Main Roads Western Australia

South Coast Highway - Kojaneerup

Biological Survey

March 2016

Executive summary

Introduction

Main Roads is planning to reconstruct, widen and seal a 20 km section along South Coast Highway between 46.4-65.7 SLK in the City of Albany. The Project will include three passing lanes, drainage improvements, parking bays and upgrades to four intersections

GHD Pty Ltd was commissioned by Main Roads to undertake a biological assessment of the Project Area. The purpose of the assessment was to delineate key flora, vegetation, fauna, soil, and hydrology values within the Project Area. The outcomes of the assessment will be used in the environmental assessment and approvals process and identify the need for and scope of further field investigations and/or more detailed environmental impact assessment.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.6 and the assumptions and qualifications contained throughout the Report.

Potential project constraints – biological aspects

The key biological constraints identified for the Project during the biological assessment are summarised in the following table.

Key biological constraints within the Project Area

Native vegetation	Conservation significant flora species	Fauna habitat	Conservation significant fauna species
222.62 ha of native vegetation is present within the Project Area. This includes: • 191.20 ha considered to be analogous to the Kwongkan TEC • 2.28 ha likely to represent Swamp Yate (*Eucalyptus occidentalis*) woodland in seasonally-inundated basins (South Coast) PEC • 12.24 ha considered to grow in association with a watercourse or wetland According to the ARVS four vegetation types described from the Project Area (ARVS Codes 14, 15, 12 and 39) are considered restricted and nine are considered rare.	12 DPaW Priority-listed flora were recorded from the Project Area including: • 13 individuals of *Leucopogon* sp. Manypeaks (A.S. George 6488) (P1). • Two individuals of *Synaphea incurva* (P1) • 15 individuals of *Stenanthemum sublineare* (P2) • 15 individuals of *Stylidium daphne* (P2) • 950+ individuals of *Gonocarpus trichostachyus* (P3) • 10 individuals of *Latrobea recurva* (P3) • One individual of *Synaphea preissii* (P3) • *Tetraria* sp. Blackwood (A.R. Annels 3043) (P3) recorded from 5 locations • 400+ individuals of *Centrolepis caespitosa* (P4) • 200+ individuals of *Drosera fimbriata* (P4) • 400+ individuals of *Stylidium gloeophyllum* (P4) • 25 individuals of *Xanthosia eichleri* (P4) In addition: • One individual of *Laxmannia grandiflora* subsp. *stirlingensis* was recorded just outside of the Project Area, but likely to be	There is habitat for two fauna species of conservation significance: • 203.60 ha Carnaby's Black Cockatoo • 222.61 ha Southern Brown Bandicoot/Quenda	The assessment identified the presence of two species of conservation significance: • Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) – Endangered under the EPBC Act and WC Act • Southern Brown Bandicoot/Quenda (*Isoodon obesulus fusciventer*) – (Priority 5) under DPaW.
		There is potential habitat for five fauna species of conservation significance: • 203.60 ha Forest Red-tailed and Baudin's Black Cockatoo • 187.80 ha Western Whipbird • 214.10 ha Rainbow Bee-eater • 219.57 Western Brush Wallaby	The assessment identified the likely presence of five species of conservation significance: • Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable under the EPBC Act and WC Act. • Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) – Endangered (Schedule 2) (WC Act) and Vulnerable (EPBC Act). • Western Whipbird (western heath) (*Psophodes nigrogularis nigrogularis*) – Endangered (Schedule 2) (WC Act) and Vulnerable (EPBC Act). • Rainbow Bee-eater (*Merops ornatus*) – Schedule 5 (WC Act) and Migratory (EPBC Act). • Western Brush Wallaby (*Macropus irma*) – Priority 4 (DPaW).

Native vegetation	Conservation significant flora species	Fauna habitat	Conservation significant fauna species
	present within the Project Area. • A sterile specimen of *Verticordia* collected from the Project Area may represent *V. harveyi* (P4). Two of the specimens collected in the field were submitted to the WA Herbarium for identification (Accession Number 6684) with the following advice: • *Tricostularia* sp. 1– the inflorescence were immature but this seems very likely to be an unrecognised taxon • *Leucopogon* sp. 1 – this belongs to a difficult complex within the *L. pulchellus* group (Group C). The circumscription of this entity needs more work, but it is very unlikely to be of conservation significance.		

Environmental approvals and referrals

This section provides preliminary environmental approvals and referrals advice based on the biological constraints identified within the Project Area. As the Project is in the concept design phase there may be opportunities to avoid and minimise the impacts on these biological constraints through design refinement. If the biological constraints can be avoided or impacts to these minimised it may negate the need for environmental approvals or referral to Commonwealth/State environmental agencies.

Matters of National Environmental Significance

Referral to the Department of the Environment (DotE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is triggered if a proposed action has or potentially has a significant impact on any Matters of National Environmental Significant (MNES). An assessment of the Project Area against key biological MNES is provided and it is considered likely that referral to DotE is required for potential impacts to the Kwongkan Threatened Ecological Community (TEC), Carnaby's Black Cockatoo, Forest Red-tailed Black Cockatoo, Baudin's Black Cockatoo and the Western Whipbird.

Environmental Protection Authority

Significant proposals must be referred to the Environmental Protection Agency (EPA) under Section 38 of the *Environmental Protection Act 1986* (EP Act). In deciding whether a proposal will be subject to the formal environmental impact assessment process, the EPA takes into account the environmental significance of any potential impacts that may result from the implementation of the scheme or proposal.

In the absence of a broader environmental assessment, the majority of the likely biological impacts associated with the Project are linked to native vegetation clearing and loss of fauna habitat. The potential impacts from the loss of native vegetation and loss of fauna habitat can be effectively assessed through the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. Therefore with consideration of the biological values discussed in this report, it is considered unlikely that the Project would require referral to the EPA under Section 38 of the EP Act.

Department of Environment and Regulation

The clearing of native vegetation in Western Australia requires a permit under Part V of the EP Act, unless an exemption applies. Main Roads has been granted a State-wide vegetation clearing permit (Clearing Permit CPS 818 and 817) which allows Main Roads to clear native vegetation for road projects and associated activities.

The Federal and Western Australia governments have entered into a bilateral agreement under the EPBC Act relating to environmental assessment (assessment bilateral agreement).

Specifically, this agreement now includes the clearing permit assessment process under Part V Division 2 of the EP Act. Under the assessment bilateral agreement, if a native vegetation clearing permit is required and the clearing will have or is likely to have an impact on a MNES, the assessment of the clearing application including the potential impacts to the MNES can be conducted by the Department of Environment and Regulation (DER) or Department of Mines and Petroleum (DMP) under delegation.

There is the presence of an EPBC Act listed and DPaW listed TEC, DPaW listed PEC and 13 conservation significant flora and fauna species within the Project Area. Furthermore, there is the likely presence of 16 conservation significant flora and fauna within the Project Area. As such, any clearing permit application should assess the significance of any potential impacts of the proposed clearing area on these communities and species.

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1. Introduction

1.1 Background

Main Roads Great Southern Region (Main Roads) is planning to reconstruct, widen and seal a 20 kilometre (km) section along South Coast Highway between 46.4-65.7 straight line kilometre (SLK) (the Project). This section of the South Coast Highway has a narrow seal width with substandard alignment and aging pavements nearing the end of their economic life. The Project will include three passing lanes, drainage improvements, parking bays and upgrades to four intersections. It will also provide appropriate seal width and safe overtaking opportunities given the growth in the Annual Average Daily Traffic, particularly in heavy haulage vehicles numbers.

1.2 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by Main Roads to undertake a biological assessment of the Project Area. The purpose of the assessment was to delineate key flora, vegetation, fauna, soil, and hydrology values within the Project Area. The outcomes of the assessment will be used in the environmental assessment and approvals process and identify the need for and scope of further field investigations and/or more detailed environmental impact assessment.

1.3 Location

1.3.1 Study area

A Study Area was defined for the desktop based searches of the biological assessment and includes a 5 km buffer of the Project Area.

1.3.2 Project area

The Project is located within the City of Albany, approximately 8 km east of the township of Manypeaks. It is located along South Coast Highway and encompasses the entire road reserve (approximately 100 m in width) from SLK 46.4-65.7 (total length 19.3 km and area 274.95 hectares (ha)) (Figure 1, Appendix A). The Project Area corresponds to the extent of biological survey area.

1.4 Scope of works

The scope of works, as detailed in the Main Roads Request for Service was to:

- Undertake a desktop assessment of the Study Area
- Undertake a biological survey of the Project Area including:
  - Spring season (Level 1) flora and vegetation survey
  - A Level 1 fauna survey
- Prepare a biological survey report that documents the results of the desktop assessment and field survey, identifies and justifies the requirement for referral to statutory authorities or other approvals for the project.

1.5 Relevant legislations, conservation codes and background information

In Western Australia some ecological communities, flora and fauna are protected under both Commonwealth and State Government legislation. In addition regulatory authorities also provide

a range of guidance and information on expected standards and protocols for environmental surveys.

An overview of key legislation and guidelines, conservation codes and background information relevant to this Project is provided in Appendix B.

1.6 Report limitations and assumptions

This report has been prepared by GHD for Main Roads and may only be used and relied on by Main Roads for the purpose agreed between GHD and Main Roads as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Main Roads arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Main Roads and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of access tracks, services, third party operational works and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

This report has assessed the flora and fauna within the Project Area (Figure 1, Appendix A). Should the Project Area change or be refined, further assessment may be required.

2. Methodology

2.1 Desktop assessment

Prior to the commencement of the field survey a desktop assessment was undertaken to identity relevant environmental information pertaining to the Study Area and to assist in survey design. This included a review of:

- Department of the Environment (DotE) Protected Matters Search Tool (PMST) to identify communities and species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) potentially occurring within the Study Area (DotE 2015a) (Appendix C)
- The Department of Parks and Wildlife (DPaW) Threatened Ecological Communities (TEC) and Priority Ecological Communities (PEC) databases to determine the potential for TECs or PECs to be present within the Study Area
- DPaW *NatureMap* database for flora and fauna species previously recorded within the Study Area (DPaW 2007–) (Appendix C)
- DPaW Threatened (Declared Rare) and Priority Flora database (TPFL) and Western Australian Herbarium database (WAHERB) for Threatened and Priority flora species listed under *Wildlife Conservation Act 1950* (WC Act) and listed as priority by DPaW, previously recorded within the Study Area
- Existing datasets including: previous vegetation mapping of the Project Area (Beard 1979), aerial photography, geology/soils and hydrology information to provide background information on the variability of the environment, likely vegetation units and fauna habitats and to identify areas with potential to contain TECs, PECs, and Threatened and Priority listed flora and fauna species.

2.2 Field survey

2.2.1 Vegetation and flora

GHD ecologists (Meranda Toner, SL011307 and Megan Dilly, SL011308) and consulting botanist Elizabeth Sandiford conducted a single season Level 1 vegetation and flora assessment of the Project Area from 12-22 October 2015 (16 people days). The field survey was undertaken to verify the results of the desktop assessment, identify and describe the dominant vegetation units, assess vegetation condition and identify and record vascular flora taxa present at the time of survey. Searches for conservation significant ecological communities and flora taxa were also undertaken.

The survey methodology employed by GHD was undertaken with reference to the EPA *Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004a) and *Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3* (EPA 2002).

Data collection

Field survey methods involved a combination of sampling quadrats, rapid assessment points and walking traverses across areas of native vegetation. Twenty non-permanent quadrats, walking transects (approximately 20 km) and 129 rapid assessments (Photo Point) sites were undertaken throughout the Project Area.

A minimum of two quadrats were located within each identified vegetation unit, for units with sufficient extent to enable two quadrat locations, with quadrats 10 m x 10 m in size (area of 100 m^2). Field data at each quadrat was recorded on a pro-forma data sheet and included the parameters detailed in Table 1. Quadrat and rapid assessment data is provided in Appendix D.

Table 1 Data collected during the flora and vegetation field survey

Aspect	Measurement
Collection attributes	Personnel/recorder; date, quadrat dimensions, photograph of the quadrat.
Physical features	Aspect, soil attributes, ground surface cover, leaf and wood litter.
Location	Coordinates recorded in GDA94 datum using a hand-held Global Positioning System (GPS) tool to accuracy approximately ± 5 m.
Vegetation condition	Vegetation condition was assessed using the Keighery (1994) condition rating scale.
Disturbance	Level and nature of disturbances (e.g. weed presence, fire and time since last fire, impacts from grazing, exploration activities).
Flora	List of dominant flora from each structural layer. List of all species within the quadrat including average height and cover (using a modified Braun-Blanquet scale)

A flora list was compiled from taxa listed in described quadrats and from opportunistic floristic records throughout the Project Area.

Vegetation units

Vegetation units were identified and boundaries delineated using a combination of aerial photography, topographical features and field data/observations.

Vegetation units were described based on structure, dominant taxa and cover characteristics as defined by quadrat data and field observations. Vegetation unit descriptions follow the National Vegetation Information System (NVIS) and are consistent with NVIS Level V (Association), and are grouped within NVIS Level III (Broad Floristic Formation). At Level V up to three taxa per stratum are used to describe the association (ESCAVI 2003).

Vegetation mapping has been undertaken at a scale of 1:5,000; this is considered a suitable scale for this Project.

Vegetation condition

The vegetation condition of the Project Area was assessed and mapped in accordance with the Keighery (1994) vegetation condition rating scale. This scale recognises the intactness of vegetation, which is defined by the following:

- Completeness of structural levels
- Extent of weed invasion
- Historical disturbance from tracks and other clearing or dumping
- The potential for natural or assisted regeneration.

The scale consists of six rating levels as outlined in Appendix B.

Flora identification and nomenclature

Species that were well known to the survey botanists were identified in the field; all other species were collected and assigned a unique collection number to facilitate tracking. Plant species were identified by the use of local and regional flora keys and by comparison with the named species held at the Western Australian Herbarium.

The conservation status of all recorded flora was compared against the current lists available on *FloraBase* (WA Herbarium 1998–) and the EPBC Act Threatened species database provided by DotE (2015b).

Nomenclature used in this report follows that used by the Western Australian Herbarium as reported on *FloraBase* (WA Herbarium 1998–).

Surveys for conservation significant flora

Prior to the field survey, information obtained from the desktop assessments (e.g. aerial photography, geology, soils and topography data, EPBC Act PMST, TPFL, *NatureMap* and the WAHERB database search results) was reviewed to determine potential conservation significant flora taxa and locations. Additionally, ecological information (e.g. habitat, associated flora taxa and phenology) was sourced from *FloraBase* (WA Herbarium 1998–) and other relevant publications where available, to provide further details.

Potential habitat were searched by transect sampling and opportunistic sampling. Locations within the Project Area with differing hydrology, fire or disturbance history to the surrounding areas were also searched where identified.

2.2.2 Fauna

GHD ecologist (Erin Lynch) conducted a single season Level 1 fauna survey over three days on the 12-14 October 2015 (spring). The survey assessed the entire extent of the Project Area. The field survey was undertaken to identify fauna habitat types, assess habitat value and connectivity, identify and record fauna taxa present at the time of survey, and undertake targeted searches for conservation significant fauna taxa and their habitats.

The survey methodology employed by GHD was undertaken with reference to the EPA Guidance Statement No. 56 *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004b) and *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2010).

Habitat assessment

A fauna habitat assessment was undertaken to document the type, condition and extent of habitats within the Project Area, this included:

- Habitat structure (e.g. vegetation type, presence/absence of overstorey, midstorey, understorey and ground cover)
- Presence/absence of refuge including: fallen timber (coarse woody debris), hollow-bearing trees and stags and rocks/boulder piles, and the type and extent of each refuge
- Presence/absence of waterways including type, extent and habitat quality within waterways
- Location of habitat within the surrounding landscape and habitat connectivity
- Identification of wildlife corridors within and immediately adjacent to the Project Area.

Opportunistic observations

The fauna survey was an opportunistic survey and did not involve any fauna trapping. The survey involved visual and aural surveys for any fauna species utilising the Project Area. The Project Area was also searched for any fauna signs, such as tracks, scats, bones, diggings and feeding signs.

Surveys also included systematic searching across all habitat types, which is an effective method of surveying for many wildlife species. This involved searching through microhabitats

where wildlife is known to frequent, including turning over logs or rocks, turning over leaf litter and examining hollow logs. Reptiles were also sighted as they basked during the day.

During the field survey, targeted searches for conservation significant fauna species and their habitats were conducted. Species – specific search strategies were used to identify any conservation protected species in the area or evidence that they utilise the Project Area.

Targeted black cockatoo survey

Three species of Black Cockatoo's were surveyed in line with the EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's Black Cockatoo (Endangered) *Calyptorhynchus latirostris*, Baudin's Black Cockatoo (Vulnerable) *Calyptorhynchus baudinii* and Forest Red-tailed Black Cockatoo (Vulnerable) *Calyptorhynchus banksia naso* (Department of Sustainability, Environment, Water, Populaiton and Communities (DSEWPaC) 2012).

The assessment involved a visual and aural assessment of the Study Area identifying actual and potential breeding trees, feeding habitat, roosting areas, current activity and any other signs of use by Black Cockatoos.

Information collected during the field survey included;

- Identification of feeding habitat (through accepted feed plant species and /or evidence of feeding)
- Identification of roosting areas, GPS location of actual and/or potential breeding trees that are >500 mm diameter at breast height (DBH) and have hollows suitable for breeding
- A map of the feeding habitat and of actual and/or potential breeding habitat or roost sites.

Fauna identification and nomenclature

Nomenclature used in this report follows that used by the Western Australian Museum and the DPaW *NatureMap* database (DPaW 2007–) with the exception of birds where Christidis and Boles (2008) was used.

2.3 Desktop and survey limitations

2.3.1 Desktop limitations

The EPBC Act PMST is based on bioclimatic modelling for the potential presence of species. As such, this does not represent actual records of the species within the area. The records from the DPaW searches of threatened flora and fauna provide more accurate information for the general area. However, some records of collections, sightings or trappings can be dated and often misrepresent the current range of threatened species.

New Wildlife Conservation (Rare Flora) and Wildlife Conservation (Specially Protected Fauna) Notices were gazetted on 3 November 2015. The format of these Notices has been changed to align with the EPBC Act threatened species lists. To date information contained in publically available databases such as *NatureMap* does not reflect these newly gazetted Notices. This report has been updated to reflect the conservation status of flora and fauna listed in these Notices. However, the outputs of database searches contained in this report such as *NatureMap*, does not reflect the conservation status of flora and fauna listed in these Notices.

2.3.2 Field survey limitations

Guidance Statement No. 51 and No. 56 (EPA 2004a, 2004b) states that flora and fauna survey reports for environmental impact assessment in Western Australia should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 2.

Table 2 Survey limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information.	Minor	Adequate information is available for the Study Area, this includes: • Broad scale (1:1,000,000) mapping by Beard (1979) and digitised by Shepherd *et al.* (2002) • Albany Regional Vegetation Survey (ARVS) (Sandiford and Barrett 2010).
Scope (what life forms were sampled etc.)	Nil	Vascular flora species were sampled during the survey. Non-vascular flora, invertebrate, terrestrial and aquatic fauna were not sampled as part of survey.
Proportion of flora collected and identified (based on sampling, timing and intensity) Proportion of fauna identified, recorded and/or collected	Minor	The vegetation and flora survey was a single season survey only and was undertaken in mid October. This was considered an optimal time for surveying due to rainfall amount received in the three months prior to the survey (see *Timing/weather/ season/cycle*). The flora recorded from the field survey is detailed in Section 4.2 and a full flora species list provided in Appendix D. Five hundred and sixty eight flora taxa representing 63 families and 219 genera were recorded from the survey. The portion of flora collected and identified was considered high. The Level 1 fauna survey was undertaken in October 2015 and was a reconnaissance survey only. The fauna assessment only sampled those species that can be easily seen, heard or has distinctive signs, such as tracks, scats, diggings etc. Many cryptic and nocturnal species would not have been identified during a reconnaissance survey and seasonal variation within species often requires targeted surveys at a particular time of the year. Of the fauna species recorded during the survey, all species were identified to species level. The fauna assessment was aimed at identifying habitat types and terrestrial vertebrate fauna utilising the Project Area. No sampling for invertebrates or aquatic species occurred. The information available on the identification, distribution and conservation status of invertebrates is generally less extensive than that of vertebrate species.
Flora determination	Nil	Flora determination was undertaken by GHD ecologists and Elizabeth Sandiford in the field and at the Western Australian Herbarium. Mrs Sandiford is an expert botanist for the south coast region of WA and was the primary author on the Albany Regional Survey. Ten native flora collections could be identified to genus only and seven taxa were uncertain species identifications due to lack of flowering and fruiting material required for identification. The taxonomy and conservation status of the Western Australian flora is dynamic. This report was prepared with reliance on taxonomy and conservation current at the time issuing, but it should be noted this may change.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Nil	The Project Area was surveyed during the vegetation, flora and fauna assessment. This included a combination of quadrats (20), walking transects (approximately 60 % of the Project Area was traversed on foot) and rapid assessments (129). The survey effort was considered sufficient to meet the brief and EPA guidance statements. The Project Area has been fully surveyed by the Level 1 fauna survey.
Mapping reliability	Nil	The vegetation was mapped at a scale of 1:5,000 using high resolution ESRI aerial imagery obtained from Landgate, topographical features, pre-European mapping (Beard 1979)

Aspect	Constraint	Comment
		and field data. Data was recorded in the field using a hand-held GPS tool. Certain atmospheric factors and other sources of error can affect the accuracy of such GPS receivers. On average, the GPS units used during this field survey (Garmin GPS, Trimble Nomad or Trimble Juno units) have an accuracy to approximately ± 5 m. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies.
Timing/weather/ season/cycle	Minor	The survey was conducted on 12-22 October 2015 (spring). In the three months prior to the survey (July to September), Mettler weather recording station (No. 009754: BoM 2016) recorded a total of 220.4 mm of rainfall. This rainfall total is approximately 10 per cent greater than the long term average for the same period (July to September; 198.3 mm) (BoM 2016). The weather conditions recorded during the field survey included (BoM 2016): • Daily maximum temperature ranging from 19 °C to 31.2 °C (Albany airport weather station) • Daily minimum temperature ranging from 5.6 °C to 15.3 °C (Albany airport weather station) • Daily rainfall 0 mm to 3.1 mm (Mettler weather station). The weather conditions recorded during the survey period were considered unlikely to have impacted upon the vegetation, flora and fauna survey.
Disturbances (e.g. fire, flood, accidental human intervention)	Minor	Sections of the Project Area have been burnt (varying ages) and are in differing successional stages post burn. The Project Area is also likely to be impacted by dieback with evidence of proteaceous species (particularly *Banksia*) death in some parts. The combined impact of fire regimes and dieback has changed to floristic composition of vegetation units within the Project Area and results in difficulties in vegetation mapping/ a change in floristic composition. Other disturbances, such as weeds / clearing, were minimal throughout the Project Area.
Intensity (in retrospect, was the intensity adequate)	Nil	The vascular flora of the Project Area was sampled in accordance with EPA (2004a) and terrestrial fauna sampled in accordance with EPA (2004b) for a Level 1 survey. The Project Area was sufficiently covered by GHD ecologists during the survey.
Resources	Nil	Adequate resources were employed during the field survey. A total of 16 person days were spent undertaking the vegetation and flora survey and three person days for the fauna assessment.
Access restrictions	Minor	No access problems were encountered during the survey. The entirety of the Project Area was accessed on foot, during the survey.
Experience levels	Nil	The survey ecologists are practitioners suitably qualified and experienced in their respective fields. Erin Lynch is an Ecologist (zoology) with over 8 years' experience in undertaking surveys in WA, Meranda Toner is a Senior Ecologist (botany) with over 10 years' experience in undertaking surveys in WA, Megan Dilly is an Ecologist (botany) with over 7 years' experience in undertaking surveys in WA and Elizabeth Sandiford is a consulting botanist with over 30 years' botanical experience in the Albany region.

3. Desktop Assessment

3.1 Climate

The Project Area is located approximately 48 km east of Albany, in the south coast region of Western Australia. The nearest Bureau of Meteorology (BoM) weather station to the Project Area with continuous data is the Mettler weather station (9754).

The climate of the region is temperate, with warm to hot summers and mild to cold winters. The mean[1] maximum temperature is 25.1 degrees Celsius (°C) in summer (January and February), and 16.2 - 17 °C in winter (June-August). The mean minimum temperature is 6.1-6.9 °C in winter and 11.7 – 14 °C in summer. The mean annual rainfall is 605.8 mm per year, with monthly means from around 25.8 mm in summer (January) to 71 mm in winter (July) (BoM 2016) (Plate 1).

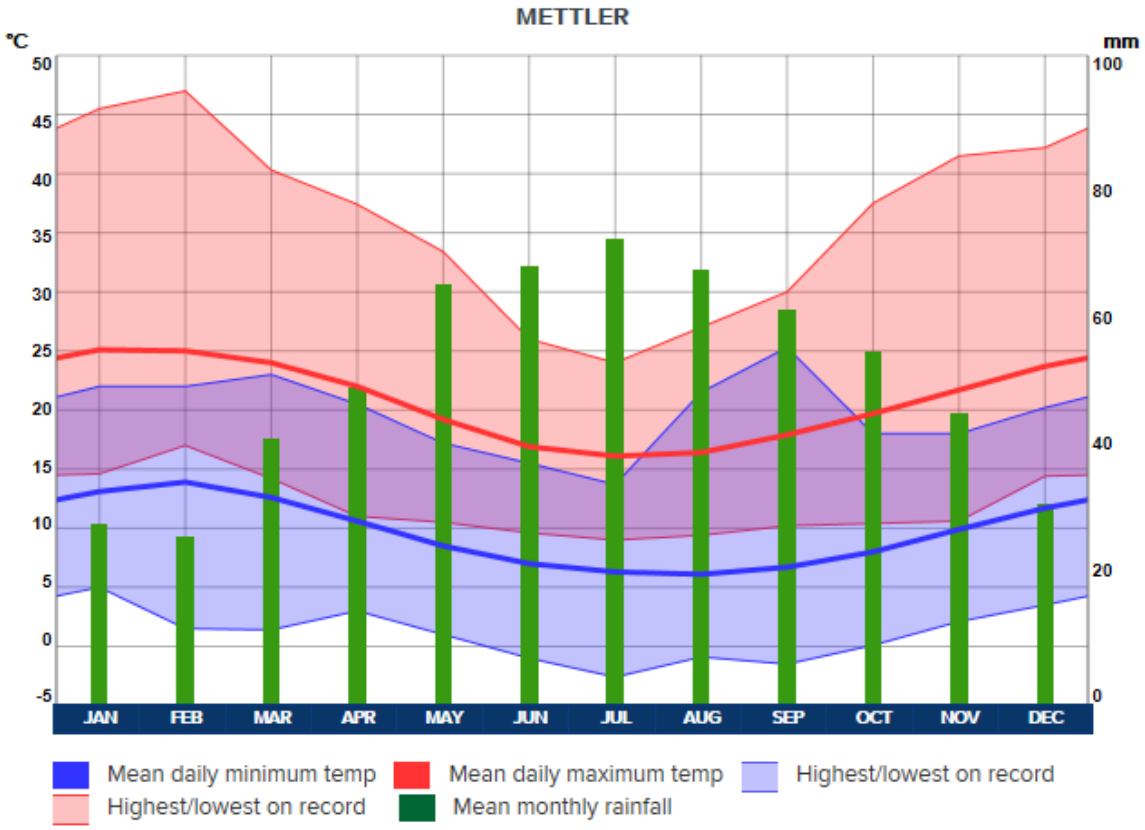

Plate 1 Mean Monthly Temperatures and Rainfall for Mettler Weather Station (Weatherzone 2016)

3.2 Landform and soils

Soil-landscape mapping is a survey of land resources which delineates repeating patterns of landscapes and associated soils (Schoknecht *et al.* 2004). The mapping of the South-West of Western Australia was investigated to determine the soil-landscapes present within the Project (DAFWA 2007). The majority of the Project Area is covered by the Chillinup System, with the Takalarup Subsystem associated with minor drainage lines from Waychinicup River, the Minor

[1] BoM 2016 provides mean data for the time period between 1966 and 1997.

Valleys 6 Subsystem associated with minor drainage lines of Wongerup Creek and the Chillinup 5 Subsystem covering 1.5 km of the Project Area between SLK 62-63.5 (DAFWA 2007).

The soil-landscapes that occur within the Project Area are detailed in Table 3.

Table 3 Soil-landscapes within the Project Area (DAFWA 2014b)

Soil-Landscape Mapping	Description	Location
Chillinup System	Level to gently undulating sandplain with scattered small lakes and depressions. Some lunettes and linear dunes. Lower slopes are often saline. Mallee-heath and yate and banksia woodlands.	The dominant unit in the centre and north of the Project Area (from approximately SLK 50 to 65.7)
Takalarup Subsystem	Broadly undulating plateau; lakes; depressions; hummocks; scattered siltstone. Gravelly yellow duplex soils on plains, yellow solonetzic soils in depressions, podzols in sands of hummocks.	Occurs in the south of the Project Area (between SLK 46.5 to 50)
Minor Valleys 6 Subsystem	Narrow V-shaped valleys, in sedimentary rocks;<10 m relief. Sandy yellow duplex soils on slopes; Jarrah-Marri low forest. Deep sands on narrow swampy floor; sedges and reeds.	Small valley sections across the Project Area
Minor Valleys S7 slope phase	Broad valleys in sedimentary rocks; 30 m relief; smooth slopes. Deep sands and iron podzols on slopes; Albany Blackbutt-jarrah-sheoak woodland. Podzols and yellow duplex soils on floors; paperbark woodland, teatree heath.	Occurs at the very southern extent of the Project Area (at SLK 46.4)
Chillinup 5 Subsystem	Gentle gravelly rises with some areas of deep sand sheet deposits.	Occurs in a band in the northern section of the Project Area (approximately SLK 62.6 - 63.8)
Dempster crest Phase	Sands and laterite on elongate crests; Jarrah-Albany Blackbutt – Marri Forest. Broad convex crests of sandy and lateritic spurs and ridges. Geology of deeply weathered siltstone. Soils of Duplex sandy gravels, grey deep sandy duplexes, pale deep sands and shallow gravels. Heath with scattered Jarrah.	Very small section at approximately SLK 56.6

3.1 Hydrology

The hydrology and hydrogeology aspects proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act) within the Project Area are provided in Table 4. No areas proclaimed under the RIWI Act were identified within the Project Area.

Table 4 Department of Water geographic atlas query results (DoW 2015)

Aspect	Detail	Result
RIWI Groundwater Areas	Groundwater areas proclaimed under the RIWI Act	The Project is not within a RIWI groundwater area.
Groundwater sub-areas	Groundwater areas proclaimed under the RIWI Act	The Project is not within a RIWI groundwater sub-area.
RIWI Watercourses	Watercourses proclaimed under the RIWI Act	The Project does not cross any RIWI watercourses.
RIWI Surface water area	Surface water areas proclaimed under the RIWI Act	The Project is not within a RIWI surface water area.

Aspect	Detail	Result
Public Drinking Water Source Areas (PDWSA)	PDWSAs is a collective term used for the description of Water Reserves, Catchment Areas and Underground Pollution Control Areas declared (gazetted) under the provisions of the *Metropolitan Water Supply, Sewage and Drainage Act 1909* or the *Country Area Water Supply Act 1947.*	No PDWSAs are present in the Project Area.

3.1.1 Surface water

The Project Area is located within the Albany Coast Drainage River Basin (DoW 2015).

A search of the ArcGIS shapefiles indicates that Wongerup Creek, including several minor drainage lines, crosses the Project Area at SLK 56. In addition, several minor drainage lines from Waychinicup River (SLK 46 to SLK 49) also cross the Project Area (Figure 2, Appendix A). These drainage lines are expected to be seasonally inundated.

3.1.2 Wetlands

Wetlands of International Significance are listed under the Ramsar Convention, which is an International treaty that covers the conservation of internationally important wetlands. A search of the EPBC Act PMST did not identify any Ramsar listed sites 5 km of the Project Area.

The South Coast Significant Wetlands dataset displays the location and boundary of regionally and internationally significant wetlands in the south coast region (DPaW 2015). A search of the ArcGIS shapefiles indicates that there are eight significant wetlands within 5 km of the Project Area (Table 5 and Figure 2, Appendix A). One of these wetlands, Sunday Swamp, is located within the Project Area.

Table 5 Significant Wetlands within 5 km of the Project Area

Wetland Name and ID Number	Category	Location
Sunday Swamp UFI: BA21603875	Conservation Class	In the Project Area (between SLK 54 and SLK 55)
Drawbin Road UFI: SEM0075	Conservation Class	Approximately 500 m west of Project Area (between SLK 59 and SLK 60)
Hassell Road UFI: BA21603835	Conservation Class	Approximately 500 m north-east of SLK 66
Cheyne Downs UFI: BA21603907	Conservation Class	Approximately 2.8 km east of SLK 46
Kojaneerup 1 UFI: SEM0074	Conservation Class	Approximately 3.2 km north-west of SLK 66
Pfeiffer Lake UFI: BA21603904	National (ANCA)	Approximately 4.6 km west of SLK 46
Tarnup Lake UFI: BA21603896	National (ANCA)	Approximately 5.4 km west of SLK 46
Kulyalli UFI BA21603828	Conservation Class	Approximately 5.7 km north-east of SLK 66

3.2 Land use

3.2.1 Existing land use

The Project Area is located within both road reserve and Hassell National Park (Class A Reserve, R 26650), which is managed by DPaW and vested with the Conservation Commission of Western Australia.

The surrounding / adjacent land-use includes national parks / reserves and agricultural land (grazing and blue-gum plantations).

3.2.2 Conservation reserves and estate

Hassell National Park is a long, linear national park (1,264.6 ha) which is located along the South Coast Highway between the road reserve and surrounding rural land. The national park occurs on both sides of the highway and ranges in width from 70 metres (m) to up to 450 m wide (on one side of the highway).

Hassell National Park exists as a well-defined corridor of uncleared native vegetation (Department of Conservation and Land Management 1991), and therefore provides an important ecological linkage through otherwise cleared land. The Park has been identified as an important inland vegetation and wildlife corridor from the Waychinicup and Mt Manypeaks area to the Cheyne Bay and Pallinup River areas.

The Project Area varies from being entirely located within the road reserve to entirely located within Hassell National Park. The cadastre for the existing Highway does not align with the road reserve, with several areas of the existing Highway located within Hassell National Park.

Overall, 188.2 ha of the Project Area is located within Hassell National Park. In areas where the Project Area is not located within Hassell National Park, it is aligned immediately adjacent.

Two other DPaW-managed reserves occur within 5 km of the Project Area (Table 6). Another five DPaW managed reserves are located within 10 km of the Project Area, including Waychinicup National Park.

Table 6 DPaW managed reserves within 5 km of the Project Area

Reserve Name/Number	Class	Size (ha)	Location
Cheyne Road Nature Reserve R 27157	Class C	367.4	Located 1.3 km south-east of the Project Area
North Sister Nature Reserve R 26385	Class C	1007.7	Located 5.5 km west of the Project Area

3.2.3 Environmentally Sensitive Areas

A search of the Clearing Permit System Map (DER 2015) indicates that there are no ESAs located within the Project Area.

Three ESAs are located within 5 km of the Project Area, which are all associated with the locations of the Threatened flora species, *Banksia brownii*, located 600 m south, 2 km east and 4 km east of the Project Area (Figure 2).

3.3 Regional biogeography

The Project Area is located within both the Esperance Plains and Jarrah Forest Interim Biogeographic Regionalisation for Australia (IBRA) regions, and within the Fitzgerald and Southern Jarrah Forest sub-regions, respectively. The southern quarter of the Project Area is

located within the Southern Jarrah Forest sub-region (SLK 46.3-50.4), and the Project Area north of SLK 50.4 is located within the Fitzgerald sub-region.

The Fitzgerald IBRA sub-region comprises myrtaceous and proteaceous scrub and mallee heaths on sandplain overlying Eocene sediments. The sub-region is rich in endemics. Herbfields and heaths (rich in endemics) occur on abrupt granite tors and quartzite ranges that rise from the plain. Eucalypt woodlands occur in gullies and alluvial footslopes (Comer *et al.* 2001).

The Southern Jarrah Forest IBRA subregion comprises of duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by Wandoo - Marri woodlands on clayey soils. Eluvial and alluvial deposits support Agonis shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands (Hearn *et al.* 2002).

3.4 Vegetation and flora

3.4.1 Broad vegetation associations and extent

Broad scale pre-European (1:250,000) vegetation mapping (1979) at an association level indicates that there are two vegetation associations present within the Project Area:

- Low forest; Jarrah and *Casuarina* (probably *Allocasuarina fraseriana*) (association 994) – mapped for the southern quarter of the Project Area (SLK 46.3-50.5 within the Jarrah Forest IBRA region).
- Shrublands; Jarrah mallee-heath (association 980) – mapped for the northern three quarters of the Project Area (SLK 50.5-65.7 within the Fitzgerald IBRA region).

The vegetation of the Albany region is very complex and the Beard (1979) associations have been mapped at a broad landscape scale. This means that the mapping does not always correlate well to actual vegetation types within areas surveyed at a finer scale. The Albany Regional Vegetation Survey (ARVS) (Sandiford and Barrett 2010) mapped vegetation types at a fine scale in a survey area within the City of Albany. The ARVS area does not include the Project Area but includes an area approximately 8 km to the west of the Project Area.

The pre-European mapping has been adapted and digitised by Shepherd *et al.* (2002). The extent of the vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by the DPaW (latest update June 2014 – Government of Western Australia (GoWA) 2015). As shown in Table 7, the current extent remaining of vegetation association 980 is greater than 33 % of its pre-European extent at all scales (e.g. State, IBRA bioregion, IBRA subregion and local government authority (LGA)). Conversely, the current extent remaining of vegetation association 994 is less than 28 per cent of its pre-European extents at all scales, and therefore is below the 30 per cent threshold level[2].

[2] The 30 per cent threshold level is the level below which species loss appears to accelerate exponentially at an ecosystem level (EPA 2000).

Table 7 Extent and status of vegetation associations mapped within the Project Area (Beard 1979, GoWA 2015)

Scale/ vegetation association		Pre-European Extent (ha)	Current Extent (ha)	% Remaining	% Current Extent in DPaW – managed land
IBRA Region – Jarrah Forest		4,506,660.26	2,457,731.55	54.54	68.32
Vegetation Association 994: Low forest: Jarrah and Casuarina	State (WA)	16,954.92	4,888.09	28.83	31.15
	IBRA region (Jarrah Forest)	16,407.62	4607.19	28.08	31.73
	IBRA subregion (Southern Jarrah Forest)	16,407.62	4,607.19	28.08	31.73
	LGA (City of Albany)	16,954.92	4,888.09	28.83	31.15
IBRA Region – Esperance Plains		2,899,940.88	1,508,057.94	52	54.43
Vegetation Association 980: Shrublands: Jarrah Mallee-heath	State (WA)	162,416.28	67,508.75	41.57	47.97
	IBRA region (Esperance Plains)	160,409.63	65,981.54	41.13	46.88
	IBRA subregion (Fitzgerald)	160,409.63	65,981.54	41.13	46.88
	LGA (City of Albany)	109,990.66	37,328.30	33.94	12.52

3.4.2 Conservation significant ecological communities

A search of the EPBC Act PMST and DPaW TEC and PEC databases identified the potential presence of one TEC and 11 PECs within 10 km of the Project Area (Table 8 and Figure 2, Appendix A).

The Federally listed TEC 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia' (Endangered) has been mapped within the Project Area. This Federally listed TEC includes a number of State listed PECs.

Table 8 Threatened and Priority Ecological Communities recorded within 10 km of the Project Area

Name	Status –EPBC Act	Status – DPaW
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Priority 3 PEC
Swamp Yate (*Eucalyptus occidentalis*) woodland in seasonally-inundated basins (South Coast)		Priority 3 PEC
Cheynes 1 Tree Mallee	**	Priority 1 PEC
Cheynes 2 Open Tree Mallee	**	Priority 1 PEC
Banksia coccinea Shrubland / *Eucalyptus staeri* / Sheoak Open Woodland (ARVS Unit 14)	**	Priority 1 PEC
Banksia coccinea Shrubland / *Melaleuca striata* / *Leucopogon flavescens* Heath (ARVS Unit 15)	**	Priority 1 PEC
Taxandria spathulata Heath (ARVS Unit 32)	**	Priority 4 PEC
Albany Blackbutt (*Eucalyptus staeri*) mallee heath on deep sand	**	Priority 2 PEC

Name	Status –EPBC Act	Status – DPaW
Tallerack (*Eucalyptus pleurocarpa*) mallee-heath on seasonally inundated soils	**	Priority 2 PEC
Melaleuca striata / *Banksia* spp. Coastal Heath (ARVS unit 16)	**	Priority 1 PEC
Mosaic of Albany Blackbutt (*Eucalyptus staeri*) mallee-heath found on lateritic ridges and Chittick (*Lambertia inermis* subsp. *inermis*) scrub-heath on seasonally-waterlogged laterite	**	Priority 1 PEC
Green Range granite hill heath and woodland community		Priority 1 PEC

** denotes a PEC has been identified within the Endangered TEC 'Proteaceae Dominated Kwongkan Shrublands'

3.4.3 Flora diversity

A search of the *NatureMap* database identified 368 taxa, including 355 native flora taxa and 13 naturalised (non-native) flora taxa, as being previously recorded within 5 km of the Project Area. Dominant families within this search included: Proteaceae (90 taxa), Fabaceae (54 taxa), Myrtaceae (43 taxa) and Ericaceae (25 taxa).

One flora species: *Leucopogon* sp. Manypeaks (A.S. George 6488) P1 was identified on the *NatureMap* database as endemic to the Study Area.

3.4.4 Conservation significant flora

Desktop searches of the EPBC Act PMST database, *NatureMap* database, and the DPaW TPFL and WAHERB databases identified the presence/potential presence of 64 conservation significant flora taxa within the Study Area.

The desktop searches recorded:

- 18 EPBC Act / WC Act listed taxa
- Two Priority 1 taxa
- 12 Priority 2 taxa
- 17 Priority 3 taxa
- 15 Priority 4 taxa

The location of conservation significant flora registered on the DPaW databases is provided in Figure 2, Appendix A.

3.4.5 Introduced flora (weeds)

A search of the *NatureMap* database identified 13 introduced flora taxa previously recorded within the Study Area.

3.5 Fauna

3.5.1 Fauna diversity

A search of the *NatureMap* database identified 109 terrestrial vertebrate fauna species previously recorded within 5 km of the Study Area (Appendix C). This total comprised of 85 birds, 11 reptiles, seven mammals and six amphibians. Of the 109 fauna species previously recorded 107 were native species and two were naturalised (introduced) species.

