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**WATER CORPORATION  
ELLENBROOK INLET AND OUTLET MAIN CORRIDOR  
LEVEL 1 FLORA AND FAUNA ASSESSMENT**



A Resource Development  
Group Company

Document status						
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## ACRONYMS AND GLOSSARY

<b>BOM</b>	Bureau of Meteorology
<b>DoE</b>	Department of the Environment (formerly DSEWPaC)
<b>DPaW</b>	Department of Parks and Wildlife (formerly DEC)
<b>DSEWPaC</b>	Department of Sustainability, Environment, Water, Population and Communities (now DoE)
<b>DRF</b>	Declared Rare Flora
<b>ESA</b>	Environmentally Sensitive Area
<b>EPA</b>	Environmental Protection Authority
<b>EP Act</b>	<i>Environmental Protection Act 1986</i>
<b>EPBC Act</b>	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
<b>IBRA</b>	Interim Biogeographic Regionalisation for Australia
<b>PEC</b>	Priority Ecological Community
<b>TEC</b>	Threatened Ecological Community
<b>WAHERB</b>	Western Australian Herbarium
<b>WC Act</b>	<i>Wildlife Conservation Act 1950</i>

## EXECUTIVE SUMMARY

The Water Corporation has proposed the construction of 4.3 kilometres (km) of DN900 inlet main and 2.35 km of DN1200 outlet main. A flora, vegetation and fauna assessment was undertaken in 2012 within the existing 20 metre (m) easement. It is now envisaged that the construction footprint will be wider than originally surveyed, therefore a 75 m wide corridor, was surveyed, as a continuation of the original 2012 survey in the surrounding areas.

A Level 1 assessment, including a brief summary desktop assessment and a flora and vegetation survey and fauna and habitat survey was undertaken within a total combined survey area of 38.5 hectares (ha), which is inclusive of areas that do not support vegetation (such as firebreaks, roads, road reserve and previously cleared areas), totalling 21.7 ha.

The Level 1 assessment confirmed that the wider study area supports flora, vegetation, fauna and fauna habitats synonymous with those mapped and sampled in the 2012 survey.

Key findings from the Level 1 assessment were:

- The study area comprises four vegetation communities ranging from near-pristine to completely degraded in condition (in accordance with Keighery's scale), and a fifth community described herein as completely degraded highly disturbed/cleared land:
  - *Banksia* Low Open Forest (BaPlAxAcLb);
  - *Kunzea*, *Banksia* and *Jacksonia* Shrubland (KgRcCa);
  - *Pinus* plantation (PsBmAb);
  - *Pinus*, *Melaleuca* and *Eucalyptus* Open Planted Woodland (PsErJfBm); and
  - Highly Disturbed/Cleared.
- No TECs exist within the study area.
- Two PECs are identified as potentially occurring within the study area, with one ('Swan Coastal Plain *Banksia attenuata* - *Banksia menziesii* woodlands, SCP23b') represented by the vegetation community '*Banksia* Low Open Forest' recorded in the northern section and along the road verge to the southern section of the study area, which shares plant species composition with the PEC 'SCP23b'. The condition of this vegetation community varies from 'Near Pristine' condition (scale of 1-2), to 'Good' condition (scale of 4) in accordance with the vegetation condition scale of Keighery (1994).
- Two Bush Forever sites are present within the study area, Sites 399 and 192, comprising 22.52 ha (58%) of the total study area.
- A total of 43 flora taxa were recorded, of which two could not be fully identified to species level due to a lack of suitable material for identification. Furthermore, both taxa represented introduced species. The total includes 36 (84%) native species and 7 (16%) introduced (weed) species.
- No Threatened (EPBC Act or WC Act listed) or Priority flora were recorded in the study area.
- Fifteen fauna species were recorded. This total includes two introduced mammal species not previously recorded within the study area (cat and dog), and one bird species (Black-cockatoo, species unknown). The faunal assemblages observed across both the previous Level 2 assessment and this assessment are typical of that occurring within the northern Swan Coastal Plain.
- One single conservation significant fauna species was recorded through secondary evidence of foraging, Black-cockatoo (*Calyptorhynchus latirostris*/*Calyptorhynchus banksii naso*). Although

identification to species-level cannot be confirmed, regional records and geographic location suggests the record was likely to be Carnaby's Black-cockatoo (*C. latirostris*).

- Four broad fauna habitats were identified, two more than identified in the previous assessment, due to a more southern extension of the study area. The habitats recorded and mapped are as follows:
  - Banksia Woodland;
  - Revegetated Banksia Woodland;
  - Pine Plantation (newly described habitat); and
  - Open Pine, Melaleuca and Eucalyptus Woodland (newly described habitat).
- Suitable foraging habitat for Black-cockatoos occurs within each of the mapped fauna habitats, equating to 16.73 ha (43.5%) of the entire study area.

Conclusions from the Level 1 assessment are as follows:

- The timing of the survey, during March (non-spring), is not generally considered suitable for adequate sampling and identification of the flora for surveys in Swan Coastal Plain (in accordance with Guidance Statement 51 (EPA 2004)). This is reflected by the fact that a large proportion of the specimens that were collected during this survey are either sterile or in their late reproductive stage. However, no Threatened Flora (previously termed Declared Rare Flora) listed under the *Wildlife Conservation Act 1950*, species of national conservation significance listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or Priority flora listed by the Department of Parks and Wildlife (DPaW) were recorded from the study area during the previous spring survey. Given the extension and synonymy of vegetation types mapped previously compared to this assessment, it is considered unlikely that threatened or priority flora species occur in the wider corridor area. A further spring assessment of this area is unlikely to be required.
- For clearing of more than 1 ha of foraging habitat for Black-cockatoos, Commonwealth referral is recommended (DSEWPaC 2012). The study area comprises 16.73 ha of good quality Black-cockatoo foraging habitat.

## 1 BACKGROUND

The Water Corporation has proposed the construction of 4.3 km of DN900 inlet main and 2.35 km of DN1200 outlet main as shown in Figure 1.1. A Flora, Vegetation and Fauna Assessment Report was undertaken in 2012 within the existing 20 m easement, however it is now envisaged that the construction footprint will be wider and therefore a 75 m wide corridor, to capture two options, was required to be surveyed. In addition, a combined 6.2 ha area was also required to be surveyed. The total combined study area is 38.5 ha, which includes areas which do not support vegetation (such as firebreaks, roads, road reserve and previously cleared areas).

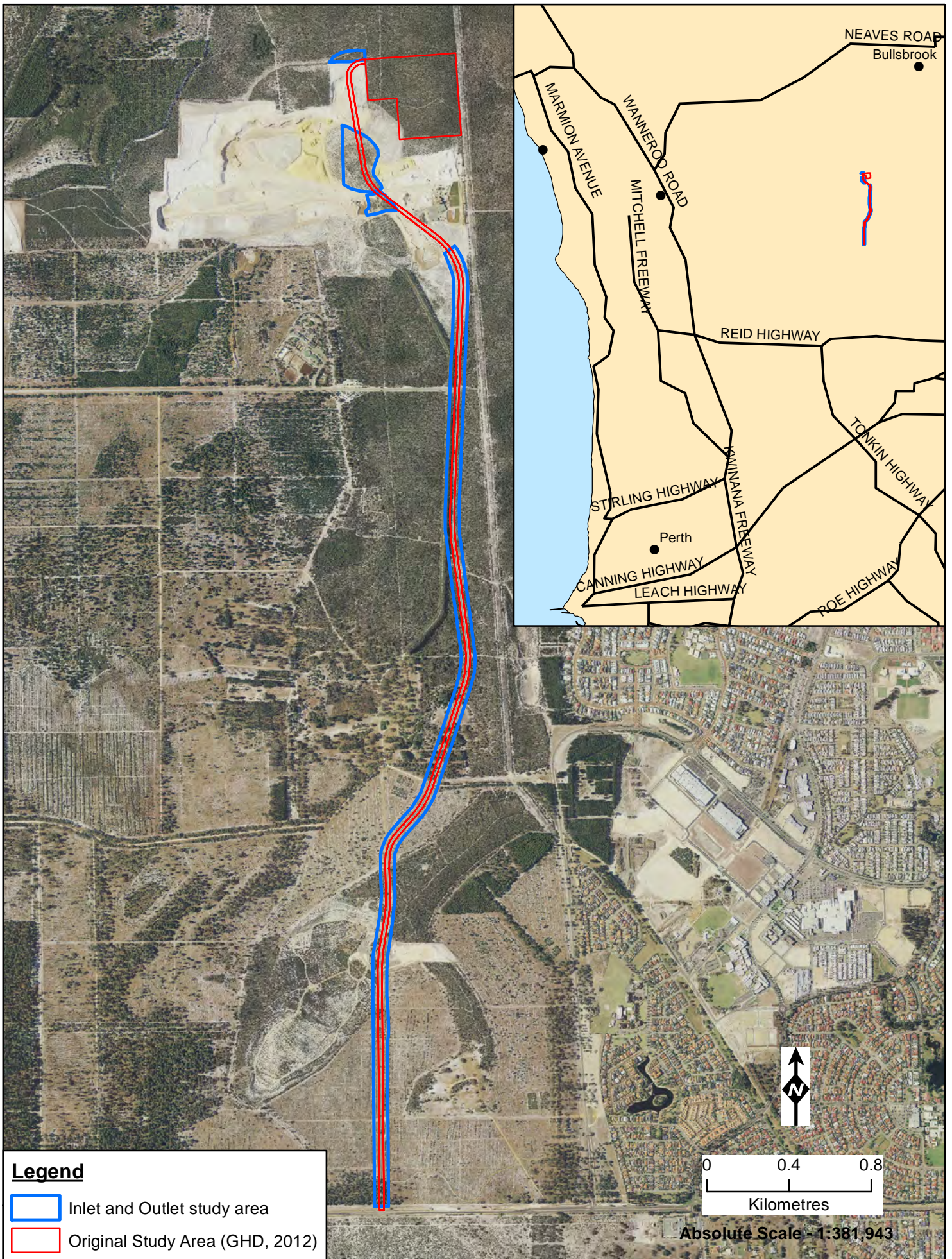
The scope encompassed undertaking a non-spring site visit and capturing the findings in a report that will advise the Water Corporation if a supplementary spring survey is warranted.

