic 2013, Ecoedge 2015).	Near creeks or wet depressions, along watercourses, rocky coastal areas, flats. Tolerates shade.	**Foraging**: edible flowers for WRPs, WRP feed on new shoots, flowers, leaves and/or fruiting bodies, WRP will use as protection from predators and travel routes (Possum Centre), WRP feed on new shoots, flowers, leaves and/or fruiting bodies. **Ground Protection**: grows in high density, large amount of leaf litter, domed shrub, dense nature provides ideal nesting sites and shelter. **Canopy:** densely branched, can offer canopy connectivity if grown near other plant species, helpful for protection and drey building.

Species Characteristics						Suitability		
Scientific Name	**Common Name**	**Naturalised Status[1]**	**Soils[2]**	**Height[3]**	**Photo[4]**	**Local Provenance Species (Yes/No)[5]**	**Preferred Growth Position in the Landscape[6]**	**Possum Habitat (Foraging, Ground Protection, Canopy)[7]**
Melaleuca preissiana	Moonah	Native	Sandy soils.	3 to 9 m		Yes (found in Endemic 2013, Ecoedge 2015, Ecosystem Solutions 2017, Ecoedge 2018).	Swamps.	**Foraging**: attractive flowers, variety of flowers and leaves, which may be palatable to WRP at times. **Ground Protection**: papery bark provides abundant leaf litter, WRP will use as protection from predators and travel routes. **Canopy:** densely branched, can offer canopy connectivity if grown near other plant species.
Paraserianthes lophantha	Albizia	Mixed (Native in Part of Range, Naturalised Elsewhere)	Sandy or granitic soils.	1 to 10 m		Yes (found in Endemic 2013, Ecosystem Solutions 2017).	Winter-wet depressions, near creeks or swamps, granite outcrops.	**Foraging**: flowers attractive to WRPs. **Ground Protection**: large amount of leaf litter, fast growing and provides quick cover for shade. **Canopy:** upper storey canopy provided in later years of growth, short lived species
Shrubs								
Acacia cyclops	Red Eye Wattle / Coastal Wattle	Native	White/grey sand.	0.8 to 4 m		Yes (found in Endemic 2013).	Coastal sand dunes and limestone. Tolerates shade.	**Foraging**: edible flowers and highly palatable leaves, WRP will sometimes feed from leaves/flowers. **Ground Protection**: a densely domed shrub, habitat shrubs which provide protection. **Canopy**: middle storey canopy cover provided in later years of growth.

Species Characteristics						Suitability		
Scientific Name	**Common Name**	**Naturalised Status[1]**	**Soils[2]**	**Height[3]**	**Photo[4]**	**Local Provenance Species (Yes/No)[5]**	**Preferred Growth Position in the Landscape[6]**	**Possum Habitat (Foraging, Ground Protection, Canopy)[7]**
Acacia pulchella	Prickly Moses	Mixed (Native in Part of Range, Naturalised Elsewhere)	Sandy soils, clay loam over laterite.	0.3 to 3 m		Yes (found in Endemic 2013, Ecoedge 2015).	Low-lying areas, swamps, near watercourses.	**Ground Protection**: a tall spreading shrub, provide protection to WRP.
Callistemon glaucus	Sweet – Albany Bottlebrush	Native	White or grey sand, clay.	1 to 3 m		Yes (found in Endemic 2013).	Swampy flats. Wetlands tolerant.	**Foraging**: new growth, leaves and flowers are attractive to WRPs, WRP will occasionally use as a food source. **Ground Protection**: fast growing, good lifespan, tall shrub (Wikipedia), good habitat shrub and WRP sometimes build nests. **Canopy:** middle storey canopy cover provided in later years of growth.
Callistemon phoeniceus	Lesser Bottlebrush	Mixed (Native in Part of Range, Naturalised Elsewhere)	Sandy soils, laterite.	1 to 6 m		Yes (found in Endemic 2013).	Found along watercourses.	**Foraging**: occasionally used by WRP as a food source. **Ground Protection:** Good habitat shrubs. **Canopy:** WRP sometimes build nests.

Species Characteristics						Suitability		
Scientific Name	**Common Name**	**Naturalised Status[1]**	**Soils[2]**	**Height[3]**	**Photo[4]**	**Local Provenance Species (Yes/No)[5]**	**Preferred Growth Position in the Landscape[6]**	**Possum Habitat (Foraging, Ground Protection, Canopy)[7]**
Calothamnus quadrifidus	One-sided bottlebrush	Mixed (Native in Part of Range, Naturalised Elsewhere)	Wide variety of soils.	0.5 to 3 m		Yes (found in Endemic 2013).	Wide variety of habitats.	**Ground Protection**: can provide protection for WRPs in later growth years.
Kunzea glabrescens	Spearwood	Native	Sandy soils.	1.5 to 4 m		Yes (found in Endemic 2013, Ecoedge 2015, Ecosystem Solutions 2017, Ecoedge 2018).	Edges of swamps, lakes, rivers, moist depressions.	**Foraging**: attractive leaves and flowers, flowers may be palatable to WRP although should be interplanted with or near peppermint trees, WRP feed on new shoots, flowers, leaves and/or fruiting bodies, is the main food source in the absence of peppermint. **Ground Protection**: fast growing, good lifespan. **Canopy:** middle storey canopy cover provided in later years of growth, WRPs will sometimes build nests.
Spyridium globulosum	Basket Bush	Native	Sand	0.3 to 5 m		Yes (found in Endemic 2013, Ecoedge 2015).	Sand. Coastal sand dunes and limestone. Lime and wind tolerant.	**Foraging**: new growth and flowers attractive to WRPs. **Ground Protection**: low erect dense shrub. **Canopy:** middle storey canopy cover provided in later years of growth. WRP will often build nests in these shrubs.

Species Characteristics						Suitability		
Scientific Name	**Common Name**	**Naturalised Status[1]**	**Soils[2]**	**Height[3]**	**Photo[4]**	**Local Provenance Species (Yes/No)[5]**	**Preferred Growth Position in the Landscape[6]**	**Possum Habitat (Foraging, Ground Protection, Canopy)[7]**
Viminaria juncea	Swish Bush	Native	Sandy and clayey soils. Prefers acidic to neutral soil with ample moisture.	1 to 4 m		Yes (found in Endemic 2013, Ecoedge 2015, Ecosystem Solutions 2017).	Near lakes and swamps, river banks, winter-wet depressions.	**Ground Protection**: grows as an erect or weeping shrub.
Climbers and Understorey								
Anigozanthos manglesii	Mangels Kangaroo Paw	Native	White, yellow or grey sand, sandy loam.	0.2 to 1.1 m		Yes (found in Endemic 2013, Ecoedge 2015).	Various	**Ground Protection**: WRP may utilise when on the ground for protection.
Gahnia trifida	Coast Saw-sedge	Native	Grey or white sand, clay, sometimes saline.	1.5 m		Yes (found in Endemic 2013)	Swamps, creeks.	**Ground Protection**: provides protection for WRP when on the ground, WRP will at times rest within the sedges during the day and sleep, sedge leaves are used for nest materials.

Species Characteristics						Suitability		
Scientific Name	**Common Name**	**Naturalised Status[1]**	**Soils[2]**	**Height[3]**	**Photo[4]**	**Local Provenance Species (Yes/No)[5]**	**Preferred Growth Position in the Landscape[6]**	**Possum Habitat (Foraging, Ground Protection, Canopy)[7]**
Hardenbergia comptoniana	Native Wisteria	Native	Sandy soils.	Climber Twining vine		Yes (found in Endemic 2013, Ecoedge 2015, Ecosystem Solutions 2017).	Coastal limestone, sandplains, dunes.	**Foraging**: attractive flowers, unknown values as food source, WRP feed on new shoots, flowers, leaves and/or fruiting bodies. **Ground Protection**: a climber that offers good habitat for WRPs when grown thickly on a fence, can cover a 3 by 3 m area in two years, smothering smaller plants it is allowed to grow over, can grow high into trees, WRP are known to build nests within the densely vegetated areas of this climber when growing on fence lines or sheds.
Patersonia occidentalis	Purple Flag	Native	Grey-brown sand or sandy clay, red-brown clayey loam, gravel, laterite, ironstone, granite, limestone.	1.5 m		Yes (found in Endemic 2013, Ecoedge 2015, Ecosystem Solutions 2017).	Winter-wet areas, dunes, granite outcrops.	**Ground Protection**: WRP may utilise these species when on the ground for protection.

Reference List

1. Florabase.
2. Florabase, AMRS & NCMRR.
3. Florabase, AMRS & NCMRR.
4. Florabase, Wikipedia.
5. Ecoedge 2018 – EPBC Protected Matters (Threatened Flora) Survey & Habitat Assessment at South Capel, Ecosystem Solutions 2017 – Flora Investigations South Capel Site, Ecoedge 2015 - CDP Flora and Vegetation Survey, Endemic 2013 – South Capel Flora and Vegetation Assessment.
6. Florabase, Wikipedia.
7. AMRS & NCMRR, Wikipedia, Possum Centre, Shedley and Williams 2014.

2.4.4 Linkage

In addition to replacing WRP habitat cleared as part of the SCRP, the offset is designed to enhance linkages between existing habitat areas as shown in Figure 3.

The offset will enhance linkages between existing vegetation by providing continuity of WRP habitat between adjacent areas of suitable WRP habitat, as evidenced by:

- the Department of Parks and Wildlife publication (Shedley, E. & Williams, K., 2014[1]) and associated spatial files, which show that areas immediately adjacent to the South Capel controlled action area on both the west and east side are considered to be of value to WRPs;
- the survey by Harewood (2018b) which found both dreys and WRPs located on the edges of the SCRP disturbance boundary at South Capel where it is likely that the WRPs are utilising the adjacent remnant vegetation where it provides suitable habitat; and
- mapped vegetation adjacent to the disturbance area by Endemic (2013) identified several units that contain species known to be preferred by WRPs (Coastal peppermint, coastal peppermint-tuart, jarrah-marri associations, sheoak woodland, and eucalypt woodland and mallee as outlined by Harewood (2018a and 2018b)), including:
  - EmBaAf – contains Jarrah and *Agonis flexuosa*;
  - EmBa – contains Jarrah;
  - CcEm – contains Jarrah-Marri association; and
  - Mp – the Mp unit directly north of the EmBaAf unit contains a patch of *Agonis flexuosa* (Endemic 2013).

2.4.5 Method

Iluka has over 40 years' experience in mine site rehabilitation and has the required resources available to undertake the rehabilitation, with activities including:

- replacement of topsoil;
- ripping the soil generally along the contour in meandering rows;
- planting and fertilisation of tube stock;
- fencing and gates to reduce grazing pressure while plants establish;
- infill planting as required;
- weed control as required; and
- rehabilitation vegetation monitoring.

Rehabilitation of the WRP offset area will be designed to ensure continuity of canopy cover from mature trees whilst providing space for vehicles to move through the area for monitoring and maintenance activities.

Once remediation and earthworks are complete with the final landform achieved, the rehabilitation works will commence and are likely to be comprised of the following:

[1] Can be found at:
https://www.dpaw.wa.gov.au/images/shedley_and_williams_2014_an_assessment_of_habitat_for_western_ringtail_possum_on_the_southern_swan_coastal_plain_-_binningup_to_dunsborough._department_of_parks_and_wildlife.pdf

- surface treatment and erosion prevention measures – the area will be deep ripped to function as interceptor and water harvesting banks across the slope;
- mulching – due to mining methods at the time of mining South Capel, topsoil was not stockpiled. A surface treatment of 25mm thick compost and mulch will be sourced locally to ensure adequate organic nutrient availability, protection from wind damage and improving moisture retention. The 90% mulch to 10% compost ratio will have a mineral fertiliser / microbial blend to encourage successful plant establishment and growth;
- fencing – this will be erected prior to planting to prevent grazing of the seedlings;
- species selection and sourcing – species listed in Table 4 are available locally;
- planting – planting will be timed as much as possible after sufficient rainfall and predictable follow up rain;
- weed control – weeds will be sprayed annually and declared weeds removed or treated;
- dieback hygiene measures – prior to entering site, all machinery will be clean of any potential pathogens and monitored for any incursion;
- monitoring set up – 10m x 10m quadrats will be established as per completion criteria (see Table 5).

2.4.6 Standards to be met (completion criteria), management and monitoring

Standards assist in being able to measure whether the offset is providing the desired WRP habitat features to enable return of WRPs to the area. The standards to be achieved are outlined in Table 5, along with the active management and monitoring of the site proposed to provide confidence in a successful outcome.