3.5.2 Conservation significant fauna

Searches of the EPBC Act PMST and DPaW *NatureMap* database identified the presence/ potential presence of 20 conservation significance fauna species within a 5 km buffer of the Study Area. The desktop searches recorded:

- 13 taxa listed under the EPBC Act and/or WC Act
- Five species listed as migratory birds (terrestrial and/or wetland species) under the EPBC Act and/or under Schedule 3 (Migratory birds protected under an international agreement) of the WC Act
- Two species listed as Priority by DPaW

Species solely listed as migratory marine species (i.e. Petrel) were excluded from this assessment as no marine habitat is present within the Study Area.

4. Field survey results

4.1 Vegetation

4.1.1 Vegetation types

The Project Area occurs on an undulating plain with gentle rises and lower lying flats and drainage depressions. Five broad floristic formations containing 11 vegetation types as well as modified areas were identified and described from the Project Area based on field observations (Table 9 and Figure 3, Appendix A). This included:

- *Hakea* Shrublands
  - *Hakea* species Complex: this is the most structurally and floristically diverse vegetation type within the Project Area. It has been further divided into four sub-types based on species dominance and location in the landscape.
- *Banksia* Shrubland
  - *Banksia* species on sands
- *Eucalyptus* Woodlands
  - *E. marginata* and *Corymbia calophylla* Woodlands
  - Mixed Mallee Woodland
  - *E. goniantha* Mallee Woodland
  - *E. decipiens* Mallee Woodland over Low Heath
  - *E. adesmophloia* Mallee Woodland over Sedgeland
- *Actinodium* Heath
  - *Actinodium* sp. Fitzgerald low heath on impeded drainage
- Swamps, Drainage lines and Sumps
  - *Taxandria parviceps* transitional drainage
  - *Eucalyptus occidentalis* Swamp
  - *Melaleuca* Swamp – several sub-types were present including *Melaleuca preissiana* / *M. cuticularis* swamps, *Kunzea recurva* Shrubland, Sedgelands in swamps/sumps.

The vegetation types form a series of mosaics, particularly in the undulating plain areas, and have been impacted by disturbances particularly *Phytophthora* dieback and fire regimes. The mosaic pattern and influence of fire and dieback made assigning boundaries and vegetation types difficult as vegetation patterns changed over a very small scale or lacked key indicator species. The vegetation types have been divided based on dominant vegetation in the key structural layers. Where these layers have been highly disturbed (such as the *Banksia* species absent from fire / dieback) key indicator species in the ground-layer have been relied upon to assign a vegetation type.

A comparison has been made (where possible) with other mapping undertaken in the area, Beard (1979) and Sandiford and Barrett (2010). The Beard (1979) vegetation associations are very broad (1:250,000 scale) and have brief descriptions. As such, aligning vegetation mapping is often difficult. The ARVS (Sandiford and Barrett 2010) provides recent vegetation mapping for the Albany area. The ARVS study area extends to Manypeaks (approximately 8 km west of the Project Area), but does not extend into the Esperance Plains Bioregion (which occupies the northern approximately 16 km of the Project Area). As such, not all vegetation types within the Project Area correlate with those described in the ARVS.

Table 9 Vegetation types

Vegetation type description	Representative photograph
***Hakea* spp. Shrublands** The *Hakea* spp. complex is structurally and floristically diverse. It has a dominance or co-dominance of *Hakea* species (*Hakea cucullata, H. trifurcata* and/or *H. ferruginea)* and varies in structure from Tall Open Mallee Woodland to Tall / Mid Shrublands. This is the dominant vegetation type within the Project Area. **Description:** Shrubland to Open Shrubland dominated or co-dominated by one or more of *Hakea cucullata, H. trifurcata* and *H. ferruginea* over a diverse Mid Shrubland typically dominated by *Taxandria spathulata, Agonis theiformis* and *Melaleuca striata* with a Low Sedgeland of *Mesomelaena tetragona, Lepidosperma drummondii* and *Anarthria prolifera.* +/- Tall Open Mallee Woodland of *Eucalyptus marginata* and *E. staeri*. **Vegetation sub- types** A –Dominated by *H. cucullata* and *H. ferruginea* on impeded drainage. B - *Hakea* spp. with *Taxandria parviceps* on low lying flats / transitional areas. This is ecotonal with the *Taxandria* drainage and transitional areas vegetation type. C – *Hakea* spp. in damp areas – *Hakea corymbosa* and *H. ceratophylla* present. D – *Hakea* spp. with dominance / co-dominance of *Taxandria spathulata* with *Banksia* species in shrub layer (*Banksia mucronata* and *B. biterax*). **Other Common Species (not listed above):** Shrubs: *Acacia browniana* var. *browniana, Hakea lasiantha, H. prostrata, H. lasiantha, Hibbertia gracilipes, Isopogon formosus, Petrophile squamata* and *Grevillea fasciculata.* Ground: *Desmocladus fasciculatus, Schoenus obtusifolia, Chordifex laxus, C. sphacelatus, Lepidosperma* aff. *squamatum, Loxocarya cinerea, Conostylis setigera and Dampiera juncea.* **Location:** Occurs throughout the Project Area. 156.26 ha in total Sub-type A (121.02 ha) – occurs in the western extent of the Project Area on impeded drainage with laterite or on higher plains / hills. Sub-type B (7.11 ha) and C (1.21 ha) – occurs throughout on low lying areas that may be seasonally inundated. Sub-type D (26.93 ha) – occurs in the eastern extent of the Project Area on plains with sandy soils. Forms a mosaic with *Banksia* Shrublands. **Mosaic / Patterns:** This association forms a mosaic with the four sub-types, the *Banksia* Shrubland and *Taxandria* transitional vegetation. **Comparison with other vegetation mapping**: ARVS Unit 31, Beard (1979) Association: 994/980 **Conservation significance**: Considered to be a	 Sub-type A in western extent of Project Area burnt 2 years (Quadrat 8)  Sub-type B in lower lying area (Quadrat 20)  Sub-type C: *Hakea* spp. in dampland area with a mosaic of *Taxandria parviceps* Shrubland (Photo Point 64).  Sub-type D: *Hakea* spp. with *Taxandria spathulata* as dominant / co-dominant in Shrub layer (Quadrat 19).

Vegetation type description	Representative photograph
component of the Kwongkan TEC. **Sampling sites:** Quadrats 8, 10, 12, 13, 19 and 20. Photo Points: 3, 4, 23, 27 – 33, 35, 36, 38, 41, 48, 49, 54, 56, 58, 61, 62, 65, 67, 72 - 74, 77, 79 - 85, 92, 93, 95, 97 - 102, 104, 105, 107, 113, 118 - 121, 123, 125 and 127	
***Banksia* Shrubland** Tall / Mid Shrubland to Open Shrubland dominated / co-dominated by *Banksia baxteri, B. attenuata* and *B. coccinea* over a Mid Open Shrubland of *Melaleuca striata, M. thymoides* and *Jacksonia spinosa* over a Sedgeland of *Anarthria scabra, A. prolifera* and *Cyathochaeta equitans.* +/- Tall Open Mallee Woodland of *Eucalyptus marginata* and E *staeri*. This vegetation type is structurally and floristically variable. The key characteristics are the presence of *Banksia* species (*B. baxteri, B. coccinea* and *B. attenuata*) as Tall (> 2 m) shrubs over sedges / herbs dominated by *Anarthria scabra, Cyathochaeta equitans* and *Dasypogon bromeliifolius.* It is found on areas with deep sands. In some areas, *B. baxteri* (such as Quadrat 7) Tall Closed Shrubland. This vegetation type has been impacted by dieback and possibly fire that has seen the *Banksia* species removed leaving species such as *Melaleuca striata / M. thymoides* and sedges as dominant in impacted areas. As such, a key component of mapping this type was the presence of typical ground layer species (sedges / rushes / herbs). In some areas the *Banksia* species are almost absent. **Other Common Species (not listed above):** Shrubs: *Adenanthos cuneatus, Hypocalymma strictum, Leucopogon elegans, Isopogon longifolius, Banksia nutans.* Ground*: Dasypogon bromeliifolius, Lyginia barbata, Hypolaena fastigiata, Hypolaena exsulca, Schoenus caespititius.* **Location:** Occurs throughout the Project Area on deep grey sands. 28.35 ha in total. **Mosaic / Patterns:** This association forms a mosaic with the *Hakea* spp. Complex, *Eucalyptus* Mallee Woodland over Low Heath and *Taxandria* transitional vegetation. The *Banksia* Shrubland occurs with the deep sand while the *Hakea* spp. Complex is associated with laterites. **Comparison with other vegetation mapping**: ARVS: affinities to unit 14 and 15 however it is noted that in the ARVS study area *Banksia baxteri* was not a key species in either of these units. ARVS study area with it being transitional with other *B. coccinea* dominated units that occur to the north and north east which include *Banksia baxteri* (Sandiford 2003-2006 in Sandiford and Barrett 2010). Beard (1979) Association: likely to occur within the broader definition of 994 and 980.	 *B. baxteri* dominant Shrub layer (Q 7).  *B. coccinea* present (Photo Point 53)  Showing area lacking in proteaceous species with *Jacksonia spinosa* and *Melaleuca striata* dominant in shrub layer (Photo Point 45).

Vegetation type description	Representative photograph
Conservation significance: Considered to be a component of the Kwongkan TEC and has affinities to *Banksia coccinea* Shrubland/*Eucalyptus staeri*/Sheoak Open Woodland (ARVS Unit 14 - Sandiford and Barrett 2010) PEC P1 but this PEC is not known to occur with *B. baxteri* and occurs to the west of the Project Area. **Sampling sites**: Quadrat 7 and 14. Photo Points: 15, 16, 17, 19, 24 – 26, 43 -46, 52, 53, 63, 66, 68, 76, 88 - 91, 96, 108, 110, 112, 114 and 117.	 Showing area lacking in shrub species with key indicator being the presence of ground species with occasional key shrub species (Photo Point 46).
<u>*Eucalyptus marginata* and *Corymbia calophylla* Woodland</u> Mid Woodland of *Eucalyptus marginata* and *Corymbia calophylla* over Tall Shrubland of *Bossiaea linophylla, Xanthorrhoea platyphylla* and *Agonis theiformis* over a Low Open Sedgeland *Cyathochaeta avenacea, Tetraria* sp. Jarrah Forrest and *Anarthria prolifera*. **Location:** Occurs in two locations within the Project Area – one on an upper hill crest with exposed laterite and the other in a lower slope. 3.52 ha in total. **Comparison with other vegetation mapping**: ARVS Unit 12 – Jarrah / Marri / Sheoak Laterite Forest Beard (1979) Association: 980 **Conservation significance**: - **Sampling sites:** Photo Points: 40 and 124	 *E. marginata* Woodland (Photo Point 40)
<u>Mixed Mallee Woodland</u> Mixed Low Open Mallee Forest to Woodland with dominance or co-dominance of *Eucalyptus angulosa, E lehmannii* and *E preissiana* subsp. *preissiana* an Open Mid Shrubland of *Taxandria spathulata, Banksia tenuis* and *Banksia dryandroides* over a Sedgeland dominated by *Tetraria* sp. Jarrah Forest, *Desmocladus fascicularis* and *Chordifex laxus.* **Other Common Species:** Mallees: *Eucalyptus goniantha*, *E. uncinata* and *E. marginata.* Shrubs: *Banksia armata, Xanthorrhoea platyphylla, Agonis theiformis, Hakea corymbosa, H. marginata*, *H. prostrata, Melaleuca suberosa, Petrophile divaricata.* Ground: *Chordifex sphacelatus, Anarthria gracilis, Gahnia aristata, Lepidosperma* aff. *squamatum, Mesomelaena tetragona, M. stygia, Chordifex isomorphus, Tetraria octandra.* **Location:** Occurs in one location on a hill slope over laterite. 5.12 ha in total. **Comparison with other vegetation mapping**:	 *Eucalyptus* Mallee at Quadrat 6

Vegetation type description	Representative photograph
ARVS Unit – no corresponding – this is likely to indicate the transition from the Jarrah Forest to the Esperance Plain Bioregion. Beard (1979) Association: 980 **Conservation significance**: Considered to be a component of the Kwongkan TEC. **Sampling sites:** Quadrats 6 and 18. Photo Points: 126 and 128.	 *Eucalytpus angulosa* Mallee on hill slope (Photo Point 128)
***Eucalyptus goniantha* Woodland** Open Mallee Woodland with *Eucalyptus goniantha / E. falcata* over Mid Open Shrubland of *Templetonia retusa, Spyridium majoranifolium* and *Acacia leioderma* over Open Herb/Sedgeland with *Opercularia hispidula, Billardiera fusiformis* and *Lepidosperma striatum*. **Location:** Occurs in two locations surrounding *Melaleuca* swamps. 0.98 ha in total. **Comparison with other vegetation mapping**: ARVS Unit 20 – *Eucalyptus goniantha* Mallee Beard (1979) Association: 980 **Conservation significance**: - **Sampling sites:** Quadrat 11.	 *E. goniantha* Mallee at Quadrat 11
***Eucalyptus* Mallee Woodland over Low Heath** Low Open Mallee Woodland of *Eucalyptus adesmophloia, E. marginata and E. staeri* over a diverse Low Heathland with *Taxandria spathulata, Hakea trifurcata* and *Xanthorrhoea platyphylla* over Low Sedgeland of *Cyathochaeta equitans*, *Anarthria gracilis* and *Chordifex laxus*. **Other Common Species:** Shrubs: *Hakea cucullata, H. ferruginea, Agonis theiformis, Petrophile squamata, Banksia gardneri, Banksia nutans, Petrophile ericifolia, Melaleuca striata, Allocasuarina humilis, Exocarpos sparteus*, *Hibbertia gracilipes*. Ground: *Mesomelaena tetragona, M. stygia, Anarthria gracilis, Chordifex sphacelatus, Desmocladus fascicularis, Anarthria prolifera, Lepidosperma aff. squamatum.* **Location:** Occurs in the eastern extent of the Project Area. 10.35 ha in total. **Mosaic / Patterns:** Forms a mosaic with *Hakea* spp. Complex and Banksia Shrubland. As it is on a low lying plain swamps / depressions are also present. There are similarities to *Hakea* spp. Complex sub-type 1D. However, it has been separated from this complex based on the presence of *E. adesmophloia*. It also occurs on a lower plain that may be seasonally damp. **Comparison with other vegetation mapping**: ARVS – possibly falls within the ARVS 31 – *Hakea* spp. Complex. Beard (1979) Association: 980	 Quadrat 5 – area burnt in past 2 years  *Eucalytus adesmophloia* and *E. marginata* over *Hakea trifurcata, H. ferruginea* and *T. spathulata* (Photo Point 2). Note: in burnt areas *Gastrolobium bracteolosum* forms a lower shrub layer.

Vegetation type description	Representative photograph
Conservation significance: Considered to be a component of the Kwongkan TEC. **Sampling sites:** Quadrat 4 and 5. Photo Point: 1, 2, 4, 5, 7, 8, 11, 12, 13, 70, 71, 109 and 111	
***Eucalyptus* Mallee Woodland over Sedgeland** Low Mallee Woodland with *Eucalyptus adesmophloia* over a Low Open Shrubland with *Hakea corymbosa, Hakea florida* and *Taxandria spathulata* over a Mid Sedgeland with *Anarthria laevis, Chordifex laxus* and *Desmocladus fascicularis.* **Other Common Species:** Shrubs: *Hakea trifurcata, Xanthorrhoea platyphylla, Hakea prostrata, Petrophile squamata, Hakea ceratophylla, Banksia dryandroides, Melaleuca suberosa.* Ground: *Lepidosperma aff. squamatum, Lepidosperma striatum, Anarthria gracilis, Schoenus caespitosus, S. obtusifolius, S. laevigatus, S. subfascicularis, Harperia lateriflora, Dampiera alata.* **Location:** Occurs in the eastern extent of the Project Area in areas transitioning to swamps / wetlands. 3.04 ha in total. **Comparison with other vegetation mapping**: ARVS Unit – no corresponding. Beard (1979) Association: 980 **Conservation significance**: - **Sampling sites:** Quadrats 15 and 17. Photo Points: 6, 20, 22, 115 and 116.	 *E. adesmophloia* over sedges at Quadrat 15  *E. adesmophloia* over sedges at Photo Point 20. Note some death of Hakea species evident.
***Actinodium* Heath** Low very diverse Open Heathland dominated by *Actinodium* sp. Fitzgerald River, *Adenanthos cuneatus* and *Astartea* sp. over a Low Open Herbland / Sedgeland of *Schoenus efoliatus, Anarthria scabra* and *Dasypogon bromeliifolius.* **Other Common Species (not listed above):** Shrubs: *Lysinema conspicuum, Leucopogon elegans, Dampiera linearis, Adenanthos obovatus, Beaufortia anisandra, Pericalymma spongiocaule, Sphaerolobium pubescens.* Ground*: Hypolaena exsulca, Hypolaena fastigiata, Mesomelaena gracilipes.* **Location:** occurs on areas of impeded drainage with grey sands in three locations either near drainage features or on upper plain. 3.2 ha in total. **Comparison with other vegetation mapping**: ARVS Unit: has affinities to 39 – *Pericalymma spongiocaule* Low Heath with location and species diversity but dominant species and structure differ. This may be due to the locations in the Project Area being burnt within the last 2-3 years or because of the more easterly location of the Project Area to the ARVS study extent. Beard (1979) Association: likely to be within the broader association 51.	 *Actinodium* heath at Quadrat 3

Vegetation type description	Representative photograph
Conservation significance: Not considered to be TEC or PEC. **Sampling sites**: Quadrat 3 and 9. Photo Points: 37 and 109	
***Taxandria* drainage and transitional areas** Tall Shrubland to Open Shrubland dominated by *Taxandria parviceps* with occasional *T. linearifolia* over a Low to Mid Sparse Shrubland with *Adenanthos obovatus, Kunzea recurva* and *Hakea ceratophylla* over a mixed Mid Sedgeland with *Schoenus laevigatus, S. efoliatus* and *Meeboldina scariosa.* **Other Common Species (not listed above):** Shrubs: *Melaleuca preissiana, Pericalymma spongiocaule, Dampiera leptoclada, Hakea corymbosa.* Ground: *Schoenus subfascicularis, Mesomelaena tetragona, M. gracilipes, Anarthria scabra, A. prolifera, Chordifex laxus.* **Location:** Occurs throughout the Project Area in low lying areas and drainage lines. Often smaller areas are located near culverts along the highway (note some of these were too small to be mapped). 4.05 ha in total. **Mosaic / Patterns:** transitional and forms a mosaic with other vegetation types on lower plains / drainage areas. **Comparison with other vegetation mapping**: ARVS Unit 38 – however affinities to ARVS units difficult to discern as it occurred in narrow strips / transitional areas. Beard (1979) Association: 51/27 **Conservation significance**: - **Sampling sites**: Photo Points: 31, 34, 47, 75, 78 and 106.	 *Taxandria parviceps* transitioning into a Sedgeland (Photo Point 34)  *T. parviceps* and *T. linearifolia* along a drainage line (Photo Point 47)
***Eucalyptus occidentalis* Swamp** **Description:** *Eucalyptus occidentalis* Mid Open Forest over Isolated Shrubs of *Melaleuca cuticularis* over a Low Closed Sedgeland of L*epidosperma striatum, Anarthria laevis* and *Tetraria* sp. Blackwood River (P3). **Location:** Occurs in two discrete locations associated with low lying swamps. 2.28 ha in total. **Comparison with other vegetation mapping**: Affinities to ARVS Unit 62 – in ARVS this unit did not contain *A. laevis* of *T.* sp. Blackwood but the floristics is likely to alter with substrate and inundation. Beard (1979) Association: 27 **Conservation significance**: PEC – Swamp Yate (*Eucalyptus occidentalis*) woodland in seasonally-inundated basins (South Coast) (State Priority 3) **Sampling sites:** Quadrats 1. Photo Point: 21	 *E. occidentalis* Swamp (Quadrat 1)

Vegetation type description	Representative photograph
Swamps and Sumps The swamps / wetlands within the Project Area tend to have differing characteristics at each location. When present an overstorey is dominated or co-dominated by *Melaleuca preissiana* or *M. cuticularis* over Shrub layer that can include *Boronia denticulata, M. densa, Kunzea recurva* and *Pericalymma spongiocaule.* Some swamps / sumps occur as Sedgelands. Three swamp / sump types have been identified. **Description:** A – *Kunzea recurva* Shrubland Mid Open Shrubland with *Kunzea recurva, Pericalymma spongiocaule* and *Petrophile squamata* over Mid Sedgeland of *Mesomelaena tetragona, Cyathochaeta avenacea* and *Lepyrodia muirii.* Other species include: *Melaleuca densa, Hakea sulcata, Meeboldina kraussii, Lepyrodia drummondiana, Schoenus subfascicularis, Tricostularia compressa, Baumea juncea, and Anarthria laevis.* This vegetation type appears to be transitional between wetland and upland vegetation types. B – Sedgelands Often occur with a *Melaleuca cuticularis* fringing Open Woodland. Other shrubs include: those in sub-type A with *Verticordia plumosa, Beaufortia empetrifolia* and *Hakea tuberculata*. Closed Sedgeland with one or more of the following usually dominant *Chorizandra enodis, Baumea articulata* or *Chordifex laxus.* Other sedges include*: Schoenus laevigatus, Ficinia nodosa, Tricostularia exsul, T. compressa*, T. sp. Wellstead, *Anarthria laevis* and *Lepidosperma striatum*. C – *Melaleuca* Swamps Low Open Woodland dominated / co-dominated by *Melaleuca preissiana* and/or, *Melaleuca cuticularis* with Mid Shrubland to Open Shrubland usually dominated by one of the following of *Boronia denticulata*, *Melaleuca densa* and *Kunzea recurva* over Low Sedgeland with *Lepidosperma striatum, Meeboldina kraussii* and *Schoenus laevigatus*. Other species include: Sedges and Shrubs from sub-type A and B. Occasionally *Banksia littoralis* is present. **Location:** Occurs throughout the Project Area in lower lying depressions. 5.46 ha in total with: • A –1.39 ha • B – 1.02 ha • C – 3.05 ha **Comparison with other vegetation mapping**: Type A: ARVS: 53 Type B: ARVS: 63/43 Type C: ARVS: 55 Aligning with ARVS was difficult as these vegetation types were often very small and	 *Melaleuca preissiana* in surrounds with *Boronia denticulata* and *Melaleuca densa* in Shrub layer (Quadrat 2).  *Melaleuca preissiana* swamp with distrubance (Photo Point 51)  Sedgeland (Photo Point 87)  *Kunzea recurva* over sedges (Photo Point 18)

Vegetation type description	Representative photograph
variable. Beard (1979) Association: 51 for Sedgelands and Kunzea recurva swamps and 27 for Melaleuca swamps. **Conservation significance**: - **Sampling sites:** Quadrats 2 and 16. Photo Points: 9, 14, 18, 39, 42, 50, 51, 55, 57, 59, 60, 64, 87, 103 and 122.	
Modified and Cleared Areas The Project Area includes areas that have been highly modified and either contain no or very few native species (52.33 ha). Photo Points: 10, 69 and 94.	
 Cleared pasture with bluegum plantation in background.	 Existing South Coast Highway

4.1.2 Conservation significant ecological communities

The field assessment confirmed the presence of the EPBC Act Endangered TEC *Proteaceous Dominated Kwongkan Shrublands (Kwongkan TEC) of the Southeast Coastal Floristic Province of Western Australia* and the DPaW PEC: *Swamp Yate (Eucalyptus occidentalis) woodland in seasonally-inundated basins (South Coast)*.

The *Banksia coccinea* Shrubland / *Melaleuca striata / Leucopogon flavescens* Heath PEC (ARVS Unit 15) has affinities to the *Banksia* Shrubland, however this PEC is not known to contain *Banksia baxteri* (which was the main *Banksia* recorded within the Project Area) and Sandiford and Barrett (2010) note that there are *B. coccinea* units that occur to the north of the ARVS survey area which contain *B. baxteri*. As such, it is not considered that this PEC is present.

Kwongkan TEC

This ecological community is found within the south coast region of Western Australia, and is dominated by flowering shrub species from the Proteaceae family. The ecological community is mainly found in the Esperance Sandplains and Mallee bioregions (DotE 2014).

The ecological community typically occurs on sandplains, occupying lower and upper slopes and ridges, as well as uplands across its range.

Some of the key diagnostic characteristics are:

- Occurs within the Southeast Coastal Floristic Province.
- Characterised by Proteaceae species having 30 per cent or greater cover of Proteaceae species across all layers where these shrubs occur.
- Two or more diagnostic Proteaceae species are present that are likely to form a significant vegetative component when regenerated. The use of diagnostic species is for situations in which the cover of Proteaceae species is reduced due to recent disturbance (e.g. fire).
- Other notes: although the structure is a shrubland – Mallee *Eucalyptus* may be present at varying densities but providing the minimum.
- Proteaceae cover is present the ecological community is still recognised.
- Adjacent woodlands are not included. However, a patch of the ecological community may contain localised patches of trees that may be higher density, where they occur within the broader Proteaceae-dominated vegetation (e.g. swamps).

The survey identified 191.20 ha of Kwongkan TEC. Due to the modifying impacts of dieback and fire and the mosaic pattern of vegetation types, areas of the Kwongkan TEC were not readily identifiable in the field. In particular, it is expected that dieback has removed Proteaceae species diversity and cover, particularly in the *Banksia* Shrublands, to the extent that some areas no longer meet the TEC criteria. Also several of the vegetation types have mosaic patterns with patches (where *Taxandria spathulata* is dominant) that fall below the 30 per cent criteria. A discussion on the vegetation types and their alignment with the Kwongkan TEC is provided in Table 10.

Table 10 Kwongkan TEC classification

Vegetation Type	Kwongkan TEC
Hakea spp. Complex Shrublands	Generally, meets the 30 % Proteaceae criteria and contains key diagnostic species in areas that have been recently burnt. Some areas are likely to be impacted by dieback and have lost Proteaceous species. This vegetation type also forms a mosaic with some areas dominated by *Taxandria spathulata* (particularly sub-type D) and contains patches that do not meet the 30 % Proteaceae cover. However, as a whole this vegetation is considered to meet the criteria for Kwongkan TEC. There were some small areas of the vegetation type that were disturbed and did not contain sufficient proteaceous species to be included in the TEC (condition rating of 4-5 or lower). 155.52 ha of Kwongkan TEC.
Banksia Shrubland	Considered to meet the 30 % Proteaceae criteria in areas that are mapped as Excellent (2) to Very Good (3). There are several areas that have been burnt and as such were difficult to determine whether they would recover to meet the criteria – these areas have been assigned a condition rating of 3 and are considered to be within the TEC but may require further analysis in time to assess their recovery. A number of areas were assigned a condition rating of Very Good (3) to Good (4) or lower. These areas appear to have been modified by dieback and do not meet the 30 % Proteaceae cover. Although the two diagnostic species (typically *Banksia attenuata* and *Adenanthos cuneatus*) were often present it is not expected that these areas would recover to meet the 30 % cover criteria and as such they have not been included as a component of the Kwongkan TEC. These areas were typically dominated by *Jacksonia spinosa, Melaleuca striata* and *M. thyoides* over a ground layer of *Anarthria scabra, Cyathochaeta avenacea* and *Dasypogon bromeliifolius*. 20.21 ha of Kwongkan TEC.
Mixed Mallee Woodland	Meets the 30 % Proteaceae criteria and considered to be a component of the Kwongkan TEC. 5.12 ha of Kwongkan TEC
Actinodium Heath	Does not meet criteria currently – areas have been recently burnt there is potential for more Proteaceae species to generate with time. *Adenanthos* species were recorded but lacks *Hakea* and *Banksia* species – not considered as part of the TEC in current condition.
Eucalyptus Mallee Woodland over Low Heath	Generally meets the 30 % Proteaceae criteria, however there are areas within the vegetation type that fall below 30 % cover – however these are considered to be patches within the broader TEC and have been included as a component of the TEC. 10.35 ha of Kwongkan TEC
Eucalyptus Mallee Woodland over Sedgeland	Does not meet criteria – contains Hakea species indicative of the TEC but cover was generally below 30 %.
Eucalyptus goniantha Mallee Woodland, *E. marginata* and *Corymbia calophylla* Woodlands, *Taxandria parviceps* transitional drainage, *E. occidentalis* Swamp and Swamps and Sumps	Do not meet the criteria for Kwongkan TEC.

Swamp Yate (Eucalyptus occidentalis) woodland in seasonally-inundated basins (South Coast) PEC

The Swamp Yate woodland PEC is restricted to the South Coast and is described as Yate woodlands with intact understorey and fringing vegetation and is poorly conserved in the region (DPaW 2015).

This PEC aligns with the *Eucalyptus occidentalis* swamp vegetation type that occurs within the Project Area. There was 2.28 ha of this PEC present within the Project Area.

4.1.3 Other significant vegetation

EPA guidance provides a definition of vegetation that may also be considered significant for reasons other than statutory listing. The vegetation within the Project Area meets the 'other significant vegetation' criteria for being poorly reserved and historical impact from threatening processes. The surrounding landscape has been extensively cleared for agriculture with native vegetation restricted to small patches within farmland, road reserves and national parks / conservation areas. As shown in Table 7, the corresponding Beard (1979) vegetation association 994, which occurs in the western extent of the Project Area, has less than 30 per cent of its pre-European extent remaining. Association 980 has less than 30 per cent of the current extent remaining at the LGA scale.

The ARVS (Sandiford and Barrett 2010) also assessed regional and local significance of vegetation units. A summary of the vegetation types and the corresponding ARVS significance is provided in Table 11.

Table 11 Regional and local significance of vegetation types

Vegetation Type	ARVS Code	ARVS Study Area				Riparian Vegetation
		Restricted ARVS	Range Limit ARVS	Rarity (1500 ha)	<10% current extent in reserves	
Hakea Shrublands	31		SW			
Banksia Shrubland	14	X		X		
	15	X	SW	X		
E. marginata and *C. calophylla* Woodlands	12	X	E		X	
Mixed Mallee Woodland	-					
E. goniantha Mallee Woodland	20		SW	X	X	
Eucalyptus Mallee Woodland over Low Heath	-					
Eucalyptus Mallee Woodland over Sedges	-					
Actinodium Heath	39	X	E	X		X
T. parviceps transitional drainage	38		E	X		X
E. occidentalis Swamp	62		S	X	X	X
Melaleuca Swamp	55		U	X	X	X
Sedgeland	63		U	X	X	X
	43		S	X		X
Kunzea recurva Shrubland	53		U	X	X	X

Note: U = Unknown, ARVS is the E – eastern extent; SW – South Western Extent; S – Southern Extent.

4.1.4 Vegetation condition

The vast majority of the vegetation condition within the Project Area was rated as Excellent (2) (64 %). The vegetation structure across the Project Area was largely intact, with the occurrence of weed species generally restricted to the edge of the existing Highway, roads and access tracks.

The Project Area contains vegetation in varying stages fire succession, with some areas burnt within the last 1-2 years. Increased fire frequency can alter vegetation structure and composition over time. Many of the species that occur within the Project Area are fire sensitive.

Evidence of dieback was also noted, particularly in the *Banksia* shrubland / *Hakea* spp. Complex vegetation types. It is expected the combination of fire / dieback has results in the loss of proteaceous species in some sections of the Project Area. Typically, where fire and / or dieback are expected to have led to the loss of species and structure these areas have been mapped as Very Good (3) to Good (4).

The extent of the vegetation condition ratings within the Project Area are detailed in Table 12 and mapped in Figure 4, Appendix A.

Table 12 Extent of vegetation condition ratings mapped within the Project Area

Vegetation type	Extent (ha) vegetation Condition					
	Excellent (2)	Excellent (2) to Very Good (3) and Very Good (3)	Very Good (3) to Good (4) and Good (4)	Good (4) to Degraded (5) and Degraded (5)	Degraded (5) to Completely Degraded (6)	Completely Degraded (6)
Hakea spp. Complex	144	8.74	2.77	0.25	0.49	
Banksia Shrubland	2.14	18.07	8.14			
Actinodium Low Heath	1.4	1.8				
Eucalyptus marginata and *Corymbia calophylla* Woodlands	3.52					
Mixed Mallee Woodland	5.12					
Eucalyptus goniantha Mallee Woodland	0.98					
Eucalyptus Mallee Woodland over Heath	10.35					
Eucalyptus Mallee Woodland over Sedgeland	0.26	2.78				
Taxandria parviceps transitional drainage	2.71	0.82	0.52			
Eucalyptus occidentalis Swamp	2.17	0.11				
Melaleuca Swamp/ *Kunzea* Swamp and Sedgelands	4.04	0.03	1.09	0.31		
Planted and Cleared					0.44	51.88
Total	**176.69**	**32.35**	**12.53**	**0.56**	**0.92**	**51.88**
% Total Project Area	**64.27**	**11.76**	**4.56**	**0.20**	**0.33**	**18.75**

4.2 Flora

4.2.1 Flora diversity

Five hundred and sixty eight flora taxa (including subspecies and varieties) representing 63 families and 219 genera were recorded from the Project Area during the field survey. This total comprised 510 native taxa and 58 introduced taxa. Dominant families recorded from the Project Area included:

- Proteaceae (73 taxa)
- Fabaceae (68 taxa)
- Myrtaceae (58 taxa)
- Cyperaceae (44 taxa)

The Project Area is considered to have a high level of floristic diversity. Based on described quadrats, species diversity ranged from 10 to 74 taxa per 100 m^2. A flora taxa list for the Project Area is provided in Appendix D.

4.2.2 Conservation significant flora

EPBC Act and/or WC Act listed taxa

No flora taxa listed under the EPBC and/or WC Act was recorded within the Project Area.

DPaW Priority listed taxa

Twelve DPaW Priority-listed flora taxa were recorded within the Project Area during the October 2015 field survey. Details on the Priority-listed flora taxa recorded within the Project Area are provided below, with locations mapped in Figure 3, Appendix A.

In addition, one individual of *Laxmannia grandiflora* subsp. *stirlingensis* (Priority 3) was recorded just beyond the northern extent of the Project Area in the *Eucalyptus* Mallee Woodland over Low Heath. Although not recorded within the Project Area, there is suitable habitat within the Project Area, and the species is likely to be present.

Furthermore, a *Verticordia* specimen was collected that could not be confirmed to species level due to a lack of flowering material. This specimen could be *Verticordia harveyi* (Priority 4), which is known to occur in the area and the habitats present. *Verticordia harveyi* flowers in February to April and would require further survey during the flowering period to confirm its presence.

Leucopogon sp. Manypeaks (A.S. George 6488) – Priority 1

Leucopogon sp. Manypeaks is a low shrub that is known from two records within Western Australia, one within Hassel National Park and the other East of Manypeaks (WA Herbarium 1998–) (Plate 2). In the Project Area, the species was recorded at four locations (13 plants) all associated with disturbance being on the edge of an access track, road verge or constructed drainage culvert. These locations were generally on hill slopes with yellow sand over laterite adjacent to *Hakea* spp. Complex and the Mixed Mallee Woodland.

Plate 2 *Leucopogon* sp. Manypeaks *in-situ*

Synaphea incurva – Priority 1

Synaphea incurva is a clumped, spreading shrub with yellow flowers (Plate 3). The species is reported to flower from September to November and is known to occur in gravelly loam and sandy soils on slopes (WA Herbarium 1998–). It was recorded from one location (2 plants) along the edge of the road reserve adjacent to the *Hakea* spp. Complex.

Plate 3 *Synaphea incurva in-situ*

Stenanthemum sublineare – Priority 2

Stenanthemum sublineare is a cryptic erect shrub, to 0.1 m high (Plate 4). The flowers are green, with flowering reported from October to December. The species is known from white sand (WA Herbarium 1998–). *Stenanthemum sublineare* was recorded in grey sand in the northern extent of the Project Area at two locations, with 15 plants recorded.

Plate 4 *Stenanthemum sublineare in-situ*

Stylidium daphne – Priority 2

Stylidium daphne is a rosetted perennial herb that is 0.15-0.45 m high (Plate 5). This species has a yellow flowering spike and is reported to flower during December. The typical habitat is gentle slopes or winter wet depressions with grey to white sand or brown sandy clay loam over laterite (WA Herbarium 1998–).

Stylidium daphne was recorded at three locations (with 15 plants) within the Project Area. Two locations were within *Hakea* spp. Complex that had been burnt in the southern extent of the Project Area. The third location was in *Hakea* spp. Complex near a Sedgeland.

Plate 5 Stylidium daphne habit

Gonocarpus trichostachyus – Priority 3

Gonocarpus trichostachyus is an erect to spreading perennial, herb, 0.05-0.17 m high (Plate 6). The flowers are red-purple, with flowering reported to occur between September and October. The species occurs on sandy soils (WA Herbarium 1998–).

During the field surveys over 950 plants were recorded across three locations. These occurred within the *Hakea* spp. Complex in the southern extent of the Project Area in areas that had been burnt. The majority of these records were within the Hakea spp. Complex on a southern slope as it transitions to a *Taxandria* drainage line.

Plate 6 *Gonocarpus trichostachyus in-situ*

Latrobea recurva – Priority 3

Latrobea recurva is an erect or procumbent, spreading shrub, 0.3-1 m high (Plate 7). The species is known to occur in grey or white sand over laterite (WA Herbarium 1998–). In the Project Area *L. recurva* was recorded in the northern extent from two locations within *Banksia* Shrublands. Scattered individuals were recorded at each site with a total of 10 plants.

Plate 7 *Latrobea recurva* habit and flowers

Synaphea preissii – Priority 3

Synaphea preissii is an erect, low shrub to 0.15-0.4 m high. The species has yellow flowers and is reported to flower from July to November. *Synaphea preissii* is known to occur on sand and gravelly loam (WA Herbarium 1998–). The species was recorded from one location (1 plant) within the Project Area. It is likely to be more widespread than recorded.

Tetraria sp. Blackwood (A.R. Annels 3043) – Priority 3

Tetraria sp. Blackwood is a lax, tall sedge that is only known from six records within Western Australia (WA Herbarium 1998–) (Plate 8). In the Project Area, the species was recorded at five locations in a variety of habitats including *Eucalyptus occidentalis* swamps and surrounding habitats, *Hakea* spp. Complex, *Banksia* Shrubland and Mixed Mallee Woodlands. *Tetraria* sp. Blackwood was scattered throughout the habitat at each location. It is expected that this species would be more widespread within the Project Area and surrounds.

Plate 8 *Tetraria* sp. Blackwood *in-situ*

Drosera fimbriata – Priority 4

Drosera fimbriata is an erect tuberous, perennial, herb, to 0.05-0.15 m high (Plate 9). The species has white flowers and is reported to flower from September to October. Drosera fimbriata is known to occur on white sands and granite (WA Herbarium 1998–).

In the Project Area, *Drosera fimbriata* was associated with *Banksia* Shrublands (recorded from four locations – three in the northern end of the Project Area and one in the southern end of the Project Area) and *Actinodium* Low Heath (recorded at one location at the southern end of the Project Area). All locations occurred on deep sand, and some had been burnt within the past two to five years.

At all locations, *Drosera fimbriata* occurred in a scattered density, with over 200 plants recorded across the five locations. It is expected that this species would occur within the *Banksia* Shrublands and *Actinodium* Heath throughout the Project Area and surrounds.

Plate 9 *Drosera fimbriata in-situ*

Centrolepis caespitosa – Priority 4

Centrolepis caespitosa is a tufted annual, herb (forming a rounded cushion up to 25 mm across) that flowers from October to December. The species is known to occur in white sand, clay associated with salt flats and wet areas (WA Herbarium 1998–).

There are many suitable locations within the Project Area for this species, which is known to like disturbance and occur in drainage lines along road verges, access tracks that are inundated and other wet areas. These areas may have been too dry during the survey period or road verges may have been sprayed. It is expected that this species is more widespread within the Project Area and surrounds that recorded.

Centrolepis caespitosa (Plate 10) was recorded at five locations, with over 400 plants:

- Two locations along an access track just north of the Warriup Road intersection
- One location on an access track north of Drawbin Road
- One location on an access track crossing a minor drainage line.
- One location in drainage within the *Banksia* Shrubland.

Plate 10 *Centrolepis caespitosa in-situ*

Stylidium gloeophyllum – Priority 4

Stylidium gloeophyllum is a rosetted perennial herb that is 0.13-0.47 m high (Plate 11). It is known to occur in sandy clay loam, granite, winter wet depressions, or fringing outcrops. It

grows in association with *Agonis*, mallee, or *Hakea* shrubland with sedges (WA Herbarium 1998–).

Over 400 plants were recorded from three locations within the Project Area. All three locations occurred in *Hakea* spp. Complex that was transitioning to damp areas (*Taxandria* drainage and wetlands). All three locations had been burnt in the previous three to five years.

Plate 11 *Stylidium gloeophyllum* habit and flowers

Xanthosia eichleri – Priority 4

Xanthosia eichleri is an erect, procumbent or decumbent shrub (subshrub) to 0.05-0.25 m high. The species is characterised by simple leaves and umbels and petals shorter than sepals. Xanthosia eichleri has white-cream flowers with reported flowering from October to November. The species is known to occur on grey sand over granite, sandy loam associated with granite outcrops and jarrah/marri woodland (WA Herbarium 1998–).

In the Project Area, *Xanthosia eichleri* was recorded at four locations (25 plants) in disturbed areas that were adjacent to the *Hakea* spp. Complex and Mixed Mallee Woodland.

Likelihood of occurrence assessment

A likelihood of occurrence assessment was conducted post-field survey for all conservation significant flora taxa identified in the desktop assessment (Appendix D). This assessment took into account previous records, habitat requirements, efficacy of the survey, intensity of the survey, flowering times and cryptic nature of species.

The likelihood of occurrence assessment post-field survey concluded:

- Twelve taxa are present (two Priority 1, two Priority 2, four Priority 3 and four Priority 4)
- Thirteen taxa are likely to be present (One EPBC Act/WC Act listed species, two Priority 2 species, five Priority 3 species and five Priority 4 species)
- Ten taxa may possibly occur (three EPBC Act/WC Act listed species, two Priority 2 species, three Priority 3 species and two Priority 4 species)
- Thirty taxa are unlikely to occur.

4.2.3 Other significant flora

EPA guidance provides a definition of flora that may also be considered significant for reasons other than statutory listing.

The Project Area is a bioregional interface between the Jarrah Forest Bioregion and Esperance Plains Bioregion and as such a number of the species recorded are at their known range limits. This also contributes to the high level of flora diversity recorded during the field survey. The survey identified 32 taxa considered to be at their range limit (mostly species that occur within

the Jarrah Forest bioregion that were at their eastern range limit). There was one range extension, *Amperea volubilis* which was recorded approximately 40 km east of its known range.