Specifically, the scope requirements included conducting the following within the designated survey corridor and study site:

- Conduct a literature review of the previous Flora, Vegetation and Fauna Assessment Report (GHD, 2012) to discuss the potential for significant species and communities to occur within the study area;
- Communicate with the Water Corporation's Environmental Officer if it is determined that further desktop information is required;
- Undertake a field survey (non-spring) using relevés;
- Produce an inventory matrix of plant taxa (including dominant weed species) by broad vegetation community types;
- Provide photos of dominant weed species, using either site photos or Florabase stock;
- Intensively search for conservation significant flora species based on habitat requirements and map the location of any potential Declared Rare Flora (DRF), Priority Flora and any other flora of local or taxonomic significance based on available taxonomic material at the time of the survey;
- Identify, map and discuss the significance of any Threatened Ecological Communities (TEC) and/or Priority Ecological Communities (PEC) based on the results of the field survey;
- Identify and discuss potential significant fauna species' habitat, with particular reference to Black Cockatoos;
- Map and photograph vegetation condition;
- Map and photograph broad vegetation types;
- The provision of all GIS shapefiles (GDA 94) which includes broad Vegetation Types, Vegetation Condition, DRF, Priority Flora, Fauna Habitat; and
- Produce a brief technical report that includes determination, justification and documentation regarding whether a supplementary spring survey is required to capture additional information about the study area.

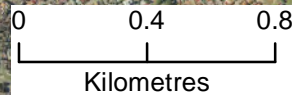
The purpose of this report is to define the flora, vegetation, fauna and habitat values, in particular their spatial location and conservation significance, associated with the project. The report will be used to assist the Water Corporation in selecting the alignment of the infrastructure with the least environmental constraints and/or to enable works to be undertaken with consideration to the environmental sensitivity of the site.





**Legend**

- Inlet and Outlet study area
- Original Study Area (GHD, 2012)



**Absolute Scale - 1:381,943**



**Water Corporation Ellenbrook Study Area**

**Figure: 1.1**  
Project ID: 1586

**Drawn: Md'A**  
Date: 13/03/2014

*Coordinate System*  
Name: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994



## 2 METHODOLOGY

A single-phase Level 1 flora, vegetation and fauna assessment was carried out during March 2014, within the proposed corridor, to a width of 75 m, and within the designated study site at the northern terminus (Figure 1.1).

Works were conducted in accordance with all other relevant legislation, including EPA policies, guidance statements and regulations relating to flora and fauna collection permits/licenses and access requirements.

### 2.1 DESKTOP ASSESSMENT AND LITERATURE REVIEW

Prior to the commencement of the field survey, a literature review was undertaken of the previous relevant assessment report (GHD 2012).

The information from the GHD (2012) report was referred to for the field assessment, including species lists and maps for Threatened and Priority flora, fauna and ecological communities. The desktop review confirmed the focus of the field assessment; including areas where conservation significant flora inventories required collection.

### 2.2 FIELD SURVEY

The survey was conducted by one botanist and one zoologist on 14 March 2014. A survey effort equivalent to two person days was expended.

The field survey incorporated a Level 1 flora and vegetation assessment in accordance with EPA Guidance Statement 51 and a Level 1 vertebrate fauna assessment in accordance with EPA Guidance Statement 56, within the proposed pipeline corridor.

Field data was collected from a total of six detailed data collection points (relevés) representative of the diversity of ecological values of the site. Where possible, relevés incorporated non-permanent quadrats, measuring 10 x 10 m, in accordance with Guidance Statement 51, and were used to confirm the information from the GHD (2012) report, and additionally to characterise all of the intact native vegetation communities supported by the study area and immediate surrounds if values were found to differ from those previously defined.

Observations and opportunistic data collection was carried out continuously inside and near the study area, in particular for conservation significant flora and fauna species determined previously by GHD as occurring within the study area. Particular attention was focussed on Black-cockatoos and their suitable habitat within the study area. General observations (direct sightings and indirect evidence of presence) for vertebrate fauna in the study area were also recorded.

### 2.3 FLORA AND VEGETATION

Descriptions of communities were based on the nomenclature utilised in the GHD (2012) report, for continuity and to allow synergies between the results of both studies. Data was also collected to sufficient detail that it will enable conclusions regarding the TEC and PEC status of each of the recorded vegetation types.

Where known occurrences of TECs or PECs exist adjacent to the study area, data was collected to verify the composition of the communities, as well as the vegetation condition (Keighery 1994) in the location directly adjacent to the proposed corridor.

## 3 RESULTS

### 3.1 FLORA

A total of 43 flora taxa were recorded in the study area, of which two could not be fully identified to species level due to a lack of suitable material for identification. Furthermore, both taxa represented

introduced species. The total includes 36 (84%) native species and seven (16%) introduced (weed) species. Some of the collected taxa have been planted for landscaping and revegetation purposes.

A complete list of the flora recorded in the study area is included in Table 3.1.

Families with the highest representation were Myrtaceae (11 taxa, all native), Fabaceae and Proteaceae (6 taxa each, all native) and Ericaceae (5 taxa, all native).

**Table 3.1 – Summary of flora species recorded in the study area**

Family	Name	Status
Asteraceae	* <i>Centaurea melitensis</i>	Introduced - Permitted
Asteraceae	<i>Podotheca gnaphalioides</i>	
Asteraceae	* <i>Ursinia anthemoides</i>	Introduced - Permitted
Casuarinaceae	<i>Allocasuarina fraseriana</i>	
Cyperaceae	<i>Lepidosperma tenue</i>	
Dasyopogonaceae	<i>Dasyopogon bromeliifolius</i>	
Dilleniaceae	<i>Hibbertia subvaginata</i>	
Ericaceae	<i>Astroloma xerophyllum</i>	
Ericaceae	<i>Astroloma xerophyllum</i>	
Ericaceae	<i>Conostephium preissii</i>	
Ericaceae	<i>Croninia kingiana</i>	
Fabaceae	<i>Jacksonia floribunda</i>	
Fabaceae	<i>Acacia pulchella</i>	
Fabaceae	<i>Bossiaea eriocarpa</i>	
Fabaceae	<i>Gompholobium tomentosum</i>	
Fabaceae	<i>Jacksonia furcellata</i>	
Fabaceae	<i>Daviesia hakeoides</i>	
Haemodoraceae	<i>Conostylis aculeata</i> subsp. <i>aculeata</i>	
Iridaceae	<i>Patersonia occidentalis</i>	
Iridaceae	* <i>Gladiolus caryophyllaceus</i>	Introduced - Permitted
Myrtaceae	<i>Regelia ciliata</i>	
Myrtaceae	<i>Verticordia nitens</i>	
Myrtaceae	<i>Corymbia calophylla</i>	
Myrtaceae	<i>Scholtzia involucrata</i>	
Myrtaceae	<i>Melaleuca preissiana</i>	
Myrtaceae	<i>Kunzea glabrescens</i>	
Myrtaceae	<i>Eucalyptus todtiana</i>	
Myrtaceae	<i>Eucalyptus rudis</i>	
Myrtaceae	<i>Eremaea pauciflora</i>	
Myrtaceae	<i>Calytrix flavescens</i>	
Myrtaceae	<i>Pericalymma ellipticum</i> var. <i>floridum</i>	
Pinaceae	* <i>Pinus</i> sp.	Introduced - Permitted
Poaceae	* <i>Aira</i> sp.	Introduced - Permitted
Poaceae	<i>Austrostipa compressa</i>	
Poaceae	* <i>Avena barbata</i>	Introduced - Permitted
Poaceae	* <i>Briza maxima</i>	Introduced - Permitted
Proteaceae	<i>Banksia menziesii</i>	

Family	Name	Status
Proteaceae	<i>Banksia attenuata</i>	
Proteaceae	<i>Conospermum stoechadis</i> subsp. <i>stoechadis</i>	
Proteaceae	<i>Petrophile linearis</i>	
Proteaceae	<i>Stirlingia latifolia</i>	
Proteaceae	<i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i>	
Restionaceae	<i>Lyginia barbata</i>	

### 3.1.1 Flora of Conservation Significance


No Threatened (EPBC Act or WC Act listed) or Priority flora were recorded in the study area.