Table 5 Standards to be met (completion criteria) for the WRP offset area

Standard (Completion Criteria)	Monitoring (method, frequency)	Timing	Threshold triggers and remedial actions	Evidence to demonstrate completion
CC01: No declared weeds present in revegatation.	Visual inpsection for weeds bi-annually to identify declared weeds.	By 10 years post planting	Any declared weeds will be removed or treated.	Visual inpsection at completion to verify absence of declared weeds. Third party report by suitably qualified professional verifying completion criteria have been met.
CC02: Weed cover is less than 20% at completion.	Spring survey year 1, 2, 3, 5, 7 and 10 post planting. A minimum of ten 10x10m quadrats will be established.	By 10 years post planting	Weeds will be sprayed annually irrespective of percentage cover observed in monitoring.	Third party report by suitably qualified professional verifying completion criteria have been met.
CC03: A minimum of 15 species will be selected from Table 4 (WRP habitat/foraging species) and established in revegetation prior to completion and will include at least: - 5 species that provide foraging value - 5 species that provide canopy value - 5 species that provide understorey value *(note that one species can rpovide more than one value).*	Spring survey year 1, 2, 3, 5, 7 and 10 post planting. A minimum of ten 10x10m quadrats will be established.	By 10 years post planting	Infill planting will be conducted if scheduled monitoring shows minimum standard has not been met.	Third party report by suitably qualified professional verifying completion criteria have been met.
CC04: A density of 800 stems per hectare of species contributing to canopy (trees and shrubs) will be established at completion.	Spring survey year 1, 2, 3, 5, 7 and 10 post planting. A minimum of ten 10x10m quadrats will be established.	By 10 years post planting	Infill planting will be conducted if scheduled monitoring shows minimum standard has not been met.	Third party report by suitably qualified professional verifying completion criteria have been met.
CC05: No areas greater than 250m^2 without a developing understorey (foliage cover between 1-50cm height) at completion.	Spring survey year 1, 2, 3, 5, 7 and 10 post planting. A minimum of ten 10x10m quadrats will be established.	By 10 years post planting	Infill planting will be conducted if scheduled monitoring shows minimum standard has not been met.	Third party report by suitably qualified professional verifying completion criteria have been met.

Standard (Completion Criteria)	Monitoring (method, frequency)	Timing	Threshold triggers and remedial actions	Evidence to demonstrate completion
CC06: A minimum of 30% cover by species contributing to canopy (trees and shrubs) will be established in revegetation at completion.	Spring survey year 1, 2, 3, 5, 7 and 10 post planting. A minimum of ten 10x10m quadrats will be established.	By 10 years post planting	Infill planting will be conducted if scheduled monitoring shows minimum standard has not been met.	Third party report by suitably qualified professional verifying completion criteria have been met.
CC07: A perpetual covenant will be established two years prior to completion.	n/a	By 8 years post planting	n/a	Conservation covenant will be registered on the freehold title at time of completion.

2.4.7 Implementation of the Offsets Assessment Guide

The EPBC Act Offsets Assessment Guide (DSEWPC 2012a), also known as the offset calculator, was used to assess the suitability of the offset proposed. The *How to use the Offsets Assessment Guide* (Australian Government, 2014) was also used as a reference to ensure inputs to the offset calculator were appropriate. This ensures that the proposed offset correlates to, and adequately compensates for, the impacts to the EPBC listed species.

2.4.8 Calculator inputs

Table 6 and Table 7 below outline the inputs to the offset calculator and the factors taken into consideration when determining these inputs. The *How to use the offsets assessment guide* was used to identify the relevant factors to be considered when populating the calculator, in particular, Figure 2 “Key considerations in determining the quality of habitat”. This figure outlines the characteristics to be considered when scoring habitat quality and include the following:

1. Site Condition
    a. What is the structure and condition of the vegetation?
    b. What is the diversity of relevant habitat species present (including both endemic and non-endemic)?
    c. What relevant habitat features are on the site?
2. Site Context
    a. What is the connectivity with other suitable/known habitat or remnants?
    b. What is the importance of the site in relation to the overall species population or the occurrence of the community?
    c. What threats occur on or near site?
3. Species Stocking Rate
    a. What is the presence of the species on the site? (i.e. confirmed/modelled)
    b. What is the density of species known to utilise the site?
    c. What is the role of the site population in regards to the overall species population?

Iluka has considered all these factors when scoring habitat quality for input to the calculator.

Iluka has extensive experience in rehabilitation and revegetation based on over 40 years of mining in the southwest. Iluka has a dedicated team of rehabilitation experts ranging from native vegetation research scientists to on-ground technicians who have been involved in rehabilitation of farmland, nature reserves, State Forest and ecological linkages. In the southwest of Western Australia, Iluka has recently undertaken revegetation of 12 ha on the Whicher Scarp at its rehabilitated Yoganup mine site which provides an ecological linkage between State Forest 28 and a TEC on (formerly) Iluka-owned land (Yoganup Native Vegetation Linkage project). This project was an offset requirement for the Tutunup South mine and was a finalist for the Golden Gecko award in 2016 due to Iluka developing and implementing innovative rehabilitation techniques, setting a new standard for the industry.

Table 6 Impact Calculator Inputs

Impact Calculator Item	Calculator Input	Factors Considered/Justification
Area of habitat to be impacted	8.44 ha	Area defined by the minimum remediation extent required to address contamination related risks

Quality (0 to 10)	4	The impacted sites are Contaminated Sites (classified as Contaminated – Remediation Required under the *Contaminated Sites Act 2003*). They are currently highly degraded, consisting of exposed by-product dams that have planted and recolonised patchy regrowth vegetation growing in and around them. The by-product materials, if left unabated, pose a potential risk to the wider environment.
		
		Site Condition
		Structure and condition of the vegetation:
		- CDP vegetation condition mapping (Completely degraded non-endemic species) (Ecoedge 2015; Harewood 2018a)
		- South Capel vegetation condition mapping (degraded to completely degraded, mostly non-endemic species) (Endemic 2013; Harewood 2018b)
		- CDP habitat quality (poor) (Harewood, 2018a)
		- South Capel habitat quality (very poor) (Harewood, 2018b)
		- both sites highly degraded due to previous disturbance (Harewood 2018a and 2018b) and contamination. Areas within controlled action area have previously been completely cleared
		Diversity of relevant habitat species present:
		- three habitat types were described at CDP (Harewood 2018a) and six habitat types were described at South Capel by Harewood (2018b)
		Relevant habitat features on site:
		- both sites contain small patches of habitat within the disturbance area with reasonably dense midstorey vegetation largely represented by planted non-endemic plant species (Harewood 2018 a and 2018b)
		- DBCA WRP Habitat Suitability Mapping of impact areas (“Low suitability” to “Unsuitable” (Shedley and Williams (2014), including supporting GIS files)
		Site Context
		Connectivity to surrounding habitat:
		- CDP area relatively small and isolated (Harewood 2018a)
		- tenuous link along Gavins Road at CDP to rail reserve to the east (Harewood 2018a)
		- very small areas on eastern side of HRCF Extension and small patch at northern extent of controlled action area at South Capel as mapped by Harewood (2018b)
		- habitat fragmented/patchy (Harewood 2018a and 2018b)
		Importance of the site in relation to the overall species population or occurrence of the community:
		- habitat category – “supporting habitat” as described in the Significant Impact Guidelines for WRPs (DEWHA 2009b)
		- connectivity to adjacent habitat:
		  - CDP area relatively small and isolated (Harewood 2018a)
		  - tenuous link along Gavins Road at CDP to rail reserve to the east (Harewood 2018a)
		  - very small areas on eastern side of HRCF Extension and small patch at northern extent of controlled action area at South Capel as mapped by Harewood (2018b)
		- habitat fragmented/patchy (Harewood 2018a and 2018b)

Impact Calculator Item	Calculator Input	Factors Considered/Justification
		Threats on or near site: - introduced predators assumed present – foxes and feral cats **Species Stocking Rate** Presence of species on the sites: - confirmed at both sites (Harewood 2018a and 2018b) Density of species within the site: - CDP– medium (Harewood 2018a) - South Capel– very low (Harewood 2018b) Role of the site population in regards to the overall species population: - both areas used by a relatively small number of WRPs (Harewood 2018a and 2018b) Based on the above considerations in assessing site condition, site context and species stocking rate, the habitat quality is considered to be low.
Total quantum of impact	2.53 ha	Adjusted hectares as per the offset calculator

Table 7 Offset Calculator Inputs

Impact Calculator Item	Calculator Input	Factors Considered/Justification
Adjusted hectares	2.53 ha	Adjusted hectares as per the offset calculator
Time over which loss is averted	20 years	The offset area will be placed under a conservation covenant and protected in perpetuity as described in Section 2.3.
Time until ecological benefit	12 years	2 years maximum between clearing and revegetation 10 - 15 years for the area to become suitable WRP habitat (*pers. comm*. G Harewood (fauna specialist) and DBCA) Realistic time until benefit chosen for input to calculator based on Iluka's extensive rehabilitation experience, benchmarking against other controlled actions and input from consultants
Start area	14.6 ha	Area of habitat to be created
Start quality (0 to 10)	0	The area to be revegetated will have no habitat present
Risk of loss without offset (%)	0%	N/A. Vegetation within bare or cleared areas will have already been lost. Advice received by the Department is that this aspect of the offset calculator is inappropriate for revegetation and 0% is the appropriate input (*pers. comm.* – **REDACTED**, 26/02/2019)
Risk of loss with offset (%)	10%	Considers risk of bushfire affecting the site
Future quality without offset (0 to 10)	0	Without revegetation of WRP habitat, the area will be returned to pasture as per the approved South Capel Closure Plan (2018)

Impact Calculator Item	Calculator Input	Factors Considered/Justification
Future quality with offset (0 to 10)	6	The offset areas will be remediated, with by-product removed and areas backfilled with suitable uncontaminated fill, providing a consolidated area to create WRP habitat. **Site Condition** Structure and condition of the vegetation: - species known to provide favourable structure (Harewood 2018a and 2018b) have been selected and, with fencing to exclude grazers, maintenance to control weeds and infill planting where required, are expected to thrive - vegetation expected to provide medium to good quality habitat for WRPs due to species selection providing continuous canopy cover, mid storey cover and understorey to provide refuge - contamination remediated Diversity of relevant habitat species present: - at least 15 suitable species will be planted within the offset area as per Section 2.4.3 and Table 4 Relevant habitat features on site: - connected canopy cover - understorey capable of providing refuge should WRPs head to the ground - connection to adjacent habitat as per Section 2.4.4 **Site Context** Connectivity to surrounding WRP habitat: - will increase as per Section 2.4.4 - habitat will be consolidated as much as possible, as opposed to current patchy habitat Importance of the site in relation to the overall species population or occurrence of the community: - habitat category – “supporting habitat” (DEWHA 2009b) - the site is expected to improve the availability, quality and connectivity of habitat for the species Threats on or near site: - predators may remain; however, connected canopy cover and dense understory are expected to provide protection for the WRPs in the long term **Species Stocking Rate:** Presence of species on the sites - WRPs are expected to repopulate the area once suitable Density of species within the site - expected to increase with increase in site condition, density of favourable species, consolidation of habitat and increased connectivity to adjacent habitat Role of the site population in regards to the overall species population - the species stocking rate is expected to increase and the offset area will provide an additional 14.6 ha of habitat for the overall species population

Impact Calculator Item	Calculator Input	Factors Considered/Justification
Confidence in result	90%	There is a high level of confidence in result due to Iluka's extensive experience with rehabilitation in the region (over 40 years) and internal expertise including native vegetation research scientists, rehabilitation specialists, environmental scientists and on-ground rehabilitation technicians. Where internal resources are not available, Iluka seeks assistance from appropriately qualified professionals, including fauna specialists. Recent rehabilitation of 12 ha of native vegetation at the Yoganup minesite has demonstrated Iluka's ability to achieve successful outcomes with regards to DoEE offset requirements (Tranen 2019). Iluka was a finalist in the Golden Gecko awards in 2016 for this project due to developing and implementing innovative rehabilitation techniques, setting a new standard for the industry. Ongoing maintenance and monitoring of the site will ensure actions are taken to increase confidence of success of rehabilitation efforts.

2.4.9 Reconciliation against the EPBC Act Environmental Offsets Policy

Detail regarding how the proposed offset package aligns with the EPBC Act Environmental Offsets Policy (DSEWPC 2012) is described in Table 8.