Two of the specimens collected in the field were submitted to the WA Herbarium for identification (Accession Number 6684) with the following advice:

- *Tricostularia* sp. 1– the inflorescence were immature but this seems very likely to be an unrecognised taxon
- *Leucopogon* sp. 1 – this belongs to a difficult complex within the *L. pulchellus* group (Group C). The circumscription of this entity needs more work, but it is very unlikely to be of conservation significance.

4.2.4 Introduced flora

Fifty-eight introduced flora taxa were recorded within the Project Area during the field survey. These species were mostly restricted to the road reserve (Plate 12), access tracks and agricultural land. Planted vegetation was present including pines (*Pinus radiata*) and *Eucalyptus* species (Blue Gum plantations).

Of the 58 introduced taxa recorded, one taxon is listed as a Declared Pest under the *Biosecurity and Agriculture Management Act 2007* (BAM Act), **Echium plantagineum* (Paterson's Curse). This taxon was recorded in one location near the road verge (Plate 12).

Plate 12 Weed incursion (road verge) and Paterson's Curse

4.3 Fauna

4.3.1 Fauna habitats

Eight broad fauna habitat types were identified within the Project Area during the field survey, based on the predominant landforms, soils and vegetation structure. This does not include highly modified and cleared areas. These fauna habitat types are closely aligned with the vegetation associations outlined in Section 4.1.1 and include:

- Proteaceous Shrublands
- Jarrah-Marri Woodlands
- Mixed Mallee Woodlands
- Low Heathlands
- Sedgelands
- *Melaleuca* Swamp
- *Eucalyptus* Swamp

- Blue Gum Plantation

A description of each of these habitat types in provided in Table 6.

The vegetation in the Project Area formed a series of mosaics across the undulating plains and drainage areas and has been impacted by disturbances such as *Phytophthora* dieback and fire. Other disturbances evident throughout the length of the project area include clearing, introduced fauna (particularly rabbits) and weeds however the vegetation was generally considered to be in excellent condition.

Table 13 Fauna habitat types

Type	Description	Conservation Significant Fauna	Area (ha)	Indicative Photograph
Proteaceous Shrublands	Mosaic of Proteaceous shrublands dominated by tall / mid-shrubland to open shrublands of *Hakea* spp. and *Banksia* spp. with occasional scattered Mallee over a diverse mid shrubland and low sedgeland. This is the dominant habitat within the Project Area. This habitat type is both structurally and floristically diverse and contains a wide variety of habitat resources for fauna, including micro-habitat features such as logs, branches, soft sands and dense ground cover. Structurally, the vegetation varies throughout the Project Area from very dense to more open shrublands over a typically dense understorey layer. This habitat provides a range of habitat resources for fauna, and in particular the denser structure provides refugia for birds, mammals and reptiles. This habitat is in excellent condition and there are minimal disturbances throughout, with the exception of clearing for tracks and roads, rabbits and some minor weeds.	Black Cockatoo's Quenda Western Whipbird Rainbow bee-eater Western Brush Wallaby	184.6 ha	
Jarrah-Marri Woodlands	Mid-woodlands of jarrah and marri over tall shrublands and low open sedgelands. This habitat type occurs in two locations within the Project Area – one on an upper hill crest with exposed laterite and the other in a lower slope. These woodlands provide a range of habitat resources for fauna, and in particular the denser structure provides refugia for birds, mammals (e.g. Western Brush Wallaby) and reptiles. Large fallen logs, rocky outcrops and thick leaf litter provide a diversity of micro-habitats for fauna.	Black Cockatoo's Quenda Rainbow bee-eater Western Brush Wallaby	3.52 ha	

Type	Description	Conservation Significant Fauna	Area (ha)	Indicative Photograph
Mixed Mallee Woodland	A large proportion of the Project Area contains open to closed Mallee woodlands of mixed tree species. The mid-shrubland layer is generally open and dominated by a mixture of *Banksia* spp., *Taxandria* spp., and *Hakea* spp. and occurs over a low sedgeland. This habitat type forms complex mosaics with surrounding Proteaceous Shrublands. This habitat type generally occurs on hill slopes and lower-lying areas, areas transitioning to swamps and wetlands. These woodlands are both structurally and floristically diverse and contain a wide-variety of habitat resources for fauna, including micro-habitat features such as logs, branches, dense ground cover and thick leaf litter. This habitat is in excellent condition, and there are minimal disturbances throughout.	Black Cockatoo's Quenda Rainbow bee-eater Western Brush Wallaby	20.5 ha	
Low Heathlands	Low open heathlands dominated by *Acticodium* sp. Fitzgerald River over and low open herbland and sedgeland. This habitat is floristically diverse and generally occurs on areas of impeded drainage with grey sands.	Quenda Western Whipbird Rainbow bee-eater Western Brush Wallaby	3.2 ha	

Type	Description	Conservation Significant Fauna	Area (ha)	Indicative Photograph
Sedgelands	Closed sedgelands with some scattered shrubs and often occur with *Melaleuca cuticularis* fringing open woodlands. Sedgelands often dominated by *Chorizandra enodis, Baumea articulata* or *Chordifex laxus.* Occurs in low-lying areas/swamps and provides a dense ground cover with little structural diversity. Provides excellent habitat for frogs, reptiles, small ground dwelling mammals and some small bird species.	Quenda	3.04 ha	
Melaleuca Swamps	Melaleuca dominated swamps and sumps over mixed shrublands over open to closed sedgelands. This habitat type occurs in low-lying areas and drainage lines. The swamps and sumps vary across the Project Area and are often transitional and form mosaics with other adjacent vegetation types on low rises and lower plains. Structural diversity is variable depending on the density of the mid shrub layer and ground layer as the diversity and density of shrubs vary.	Quenda Western Brush Wallaby	5.47 ha	

Type	Description	Conservation Significant Fauna	Area (ha)	Indicative Photograph
Eucalyptus Swamps	*Eucalyptus occidentalis* open forest over isolated *Melaleuca* shrubs over a low closed sedgeland in low-lying swamps. This habitat type provides a range of habitat resources for fauna, and in particular when seasonally inundated with water it provides excellent habitat for fauna, particularly frogs.	Black Cockatoo's Quenda Rainbow bee-eater Western Brush Wallaby	2.28 ha	
Blue gum Plantations	Plantations of *Eucalyptus globulus* (Blue gum) occur on private properties adjacent to the road reserve. These plantations provide very little structural diversity however they do provide some suitable foraging habitat for Black Cockatoo's.	Black Cockatoo's	Information not available	
Modified and cleared areas	There are sections of the Project Area that are highly modified and are entirely (or mostly) cleared and devoid of native vegetation. This includes cleared areas such as the existing highway, roads and access tracks, and agricultural paddocks (some of which contain scattered regrowth). These areas provide very limited habitat for fauna species.		52.32 ha	

4.3.2 Fauna diversity

Fifty-three native fauna species were observed (or positively identified from scats, tracks, foraging evidence or calls) across the Project Area during the survey. This total consisted of 41 birds, seven reptiles, two mammals and three frogs. Additionally, four introduced species were also recorded during the survey, including the Laughing Kookaburra (*Dacelo novaeguineae*), European Rabbit (*Oryctolagus cuniculus*), Cat (*Felis catus*) and the Red Fox (*Vulpes vulpes*).

4.3.3 Conservation significant fauna

The presence and/or evidence of the presence of two conservation significant fauna species were identified in the Project Area during the survey:

- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) –Endangered (Schedule 2) (WC Act) and Endangered (EPBC Act)
- Southern Brown Bandicoot/Quenda (*Isoodon obesulus fusciventer*) – (Priority 5) under DPaW.

Carnaby's Black Cockatoo was recorded flying over the Project Area and resting in trees during the survey. Additionally, foraging evidence attributed to the Carnaby's Black Cockatoo was observed at various locations across the Project Area. Diggings attributed to the Quenda were also recorded at various locations across the Project Area, primarily in areas of dense undergrowth and low-lying damplands.

Black Cockatoo Habitat Assessment

Thirteen potential habitat trees (Diameter at Breast Height (DBH) >500 mm) were recorded in the Project Area. None of the potential habitat trees identified in the Project Area had hollows. Trees species included *Corymbia calophylla* (Marri) (seven trees) and *Eucalyptus marginata* (Jarrah) (six trees). The location of the potential habitat trees recorded during the survey is mapped in Figure 5, Appendix A and listed in Appendix E.

The entire Project Area contains a mix of plant species documented by DSEWPaC (2012) as foraging species for one or more of the three threatened black cockatoo species, all of which may frequent the area. All of the remnant vegetation present within the Project Area boundary can be considered as suitable black cockatoo feeding habitat as suitable foraging species were present in all vegetation types however just ranging in density. Some foraging species may have only been present as a scattered shrub or tree and were not a dominant component of that vegetation type. Suitable foraging species present within the Project Area include Marri, Jarrah and other *Eucalyptus* species (spp.), proteaceous plants including *Banksia* spp., *Hakea* spp., and *Grevillea* spp., and also Allocasuarina. Chewed Marri nuts resulting from Carnaby's Black Cockatoo's was the only evidence of foraging recorded during the survey (Plate 13). A total of 203.60 ha of suitable black cockatoo foraging habitat is present within the Project Area (this does not include vegetation types with very few/scattered foraging species or trees within the plantations).

No existing roosting trees (trees used at night by black cockatoos to rest) were identified during the survey. Black cockatoos generally roost in or near riparian environments or other permanent water sources usually in the tallest trees in an area. There is limited suitable roosting habitat available within the Project Area.

Plate 13 Chewed Marri nuts from Carnaby's Black Cockatoo

4.3.4 Likelihood of occurrence

As well as the above recorded species, the desktop assessment identified an additional 18 conservation significant fauna species as potentially occurring within 5 km of the Project Area (DPaW 2007–, DotE 2015a).

A likelihood of occurrence assessment was conducted for all conservation significant fauna species identified in the desktop assessment. This assessment was based on species biology, habitat requirements, the likely quality and availability of suitable habitat (based on vegetation associations present within the Project Area) and records of the species in the vicinity of the Project Area. The assessment is provided in Appendix E.

The likelihood of occurrence post-site assessment concluded that an additional five conservation significant fauna species are likely to occur in the Project Area and surrounding vegetation. These included:

- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable (Schedule 3) (WC Act) and Vulnerable (EPBC Act). The Project Area lies within the south-eastern most extent of the modelled distribution of where this species may occur (DSEWPaC 2012). Suitable foraging habitat and some potential breeding and roosting habitat is present within the Project Area.
- Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) – Endangered (Schedule 2) (WC Act) and Vulnerable (EPBC Act). This species is likely to frequent the area on occasions. There are two records of this species within 5 km of the Project Area (DPaW 2007–). The Project Area lies within the south-eastern extent of the modelled distribution of where the Baudin's Black Cockatoo is likely to occur however it is outside of its predicted breeding range (DSEWPaC 2012). Suitable foraging habitat and some potential roosting habitat is present within the Project Area.
- Western Whipbird (western heath) (*Psophodes nigrogularis nigrogularis*) – Endangered (Schedule 2) (WC Act) and Vulnerable (EPBC Act). There is one previous record (in 2000) of the Western Whipbird within the Project Area (DPaW 2007–). Although there is suitable habitat for this species within the Project Area, it is generally restricted to dense coastal heath in the Two-Peoples Bay and Mount Manypeaks region. Other nearby records of this species include one approximately 5 km south of the Project Area south of Cheyne Road and approximately 13 km south at Waychinicup Beach.
- Rainbow Bee-eater (*Merops ornatus*) – Schedule 5 (WC Act) and Migratory (EPBC Act). The Rainbow Bee-eater is a common and widespread migrant to the south west of Western Australia with a large habitat range. There is some suitable habitat present within the Project Area. This species may occasionally forage and roost within Project Area.

- Western Brush Wallaby (*Macropus irma*) – Priority 4 (DPaW). There is suitable habitat for this species within the Project Area. The Western Brush Wallaby has previously been recorded within 1 km of the Project Area (in 1959), with other scattered records in the local region (DPaW 2007–).

4.3.5 Habitat value and connectivity

Habitat value

Native vegetation within the south west of Western Australia has been significantly altered since European settlement and as local development of the land continues to grow, the significance of any remnant vegetation increases. Where landscapes that have been extensively cleared, roadside vegetation provides essential wildlife corridors and habitat for local fauna, including threatened species.

The Project Area is located within both road reserve and Hassell National Park. Hassell National Park is a long linear park which is located along the South Coast Highway between the road reserve and surrounding rural land. Much of the native vegetation in the region has been cleared for agriculture and only remnant patches remain. The entire Project Area is considered to have high habitat value as it contains dense remnant native vegetation that forms a continuous habitat corridor to the surrounding landscape and is important for the maintenance of ongoing ecological processes. The vegetation contains high floral diversity and vegetation associations in excellent condition which are representative of landforms in a region which has been extensively cleared. The vegetation also provides suitable habitat to various fauna species of conservation significance including the three threatened species of black cockatoo and quenda.

Fauna habitat connectivity

Habitat linkages are essential in maintaining biodiversity and allow animals to move between areas of resource availability. They are important for ground and aerial fauna, providing cover, resources, and linking areas suitable for rest and reproduction. The decline of species is often caused by fragmentation or isolation of habitats. Roadside vegetation can play a vital role in providing connectivity between bush remnants. Although some roadside reserves are inadequate in size to support many animal communities, they are integral in providing connections between larger areas of potentially more suitable remnant patches.

Many fauna species, particularly small birds need continuous corridors of dense vegetation to move throughout the landscape. Roadsides therefore are of particular importance to avifauna because they can contain the only continuous linear vegetation in some areas. Even degraded roadside have the ability to act as corridors for the dispersal of a variety of fauna.

Much of the Project Area is situated within Hassell National Park which exists as a well-defined corridor of uncleared native vegetation, and therefore provides an important ecological linkage through otherwise cleared land. The park has been identified as an important inland vegetation and wildlife corridor from the Waychinicup and Mt Manypeaks area to the Cheyne Bay and Pallinup River areas (DotE 2015c). The vegetation remaining within the Project Area is also considered to have high conservation value as a biological corridor as it provides suitable habitat to a number of threatened fauna species known to occur in the region.

5. Environmental approvals and referrals

This section provides preliminary environmental approvals and referrals advice based on the biological constraints identified within the Project Area. As the Project is in the concept design phase there may be opportunities to avoid and minimise the impacts on these biological constraints through design refinement. If the biological constraints can be avoided or impacts to these minimised it may negate the need for environmental approvals or referral to Commonwealth/State environmental agencies.

5.1 Key biological constraints

The key biological constraints identified within the Project Area during the biological assessment are summarised below in Table 14.

Table 14 Key biological constraints within the Project Area

Native vegetation	Conservation significant flora species	Fauna habitat	Conservation significant fauna species
222.62 ha of native vegetation is present within the Project Area. This includes: • 191.20 ha considered to be analogous to the Kwongkan TEC • 2.28 ha likely to represent Swamp Yate (*Eucalyptus occidentalis*) woodland in seasonally-inundated basins (South Coast) PEC • 12.24 ha considered to grow in association with a watercourse or wetland According to the ARVS four vegetation types described from the Project Area (ARVS Codes 14, 15, 12 and 39) are considered restricted and nine are considered rare.	12 DPaW Priority-listed flora were recorded from the Project Area including: • 13 individuals of *Leucopogon* sp. Manypeaks (A.S. George 6488) (P1). • Two individuals of *Synaphea incurva* (P1) • 15 individuals of *Stenanthemum sublineare* (P2) • 15 individuals of *Stylidium daphne* (P2) • 950+ individuals of *Gonocarpus trichostachyus* (P3) • 10 individuals of *Latrobea recurva* (P3) • One individual of *Synaphea preissii* (P3) • *Tetraria* sp. Blackwood (A.R. Annels 3043) (P3) recorded from 5 locations • 400+ individuals of *Centrolepis caespitosa* (P4) • 200+ individuals of *Drosera fimbriata* (P4) • 400+ individuals of *Stylidium gloeophyllum* (P4) • 25 individuals of *Xanthosia eichleri* (P4) In addition: • One individual of *Laxmannia grandiflora* subsp. *stirlingensis* was recorded just outside of the Project Area, but likely to be	There is habitat for two fauna species of conservation significance: • 203.60 ha Carnaby's Black Cockatoo • 222.61 ha Southern Brown Bandicoot/Quenda	The assessment identified the presence of two species of conservation significance: • Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) – Endangered under the EPBC Act and WC Act • Southern Brown Bandicoot/Quenda (*Isoodon obesulus fusciventer*) – (Priority 5) under DPaW.
		There is potential habitat for five fauna species of conservation significance: • 203.60 ha Forest Red-tailed and Baudin's Black Cockatoo • 187.80 ha Western Whipbird • 214.10 ha Rainbow Bee-eater • 219.57 Western Brush Wallaby	The assessment identified the likely presence of five species of conservation significance: • Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable under the EPBC Act and WC Act. • Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) – Endangered (Schedule 2) (WC Act) and Vulnerable (EPBC Act). • Western Whipbird (western heath) (*Psophodes nigrogularis nigrogularis*) – Endangered (Schedule 2) (WC Act) and Vulnerable (EPBC Act). • Rainbow Bee-eater (*Merops ornatus*) – Schedule 5 (WC Act) and Migratory (EPBC Act). • Western Brush Wallaby (*Macropus irma*) – Priority 4 (DPaW).

Native vegetation	Conservation significant flora species	Fauna habitat	Conservation significant fauna species
	present within the Project Area. • A sterile specimen of *Verticordia* collected from the Project Area may represent *V. harveyi* (P4). Two of the specimens collected in the field were submitted to the WA Herbarium for identification (Accession Number 6684) with the following advice: • *Tricostularia* sp. 1– the inflorescence were immature but this seems very likely to be an unrecognised taxon • *Leucopogon* sp. 1 – this belongs to a difficult complex within the *L. pulchellus* group (Group C). The circumscription of this entity needs more work, but it is very unlikely to be of conservation significance.		

5.2 Federal approvals

Referral to the DotE under the EPBC Act is triggered if a proposed action has or potentially has a significant impact on any Matters of National Environmental Significance (MNES). Table 15 shows an assessment of the Project Area against key biological MNES.

Table 15 Assessment of the key Matters of National Environmental Significance

Matter of National Environmental Significance	Present	Need for referral to DotE under EPBC Act (likely significant impact)
Listed Threatened Species and Ecological Communities	The assessment identified the presence of the Endangered Kwongkan TEC.	Yes – 180.84 ha of vegetation considered to be analogous of the Kwongkan TEC was recorded within the Project Area. This vegetation was in Excellent (2) to Good (4) condition. It is unlikely that the Project can avoid impacts to this community, therefore recommend referral.
	The assessment identified the presence of one EPBC listed threatened fauna species: • Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) - Endangered	Yes – This species was recorded on site active and numerous evidence of feeding undertaken. Black Cockatoo are assessed via a dedicated referral guideline. Two triggers for referral are met with 203.60 ha of foraging habitat present and 13 potential breeding trees >500 mm DBH present.
	The assessment identified the likely presence of three EPBC listed threatened fauna species: • Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable • Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) – Vulnerable • Western Whipbird (western heath) (*Psophodes nigrogularis nigrogularis*) – Vulnerable	Yes – Black Cockatoo habitat was recorded on site. Black Cockatoo are assessed via a dedicated referral guideline. Two triggers for referral are met with 203.60 ha of foraging habitat present and 13 potential breeding trees >500 mm DBH present. The Western Whip Birds is also likely to trigger referral as this species is only known from the region, is in low numbers and has previously been recorded on site. There are 187.80 ha of habitat available for this species.
Migratory Species	Rainbow Bee-eater (Merops ornatus) - Migratory EPBC Act and WC Act	Unlikely – This species is widespread throughout Australia and occurs in a wide range of habitat types. The Rainbow Bee-eater is reasonably common bird and there is abundant potentially suitable breeding and foraging habitat nearby. It is most likely that this species would utilise the Project Area for foraging and during dispersal. Therefore the Rainbow Bee-eater is unlikely to rely on the habitats present within the Project Area and clearing of habitat for the Project is unlikely to significantly impact on individuals or a population of this species.

5.3 Western Australian government

5.3.1 Environmental Protection Authority

Significant proposals must be referred to the EPA under Section 38 of the EP Act. In deciding whether a proposal will be subject to the formal environmental impact assessment process, the EPA takes into account the environmental significance of any potential impacts that may result from the implementation of the scheme or proposal.

The majority of the likely biological impacts associated with the Project are linked to native vegetation clearing and loss of fauna habitat. The potential impacts from the loss of native vegetation clearing and loss of fauna habitat for the Project can be effectively assessed through the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. Therefore with consideration of only the biological values discussed in this report, it is unlikely that the Project would require referral to the EPA under Section 38 of the EP Act. Main Roads should consider discussing the project (and the outcome of any EIA process) with the EPA for transparency of process.

5.3.2 Department of Environment Regulations

The clearing of native vegetation in Western Australia requires a permit under Part V of the EP Act, unless an exemption applies. Main Roads has been granted State-wide vegetation clearing permit (Clearing Permit CPS 818 and 817) which allows Main Roads to clear native vegetation for road projects and associated activities.

The Federal and Western Australia governments have entered into a bilateral agreement under the EPBC Act relating to environmental assessment (assessment bilateral agreement). Specifically, this agreement now includes the clearing permit assessment process under Part V Division 2 of the EP Act. Under the assessment bilateral agreement, if a native vegetation clearing permit is required and the clearing will have or is likely to have an impact on a MNES, the assessment of the clearing application including the potential impacts to the MNES can be conducted by the DER or DMP under delegation.

There is the presence of an EPBC Act listed and DPaW listed TEC, DPaW listed PEC and 13 conservation significant flora and fauna species within the Project Area. Furthermore, there is the likely presence of 16 conservation significant flora and fauna within the Project Area. As such, any clearing permit application should assess the significance of any potential impacts of the proposed clearing area on these communities and species.

6. Conclusions

6.1 Key findings

6.1.1 Vegetation and flora

Five broad floristic formations comprising 11 vegetation types as well as modified areas were identified and described from the Project Area. A number of vegetation types within the Project Area (total area 191.20 ha) are considered to represent the Kwongkan TEC (listed as Endangered under the EPBC Act). Vegetation within the Project Area is also considered represent the Swamp Yate (*Eucalyptus occidentalis*) woodland in seasonally-inundated basins (South Coast) PEC (listed as Priority 3 by DPaW) (2.28 ha) and grow in association with a watercourse or wetland (12.24 ha). Furthermore, according to the ARVS, four vegetation types describe from the Project Area are considered restricted and nine are considered rare.

The vegetation condition within the Project Area was rated from Excellent (2) to Completely Degraded (6). The majority of vegetation was rated as Excellent (2) with largely intact structure and weed incursion restricted to the edge of the existing Highway. Evidence of dieback was also noted; it is expected the combination of fire / dieback has results in the loss of proteaceous species in some sections of the Project Area.

Twelve DPaW Priority listed flora taxa were recorded from the Project Area, including 2 Priority 1 taxa, 2 Priority 2 taxa, 4 Priority 3 taxa and 4 Priority 4 taxa. A further three flora taxa were considered 'other significant flora' representing a range extension, possible unrecognised taxon and part of an unresolved complex. In addition, a likelihood of occurrence assessment post-field survey concluded that 13 taxa are likely to occur, 10 taxa may possibly occur and the remaining 30 taxa are unlikely to occur within the Project Area.

6.1.2 Fauna

Two fauna species of conservation significance were recorded during the current survey (Carnaby's Black Cockatoo and Southern Brown Bandicoot) and it was determined that five additional fauna species of conservation significance species are likely to occur within the Project Area (Forest Red-tailed Black Cockatoo, Baudin's Black Cockatoo, Western Whipbird, Western Brush Wallaby and Rainbow Bee-eater).

The habitats within the Project Area are not well represented at a local or regional level when compared to the associated vegetation types. Furthermore the majority of the Project Area is located within Hassell National Park. Much of the native vegetation in the region has been cleared for agriculture and only remnant patches remain.

The entire Project Area is considered to have high habitat value as it forms a continuous habitat corridor to the surrounding landscape and is important for the maintenance of ongoing ecological processes. Hassell National Park has been identified as an important inland vegetation and wildlife corridor from the Waychinicup and Mt Manypeaks area to the Cheyne Bay and Pallinup River areas (DotE 2015c). The vegetation also provides known and potentially suitable habitat to various fauna species of conservation significance including the three threatened species of black cockatoo and quenda.

Furthermore the Carnaby's Black Cockatoo has 203.60 ha of foraging habitat within the Project Area and the species has been recorded within the Project Area and broader Study Area. The effect of the clearing on this species is known and is the primary cause of the species decline throughout its range.

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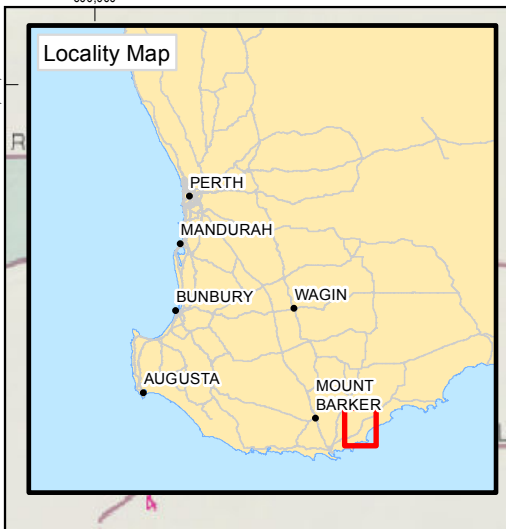
Appendices

Appendix A – Figures



LEGEND

Project Area

Study Area

Paper Size A3

0 0.5 1 2 3 4 5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Job Number 61-32576
Revision 0
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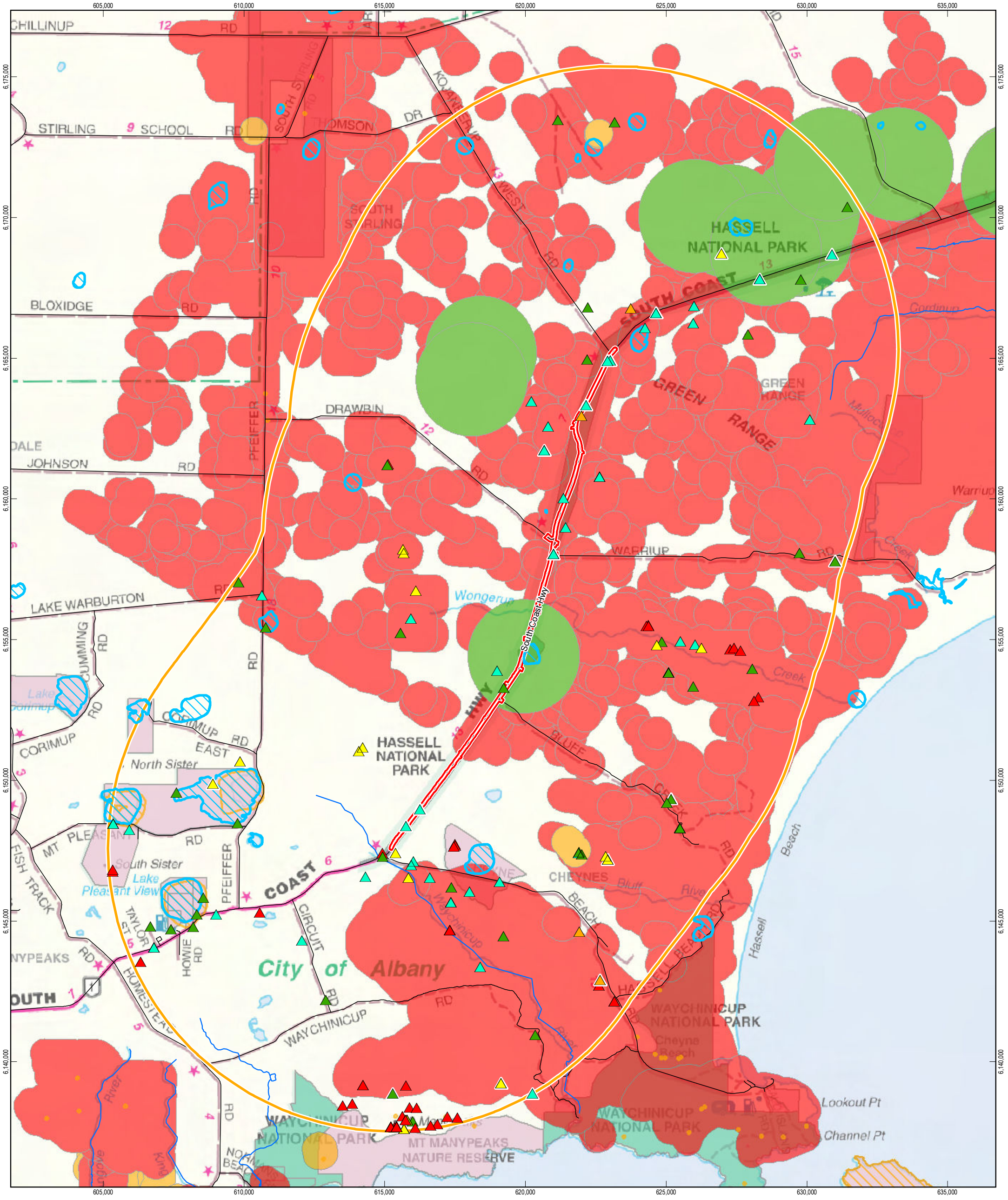
Project Location

Figure 1

G:\61\32576\GIS\Maps\MXD\6132576_001_Rev0_ProjectLocation.mxd

999 Hay Street, Perth, WA, 6000 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com W www.ghd.com

Data source: GHD: Hillshade - 20151015; Study Area - 20160120 Landgate: Travellers Atlas - 2004; MRWA: Project Area - 20150812; GA: Geodata Topo Series III - 2006. Created by: RB



LEGEND

- River
- Road
- Environmentally Sensitive Area
- Project Area
- Study Area

Managed Lands & Water

- 5(1)(h) Reserve
- National Park
- Nature Reserve
- South Coast Significant Wetlands

Threatened (Declared Rare) & Priority Flora

- (T) Threatened Rare Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Rare Taxa

TEC/PEC

- Endangered (EPBC)
- Priority 1
- Priority 3

Paper Size A3

0 1 2 3 4 5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Main Roads Western Australia
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Job Number	61-32576
Revision	0
Date	16 Mar 2016

Biological Constraints

Figure 2

G:\61\32576\GIS\Maps\MXD\6132576_002_Rev0_BiologicalConstraints.mxd

999 Hay Street, Perth, WA, 6000 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com W www.ghd.com

Data source: Landgate: Travellers Atlas 2004, Road - 20151014; DER: Environmentally Sensitive Area - 20141008; DPaW: Wetlands - 20141028, TEC/PEC, Threatened (Declared Rare) & Priority Flora - 20151014; DoW: River - 20141008; MRWA: Project Area, Study Area - 20150814. Created by: RB

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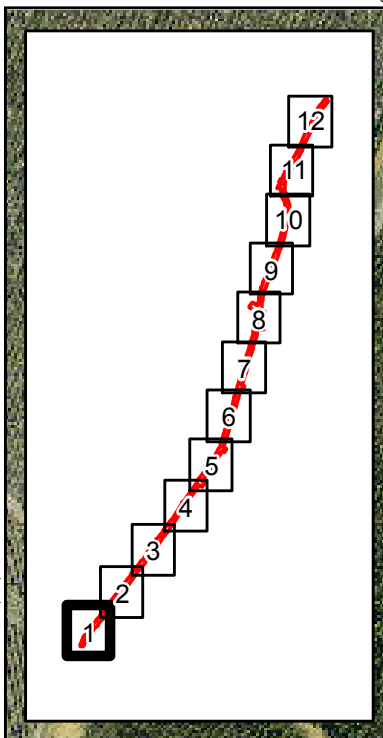
6,148,500 6,148,000 6,147,500



Quadrat 3
Photo Point 37
Quadrat 2
Photo Point 36
Photo Point 72
Photo Point 81
Photo Point 73
Quadrat 8
Photo Point 80
Photo Point 74
Photo Point 79
Photo Point 75
Photo Point 76
Photo Point 78
Quadrat 9
Photo Point 77

615,000 615,500 616,000

LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point
- Quadrat

Vegetation Type

- *Actinodium* Low Heath
- *Banksia* Shrubland
- *Hakea* spp Complex - A
- *Hakea* spp Complex - B
- *Taxandria* transitional areas and drainage
- Cleared
- Pasture
- *Melaleuca* Swamps

Conservation significant flora

- *Drosera fimbriata*
- *Gonocarpus trichostachyus*
- *Stylidium daphne*
- *Stylidium gloeophyllum*

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

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Figure 3

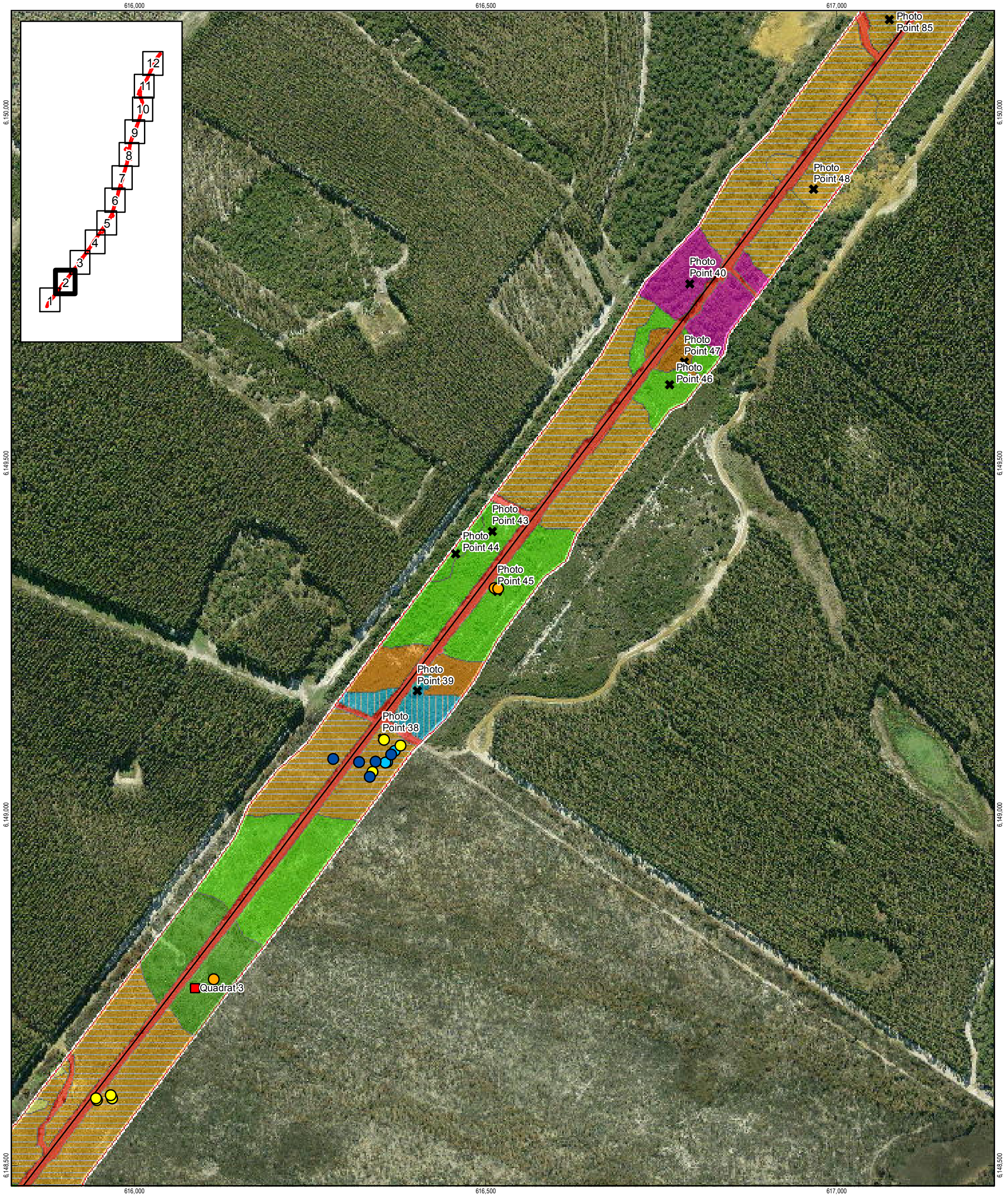
Vegetation types and survey locations

Sheet 1 of 12

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point
- Quadrat

Vegetation Type

- *Actinodium* Low Heath
- *Banksia* Shrubland
- *Eucalyptus marginata* and *Corymbia calophylla* Woodlands
- *Hakea* spp Complex - A
- *Taxandria* transitional areas and drainage
- Cleared
- Pasture
- *Kunzea* Swamps

Conservation significant flora

- *Drosera fimbriata*
- *Gonocarpus trichostachyus*
- *Stylidium daphne*
- *Stylidium gloeophyllum*

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

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Revision 0
Date 16 Mar 2016

Figure 3
Vegetation types and survey locations *Sheet 2 of 12*

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB

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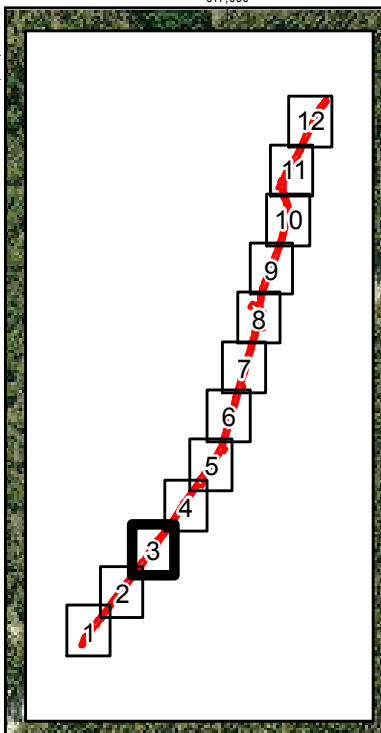

Photo Point 32
Photo Point 34
Photo Point 35
Quadrat 10
Photo Point 82
Photo Point 83
Photo Point 84
Photo Point 85
Photo Point 48

LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point
- Quadrat

Vegetation Type

- *Hakea* spp Complex - A
- *Taxandria* transitional areas and drainage
- Cleared
- Sedgeland Swamps

Conservation significant flora

- *Synaphea incurva*
- *Xanthosia eichleri*

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

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Date	16 Mar 2016

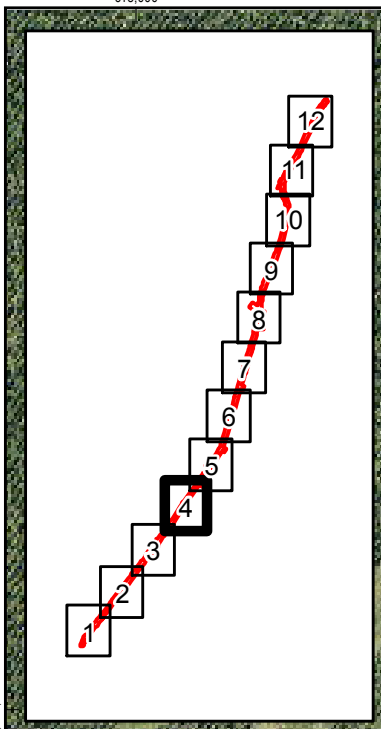
Figure 3

Vegetation types and survey locations *Sheet 3 of 12*

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB



618,000 618,500 619,000

6,152,500 6,152,000 6,151,500

Photo Point 86
Photo Point 87
Photo Point 42
Photo Point 52
Photo Point 41
Photo Point 51
Photo Point 50
Photo Point 49
Photo Point 31
Photo Point 32

LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point

Vegetation Type

- *Banksia* Shrubland
- *Eucalyptus goniantha Mallee* Woodland
- *Hakea* spp Complex - A
- *Hakea* spp Complex - B
- *Taxandria* transitional areas and drainage
- Cleared
- Pasture
- Planted
- *Melaleuca* Swamps
- *Kunzea* Swamps
- Sedgeland Swamps

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

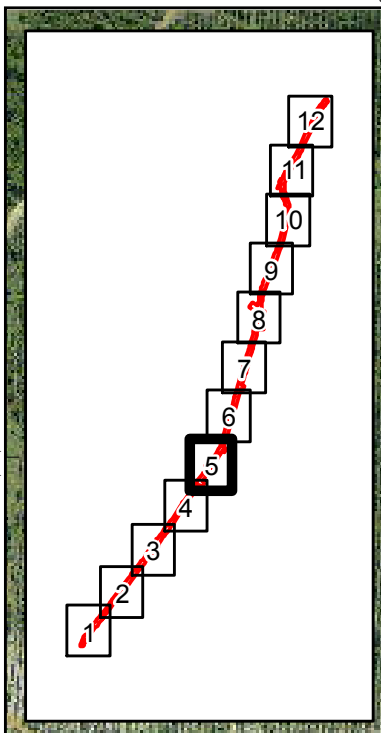
Job Number 61-32576
Revision 0
Date 16 Mar 2016

Figure 3
Vegetation types and survey locations *Sheet 4 of 12*

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB



619,000 619,500 620,000

6,154,000 6,153,500 6,153,000

Photo Point 121
Photo Point 88
Photo Point 91
Photo Point 89
Photo Point 90
Photo Point 86

LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point

Vegetation Type

- *Banksia* Shrubland
- *Eucalyptus goniantha* *Mallee* Woodland
- *Hakea* spp Complex - A
- *Hakea* spp Complex - B
- Cleared
- Pasture
- Planted

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

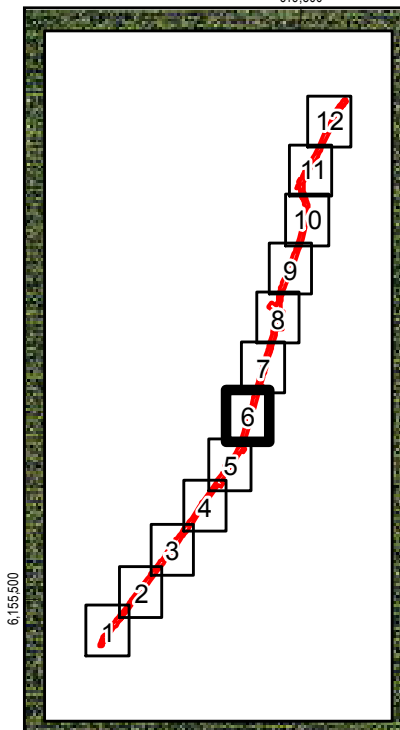
Job Number	61-32576
Revision	0
Date	16 Mar 2016

Figure 3
Vegetation types and survey locations *Sheet 5 of 12*

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB



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6,155,500 6,155,000 6,154,500

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Quadrat 12
Photo Point 97
Photo Point 96
Photo Point 95
Quadrat 7
Photo Point 53
Photo Point 30
Photo Point 92
Quadrat 11
Quadrat 1
Photo Point 93

LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point
- Quadrat

Vegetation Type

- *Banksia* Shrubland
- *Eucalyptus goniantha Mallee* Woodland
- *Eucalyptus occidentalis* Swamp
- *Hakea* spp Complex - A
- *Hakea* spp Complex - B
- Cleared
- Pasture
- Planted
- *Melaleuca* Swamps

Conservation significant flora

- *Centrolepis caespitosa*

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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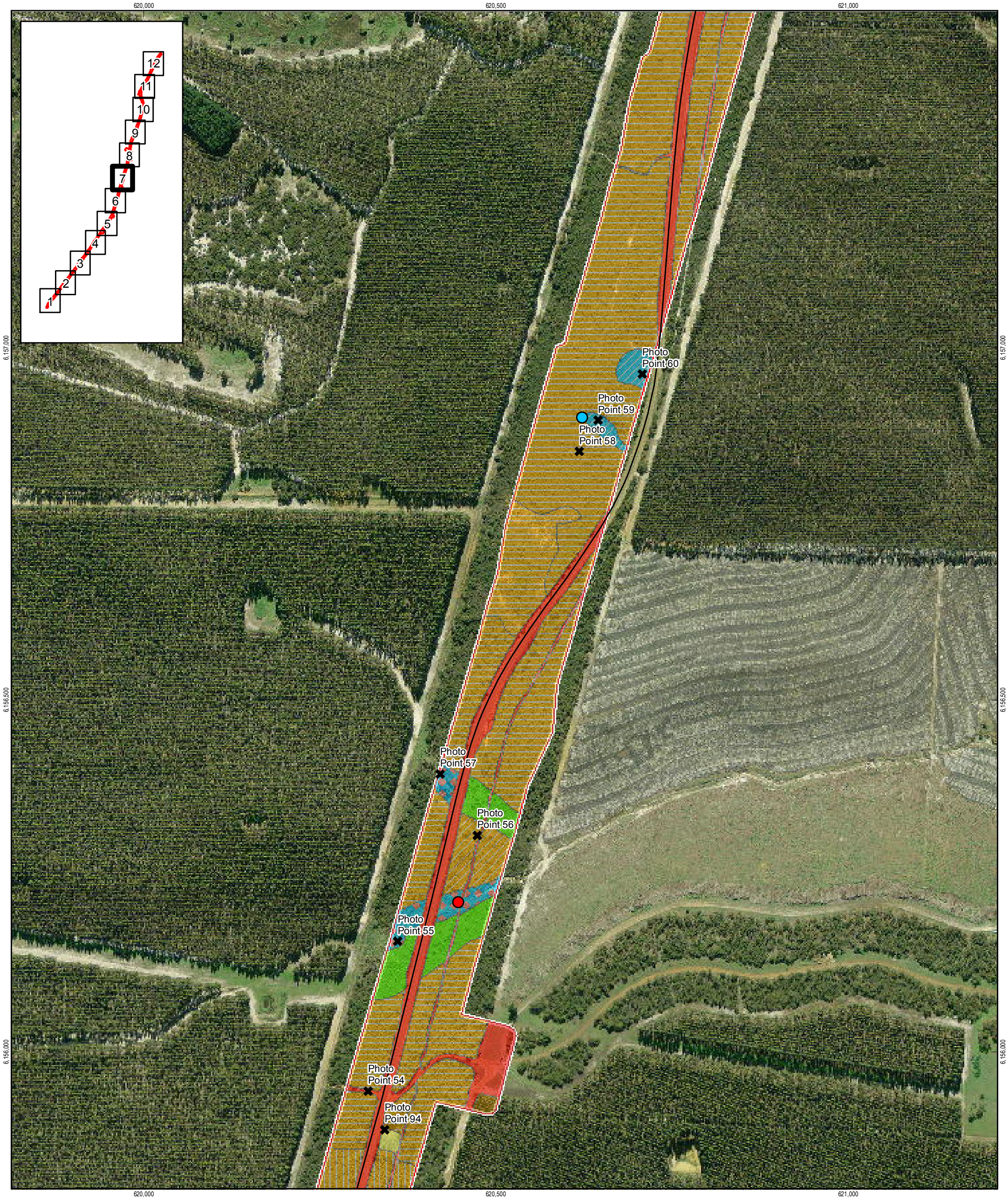
Figure 3

Vegetation types and survey locations *Sheet 6 of 12*

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point

Vegetation Type

- *Banksia* Shrubland
- *Hakea* spp Complex - A
- *Hakea* spp Complex - B
- *Hakea* spp Complex - C
- Cleared
- Pasture
- Planted
- *Melaleuca* Swamps
- Sedgeland Swamps

Conservation significant flora

- *Centrolepis caespitosa*
- *Stylidium daphne*

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Job Number	61-32576
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Date	16 Mar 2016

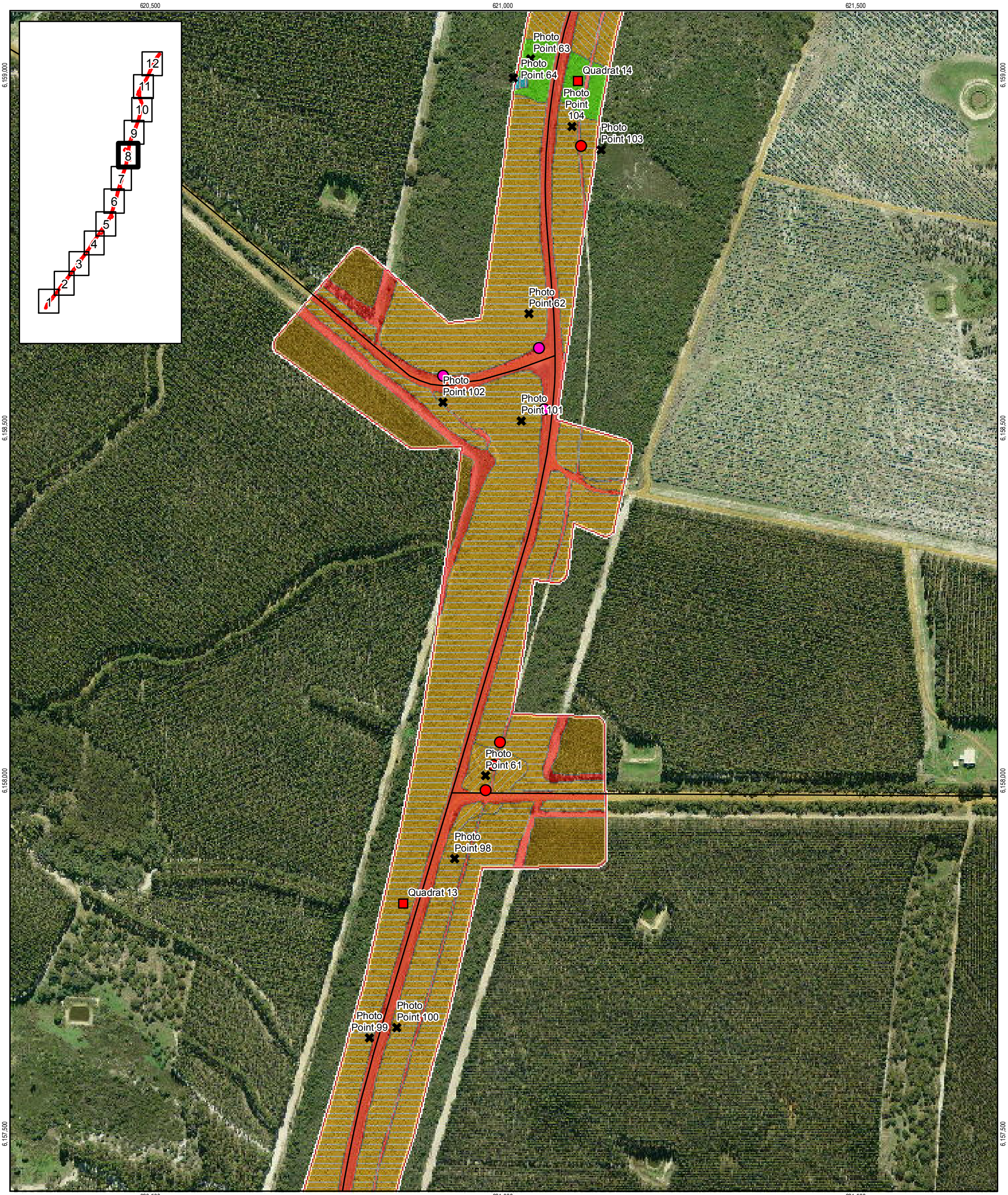
Figure 3

Vegetation types and survey locations *Sheet 7 of 12*

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point
- Quadrat

Vegetation Type

- *Banksia* Shrubland
- *Hakea* spp Complex - A
- *Hakea* spp Complex - C
- *Hakea* spp Complex - D
- Cleared
- Planted
- *Kunzea* Swamps

Conservation significant flora

- *Centrolepis caespitosa*
- *Xanthosia eichleri*

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Job Number	61-32576
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Date	16 Mar 2016

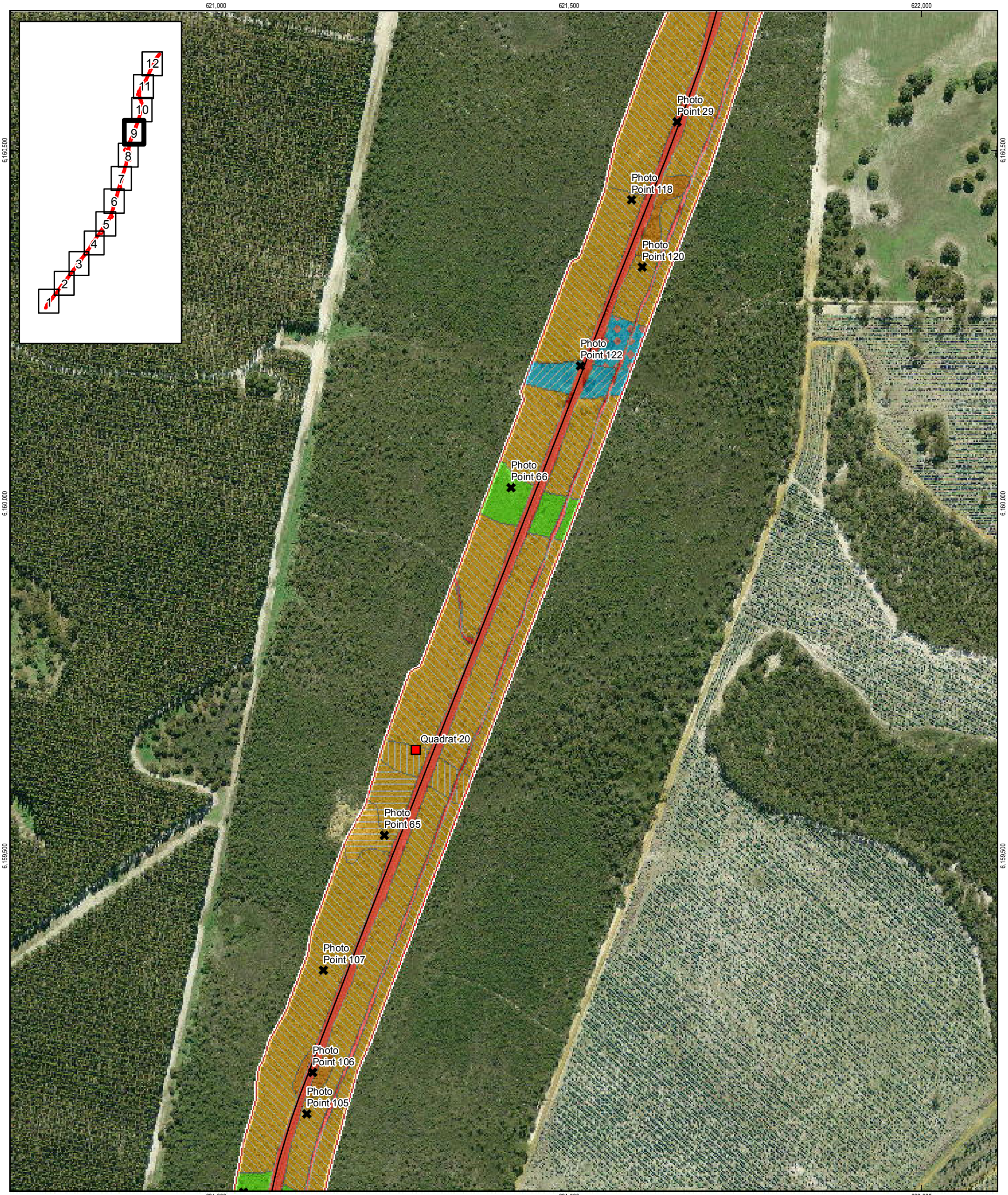
Figure 3

Vegetation types and survey locations *Sheet 8 of 12*

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point
- Quadrat

Vegetation Type

- *Banksia* Shrubland
- *Hakea* spp Complex - A
- *Hakea* spp Complex - B
- *Hakea* spp Complex - D
- *Taxandria* transitional areas and drainage
- Cleared
- *Melaleuca* Swamps
- Sedgeland Swamps

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Date	16 Mar 2016

Figure 3

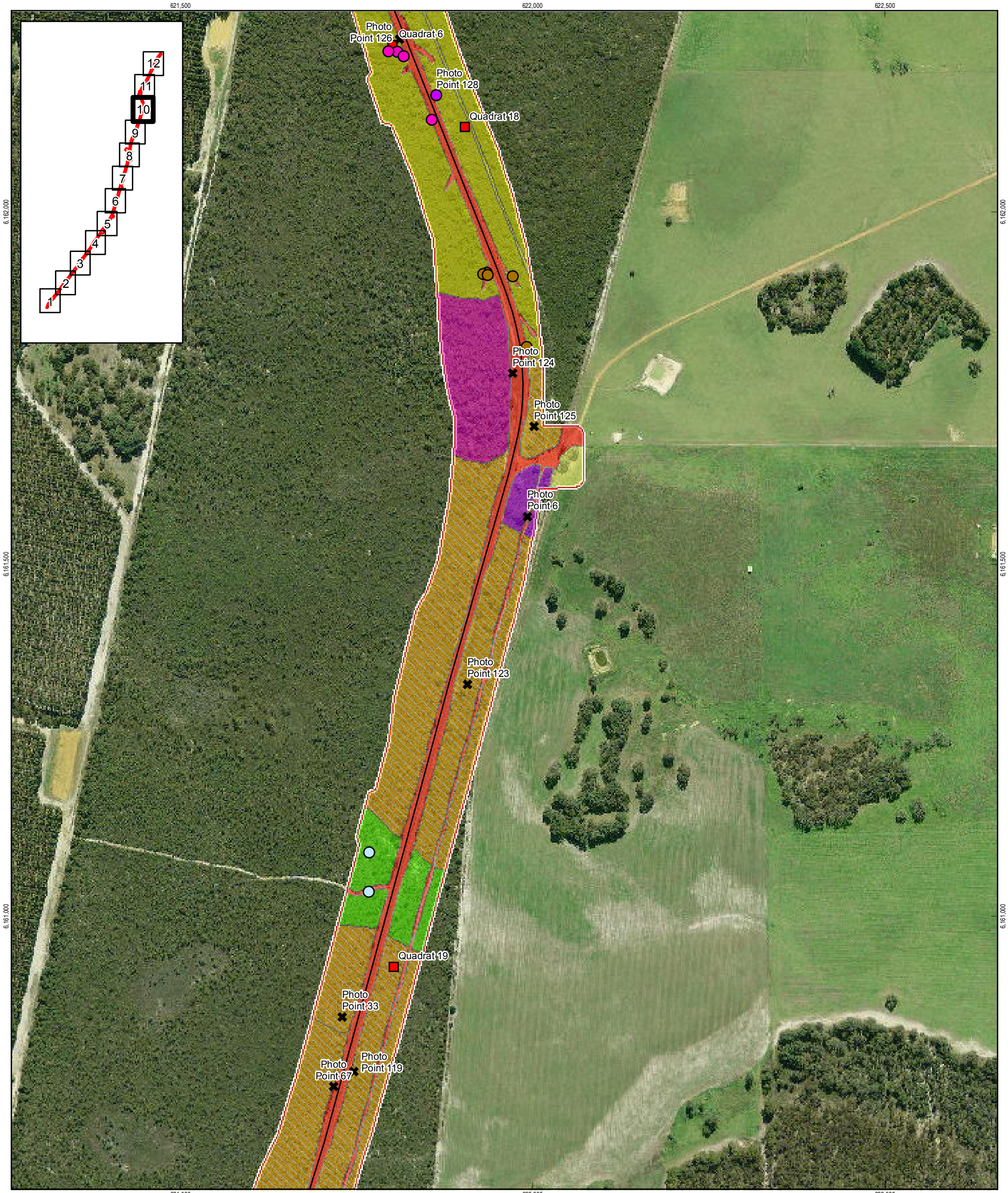
Vegetation types and survey locations

Sheet 9 of 12

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point
- Quadrat

Vegetation Type

- *Banksia* Shrubland
- *Eucalyptus marginata* and *Corymbia calophylla* Woodlands
- *Eucalyptus* Mallee Woodland over Sedgeland
- *Hakea* spp Complex - D
- Cleared
- Mixed Mallee Woodland
- Pasture

Conservation significant flora

- *Leucopogon* sp. Manypeaks (A.S. George 6488)
- *Stenanthemum sublineare*
- *Tetraria* sp. Blackwood River (A.R. Annels 3043)
- *Xanthosia eichleri*

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Job Number	61-32576
Revision	0
Date	16 Mar 2016

Figure 3
Vegetation types and survey locations *Sheet 10 of 12*

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB

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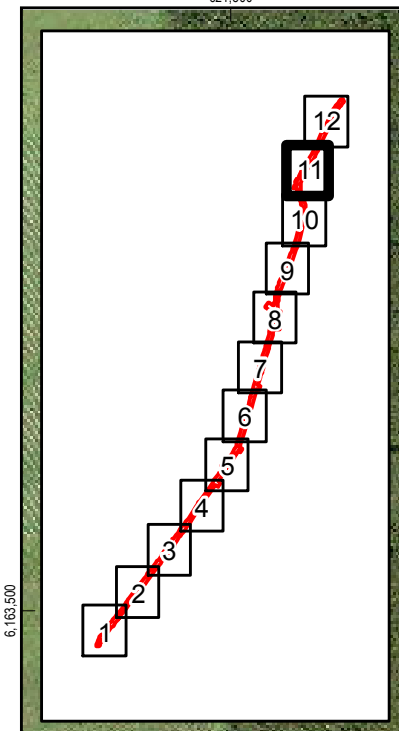

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Quadrat 17
Photo Point 116
Photo Point 115
Photo Point 114
Photo Point 23
Photo Point 113
Photo Point 24
Photo Point 112
Photo Point 25
Photo Point 26
Photo Point 117
Photo Point 27
Photo Point 28
Photo Point 127
Photo Point 126
Quadrat 6

621,500 622,000 622,500

LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point
- Quadrat

Vegetation Type

- *Banksia* Shrubland
- *Eucalyptus* Mallee Woodland over Sedgeland
- *Hakea* spp Complex - A
- *Hakea* spp Complex - D
- Cleared
- Mixed Mallee Woodland

Conservation significant flora

- *Drosera fimbriata*
- *Latrobea recurva*
- *Leucopogon* sp. Manypeaks (A.S. George 6488)
- *Tetraria* sp. Blackwood River (A.R. Annels 3043)
- *Xanthosia eichleri*

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

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SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Job Number	61-32576
Revision	0
Date	16 Mar 2016

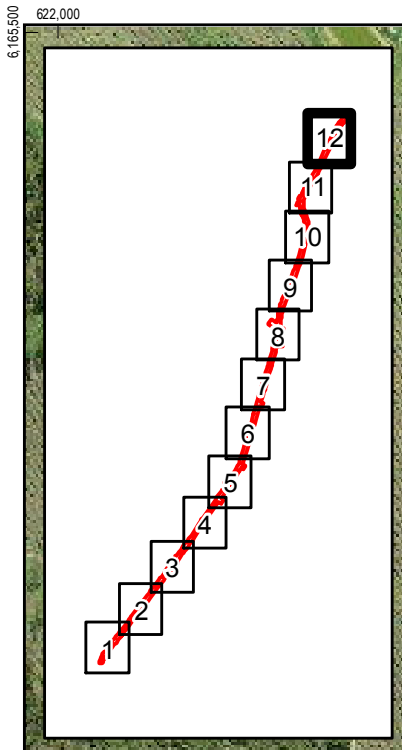
Figure 3

Vegetation types and survey locations *Sheet 11 of 12*

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB



622,000 622,500 623,000

6,165,500 6,165,000 6,164,500 6,164,000

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Photo Point 3
Photo Point 4
Photo Point 5
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Photo Point 12
Photo Point 71
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Photo Point 111
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Photo Point 110
Quadrat 16
Photo Point 17
Photo Point 18
Photo Point 19
Photo Point 109
Photo Point 68
Photo Point 20
Photo Point 108
Photo Point 21
Quadrat 15
Photo Point 22
Photo Point 116
Quadrat 17

LEGEND

- Road
- River
- Project Area

Survey Locations

- Photo Point
- Quadrat

Vegetation Type

- *Actinodium* Shrubland
- *Banksia* Shrubland
- *Eucalyptus occidentalis* Swamp
- *Eucalyptus* Mallee Woodland over Low Shrubland
- *Eucalyptus* Mallee Woodland over Sedgeland
- *Hakea* spp Complex - D
- *Taxandria* transitional areas and drainage
- Cleared
- Pasture and regrowth
- *Melaleuca* Swamps
- *Kunzea* Swamps
- Sedgeland Swamps

Conservation significant flora

- *Drosera fimbriata*
- *Latrobea recurva*
- *Laxmannia grandiflora* subsp. *stirlingensis*
- *Stenanthemum sublineare*
- *Tetraria* sp. Blackwood River (A.R. Annels 3043)
- *Synaphea preissii*

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Job Number	61-32576
Revision	0
Date	16 Mar 2016

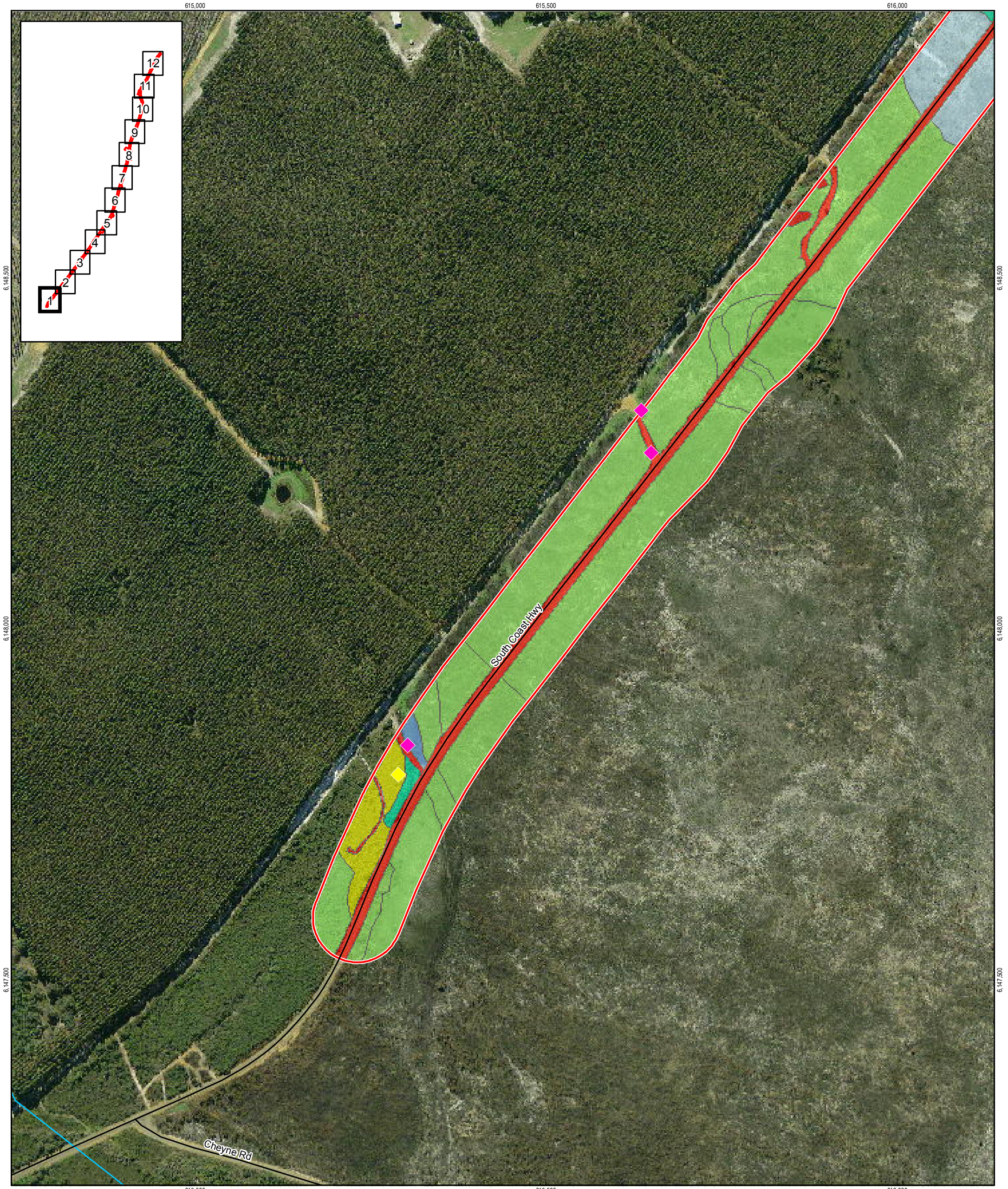
Figure 3

Vegetation types and survey locations *Sheet 12 of 12*

G:\61\32576\GIS\Maps\MXD\6132576_003_Rev0_VegType.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160122; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Vegetation Type - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

Weed Locations

- *Acacia longifolia*
- *Echium plantagineum* (Paterson's Curse)
- *Gladiolus undulatus* (Gladiolus)
- *Leptosperma laevigatum* (Victorian tea-tree)
- *Melaleuca armillaris*

- Road
- River
- Project Area

Vegetation Condition

- 2. Excellent
- 2-3
- 2-4
- 3. Very Good
- 3-4
- 4. Good
- 4-5
- 5. Degraded
- 5-6
- 6. Completely Degraded

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Vegetation Condition and Weeds

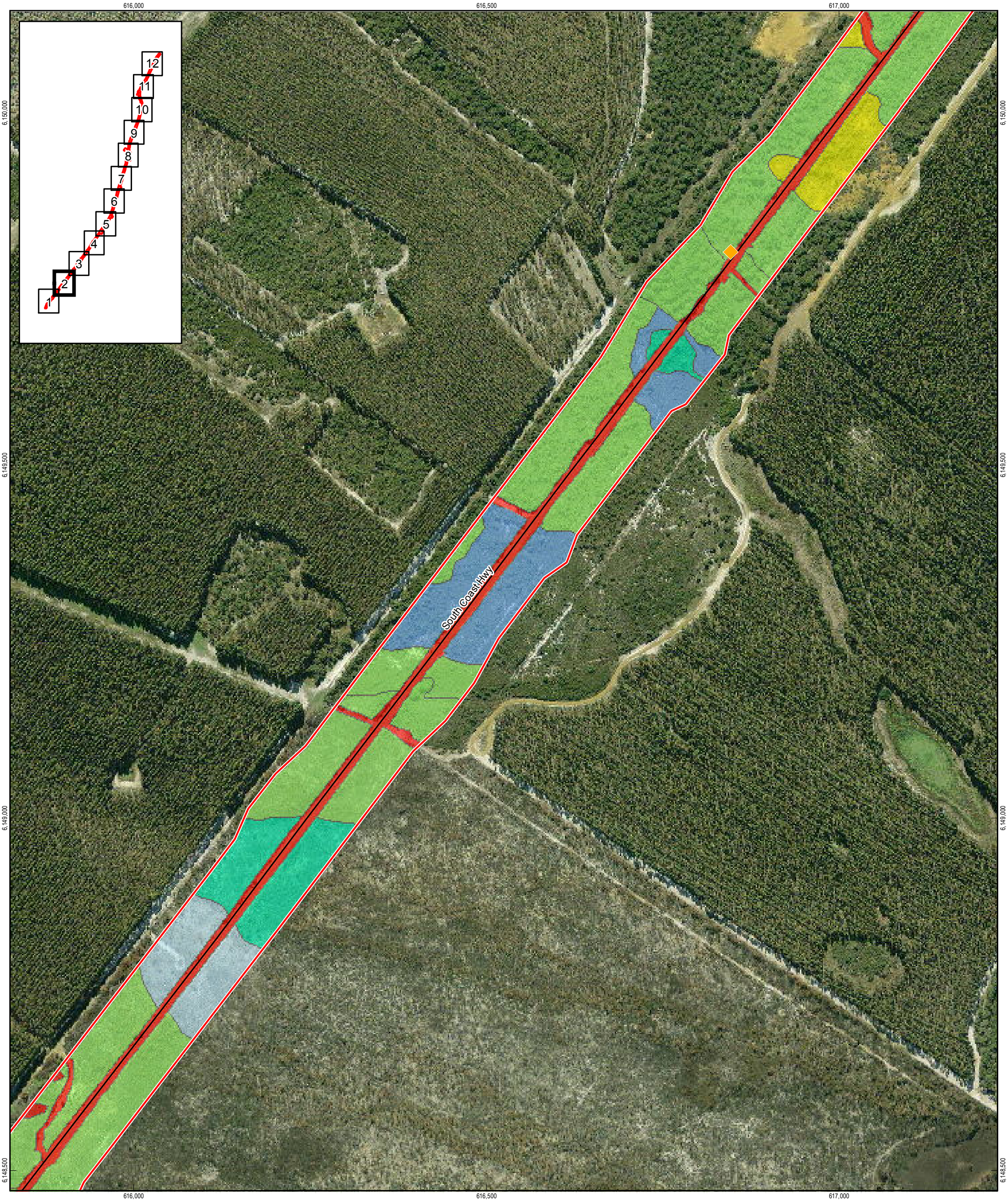
Job Number	61-32576
Revision	0
Date	16 Mar 2016

Figure 4
Sheet 1 of 12

G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

Weed Locations

- *Acacia longifolia*
- *Echium plantagineum* (Paterson's Curse)
- *Gladiolus undulatus* (Gladiolus)
- *Leptosperma laevigatum* (Victorian tea-tree)
- *Melaleuca armillaris*

- Road
- River
- Project Area

Vegetation Condition

- 2. Excellent
- 2-3
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- 3. Very Good
- 3-4
- 4. Good
- 4-5
- 5. Degraded
- 5-6
- 6. Completely Degraded

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Job Number 61-32576
Revision 0
Date 16 Mar 2016

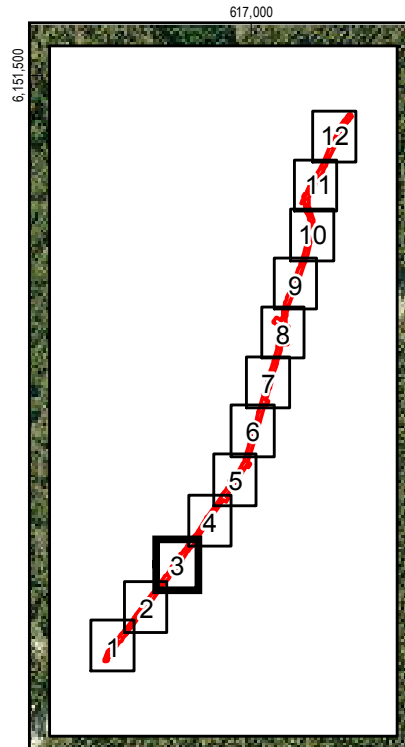
Figure 4
Sheet 2 of 12

Vegetation Condition and Weeds

G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB



617,000 617,500 618,000

6,151,500 6,151,000 6,150,500 6,150,000

South Coast Hwy

LEGEND

Weed Locations

- *Acacia longifolia*
- *Echium plantagineum* (Paterson's Curse)
- *Gladiolus undulatus* (Gladiolus)
- *Leptosperma laevigatum* (Victorian tea-tree)
- *Melaleuca armillaris*

- Road
- River
- Project Area

Vegetation Condition

- 2. Excellent
- 2-3
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- 4. Good
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Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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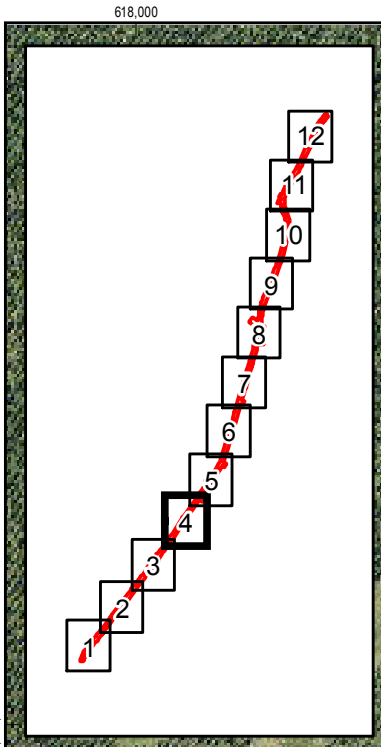
Job Number 61-32576
Revision 0
Date 16 Mar 2016

Figure 4
Vegetation Condition and Weeds
Sheet 3 of 12

G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB



618,000 618,500 619,000

6,152,500 6,152,000 6,151,500

Bluff Creek Rd

South Coast Hwy

LEGEND

Weed Locations

- *Acacia longifolia*
- *Echium plantagineum* (Paterson's Curse)
- *Gladiolus undulatus* (Gladiolus)
- *Leptosperma laevigatum* (Victorian tea-tree)
- *Melaleuca armillaris*

- Road
- River
- Project Area

Vegetation Condition

- 2. Excellent
- 2-3
- 2-4
- 3. Very Good
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- 5. Degraded
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- 6. Completely Degraded

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Vegetation Condition and Weeds

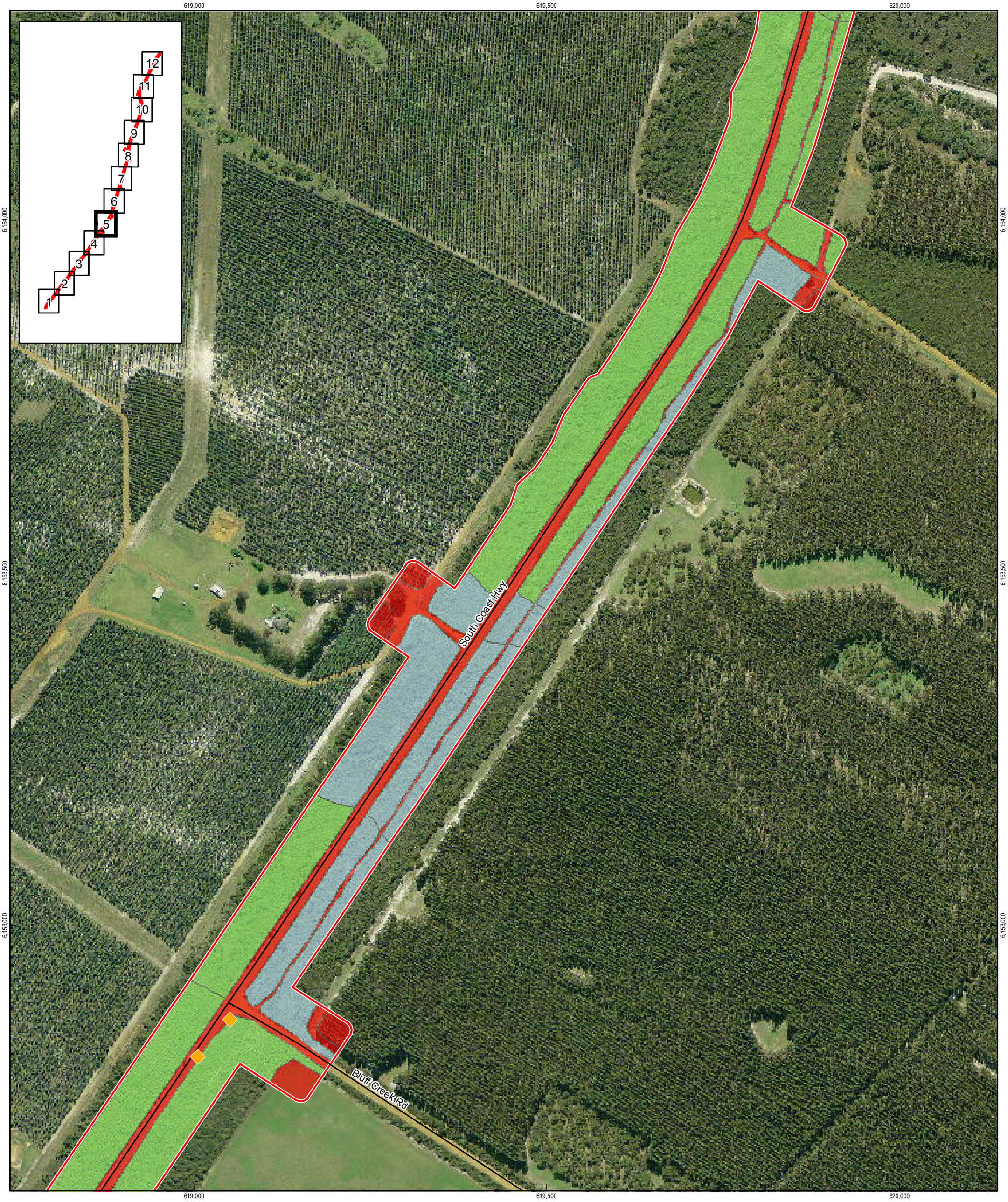
Job Number	61-32576
Revision	0
Date	16 Mar 2016

Figure 4
Sheet 4 of 12

G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

Weed Locations

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- *Echium plantagineum* (Paterson's Curse)
- *Gladiolus undulatus* (Gladiolus)
- *Leptosperma laevigatum* (Victorian tea-tree)
- *Melaleuca armillaris*

- Road
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Vegetation Condition

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Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Vegetation Condition and Weeds

Job Number	61-32576
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Date	16 Mar 2016

Figure 4
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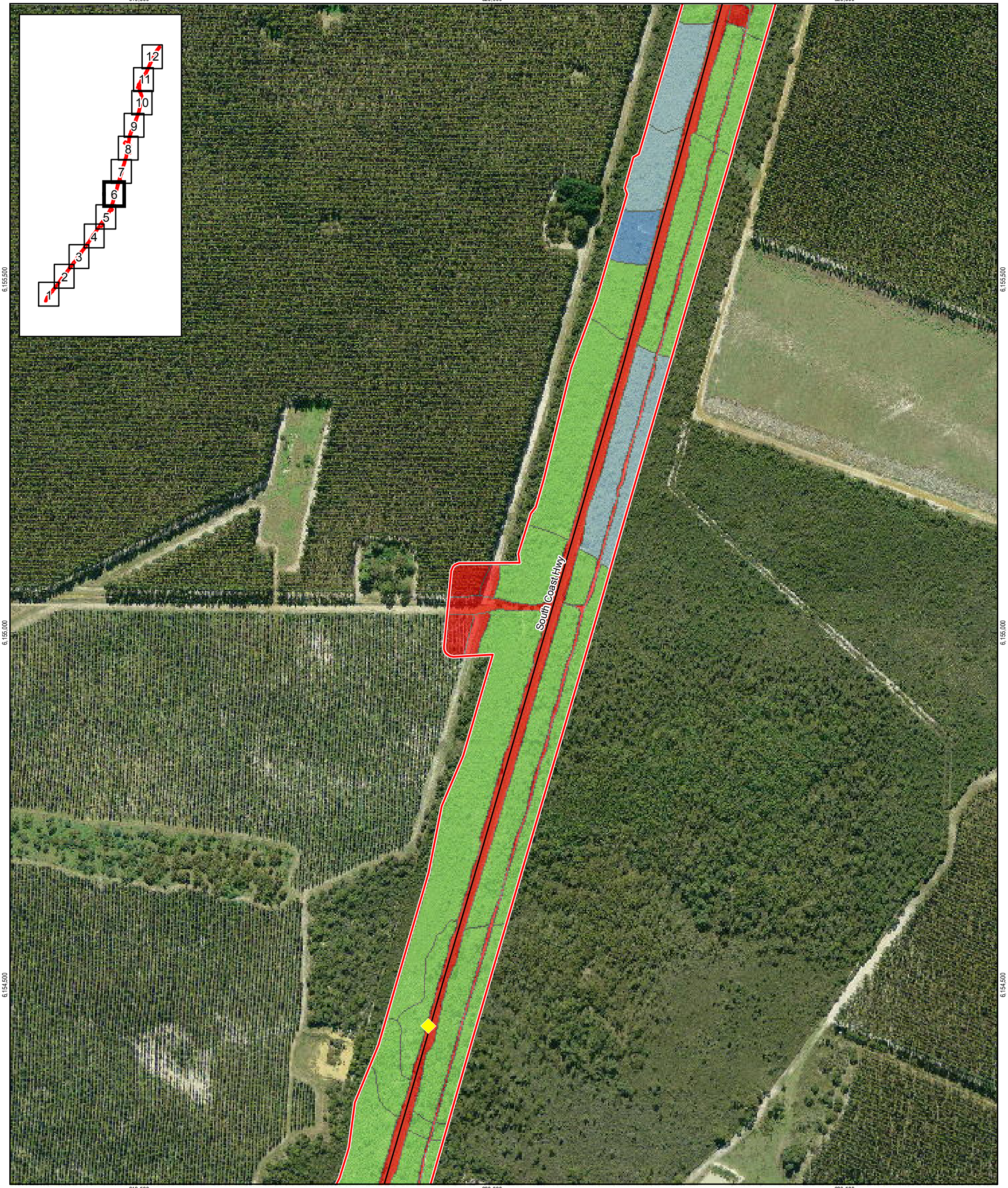
G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

Weed Locations

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Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