## 3.2 VEGETATION

### 3.2.1 Vegetation Communities of the study area


Vegetation communities were recorded and mapped within the study area. These are summarised in Table 3.2 and shown in Figures 3.1 and 3.2 below.

**Table 3.2 – Vegetation communities of the study area**

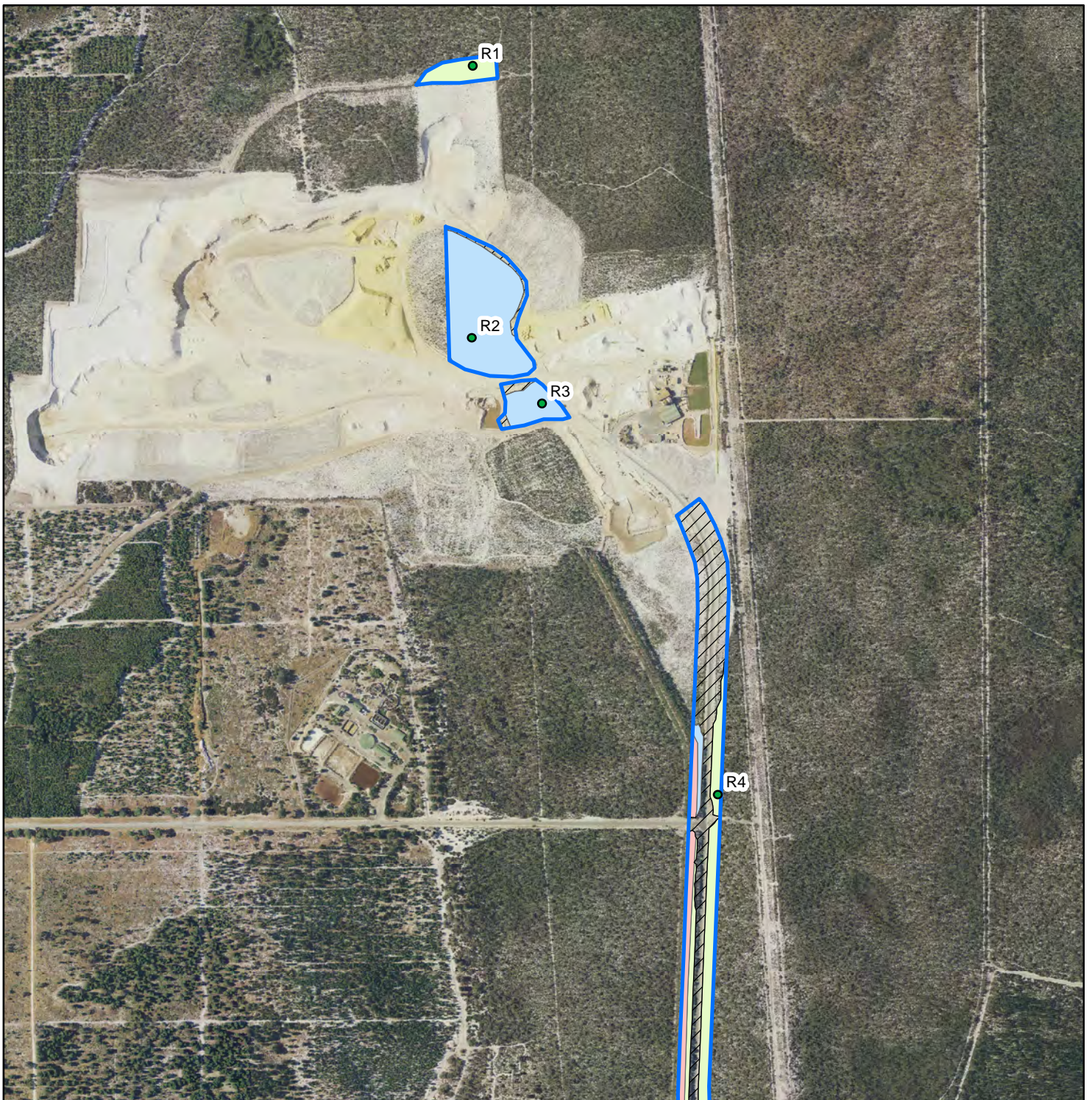
Vegetation community	Associated species	Relevé Sites	Photograph
<p><i>Banksia</i> Low Open Forest (BaPIAxAcLb)</p> <p>Low open forest of <i>Banksia attenuata</i> and <i>Banksia menziesii</i> over Shrubland of <i>Petrophile linearis</i> and <i>Stirlingia latifolia</i> over Open Low Heath of <i>Astroloma xerophyllum</i> and <i>Croninia kingiana</i> over Very Open Grassland of <i>*Aira</i> sp. and <i>*Briza maxima</i> over Very Open Herbland of <i>*Ursinia anthemoides</i></p> <p>Area: 8.19 ha (21.3% of study area)</p> <p>Condition: Pristine to Good</p>	<p><i>Banksia attenuata</i></p> <p><i>Banksia menziesii</i></p> <p><i>Scholtzia involucrata</i></p> <p><i>Calytrix flavescens</i></p> <p><i>Astroloma xerophyllum</i></p> <p><i>Eremaea pauciflora</i></p> <p><i>Petrophile linearis</i></p> <p><i>Conostephium preissii</i></p> <p><i>Gompholobium tomentosum</i></p> <p><i>Jacksonia floribunda</i></p> <p><i>Stirlingia latifolia</i></p> <p><i>Croninia kingiana</i></p> <p><i>*Ursinia anthemoides</i></p> <p><i>*Aira</i> sp.</p> <p><i>*Briza maxima</i></p> <p><i>Lyginia barbata</i></p> <p><i>Austrostipa compressa</i></p>	<p>R1, R4, R6</p>	

Vegetation community	Associated species	Relevé Sites	Photograph
<p><i>Kunzea</i>, <i>Banksia</i> and <i>Jacksonia</i> Shrubland (KgRcCa) Shrubland of <i>Kunzea glabrescens</i>, <i>Banksia attenuata</i> and <i>Jacksonia furcellata</i> over Low Shrubland of <i>Regelia ciliata</i> and <i>Hibbertia</i> species over Very Open Herbland of <i>Conostylis aculeata</i> subsp. <i>aculeata</i> and *<i>Gladiolus caryophyllaceus</i> (Revegetated)</p> <p>Area: 5.24 ha (13.6% of study area) Condition: Good to degraded</p>	<p><i>Kunzea glabrescens</i> <i>Banksia attenuata</i> <i>Jacksonia furcellata</i> <i>Regelia ciliata</i> <i>Acacia pulchella</i> <i>Gladiolus caryophyllaceus</i> <i>Dasyogon bromeliifolius</i> <i>Centaurea melitensis</i> <i>Scholtzia involucreta</i> <i>Bossiaea eriocarpa</i> <i>Podotheca gnaphalioides</i> <i>Stirlingia latifolia</i> <i>Ursinia anthemoides</i> <i>Conostylis aculeata</i> subsp. <i>aculeata</i> <i>Hibbertia subvaginata</i> <i>Banksia menziesii</i> *<i>Avena barbata</i> <i>Daviesia hakeoides</i> *<i>Aira</i> sp.</p>	<p>R2, R3</p>	
<p><i>Pinus</i> plantation (PsBmAb) Open planted forest of *<i>Pinus</i> sp. over <i>Banksia menziesii</i> shrubs over weedy grasses</p> <p>Area: 1.88 ha (4.9% of study area) Condition: Completely degraded</p>	<p>*<i>Pinus</i> sp. <i>Banksia menziesii</i> *<i>Avena barbata</i></p>		
<p><i>Pinus</i>, <i>Melaleuca</i> and <i>Eucalyptus</i> Open Planted Woodland (PsErJfBm) Open planted woodland of *<i>Pinus</i> sp., <i>Eucalyptus rudis</i> and <i>Melaleuca preissiana</i> over <i>Jacksonia furcellata</i> and <i>Pericalymma ellipticum</i> var. <i>floridum</i> open shrubland over sparse weedy grasses</p> <p>Area: 1.4 ha (3.7% of study area) Condition: Completely degraded</p>	<p>*<i>Pinus</i> sp. <i>Eucalyptus rudis</i> <i>Melaleuca preissiana</i> <i>Pericalymma ellipticum</i> var. <i>floridum</i> *<i>Briza maxima</i> *<i>Aira</i> sp. <i>Jacksonia furcellata</i></p>	<p>R5</p>	