Table 8 Reconciliation against the EPBC Act Environmental Offsets Policy

Offset Principle (DSEWPC 2012)	Alignment of Offset with Principle
1. *Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action.*	The proposed offset package targets WRP habitat and results in: • The creation of new WRP habitat (approximately 14.6 ha) • An overall increase in the presence of WRP habitat in better condition to that cleared • Improved linkages between existing areas of WRP habitat • Consolidation of WRP habitat into a large area, as opposed to patchy habitat • The conservation in perpetuity of the WRP habitat through a conservation covenant as described in Section 2.3.
2. *Be built around direct offsets but may include other compensatory measures.*	The proposed offset package is comprised of 100% direct offsets.
3. *Be in proportion to the level of statutory protection that applies to the protected matter.*	The level of statutory protection (Critically Endangered) has been used for classifying the EPBC Act Status within the Offsets Assessment Guide (the offset calculator) (DSEWPC 2012a) (Appendix 2). The guide takes into consideration the level of statutory protection for the protected matter.
4. *Be of a size and scale proportionate to the residual impacts on the protected matter.*	The size and scale of the residual impact (adjusted hectares = 2.53 ha) has been accounted for when implementing the EPBC Act Offsets Assessment Guide (DSEWPC 2012a) (Appendix 2). The guide takes this into consideration for the protected matter. A total of 14.6 ha of WRP habitat will be created to offset the clearing of WRP habitat required to conduct remediation works. This is a ratio of approximately 1:5.8, adjusted impact area to offset area ratio. Using the EPBC Act Offsets Assessment Guide, it is considered the proposed offset is proportionate to the final residual impact.
5. *Effectively account for and manage the risks of the offset not succeeding.*	An adaptive management approach will be implemented to evaluate the effectiveness of the offset and whether the offset requirements have been achieved. Actions will be undertaken as required to ensure success as outlined in Table 5.
6. *Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action)*	The tenure of the proposed offset areas is described in Section 2.4.2. The proposed offset strategies are additional to any other requirements as the current plan for the offset site is to return it to the pre-mining land use of agriculture.

Offset Principle (DSEWPC 2012)	Alignment of Offset with Principle
7. *Be efficient, effective, timely, transparent, scientifically robust and reasonable.*	The proposed offset package is described in Section 2.4 and is designed to be efficient, effective, timely, transparent, scientifically robust and reasonable. **Efficient and Timely** Commencement of revegetation of WRP habitat will be efficient and timely as it will occur during the first Autumn following remediation and final landform development, reducing the time between clearing and habitat recreation. This will occur during one autumn season, expected to be around 2 months. **Effective** Monitoring of the site will assess progress and identify any rectification works such as infill planting or weed control, for example, to ensure the offset is effective. Species selected have been confirmed as suitable by Harewood (*pers. comm.* 12/12/2018), available literature and by identifying species currently in use by WRPs within the disturbance footprint. **Transparent** Approvals documents will be publicly available and monitoring will occur to demonstrate effectiveness. As the offset will also be required under the EP Act, they will be listed on the publically available WA Environmental Offsets Register, providing transparency. **Scientifically Robust** The proposed revegetation of WRP habitat is considered to be scientifically robust and effective in increasing the area of habitat as well as improving linkages with adjacent habitat, addressing the key threatening processes for WRPs as outlined in the Recovery Plan for the species. Species to be used provide canopy, foraging and/or ground protection functions for WRPs and are suitable for the site. **Reasonable** The proposed offset is reasonable as determined by the offset calculator.
8. *Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.*	Iluka recognise that governance arrangements will be set by the Department of the Environment and Energy. Iluka has environmental management systems in place which allow for monitoring, measurement, auditing, inspections, reporting, checking and review.

2.4.10 Alignment with State Offset Requirements

Clearing permits under Part V of the *Environmental Protection Act 1986* (WA) are required for the SCRP as follows:

- Capel Dry Plant Clearing Permit (CPS 8066/1) – assessed by DWER; and
- South Capel Clearing Permit (CPS 8092/1) – assessed by Department of Mines, Industry Regulation and Safety (DMIRS).

The offset proposal outlined in this section has been developed in consultation with both Commonwealth (DoEE) and State (DWER and DMIRS) agencies to ensure alignment. The offsets proposed in this document are also proposed to ensure offset requirements are met for the State clearing permits.

This is consistent with the WA Environmental Offsets Policy (2011) which states that *"The Western Australian Government will endeavour to work cooperatively with the Australian Government to avoid duplication of offsets, however, this may not be possible where a proposal or action is not jointly assessed under a bilateral agreement or a strategic assessment. It is intended that as far as possible there will be minimal duplication between State and Commonwealth requirements for environmental offsets".*

3 Threat Abatement Plans and Recovery Plans

3.1 Threat Abatement Plans

Table 9 provides an assessment of consistency of the SCRP with the Threat Abatement Plans identified by the Department within the Preliminary Documentation advice (as outlined in Item 3 in Table 1 above). The Threat Abatement Plans identify management measures, objectives and actions relating to each threat.

Table 9 Consistency with Threat Abatement Plans

Threat Abatement Plan	Consistent Actions
Phytophthora cinnamomi - Dieback	The SCRP is not expected to increase the risk of dieback. Earthmoving machinery and other vehicles will be required to remain within disturbed areas and existing tracks and will be required to undergo weed and seed inspections prior to mobilisation to site. Revegetation within the offset area will include dieback-resistant species.
Feral Cats	The SCRP is not expected to increase the presence of feral cats.
Rabbits	The SCRP is not expected to increase the presence of rabbits. Remediation/excavation works have the potential to remove rabbit warrens.
European Red Fox	The SCRP is not expected to increase the presence of foxes.

3.2 Recovery Plans

Of the list of Recovery Plans provided by the Department as outlined in Item 3 of Table 1 above, only the WRP (*Pseudocheirus occidentalis*) Recovery Plan (DPaW 2014) is relevant to the SCRP. The WRP Recovery Plan and the recovery action items listed in Section 12 of the Plan are generally targeted for relevant government departments. However, the following are relevant to the SCRP:

- long term goal (Section 12.1 of the Recovery Plan):
  - To ensure that the threatening processes do not compromise the ongoing viability of the WRP.
- Objective 2 of the plan (Section 12.1 of the Recovery Plan):
  - To mitigate threatening processes constraining the recovery of WRPs.

Key threatening processes relevant to the SCRP include habitat loss and fragmentation, and predation. Through revegetation of WRP habitat, there will be a long term net gain of WRP habitat resulting from the SCRP. The offset area at South Capel will replace WRP habitat cleared as part of the SCRP, and there is not expected to be any long term compromise to the ongoing viability of the WRP resulting from the SCRP. In addition, the offset will enhance linkages between existing habitat patches (see Section 2.4.4). Species to be planted as outlined in Section 2.4.3 will also ensure continuity of canopy cover and understorey to provide protection from predators.

4 Conservation Advices

4.1 Listed flora species

As the targeted flora survey conducted by Ecoedge (2018) did not find any listed species, the listed conservation advices for flora species supplied by the Department (Item 4 in Table 1 above) are not relevant to the SCRP and will not be discussed further.

4.2 Listed fauna species

The 'Conservation Advice for *Pseudocheirus occidentalis* Western Ringtail Possum' (Threatened Species Scientific Committee 2018) is a relevant conservation advice for the SCRP. It includes an outline of key threats to the species, research priorities, regional priority actions and local priority actions. Of relevance to the SCRP are the key threats of habitat loss and fragmentation, and predation.

The SCRP will result in a temporary loss of habitat at both CDP and South Capel. This results in a direct loss of habitat and the possibility of increased risk of predation if WRPs traverse the ground post clearing.

Once remediation of the areas has been completed, revegetation of WRP habitat will occur at South Capel that replaces habitat cleared and enhances linkages between existing habitat patches. Planting density will provide a continuous canopy cover to minimise exposure of WRPs to predators.

Providing habitat for WRPs that ensures continuity of canopy cover and linkages between other habitat patches is directly relevant to the regional priority action to re-create, retain and improve habitat characteristics, including corridors. In addition, it is also relevant to the following Local Priority Actions as stated in the Conservation Advice (Threatened Species Scientific Committee 2014):

- "retain and plant peppermint (*Agonis flexuosa*) trees":

  peppermint trees will be included in the species planted during revegetation works;

- "suitably control and manage access on private land and other land tenure":

  as private land and a site undergoing rehabilitation, access to the area is restricted via fencing and locked gates;

- 'minimise adverse impacts from land use at known sites. Minimise the impact of land developments through in-situ conservation":

  as outlined in Section 2.2, where possible and approved by DBCA, WRPs will be left in-situ within vegetation that will not be cleared. WRPs within the disturbance footprint will be relocated to nearby or other suitable areas following receipt of the required Fauna Taking (Relocation) Licences from DBCA.

5 Economic and social matters

5.1 Social and economic costs and benefits

Employment benefits are based on predicted manning levels as provided by the proposed execution contractor as per their submitted tender offer and Iluka's own workforce projections.

Social and environmental benefits are estimated based upon the specific project objectives to remove unacceptable risks to the environment.

The SCRP is expected to provide employment opportunities for up to 44 people across the duration of the project as provided in Table 10 below.

Table 10 Anticipated Workforce Requirements

Workforce by Category	Anticipated Workforce Requirement (people)
Iluka personnel	5
Subcontractors	35
Subconsultants	4
Total workforce	**44**
Workforce by Operations Role	
Iluka project personnel	5
Project Management / foremen / surveyors	5
Plant operators	25
Ancilliary	5
Auditors and assistants	4
Total workforce	**44**

5.2 Benefits to the local and wider community

The SCRP is specifically seeking to protect the environment in the form of groundwater and nearby watercourses and associated ecosystems. Execution of the project will enable groundwater quality to recover to acceptable levels, thereby affording a suitable level of environmental protection, and amenity for the local community.

Similarly, the successful management of environmental risks and the significant step the SCRP takes the sites towards eventual closure and potential beneficial re-use will create a positive impact on the wider community.

The overall socio-economic impact of the SCRP on revenue generation and the community are considered positive (see Section 5.3 for consultation undertaken). Whilst the SCRP is not income generating from Iluka's standpoint, the indirect impact through purchase of local goods and services for the duration of the SCRP will positively impact the Capel community.

5.3 Consultation

For the purposes of the SCRP, relevant stakeholders have been identified as follows:

- private home / landowners;
- educational establishments;
- government agencies and authorities;

- regulatory authorities; and
- wider community.

Engagement with each stakeholder group is discussed below.

Private Landowners/ Residents

Iluka has undertaken engagement with the owners of private property in the area surrounding the CDP and South Capel site, suspected of being impacted by groundwater contamination. Initial engagement on this matter dates back to 2007 when property owners were first contacted by Iluka in advance of the CDP being formally reported under the *Contaminated Sites Act 2003*, with more intensive engagement being undertaken since 2017 as the project entered design and planning stages. To date, there has been no community opposition to the SCRP and communications are considered positive.

In July 2017, in advance of the groundwater monitoring well installation program in Capel, the current owners of those same properties (approximately 100 parties) were contacted through one or more of the following mechanisms:

1. direct conversations at the property owner's residence, with supporting factsheet;
2. formal letter and factsheet mailed to those unable to be met in person (e.g. away on holidays); and
3. community information session – 18 July 2017 (advertised through social and print media).

An example factsheet is provided in Appendix 3.

Engagement comprised setting out the risks concerning groundwater contamination, and the broad program of works that Iluka was taking to address such risks comprising:

- drilling programme;
- remediation design and approvals; and
- project execution.

Further engagement including email updates and a community drop-in/information session in 2018 was undertaken. The community session concentrated upon the planned remediation works, traffic, noise, and environmental management and mitigation measures. Iluka maintains an electronic mail list of interested parties for the provision of project updates, including, most recently, the delay of planned commencement of the project into 2019.

Government Agencies and Authorities

Due to the indiscrete nature of groundwater contamination, off-site contamination may pass beneath a number of different land parcels and ownerships (in brackets) including:

- Shire roads and major trunk roads / highways (Shire of Capel and Main Roads WA respectively);
- railway reserves (Public Transport Authority);
- vacant or unallocated crown land (Shire of Capel);
- Nature Reserve (Department of Biodiversity, Conservation and Attractions – Parks and Wildlife Service); and
- utility easements (e.g. Western Power, Telstra, ATCO).

Initial consultation with relevant agencies was undertaken at the time of reporting of sites under the *Contaminated Sites Act 2003* in 2007 and subsequently on an ad-hoc basis as either Iluka or agency engineering works have been planned and carried out in the local area. In all cases given the issue relates to groundwater and does not pose an occupational health risk to workers, stakeholders have not raised any concerns or issues other than expressing a wish to be kept informed of major developments at the appropriate times.

Approving Agencies

In addition to approval under the EPBC Act, Table 11 outlines the state environmental approvals being sought for the SCRP where consultation is ongoing with the relevant agencies with regards to the project.

Table 11 State Approvals sought for the SCRP

Legislation	Approving Agency	Approval
Mining Act 1978	Department of Industry Resources and Safety (DMIRS)	Mining Proposal – South Capel **(approved)** Mine Closure Plan – South Capel **(approved)**
Mine Safety and Inspection Regulations 1995	DMIRS Radiological Council of Western Australia (RCWA)	Radiation Management Plan Amendment **(approved)**
Environmental Protection Act 1986	Department of Water and Environmental Regulation (DWER)	Works Approval – South Capel **(approved)** Native Vegetation Clearing Permit – CDP **(under assessment)**
	DMIRS	Native Vegetation Clearing Permit – South Capel **(under assessment)**
Contaminated Sites Act 2003	DWER	Remedial Action Plan **(approved)**
Biodiversity Conservation Act 2016	DBCA	Licence to Take Fauna (for relocation) **(application yet to be submitted)**

Initial engagement in respect of the project was with DWER Contaminated Sites Branch, as the lead regulator, with additional discussions / meetings by individual project team members with DWER Licensing, DMIRS, and the RCWA to scope out the required approvals for the project and discuss any concerns.