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Revision 0
Date 16 Mar 2016

Vegetation Condition and Weeds

Figure 4
Sheet 6 of 12

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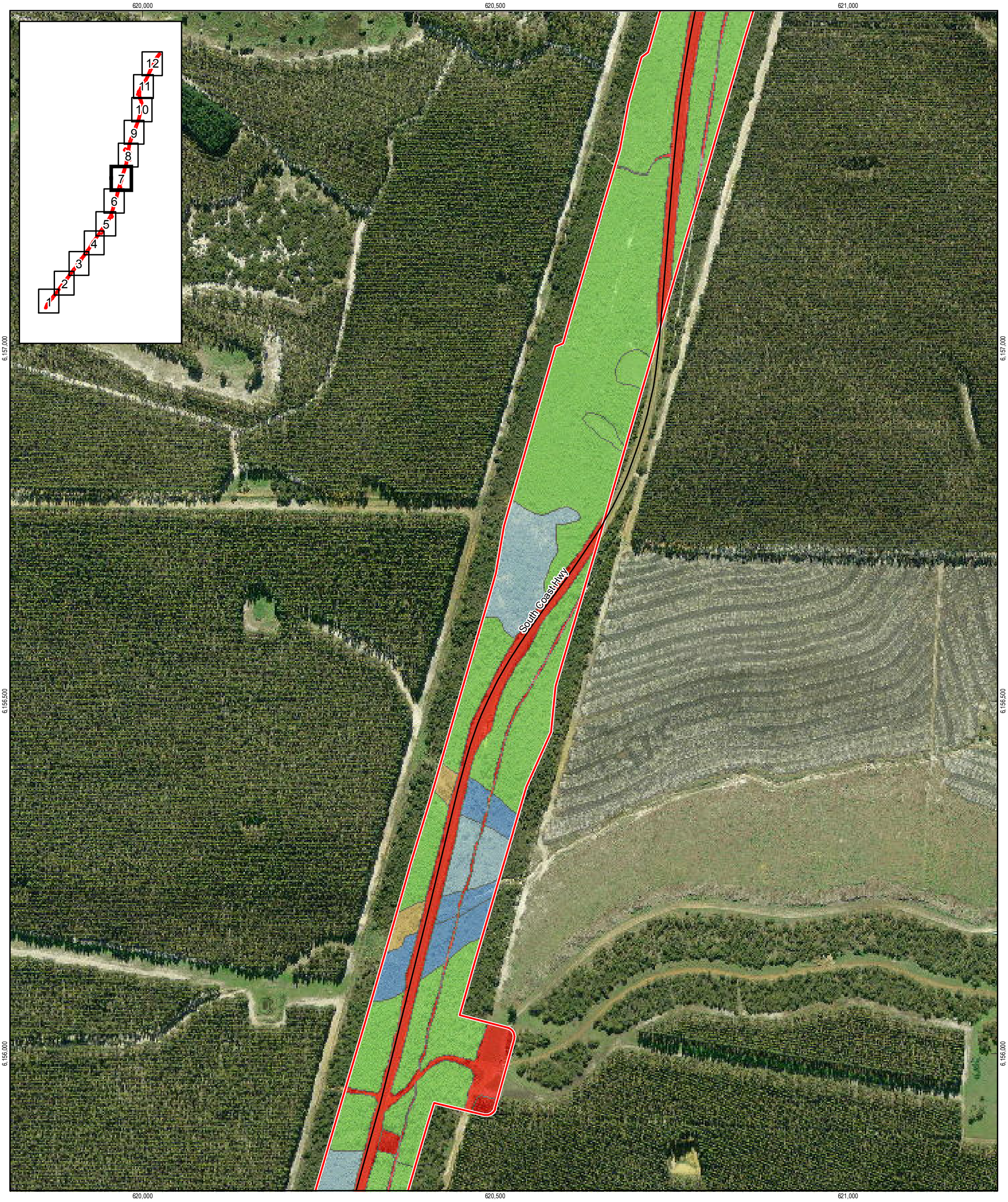
999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

Weed Locations

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- 6. Completely Degraded

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Vegetation Condition and Weeds

Job Number	61-32576
Revision	0
Date	16 Mar 2016

Figure 4
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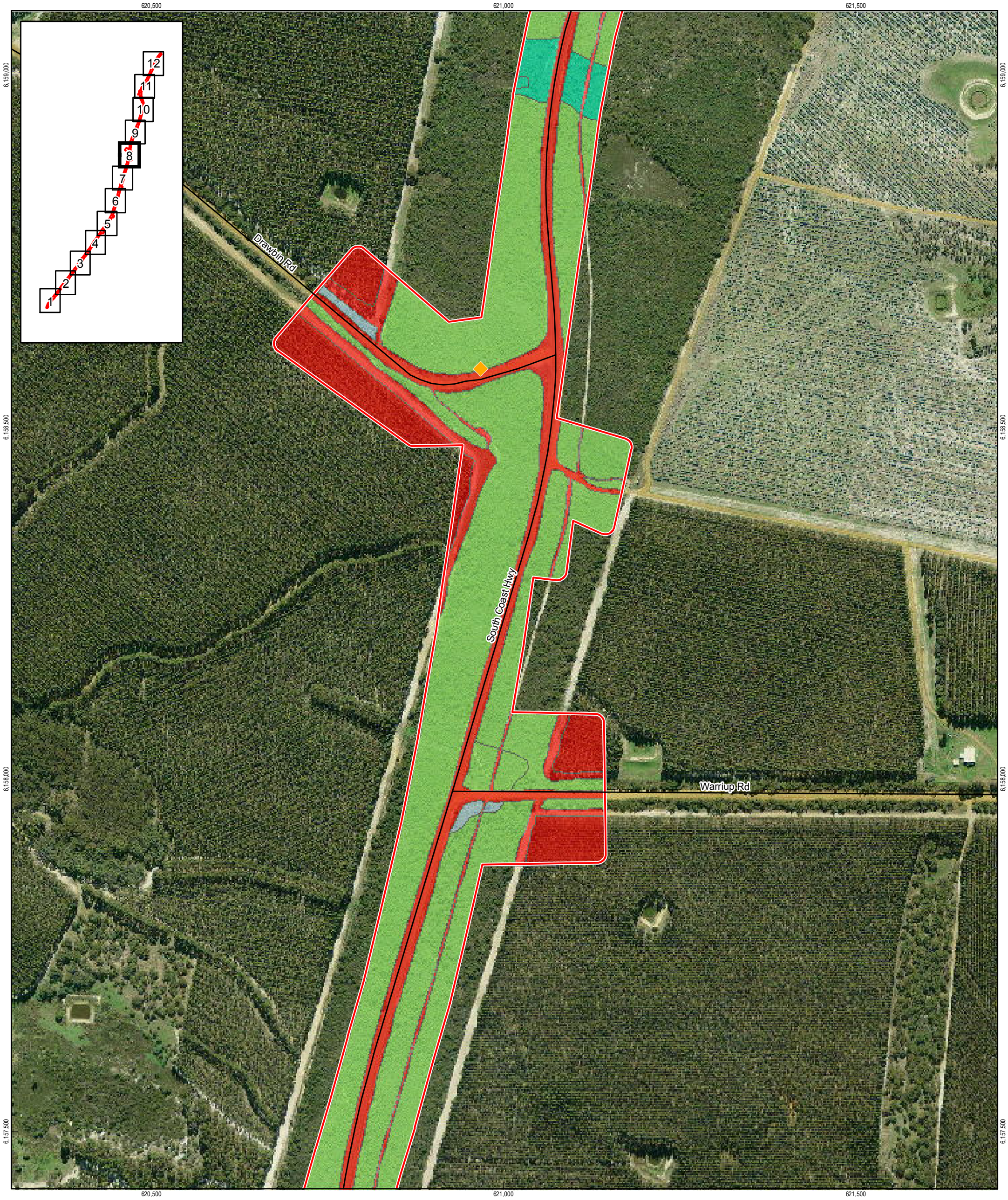
G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

Weed Locations

- *Acacia longifolia*
- *Echium plantagineum* (Paterson's Curse)
- *Gladiolus undulatus* (Gladiolus)
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Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Vegetation Condition and Weeds

Job Number	61-32576
Revision	0
Date	16 Mar 2016

Figure 4
Sheet 8 of 12

G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB

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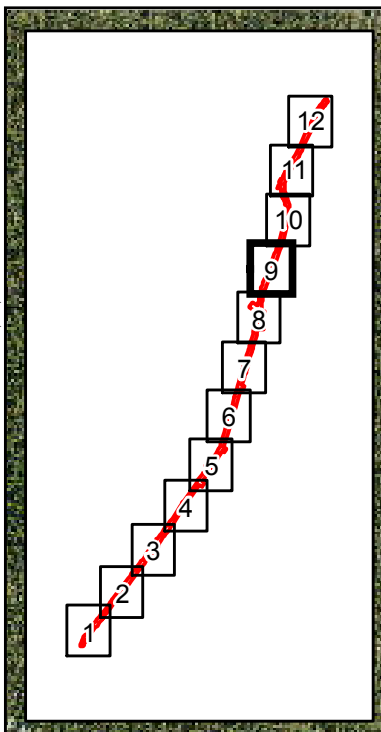
6,160,500 6,160,000 6,159,500



South Coast Hwy

621,000 621,500 622,000

LEGEND

Weed Locations

- *Acacia longifolia*
- *Echium plantagineum* (Paterson's Curse)
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- *Leptosperma laevigatum* (Victorian tea-tree)
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Vegetation Condition

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- 4. Good
- 4-5
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- 5-6
- 6. Completely Degraded

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Vegetation Condition and Weeds

Job Number	61-32576
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Figure 4
Sheet 9 of 12

G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

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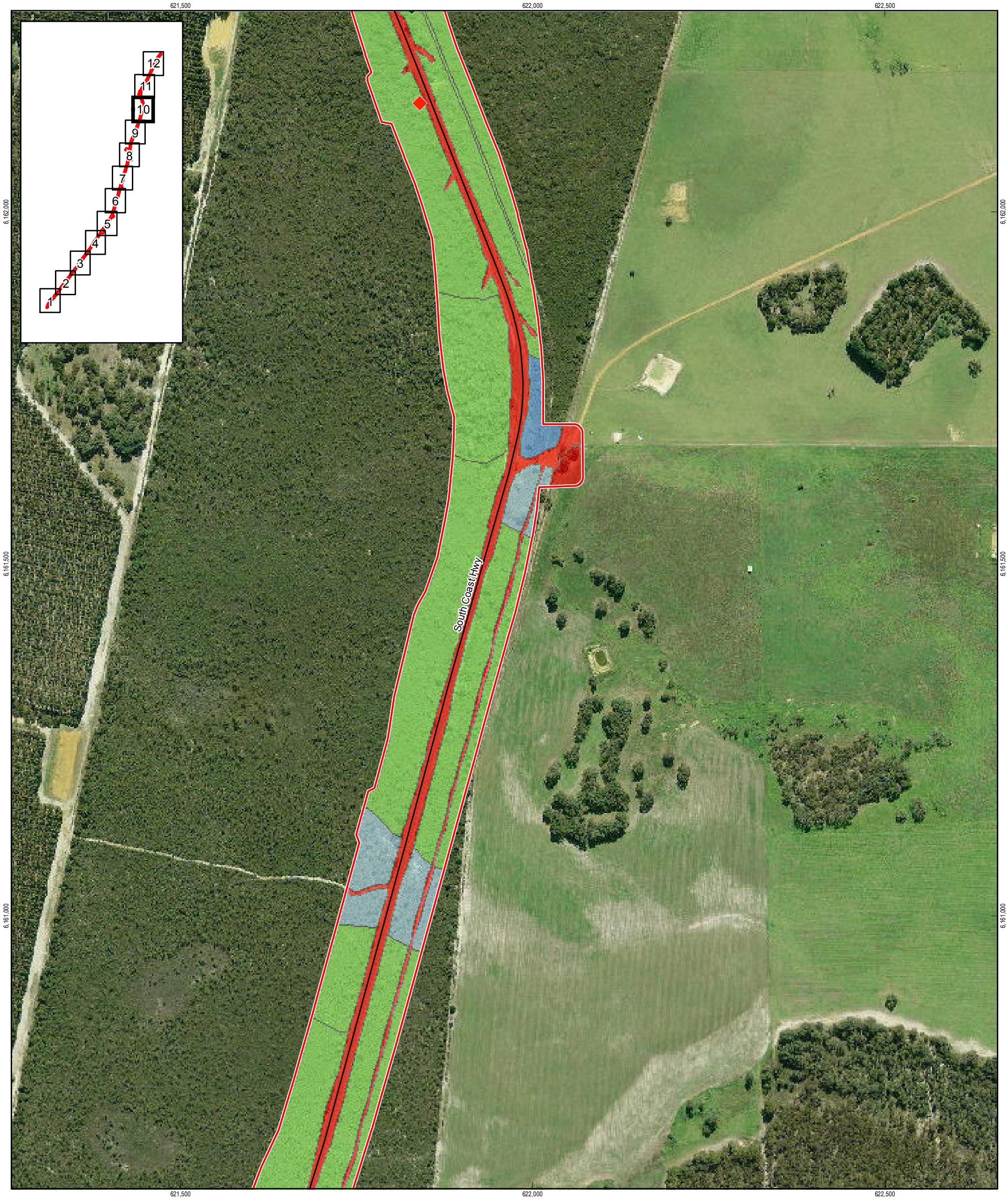
Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB



LEGEND

Weed Locations

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- Road
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- 6. Completely Degraded

Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Vegetation Condition and Weeds

Job Number	61-32576
Revision	0
Date	16 Mar 2016

Figure 4
Sheet 10 of 12

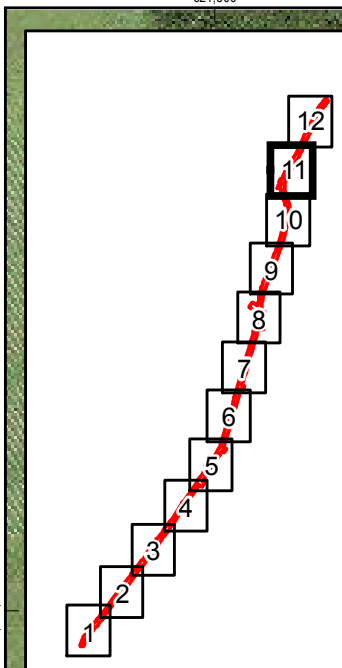
G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB

621,500 622,000 622,500

6,163,500 6,163,000 6,162,500



South Coast Hwy

621,500 622,000 622,500

LEGEND

Weed Locations

- *Acacia longifolia*
- *Echium plantagineum* (Paterson's Curse)
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- Road
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Vegetation Condition

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Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

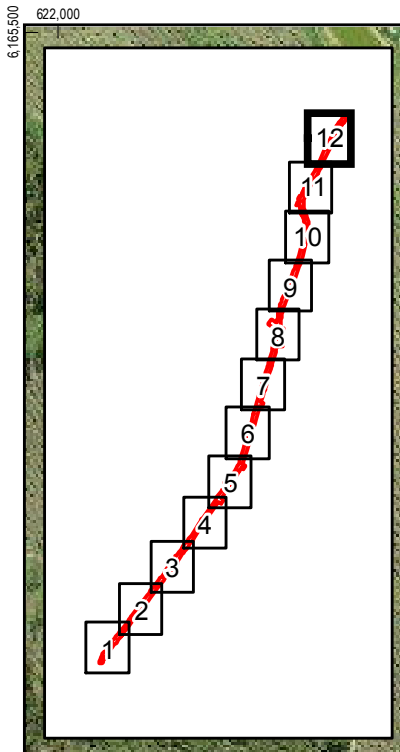
Job Number 61-32576
Revision 0
Date 16 Mar 2016

Figure 4
Vegetation Condition and Weeds
Sheet 11 of 12

G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB



622,000 622,500 623,000

6,165,500 6,165,000 6,164,500 6,164,000

Kojaneerup West Rd

South Coast Hwy

LEGEND

Weed Locations

- *Acacia longifolia*
- *Echium plantagineum* (Paterson's Curse)
- *Gladiolus undulatus* (Gladiolus)
- *Leptosperma laevigatum* (Victorian tea-tree)
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- Road
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- Project Area

Vegetation Condition

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Paper Size A3

0 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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mainroads WESTERN AUSTRALIA

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Job Number 61-32576
Revision 0
Date 16 Mar 2016

Figure 4
Sheet 12 of 12

Vegetation Condition and Weeds

G:\61\32576\GIS\Maps\MXD\6132576_004_Rev0_VegCondition.mxd

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Data source: Landgate: Imagery (Virtual Mosaic), Road - 20150814; MRWA: Project Area - 20150814; GHD: Weed Location, Vegetation Condition - 20160122, DoW: River - 20110802. Created by: RB

616,000 618,000 620,000

6,152,000 6,150,000 6,148,000

616,000 618,000 620,000

LEGEND

- Potential Black Cockatoo Habitat Tree (>500mm DBH)
- Road
- River
- Black Cockatoo Foraging Habitat
- Project Area

Paper Size A3

0 500 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Black Cockatoo Habitat

Job Number	61-32576
Revision	0
Date	16 Mar 2016

Figure 5
Sheet 1 of 3

G:\61\32576\GIS\Maps\MXD\6132576_005_Rev0_BlackCockatooHabitat.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160290; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Black Cockatoo Foraging Habitat, Potential Black Cockatoo Habitat Trees - 20160209, DoW: River - 20110802. Created by: MM

618,000 620,000 622,000

6,160,000 6,158,000 6,156,000 6,154,000

LEGEND

- Potential Black Cockatoo Habitat Tree (>500mm DBH)
- Road
- River
- Black Cockatoo Foraging Habitat
- Project Area

Paper Size A3

0 500 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

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Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Black Cockatoo Habitat

Job Number	61-32576
Revision	0
Date	16 Mar 2016

Figure 5
Sheet 2 of 3

G:\61\32576\GIS\Maps\MXD\6132576_005_Rev0_BlackCockatooHabitat.mxd

999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160290; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Black Cockatoo Foraging Habitat, Potential Black Cockatoo Habitat Trees - 20160209, DoW: River - 20110802. Created by: MM

620,000 622,000 624,000

6,166,000 6,164,000 6,162,000 6,160,000

LEGEND

- Potential Black Cockatoo Habitat Tree (>500mm DBH)
- Road
- River
- Black Cockatoo Foraging Habitat
- Project Area

Paper Size A3

0 500 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Main Roads Western Australia
SCH Kojaneerup SLK 46.4-65.7 Biological Survey

Job Number 61-32576
Revision 0
Date 16 Mar 2016

Figure 5
Black Cockatoo Habitat
Sheet 3 of 3

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999 Hay Street, Perth, WA, 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com **W** www.ghd.com

Data source: Landgate: Imagery (Virtual Mosaic), Road - 20160290; MRWA: Project Area - 20150814; GHD: Conservation significant flora, Survey Location, Black Cockatoo Foraging Habitat, Potential Black Cockatoo Habitat Trees - 20160209, DoW: River - 20110802. Created by: MM

Appendix B – Relevant legislation, conservation codes and background information

Legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

- Nationally threatened flora and fauna species and ecological communities
- Migratory species

A person must not take an action that has, will have, or is likely to have a significant impact MNES, without approval from the Federal Minister for the Environment.

A person must not undertake an action that has, will have, or is likely to have a significant impact (direct or indirect) on MNES, without approval from the Australian Government Minister for the Environment.

State *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the primary legislative Act dealing with the protection of the environment in Western Australia. It provides for an Environmental Protection Authority (EPA), for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the above.

Clearing of native vegetation in Western Australia requires a permit from the Department of Environment Regulation (DER) (formerly the Department of Environment and Conservation – DEC), unless exemptions apply. Native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native, but not vegetation planted in a plantation or planted with commercial intent.

In the EP Act Section 51A, clearing is defined as the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage of some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above.

When making a decision to grant or refuse a permit to clear native vegetation the assessment considers clearing against the ten clearing principles as specified in Schedule 5 of the EP Act:

a) Native vegetation should not be cleared if it comprises a high level of biodiversity.

b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.

c) Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.

d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.

e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

There are a number of Environmentally Sensitive Areas (ESAs) within Western Australia where exemptions in regulations do not apply. ESAs include locations of threatened communities and species.

State *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*

ESAs are declared by a notice under Section 51B of the EP Act. The Table below outlines the aspects of areas declared as ESA (under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 – Reg 6).

Aspects of Environmentally Sensitive Areas

Aspects of Environmentally Sensitive Areas
A declared World Heritage property as defined in Section 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
An area that is registered on the Register of the National Estate (RNE), because of its natural values, under the *Australian Heritage Commission Act 1975* of the Commonwealth (the RNE was closed in 2007 and is no longer a statutory list – all references to the RNE were removed from the EPBC Act on 19 February 2012).
A defined wetland and the area within 50 m of the wetland.
The area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located.
The area covered by a TEC.
A Bush Forever Site.
The areas covered by the following policies:
a) The *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*.
b) The *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*.
The areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (SCPL) (EPP Lakes) applies.
Protected wetlands as defined in the *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.
Areas of fringing native vegetation in the policy area as defined in the *Environmental Protection (Swan and Canning Rivers) Policy 1997*.

State *Wildlife Conservation Act 1950*

The *Wildlife Conservation Act 1950* (WC Act) provides for the conservation and protection of wildlife. It is administered by the Department of Parks and Wildlife (DPaW) (formerly the DEC) and applies to both flora and fauna. Any person wanting to capture, collect, disturb or study fauna requires a permit to do so. A permit is required under the WC Act if removal of threatened species is required.

State *Biosecurity and Agriculture Management Act 2007*

Under the *Biosecurity and Agriculture Management Act 2007* (BAM Act), a Declared Pest is a prohibited organism or an organism for which a declaration under Section 22(2) is in force. The Department of Agriculture and Food Western Australia (DAFWA) maintains a list of Declared Pests for Western Australia. If a Pest is declared for the whole of the State or for particular Local Government Areas, all landholders are obliged to comply with the specific category of control. Declared plants are gazetted under categories, which define the action required. The category may apply to the whole of the State, districts, individual properties or even paddocks. Categories of control are defined below. Among the factors considered in categorising Declared Pests are:

- The impact of the plant on individuals, agricultural production and the community in general
- Whether it is already established in the area
- The feasibility and cost of possible control measures

The BAM Act replaces the repealed *Agriculture and Related Resources Protection Act 1976* (ARRP Act).

Department of Agriculture and Food (Western Australia) Categories for Declared Pests under the *Biosecurity and Agriculture Management Act 2007*

Control class code	Description
C1 (Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 (Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 (Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Background information and conservation codes

Reserves and conservation areas

Department of Parks and Wildlife managed lands and waters

DPaW manages lands and waters throughout Western Australia to conserve ecosystems and species, and to provide for recreation and appreciation of the natural environment. DPaW managed lands and waters include national parks, conservation parks and reserves, marine parks and reserves, regional parks, nature reserves, State forest and timber reserves. DPaW managed conservation estate, is vested with the Conservation Commission of Western Australia. Access to, or through, some areas of DPaW managed lands may require a permit or could be restricted due to management activities. Proposed land use changes and development proposals that abut DPaW managed lands will generally be referred to DPaW throughout the assessment process.

Vegetation extent and status

The National Objectives and Targets for Biodiversity Conservation 2001–2005 (Commonwealth of Australia 2001) recognise that the retention of 30 percent or more of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected. This is the threshold level below which species loss appears to accelerate exponentially and loss below this level should not be permitted. This level of recognition is in keeping with the targets recommended in the review of the National Strategy for the Conservation of Australia's Biological Diversity (ANZECC 2000) and in Environmental Protection Authority (EPA) Position Statement No. 2 on environmental protection of native vegetation in Western Australia (EPA 2000).

From a purely biodiversity perspective and taking no account of any other land degradation issues, there are a number of key criteria now being applied to the clearing of native vegetation in Western Australia (EPA 2000).

- The "threshold level" below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30 percent of the pre-European extent of the vegetation type.
- A level of 10 percent of the original extent is regarded as being a level representing Endangered.
- Clearing which would put the threat level into the class below should be avoided.
- From a biodiversity perspective, stream reserves should generally be in the order of at least 200 metres (m) wide.

Vegetation condition

The vegetation condition in the Coolgardie IBRA bioregion can be assessed in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces (devised by Keighery (1994) and adapted by EPA and DPaW (2015). The scale recognises the intactness of vegetation and consists of six rating levels as outlined below.

Vegetation condition rating scale

Class	South West and Interzone Botanical Provinces description
1	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
2	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
3	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
4	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
6	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
7	The structure of vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Conservation codes

Species of significant flora, fauna and communities are protected under both Federal and State Acts. The Federal EPBC Act provides a legal framework to protect and manage nationally important flora and communities. The State WC Act is the primary wildlife conservation legislation in Western Australia. Information on the conservation codes is summarised in the following sections.

Conservation significant communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English and Blyth 1997). Federally listed Threatened Ecological Communities (TECs) are protected under the EPBC Act administered by the Department of the Environment (DotE) (formerly Department of Sustainability, Environment, Water, Population and Communities – DSEWPaC). The DPaW also maintains a list of TECs for Western Australia; some of which are also protected under the EPBC Act. TECs are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable.

Possible TEC that do not meet survey criteria are added to the DPaW Priority Ecological Community (PEC) List under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed in Priority 4. These ecological communities require regular

monitoring. Conservation dependent ecological communities are placed in Priority 5. PECs are not listed under any formal Federal or State legislation.

Conservation codes and definitions for Threatened Ecological Communities endorsed by the Western Australian Minister for the Environment and listed under the *Environment Protection and Biodiversity Conservation Act 1999*

Western Australia conservation categories		Federal Government Conservation Categories (EPBC Act)	
Presumed Totally Destroyed (PD)	The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.	Critically Endangered (CR)	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated	Endangered (EN)	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.	Vulnerable (VU)	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.		

Conservation categories and definitions for Priority Ecological Communities as listed by the Department of Parks and Wildlife

Category	Description
Priority 1	**Poorly known ecological communities.** Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority 2	**Poorly known ecological communities.** Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
Priority 3	**Poorly known ecological communities.** (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
Priority 4	**Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.** (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Category	Description
Priority 5	**Conservation Dependent ecological communities.** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Other significant vegetation

Vegetation may be significant for a range of reasons, other than a statutory listing as TEC or because the extent is below a threshold level. The EPA (2004) states that significant vegetation may include vegetation that includes the following:

- Scarcity
- Unusual species
- Novel combinations of species
- A role as a refuge
- A role as a key habitat for Threatened species or large population representing a significant proportion of the local to regional total population of a species
- Being representative of the range of a unit (particularly, a good local and/or regional example of a unit in 'prime' habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- A restricted distribution

This may apply at a number of levels, so the unit may be significant when considered at the fine-scale (intra-locality), intermediate-scale (locality or inter-locality) or broad-scale (local to region).

Conservation significant flora and fauna

Species of significant flora are protected under both Federal and State legislation. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act, and/or the WC Act can warrant referral to the DotE and/or the EPA.

The Federal conservation level of flora and fauna species and their significance status is assessed under the EPBC Act. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN).

Threatened species have been published as Specially Protected under the WC Act 1950, and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora. The schedules align with the categories of the EPBC Act. Threatened species are those are species which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

For the purposes of this assessment, all species listed under the EPBC Act, WC Act and DPaW Priority species are considered conservation significant.

Conservation categories and definitions for *Environment Protection and Biodiversity Conservation Act 1999* listed flora & fauna species

Conservation category	Definition
Extinct	Taxa not definitely located in the wild during the past 50 years
Extinct in the Wild	Taxa known to survive only in captivity
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future
Endangered	Taxa facing a very high risk of extinction in the wild in the near future
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term
Near Threatened	Taxa that risk becoming Vulnerable in the wild
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not considered Threatened

Conservation codes and descriptions for Western Australian flora and fauna

Code	Conservation category	Description
Wildlife Conservation Act 1950		
T	Threatened species	Published as Specially Protected under the *Wildlife Conservation Act 1950,* and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora). ***Threatened fauna*** is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act. ***Threatened flora*** is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.
CR	Critically endangered species	Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.
EN	Endangered species	Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.
VU	Vulnerable species	Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.
EX	Presumed extinct species	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.
IA	Migratory birds protected under an international agreement	Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.
CD	Conservation dependent fauna	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.
OS	Other specially protected fauna	Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

Code	Conservation category	Description
DPaW Priority Listed		
1	Priority One: Poorly-known taxa	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
2	Priority Two: Poorly-known taxa	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
3	Priority Three: Poorly-known taxa	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
4	Priority Four: Rare, Near Threatened and other taxa in need of monitoring	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Migratory species listed under the EPBC Act

The EPBC Act also protects land and migratory species that are listed under International Agreements. The list of migratory species established under section 209 of the EPBC Act comprises:

- Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)
- Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China–Australia Migratory Bird Agreement (CAMBA)

- Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

Other significant flora and fauna

Flora species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than as Threatened (Declared Rare) Flora or Priority Flora. The EPA (2004) states that significant flora may include taxa that have:

- A keystone role in a particular habitat for threatened species or supporting large populations representing a significant proportion of the local regional population of a species
- Relic status
- Anomalous features that indicate a potential new discovery
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- The presence of restricted subspecies, varieties, or naturally occurring hybrids
- Local endemism/a restricted distribution
- Being poorly reserved

The application of the degree of significance may apply at a range of scales.

Introduced plants (weeds)

Declared Pests

Information on species considered to be Declared Pests is provided under *State Biosecurity and Agriculture Management Act 2007.*

Weeds of National Significance

The spread of weeds across a range of land uses or ecosystems is important in the context of socio-economic and environmental values. The assessment of Weeds of National Significance (WoNS) is based on four major criteria:

- Invasiveness
- Impacts
- Potential for spread
- Socio-economic and environmental values

Australian state and territory governments have identified thirty two Weeds of National Significance (WoNS); a list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012 (Australian Government 2014).

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Appendix C – Desktop searches

Australian Government

Department of the Environment

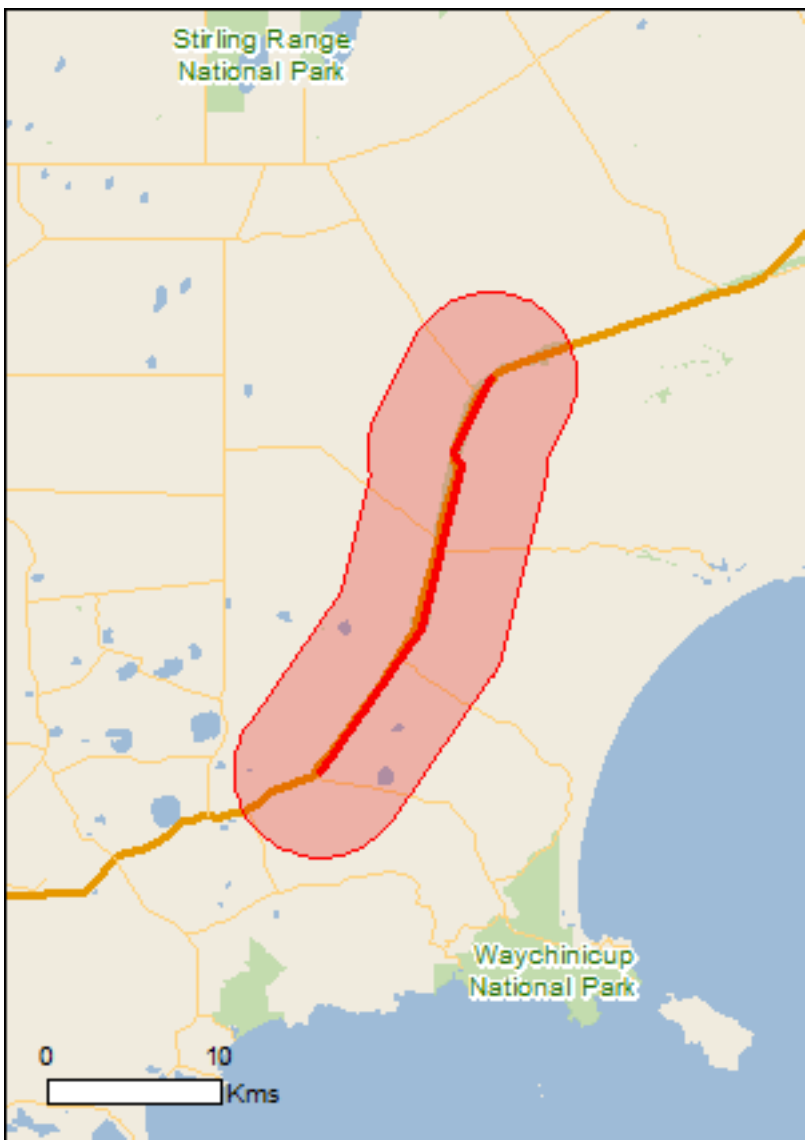
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 07/10/15 13:51:35



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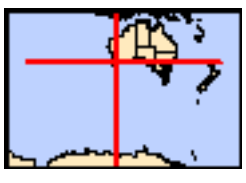

Summary

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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	27
Listed Migratory Species:	6

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:	8
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	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:	2
Regional Forest Agreements:	None
Invasive Species:	13
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

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
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Atrichornis clamosus Noisy Scrub-bird, Tjimiluk [654]	Vulnerable	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
Dasyornis longirostris Western Bristlebird [515]	Vulnerable	Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Pezoporus flaviventris Western Ground Parrot, Kyloring [84650]	Critically Endangered	Species or species habitat may occur within area
Psophodes nigrogularis nigrogularis Western Whipbird (western heath) [64449]	Endangered	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

Name	Status	Type of Presence
Parantechinus apicalis		
Dibbler [313]	Endangered	Species or species habitat likely to occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum, Ngwayir [25911]	Vulnerable	Species or species habitat may occur within area
Setonix brachyurus		
Quokka [229]	Vulnerable	Species or species habitat may occur within area
Plants		
Anigozanthos bicolor subsp. minor		
Little Kangaroo Paw, Two-coloured Kangaroo Paw, Small Two-colour Kangaroo Paw [21241]	Endangered	Species or species habitat likely to occur within area
Banksia brownii		
Brown's Banksia, Feather-leaved Banksia [8277]	Endangered	Species or species habitat known to occur within area
Banksia pseudoplumosa		
False Plumed-Banksia [82760]	Endangered	Species or species habitat likely to occur within area
Chordifex abortivus		
Manypeaks Rush [64868]	Endangered	Species or species habitat known to occur within area
Conostylis misera		
Grass Conostylis [21320]	Endangered	Species or species habitat known to occur within area
Darwinia collina		
Yellow Mountain Bell [17296]	Endangered	Species or species habitat may occur within area
Darwinia oxylepis		
Gillam's Bell [13188]	Endangered	Species or species habitat may occur within area
Darwinia wittwerorum		
Wittwer's Mountain Bell [15626]	Endangered	Species or species habitat may occur within area
Daviesia obovata		
Paddle-leaf Daviesia [17311]	Endangered	Species or species habitat may occur within area
Drakaea micrantha		
Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Isopogon uncinatus		
Hook-leaf Isopogon [20871]	Endangered	Species or species habitat likely to occur within area
Kennedia glabrata		
Northcliffe Kennedia [16452]	Vulnerable	Species or species habitat likely to occur within area
Persoonia micranthera		
Small-flowered Snottygobble [64939]	Endangered	Species or species habitat may occur within area
Sphenotoma drummondii		
Mountain Paper-heath [21160]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
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
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		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		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to 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
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
		within area
Thinornis rubricollis		
Hooded Plover [59510]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Cheyne Road	WA
Hassell	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		
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		
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus		
Black Rat, Ship Rat [84]		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
Genista sp. X Genista monspessulana		
Broom [67538]		Species or species habitat may occur within area

Name	Status	Type of Presence
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to 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
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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

-34.808674 118.260242,-34.747199 118.312427,-34.677773 118.333026,-34.672126 118.329593,-34.640496 118.348819,-34.640496 118.348819

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
-Parks and Wildlife Commission NT, Northern Territory Government
-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, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-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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NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report_Flora

Created By Guest user on 07/10/2015

Kingdom	Plantae
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Line'
Vertices	34° 44' 59" S,118° 18' 33" E 34° 48' 32" S,118° 15' 25" E 34° 44' 54" S,118° 18' 35" E 34° 40' 43" S,118° 19' 54" E 34° 40' 11" S,118° 19' 43" E 34° 38' 37" S,118° 20' 43" E
Group By	Family