Vegetation community	Associated species	Relevé Sites	Photograph
<p>Highly Disturbed/Cleared (HD)</p> <p>Areas with significantly altered vegetation composition and structure due to clearing and/or other activities.</p> <p>These areas are completely or almost completely without native species with some scattered native trees (<i>Eucalyptus</i> spp. and <i>Melaleuca</i> spp.)</p> <p>Understorey dominated by weedy grasses and herbs.</p> <p>Area: 21.7 ha (56.5 % of Study Area)</p> <p>Condition: Completely degraded</p>	<p><i>Eucalyptus</i> sp.</p> <p><i>Melaleuca preissiana</i></p> <p>*<i>Briza maxima</i></p> <p>*<i>Aira</i> sp.</p> <p>*<i>Avena barbata</i></p> <p>*<i>Ursinia anthemoides</i></p>		



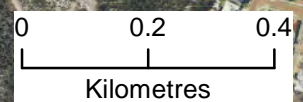


**Legend**

- Relevé Sites
- Study Area

**Vegetation Mapping**

- BaPIAxAcLb: Banksia Low Open Forest
- KgRcCa: Kunzea, Banksia and Jacksonia Shrubland
- PsJfBm: *Pinus* and *Melaleuca* Open Planted Woodland
- *Pinus* Plantation
- Highly Disturbed/Cleared



**Absolute Scale - 1:12,000**



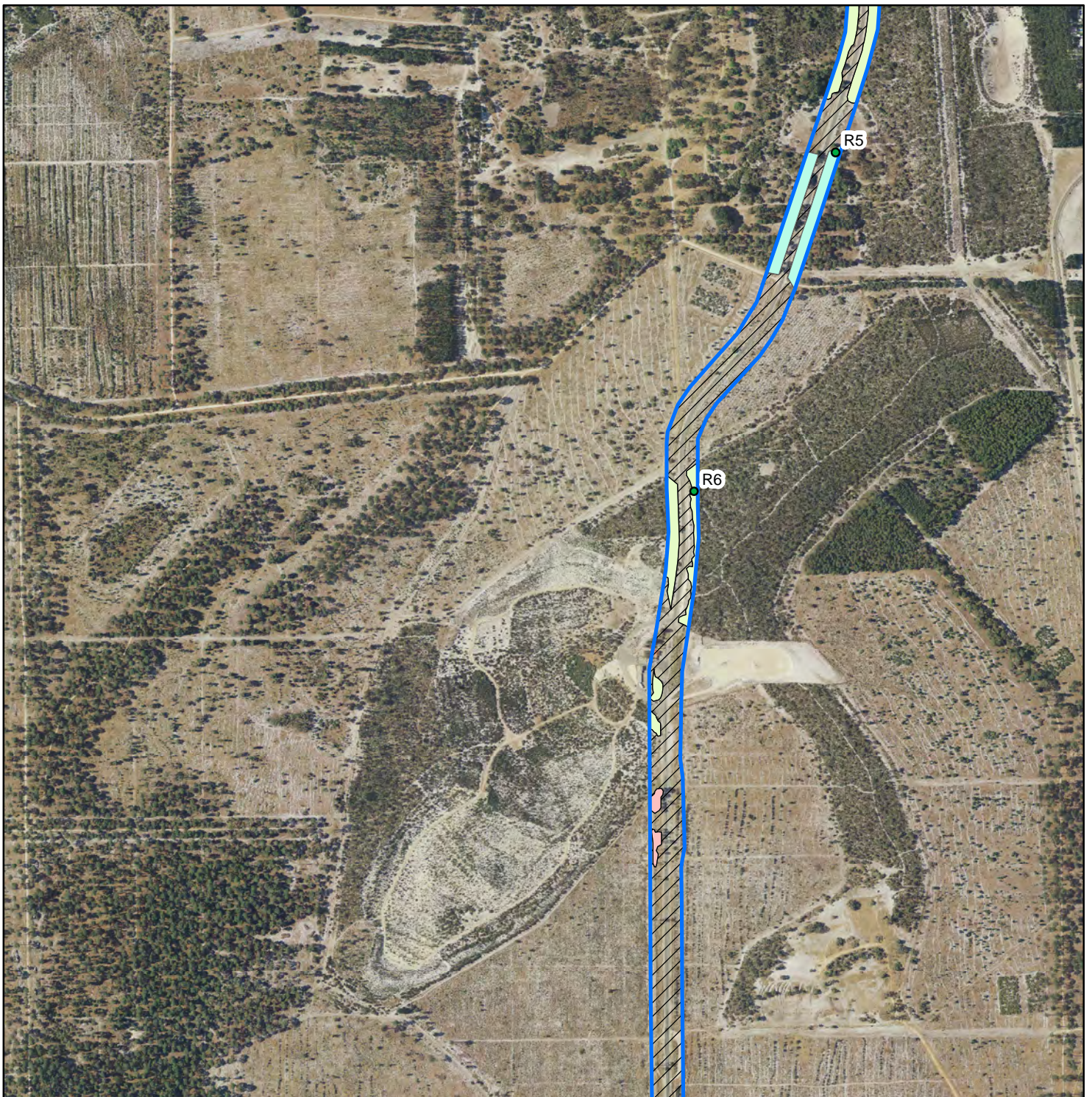
**Vegetation Communities  
of the Study Area  
Map A**

Figure: 3.1  
Project ID: 1586

Drawn: Md'A  
Date: 13/03/2014

Coordinate System  
Name: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994





**Legend**

● Relevé Sites

□ Study Area

**Vegetation Mapping**

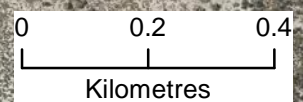
■ BaPIAxAcLb: Banksia Low Open Forest

■ KgRcCa: Kunzea, Banksia and Jacksonia Shrubland

■ PsJfBm: *Pinus* and *Melaleuca* Open Planted Woodland

■ *Pinus* Plantation

▨ Highly Disturbed/Cleared



**Absolute Scale - 1:12,000**



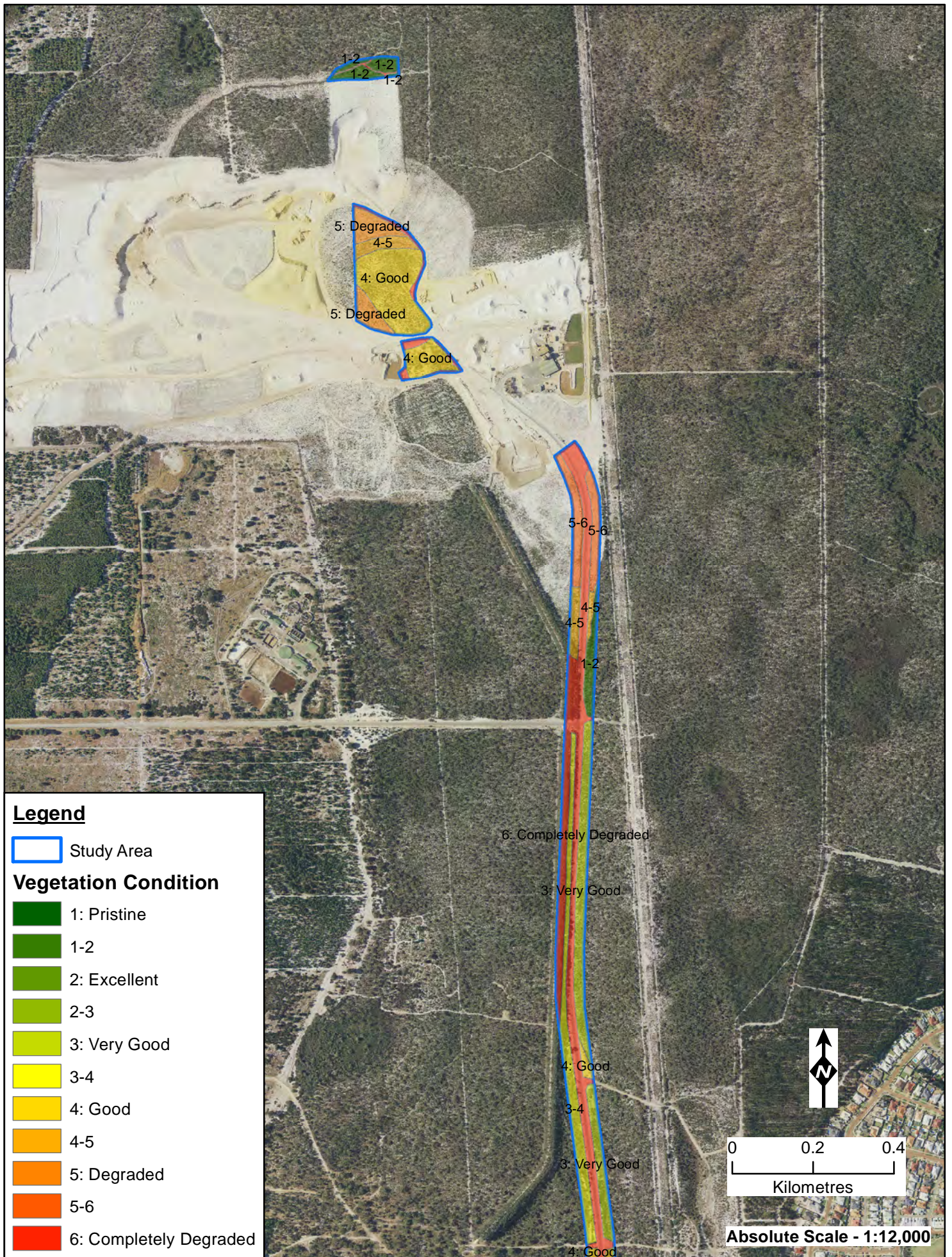
**Vegetation Communities  
of the Study Area  
Map B**