Additional formal consultation was undertaken with DWER Licencing and Contaminated sites branches, including a site visit, in May 2018 in anticipation of the various approval submissions. Other formal consultation was undertaken with DMIRS and RCWA in Quarter 2 2018, also regarding approval submissions.

A meeting was held with DMIRS in August 2018 to outline the project and discuss the clearing permit. Discussions were held over the phone with DWER regarding the clearing permit in October 2018 and December 2018. A meeting was held with DWER in September 2018 to discuss the works approval and licencing process with ongoing communication in December 2018 and February 2019.

In January and February 2019, several meetings were held with the Department, DWER and DMIRS regarding WRP offsets and to ensure the requirement for these were aligned between the Commonwealth and State agencies. Significant consultation was subsequently held over the following months to ensure the offsets provided met the requirements of all agencies.

Iluka is continuing consultation with DBCA regarding the relocation of possums and other fauna within the project footprint. Iluka will apply for a Fauna Taking (Relocation) Licence from DBCA prior to relocating fauna ahead of clearing. Initial consultation began in 2018 and is ongoing.

Wider Community

A project specific email address southcapel@iluka.com and enquiry number 1800 339 997 has been established to ensure an avenue for all enquiries, even those where direct contact with project personnel has not been made.

Iluka is seeking to ensure that project engagement with the community is not simply limited to those who own or occupy properties potentially above contaminated groundwater in Capel or South Capel.

Significant engagement efforts associated with the remediation of source material at CDP, destined for South Capel were undertaken in 2017 in the town of Capel. This included social media messaging, direct engagement at individual residences and an advertised drop-in information session hosted in Iluka's Capel office. Iluka also met with the State Member of Parliament, and presented to the Shire of Capel Councillors and senior staff.

A further community information day was held on 11 June 2018 which gave an update on the proposed design and selection of the remediation approach at both CDP and the South Capel sites, and detailed how Iluka are proposing to implement the remediation. The community information day was a drop-in set-up at the Iluka Capel offices and included access to currently prepared reports pertaining to the remediation, aerial photographs and drone footage. The community was invited to look at the various aspects of remediation design and have an opportunity to provide feedback. Community consulted included local residents, local members and the nearby school (to Capel).

Engagement focussed upon Iluka's proposed approach to managing potential impacts to the community, particularly in respect of nuisance (noise, traffic and dust) as well as explaining the reason for the project and its benefit to the protection of the wider environment. Table 12 below summarises recent stakeholder engagement.

Table 12 Summary of Recent Project Stakeholder Engagement

Stakeholder Type	Potentially Affected Site	Feedback	Iluka Response (in addition to provision of Fact Sheet)
John Calvin Christian College	Yes	• No issues with proposed traffic impact and operational hours. No specific haulage curfews required.	• Maintain engagement and ensure easy and open communication throughout project execution.
Private landowners	Yes	• Generally receptive to Iluka proactively engaging prior to the works, and providing a communication route for residents; • Some concerns in respect of house price values and potential for blight; • Questions raised regarding wider closure of the sites and potential future uses.	• Commit to future engagement upon completion of remediation design, prior to implementation. Obtain contact details for communication. • Offer of technical support in the event of sale of property to ensure appropriate communication of the project to potential future owners / purchasers. • Feedback provided regarding cessation of operations on site and longer-term demolition of the site.
Shire of Capel	Yes	• Understanding the wider project and wanting to be kept informed of Iluka's community engagement. • Happy to support Iluka's communications through its own social media avenues, although not detracting from Iluka being responsible for the project and its success.	• Maintain engagement with elected Councillors and staff generally, but also specifically with respect to traffic planning.

Stakeholder Type	Potentially Affected Site	Feedback	Iluka Response (in addition to provision of Fact Sheet)
Western Power	Yes	• Receptive to engagement, no concerns once issue established as one affecting groundwater and not anything near surface, relevant to worker safety.	• Ongoing engagement at significant project milestones.
Public Transport Authority	Yes	• Receptive to engagement, no concerns in respect of groundwater contamination.	• Ongoing engagement at significant project milestones • Separately engaging in respect of potential surface contamination of railway reserves.
Main Roads WA	Yes	• Receptive to engagement, no concerns once issue established as one affecting groundwater and not anything near surface, relevant to worker safety. • Supplementary engagement ongoing to establish traffic management plan for safe execution of the works in relation to transportation of materials from CDP to SC.	• Ongoing engagement at significant project milestones, and also in respect of traffic management planning.
DBCA / Department of Parks and Wildlife	Yes	• Receptive to engagement, no concerns in respect of groundwater contamination	• Ongoing engagement at significant project milestones. Otherwise more detailed engagement will be required prior to site closure.
State Member of Parliament	No	• Receptive to engagement. No immediate concerns provided Iluka is proactively engaging with the community	• Provide project updates at appropriate project milestones
DMIRS and DWER	No	• Extensive consultation with regards to clearing permits and offset requirements	• Development of offset proposal that meets federal and state requirements

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Figures

Figure 1: South Capel Remediation Project Controlled Action Area

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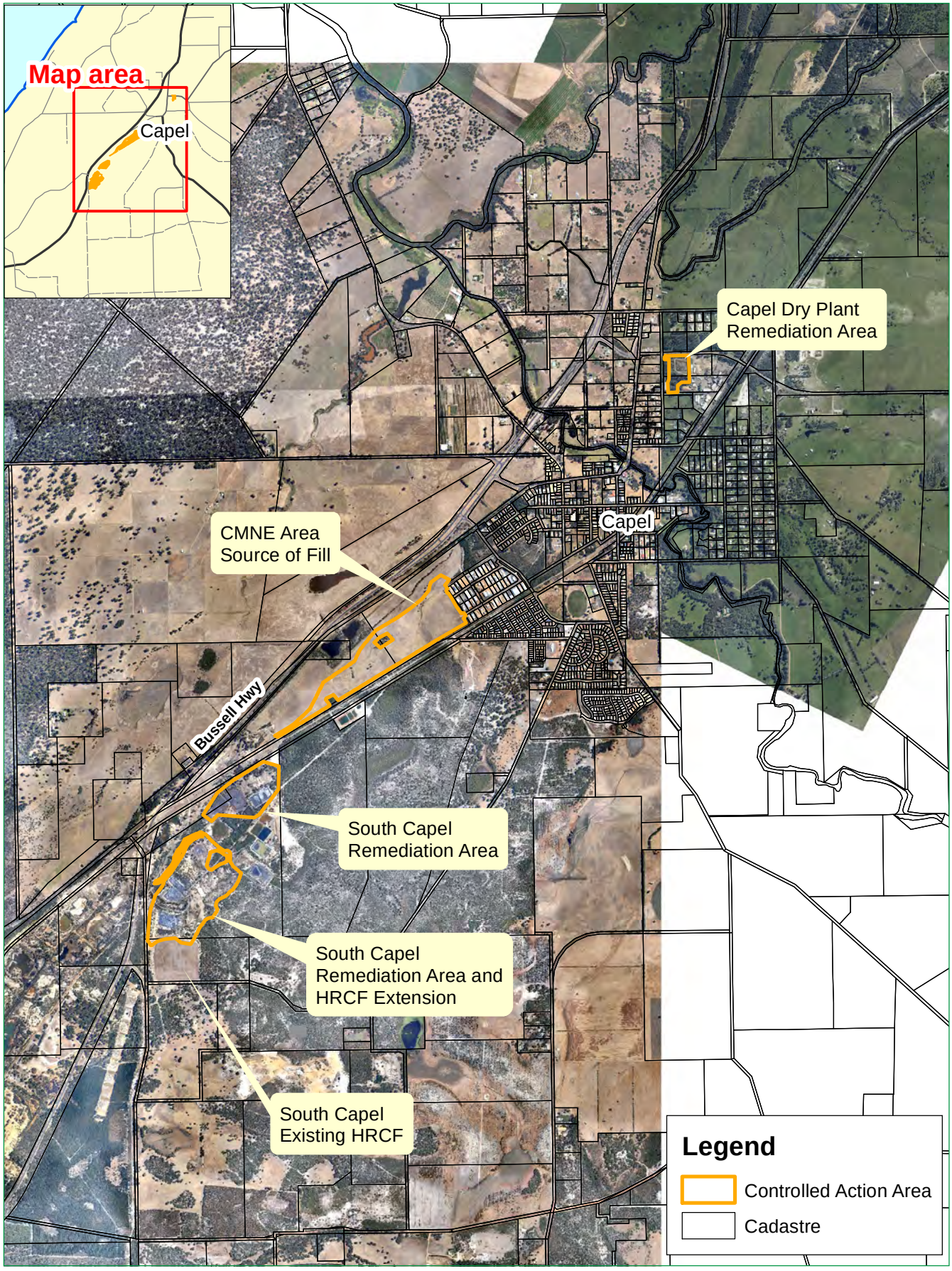

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Aerial Photograph: 2018

SOUTH CAPEL REMEDIATION PROJECT

Controlled Action Area

ILUKA

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FIGURE: 1

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Figure 2: South Capel Offset Area

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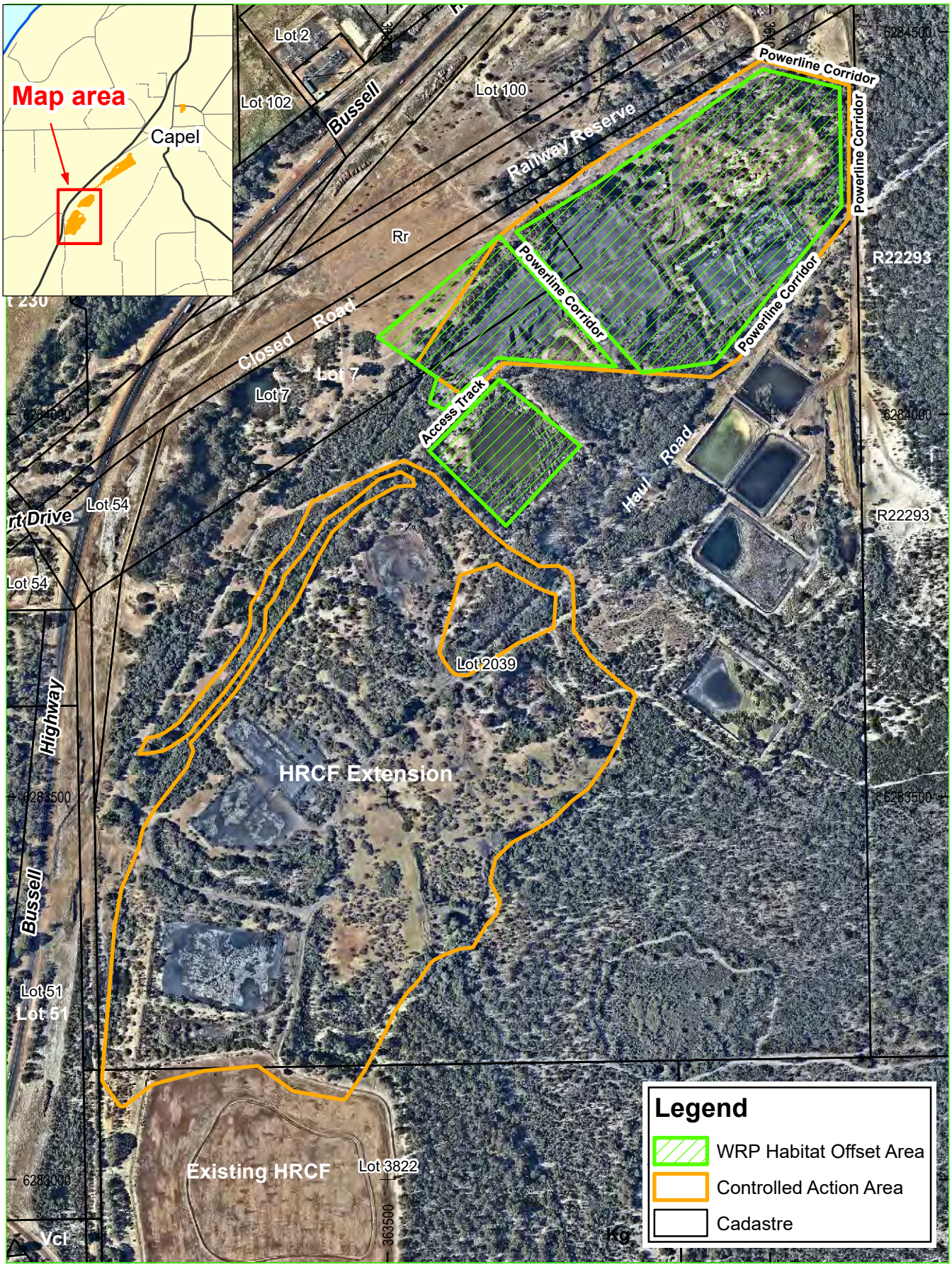