Family	Species	Records
Anarthriaceae	2	3
Apiaceae	4	5
Asparagaceae	5	6
Asteraceae	9	10
Bryaceae	4	4
Caprifoliaceae	1	1
Casuarinaceae	2	2
Centrolepidaceae	1	8
Cephalotaceae	1	1
Crassulaceae	1	1
Cyperaceae	10	11
Dasypogonaceae	1	1
Dicranaceae	4	7
Dilleniaceae	5	9
Ditrichaceae	1	1
Droseraceae	8	23
Elaeocarpaceae	2	2
Ericaceae	25	35
Euphorbiaceae	1	1
Fabaceae	54	105
Funariaceae	1	2
Goodeniaceae	9	11
Gyrostemonaceae	1	1
Haemodoraceae	8	14
Hemerocallidaceae	3	4
Iridaceae	2	2
Juncaceae	2	3
Lamiaceae	2	7
Lauraceae	1	2
Loganiaceae	2	3
Loranthaceae	1	1
Malvaceae	5	8
Menyanthaceae	2	2
Myrtaceae	43	73
Orchidaceae	11	16
Phyllanthaceae	1	1
Pittosporaceae	2	2
Poaceae	4	4
Polygalaceae	1	1
Polygonaceae	2	2
Portulacaceae	1	1
Pottiaceae	1	4
Primulaceae	1	1
Proteaceae	60	121
Racopilaceae	1	3
Ranunculaceae	1	2
Restionaceae	16	32
Rhamnaceae	2	7
Rutaceae	10	15
Santalaceae	4	5
Sapindaceae	1	1
Sematophyllaceae	1	5
Solanaceae	1	1
Stylidiaceae	16	40
Thymelaeaceae	5	5
Typhaceae	1	1
Xyridaceae	1	1
Zamiaceae	1	1
TOTAL	**368**	**641**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Anarthriaceae					
1.	1058	*Anarthria gracilis*			
2.	1062	*Anarthria prolifera*			
Apiaceae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
3.	6253	*Platysace filiformis*			
4.	6263	*Schoenolaena juncea*			
5.	18453	*Xanthosia eichleri*		P4	
6.	6292	*Xanthosia rotundifolia (Southern Cross)*			
Asparagaceae					
7.	1301	*Laxmannia brachyphylla (Stilted Paper-lily)*			
8.	11510	*Laxmannia grandiflora subsp. stirlingensis*		P3	
9.	11464	*Laxmannia sessiliflora subsp. australis*			
10.	1240	*Lomandra purpurea (Purple Mat Rush)*			
11.	1351	*Thysanotus sparteus*			
Asteraceae					
12.	7962	*Dittrichia viscosa*	Y		
13.	15137	*Euchiton sphaericus*			
14.	20247	*Gamochaeta calviceps*	Y		
15.	29594	*Helichrysum luteoalbum (Jersey Cudweed)*			
16.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
17.	8092	*Ixiolaena viscosa (Sticky Ixiolaena)*			
18.	8206	*Senecio glomeratus (Cluster-headed Fireweed)*			
19.	20663	*Senecio multicaulis subsp. multicaulis*			
20.	8251	*Trichocline spathulata (Native Gerbera)*			
Bryaceae					
21.	32380	*Gemmabryum pachythecum*			
22.	32424	*Rosulabryum albolimbatum*			
23.	44608	*Rosulabryum billarderii*			
24.	32426	*Rosulabryum campylothecium*			
Caprifoliaceae					
25.	7365	*Lonicera japonica (Japanese Honeysuckle)*	Y		
Casuarinaceae					
26.	1728	*Allocasuarina fraseriana (Sheoak, Kondil)*			
27.	1740	*Allocasuarina trichodon*			
Centrolepidaceae					
28.	1123	*Centrolepis caespitosa*		P4	
Cephalotaceae					
29.	3148	*Cephalotus follicularis (Albany Pitcher Plant)*			
Crassulaceae					
30.	15706	*Crassula natans var. minus*	Y		
Cyperaceae					
31.	768	*Cyathochaeta avenacea*			
32.	815	*Cyperus tenellus (Tiny Flatsedge)*	Y		
33.	822	*Eleocharis acuta (Common Spikerush)*			
34.	899	*Gahnia ancistrophylla (Hooked-leaf Saw Sedge)*			
35.	14540	*Isolepis hystrix*	Y		
36.	916	*Isolepis inundata (Swamp Club Rush)*			
37.	917	*Isolepis marginata (Coarse Club-rush)*			
38.	931	*Lepidosperma drummondii*			
39.	11473	*Mesomelaena stygia subsp. stygia*			
40.	957	*Mesomelaena tetragona (Semaphore Sedge)*			
Dasypogonaceae					
41.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
Dicranaceae					
42.	32334	*Campylopus australis*			
43.	32461	*Campylopus bicolor var. bicolor*			
44.	32338	*Campylopus introflexus*	Y		
45.	32344	*Dicranoloma diaphanoneuron*			
Dilleniaceae					
46.	5126	*Hibbertia furfuracea*			
47.	5131	*Hibbertia gracilipes*			
48.	5143	*Hibbertia lineata*			
49.	20031	*Hibbertia pulchra var. crassinervia*			
50.	5163	*Hibbertia recurvifolia*			
Ditrichaceae					
51.	32462	*Ceratodon purpureus subsp. convolutus*			
Droseraceae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
52.	3094	*Drosera dichrosepala (Rusty Sundew)*			
53.	3096	*Drosera fimbriata (Manypeaks Sundew)*		P4	
54.	3102	*Drosera huegelii (Bold Sundew)*			
55.	3110	*Drosera microphylla (Golden Rainbow)*			
56.	3117	*Drosera paleacea (Dwarf Sundew)*			
57.	3122	*Drosera platypoda (Fan-leaved Sundew)*			
58.	3128	*Drosera ramellosa (Branched Sundew)*			
59.	3130	*Drosera scorpioides (Shaggy Sundew)*			
Elaeocarpaceae					
60.	4524	*Platytheca galioides*			
61.	4541	*Tetratheca pubescens*			
Ericaceae					
62.	25844	*Andersonia caerulea subsp. caerulea*			
63.	6319	*Andersonia setifolia*		P3	
64.	6320	*Andersonia simplex (Spiked Andersonia)*			
65.	6321	*Andersonia sprengelioides*			
66.	6322	*Astroloma baxteri*			
67.	6334	*Astroloma pallidum (Kick Bush)*			
68.	6335	*Astroloma prostratum (Cranberry Heath)*			
69.	6338	*Astroloma tectum*			
70.	6360	*Leucopogon australis (Spiked Beard-heath)*			
71.	6363	*Leucopogon bracteolaris*		P2	
72.	6385	*Leucopogon denticulatus*			
73.	35500	*Leucopogon elegans subsp. elegans*			
74.	6394	*Leucopogon gibbosus*			
75.	6396	*Leucopogon glabellus*			
76.	6425	*Leucopogon oxycedrus*			
77.	6428	*Leucopogon pendulus*			
78.	14637	*Leucopogon sp. Coujinup (M.A. Burgman 1085)*			
79.	36058	*Leucopogon sp. Manypeaks (A.S. George 6488)*		P1	Y
80.	19202	*Leucopogon sp. Walpole (R.J. Cranfield 10940)*			
81.	6449	*Leucopogon tamariscinus*			
82.	6456	*Lysinema ciliatum (Curry Flower)*			
83.	6459	*Lysinema fimbriatum*			
84.	6460	*Lysinema lasianthum*		P4	
85.	6467	*Sphenotoma dracophylloides*			
86.	31952	*Sphenotoma gracilis (Swamp Paper-heath)*			
Euphorbiaceae					
87.	4585	*Amperea ericoides*			
Fabaceae					
88.	14608	*Acacia aemula subsp. aemula*			
89.	11731	*Acacia browniana var. browniana*			
90.	3289	*Acacia delphina*			
91.	11192	*Acacia drummondii subsp. elegans*			
92.	3413	*Acacia leioderma*			
93.	3428	*Acacia luteola*			
94.	3453	*Acacia myrtifolia*			
95.	15482	*Acacia pulchella var. goadbyi*			
96.	3564	*Acacia subcaerulea*			
97.	13504	*Acacia sulcata var. sulcata*			
98.	3575	*Acacia tetanophylla*			
99.	3689	*Aotus intermedia*			
100.	3707	*Bossiaea dentata*			
101.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
102.	3713	*Bossiaea linophylla*			
103.	3760	*Chorizema reticulatum (Showy Flame Pea)*			
104.	3791	*Daviesia alternifolia*			
105.	16580	*Daviesia emarginata*			
106.	3827	*Daviesia oppositifolia (Rattle-pea)*			
107.	3840	*Daviesia spinosissima*			
108.	3846	*Daviesia trigonophylla*			
109.	3873	*Eutaxia cuneata*			
110.	3879	*Eutaxia parvifolia*			
111.	3891	*Gastrolobium bilobum (Heart Leaf Poison)*			
112.	20508	*Gastrolobium bracteolosum*			
113.	20490	*Gastrolobium coriaceum*			
114.	20453	*Gastrolobium latifolium*			
115.	20512	*Gastrolobium praemorsum*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
116.	19733	*Gastrolobium retusum*			
117.	3947	*Gompholobium burtonioides*			
118.	3948	*Gompholobium capitatum*			
119.	10909	*Gompholobium confertum*			
120.	3954	*Gompholobium polymorphum*			
121.	11083	*Gompholobium scabrum*			
122.	3958	*Gompholobium venustum (Handsome Wedge-pea)*			
123.	3964	*Hovea chorizemifolia (Holly-leaved Hovea)*			
124.	3968	*Hovea trisperma (Common Hovea)*			
125.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
126.	4002	*Jacksonia capitata*			
127.	4028	*Jacksonia spinosa*			
128.	4037	*Kennedia coccinea (Coral Vine)*			
129.	4041	*Kennedia microphylla*			
130.	4050	*Latrobea genistoides*			
131.	20704	*Latrobea recurva*		P3	
132.	4140	*Phyllota barbata*			
133.	17016	*Podalyria sericea*	Y		
134.	4164	*Pultenaea aspalathoides*			
135.	20781	*Pultenaea calycina subsp. calycina*		P3	
136.	4185	*Pultenaea strobilifera*			
137.	4187	*Pultenaea verruculosa*			
138.	4200	*Sphaerolobium alatum*			
139.	17551	*Sphaerolobium drummondii*			
140.	4204	*Sphaerolobium grandiflorum*			
141.	4325	*Viminaria juncea (Swishbush, Koweda)*			
Funariaceae					
142.	32464	*Entosthodon subnudus var. subnudus*			
Goodeniaceae					
143.	7420	*Dampiera alata (Winged-stem Dampiera)*			
144.	7452	*Dampiera leptoclada (Slender-shooted Dampiera)*			
145.	7454	*Dampiera linearis (Common Dampiera)*			
146.	29362	*Goodenia coerulea*			
147.	7508	*Goodenia filiformis (Thread-leaved Goodenia)*			
148.	7517	*Goodenia incana (Hoary Goodenia)*			
149.	7575	*Lechenaultia formosa (Red Leschenaultia)*			
150.	7590	*Lechenaultia tubiflora (Heath Leschenaultia)*			
151.	7624	*Scaevola microphylla (Small-leaved Scaevola)*			
Gyrostemonaceae					
152.	2779	*Cypselocarpus haloragoides*			
Haemodoraceae					
153.	1415	*Anigozanthos rufus (Red Kangaroo Paw)*			
154.	1441	*Conostylis misera (Grass Conostylis)*		T	
155.	1447	*Conostylis pusilla*			
156.	1453	*Conostylis serrulata*			
157.	11597	*Conostylis setigera subsp. setigera*			
158.	1460	*Conostylis vaginata (Sheath Conostylis)*			
159.	1481	*Tribonanthes australis*			
160.	1485	*Tribonanthes violacea*			
Hemerocallidaceae					
161.	1299	*Johnsonia teretifolia (Hooded Lily)*			
162.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
163.	1362	*Tricoryne humilis*			
Iridaceae					
164.	1548	*Patersonia limbata*			
165.	1553	*Patersonia umbrosa (Yellow Flags)*			
Juncaceae					
166.	1186	*Juncus microcephalus*	Y		
167.	1195	*Juncus subsecundus (Finger Rush)*			
Lamiaceae					
168.	6855	*Hemigenia humilis*			
169.	6894	*Microcorys lenticularis*			
Lauraceae					
170.	2953	*Cassytha melantha (Large Dodder-laurel)*			
Loganiaceae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
171.	6506	*Logania campanulata (Bell-flowered Logania)*			
172.	14551	*Logania serpyllifolia subsp. serpyllifolia*			
Loranthaceae					
173.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			
Malvaceae					
174.	40920	*Commersonia grandiflora*			
175.	5075	*Thomasia angustifolia (Narrow Leaved Thomasia)*			
176.	5080	*Thomasia foliosa*			
177.	5086	*Thomasia macrocalyx*			
178.	5094	*Thomasia purpurea*			
Menyanthaceae					
179.	36178	*Liparophyllum lasiospermum*			
180.	36181	*Ornduffia parnassifolia*			
Myrtaceae					
181.	5315	*Actinodium cunninghamii (Albany Daisy)*			
182.	35620	*Actinodium sp. Fitzgerald River (H.A. Froebe & R. Classen 810)*			
183.	19789	*Agonis theiformis*			
184.	20127	*Astartea glomerulosa*			
185.	45213	*Astartea pulchella*			
186.	5376	*Beaufortia anisandra*			
187.	5381	*Beaufortia decussata (Gravel Bottlebrush)*			
188.	5394	*Callistemon glaucus*			
189.	5409	*Calothamnus gracilis*			
190.	35816	*Calothamnus quadrifidus subsp. quadrifidus*			
191.	5430	*Calothamnus schaueri*			
192.	5458	*Calytrix flavescens (Summer Starflower)*			
193.	5465	*Calytrix leschenaultii*			
194.	35639	*Chamelaucium sp. Waychinicup (D. Davidson s.n. PERTH 01486527)*		P2	
195.	5533	*Darwinia vestita (Pom-pom Darwinia)*			
196.	16885	*Eucalyptus buprestium x staeri*		P4	
197.	5605	*Eucalyptus cornuta (Yate, Yeid)*			
198.	5616	*Eucalyptus decurva (Slender Mallee)*			
199.	5643	*Eucalyptus falcata (Silver Mallet, Dulyumuk)*			
200.	11458	*Eucalyptus goniantha subsp. goniantha (Jerdacuttup Mallee)*			
201.	5693	*Eucalyptus lehmannii (Bushy Yate)*			
202.	19665	*Eucalyptus lehmannii subsp. lehmannii*			
203.	42063	*Eucalyptus notactites*			
204.	5816	*Homalospermum firmum*			
205.	5818	*Hypocalymma cordifolium*			
206.	5841	*Kunzea recurva*			
207.	5902	*Melaleuca densa*			
208.	5905	*Melaleuca diosmifolia*			
209.	5938	*Melaleuca microphylla*			
210.	5971	*Melaleuca striata*			
211.	5973	*Melaleuca suberosa (Corky Honeymyrtle)*			
212.	15876	*Melaleuca viminea subsp. demissa*			
213.	13280	*Melaleuca viminea subsp. viminea*			
214.	16477	*Pericalymma ellipticum var. ellipticum*			
215.	15501	*Pericalymma spongiocaule*			
216.	6027	*Rinzia schollerifolia*			
217.	20135	*Taxandria linearifolia*			
218.	20134	*Taxandria marginata*			
219.	20133	*Taxandria parviceps*			
220.	6079	*Verticordia fastigiata (Mouse Featherflower)*			
221.	6084	*Verticordia habrantha (Hidden Featherflower)*			
222.	12450	*Verticordia plumosa var. grandiflora*			
223.	12461	*Verticordia sieberi var. lomata*			
Orchidaceae					
224.	18022	*Caladenia fuscolutescens*			
225.	15353	*Caladenia heberleana*			
226.	15372	*Caladenia nana subsp. unita*			
227.	1609	*Caladenia pectinata (King Spider Orchid)*			
228.	1645	*Epiblema grandiflorum (Babe-in-a-cradle)*			
229.	1658	*Microtis atrata (Swamp Mignonette Orchid)*			
230.	1662	*Microtis pulchella (Beautiful Mignonette Orchid)*		P4	
231.	1668	*Prasophyllum brownii*			
232.	1706	*Thelymitra cucullata (Swamp Sun Orchid)*			
233.	1708	*Thelymitra fuscolutea (Chestnut Sun Orchid)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
234.	1716	*Thelymitra tigrina (Tiger Orchid)*			
Phyllanthaceae					
235.	4690	*Poranthera huegelii*			
Pittosporaceae					
236.	25798	*Billardiera fusiformis (Australian Bluebell)*			
237.	3165	*Billardiera variifolia*			
Poaceae					
238.	29839	*Agrostis castellana*	Y		
239.	195	*Amphipogon avenaceus*			
240.	17257	*Austrostipa variabilis*			
241.	548	*Phalaris aquatica (Phalaris)*	Y		
Polygalaceae					
242.	4564	*Comesperma virgatum (Milkwort)*			
Polygonaceae					
243.	2412	*Muehlenbeckia adpressa (Climbing Lignum)*			
244.	2435	*Rumex drummondii*		P4	
Portulacaceae					
245.	20476	*Calandrinia sp. southern granites (G.J. Keighery 11266)*			
Pottiaceae					
246.	32451	*Triquetrella papillata*			
Primulaceae					
247.	6484	*Samolus repens (Creeping Brookweed)*			
Proteaceae					
248.	1769	*Adenanthos apiculatus*			
249.	1773	*Adenanthos cuneatus (Coastal Jugflower)*			
250.	32686	*Banksia anatona*		T	
251.	32684	*Banksia arctotidis*			
252.	32681	*Banksia armata (Prickly Dryandra)*			
253.	32683	*Banksia armata var. ignicida*			
254.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
255.	1803	*Banksia baxteri (Baxter's Banksia)*			
256.	1806	*Banksia brownii (Feather-leaved Banksia)*		T	
257.	32597	*Banksia brunnea*			
258.	1811	*Banksia coccinea (Scarlet Banksia)*			
259.	1814	*Banksia dryandroides (Dryandra-leaved Banksia)*			
260.	32525	*Banksia formosa (Showy Dryandra)*			
261.	11532	*Banksia gardneri var. gardneri*			
262.	1830	*Banksia littoralis (Swamp Banksia, Pungura)*			
263.	32207	*Banksia mucronulata (Swordfish Dryandra)*			
264.	32202	*Banksia nivea (Honeypot Dryandra, Pudjarn)*			
265.	1836	*Banksia nutans (Nodding Banksia)*			
266.	11941	*Banksia nutans var. cernuella*			
267.	32198	*Banksia obovata (Wedge-leaved Dryandra)*			
268.	1837	*Banksia occidentalis (Red Swamp Banksia)*			
269.	1844	*Banksia quercifolia (Oak-leaved Banksia)*			
270.	12111	*Banksia sphaerocarpa var. sphaerocarpa (Fox Banksia)*			
271.	1862	*Conospermum caeruleum (Blue Brother)*			
272.	1872	*Conospermum flexuosum (Tangled Smokebush)*			
273.	1873	*Conospermum floribundum*			
274.	1879	*Conospermum petiolare*			
275.	1883	*Conospermum teretifolium (Spider Smokebush)*			
276.	2005	*Grevillea fasciculata*			
277.	2053	*Grevillea oligantha*			
278.	2137	*Hakea ceratophylla (Horned Leaf Hakea)*			
279.	2150	*Hakea cucullata (Hood Leaved Hakea)*			
280.	12226	*Hakea denticulata*			
281.	2156	*Hakea elliptica (Oval-leaf Hakea)*			
282.	2160	*Hakea ferruginea*			
283.	2162	*Hakea florida*			
284.	2169	*Hakea lasiantha (Woolly Flowered Hakea)*			
285.	12229	*Hakea lasiocarpha*		P3	
286.	2171	*Hakea laurina (Pincushion Hakea, Kodjet)*			
287.	2214	*Hakea trifurcata (Two-leaf Hakea)*			
288.	16640	*Hakea tuberculata*			
289.	2226	*Isopogon cuneatus (Coneflower)*			
290.	16880	*Isopogon formosus subsp. formosus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
291.	2233	*Isopogon longifolius*			
292.	14878	*Lambertia echinata subsp. citrina*			
293.	16871	*Lambertia inermis var. inermis*			
294.	2253	*Lambertia uniflora*			
295.	2287	*Petrophile carduacea*		P2	
296.	2292	*Petrophile divaricata*			
297.	2293	*Petrophile diversifolia*			
298.	14443	*Petrophile ericifolia subsp. ericifolia*			
299.	20605	*Petrophile filifolia subsp. filifolia*			
300.	2302	*Petrophile media*			
301.	2309	*Petrophile serruriae*			
302.	17765	*Petrophile squamata subsp. squamata*			
303.	2318	*Stirlingia tenuifolia*			
304.	2324	*Synaphea petiolaris (Synaphea)*			
305.	2326	*Synaphea polymorpha (Albany Synaphea, Pinda)*			
306.	2328	*Synaphea reticulata*			
307.	2329	*Synaphea spinulosa*			
Racopilaceae					
308.	32480	*Racopilum cuspidigerum var. convolutaceum*			
Ranunculaceae					
309.	2929	*Clematis pubescens (Common Clematis)*			
Restionaceae					
310.	17687	*Chaetanthus tenellus*			
311.	17705	*Chordifex abortivus*		T	
312.	17828	*Chordifex isomorphus*			
313.	17689	*Chordifex laxus*			
314.	1067	*Empodisma gracillimum*			
315.	17831	*Harperia confertospicata*			
316.	1068	*Harperia lateriflora*			
317.	1070	*Hypolaena exsulca*			
318.	1075	*Lepidobolus preissianus*			
319.	1084	*Lepyrodia drummondiana*			
320.	1087	*Lepyrodia hermaphrodita*			
321.	1090	*Lepyrodia muirii*			
322.	17678	*Meeboldina kraussii*			
323.	17694	*Meeboldina scariosa*			
324.	17843	*Meeboldina tephrina*			
325.	17684	*Tremulina tremula*			
Rhamnaceae					
326.	4828	*Spyridium globulosum (Basket Bush)*			
327.	19704	*Stenanthemum sublineare*		P2	
Rutaceae					
328.	4404	*Boronia albiflora*			
329.	4413	*Boronia crenulata (Aniseed Boronia)*			
330.	11503	*Boronia crenulata var. crenulata*			
331.	4416	*Boronia denticulata*			
332.	4422	*Boronia gracilipes (Karri Boronia)*			
333.	4440	*Boronia scabra (Rough Boronia)*			
334.	4441	*Boronia spathulata (Boronia)*			
335.	4446	*Boronia tetrandra (Yellow Boronia)*			
336.	4448	*Chorilaena quercifolia (Chorilaena)*			
337.	18547	*Rhadinothamnus anceps*			
Santalaceae					
338.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			
339.	2345	*Leptomeria ericoides*			
340.	2350	*Leptomeria pauciflora (Sparse-flowered Currant Bush)*			
341.	2355	*Leptomeria squarrulosa*			
Sapindaceae					
342.	4757	*Dodonaea ceratocarpa*			
Sematophyllaceae					
343.	32433	*Sematophyllum homomallum*			
Solanaceae					
344.	11505	*Anthocercis viscosa subsp. viscosa*			
Stylidiaceae					
345.	7684	*Stylidium amoenum (Lovely Triggerplant)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
346.	7687	*Stylidium assimile (Bronze-leaved Triggerplant)*			
347.	7696	*Stylidium calcaratum (Book Triggerplant)*			
348.	7699	*Stylidium carnosum (Fleshy-leaved Triggerplant)*			
349.	12057	*Stylidium corymbosum var. corymbosum*			
350.	17893	*Stylidium daphne*		P2	
351.	7718	*Stylidium diversifolium (Touch-me-not)*			
352.	20691	*Stylidium gloeophyllum*		P4	
353.	7735	*Stylidium hirsutum (Hairy Triggerplant)*			
354.	7745	*Stylidium junceum (Reed Triggerplant)*			
355.	7757	*Stylidium luteum (Yellow Triggerplant)*			
356.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
357.	7777	*Stylidium preissii (Lizard Triggerplant)*			
358.	7785	*Stylidium repens (Matted Triggerplant)*			
359.	7796	*Stylidium scandens (Climbing Triggerplant)*			
360.	7800	*Stylidium spinulosum (Topsy-turvy Triggerplant)*			
Thymelaeaceae					
361.	5231	*Pimelea angustifolia (Narrow-leaved Pimelea)*			
362.	5251	*Pimelea imbricata*			
363.	11639	*Pimelea longiflora subsp. longiflora*			
364.	18117	*Pimelea rosea subsp. rosea*			
365.	5269	*Pimelea sylvestris*			
Typhaceae					
366.	99	*Typha orientalis (Bulrush, Cumbungi)*	Y		
Xyridaceae					
367.	1150	*Xyris lanata*			
Zamiaceae					
368.	85	*Macrozamia riedlei (Zamia, Djiridji)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report_Fauna

Created By Guest user on 07/10/2015

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Line'
Vertices	34° 48' 32" S,118° 15' 21" E 34° 44' 31" S,118° 18' 43" E 34° 40' 24" S,118° 19' 51" E 34° 38' 40" S,118° 20' 47" E
Group By	Species Group

Species Group	Species	Records
Amphibian	6	23
Bird	85	838
Fish	1	1
Invertebrate	1	1
Mammal	7	9
Reptile	11	25
TOTAL	**111**	**897**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amphibian					
1.	25399	*Crinia glauerti (Clicking Frog)*			
2.	25402	*Crinia subinsignifera (South Coast Froglet)*			
3.	25404	*Geocrinia leai (Ticking Frog)*			
4.	25383	*Litoria cyclorhyncha (Spotted-thighed Frog)*			
5.	25388	*Litoria moorei (Motorbike Frog)*			
6.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
Bird					
7.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
8.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
9.	24262	*Acanthiza inornata (Western Thornbill)*			
10.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
11.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
12.	24312	*Anas gracilis (Grey Teal)*			
13.	24315	*Anas rhynchotis (Australasian Shoveler)*			
14.	24316	*Anas superciliosa (Pacific Black Duck)*			
15.	24561	*Anthochaera carunculata (Red Wattlebird)*			
16.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
17.	24285	*Aquila audax (Wedge-tailed Eagle)*			
18.	24341	*Ardea pacifica (White-necked Heron)*			
19.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
20.	24358	*Atrichornis clamosus (Noisy Scrub-bird)*		T	
21.	24318	*Aythya australis (Hardhead)*			
22.	24319	*Biziura lobata (Musk Duck)*			
23.	24345	*Botaurus poiciloptilus (Australasian Bittern)*		T	
24.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
25.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
26.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)*		T	
27.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo (long-billed black-cockatoo), Baudin's Cockatoo)*		T	
28.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)*		T	
29.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
30.	24833	*Cincloramphus cruralis (Brown Songlark)*			
31.	24288	*Circus approximans (Swamp Harrier)*			
32.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
33.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
34.	24416	*Corvus bennetti (Little Crow)*			
35.	25592	*Corvus coronoides (Australian Raven)*			
36.	25701	*Coturnix ypsilophora (Brown Quail)*			
37.	25595	*Cracticus tibicen (Australian Magpie)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
38.	25596	*Cracticus torquatus (Grey Butcherbird)*			
39.	24322	*Cygnus atratus (Black Swan)*			
40.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
41.	24440	*Dasyornis longirostris (Western Bristlebird)*		T	
42.	24567	*Epthianura albifrons (White-fronted Chat)*			
43.	24368	*Eurostopodus argus (Spotted Nightjar)*			
44.	25621	*Falco berigora (Brown Falcon)*			
45.	25622	*Falco cenchroides (Australian Kestrel)*			
46.	25623	*Falco longipennis (Australian Hobby)*			
47.	25727	*Fulica atra (Eurasian Coot)*			
48.	25530	*Gerygone fusca (Western Gerygone)*			
49.	24735	*Glossopsitta porphyrocephala (Purple-crowned Lorikeet)*			
50.	24443	*Grallina cyanoleuca (Magpie-lark)*			
51.	24295	*Haliastur sphenurus (Whistling Kite)*			
52.	24491	*Hirundo neoxena (Welcome Swallow)*			
53.	25661	*Lichmera indistincta (Brown Honeyeater)*			
54.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
55.	25650	*Malurus elegans (Red-winged Fairy-wren)*			
56.	25654	*Malurus splendens (Splendid Fairy-wren)*			
57.	24583	*Manorina flavigula (Yellow-throated Miner)*			
58.	25758	*Megalurus gramineus (Little Grassbird)*			
59.	25663	*Melithreptus brevirostris (Brown-headed Honeyeater)*			
60.	25610	*Myiagra inquieta (Restless Flycatcher)*			
61.	24738	*Neophema elegans (Elegant Parrot)*			
62.	25748	*Ninox novaeseelandiae (Boobook Owl)*			
63.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
64.	25679	*Pachycephala pectoralis (Golden Whistler)*			
65.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
66.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
67.	25682	*Pardalotus striatus (Striated Pardalote)*			
68.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
69.	24409	*Phaps chalcoptera (Common Bronzewing)*			
70.	25587	*Phaps elegans (Brush Bronzewing)*			
71.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
72.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
73.	25720	*Platycercus icterotis (Western Rosella)*			
74.	25703	*Podargus strigoides (Tawny Frogmouth)*			
75.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
76.	25722	*Polytelis anthopeplus (Regent Parrot)*			
77.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
78.	25579	*Psophodes nigrogularis (Western Whipbird)*			
79.	24388	*Psophodes nigrogularis subsp. nigrogularis (Western Whipbird (western heath))*		T	
80.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
81.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
82.	24645	*Stagonopleura oculata (Red-eared Firetail)*			
83.	25655	*Stipiturus malachurus (Southern Emu-wren)*			
84.	24554	*Stipiturus malachurus subsp. westernensis (Southern Emu-wren)*			
85.	25597	*Strepera versicolor (Grey Currawong)*			
86.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
87.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
88.	24844	*Threskiornis molucca (Australian White Ibis)*			
89.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
90.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
91.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			
Fish					
92.		*Elops hawaiensis*			
Invertebrate					
93.		*Urodacus novaehollandiae*			
Mammal					
94.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P5	
95.	24133	*Macropus irma (Western Brush Wallaby)*		P4	
96.	24223	*Mus musculus (House Mouse)*	Y		
97.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum)*		T	
98.	24243	*Rattus fuscipes (Western Bush Rat)*			
99.	24145	*Setonix brachyurus (Quokka)*		T	
100.	24158	*Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)*			
Reptile					
101.	24994	*Aprasia striolata (Lined Worm-lizard)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
102.	24980	*Christinus marmoratus (Marbled Gecko)*			
103.	25031	*Ctenotus catenifer*			
104.	25049	*Ctenotus labillardieri*			
105.	24995	*Delma australis*			
106.	25096	*Egernia kingii (King's Skink)*			
107.	25117	*Hemiergis peronii subsp. peronii*			
108.	25154	*Lerista microtis subsp. microtis*			
109.	42413	*Lissolepis luctuosa (Western Swamp Skink)*			
110.	25252	*Notechis scutatus (Tiger Snake)*			
111.	25008	*Pygopus lepidopodus (Common Scaly Foot)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix D – Flora data

Flora species list

Flora likelihood of occurrence guidelines

Flora likelihood of occurrence assessment

Quadrat data

Flora species list

Family	Taxon	Status	Range
Anarthriaceae	*Anarthria gracilis*		
Anarthriaceae	*Anarthria laevis*		
Anarthriaceae	*Anarthria prolifera*		
Anarthriaceae	*Anarthria scabra*		
Apiaceae	*Actinotus glomeratus*		
Apiaceae	*Centella asiatica*		
Apiaceae	*Platysace compressa*		
Apiaceae	*Platysace deflexa*		
Apiaceae	*Platysace filiformis*		
Apiaceae	*Platysace pendula*		E extent
Apiaceae	*Xanthosia eichleri*	P4	
Apiaceae	*Xanthosia huegelii*		
Apiaceae	*Xanthosia rotundifolia*		
Apiaceae	*Xanthosia singuliflora*		
Araliaceae	*Trachymene pilosa*		
Asparagaceae	*Chamaescilla corymbosa*		
Asparagaceae	*Chamaescilla spiralis*		
Asparagaceae	*Chamaexeros serra*		
Asparagaceae	*Laxmannia brachyphylla*		
Asparagaceae	*Laxmannia grandiflora subsp. stirlingensis*	P3	
Asparagaceae	*Laxmannia sessiliflora*		
Asparagaceae	*Lomandra sp. (nf)*		
Asparagaceae	*Lomandra ?preissii*		
Asparagaceae	*Lomandra caespitosa*		
Asparagaceae	*Lomandra hastilis*		
Asparagaceae	*Lomandra nigricans*		
Asparagaceae	*Lomandra nutans*		
Asparagaceae	*Lomandra sericea*		
Asparagaceae	*Lomandra sonderi*		
Asparagaceae	*Pterochaeta paniculata*		
Asparagaceae	*Thysanotus ? thyrsoideus*		
Asparagaceae	*Thysanotus manglesianus*		
Asparagaceae	*Thysanotus multiflorus*		
Asparagaceae	*Thysanotus pseudojunceus*		
Asparagaceae	*Thysanotus sparteus*		
Asteraceae	*Arctotheca calendula*	*	
Asteraceae	*Blennospora drummondii*		
Asteraceae	*Cirsium vulgare*	*	
Asteraceae	*Conyza sp.*	*	
Asteraceae	*Gnephosis drummondii*		
Asteraceae	*Helichrysum luteoalbum*		
Asteraceae	*Hyalosperma demissum*		

Family	Taxon	Status	Range
Asteraceae	*Hypochaeris radicata*	*	
Asteraceae	*Senecio quadridentatus*		
Asteraceae	*Siloxerus filifolius*		
Asteraceae	*Sonchus asper*	*	
Asteraceae	*Sonchus oleraceus*	*	
Boraginaceae	*Echium plantagineum*	*	
Brassicaceae	*Raphanus raphanistrum*	*	
Campanulaceae	*Monopsis debilis*	*	
Campanulaceae	*Wahlenbergia capensis*	*	
Caryophyllaceae	*Cerastium glomeratum*	*	
Caryophyllaceae	*Polycarpon tetraphyllum*	*	
Caryophyllaceae	*Polypogon monspeliensis*	*	
Caryophyllaceae	*Silene gallica*	*	
Casuarinaceae	*Allocasuarina fraseriana*		E extent within 10 km of Project Area
Casuarinaceae	*Allocasuarina humilis*		
Casuarinaceae	*Allocasuarina microstachya*		
Casuarinaceae	*Allocasuarina thuyoides*		
Casuarinaceae	*Allocasuarina trichodon*		
Celastraceae	*Stackhousia pubescens*		
Centrolepidaceae	*Aphelia cyperoides*		
Centrolepidaceae	*Aphelia sp. Albany (BG Briggs 596)*		
Centrolepidaceae	*Centrolepis aristata*		
Centrolepidaceae	*Centrolepis caespitosa*	P4	E extent within 10 km of Project Area
Centrolepidaceae	*Centrolepis drummondiana*		
Centrolepidaceae	*Centrolepis polygyna*		
Centrolepidaceae	*Centrolepis strigosa subsp. strigosa*		
Colchicaceae	*Burchardia congesta*		E extent
Colchicaceae	*Burchardia multiflora*		E extent
Crassulaceae	*Crassula colorata*		
Crassulaceae	*Crassula decumbens*		
Crassulaceae	*Crassula peduncularis*		
Cucurbitaceae	*Cucumis myriocarpus*	*	
Cyperaceae	*Baumea acuta*		
Cyperaceae	*Baumea articulata*		
Cyperaceae	*Baumea juncea*		
Cyperaceae	*Caustis dioica*		
Cyperaceae	*Chorizandra enodis*		
Cyperaceae	*Cyathochaeta avenacea*		
Cyperaceae	*Cyathochaeta equitans*		
Cyperaceae	*Cyperus tenellus*	*	
Cyperaceae	*Ficinia nodosa*		

Family	Taxon	Status	Range
Cyperaceae	*Gahnia ancistrophylla*		
Cyperaceae	*Gahnia aristata*		
Cyperaceae	*Isolepis cyperoides*	*	
Cyperaceae	*Isolepis hystrix*	*	
Cyperaceae	*Lepidosperma aff squamatum*		
Cyperaceae	*Lepidosperma carphoides*		
Cyperaceae	*Lepidosperma drummondii*		
Cyperaceae	*Lepidosperma pubisquameum*		
Cyperaceae	*Lepidosperma sp. 1*		
Cyperaceae	*Lepidosperma sp. 2*		
Cyperaceae	*Lepidosperma squamatum*		
Cyperaceae	*Lepidosperma striatum*		
Cyperaceae	*Lepidosperma tenue*		
Cyperaceae	*Schoenus acuminatus*		E extent
Cyperaceae	*Schoenus brevisetis*		
Cyperaceae	*Schoenus caespititius*		
Cyperaceae	*Schoenus curvifolius*		
Cyperaceae	*Schoenus efoliatus*		
Cyperaceae	*Schoenus laevigatus*		
Cyperaceae	*Schoenus nanus*		
Cyperaceae	*Schoenus obtusifolius*		
Cyperaceae	*Schoenus plumosus*		E extent of Albany populations. A record near Esperance
Cyperaceae	*Schoenus sp. South Coast (R. davis 10239)*		
Cyperaceae	*Schoenus subbarbatus*		
Cyperaceae	*Schoenus subfascicularis*		
Cyperaceae	*Schoenus subflavus subsp long leaves (KL Wilson 2865)*		
Cyperaceae	*Schoenus sublateralis*		E extent
Cyperaceae	*Tetraria octandra*		
Cyperaceae	*Tetraria sp. Blackwood River (A.R. Annels 3043)*	P3	E extent
Cyperaceae	*Tetraria sp. Jarrah Forest (R. Davis 7391)*		
Cyperaceae	*Tricostularia compressa*		
Cyperaceae	*Tricostularia exsul*		
Cyperaceae	*Tricostularia sp. 1*	OS	
Cyperaceae	*Tricostularia sp. south coast (R.T. Wills 1423)*		SE extent
Cyperaceae	*Tricostularia sp. Wellstead (R. Davis 302)*		
Dasypogonaceae	*Calectasia grandiflora*		
Dasypogonaceae	*Dasypogon bromeliifolius*		

Family	Taxon	Status	Range
Dasypogonaceae	*Kingia australis*		
Dilleniaceae	*Hibbertia acerosa*		
Dilleniaceae	*Hibbertia amplexicaulis*		
Dilleniaceae	*Hibbertia cunninghamii*		
Dilleniaceae	*Hibbertia gracilipes*		
Dilleniaceae	*Hibbertia lineata*		
Dilleniaceae	*Hibbertia recurvifolia*		
Droseraceae	*Drosera dichrosepala*		
Droseraceae	*Drosera fimbriata*	P4	
Droseraceae	*Drosera glanduligera*		
Droseraceae	*Drosera huegelii*		
Droseraceae	*Drosera menziesii*		
Droseraceae	*Drosera neesii subsp. neesii*		
Droseraceae	*Drosera pallida*		
Droseraceae	*Drosera platypoda*		
Droseraceae	*Drosera platystigma*		
Droseraceae	*Drosera pulchella*		
Droseraceae	*Drosera scorpioides*		
Droseraceae	*Drosera sp. (climbing) (nf)*		
Droseraceae	*Drosera subhirtella*		
Droseraceae	*Drosera sulphurea*		E extent (12 km west of Cheynes intersection)
Elaeocarpaceae	*Tetratheca pubescens*		
Ericaceae	*Acrotriche ramiflora*		
Ericaceae	*Andersonia aff. sprengelioides*		
Ericaceae	*Andersonia caerulea*		
Ericaceae	*Andersonia micrantha*		
Ericaceae	*Andersonia parvifolia*		
Ericaceae	*Andersonia simplex*		
Ericaceae	*Astroloma baxteri*		
Ericaceae	*Astroloma pallidum*		
Ericaceae	*Astroloma prostratum*		
Ericaceae	*Astroloma tectum*		
Ericaceae	*Leucopogon ? propinquus*		
Ericaceae	*Leucopogon corynocarpus*		
Ericaceae	*Leucopogon elegans subsp. elegans*		E extent
Ericaceae	*Leucopogon gibbosus*		
Ericaceae	*Leucopogon glabellus*		E extent
Ericaceae	*Leucopogon obovatus subsp. revolutus*		
Ericaceae	*Leucopogon oxycedrus*		
Ericaceae	*Leucopogon penicillatus*		
Ericaceae	*Leucopogon rubricaulis*		

Family	Taxon	Status	Range
Ericaceae	*Leucopogon sp. 1*	OS	
Ericaceae	*Leucopogon sp. Coujinup (M.A. Burgman 1085)*		
Ericaceae	*Leucopogon sp. Manypeaks (A.S. George 6488)*	P1	
Ericaceae	*Leucopogon tamariscinus*		
Ericaceae	*Leucopogon verticillatus*		E extent
Ericaceae	*Leucopogon woodsii*		
Ericaceae	*Lysinema ciliatum*		
Ericaceae	*Lysinema conspicuum*		E extent
Ericaceae	*Lysinema fimbriatum*		E extent
Ericaceae	*Lysinema pentapetalum*		
Ericaceae	*Needhamiella pumilio*		
Ericaceae	*Sphenotoma capitata*		
Ericaceae	*Sphenotoma dracophylloides*		
Ericaceae	*Sphenotoma gracilis*		
Euphorbiaceae	*Amperea volubilis*		RE other records approx. 40 km west
Euphorbiaceae	*Stachystemon polyandrus*		W extent
Fabaceae	*Acacia aemula subsp. aemula*		
Fabaceae	*Acacia aemula subsp. muricata*		
Fabaceae	*Acacia applanata*		
Fabaceae	*Acacia biflora*		
Fabaceae	*Acacia browniana var. browniana*		
Fabaceae	*Acacia chrysocephala*		
Fabaceae	*Acacia crispula*		
Fabaceae	*Acacia cyclops*		
Fabaceae	*Acacia drummondii subsp. elegans*		
Fabaceae	*Acacia leioderma*		
Fabaceae	*Acacia longifolia*	*	
Fabaceae	*Acacia luteola*		
Fabaceae	*Acacia myrtifolia*		
Fabaceae	*Acacia pycnocephala*		
Fabaceae	*Acacia subcaerulea*		
Fabaceae	*Acacia willdenowiana*		
Fabaceae	*Bossiaea linophylla*		
Fabaceae	*Bossiaea praetermissa*		
Fabaceae	*Callistachys lanceolata*		
Fabaceae	*Chorizema aciculare*		
Fabaceae	*Chorizema glycinifolium*		
Fabaceae	*Chorizema reticulatum*		
Fabaceae	*Chorizema rhombeum*		
Fabaceae	*Daviesia alternifolia*		
Fabaceae	*Daviesia emarginata*		

Family	Taxon	Status	Range
Fabaceae	*Daviesia flexuosa*		
Fabaceae	*Daviesia gracilis*		
Fabaceae	*Daviesia incrassata*		
Fabaceae	*Daviesia preissii*		
Fabaceae	*Daviesia trigonophylla*		
Fabaceae	*Eutaxia parvifolia*		
Fabaceae	*Gastrolobium bracteolosum*		
Fabaceae	*Gastrolobium retusum*		
Fabaceae	*Gastrolobium velutinum*		
Fabaceae	*Gompholobium burtonioides*		
Fabaceae	*Gompholobium confertum*		
Fabaceae	*Gompholobium knightianum*		
Fabaceae	*Gompholobium marginatum*		
Fabaceae	*Gompholobium ovatum*		
Fabaceae	*Gompholobium polymorphum*		
Fabaceae	*Gompholobium scabrum*		
Fabaceae	*Gompholobium tomentosum*		
Fabaceae	*Gompholobium venustum*		
Fabaceae	*Gompholobium villosum*		
Fabaceae	*Hardenbergia comptoniana*		E extent
Fabaceae	*Hovea chorizemifolia*		
Fabaceae	*Hovea trisperma*		
Fabaceae	*Jacksonia capitata*		
Fabaceae	*Jacksonia condensata*		
Fabaceae	*Jacksonia spinosa*		
Fabaceae	*Kennedia coccinea*		
Fabaceae	*Latrobea genistoides*		
Fabaceae	*Latrobea recurva*	P3	
Fabaceae	*Lotus sp.*	*	
Fabaceae	*Ornithopus sp.*	*	
Fabaceae	*Phyllota barbata*		
Fabaceae	*Pultenaea aspalathoides*		SE extent
Fabaceae	*Pultenaea verruculosa*		
Fabaceae	*Sphaerolobium alatum*		
Fabaceae	*Sphaerolobium drummondii*		
Fabaceae	*Sphaerolobium grandiflorum*		
Fabaceae	*Sphaerolobium macranthum*		
Fabaceae	*Sphaerolobium medium*		
Fabaceae	*Sphaerolobium pubescens*		
Fabaceae	*Sphaerolobium vimineum*		
Fabaceae	*Templetonia retusa*		
Fabaceae	*Trifolium repens*	*	
Fabaceae	*Trifolium subterranean*	*	
Gentianaceae	*Cicendia filiformis*	*	

Family	Taxon	Status	Range
Geraniaceae	*Erodium botrys*	*	
Geraniaceae	*Pelargonium ×domesticum*	*	
Goodeniaceae	*Dampiera alata*		
Goodeniaceae	*Dampiera juncea*		
Goodeniaceae	*Dampiera leptoclada*		
Goodeniaceae	*Dampiera linearis*		
Goodeniaceae	*Goodenia coerulea*		
Goodeniaceae	*Goodenia filiformis*		
Goodeniaceae	*Goodenia incana*		
Goodeniaceae	*Goodenia pterigosperma*		
Goodeniaceae	*Lechenaultia formosa*		
Goodeniaceae	*Lechenaultia tubiflora*		
Goodeniaceae	*Scaevola striata*		
Goodeniaceae	*Velleia trinervis*		
Haemodoraceae	*Anigozanthos flavidus*		E extent
Haemodoraceae	*Anigozanthos rufus*		
Haemodoraceae	*Conostylis pusilla*		
Haemodoraceae	*Conostylis serrulata*		
Haemodoraceae	*Conostylis setigera*		
Haemodoraceae	*Conostylis vaginata*		
Haemodoraceae	*Haemodorum discolor*		
Haemodoraceae	*Haemodorum laxum*		
Haemodoraceae	*Haemodorum simplex*		
Haemodoraceae	*Haemodorum sparsiflorum*		
Haemodoraceae	*Haemodorum spicatum*		
Haemodoraceae	*Tribonanthes australis*		
Haemodoraceae	*Tribonanthes violacea*		
Haloragaceae	*Glischrocaryon aureum*		
Haloragaceae	*Gonocarpus paniculatus*		
Haloragaceae	*Gonocarpus trichostachyus*	P3	
Hemerocallidaceae	*Agrostocrinum hirsutum*		
Hemerocallidaceae	*Dianella revoluta*		
Hemerocallidaceae	*Johnsonia acaulis*		
Hemerocallidaceae	*Johnsonia teretifolia*		
Hemerocallidaceae	*Stypandra glauca*		
Hemerocallidaceae	*Tricoryne elatior*		
Iridaceae	*Gladiolus undulatus*	*	
Iridaceae	*Ixia maculata*	*	
Iridaceae	*Patersonia lanata forma lanata*		
Iridaceae	*Patersonia limbata*		
Iridaceae	*Patersonia maxwellii*		
Iridaceae	*Patersonia occidentalis*		
Iridaceae	*Patersonia pygmaea*		
Iridaceae	*Patersonia umbrosa var. umbrosa*		

Family	Taxon	Status	Range
Iridaceae	*Romulea rosea*	*	
Juncaceae	*Juncus articulatus*	*	
Juncaceae	*Juncus bufonius*	*	
Juncaceae	*Juncus capitatus*	*	
Juncaceae	*Juncus pallidus*		
Lamiaceae	*Hemigenia ? humilis*		
Lamiaceae	*Microcorys lenticularis*		
Lauraceae	*Cassytha glabella*		
Lauraceae	*Cassytha melantha*		
Lauraceae	*Cassytha racemosa*		
Lindsaeaceae	*Lindsaea linearis*		
Loganiaceae	*Logania campanulata*		
Loganiaceae	*Logania micrantha*		
Loganiaceae	*Logania serpyllifolia subsp. serpyllifolia*		
Loganiaceae	*Phyllangium paradoxum*		
Loranthaceae	*Nuytsia floribunda*		
Lycopodiaceae	*Phylloglossum drummondii*		
Malvaceae	*Thomasia purpurea*		
Menyanthaceae	*Liparophyllum latifolium*		E extent
Menyanthaceae	*Ornduffia parnassifolia*		
Myrtaceae	*Actinodium sp. Fitzgerald River (H.A. Froebe & R. Classen 810)*		
Myrtaceae	*Agonis flexuosa var. flexuosa*		
Myrtaceae	*Agonis theiformis*		
Myrtaceae	*Astartea aspera*		
Myrtaceae	*Astartea glomerulosa*		
Myrtaceae	*Astartea sp. southern ranges (T.E.H. Aplin 2108)*		SE extent
Myrtaceae	*Beaufortia anisandra*		
Myrtaceae	*Beaufortia empetrifolia*		
Myrtaceae	*Callistemon phoeniceus*		
Myrtaceae	*Calothamnus gibbosus*		
Myrtaceae	*Calothamnus gracilis*		
Myrtaceae	*Calothamnus quadrifidus*		
Myrtaceae	*Calothamnus sanguineus*		
Myrtaceae	*Calothamnus schaueri*		E extent
Myrtaceae	*Calytrix ? asperula (nf)*		
Myrtaceae	*Calytrix ? flavescens*		
Myrtaceae	*Corymbia calophylla*		SE extent
Myrtaceae	*Darwinia vestita*		
Myrtaceae	*Eucalyptus adesmophloia*		
Myrtaceae	*Eucalyptus angulosa*		
Myrtaceae	*Eucalyptus ecostata*		
Myrtaceae	*Eucalyptus falcata*		
Myrtaceae	*Eucalyptus goniantha*		