Figure: 3.2  
Project ID: 1586

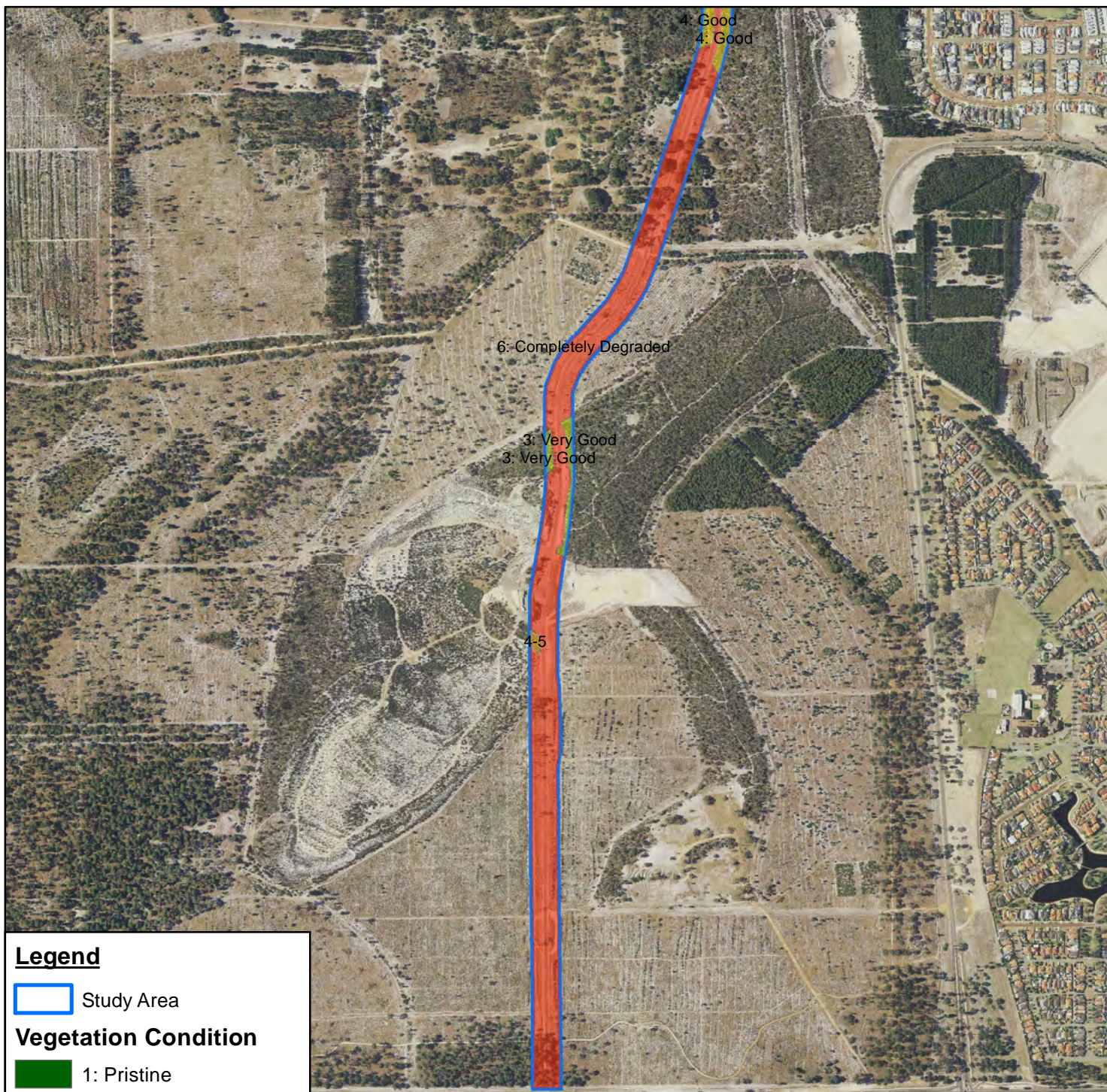
Drawn: Md'A  
Date: 13/03/2014

*Coordinate System*  
Name: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994







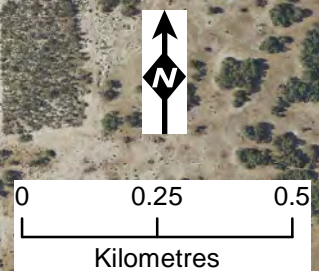


**Legend**

 Study Area

**Vegetation Condition**

-  1: Pristine
-  1-2
-  2: Excellent
-  2-3
-  3: Very Good
-  3-4
-  4: Good
-  4-5
-  5: Degraded
-  5-6
-  6: Completely Degraded



**Absolute Scale - 1:14,000**



**Vegetation Condition  
of the Study Area  
Map B**

**Figure: 3.4**  
Project ID: 1586

**Drawn: Md'A**  
Date: 13/03/2014

*Coordinate System*  
Name: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994



### 3.2.2 Threatened and Priority Ecological Communities

A search of the EPBC Act Protected Matters Search Tool database identified two TECs occur within 5 km of the study area; ‘Organic Mound Springs’ listed as Critically Endangered and the ‘Shrublands and Woodlands on Muchea Limestone’ listed as Endangered (GHD 2012). A Department of Parks and Wildlife (DPaW) TEC/PEC database search retrieved one TEC within 5 km of the study area (GHD 2012).

None of the vegetation communities identified during the field survey were comparable to the TECs listed above.

A search of the DPaW database identified three PECs within 5 km of the study area and two that potentially occur within the study area (Figure 3.5) (GHD 2012). Out of the three PECs identified within 5 km of the study area, two occur within the study area (with their buffers), these are:

1. Swan Coastal Plain *Banksia attenuata* - *Banksia menziesii* woodlands, SCP23b; and
2. *Banksia ilicifolia* woodlands, SCP22.

Of these two PECs, only one, ‘Swan Coastal Plain *Banksia attenuata* - *Banksia menziesii* woodlands, SCP23b’ was comparable to a vegetation community recognised during the field assessment. This was also recognised by GHD (2012) during the Level 2 survey. The vegetation community ‘*Banksia* Low Open Forest’ recorded in the northern section and along the road verge to the southern section of the study area is comparable to PEC ‘SCP23b’. The condition of this vegetation community varies from ‘Near-Pristine’ (scale of 1-2), to ‘Good’ condition (scale of 4) in accordance with the scale of Keighery (1994) (Figure 3.3 and Figure 3.4).