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Aerial Photograph: 2018

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MGA Coordinates, GDA94

SOUTH CAPEL REMEDIATION PROJECT

WRP HABITAT OFFSET AREA

ILUKA

ORIG: K.Tedesco DRAWN: K. Tedesco SCALE: 1:7,000 (A4) DATE: 15/05/2019 DWG No: SCRP_PDfinal_Fig2.mxd

FIGURE: 2

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Figure 3: WRP Habitat Offset Area Linkage to Surrounding Habitat

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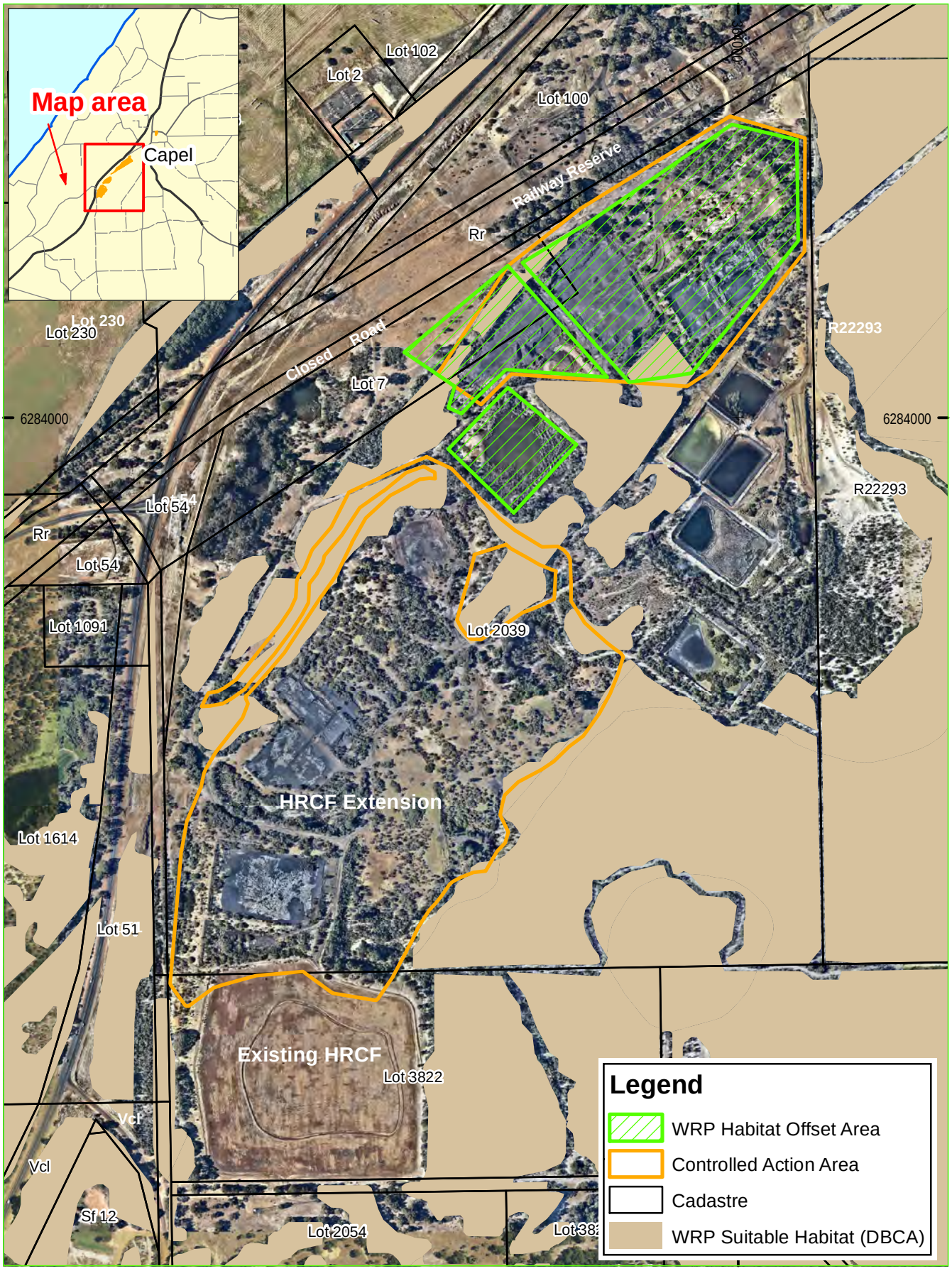

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Aerial Photograph: 2018

0 0.25 Kilometers

MGA Coordinates, GDA94

SOUTH CAPEL REMEDIATION PROJECT

WRP HABITAT OFFSET AREA
LINKAGE TO SURROUNDING HABITAT

ILUKA

ORIG: K.Tedesco DRAWN: K. Tedesco SCALE: 1:8,254 (A4) DATE: 15/05/2019 DWG No: SCRP_PDfinal_Fig3.mxd

FIGURE: 3

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Appendices

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Appendix 1: Targeted Flora and Habitat Survey

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EPBC Act Protected Matters (Threatened Flora) Survey and Habitat Assessment at South Capel

Prepared for Iluka Resources Limited

November 2018

Ecoedge

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enquiries@ecoedge.com.au

Cover images:

Left: Edge of the disturbance footprint near the south eastern corner of Survey Site 3. Image N McQuoid.

Centre: Wetland with *Eucalyptus rudis* trees in the centre north of Survey Site 3. Image N McQuoid.

Right: Constructed drain with introduced Eucalyptus camaldulensis on the western side of Survey Site 2.

Version	Origin	Review	Review date	Ecoedge release approval	Issue date
V1	N. McQuoid	M. Portman	08/11/2018		
V2	M. Portman	N. McQuoid	09/11/2018		
Final Draft	M. Portman	A. Bishop, K. Tedesco (Iluka)	04/12/2018	M. Portman	12/11/2018
Final	M. Portman			M. Portman	05/12/2018

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Statement of limitations

Reliance on Data

In the preparation of this report, Ecoedge has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Unless stated otherwise in the report, Ecoedge has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Ecoedge will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to Ecoedge.

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1 Introduction

Ecoedge was engaged by Iluka Resources Limited (Iluka) in September 2018 to undertake a habitat assessment and targeted search for Matters of National Environmental Significance (MNES) Threatened Flora under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Australian Government 2018) (**Appendix 1**), within three areas at South Capel (the Survey Sites) (**Figure 1**).

Iluka intends to clear three rehabilitated mining and processing areas east of Bussell Highway south of Capel for its South Capel Remediation Project. Iluka wishes to understand the status of habitats and/or occurrences of the MNES Threatened Flora (Australian Government 2018) at the three Survey Sites, as regenerating (i.e. naturally occurring) native flora have been recorded within the sites along with the planted exotic taxa that were used in the partial rehabilitation of the site (Mattiske and Bamford 1998; Mattiske 2010; Endemic 2013; A Riedmann Pers. comm.).

The survey was undertaken in accordance with the WA Environment Protection Authority (EPA) Technical Guidance (EPA 2016), and the Draft Survey Guidelines for Australia's Threatened Orchids (Commonwealth of Australia 2013).

This report compiles findings of the desktop study and field survey.

1.1 Scope of Works

A detailed scope of works was provided by Iluka for the survey, as follows:

- Flora assessment of Federally-listed Threatened Flora species that have the potential to occur within the nominated footprint and likelihood of occurrence of these species.
- Undertake targeted search for Federally-listed Threatened Flora species within the nominated footprint for South Capel.
- For Orchid species, ensure that the survey is undertaken in accordance with the Department of Environment and Energy (DoEE) document 'Survey Guidelines for Australia's Threatened Orchids; Guidelines for Detecting Orchids Listed as 'Threatened' Under the Environment Protection and Biodiversity Conservation Act 1999 to guide the survey. For example, using the random 'meander' method.
- Prepare a report that provides the outcomes of the survey for South Capel.

1.2 Site Location and Description

The habitat assessment and survey (disturbance footprint) area, situated immediately to the south of Capel townsite alongside Bussell Highway, is comprised of three Survey Sites totalling approximately 84 ha (**Figure 2**).

The Survey Sites comprise altered landforms as locations of previous mining and mineral processing activities, mining and processing by-products, administration buildings, constructed drainages and overburden deposits (A Riedmann pers. comm.) Some have been revegetated with principally exotic species, and the northern site is largely reconstructed farmland (A Riedmann pers. comm.). Some small fragments of original vegetation exist on the extremities of Survey Sites 2 and 3, and as one remnant on Survey Site 1 (**Figure 2**).

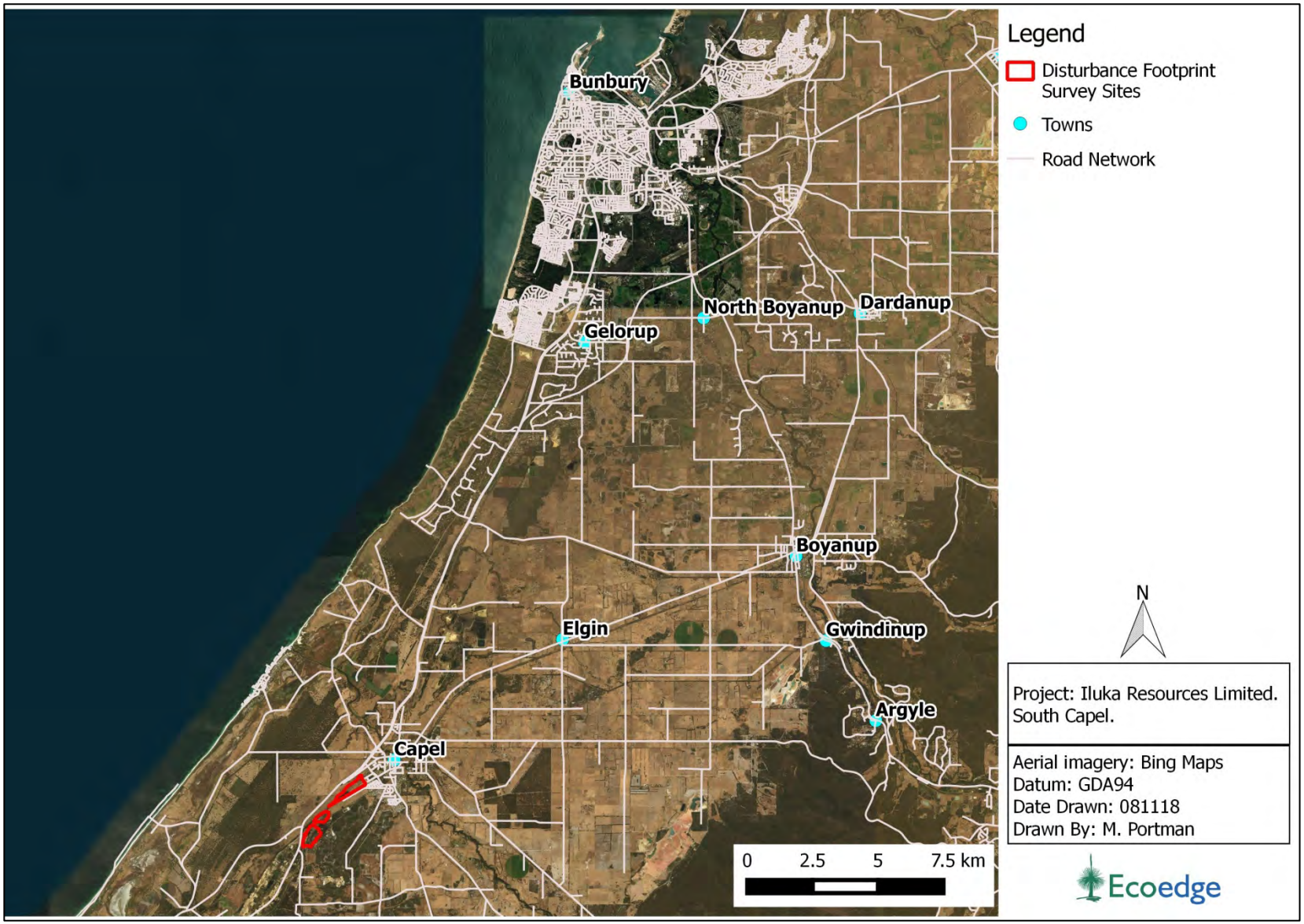

Figure 1. The South Capel disturbance footprint sites (Survey Sites) are located south of the Capel townsite.