Family	Taxon	Status	Range
Myrtaceae	*Eucalyptus lehmannii*		
Myrtaceae	*Eucalyptus marginata*		
Myrtaceae	*Eucalyptus occidentalis*		
Myrtaceae	*Eucalyptus preissiana subsp. preissiana*		
Myrtaceae	*Eucalyptus staeri*		
Myrtaceae	*Eucalyptus uncinata*		
Myrtaceae	*Hypocalymma strictum*		
Myrtaceae	*Kunzea affinis*		W extent
Myrtaceae	*Kunzea micrantha*		
Myrtaceae	*Kunzea micromera*		
Myrtaceae	*Kunzea recurva*		
Myrtaceae	*Leptospermum laevigatum*	*	
Myrtaceae	*Melaleuca bracteosa*		
Myrtaceae	*Melaleuca acuminata*		
Myrtaceae	*Melaleuca armillaris*	*	
Myrtaceae	*Melaleuca cuticularis*		
Myrtaceae	*Melaleuca densa*		
Myrtaceae	*Melaleuca preissiana*		
Myrtaceae	*Melaleuca rhaphiophylla*		
Myrtaceae	*Melaleuca spathulata*		
Myrtaceae	*Melaleuca striata*		
Myrtaceae	*Melaleuca suberosa*		
Myrtaceae	*Melaleuca subtrigona*		
Myrtaceae	*Melaleuca thymoides*		
Myrtaceae	*Melaleuca viminea*		
Myrtaceae	*Melaleuca violacea*		
Myrtaceae	*Pericalymma spongiocaule*		
Myrtaceae	*Rinzia schollerifolia*		
Myrtaceae	*Taxandria linearifolia*		
Myrtaceae	*Taxandria parviceps*		
Myrtaceae	*Taxandria spathulata*		
Myrtaceae	*Verticordia ? harveyi (nf)*	P4	
Myrtaceae	*Verticordia habrantha*		
Myrtaceae	*Verticordia plumosa var. grandiflora*		
Onagraceae	*Oenothera stricta*	*	
Orchidaceae	*Caladenia flava subsp. flava*		
Orchidaceae	*Caladenia sp. (nf)*		
Orchidaceae	*Disa bracteata*	*	
Orchidaceae	*Drakaea sp. (nf)*		
Orchidaceae	*Elythranthera brunonis*		
Orchidaceae	*Elythranthera emarginata*		
Orchidaceae	*Lyperanthus serratus*		
Orchidaceae	*Microtis media*		

Family	Taxon	Status	Range
Orchidaceae	*Prasophyllum fimbria*		
Orchidaceae	*Pterostylis recurva*		
Orchidaceae	*Pyrorchis nigricans*		
Orchidaceae	*Thelymitra crinita*		
Orchidaceae	*Thelymitra flexuosa*		
Orchidaceae	*Thelymitra graminea*		
Orchidaceae	*Thelymitra macrophylla*		
Orchidaceae	*Thelymitra sp (nf)*		
Papaveraceae	*Fumaria muralis*	*	
Philydraceae	*Philydrella pygmaea*		
Phyllanthaceae	*Phyllanthus calycinus*		
Phyllanthaceae	*Poranthera huegelii*		
Phyllanthaceae	*Poranthera microphylla*		
Phytolaccaceae	*Phytolacca octandra*	*	
Pinaceae	*Pinus radiata*	*	
Pittosporaceae	*Billardiera fusiformis*		
Pittosporaceae	*Billardiera variifolia*		
Pittosporaceae	*Billardiera venusta*		
Plantaginaceae	*Gratiola pubescens*		
Poaceae	*Aira sp.*	*	
Poaceae	*Amphipogon amphipogonoides*		
Poaceae	*Amphipogon debilis*		
Poaceae	*Amphipogon sp. (nf)*		
Poaceae	*Amphipogon turbinatus*		
Poaceae	*Anthoxanthum odoratum*	*	
Poaceae	*Austrostipa hemipogon*		
Poaceae	*Avellinia michelii*	*	
Poaceae	*Avena barbata*	*	
Poaceae	*Briza maxima*	*	
Poaceae	*Briza minor*	*	
Poaceae	*Bromus diandrus*	*	
Poaceae	*Bromus hordeaceus*	*	
Poaceae	*Cyperochloa hirsuta*		
Poaceae	*Ehrharta calycina*	*	
Poaceae	*Ehrharta erecta*	*	
Poaceae	*Ehrharta longiflora*	*	
Poaceae	*Eragrostis curvula*	*	
Poaceae	*Holcus lanatus*	*	
Poaceae	*Lagurus ovatus*	*	
Poaceae	*Lolium perenne*	*	
Poaceae	*Neurachne alopecuroidea*		
Poaceae	*Rytidosperma caespitosum*		
Poaceae	*Rytidosperma setaceum*		
Poaceae	*Sporobolus virginicus*		

Family	Taxon	Status	Range
Poaceae	*Vulpia sp.*	*	
Polygalaceae	*Comesperma ciliatum*		
Polygalaceae	*Comesperma virgatum*		
Polygalaceae	*Comesperma volubile*		
Primulaceae	*Lysimachia arvensis*	*	
Primulaceae	*Samolus junceus*		
Primulaceae	*Samolus repens*		
Proteaceae	*Adenanthos apiculatus*		
Proteaceae	*Adenanthos cuneatus*		
Proteaceae	*Adenanthos obovatus*		
Proteaceae	*Banksia arctotidis*		
Proteaceae	*Banksia armata*		
Proteaceae	*Banksia attenuata*		
Proteaceae	*Banksia baxteri*		
Proteaceae	*Banksia biterax*		
Proteaceae	*Banksia brunnea*		
Proteaceae	*Banksia coccinea*		
Proteaceae	*Banksia dryandroides*		
Proteaceae	*Banksia falcata*		
Proteaceae	*Banksia formosa*		
Proteaceae	*Banksia gardneri var. gardneri*		
Proteaceae	*Banksia grandis*		
Proteaceae	*Banksia littoralis*		
Proteaceae	*Banksia mucronulata*		
Proteaceae	*Banksia nivea*		
Proteaceae	*Banksia nutans*		
Proteaceae	*Banksia obovata*		
Proteaceae	*Banksia pellaeifolia*		
Proteaceae	*Banksia repens*		
Proteaceae	*Banksia sessilis*		
Proteaceae	*Banksia sphaerocarpa var. sphaerocarpa*		
Proteaceae	*Banksia tenuis var. tenuis*		
Proteaceae	*Conospermum caeruleum*		
Proteaceae	*Conospermum flexuosum*		
Proteaceae	*Conospermum teretifolium*		
Proteaceae	*Franklandia fucifolia*		
Proteaceae	*Grevillea fasciculata*		
Proteaceae	*Grevillea pulchella subsp. pulchella*		
Proteaceae	*Hakea baxteri*		
Proteaceae	*Hakea ceratophylla*		
Proteaceae	*Hakea corymbosa*		
Proteaceae	*Hakea cucullata*		
Proteaceae	*Hakea ferruginea*		

Family	Taxon	Status	Range
Proteaceae	*Hakea florida*		
Proteaceae	*Hakea lasiantha*		
Proteaceae	*Hakea laurina*		
Proteaceae	*Hakea marginata*		
Proteaceae	*Hakea prostrata*		
Proteaceae	*Hakea ruscifolia*		
Proteaceae	*Hakea sulcata*		
Proteaceae	*Hakea trifurcata*		
Proteaceae	*Hakea tuberculata*		
Proteaceae	*Isopogon heterophyllus*		
Proteaceae	*Isopogon attenuatus*		
Proteaceae	*Isopogon cuneatus*		
Proteaceae	*Isopogon formosus*		
Proteaceae	*Isopogon longifolius*		
Proteaceae	*Isopogon teretifolius subsp. teretifolius*		
Proteaceae	*Lambertia inermis*		
Proteaceae	*Lambertia uniflora*		
Proteaceae	*Persoonia striata*		
Proteaceae	*Persoonia striata*		
Proteaceae	*Petrophile acicularis*		E
Proteaceae	*Petrophile divaricata*		
Proteaceae	*Petrophile diversifolia*		
Proteaceae	*Petrophile ericifolia subsp. ericifolia*		
Proteaceae	*Petrophile filifolia subsp. filifolia*		SE extent
Proteaceae	*Petrophile longifolia*		
Proteaceae	*Petrophile media*		
Proteaceae	*Petrophile phylicoides*		
Proteaceae	*Petrophile rigida*		
Proteaceae	*Petrophile seminuda*		
Proteaceae	*Petrophile squamata*		
Proteaceae	*Petrophile teretifolia*		
Proteaceae	*Stirlingia latifolia*		
Proteaceae	*Stirlingia tenuifolia*		
Proteaceae	*Synaphea favosa*		
Proteaceae	*Synaphea incurva*	P1	E exent
Proteaceae	*Synaphea petiolaris subsp. petiolaris*		
Proteaceae	*Synaphea polymorpha*		
Proteaceae	*Synaphea preissii*	P3	E extent
Proteaceae	*Synaphea reticulata*		
Ranunculaceae	*Clematis pubescens*		
Restionaceae	*Chaetanthus tenellus*		
Restionaceae	*Chordifex isomorphus*		
Restionaceae	*Chordifex laxus*		
Restionaceae	*Chordifex sphacelatus*		

Family	Taxon	Status	Range
Restionaceae	*Desmocladus fasciculatus*		
Restionaceae	*Harperia lateriflora*		
Restionaceae	*Hypolaena exsulca*		
Restionaceae	*Hypolaena fastigiata*		
Restionaceae	*Leptocarpus tenax*		
Restionaceae	*Lepyrodia drummondiana*		
Restionaceae	*Lepyrodia hermaphrodita*		
Restionaceae	*Loxocarya cinerea*		
Restionaceae	*Lyginia barbata*		
Restionaceae	*Lyginia imberbis*		
Restionaceae	*Meeboldina kraussii*		
Restionaceae	*Meeboldina scariosa*		
Restionaceae	*Meeboldina tephrina*		SE extent
Restionaceae	*Mesomelaena gracilipes*		
Restionaceae	*Mesomelaena stygia subsp. stygia*		
Restionaceae	*Mesomelaena tetragona*		
Restionaceae	*Cytogonidium leptocarpoides*		E extent
Restionaceae	*Lepyrodia muirii*		
Restionaceae	*Tremulina tremula*		E extent
Rhamnaceae	*Cryptandra nutans*		
Rhamnaceae	*Spyridium majoranifolium*		
Rhamnaceae	*Stenanthemum sublineare*	P2	E extent
Rubiaceae	*Opercularia hispidula*		
Rubiaceae	*Opercularia vaginata*		
Rutaceae	*Boronia albiflora*		
Rutaceae	*Boronia crenulata*		
Rutaceae	*Boronia denticulata*		
Rutaceae	*Boronia spathulata*		
Rutaceae	*Boronia subsessilis*		
Santalaceae	*Exocarpos sparteus*		
Santalaceae	*Leptomeria pauciflora*		
Santalaceae	*Leptomeria scrobiculata*		SE extent within 10 km of Project Area
Santalaceae	*Leptomeria squarrulosa*		
Solanaceae	*Solanum nigrum*	*	
Solanaceae	*Solanum symonii*	*	
Stylidiaceae	*Levenhookia pusilla*		
Stylidiaceae	*Levenhookia stipitata*		
Stylidiaceae	*Stylidium amoenum*		
Stylidiaceae	*Stylidium calcaratum*		
Stylidiaceae	*Stylidium corymbosum*		
Stylidiaceae	*Stylidium daphne*	P2	
Stylidiaceae	*Stylidium despectum*		

Family	Taxon	Status	Range
Stylidiaceae	*Stylidium gloeophyllum*	P4	E extent
Stylidiaceae	*Stylidium hirsutum*		
Stylidiaceae	*Stylidium imbricatum*		
Stylidiaceae	*Stylidium junceum*		
Stylidiaceae	*Stylidium luteum*		
Stylidiaceae	*Stylidium perpusillum*		
Stylidiaceae	*Stylidium piliferum*		
Stylidiaceae	*Stylidium preissii*		
Stylidiaceae	*Stylidium repens*		
Stylidiaceae	*Stylidium rupestre*		
Stylidiaceae	*Stylidium scandens*		
Stylidiaceae	*Stylidium schoenoides*		
Stylidiaceae	*Stylidium spinulosum*		
Thymelaeaceae	*Pimelea angustifolia*		
Thymelaeaceae	*Pimelea brevifolia subsp. brevifolia*		
Thymelaeaceae	*Pimelea lehmanniana subsp. lehmanniana*		
Thymelaeaceae	*Pimelea longiflora subsp. longiflora*		
Thymelaeaceae	*Pimelea sulphurea*		
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		

* introduced species

E – eastern extent. W western extent SE south eastern extent

OS other significant taxa

Range – according to data on NatureMap (DPaW 2007–)

Priority flora locations

Species	Status	Co-ordinates		Count
Centrolepis caespitosa	P4	-34.72908433	118.3155867	200+
Centrolepis caespitosa	P4	-34.71302753	118.321105	12
Centrolepis caespitosa	P4	-34.71240912	118.3213184	100+
Centrolepis caespitosa	P4	-34.71270273	118.3212181	20+
Centrolepis caespitosa	P4	-34.70477823	118.3224556	100+
Centrolepis caespitosa	P4	-34.73786839	118.3126688	10+
Drosera fimbriata	P4	-34.65703198	118.337034	1
Drosera fimbriata	P4	-34.65708562	118.3370447	5
Drosera fimbriata	P4	-34.65730556	118.336857	1
Drosera fimbriata	P4	-34.65766498	118.3368248	1
Drosera fimbriata	P4	-34.657783	118.3367282	1
Drosera fimbriata	P4	-34.66125914	118.3346415	1
Drosera fimbriata	P4	-34.66123232	118.3345449	1
Drosera fimbriata	P4	-34.66127523	118.3345395	1
Drosera fimbriata	P4	-34.66606029	118.331809	1
Drosera fimbriata	P4	-34.79672679	118.2692868	1
Drosera fimbriata	P4	-34.79166278	118.2735783	1
Drosera fimbriata	P4	-34.79166814	118.2736373	1
Drosera fimbriata	P4	-34.80621900000	118.26064000000	10
Drosera fimbriata	P4	-34.80690900000	118.26068600000	100+ in 10*10
Drosera fimbriata	P4	-34.80663500000	118.26049400000	10
Drosera fimbriata	P4	-34.65703717	118.3370156	5
Drosera fimbriata	P4	-34.66608661	118.3315573	1
Drosera fimbriata	P4	-34.65764964	118.3376686	10
Drosera fimbriata	P4	-34.65749801	118.3376993	3
Drosera fimbriata	P4	-34.65725837	118.3368592	2
Drosera fimbriata	P4	-34.65729626	118.3368125	5
Drosera fimbriata	P4	-34.6576545	118.3367253	5
Drosera fimbriata	P4	615311.7229	6147660.498	10+
Drosera fimbriata	P4	615318.5765	6147696.276	10+
Drosera fimbriata	P4	615321.4539	6147718.979	20+
Gonocarpus trichostachyus	P3	-34.80561500000	118.26110200000	50+
Gonocarpus trichostachyus	P3	-34.80542200000	118.26118000000	20+
Gonocarpus trichostachyus	P3	-34.80447200000	118.26193900000	50+
Gonocarpus trichostachyus	P3	-34.80311300000	118.26335000000	10
Gonocarpus trichostachyus	P3	-34.80418700000	118.26165300000	5
Gonocarpus trichostachyus	P3	-34.80434000000	118.26147500000	50+
Gonocarpus	P3	-34.80459700000	118.26122100000	50+

Species	Status	Co-ordinates		Count
trichostachyus				
Gonocarpus trichostachyus	P3	-34.80547600000	118.26074200000	2
Gonocarpus trichostachyus	P3	-34.79829471	118.2674919	20+
Gonocarpus trichostachyus	P3	-34.79827107	118.2677254	10
Gonocarpus trichostachyus	P3	-34.79362473	118.2718873	10+
Gonocarpus trichostachyus	P3	-34.7982771	118.2674789	1
Gonocarpus trichostachyus	P3	-34.79827174	118.2677257	1
Gonocarpus trichostachyus	P3	-34.79823419	118.2677096	1
Gonocarpus trichostachyus	P3	-34.79369589	118.272146	1
Gonocarpus trichostachyus	P3	-34.79403921	118.2717168	1
Gonocarpus trichostachyus	P3	615393.5278	6147957.659	20+
Gonocarpus trichostachyus	P3	615384.8018	6147942.795	100+
Gonocarpus trichostachyus	P3	615471.0778	6147964.633	20+
Gonocarpus trichostachyus	P3	615483.0767	6147972.986	100+
Gonocarpus trichostachyus	P3	615388.4385	6147953.102	100+
Gonocarpus trichostachyus	P3	615354.9304	6147931.893	20+
Gonocarpus trichostachyus	P3	615336.0934	6147913.274	10+
Gonocarpus trichostachyus	P3	615368.6788	6147788.265	20+
Gonocarpus trichostachyus	P3	615410.5236	6147878.323	100+
Gonocarpus trichostachyus	P3	615436.0973	6147874.859	30+
Gonocarpus trichostachyus	P3	615448.7245	6147884.683	200+
Latrobea recurva	P3	-34.65747800000	118.33734500000	1
Latrobea recurva	P3	-34.65716300000	118.33752700000	1
Latrobea recurva	P3	-34.65688379	118.3370352	2
Latrobea recurva	P3	-34.66553919	118.3318386	1
Latrobea recurva	P3	-34.66595401	118.3315489	1
Latrobea recurva	P3	-34.65764964	118.3376686	4
Laxmannia grandiflora subsp. stirlingensis	P3	-34.64575061	118.344276	1
Leucopogon sp. Manypeaks (A.S. George 6488)	P1	-34.66814169	118.3314174	1

Species	Status	Co-ordinates		Count
Leucopogon sp. Manypeaks (A.S. George 6488)	P1	-34.6694667	118.3299261	1
Leucopogon sp. Manypeaks (A.S. George 6488)	P1	-34.67751333	118.3310151	1
Leucopogon sp. Manypeaks (A.S. George 6488)	P1	-34.66766685	118.3305518	1
Leucopogon sp. Manypeaks (A.S. George 6488)	P1	-34.66943636	118.3300019	3
Leucopogon sp. Manypeaks (A.S. George 6488)	P1	-34.67218352	118.3291262	1
Leucopogon sp. Manypeaks (A.S. George 6488)	P1	-34.67753009	118.3309623	1
Leucopogon sp. Manypeaks (A.S. George 6488)	P1	-34.67754057	118.3310289	2
Leucopogon sp. Manypeaks (A.S. George 6488)	P1	-34.67755037	118.3314199	1
Leucopogon sp. Manypeaks (A.S. George 6488)	P1	-34.67845403	118.3316508	1
Stenanthemum sublineare	P2	-34.68545551	118.3293148	1
Stenanthemum sublineare	P2	-34.65593948	118.3375267	11 in 10 m radius
Stenanthemum sublineare	P2	622567.6219	6164293.101	1
Stenanthemum sublineare	P2	-34.68494841	118.3293146	1
Stenanthemum sublineare	P2	-34.65595909	118.3375651	1
Stylidium daphne	P2	-34.79391047	118.2719421	2
Stylidium daphne	P2	-34.80287300000	118.26279600000	1
Stylidium daphne	P2	-34.79376915	118.272057	10+
Stylidium daphne	P2	-34.79391642	118.2719163	2
Stylidium daphne	P2	-34.72285942	118.3174068	1
Stylidium gloeophyllum	P4	-34.80072328	118.265478	1
Stylidium gloeophyllum	P4	-34.79381391	118.2720065	1
Stylidium gloeophyllum	P4	-34.79410359	118.2716793	1
Stylidium gloeophyllum	P4	615388.4385	6147953.102	20+
Stylidium gloeophyllum	P4	615361.2556	6147937.73	100+
Stylidium gloeophyllum	P4	615354.9304	6147931.893	50+
Stylidium gloeophyllum	P4	615336.0934	6147913.274	15+
Stylidium gloeophyllum	P4	615368.6788	6147788.265	10+
Stylidium gloeophyllum	P4	615410.5236	6147878.323	10+
Stylidium gloeophyllum	P4	615436.0973	6147874.859	20+

Species	Status	Co-ordinates		Count
Stylidium gloeophyllum	P4	615448.7245	6147884.683	100+
Stylidium gloeophyllum	P4	-34.80425900000	118.26145500000	2
Stylidium gloeophyllum	P4	-34.80077298	118.2655561	50+
Stylidium gloeophyllum	P4	-34.800086	118.2650236	2
Stylidium gloeophyllum	P4	-34.79939299	118.2659539	10
Stylidium gloeophyllum	P4	-34.79391005	118.2717638	2
Stylidium gloeophyllum	P4	-34.79391742	118.2715066	15
Stylidium gloeophyllum	P4	-34.79388013	118.2711011	3
Synaphea incurva	P1	-34.78144691	118.2820243	1
Synaphea incurva	P1	-34.78151749	118.282433	1
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.6585652	118.3363373	scattered 20 +
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.65881506	118.3361545	scattered throughout swamp
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.65903542	118.3357697	50+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.65920549	118.3355447	10+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.6593505	118.3354358	10+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.6617504	118.3345664	10+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.66417571	118.3328794	10+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.67524644	118.3301971	10+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.65878078	118.3361435	10+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.65899535	118.3359718	10+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.65910801	118.3360523	10+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.65922066	118.3360148	10+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.6601487	118.3354569	10+
Tetraria sp. Blackwood River (A.R. Annels 3043)	P3	-34.66033646	118.3352959	10+
Tetraria sp. Blackwood River (A.R. Annels	P3	619934.6943	6154430.497	10+

Species	Status	Co-ordinates		Count
3043)				
Xanthosia eichleri	P4	-34.67469800000	118.32958700000	10
Xanthosia eichleri	P4	-34.67388782	118.3295398	2
Xanthosia eichleri	P4	-34.70737	118.3218451	1
Xanthosia eichleri	P4	-34.78144691	118.2820243	1
Xanthosia eichleri	P4	-34.70815279	118.3219364	1
Xanthosia eichleri	P4	-34.7077383	118.3203653	6
Xanthosia eichleri	P4	-34.67389234	118.3295614	1
Xanthosia eichleri	P4	-34.67469164	118.3294433	1
Xanthosia eichleri	P4	-34.67475601	118.3296794	1
Xanthosia eichleri	P4	-34.67556068	118.3301354	1
Synaphea preissii	P3	-34.6541942	118.3386486	1

Flora likelihood of occurrence assessment guidelines

Likelihood of occurrence	Guideline
Known	Species definitely recorded within the Study Area either from previous records or field survey results.
Likely	Species previously recorded within the Study Area and large areas of suitable habitat occurs in the Project Area. Also takes into account other considerations.
Possible	Species previously recorded within the Study Area with marginally suitable habitat occurring in the Project Area.
Unlikely	Species previously recorded within the Study Area, but suitable habitat does not occur in the Project Area.
Highly unlikely	Species not previously recorded within Study Area, suitable habitat does not occur in the Project Area and/or Project Area is outside the natural distribution of the species.
Other considerations	Intensity of survey, availability of access, growth form type, recorded flowering times, cryptic nature of species

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Apiaceae	*Xanthosia eichleri*		P4	Erect, procumbent or decumbent shrub (subshrub), 0.05-0.25 m high, leaves simple, cuneate; umbels simple; petals shorter than sepals. Fl. white-cream, Oct to Nov.	Grey sand over granite, sandy loam. Granite outcrops, jarrah/marri woodland.	Present	NatureMap (DPaW 2007–)
Asparagaceae	*Laxmannia grandiflora* subsp. *stirlingensis*		P3	Tall, slender, rambling, stilt-rooted perennial, herb, to 0.22 m high. Fl. white, Sep to Nov.	White sand, sandy clay. Winter-wet locations.	Present	NatureMap (DPaW 2007–), DPaW databases TPFL and WAHerb)
Centrolepidaceae	*Centrolepis caespitosa*		P4	Tufted annual, herb (forming a rounded cushion up to 25 mm across). Fl. Oct to Dec.	White sand, clay. Salt flats, wet areas.	Present	NatureMap (DPaW 2007–), DPaW databases TPFL and WAHerb)
Cyperaceae	*Tetraria* sp. Blackwood River (A.R. Annels 3043)		P3			Present	DPaW databases TPFL and WAHerb)

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Dasypogonaceae	*Calectasia obtusa*		P3	Erect, low herb, 0.25-0.4 m high, to 0.2; with aerial roots. Fl. blue, Aug to Sep.	Sand, clay loam, gravel, laterite. Flats.	Unlikely	DPaW databases TPFL and WAHerb)
Droseraceae	*Drosera fimbriata*		P4	Erect tuberous, perennial, herb, 0.05-0.15 m high. Fl. white, Sep to Oct.	White sand, granite.	Present	NatureMap (DPaW 2007–) / DPaW databases (TPFL and WAHERB
Ericaceae	*Andersonia setifolia*		P3	Decumbent to erect, cushion-forming shrub, 0.05-0.15 m high. Fl. red/white, Jun to Oct.	Sandy & gravelly soils. Hillslopes & breakaways.	Likely	NatureMap (DPaW 2007–) / DPaW databases (TPFL and WAHERB
Ericaceae	*Andersonia pinaster*	V	T	Erect, slender shrub, 0.2-0.6 m high. Fl. blue, Jul to Nov.	Grey/white sand, sandy clay, granite. Winter-wet slopes, outcrops, hills. Known from the Two Peoples Bay area	Unlikely – occurs in coastal sand	DPaW databases TPFL and WAHerb)
Ericaceae	*Leucopogon altissimus*		P3			Possible	DPaW databases TPFL and WAHerb)
Ericaceae	*Leucopogon bracteolaris*		P2	Shrub, 0.25-1 m high. Fl. White, Feb or May or Jul or Oct.	Stony sand, gravelly loam.	Likely	NatureMap (DPaW 2007–), DPaW databases TPFL and WAHerb)
Ericaceae	*Leucopogon* sp. Manypeaks (A.S. George 6488)		P1			Present	NatureMap (DPaW 2007–) / DPaW databases (TPFL and WAHERB

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Ericaceae	*Lysinema lasianthum*		P4	Spindly shrub, 0.25-0.7 m high. Fl. white-cream, Jul to Nov.	Swamps, seasonally wet areas.	Likely	NatureMap (DPaW 2007–), DPaW databases TPFL and WAHerb)
Ericaceae	*Sphenotoma drummondii*	E	T	Tufted shrub, 0.15-0.5 m high. Fl. white, Sep to Dec.	Stony or shallow soils over granite or quartzite. Steep rocky slopes, crevices of rocks.	Unlikely	PMST (2015a), DPaW databases TPFL and WAHerb)
Ericaceae	*Sphenotoma* sp. Stirling Range (P.G. Wilson 4235)		P3	Shrub, 0.3-2 m high. Fl. white, Aug to Dec.	Skeletal soils over granite or quartzite. Rocky slopes & plateaus, gullies. Populations are known from Stirling Range National Park, Mt FranklandNational Park and the Denbarker area (DotE 2015)	Unlikely	DPaW databases TPFL and WAHerb)
Fabaceae	*Acacia declinata*		P3	Dense, intricately branched, prostrate, pungent shrub, 0.2-0.4 m high. Fl. yellow, Aug to Sep.	Loamy or sandy clay. Restricted to near Borden, Manypeaks and Boxwood Hill. Grows in loamy sand, loam and clay in tall shrubland and woodland (Maslin 2001)	Unlikely	DPaW databases TPFL and WAHerb)
Fabaceae	*Daviesia obovata*	E	T	Erect, slender shrub, 0.7-1.5 m high. Fl. yellow & black, Sep to Oct.	Stony loam, sandy loam. Hillslopes, outcrops.	Unlikely	EPBC PMST
Fabaceae	*Daviesia ovata*		T	Erect or spreading shrub, 0.4-1.8 m high. Fl. yellow/orange & red/brown, Sep to Nov.	Sand over granite. Rocky steep slopes. Known from Manypeaks	Unlikely	DPaW databases TPFL and WAHerb)
Fabaceae	*Jacksonia calycina*		P4	Erect or straggling shrub, (0.2-)0.4-1.4 m high. Fl. orange/yellow & red, Sep to Nov.	Gravelly sandy or clayey soils. Sandplains, low rises, hillslopes.	Likely	DPaW databases TPFL and WAHerb)

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Fabaceae	*Kennedia glabrata*	V	T	Prostrate shrub, 0.05-0.5 m high, to 5 m wide. Fl. red, Aug to Nov.	Soil pockets, sandy soils. Granite outcrops	Unlikely	EPBC PMST
Fabaceae	*Latrobea recurva*		P3	Erect or procumbent, spreading shrub, 0.3-1 m high.	Grey or white sand over laterite. This species is known from the Lake Grace area to the Stirling Range in dense heathland, or seasonally wet eucalypt woodland, on grey or white sand over laterite (Wilkins and Chappill 2007)	Present	NatureMap (DPaW 2007–), DPaW databases TPFL and WAHerb)
Fabaceae	*Pultenaea calycina* subsp. *calycina*		P3	Rounded shrub, 0.45-1m high. Fl. Yellow-orange, August to October.	Sand, sandy clay, clam loam. Flat plains	Likely	NatureMap (DPaW 2007–) / DPaW databases (TPFL and WAHERB
Fabaceae	*Pultenaea pinifolia*		P3	Erect, slender shrub, 1-3 m high. Fl. yellow-orange, Oct to Nov.	Loam or clay. Floodplains, swampy areas.	Unlikely	DPaW databases TPFL and WAHerb)
Goodeniaceae	*Scaevola xanthina* (was *S.* sp. *Waychinicup* (E.M. Sandiford EMS 1336)		P2	Sub-shrub with multiple, spreading, woody branches almost 0.15 m high and 1.5m wide. Yellow flowers Dec and Feb (Shepherd and Hislop 2014).	Only known from the Mount Manypeaks region where it is found in gullies among granite outcrops associated with *Eucalyptus megacarpa, Agonis flexuosa, Hakea elliptica* and *Lepidosperma*	Unlikely	DPaW databases TPFL and WAHerb)
Haemodoraceae	*Anigozanthos bicolor* subsp. *minor*	E	T	Rhizomatous, perennial, herb, 0.05-0.2 m high. Fl. green&red, Aug to Oct.	Sand. Well-watered sites	Unlikely	EPBC PMST

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Haemodoraceae	*Conostylis misera*	E	T	Rhizomatous, tufted perennial, grass-like or herb, 0.05-0.18 m high. Fl. yellow, Oct to Nov.	White or grey sand, sandy loam. Winter-wet flats. This species occurs from Narrikup, in the Stirling Range and across to the South Stirling area. It favours seasonally waterlogged flats of sandy loam over clay duplex soils with underlying laterite in low woodland over heath or sedge, mallee heath and heath (DotE 2015)	Possible	NatureMap (DPaW 2007–), EPBC PMST, DPaW databases TPFL and WAHerb)
Haloragaceae	*Gonocarpus trichostachyus*		P3	Erect to spreading perennial, herb, 0.05-0.17 m high. Fl. red-purple, Sep to Oct.	Sandy soils.	Present	DPaW databases TPFL and WAHerb)
Hemerocallidaceae	*Agrostocrinum scabrum* subsp. *littorale*		P2	Rhizomatous, perennial, herb, to 0.15 m high. Fl. blue, Oct to Nov.	Shallow granite loams. Coastal slopes.	Unlikely	DPaW databases (TPFL and WAHERB
Malvaceae	*Lasiopetalum* sp. Denmark (BG Hammersley 2012)		P3	NA	NA	Possible	DPaW databases TPFL and WAHerb)
Malvaceae	*Thomasia solanacea*		P4	Erect shrub, 0.5-3 m high. Fl. blue-purple-pink, Sep to Dec.	Alluvium, sand over limestone, rocky loam. Coastal areas.	Unlikely	DPaW databases TPFL and WAHerb)
Myrtaceae	*Calothamnus robustus*		P3	Erect, compact shrub, 0.5-1.5 m high. Fl. red, Feb or Jul or Sep to Nov.	Rocky quartzite or granitic soils. Low hills.	Unlikely	DPaW databases TPFL and WAHerb)
Myrtaceae	*Calytrix pulchella*		P3	Shrub, 0.3-0.7(-1) m high. Fl. pink, Aug to Nov.	Grey or white sand over laterite. Ridges, flats	Likely	DPaW databases TPFL and WAHerb)
Myrtaceae	*Chamelaucium* sp. Waychinicup (D. Davidson s.n. PERTH 01486527)		P2		In sloping sites of sand-loam over granite. In heathland. Occurs at Waychinicup and Mount Manypeaks	Unlikley	NatureMap (DPaW 2007–), DPaW databases TPFL and WAHerb)

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Myrtaceae	*Darwinia collina*	E	T	Erect shrub, 0.3-1.2 m high. Fl. yellow, Sep to Nov.	Peaty sand. Rocky quartzite slopes.	Unlikely	EPBC PMST
Myrtaceae	*Darwinia oxylepis*	E	T	Upright, dense shrub, 0.6-1.5 m high. Fl. red, Aug to Nov.	Stony, peaty sand. Rocky gullies.	Unlikely	EPBC PMST
Myrtaceae	*Darwinia wittwerorum*	E	T	Erect, single-stemmed shrub, 0.3-1 m high. Fl. green/white & pink, Sep to Dec.	Clay loam, sandy clay. Roadsides, slopes.	Unlikely	EPBC PMST
Myrtaceae	*Eucalyptus buprestium* x *staeri*		P4	Mallee or tree, 1.5-4 m high. Fl. Apr.	Sand or loam with lateritic gravel, sandy loam. Steep slopes	Likely	NatureMap (DPaW 2007–)
Myrtaceae	*Verticordia harveyi*		P4	Slender, spindly shrub, 0.2-1.5 m high. Fl. white & pink/pink-purple, Jan to Feb or Apr.	White sand. Low hills.	Likely	DPaW databases TPFL and WAHerb)
Orchidaceae	*Drakaea micrantha*	V	T	Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red & yellow, Sep to Oct.	White-grey sand. This species is known from 32 small scattered populations from Perth to Albany. This species is often found in open, disturbed sandy patches (DotE 2015).	Unlikely	EPBC PMST
Orchidaceae	*Microtis pulchella*		P4	Tuberous,perennial, herb, 0.12-0.25 m high. Fl. white, Nov to Dec or Jan.	Peaty sand. Winter-wet swamps.	Likely	NatureMap (DPaW 2007–), DPaW databases TPFL and WAHerb)
Pittosporaceae	*Marianthus granulatus*		P4	Twining shrub or climber, 1-5 m high. Fl. blue, Jul or Oct to Dec.	Loam over granite. Creekbeds. This species occurs at the Porongurup Ranges with one record from Mt Manypeaks	Unlikely	DPaW databases TPFL and WAHerb)
Polygonaceae	*Rumex drummondii*		P4	Erect perennial, herb, 0.6-0.9 m high.	Winter-wet disturbed areas.	Possible	NatureMap (DPaW 2007–) / DPaW databases (DEFL and WAHERB

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Proteaceae	*Adenanthos filifolius*		P3	Erect shrub, (0.2-)0.7-2(-5) m high. Fl. cream-white, May or Sep to Dec.	White, grey or black peaty sand, sandy clay. Rocky hillsides (usually granite, sandstone or quartzite).	Unlikely	DPaW databases TPFL and WAHerb)
Proteaceae	*Banksia anatona*	CE	T	Upright, non-lignotuberous shrub, to 5 m high. Fl. yellow, Jan to Mar.	Grey sand over gravelly shale, rocky silty clay loam. Lower slopes of ranges. This species is only known from Stirling Range National Park on slopes in sandy soil over gravely shale, in thick kwongan vegetation (DotE 2015). Record from the area is planted.	Unlikely	NatureMap (DPaW 2007–), DPaW databases TPFL and WAHerb)
Proteaceae	*Banksia brownii*	E	T	Bushy, non-lignotuberous shrub or tree (small), 1-6 m high. Fl. cream & brown/orange-red, Mar to Jul.	Sand over laterite, gravel, loam over granite. In gullies.	Possible.	NatureMap (DPaW 2007–), EPBC PMST DPaW databases TPFL and WAHerb)
Proteaceae	*Banksia pseudoplumosa*	E	T	Non-lignotuberous shrub, to 1.8 m high. Fl. Nov to Dec.	Gravelly soils. The species is known from seven subpopulations in the Stirling Range National Park and patches of vegetation in the vicinity. This species occurs in woodland over heath in orange gravelly clay loam over laterite (DotE 2015)	Unlikely	EPBC PMST
Proteaceae	*Banksia serra*		P4	Erect, slender, non-lignotuberous shrub, 1-4(-7) m high. Fl. yellow/cream-green, Jul to Sep.	Gravel, sand or clay loam over laterite. Hillslopes.	Possible	DPaW databases TPFL and WAHerb)

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Proteaceae	*Banksia verticillata*	V	T	Non-lignotuberous shrub or tree (rarely), 1.3-6 m high. Fl. yellow-orange, Jan to Apr.	Sandy loam. On or beside granite outcrops. This species grows in granite fissures and deeper soil around the edges of outcrops and often on rocks that run into the ocean. All but two of the populations are within 2 km of the coast (DotE 2015).	Unlikely	DPaW databases TPFL and WAHerb)
Proteaceae	*Hakea lasiocarpha*		P3	Erect shrub, to 6 m high. Fl. white, May to Jul.	Sandy loam soils, organic litter over sand, clay or gravel. Hill tops, valleys.	Likely	NatureMap (DPaW 2007–) / DPaW databases (TPFL and WAHERB
Proteaceae	*Hakea oldfieldii*		P3	Open, straggling shrub, up to 2.5 m high. Fl. white-cream/yellow, Aug to Oct.	Red clay or sand over laterite. Seasonally wet flats.	Possible	DPaW databases TPFL and WAHerb)
Proteaceae	*Isopogon uncinatus*	E	T	Tufted spreading or prostrate, non-lignotuberous shrub, 0.05-0.4 m high. Fl. yellow/cream, Oct to Nov.	Loam or sand on granite, peaty sand. Swampy depressions, hillslopes. Confined to the Albany area in seasonally damp soil, shallow sandy-clay over granite or gravelly soil from decomposed laterite over granite, in saddles between summit rocks; associated vegetation is heath (DotE 2015)	Likely	EPBC PMST
Proteaceae	*Persoonia micranthera*	E	T	Decumbent to prostrate shrub, 0.1-0.4 m high. Fl. yellow, Aug.	Sandy, stony soils. Summit of plateau. Occurs at high altitudes in the Stirling Ranges in low dense heath and scrub on a rocky shallow soil over schist (DotE 2015).	Unlikely	EPBC PMST

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Proteaceae	*Petrophile carduacea*		P2	Non-lignotuberous shrub, 1-1.5 m high. Fl. yellow, Sep to Oct.	Gravelly soils.	Possible	NatureMap (DPaW 2007–) / DPaW databases (EPBC and WAHERB
Proteaceae	*Synaphea incurva*		P1	Clumped, spreading shrub. Fl. yellow, Sep to Nov.	Gravelly loam, sandy soils. Slopes	Present	DPaW databases TPFL and WAHerb)
Restionaceae	*Chordifex abortivus*	E	T	Rhizomatous, erect perennial, herb, to 0.5 m high. Fl. brown, Sep to Oct.	Sand. Low rises & undulating areas. Currently known from 3 populations approximately 40 km apart in the Waychinicup areas. Occurs in sand over gravelly clay in heath or scrub with a sedge understorey (DotE 2015).	Possible	NatureMap (DPaW 2007–) / DPaW databases WAHERB, EPBC PMST
Restionaceae	*Chordifex leucoblepharus*		P2	Rhizomatous, perennial, herb, ca 0.4 m high. Fl. brown, Nov to Dec.	Sand. Dry heath.	Likely	DPaW databases TPFL and WAHerb)
Rhamnaceae	*Pomaderris grandis*		P4	Erect shrub, 1-4.5 m high. Fl. white, Jul to Oct.	Loam, rocky sand. Creek beds, rocky gullies. Only recorded from the Mt Manypeaks area	Unlikely	DPaW databases TPFL and WAHerb)
Rhamnaceae	*Spyridium riparium*		P2	Erect shrub, 0.8-1.5 m high. Fl. white/cream, Jul to Oct.	Sandy or gravelly soils over laterite. River banks, slopes. Recorded from lateritic soils along rivers, recorded only from the Kent and Mitchell Rivers (Rye 1995)	Unlikely	DPaW databases TPFL and WAHerb)
Rhamnaceae	*Stenanthemum sublineare*		P2	Erect shrub, to 0.1 m high. Fl. green, Oct to Dec.	Littered white sand. Coastal plain.	Present.	NatureMap (DPaW 2007–), DPaW databases TPFL and WAHerb)

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Rutaceae	*Muiriantha hassellii*		P4	Slender, erect shrub, 0.15-0.3 m high. Fl. yellow, Apr to Oct.	Peaty sand, stony clay. Hillsides & summits.	Unlikely	DPaW databases TPFL and WAHerb)
Stylidiaceae	*Stylidium articulatum*		P2	Rosetted perennial, herb, 0.15-0.25 m high, Leaves erect to spreading, oblanceolate, 3-8 cm long, 5-14 mm wide, apex subacute to acute, glabrous. Scape glandular in upper half. Inflorescence paniculate. Fl. pink, Nov to Dec.	Sandy loam, granite. Hills, coastal heath.	Unlikely.	DPaW databases TPFL and WAHerb)
Stylidiaceae	*Stylidium corymbosum* var. *proliferum*		P2	Rosetted perennial, herb, 0.07-0.3 m high. Fl. white, Oct to Nov.	Sandy soils. Granite rocks.	Possible.	DPaW databases TPFL and WAHerb)
Stylidiaceae	*Stylidium daphne*		P2	Rosetted perennial, herb, 0.15-0.45 m high, Leaves tufted, linear to narrowly oblanceolate, 1-4.5 cm long, 0.5-2 (-3) mm wide, apex subacute, margin entire, hoary. Scape mostly glabrous, inflorescence axis sparingly glandular. Inflorescence racemose. Fl. yellow, Dec.	Grey to white sand or brown sandy clay loam over laterite. Gentle slopes or winter wet depressions. Mallee or Melaleuca shrubland.	Present	NatureMap (DPaW 2007–) / DPaW databases (TPFL and WAHERB
Stylidiaceae	*Stylidium gloeophyllum*		P4	Rosetted perennial, herb, 0.13-0.47 m high, Leaves tufted, oblanceolate, 1.5-7 cm long, 2-12 mm wide, apex subacute, margin entire, glandular. Scape glandular on lower portion. Inflorescence racemose. Fl. orange/yellow, Oct to Dec.	Sandy clay loam, granite. Winter wet depressions, or fringing outcrops. *Agonis*, mallee, or *Hakea* shrubland with sedges.	Present	NatureMap (DPaW 2007–), DPaW databases TPFL and WAHerb)