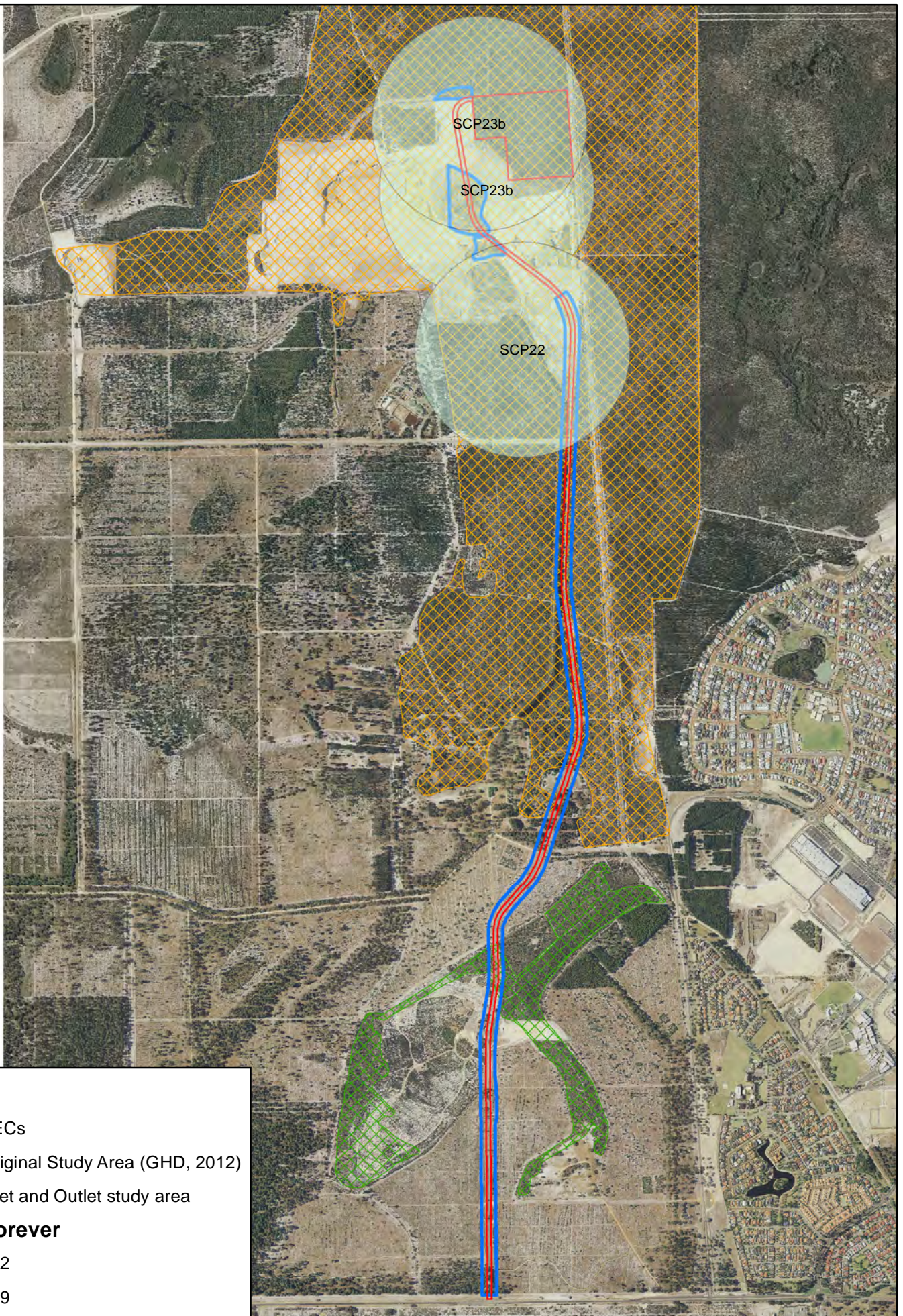
### 3.2.3 Bush Forever Sites

Over half of the study area (58.5%, 22.52 ha) is comprised of Bush Forever Sites. Two are represented by native vegetation and these are summarised in below and shown in Figure 3.5.

**Table 3.3 – Bush Forever sites in the study area**

Bush Forever Site Number	Area within study area	% of study area
399	21.23 ha	55.2
192	1.29 ha	3.3





**Legend**

- PECs
  - Original Study Area (GHD, 2012)
  - Inlet and Outlet study area
- Bush Forever**
- 192
  - 399










### 3.2.4 Introduced Flora

A total of seven Environmental Weeds (DAFWA 2014) were recorded within the study area. The complete list with images is presented in Table 3.4. These weed species were observed though out the study area. Weed infestation was found to be significant in degraded areas.

No Weeds of National Significance (WONS) were recorded in the study area, and no Declared Pests (weeds) were identified.

**Table 3.4 – Environmental Weeds Recorded in the study area**

Family	Taxon	Image
Asteraceae	<i>Centaurea melitensis</i>	 <p style="font-size: small; text-align: center;"> <i>Centaurea melitensis</i>      Photos: G. Byrne &amp; K.R. Thiele            (Western Australian Herbarium 1998-2014)         </p>
Asteraceae	<i>Ursinia anthemoides</i>	 <p style="text-align: center;">(ecologia 2014)</p>
Iridaceae	<i>Gladiolus caryophyllaceus</i>	 <p style="font-size: small; text-align: center;"> <i>Gladiolus caryophyllaceus</i>      Photos: J. Dodd &amp; K.C. Richardson            (Western Australian Herbarium 1998-2014)         </p>

<p>Pinaceae</p>	<p><i>Pinus</i> sp.</p>	 <p>(ecologia 2014)</p>
<p>Poaceae</p>	<p><i>Aira</i> sp.</p>	 <p><i>Aira</i> Photo: R. Randall (Western Australian Herbarium 1998-2014)</p>
<p>Poaceae</p>	<p><i>Avena barbata</i></p>	 <p>(ecologia 2014)</p>
<p>Poaceae</p>	<p><i>Briza maxima</i></p>	 <p>(ecologia 2014)</p>

### 3.3 FAUNA

A DPaW NatureMap search (GHD 2012) identified 109 fauna species within 5 km of the study area, of which none are introduced (feral) species. A single-phase level 2 field assessment was conducted in 2012 (GHD 2012), during which 21 fauna species were recorded within the previously defined study area as surveyed by GHD in 2012. Of these, 19 were bird species, and the other two species were mammals. During the 2014 level 1 field assessment, a total of 15 species were recorded (both through direct observation and through records of secondary evidence (tracks, scats, feathers, calls and foraging evidence) (Table 3.5). This includes an additional two mammal species not previously recorded within the study area (GHD 2012) (domestic/feral cat and dog), and one bird species (Forest Red-tailed Black-cockatoo), although these were assessed previously as likely to occur (GHD 2012). The faunal assemblage is typical of that occurring within the northern Swan Coastal Plain.

**Table 3.5 – Vertebrate fauna recorded in the study area**

Common Name	Scientific Name
<b>Mammals</b>	
Western Grey Kangaroo (S)	<i>Macropus fuliginosus</i>
*Dog (S)	<i>Canis lupis familiaris</i>
*Cat (S)	<i>Felis catus</i>
*European Rabbit (S)	<i>Oryctolagus cuniculus</i>
<b>Birds</b>	
Emu (S)	<i>Dromaius novaehollandiae</i>
Black-cockatoo (S)	<i>Calyptorhynchus latirostris/ Calyptorhynchus banksii naso</i> (species unknown, likely to be <i>C. latirostris</i> )
Galah	<i>Eolophus roseicapilla</i>
Weebill	<i>Smicronis brevirostris occidentalis</i>
Western Gerygone	<i>Gerygone fusca</i>
Singing Honeyeater	<i>Lichenostomus virescens virescens</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>
Willie Wagtail	<i>Rhipidura leucophrys leucophrys</i>
Australian Raven	<i>Corvus coronoides perplexus</i>
Magpie-lark	<i>Grallina cyanoleuca</i>

\* Introduced species

(S) Secondary evidence - scats, tracks, feathers, foraging evidence etc.

### 3.4 HABITATS

Two fauna habitats were previously identified by GHD in 2012; *Banksia* Woodland and Revegetated *Banksia* Woodland. Extended mapping of the original corridor has revealed a further two habitat types. The habitats identified during 2014 are summarised below and mapped in Figure 3.11 and Figure 3.12.

#### 3.4.1 *Banksia* Woodland

This habitat type was previously mapped by GHD and described as follows:

“Woodland habitats offer particularly high habitat value for fauna species due to the variety of microhabitats and various resource niches available in the woodland habitat. The *Banksia* woodland is relatively uniform across the site and no large trees were recorded. Throughout the *Banksia* Woodland there are areas of loose coastal sand that are suitable for burrowing reptiles, and in particular provide potential habitat for the conservation significant *Neelaps calonotos* (Black-striped



Snake). The *Banksia* Woodland is dominated by *Banksia attenuata* and *Banksia menziesii* with other Proteaceous species. The vegetation in this area is very dense and provides good habitat for a number of fauna species including potential feeding habitat for the conservation significant for Black-cockatoos. The study area is located within a larger area of foraging habitat to the north and east and provides regionally significant contiguous bushland linkages, which are a contiguous or largely contiguous corridor of bushland areas. These areas are of particular significance as they provide corridors through otherwise highly cleared lands and provide linkages of regional significance for fauna species.” (GHD 2012)

The *Banksia* Woodland habitat is confirmed to be the dominant habitat type of the 2014 study area and comprises 8.2 ha (21.3%) of the study area.