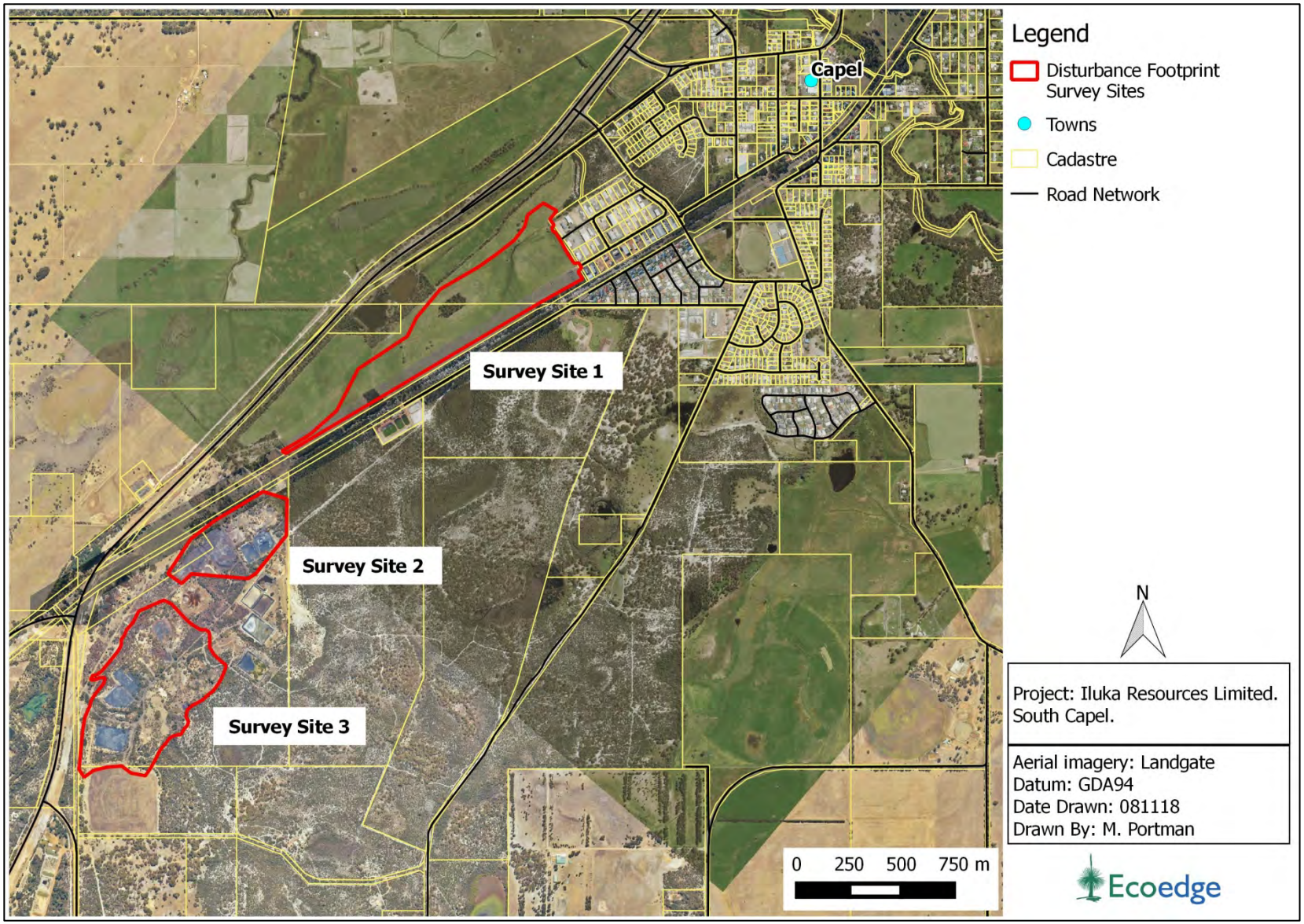

Figure 2. The South Capel disturbance footprint sites (Survey Sites).

2 Methods

2.1 Desktop Study

Prior to conducting the field habitat assessment and targeted flora survey, a 'desktop study' was carried out, which centred on species listed in the EPBC Act Protected Matters Search Tool (PMST) Report for Matters of National Environmental Significance (MNES) - Threatened Flora - in the area selected: a 5 km radius of the South Capel disturbance footprint sites (Australian Government 2018) (**Appendix 1**). The study also assessed the findings of previous flora surveys in the South Capel area (Mattiske and Bamford 1998; Mattiske 2010; Endemic 2013; Ecosystem Solutions 2017).

Locations of MNES Threatened Flora are known near the Survey Sites. These locations and their habitats were reviewed to determine habitat preferences, potential suitability of altered habitat and likelihood of occurrence at the South Capel Survey Sites.

Images of MNES Threatened Flora taxa not known to the botanists were examined to familiarise them with their morphological and other features to assist in their field identification for the survey. In addition, the following Recovery Plans and Conservation Advices were reviewed for descriptions of the species, their distribution and habitat:

- Swamp Honeypot - (*Banksia nivea* subsp. *uliginosa*) Recovery Plan
- Bussell's Spider Orchid (*Caladenia busselliana*) Recovery Plan
- Glossy-leafed Hammer Orchid (*Drakaea elastica*) Recovery Plan
- Approved Conservation Advice for *Chamelaucium* sp. S coastal plain (R.D. Royce 4872) (Royce's Waxflower)
- Approved Conservation Advice for *Diuris drummondii* (Tall Donkey Orchid)
- Approved Conservation Advice for *Diuris micrantha* (Dwarf Bee Orchid)
- Approved Conservation Advice for *Synaphea* sp. Fairbridge Farm (D. Papenfus 696) (Selena's Synaphea)
- Approved Conservation Advice for *Verticordia densiflora* var. *pedunculata* (Long-stalked Featherflower)

The specific habitat preferences of each of the above listed species were noted. This information was used to help guide the field survey.

2.2 Habitat Assessment and Targeted Flora Survey

The habitat assessment and targeted threatened flora survey was carried out during October 15 to 17 2018 over the three Survey Sites. The weather was fine and mild, with survey conditions ideal.

The assessment and survey utilised the grid search method by two botanists across the Survey Sites at approximate 20-metre spacings (**Figure 3**, **Appendix 2**). The habitat assessment considered the suitability of habitats based on soil type, position in landscape, landform and condition in determining a match for potentially suitable habitats for the threatened flora. The targeted threatened flora survey search was conducted with an emphasis on potentially suitable habitats to determine and identify presence/absence of listed MNES threatened flora.

The threatened flora survey was conducted in line with the Draft Survey Guidelines for Australia's Threatened Orchids, using a random 'meander' survey method to cover areas of potential habitat at the site to ascertain the presence of the target orchid species (Commonwealth of Australia 2013).

Two GPS Units were used, one by each botanist, to identify area boundaries, track grid patterns, record waypoints and track search movements (**Appendix 2**). Field notes were recorded of vegetation and flora at representative sites as relevé data, digital photographs of the relevé sites were taken, and sites recorded as GPS waypoints.

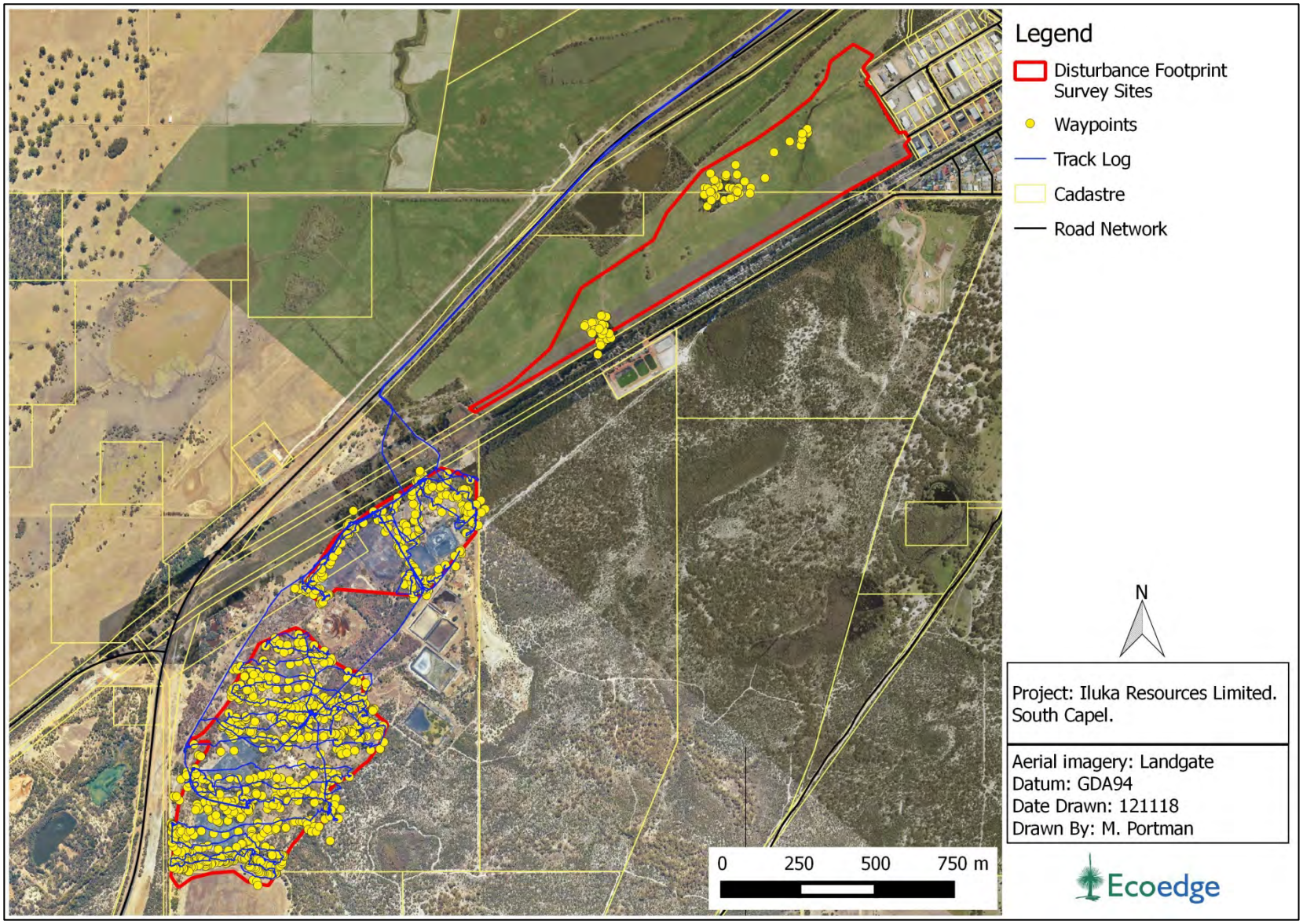

Figure 3. Track logs and waypoints generated during the field survey.

Relevé flora data was collected to record potential habitat indicator taxa should they be required and as a reference for the flora and vegetation composition, structure and condition at the relevé sites.

2.3 Survey Limitations

Limitations in regards to the survey are presented in **Table 1**.

Table 1. Limitations of the survey.

Aspect	Constraint	Comment
Scope	No	The survey scope was prepared in consultation with the relevant stakeholders and was designed to comply with requirements as stipulated by Iluka.
Access	No	All of the survey area was accessible on foot.
Proportion of flora identified	No	The survey area was searched thoroughly on foot.
Completeness of the survey	No	The 2018 spring season was ideal for the species because of relatively high winter rainfall. Rainfall over three winter months was slightly above average, and September was also above average.
Skill and knowledge of the botanists	Negligible	The senior field botanist conducting the survey has had extensive experience in botanical survey in southwest Australia over a period of 25 years, and the assisting botanist has an excellent knowledge of the flora of the district. Support was provided by additional skilled botanists with extensive knowledge of the southwest flora, including that of the immediate area.

3 Results

3.1 Desktop Study

The PMST report generated for the project identified 19 Taxa possibly occurring or with habitat possibly occurring within a five km radius of the South Capel Survey Sites (Australian Government 2018) (**Table 2**; **Appendix 1**).

Table 2. MNES Threatened Flora and habitat likelihood within a five km radius of the South Capel disturbance footprint sites (Australian Government, 2018).

Taxon	Conservation Status	Likelihood in 5 km radius of South Capel Site according to the PMST report
Andersonia gracilis	Endangered	Species or species habitat may occur within area
Banksia nivea subsp. *uliginosa*	Endangered	Species or species habitat likely to occur within area
Banksia squarrosa subsp. *argillacea*	Vulnerable	Species or species habitat may occur within area
Brachyscias verecundus	Critically Endangered	Species or species habitat may occur within area
Caladenia busselliana	Endangered	Species or species habitat known to occur within area
Caladenia huegelii	Endangered	Species or species habitat likely to occur within area
Chamelaucium sp. S coastal plain (R.D. Royce 4872)	Vulnerable	Species or species habitat likely to occur within area
Diuris drummondii	Vulnerable	Species or species habitat likely to occur within area
Diuris micrantha	Vulnerable	Species or species habitat likely to occur within area
Drakaea elastica	Endangered	Species or species habitat known to occur within area
Drakaea micrantha	Vulnerable	Species or species habitat may occur within area
Gastrolobium papilio	Endangered	Species or species habitat may occur within area
Lambertia echinata subsp. *occidentalis*	Endangered	Species or species habitat may occur within area
Petrophile latericola	Endangered	Species or species habitat may occur within area
Synaphea sp. Fairbridge farm (D Papenfus 696)	Critically Endangered	Species or species habitat likely to occur within area
Synaphea stenoloba	Endangered	Species or species habitat may occur within area
Tetraria australiensis	Vulnerable	Species or species habitat likely to occur within area
Verticordia densiflora var. *pedunculata*	Endangered	Species or species habitat known to occur within area
Verticordia plumosa var. *vassensis*	Endangered	Species or species habitat may to occur within area

Of the 19 taxa considered to potentially be present within five km of the Survey Sites, based on extensive experience in surveying the flora and their habitats on the southern Swan Coastal Plain, only nine were considered possible to occur on the Survey Sites based on the presence/absence of suitable habitat (**Table 3**).