This habitat type is considered to be in good to very good condition and provides suitable foraging habitat for Black-cockatoos.



**Figure 3.6 –*Banksia* Woodland habitat type**

### 3.4.2 Revegetated *Banksia* Woodland

This habitat type was also described previously by GHD as follows:

“This habitat type occurred within the area of the proposed inlet and outlet mains, and consisted of mine revegetation of *Banksia* Woodland. This habitat type was still in the early stages of growth and as such had sparse lower storey vegetation and very limited leaf litter and ground cover. As a result, this habitat type would provide limited habitat for ground-dwelling fauna, particularly reptiles and mammals, due to the lack of cover for these species” (GHD, 2012)

Further mapping of the wider study area for this assessment has identified a total of 5.24 ha (13.6%) of this habitat type is present.

This habitat type is considered in good condition, however is immature and therefore quite sparse and is isolated by heavily-used road infrastructure for the Rocla operations, therefore suitability as habitat for ground dwelling species is limited.



**Figure 3.7 – Revegetated *Banksia* Woodland habitat type**



### 3.4.3 Pine Plantation

The study area contains 1.67 ha of planted trees of *Pinus* species (as well as 0.21 ha of isolated Pine trees, not in a plantation alignment). This makes up a total of 4.9% of the total study area.

Ground cover and undergrowth is sparse to non-existent, and because of this, this habitat is considered of low value to native vertebrate fauna, although, Pine plantations are considered suitable foraging habitat for Black-cockatoos (EPBC Act 1999 Referral Guidelines for Black Cockatoos) (DSEWPaC 2012), and evidence of foraging within the Pine plantations within study area was observed during the field assessment.



**Figure 3.8 – Pine Plantation habitat type**



**Figure 3.9 – Evidence of foraging within Pine Plantations by Black-cockatoos**

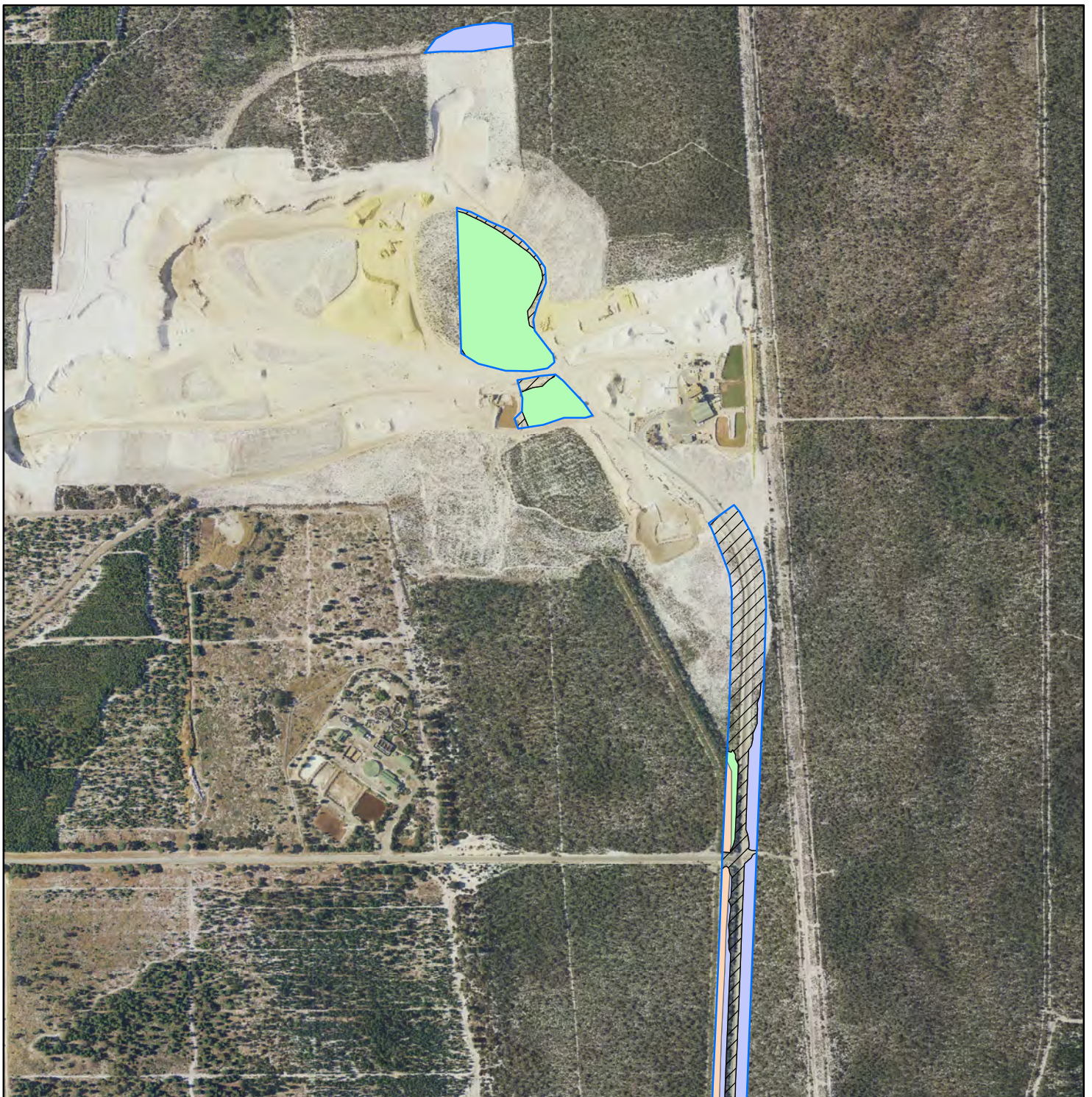
### 3.4.4 Open Pine, *Melaleuca* and *Eucalyptus* Woodland

This habitat comprises 1.4 ha or 3.6% of the study area and represents a low-lying area of vegetation representing an area of seasonally water-logged sandy soils supporting a mixture of planted and naturally occurring Pine, *Melaleuca* and *Eucalyptus* species, over thick grasslands. This habitat type may be suitable for a number of priority listed species identified by GHD (GHD, 2012) as potentially occurring in the study area, such as the Southern Brown Bandicoot (*Isodon obesulus fusciventer*); Western Brush Wallaby (*Macropus Irma*) and Black-striped Snake (*Neelaps calonotos*), as well as a host of common species known from the area. This habitat type is contiguous to habitats outside the study area and is considered to be in good condition.



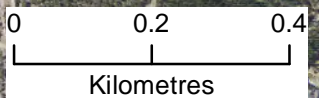
**Figure 3.10 – Open Pine, *Melaleuca* and Eucalyptus Woodland**





**Legend**

- Study Area
- Fauna Habitats**
- Banksia Woodland
- Revegetated Banksia Woodland
- Pine Plantation
- Open Planted Woodland (Pine, Maleleuca)
- Isolated Pine Trees
- Cleared