Table 3. MNES Threatened Flora ecology and likelihood at the South Capel disturbance footprint sites based on presence/absence of suitable habitats.

Taxon	Flowering Period	Description and Habitat	Likelihood Ecoedge
Andersonia gracilis	Sep-Nov	Slender erect or open straggly shrub, 0.1-0.5(-1) m high. Fl. white-pink-purple. White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Unlikely
Banksia nivea subsp. *uliginosa*	Aug-Sep	Dense, erect, non-lignotuberous shrub, 0.2–1.5 m high. Fl. yellow, brown. Sandy clay, gravel.	Unlikely
Banksia squarrosa subsp. *argillacea*	Jun-Nov	Erect, open, non-lignotuberous shrub, 1.2–4 m high. Fl. yellow, Jun–Nov. White/grey sand, gravelly clay or loam. Winter-wet flats, clay flats.	Unlikely, unless planted
Brachyscias verecundus	Nov	Annual (or ephemeral), herb, 0.012-0.022 m high, entirely glabrous. Fl. white/cream. In a moss sward. On a granite outcrop.	Unlikely
Caladenia busselliana	Sep-Oct	Tuberous, perennial, herb, 0.2–0.3 m high. Fl. green, yellow, cream. Sandy loam. Winter-wet swamps.	Unlikely
Caladenia huegelii	Sep-Oct	Tuberous, perennial, herb, 0.25-0.6 m high. Fl. green, cream, red. Grey or brown sand, clay loam.	Possible
Chamelaucium sp. S coastal plain (R.D. Royce 4872)	Oct-Dec	Winter-wet areas, loams and ironstone.	Unlikely
Diuris drummondii	Nov-Jan	Tuberous, perennial, herb, 0.2-0.5 m high. Fl. yellow. Clay. Winter-wet flats.	Possible
Diuris micrantha	Sep-Oct	Tuberous, perennial, herb, 0.3–0.6 m high. Fl. yellow, brown. Brown loamy clay. Winter-wet swamps, in shallow water.	Possible

Taxon	Flowering Period	Description and Habitat	Likelihood Ecoedge
Drakaea elastica	Oct-Nov	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red, green, yellow. White or grey sand. Low-lying situations adjoining winter-wet swamps.	Possible
Drakaea micrantha	Sep-Oct	Tuberous, perennial, herb, 0.15–0.3 m high. Fl. red, yellow. White-grey sand.	Possible
Gastrolobium papilio	Oct-Dec	Tangled, clumped shrub, to 1.5 m high. Fl. cream-red. Sandy clay over ironstone and laterite. Flat plains.	Possible
Lambertia echinata subsp. *occidentalis*	Feb/May-Jun/Oct	Prickly, much-branched, non-lignotuberous shrub, to 3 m high. Fl. yellow. White sandy soils over laterite, orange/brown-red clay over ironstone.	Unlikely
Petrophile latericola	Nov	Multi-stemmed shrub, 0.4-1.5 m high. Fl. yellow. Red lateritic clay. Winter-wet flats.	Unlikely
Synaphea sp. Fairbridge farm (D Papenfus 696)	Oct	Dense, clumped shrub, to 0.3 m high, to 0.4 m wide. Fl. Yellow. Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	Unlikely
Synaphea stenoloba	Aug-Oct	Caespitose shrub, 0.3–0.45 m high. Fl. Yellow. Sandy or sandy clay soils. Winter-wet flats, granite. Shrublands and woodlands on loamy soils.	Unlikely (Pinjarra area)
Tetraria australiensis	Nov-Dec	Rhizomatous, tufted perennial, grass-like or herb (sedge), to 1 m high. Fl. brown.	Possible
Verticordia densiflora var. *pedunculata*	Dec-Jan	Erect to spreading shrub, 0.3-0.6 m high. Fl. pink/pink-white. Grey/yellow sand, sandy loam. Winter-wet low-lying areas.	Possible
Verticordia plumosa var. vassensis	Sep-Feb	Shrub, 0.3–1 m high. Fl. pink. White/grey sand. Winter-wet flats.	Possible

Of the previous biological studies of the South Capel area (Mattiske and Bamford 1998; Mattiske 2010; Endemic 2013; Ecosystem Solutions 2017), only small sections of the 2013 study by Endemic Ltd (Endemic 2013) and addressed by the 2010 study by Mattiske Consulting (Mattiske 2010), relate to the three Survey Sites addressed by this current assessment (**Figure 2**). All or parts of the other studies (Mattiske and Bamford 1998; Ecosystem Solutions 2017) were for areas adjacent to and outside the three Survey Sites of this study.

3.2 Threatened Flora Survey

No individuals of any of the target species were found in any of the three Survey Sites. Further, no other state-listed Threatened or Priority flora were found.

3.3 Threatened Flora Habitat Assessment

The earlier studies aforementioned did not record occurrences of the MNES taxa (**Table 2**, **Table 3**) in their surveys within the three Survey Sites of this current study. However, they did record some occurrences adjacent (Mattiske and Bamford 1998; Mattiske 2010; Endemic 2013; Ecosystem Solutions 2017). These adjacent occurrences are likely due to the intact habitats in good or better condition found in these areas, compared to the significantly altered and degraded habitats of the current Survey Sites.

The habitats of the three Survey Sites are almost all reconstructed or significantly altered; they include mounded sand over mine and processing by-product, lower-lying wetlands between mounded areas, constructed drainage lines alongside mounded areas, a small paddock remnant over an original sand substrate, and roads and hard stands as leftovers of processing and access infrastructure.

Predominant vegetation of the habitats includes: tall woodland of locally native and *introduced *Eucalyptus rudis, E. marginata, Corymbia calophylla, *E. robusta, *C. maculata*; low woodland and shrubland of introduced **Acacia spp.*; low woodland of *Agonis flexuosa*, *Kunzea glabrescens* and *Melaleuca preissiana*; shrubland of *introduced **Calothamnus sp.* and **Chamelaucium uncinatum*; low shrubland of *Pteridium esculentum* and *Hypocalymma angustifolia*, and sedgeland of *Juncus pallidus* and *Ficinia nodosa*.

The common native orchids *Caladenia attingens, C. flava, C. latifolia, Microtis media* and *Pterostylis vittata* were recorded in a few sandy sites lower in the profile including along some drainage lines.

The majority of habitats of the three Survey Sites were found to be in degraded to severely degraded condition, with only a very small area in the extreme south east of the southern site considered to be in good condition.

4 Discussion and Conclusion

Based on the absence of all target species searched for during the survey, it is concluded that the reconstructed substrates present within the Survey Sites do not appear to provide suitable habitat for the MNES taxa, which have been found to prefer unaltered (intact) habitats where they occur nearby (**Table 3**; Mattiske and Bamford 1998; Mattiske 2010; Endemic 2013; Ecosystem Solutions 2017; R Smith pers. comm.).

The native plant taxa recorded during the survey exist on the Survey Sites due to either remaining within small fragmented remnants, or their ability to either persist as seed in or disperse onto altered sandy soils to establish (Rokich et al 2000; Hopper 2009). There were no known disturbance averse native plants recorded during the survey.

The common native orchids observed during the survey are known to occur on relatively disturbed sandy sites and their presence was not unexpected on the degraded sand substrates of the Survey Sites. This contrasts with the rare MNES orchid taxa, which require intact and often damp habitats (**Table 3**). The presence of the common native orchids indicate that the seasonal conditions and survey timing were ideal for locating the target species should they have been present, however are not an indicator of the likelihood of occurrence of the MNES orchids at the Survey Sites.

5 References

Commonwealth of Australia (2013). *Draft Survey Guidelines for Australia's Threatened Orchids. Guidelines for Detecting Orchids Listed as 'Threatened' Under the* Environment Protection and Biodiversity Conservation Act *1999.* Australian Government, Canberra ACT

Department of Parks and Wildlife (2015). Conservation Codes for Western Australian Ecoedge (2013). Level 1 *Flora and Vegetation Assessment: Bussell Highway - Hutton Road to Sabina River (32.10 – 43.92 SLK).* Unpublished report to Main Roads W.A.

Ecosystem Solutions (2017). *Flora Investigations, Iluka South Site, Capel*. Ecosystem Solutions Dunsborough WA

Endemic Pty Ltd (2013). *South Capel Flora and Vegetation Assessment*. Endemic Pty Ltd Subiaco WA

Environmental Protection Authority and Department of Parks and Wildlife (2015). *Technical Guide – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment* (eds. K Freeman, G Stack, S Thomas and N Woolfrey). Perth, Western Australia.

Hopper S.D. (2009). OCBIL Theory: towards an integrated understanding of the evolution, ecology and conservation of biodiversity on old, climatically buffered, infertile landscapes. *Plant, Soil* 322: 49-86

Mattiske Consulting Pty Ltd and M.J. and A.R. Bamford (1998). *Flora, Vegetation and Vertebrate Fauna, South Capel Area*. Mattiske Consulting Pty Ltd, Kalamunda WA

Mattiske Consulting Pty Ltd (2010). *Flora and Vegetation Survey of Areas Outside the Boundary of South Capel*. Mattiske Consulting Pty Ltd, Kalamunda WA

Rokich D.P., Dixon K.W., Sivasithamparam K. and Meney K.A. (2000). Topsoil handling and storage effects on woodland restoration in Western Australia. *Restoration Ecology* 8, 196–208.

Appendix 1. Protected Matters Search Tool Report

Australian Government
Department of the Environment and Energy

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.

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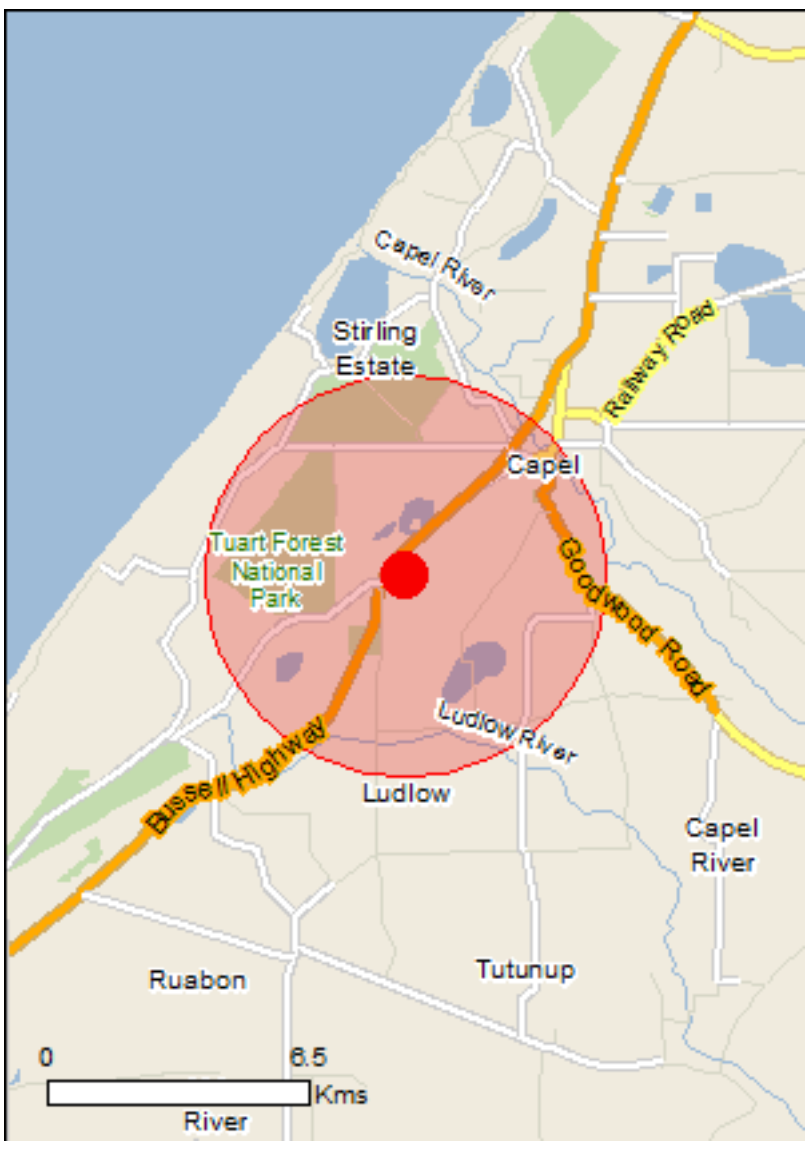

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

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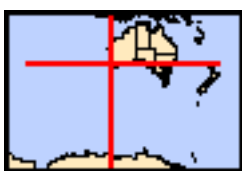

Summary

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:	2
Listed Threatened Species:	39
Listed Migratory Species:	16

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:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	22
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:	25
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Vasse-wonnerup 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
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
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 may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Breeding known 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 epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may 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

Name	Status	Type of Presence
		area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica		
Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Pezoporus occidentalis		
Night Parrot [59350]	Endangered	Extinct within area
Sternula nereis nereis		
Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
Thalassarche cauta cauta		
Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi		
White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Nannatherina balstoni		
Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Breeding known to occur within area
Other		
Westralunio carteri		
Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
Plants		
Andersonia gracilis		
Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Banksia nivea subsp. uliginosa		
Swamp Honeypot [82766]	Endangered	Species or species habitat likely to occur within area
Banksia squarrosa subsp. argillacea		
Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat may occur within area
Brachyscias verecundus		
Ironstone Brachyscias [81321]	Critically Endangered	Species or species habitat may occur within area
Caladenia busselliana		
Bussell's Spider-orchid [24369]	Endangered	Species or species habitat known to occur within area
Caladenia huegelii		
King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Chamelaucium sp. S coastal plain (R.D.Royce 4872)		
Royce's Waxflower [87814]	Vulnerable	Species or species habitat likely to occur within area
Diuris drummondii		
Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	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 may occur within area
Gastrolobium papilio Butterfly-leaved Gastrolobium [78415]	Endangered	Species or species habitat may occur within area
Lambertia echinata subsp. occidentalis Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat may occur within area
Petrophile latericola Laterite Petrophile [64532]	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 stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat may occur within area
Tetraria australiensis Southern Tetraria [10137]	Vulnerable	Species or species habitat likely to occur within area
Verticordia densiflora var. pedunculata Long-stalked Featherflower [55689]	Endangered	Species or species habitat known to occur within area
Verticordia plumosa var. vassensis Vasse Featherflower [55804]	Endangered	Species or species habitat may 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		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		to occur within area
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 may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat 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

Commonwealth Land	[Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

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
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 may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		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 likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Capel	WA
Tuart Forest	WA
Unnamed WA50190	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		
Anas platyrhynchos Mallard [974]		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
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
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
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Oryctolagus cuniculus Rabbit, European Rabbit [128]		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
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may 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 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
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

Nationally Important Wetlands	[Resource Information]
Name	State
McCarleys Swamp (Ludlow Swamp)	WA

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

-33.57508 115.53033

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 2. Waypoint and Tracklog Shapefiles from the survey (Accompanying files) - can be supplied if required

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Appendix 2: Offsets Assessment Guide (Offset Calculator)

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Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	WRP habitat	**Area**	8.44	Hectares	
			Quality	**4**	Scale 0-10	
			Total quantum of impact	3.38	Adjusted hectares	
Threatened species						
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	3.38	Adjusted hectares		**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	14.63222	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	10%								
									Future area without offset (adjusted hectares)	14.6	**Future area with offset (adjusted hectares)**	13.2	-1.46	90%	-1.32	-0.35	3.38	100.00%	Yes	
					Time until ecological benefit	12	**Start quality (scale of 0-10)**	**0**	**Future quality without offset (scale of 0-10)**	**0**	**Future quality with offset (scale of 0-10)**	**6**	6.00	90%	5.40	2.45				
Threatened species																				
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Appendix 3: Consultation Factsheet

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ILUKA

SOUTH CAPEL REMEDIATION PROJECT

July 2017

Overview

Iluka Resources is committed to identifying and addressing any environmental matters connected to the company's current and past business activities.

Iluka's groundwater monitoring has indicated there are levels of manganese and sulphate above environmental standards in the shallow groundwater directly underneath and adjacent to decommissioned mineral waste dams at its Capel dry plant and the former South Capel processing site. The waste material is a by-product of historical mineral sands mining and processing activities. The dams containing the material met regulatory and industry standards of the day but over time have failed to fully contain the material which has led to the impact on the shallow groundwater.

The levels do not pose a risk to human health, but may impact water quality with respect to odour. The company will shortly commence activities to remove the material impacting this shallow groundwater to allow a natural decline in the currently elevated levels.

Remediation project

In spring 2018, Iluka plans to commence remediation activities to remove and store material from identified dams at the Capel and South Capel sites at a purpose-built, capped facility at South Capel. Preparatory works, including the installation of additional groundwater monitoring bores, attainment of necessary regulatory approvals, design and construction of the new facility, are scheduled to commence in spring 2017.

It is anticipated the physical removal and relocation of the material will take approximately 6 months to complete. Transportation of the material will require approximately 60,000 cubic metres to be taken from the Capel dry plant site to the purpose-built facility at South Capel. No off site transportation is required for the relocation of material from identified dams at South Capel to the purpose-built facility.

Iluka currently monitors groundwater in the area, and the company will be expanding the current program to inform environmental management decisions during and after the remediation project. The expansion of this monitoring program is expected to cause minimal disruption to the community.

It will take time for the manganese and sulphate levels to improve. Iluka anticipates that removal of the material will improve the groundwater over an approximate 10-20 year period, although this timeframe will be further defined once the project begins.

Regulatory controls

The remediation project is subject to approval and ongoing regulation by the Department of Water and Environmental Regulation which administers the *Contaminated Sites Act 2003*.

As required under the Act, accredited Contaminated Sites Auditors are providing independent oversight of the project to ensure Iluka meets its legal obligations, including with respect to the design and execution of the remediation activities and the ongoing monitoring of the groundwater.

The Contaminated Sites Auditors have confirmed:

- the levels of sulphate and manganese in groundwater do not pose a risk to human health;
- the removal of the material is an appropriate remediation method;
- ongoing groundwater monitoring is an appropriate environmental management method; and
- the proposed management methods for potential community impacts are appropriate.

Remediation activities associated with this project will require oversight or approval from appropriate regulatory agencies to ensure minimal impacts on the community. The community will be consulted on management plans for transport, dust and noise prior to submission for regulatory approval and commencement of activities.

Contaminated Sites Act 2003

The *Contaminated Sites Act 2003* requires mandatory reporting of known or suspected contaminated sites to the Department of Water and Environmental Regulation.

Iluka has previously reported a number of properties around the Capel dry plant, South Capel and North Capel processing sites for suspected contamination to the groundwater. The company engaged with all affected landowners at the time of reporting the sites.

Iluka's reported sites are awaiting assessment by the Department of Water and Environmental Regulation. While not all sites have been classified by the department, Iluka is engaging with all relevant stakeholders ahead of the upcoming remediation project.

It is possible that some properties adjacent to the Capel dry plant will be classified. If so, the department will write to the property owners directly. The effect of classification is that a memorial may be registered on the land title requiring assessment and/or remediation of contamination. Where it can be demonstrated that classified sites have been remediated and rendered suitable for all uses, sites can be reclassified.

By removing the contamination source material and monitoring the groundwater afterwards, Iluka aims to ensure appropriate management and classification of the sites.

Further information on the Act can be found at https://www.der.wa.gov.au/your-environment/contaminated-sites or by calling the Contaminated Sites hotline 1300 762 982.

Bore water monitoring in the Capel region.

Frequently Asked Questions

July 2017

What are mineral sands and what are they used for?

"Mineral sands" are concentrations of heavy minerals found in ancient beach, dune or river systems, such as rutile, ilmenite, zircon and monazite. These products have a wide range of consumer, lifestyle, and industrial applications including pigment production used in paints, plastics, papers, titanium metal production, welding electrodes, floor and wall tiles, sanitary ware, zirconium-based chemicals, and zirconia metal applications.

Mineral sands mining and processing is a specialist and niche segment of the global resources sector. It supplies raw products input to the commercial manufacture of a wide range of end product applications.

What is waste material?

Mining and processing operations produce waste materials. 'Waste' is a general term for material which currently has little or no economic value. They are removed from the valuable minerals over various processing stages and discharged to dams in accordance with their properties, environmental factors and regulations.

The difference in mineral context can change depending on market conditions and available extraction technology, and there are a number of cases where material that was once considered waste has become a resource for modern mining operations.

What is the cause of contamination?

Over time, the dams have failed to fully contain the material, which has led to elevated levels of manganese and sulphate in the shallow aquifer below and adjacent to the facilities.

Why does Iluka conduct groundwater monitoring?

Iluka undertakes groundwater monitoring at former and current operating sites as part of its ongoing environmental monitoring regime. Monitoring is either completed by Iluka personnel or external consultants before being analysed at Iluka's laboratory or an external facility.

What are the contaminants?

Iluka's groundwater monitoring has indicated that there are elevated levels of manganese and sulphate in the shallow groundwater.

Manganese is a relatively abundant element found in the environment in a number of minerals and rocks. Manganese is principally used in the manufacture of iron, steel and alloys. Concentrations of manganese in food can vary considerably. The highest concentrations have been reported in grains, nuts and vegetables, while tea leaves can have extremely high concentrations.

Sulphate occurs naturally in a number of minerals, and is used commercially in the manufacture of numerous products including dyes, glass, paper, soaps, textiles and insecticides. Food is probably the major source of intake of sulphate.

Do the elevated levels represent a risk to human health or the environment?

The Department of Water and Environmental Regulation accredited Contaminated Sites Auditors appointed to oversee this body of work have confirmed the levels do not pose a risk to human health.

The contaminants can however impact water quality with respect to odour, and may present an environmental risk if left unabated. Iluka is therefore taking measures to address the matter now.

Are there any other contaminants?

There is no indication that other contaminants are present at levels above guidelines. However, Iluka is taking a precautionary risk management approach. Iluka will continue to undertake groundwater monitoring for a range of other potential contaminants and indicators such as aluminium, chloride, radionuclides, conductivity and iron.

All results from the monitoring program will be communicated to the relevant stakeholders and broader community throughout the project.

What is the remediation project?

The South Capel Remediation Project will remove and relocate waste material from a decommissioned dam at the Capel dry plant and identified decommissioned dams at the South Capel site to a purpose-built, capped facility at South Capel.

This material has been the source of the elevated manganese and sulphate readings in the shallow aquifer. With the source material removed, these levels will reduce over time.

In order to further inform these rehabilitation activities, Iluka will also be drilling new monitoring bores and undertaking additional monitoring for sulphate and manganese in the groundwater, as well as other potential contaminants.

Iluka's plan to remove the source material to the purpose-built, capped facility and undertake ongoing groundwater monitoring has been recognised by the Department of Water and Environmental Regulation as an appropriate environmental management method.

How long will it take for the groundwater to improve?

It will take time for the manganese and sulphate levels in the shallow aquifer to improve.

It is expected that removal of the source material will improve the groundwater over an approximate 10 – 20 year period, although this timeframe will be further defined once the project begins.

In the event groundwater improvement is not at the desired rate, further works may be required.

How long will the project take?

Iluka anticipates installation of the monitoring bore network in spring 2017. Upon receipt of regulatory approvals, the removal of material is scheduled to commence in spring 2018 for a period of approximately 6 months.

Iluka will continue to monitor the bores throughout to ensure appropriate management of the matter.

Is the water from my groundwater bore safe to continue using?

The manganese and sulphate in the shallow aquifer do not pose a risk to human health. As a precaution, residents who have bores drawing from the shallow aquifer should not drink from them while the levels remain elevated (those drawing from the deeper aquifer are not affected). In accordance with Department of Health advice, if shallow groundwater is being, or is proposed to be, extracted, the Department of Water and Environmental Regulation and Iluka recommend that analytical testing should be carried out to determine whether the groundwater is suitable for its intended use. If you have a bore or propose to install one, please contact Iluka to discuss options.

How will Iluka keep the public informed of the activities?

We want to work with residents and the public to ensure our approach is acceptable and addresses any concerns you may have.

Some of the two-way communications channels include:

- staffing a dedicated community feedback line (1800 339 997) and email address (southcapel@iluka.com) for residents to contact us directly;
- providing the phone numbers of key staff to affected residents;
- door knocking with fact sheet; and
- an initial community information session on 18 July 2017, with similar sessions if required as part of ongoing community engagement activities.

ILUKA

About Iluka

Iluka Resources is involved in the exploration, project development, operations and marketing of mineral sands. The company is a major producer of zircon globally and a large producer of the high-grade titanium dioxide products rutile and synthetic rutile. Iluka's products are used in an increasing array of applications including home, workplace, medical, lifestyle and industrial uses.

Iluka is listed on the Australian Securities Exchange, with its headquarters in Perth. The company currently has operations in Western Australia, Victoria, South Australia and Sierra Leone; and a workforce of over 2,500 people.

Further information

Iluka will continue to engage with, and provide regular progress updates to, relevant regulatory agencies, landowners and stakeholders throughout the project. We welcome your feedback and encourage you to contact us on southcapel@iluka.com or call the dedicated contact line 1800 339 997.