**Absolute Scale - 1:11,000**



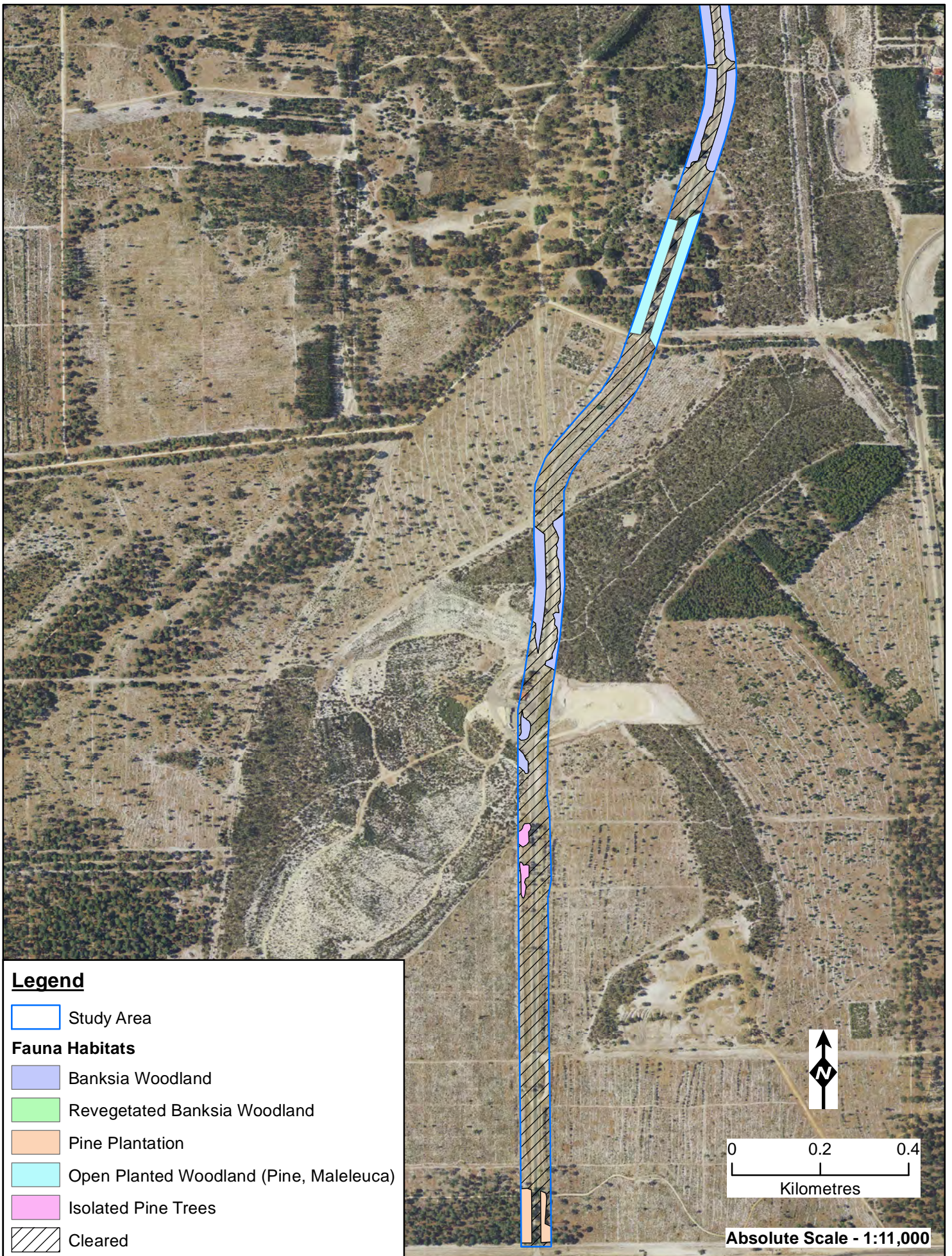
**Fauna Habitats  
of the Study Area  
Map A**

**Figure: 3.11  
Project ID: 1586**

**Drawn: Md'A  
Date: 13/03/2014**

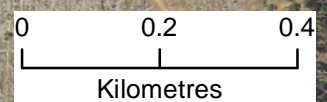
*Coordinate System*  
Name: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994





**Legend**

- Study Area
- Fauna Habitats**
- Banksia Woodland
- Revegetated Banksia Woodland
- Pine Plantation
- Open Planted Woodland (Pine, Maleleuca)
- Isolated Pine Trees
- Cleared



**Absolute Scale - 1:11,000**



## 4 DISCUSSION

### 4.1 FLORA

No flora listed as Threatened under the EPBC Act or the WC Act or Priority flora were recorded from the study area. The small number of taxa collected from the study area (43 taxa) is considered low for an area of 38.7 ha, which reflects the level of disturbance at the site. The higher representation of native plant families Myrtaceae (11 taxa, all native), Fabaceae and Proteaceae (six taxa each, all native) and Ericaceae (five taxa, all native) is due to remnant vegetation communities that were once supported by the study area and the revegetation happening in the area.

The timing of the field assessment, during March (non-spring), may be considered inappropriate for adequate collection and identification of the flora present for surveys in Swan Coastal Plain. This is supported by the fact that a large proportion of the specimens that were collected during this field assessment are either sterile or in their late reproductive stage.

### 4.2 VEGETATION

The vegetation assessment did not identify the presence of any TECs within the study area.

However, the species composition of 'Banksia Low Open Forest' is similar to that of the PEC 'Swan Coastal Plain *Banksia attenuata* - *Banksia menziesii* woodlands, SCP23b'. This vegetation community was recorded in the northern section and along the road verge in the southern section. GHD (2012) recognised this community as occurring only in the northern section however, according to the current survey, patches of this community occur further to the south of the study area. Approximately 16.47 ha of this PEC is located within the study area.

### 4.3 FAUNA

The fauna assemblage recorded from the study area in both assessments, is typical of the northern Swan Coastal Plain. The record of two additional feral species (dog and cat) is not unexpected nor unusual for this area. GHD (2012) previously mapped and identified suitable habitat for the Graceful Sun Moth (*Synemon gratiosa*), which was federally listed as Endangered at the time of reporting. Since then, this species has been removed from the EPBC list of conservation significant species (effective 18 May 2013) and therefore has not been addressed in this assessment.

The desktop assessment identified 18 conservation significant species as occurring or potentially occurring in the study area (GHD 2012). Of these, eight were assessed as having a medium to high likelihood of occurrence within the study area. These are:

- Forest Red-tailed Black-cockatoo (*Calyptorhynchus banksii naso* - State Threatened, Federally Vulnerable);
- Baudin's Black-cockatoo (*Calyptorhynchus baudinii* - State Threatened, Federally Endangered);
- Carnaby's Black-cockatoo (*Calyptorhynchus latirostris* - State Threatened, Federally Endangered);
- Peregrine Falcon (*Falco peregrinus* - S4);
- Black-striped Snake (*Neelaps calonotos* – P3);
- Graceful Sun-moth (*Synemon gratiosa* – P4);
- Southern Brown Bandicoot (*Isodon obesulus fusciventer* - P5); and
- Western Brush Wallaby (*Macropus irma* - P4).

With the exception of the Black-cockatoo species (discussed below), no evidence of the remaining five species conservation significant species was recorded in either in the study area, although

presence of some areas of suitable habitat within the study area suggests they may occasionally occur.

#### **4.3.1 Black-cockatoos**

A total of 16.73 ha (43.5%) of the study area, representing all non-cleared areas of vegetation within the study area potentially provides suitable foraging habitat for Black-cockatoos, with the preferred areas being the Pine plantations and isolated Pine trees, as well as the *Banksia* Woodlands. The revegetated area, although relatively young and underdeveloped has the potential to produce suitable *Banksia* and *Eucalyptus* fruit for Black-cockatoos food sources, although this would not be their preferred habitat, especially given its exposure to mining activity. No suitable trees for nesting/roosting with a diameter at breast height (DBH) >500 mm are present within the study area, therefore the site is likely to be utilised for foraging only.

#### **4.4 HABITATS**

GDH (2012) identified the habitats within the study area as important for providing corridors within an area of previously extensively cleared Swan Coastal Plain. The study area comprises bushland that has been recognised as significant and comprises a total of 22.52ha of Bush Forever sites (21.23 ha of Site 399; and 1.29 ha of Site 192). Further clearing of the study area would lead to a further decrease in habitat available for fauna species, and a further decrease in native pre-European vegetation.

In accordance with the EPBC Referral Guidelines for Black-cockatoos, clearing of more than 1 ha of quality foraging habitat requires Commonwealth referral. The study area contains 16.73 ha of quality Black-cockatoo foraging habitat.

## 5 CONCLUSION AND RECOMMENDATIONS

The key results and conclusions of the flora, vegetation and fauna assessment are as follows:

- No Threatened (EPBC Act or WC Act listed) or Priority flora were recorded in the study area.
- No Weeds of National Significance (WONS) or Declared Pests (weeds) were recorded in the study area.
- No TECs are supported by the study area.
- One PEC is supported by the study area: The PEC Swan Coastal Plain *Banksia attenuata* - *Banksia menziesii* woodlands, SCP23b. Approximately 16.47 ha of this PEC is located within the study area. This PEC is in pristine to good condition and clearing of vegetation representative of this would be considered to be at variance with clearing principle (a).
- The timing of the survey, during March (non-spring), is not considered suitable for adequate sampling and identification of the flora for surveys in Swan Coastal Plain (in accordance with Guidance Statement 51 (EPA 2004)). This is reflected by the fact that a large proportion of the specimens that were collected during this survey are either sterile or in their late reproductive stage. However, no Threatened Flora (previously called Declared Rare Flora) listed under the WC Act, species of national conservation significance listed under the EPBC Act or Priority flora listed by DPaW were recorded from the study area. Given the extension and synonymy of vegetation types mapped previously and during this assessment of the broader study area, it is unlikely that threatened or priority flora species occur in the wider corridor area. A further spring assessment of this area is unlikely to be required.
- For clearing of more than 1 ha of foraging habitat for Black-cockatoos, Commonwealth referral is recommended (DSEWPaC 2012). The study area comprises 16.73 ha of good quality Black-cockatoo foraging habitat.

## 6 REFERENCES

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DSEWPaC (2012). EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) *Calyptorhynchus latirostris*, Baudin's cockatoo (vulnerable) *Calyptorhynchus baudinii*, Forest red-tailed black cockatoo (vulnerable) *Calyptorhynchus banksii naso*. Canberra, Department of Sustainability, Environment, Water, Population and Communities.

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