Family	Taxon	Status (EPBC Act)	Status (WC Act/ DPaW)	Description	Habitat	Likelihood of occurrence	Source
Stylidiaceae	*Stylidium keigheryi*		P2	Rosetted perennial, herb, 0.04-0.25 m high, Leaves narrowly oblanceolate to oblanceolate, 0.4-1.2 cm long, 0.8-1.5 mm wide, apex subacute, margin entire, glabrous. Scape glabrous. Fl. pink, Feb to Apr.	Clay loam, peaty sand. Mountain peaks and slopes. Heath.	Unlikely	DPaW databases TPFL and WAHerb)

References:

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Site	Q1	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 14/10/2015	**Described by:** MT and ES
Co-ordinates: MGA 50	619937 mE 6154434 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Eucalyptus occidentalis* Swamp			
Landform: Swamp	**Drainage:** Seasonal wet		
Soil Colour & Type: Grey Sand			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure, Exotic Weeds			
Fire Age & Intensity: Old > 5 yr – No damage			
Bare Ground: -	**% Logs:** -	**% Twigs:** <10	

% Leaves: 10-30	**% Rocks (< 2cm):** -		**% Rocks (2-30 cm):** -		**% Rocks (>30cm):** -		
Stratum %Cover	**U1:** 30-70	**U2:** <2	**M1:** 2-10	**M2**	**M3**	**G1:** 30-70	**G2:** <2
Height Range (m)	12-16	2-4	2-3			0.1-0.6	0.05-0.3

Species List

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus occidentalis*		U1	30-70	15
Myrtaceae	*Melaleuca cuticularis*		U2	<2T	3-4
Fabaceae	*Acacia longifolia*	*	M1	<2T	2-3
Pittosporaceae	*Billardiera fusiformis*		M2	2-10	<1
Goodeniaceae	*Dampiera leptoclada*		G2	<2N	0.1-0.3
Cyperaceae	*Tetraria* sp. Blackwood River (A.R. Annels 3043)	P3	G1	10-30	0.6
Cyperaceae	*Schoenus subfascicularis*		G1	<2N	0.4
Asteraceae	*Hypochaeris radicata*	*	G2	<2T	0.05
Cyperaceae	*Lepidosperma striatum*		G1	30-70	0.6
Restionaceae	*Meeboldina kraussii*		G1	<2N	0.2
Restionaceae	*Lepyrodia drummondiana*		G1	<2T	0.4
Haemodoraceae	*Haemodorum simplex*		G2	<2T	0.2
Orchidaceae	*Microtis media*		G2	<2T	0.2
Orchidaceae	*Thelymitra crinita*		G2	<2T	0.2
Poaceae	*Cyperochloa hirsuta*		G1	<2T	0.1

Quadrat Data Sheets: Kojaneerup

Site	Q2	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 14/10/2015	**Described by:** MT and ES
Co-ordinates: MGA 50	615809 mE 6148398 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Melaleuca* Swamp			
Landform: Swamp	**Drainage:** Seasonal wet		
Soil Colour & Type: Grey Sand - Loam			
Vegetation Condition: Excellent (2) – Very Good (3)			
Disturbances: Infrastructure, Exotic Weeds			
Fire Age & Intensity: Old > 5 yr – No damage			
Bare Ground: <2	**% Logs:** -	**% Twigs:** <10	

% Leaves: -	**% Rocks (< 2cm):** -		**% Rocks (2-30 cm):** -			**% Rocks (>30cm):** -	
Stratum %Cover	**U1**	**U2**	**M1:** 30-70	**M2:** 30-70	**M3**	**G1:** 10-30	**G2:** <2
Height Range (m)			1.5-2	<1		0.6	0.2

Family	Taxon	Status	Stratum	Cover %	Height (m)
Rutaceae	*Boronia denticulata*		M1	30-70	1.5-2
Myrtaceae	*Melaleuca densa*		M2	30-70	<1
Cyperaceae	*Lepidosperma striatum*		G1	10-30	<1
Restionaceae	*Meeboldina tephrina*		G1	10-30	<1
Fabaceae	*Sphaerolobium vimineum*		M2	<2T	<1
Menyanthaceae	*Liparophyllum latifolium*		G2	<2T	<0.1
Restionaceae	*Lepyrodia muirii*		G1	<2T	<1
Euphorbiaceae	*Amperea volubilis*		G2	<2T	<1
Orchidaceae	*Thelymitra* sp (nf)		G2	<2T	0.2
Cyperaceae	*Schoenus laevigatus*		G1	<2T	0.2
Rutaceae	*Boronia denticulata*		M1	30-70	1.5-2

Site	Q3	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 14/10/2015	**Described by:** MT and ES
Co-ordinates: MGA 50	616086 mE 6148750 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Actinodium* Heath			
Landform: Plain	**Drainage:** Impeded drainage		
Soil Colour & Type: Grey Sand			
Vegetation Condition: Excellent (2) – Very Good (3)			
Disturbances: Infrastructure, Exotic Weeds, Dieback			
Fire Age & Intensity: Moderate 1 – 5 yrs			
Bare Ground: <2	**% Logs:** -	**% Twigs:** -	

% Leaves: 10-30	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -	**% Rocks (>30cm):** -

Stratum %Cover	**U1:**	**U2**	**M1:** <2	**M2:** 10-30	**M3**	**G1:** 10-30	**G2:** 2-10
Height Range (m)			1	0.2-1		0.05-0.4	0.01-0.2

Family	Taxon	Status	Stratum	Cover %	Height (m)
Proteaceae	*Adenanthos obovatus*		M1	<2T	1
Myrtaceae	*Actinodium* sp. Fitzgerald River (H.A. Froebe & R. Classen 810)		M2	10-30	0.5
Myrtaceae	*Beaufortia anisandra*		M2	<2T	0.4
Myrtaceae	*Verticordia ? harveyi (nf)*	P4	M1	<2T	0.4
Asparagaceae	*Lomandra caespitosa*		G2	<2T	0.1
Cyperaceae	*Schoenus sp. South Coast (R. Davis 10239)*		G1	<2T	0.2
Loranthaceae	*Nuytsia floribunda*		M2	<2T	0.4
Goodeniaceae	*Dampiera linearis*		G2	<2T	0.2
Asparagaceae	*Laxmannia sessiliflora*		G2	<2T	0.05
Stylidiaceae	*Stylidium repens*		G2	<2T	0.05
Anarthriaceae	*Anarthria scabra*		G1	2-10	0.3
Cyperaceae	*Tricostularia exsul*		G1	2-10	0.4
Hemerocallidaceae	*Stypandra glauca*		G2	<2N	0.2
Proteaceae	*Conospermum caeruleum*		M2	<2T	0.2
Dasypogonaceae	*Dasypogon bromeliifolius*		G2	2-10	0.4
Ericaceae	*Needhamiella pumilio*		M2	<2T	0.05
Ericaceae	*Leucopogon elegans* subsp. *elegans*		M2	<2T	0.2
Myrtaceae	*Calytrix ? asperula (nf)*		M2	<2T	0.4
Anarthriaceae	*Anarthria prolifera*		G1	<2T	0.2
Cyperaceae	*Schoenus acuminatus*		G1	<2T	0.2
Cyperaceae	*Schoenus efoliatus*		G1	2-10	0.3
Droseraceae	*Drosera sulphurea*		G2	<2T	0.2
Fabaceae	*Sphaerolobium pubescens*		M2	<2T	0.2
Cyperaceae	*Tricostularia exsul*		G1	<2T	0.2
Dasypogonaceae	*Kingia australis*		M2	<2T	0.4

Myrtaceae	*Astartea glomerulosa*		M2	2-10	0.4
Proteaceae	*Adenanthos cuneatus*		M2	<2T	0.4
Hemerocallidaceae	*Johnsonia teretifolia*		G2	<2T	0.2
Lycopodiaceae	*Phylloglossum drummondii*		G2	<2T	0.05
Restionaceae	*Hypolaena fastigiata*		G1	<2T	0.1
Ericaceae	*Lysinema conspicuum*		M2	<2T	0.2
Restionaceae	*Lyginia barbata*		G1	<2T	0.4
Poaceae	*Amphipogon debilis*		G1	<2T	0.1
Proteaceae	*Synaphea petiolaris* subsp *petiolaris*		M2	<2T	0.2
Stylidiaceae	*Stylidium luteum*		G2	<2T	0.3
Ericaceae	*Andersonia simplex*		M2	<2T	0.1
Ericaceae	*Andersonia* aff *sprengelioides*		M2	<2T	0.1
Haemodoraceae	*Haemodorum spicatum*		G2	<2T	0.2
Rutaceae	*Boronia spathulata*		M2	<2T	0.4
Restionaceae	*Hypolaena exsulca*		G1	<2T	0.2
Colchicaceae	*Burchardia congesta*		G2	<2T	0.2
Polygalaceae	*Comesperma virgatum*		G2	<2T	0.1

Site	Q4	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 19/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	622304 mE 6164986 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Mallee over low heath*			
Landform: Plain	**Drainage:** Good		
Soil Colour & Type: Grey Sand			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure, Exotic Weeds, Dieback			
Fire Age & Intensity: Old > 5 yr – No damage			
Bare Ground: 2	**% Logs:** -	**% Twigs:** <2	

% Leaves: 2-10	**% Rocks (< 2cm):** -		**% Rocks (2-30 cm):** -		**% Rocks (>30cm):** -	
Stratum %Cover	**U1:** 2-10	**U2**: <2	**M1:** <2	**M2:** 30-70	**M3:** 2-10	**G1:** 30-70	**G2:** 2-10
Height (m)	6	2.5	3	1-2	<1	0.1-0.5	0.05-0.4

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus marginata*		U2	<2T	2.5
Myrtaceae	*Eucalyptus adesmophloia*		U1	2-10	6
Myrtaceae	*Taxandria spathulata*		M2	2-10	1-2
Proteaceae	*Petrophile ericifolia* subsp. *ericifolia*		M2	2-10	1-2
Myrtaceae	*Agonis theiformis*		M2	<2N	0.5-1
Myrtaceae	*Melaleuca thymoides*		M2	2-10	0.5-1
Proteaceae	*Hakea corymbosa*		M2	<2T	1.5
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M2	2-10	0.6
Proteaceae	*Adenanthos cuneatus*		M3	2-10	0.5
Proteaceae	*Petrophile longifolia*		M3	<2T	0.3
Proteaceae	*Petrophile media*		M3	<2N	0.4
Rutaceae	*Boronia spathulata*		M3	<2N	0.4
Dilleniaceae	*Hibbertia gracilipes*		M3	2-10	0.3
Dilleniaceae	*Hibbertia recurvifolia*		M3	<2N	0.5
Rutaceae	*Boronia crenulata*		M3	<2T	0.4
Proteaceae	*Petrophile filifolia* subsp. *filifolia*		M3	<2T	0.4
Ericaceae	*Astroloma baxteri*		M3	<2T	0.5
Proteaceae	*Isopogon formosus*		M3	<2T	0.5
Fabaceae	*Gastrolobium bracteolosum*		M3	<2N	0.2
Proteaceae	*Conospermum caeruleum*		M3	<2N	0.3
Iridaceae	*Patersonia lanata forma lanata*		G2	<2N	0.3
Restionaceae	*Desmocladus fasciculatus*		G1	<2N	0.1
Poaceae	*Neurachne alopecuroidea*		G1	2-10	0.1
Haemodoraceae	*Conostylis setigera*		G2	<2N	0.1
Cyperaceae	*Schoenus subflavus* subsp *long leaves* (KL Wilson 2865)		G1	<2N	0.1
Restionaceae	*Chordifex sphacelatus*		G1	<2N	0.2

Haemodoraceae	*Conostylis serrulata*		G2	<2T	0.3
Goodeniaceae	*Dampiera juncea*		G2	<2N	0.2
Restionaceae	*Hypolaena fastigiata*		G1	<2N	0.2
Myrtaceae	*Melaleuca subtrigona*		M3	<2T	0.2
Fabaceae	*Acacia subcaerulea*		M3	<2T	0.5
Restionaceae	*Mesomelaena gracilipes*		G1	<2N	0.3
Cyperaceae	*Schoenus obtusifolius*		G1	<2N	0.1
Stylidiaceae	*Stylidium schoenoides*		G2	<2N	0.1
Anarthriaceae	*Anarthria prolifera*		G1	2-10	0.3
Restionaceae	*Lyginia imberbis*		G1	<2N	0.4
Fabaceae	*Hovea trisperma*		M3	<2T	0.3
Asparagaceae	*Lomandra nigricans*		G2	<2T	0.5
Dilleniaceae	*Hibbertia lineata*		M3	<2T	0.2
Cyperaceae	*Tricostularia compressa*		G1	<2T	0.3
Asparagaceae	*Chamaescilla spiralis*		G2	<2T	0.1
Ericaceae	*Astroloma tectum*		M3	<2N	0.1
Cyperaceae	*Lepidosperma tenue*		G1	<2T	0.4
Cyperaceae	*Lepidosperma pubisquameum*		G1	2-10	0.5
Restionaceae	*Chordifex laxus*		G1	<2N	0.2
Myrtaceae	*Darwinia vestita*		M3	<2T	0.5
Goodeniaceae	*Dampiera alata*		G2	<2N	0.3
Fabaceae	*Bossiaea praetermissa*		M3	<2T	0.4
Proteaceae	*Banksia nutans*		M2	<2T	0.8
Myrtaceae	*Taxandria parviceps*		M1	<2T	3
Proteaceae	*Hakea ceratophylla*		M3	<2T	0.6
Cyperaceae	*Cyathochaeta equitans*		G1	10-30	0.8
Anarthriaceae	*Anarthria gracilis*		G1	2-10	0.4
Proteaceae	*Banksia repens*		M3	<2T	0.2
Fabaceae	*Daviesia incrassata*		M2	<2T	1.1

Site	Q5	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 19/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	623447.22 mE 6164348 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Low Mallee*			
Landform: Plain	**Drainage:** Good		
Soil Colour & Type: Grey Loamy Sand			
Vegetation Condition: Excellent (2) – Very Good (3)			
Disturbances: Infrastructure			
Fire Age & Intensity: Moderate 1 - 5 yr – few trees killed, most resprouting			
Bare Ground: -	**% Logs:** -	**% Twigs:** <10	

% Leaves: 10-30	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -			**% Rocks (>30cm):** -	
Stratum %Cover	**U1:** <2	**U2**:	**M1:** 2-10	**M2:** 30-70	**M3:**	**G1:** 10-30	**G2:** <2
Height (m)	2-3		1-2	0.2-0.6		0.2-0.5	0.05-0.4

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus marginata*		U1	<2T	2
Myrtaceae	*Eucalyptus adesmophloia*		U1	<2T	3
Proteaceae	*Hakea trifurcata*		M1	2-10	1.3
Proteaceae	*Hakea ferruginea*		M1	2-10	1.2
Fabaceae	*Acacia leioderma*		M1	<2T	1
Santalaceae	*Exocarpos sparteus*		M1	<2T	1
Proteaceae	*Banksia dryandroides*		M2	2-10	0.6
Fabaceae	*Gastrolobium bracteolosum*		M2	10-30	0.5
Fabaceae	*Daviesia incrassata*		M2	2-10	0.6
Fabaceae	*Acacia chrysocephala*		M2	2-10	0.4
Myrtaceae	*Kunzea recurva*		M2	<2N	0.4
Proteaceae	*Petrophile squamata*		M2	<2N	0.3
Thymelaeaceae	*Pimelea lehmanniana* subsp. *lehmanniana*		M2	<2T	0.3
Goodeniaceae	*Scaevola striata*		G2	<2N	0.1
Fabaceae	*Gompholobium marginatum*		M2	<2N	0.1
Poaceae	*Austrostipa hemipogon*		G1	<2T	0.4
Lauraceae	*Cassytha racemosa*		M2	<2T	0.3
Restionaceae	*Mesomelaena stygia* subsp. *stygia*		G1	<2N	0.3
Restionaceae	*Mesomelaena gracilipes*		G1	<2N	0.3
Stylidiaceae	*Stylidium rupestre*		G2	<2N	0.05
Poaceae	*Neurachne alopecuroidea*		G1	<2N	0.1
Goodeniaceae	*Lechenaultia formosa*		G2	<2T	0.2
Restionaceae	*Desmocladus fasciculatus*		G1	2-10	0.1
Fabaceae	*Gompholobium polymorphum*		M2	<2N	0.3
Ericaceae	*Astroloma prostratum*		M2	<2T	0.2
Restionaceae	*Hypolaena fastigiata*		G1	<2T	0.2

Dilleniaceae	*Hibbertia gracilipes*		M2	<2N	0.3
Goodeniaceae	*Dampiera juncea*		G2	<2T	0.1
Proteaceae	*Grevillea fasciculata*		M2	<2T	0.3
Fabaceae	*Daviesia alternifolia*		M2	<2T	0.2
Myrtaceae	*Darwinia vestita*		M2	<2T	0.4
Fabaceae	*Daviesia trigonophylla*		M2	<2T	0.4
Asparagaceae	*Thysanotus pseudojunceus*		G2	<2T	0.3
Cyperaceae	*Schoenus laevigatus*		G1	2-10	0.3
Proteaceae	*Banksia armata*		M2	<2T	0.3
Ericaceae	*Leucopogon glabellus*		M2	<2N	0.2
Asparagaceae	*Lomandra nutans*		G1	<2T	0.2
Thymelaeaceae	*Pimelea brevifolia subsp. brevifolia*		M2	<2T	0.3
Loganiaceae	*Logania serpyllifolia* subsp. *serpyllifolia*		G2	<2T	0.05
Proteaceae	*Synaphea petiolaris* subsp *petiolaris*		M2	<2T	0.2
Restionaceae	*Harperia lateriflora*		G1	2-10	0.1
Anarthriaceae	*Anarthria gracilis*		G1	<2N	0.2
Casuarinaceae	*Allocasuarina thuyoides*		M2	<2T	0.2
Hemerocallidaceae	*Agrostocrinum hirsutum*		G2	<2T	0.4
Proteaceae	*Banksia arctotidis*		M2	<2N	0.1
Cyperaceae	*Schoenus caespititius*		G1	<2N	0.3
Cyperaceae	*Lepidosperma striatum*		G1	<2N	0.3
Ericaceae	*Astroloma pallidum*		M2	<2T	0.1
Fabaceae	*Pultenaea verruculosa*		M2	<2N	0.1
Dilleniaceae	*Hibbertia lineata*		M2	<2T	0.2
Fabaceae	*Gompholobium burtonioides*		M2	<2N	0.2
Casuarinaceae	*Allocasuarina microstachya*		M2	<2T	0.3
Proteaceae	*Petrophile phylicoides*		M2	<2T	0.3
Myrtaceae	*Melaleuca suberosa*		M2	<2N	0.4
Myrtaceae	*Taxandria spathulata*		M2	<2N	0.3
Goodeniaceae	*Dampiera alata*		G2	<2N	0.05
Ericaceae	*Lysinema ciliatum*		M2	<2T	0.3
Proteaceae	*Banksia gardneri* var. *gardneri*		M2	2-10	0.1
Santalaceae	*Leptomeria squarrulosa*		M2	<2T	0.05
Myrtaceae	*Melaleuca violacea*		M2	<2N	0.5
Proteaceae	*Isopogon longifolius*		M2	<2T	0.4
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M2	<2T	0.9
Cyperaceae	*Tetraria octandra*		G1	<2T	0.3
Proteaceae	*Banksia repens*		M2	<2T	0.1
Cyperaceae	*Schoenus obtusifolius*		G1	<2T	0.2
Proteaceae	*Hakea prostrata*	0	M2	<2T	0.4

Rutaceae	*Boronia spathulata*	0	M2	<2T	0.2
Haemodoraceae	*Conostylis setigera*	0	G2	<2N	0.05
Poaceae	*Amphipogon debilis*	0	G1	<2T	0.1
Restionaceae	*Chordifex sphacelatus*	0	G1	<2N	0.3
Proteaceae	*Petrophile divaricata*	0	M2	<2T	0.1
Proteaceae	*Hakea corymbosa*	0	M2	<2T	0.6
Restionaceae	*Mesomelaena tetragona*	0	G1	<2T	0.4

Site	Q6	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 19/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	622270.94 mE 6162015.8 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: Mixed Mallee			
Landform: Slope - middle	**Drainage:** Good - impeded		
Soil Colour & Type: Yellow - Grey Sandy Loam			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure, Dieback			
Fire Age & Intensity: Old > 5 yr – No damage			
Bare Ground: -	**% Logs:** -	**% Twigs:** 2-10	

% Leaves: -	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -	**% Rocks (>30cm):** -

Stratum %Cover	**U1:** 10-30	**U2**:	**M1:** 2-10	**M2:** 10-30	**M3:** 2-10	**G1:** 30-70	**G2:** <2
Height (m)	4-5 (5)		2-2.5 (2)	1-2 (1.6)	0.2-1 (0.5)	0.2 – 0.6 (0.3)	0.05 – 0.4 (0.1)

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus preissiana* subsp. *preissiana*		U1	2-10	4
Myrtaceae	*Eucalyptus lehmannii*		U1	10-30	5
Proteaceae	*Hakea trifurcata*		M1	2-10	2.5
Myrtaceae	*Eucalyptus uncinata*		U1	<2T	5
Myrtaceae	*Taxandria spathulata*		M2	2-10	1.7
Myrtaceae	*Agonis theiformis*		M2	2-10	1.6
Proteaceae	*Hakea cucullata*		M2	<2T	1.5
Iridaceae	*Patersonia maxwellii*		G2	<2N	0.1
Orchidaceae	*Caladenia flava* subsp. *flava*		G2	<2T	0.05
Fabaceae	*Acacia leioderma*		M3	<2T	0.6
Proteaceae	*Hakea corymbosa*		M3	<2N	0.8
Fabaceae	*Gastrolobium velutinum*		M3	<2T	0.4
Dilleniaceae	*Hibbertia gracilipes*		M3	<2N	0.3
Proteaceae	*Synaphea petiolaris* subsp *petiolaris*		M3	<2T	0.3
Fabaceae	*Gompholobium polymorphum*		M3	<2N	0.7
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M3	<2T	0.8
Loganiaceae	*Logania micrantha*		G2	<2T	0.1
Colchicaceae	*Burchardia congesta*		G2	<2T	0.5
Goodeniaceae	*Dampiera juncea*		G2	<2T	0.3
Myrtaceae	*Melaleuca bracteosa*		M3	<2T	0.7
Rutaceae	*Boronia spathulata*		M3	<2T	0.3
Proteaceae	*Banksia tenuis var. tenuis*		M3	2-10	0.9
Fabaceae	*Bossiaea praetermissa*		M3	<2T	0.3
Proteaceae	*Banksia dryandroides*		M3	2-10	0.4
Anarthriaceae	*Anarthria prolifera*		G1	<2N	0.3

Cyperaceae	*Lepidosperma pubisquameum*		G1	2-10	0.5
Cyperaceae	*Tetraria octandra*		G1	2-10	0.4
Restionaceae	*Mesomelaena tetragona*		G1	<2T	0.5
Restionaceae	*Hypolaena fastigiata*		G1	2-10	0.2
Cyperaceae	*Schoenus obtusifolius*		G1	<2N	0.4
Poaceae	*Neurachne alopecuroidea*		G1	<2N	0.2
Restionaceae	*Desmocladus fasciculatus*		G1	2-10	0.1
Anarthriaceae	*Anarthria gracilis*		G1	2-10	0.3
Haemodoraceae	*Conostylis setigera*		G2	<2N	0.05
Proteaceae	*Petrophile divaricata*		M3	<2T	0.5
Myrtaceae	*Melaleuca suberosa*		M3	<2T	0.4
Thymelaeaceae	*Pimelea brevifolia* subsp. *brevifolia*		M3	<2T	0.2
Asparagaceae	*Thysanotus pseudojunceus*		M3	<2T	0.3
Pittosporaceae	*Billardiera variifolia*		M3	<2T	CLIMB
Cyperaceae	*Tetraria sp*. Jarrah Forest (R. Davis 7391)		G1	2-10	0.2
Cyperaceae	*Gahnia ancistrophylla*		G1	<2N	0.4
Restionaceae	*Chordifex sphacelatus*		G1	<2N	0.3
Proteaceae	*Banksia armata*		M3	<2T	0.3
Stylidiaceae	*Stylidium rupestre*		G2	<2N	0.05
Myrtaceae	*Melaleuca subtrigona*		M3	<2T	0.4
Proteaceae	*Persoonia striata*		M3	<2T	0.3
Haemodoraceae	*Haemodorum simplex*		G2	<2T	0.2
Dasypogonaceae	*Calectasia grandiflora*		M3	<2T	0.2
Asparagaceae	*Chamaexeros serra*		G2	<2N	0.1
Restionaceae	*Chordifex isomorphus*		G1	2-10	0.1
Stylidiaceae	*Stylidium hirsutum*		G2	<2T	0.1
Droseraceae	*Drosera* sp (climbing) (nf)		G2	<2T	0.1
Asparagaceae	*Lomandra nutans*		G1	<2T	0.4
Fabaceae	*Acacia subcaerulea*		M3	<2T	0.8
Orchidaceae	*Thelymitra* sp (nf)		G2	<2T	0.3
Restionaceae	*Harperia lateriflora*		G1	<2N	0.1
Apiaceae	*Xanthosia singuliflora*		G2	<2T	0.05

Site	Q7	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 19/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	622270.94 mE 6162015.8 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Banksia Shrubland*			
Landform: Slope - middle	**Drainage:** Good		
Soil Colour & Type: Grey Sand			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure, Dieback			
Fire Age & Intensity: Old > 5 yr – No damage			
Bare Ground: -	**% Logs:** -	**% Twigs:** 2-10	

% Leaves: -10-30	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -			**% Rocks (>30cm):** -	
Stratum %Cover	**U1:** 10-30	**U2**:	**M1:** 30-70	**M2:** 10-30	**M3:** 2-10	**G1:** 70+	**G2:** 10-30
Height (m)	4-6		3-4	1-2	<1	0.2 – 0.6	0.05 – 0.4

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus marginata*		U1	10-30	7
Proteaceae	*Banksia baxteri*		M1	30-70	4
Proteaceae	*Hakea corymbosa*		M1	2-10	2.5
Myrtaceae	*Melaleuca striata*		M2	2-10	1-2
Myrtaceae	*Agonis theiformis*		M2	2-10	1-2
Myrtaceae	*Taxandria spathulata*		M2	<2N	1-2
Anarthriaceae	*Anarthria scabra*		G1	>70	0.5
Haemodoraceae	*Haemodorum simplex*		G2	<2T	0.4
Dasypogonaceae	*Dasypogon bromeliifolius*		G2	10-30	0.4
Proteaceae	*Isopogon longifolius*		M3	<2T	0.5
Pittosporaceae	*Billardiera variifolia*		M3	<2T	CLIMB
Proteaceae	*Adenanthos cuneatus*		M3	<2N	0.5
Proteaceae	*Stirlingia latifolia*		M3	<2T	0.4
Myrtaceae	*Darwinia vestita*		M3	<2T	0.3
Proteaceae	*Banksia dryandroides*		M3	<2T	0.5
Proteaceae	*Banksia mucronulata*		M3	<2T	0.5
Rutaceae	*Boronia spathulata*		M3	<2T	0.3
Proteaceae	*Banksia sphaerocarpa* var. *sphaerocarpa*		M3	<2T	1.2
Restionaceae	*Hypolaena exsulca*		G1	<2N	0.3
Restionaceae	*Hypolaena fastigiata*		G1	<2N	0.2
Anarthriaceae	*Anarthria prolifera*		G1	2-10	0.4
Proteaceae	*Banksia nutans*		M2	2-10	0.6
Goodeniaceae	*Dampiera juncea*		G2	<2T	0.3
Cyperaceae	*Cyathochaeta equitans*		G1	2-10	0.5
Pittosporaceae	*Billardiera fusiformis*		M3	<2T	0.7
Fabaceae	*Acacia subcaerulea*		M3	<2T	0.4
Fabaceae	*Acacia browniana* var. *browniana*		M3	<2T	0.4

Proteaceae	*Isopogon heterophyllus*		M3	<2T	1.6
Proteaceae	*Isopogon attenuatus*		M3	<2N	0.5
Myrtaceae	*Melaleuca thymoides*		M3	<2T	0.5
Droseraceae	*Drosera sp* (climbing) (nf)		G2	<2T	CLIMB
Myrtaceae	*Hypocalymma strictum*		M3	<2N	0.5
Proteaceae	*Banksia attenuata*		M1	<2T	2
Cyperaceae	*Schoenus laevigatus*		G1	<2N	0.4
Proteaceae	*Conospermum caeruleum*		M3	<2T	0.7

Site	Q8	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 20/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	616079 mE 6147776 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Hakea spp complex*			
Landform: Slope – upper / Rise	**Drainage:** Good - impeded		
Soil Colour & Type: Yellow - Grey Sandy Gravel			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure, Dieback			
Fire Age & Intensity: Moderate 1- 5 yr – few trees killed, most resprouting			
Bare Ground: 2-10	**% Logs:** 2-10	**% Twigs:** 2-10	

% Leaves: 2-10	**% Rocks (< 2cm):** <2	**% Rocks (2-30 cm):** -			**% Rocks (>30cm):** -	
Stratum %Cover	**U1:** <2	**U2**:	**M1:** 30-70	**M2:** 30-70	**M3:**	**G1:** 10-30	**G2:** 2-10
Height (m)	4		1-2	0.4-1		0.1 – 0.6	0.05 – 0.4

Family	Taxon	Status	Stratum	Cover %	Height (m)
Proteaceae	*Hakea cucullata*		M1	30-70	1.7
Proteaceae	*Banksia mucronulata*		M1	10-30	1.5
Myrtaceae	*Eucalyptus staeri*		U1	<2T	4
Apiaceae	*Xanthosia rotundifolia*		G2	2-10	0.3
Myrtaceae	*Agonis theiformis*		M2	<2N	0.7
Myrtaceae	*Melaleuca striata*		M2	2-10	0.6
Myrtaceae	*Taxandria spathulata*		M2	2-10	0.6
Proteaceae	*Petrophile divaricata*		M2	2-10	0.5
Proteaceae	*Grevillea fasciculata*		M2	<2N	0.6
Proteaceae	*Hakea lasiantha*		M2	<2N	1
Fabaceae	*Sphaerolobium drummondii*		M2	<2T	0.2
Ericaceae	*Leucopogon gibbosus*		M2	<2T	0.2
Fabaceae	*Pultenaea verruculosa*		M2	<2N	0.4
Fabaceae	*Acacia browniana* var. *browniana*		M2	2-10	0.5
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M2	<2T	0.9
Stylidiaceae	*Stylidium junceum*		G2	<2N	0.2
Ericaceae	*Sphenotoma dracophylloides*		G2	<2T	0.2
Goodeniaceae	*Dampiera juncea*		G2	<2T	0.1
Fabaceae	*Sphaerolobium macranthum*		G2	<2N	0.2
Iridaceae	*Patersonia lanata forma lanata*		G2	<2T	0.3
Droseraceae	*Drosera platypoda*		G2	<2N	0.05
Apiaceae	*Xanthosia singuliflora*	0	G2	<2N	0.1
Cyperaceae	*Tetraria octandra*	0	G1	2-10	0.3
Restionaceae	*Mesomelaena stygia* subsp. *stygia*		G1	<2N	0.2
Restionaceae	*Lepyrodia hermaphrodita*		G1	<2N	0.05
Asparagaceae	*Lomandra caespitosa*		G2	<2N	0.2

Anarthriaceae	*Anarthria prolifera*		G1	2-10	0.3
Goodeniaceae	*Dampiera linearis*		G2	<2N	0.1
Myrtaceae	*Taxandria parviceps*		M3	<2T	0.3
Rutaceae	*Boronia spathulata*		M3	<2N	0.2
Cyperaceae	*Schoenus caespititius*		G1	2-10	0.4
Haemodoraceae	*Conostylis setigera*		G2	<2N	0.2
Myrtaceae	*Kunzea recurva*		M3	<2T	0.8
Cyperaceae	*Lepidosperma striatum*		G1	<2N	0.4
Cyperaceae	*Cyathochaeta equitans*		G1	<2N	0.3
Proteaceae	*Synaphea polymorpha*		M3	<2T	0.3
Dilleniaceae	*Hibbertia gracilipes*		M3	<2N	0.3
Fabaceae	*Hovea trisperma*		M3	<2T	0.1
Orchidaceae	*Thelymitra graminea*		G2	<2T	0.1
Orchidaceae	*Thelymitra crinita*		G2	<2T	0.02
Cyperaceae	*Schoenus obtusifolius*		G1	<2N	0.3
Restionaceae	*Desmocladus fasciculatus*		G1	<2N	0.1
Ericaceae	*Sphenotoma gracilis*		M3	<2N	0.3
Cyperaceae	*Tetraria* sp. Jarrah Forest (R. Davis 7391)		G1	2-10	0.6
Fabaceae	*Gompholobium knightianum*		M3	<2N	0.4
Asparagaceae	*Thysanotus multiflorus*		G2	<2N	0.1
Droseraceae	*Drosera dichrosepala*		G2	<2T	0.1
Stylidiaceae	*Stylidium daphne*	P2	G2	<2T	0.05
Fabaceae	*Hovea chorizemifolia*		M3	<2T	0.05
Asparagaceae	*Lomandra sp (nf)*		G2	<2T	0.2
Cyperaceae	*Lepidosperma squamatum*		G1	<2N	0.1
Restionaceae	*Chordifex isomorphus*		G1	<2N	0.2
Anarthriaceae	*Anarthria gracilis*		G1	<2N	0.2
Cyperaceae	*Lepidosperma drummondii*		G1	2-10	0.3
Thymelaeaceae	*Pimelea longiflora subsp. longiflora*		M3	<2N	0.4

Site	Q9	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 20/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	615468 mE 6147378 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Low heath*			
Landform: flat	**Drainage:** Good - impeded		
Soil Colour & Type: Grey Sand			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure, Dieback			
Fire Age & Intensity: Old > 5 yrs			
Bare Ground: 10-30	**% Logs:** -	**% Twigs:** 2-10	

% Leaves: 2-10	**% Rocks (< 2cm):** -		**% Rocks (2-30 cm):** -		**% Rocks (>30cm):** -	
Stratum %Cover	**U1:**	**U2**:	**M1:** 2-10	**M2:** 2-10	**M3:**	**G1:** 30-70	**G2:** 2-10
Height (m)			0.5-1	<0.5		0.05-0.4	0.01 – 0.2

Family	Taxon	Status	Stratum	Cover %	Height (m)
Proteaceae	*Adenanthos obovatus*		M1	2-10	1
Fabaceae	*Jacksonia spinosa*		M1	2-10	0.6
Myrtaceae	*Melaleuca thymoides*		M1	<2T	0.7
Fabaceae	*Daviesia incrassata*		M1	2-10	0.8
Myrtaceae	*Actinodium* sp. Fitzgerald River (H.A. Froebe & R. Classen 810)		M2	<2N	0.5
Thymelaeaceae	*Pimelea longiflora* subsp. *longiflora*		M2	<2N	0.5
Proteaceae	*Petrophile rigida*		M2	<2N	0.3
Cyperaceae	*Schoenus efoliatus*		G1	10-30	0.8
Restionaceae	*Mesomelaena gracilipes*		G1	<2N	0.4
Anarthriaceae	*Anarthria scabra*		G1	10-30	0.6
Ericaceae	*Leucopogon elegans* subsp. *elegans*		M2	<2N	0.3
Stylidiaceae	*Stylidium scandens*		G2	<2N	0.2
Myrtaceae	*Verticordia ? harveyi*		M3	<2T	0.2
Ericaceae	*Lysinema conspicuum*		M3	<2N	0.2
Fabaceae	*Sphaerolobium pubescens*		M3	<2N	0.2
Myrtaceae	*Kunzea recurva*		M3	<2N	0.1
Iridaceae	*Patersonia maxwellii*		G2	<2T	0.05
Lauraceae	*Cassytha glabella*		G2	<2N	CLIMB
Restionaceae	*Hypolaena exsulca*		G1	<2N	0.2
Droseraceae	*Drosera platypoda*		G2	<2N	0.01
Apiaceae	*Actinotus glomeratus*		G2	<2N	0.02
Goodeniaceae	*Dampiera linearis*		M2	<2T	0.1
Rutaceae	*Boronia spathulata*		M2	<2N	0.1
Droseraceae	*Drosera subhirtella*		G2	<2N	0.01
Myrtaceae	*Pericalymma spongiocaule*		M2	<2T	0.2
Cyperaceae	*Schoenus subflavus* subsp long		G1	<2N	0.05

	leaves (KL Wilson 2865)				
Asparagaceae	*Lomandra sonderi*		G2	<2N	0.3
Proteaceae	*Petrophile acicularis*		M2	<2N	0.4
Apiaceae	*Platysace pendula*		G2	<2N	0.1
Dasypogonaceae	*Dasypogon bromeliifolius*		G2	<2N	0.2
Cyperaceae	*Schoenus caespititius*		G1	2-10	0.3
Restionaceae	*Mesomelaena stygia* subsp. *stygia*		G1	<2N	0.3
Stylidiaceae	*Stylidium hirsutum*		G2	<2N	0.1
Ericaceae	*Andersonia simplex*		M2	<2N	0.1
Stylidiaceae	*Stylidium amoenum*		G2	<2N	0.01
Restionaceae	*Hypolaena fastigiata*		G1	<2N	0.1

Site	Q10	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 20/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	615468 mE 6147378 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Hakea spp complex*			
Landform: Slope - middle	**Drainage:** Good - impeded		
Soil Colour & Type: Yellow – Grey Sandy Gravel			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure, Dieback			
Fire Age & Intensity: Old > 5 yrs			
Bare Ground: 10-30	**% Logs:** -	**% Twigs:** 2-10	

% Leaves: 2-10	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -			**% Rocks (>30cm):** -	
Stratum %Cover	**U1:** 10-30	**U2**:	**M1:** 30-70	**M2:** 2-10	**M3:** <2	**G1:** 30-70	**G2:** >2
Height (m)	5		3-4	1-2	0.2-1	0.1-0.8	0.05-0.6

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus marginata*		U1	10-30	5
Proteaceae	*Hakea lasiantha*		M1	10-30	4
Proteaceae	*Hakea ferruginea*		M1	10-30	3
Myrtaceae	*Taxandria parviceps*		M1	2-10	3
Dasypogonaceae	*Kingia australis*		M2	2-10	1.7
Ericaceae	*Sphenotoma gracilis*		M2	<2T	1.9
Cyperaceae	*Tetraria octandra*		G1	2-10	0.8
Myrtaceae	*Agonis theiformis*		M2	<2N	1.9
Proteaceae	*Hakea ceratophylla*		M3	<2N	0.9
Anarthriaceae	*Anarthria prolifera*		G1	2-10	0.6
Cyperaceae	*Lepidosperma drummondii*		G1	10-30	0.9
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M3	<2N	0.9
Restionaceae	*Chordifex isomorphus*		G1	2-10	0.5
Goodeniaceae	*Dampiera juncea*		G2	<2N	0.1
Ericaceae	*Astroloma tectum*		M3	<2T	0.05
Proteaceae	*Banksia repens*		M3	<2T	0.2
Restionaceae	*Desmocladus fasciculatus*		G1	<2N	0.1
Cyperaceae	*Cyathochaeta equitans*		G1	<2T	1.2
Myrtaceae	*Taxandria spathulata*		M2	2-10	1.5
Droseraceae	*Drosera sulphurea*		G2	<2T	0.4
Casuarinaceae	*Allocasuarina humilis*		M3	<2T	0.6
Haemodoraceae	*Conostylis setigera*		G2	<2N	0.05
Fabaceae	*Pultenaea verruculosa*		M3	<2T	0.1
Cyperaceae	*Schoenus obtusifolius*		G1	<2T	0.2
Lauraceae	*Cassytha glabella*		G2	<2T	CLIMB
Fabaceae	*Hovea trisperma*		M3	<2T	0.1
Cyperaceae	*Schoenus caespititius*		G1	<2N	0.3
Stylidiaceae	*Stylidium scandens*		G2	<2T	0.6

Rutaceae	*Boronia spathulata*		G2	<2T	0.5
Dilleniaceae	*Hibbertia gracilipes*		M3	<2N	0.2
Fabaceae	*Acacia browniana* var. *browniana*		M3	<2T	0.4
Cyperaceae	*Tetraria* sp. Jarrah Forest (R. Davis 7391)		G1	2-10	0.3
Lindsaeaceae	*Lindsaea linearis*		G2	<2N	0.2
Iridaceae	*Patersonia occidentalis*		G2	<2T	0.4
Proteaceae	*Banksia mucronulata*		M3	<2N	0.7
Fabaceae	*Hovea chorizemifolia*		M3	<2T	0.2
Myrtaceae	*Kunzea recurva*		M3	<2T	0.4

Site	Q11	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 20/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	620214 mE 6154158 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: E. falcata / goniantha *Mallee*			
Landform: Slope - lower	**Drainage:** Good		
Soil Colour & Type: Brown - Yellow Sandy Loam			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure			
Fire Age & Intensity: Old > 5 yrs			
Bare Ground: -	**% Logs:** 2	**% Twigs:** 2-10	

% Leaves: 30-70	% Rocks (< 2cm): -	% Rocks (2-30 cm): -	% Rocks (>30cm): -

Stratum %Cover	U1: 30-70	U2:	M1: 10-30	M2: 2-10	M3:	G1: 10-30	G2: 30-70
Height (m)	8-10		2-4	1-2		0.1-0.6	0.05-0.4

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus goniantha*		U1	30-70	8-10
Fabaceae	*Templetonia retusa*		M1	10-30	2-4
Fabaceae	*Acacia leioderma*		M2	2-10	1-2
Ranunculaceae	*Clematis pubescens*		M2	2-10	CLIMB
Pittosporaceae	*Billardiera fusiformis*		M2	<2T	CLIMB
Rhamnaceae	*Spyridium majoranifolium*		M2	<2T	1-2
Rubiaceae	*Opercularia hispidula*		G2	10-30	0.4
Cyperaceae	*Lepidosperma striatum*		G1	2-10	0.5
Hemerocallidaceae	*Dianella revoluta*		G2	<2T	0.2
Cyperaceae	*Lepidosperma tenue*		G1	2-10	0.6

Site	Q12	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 21/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	620592 mE 615725 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Hakea spp Complex (patch Taxandria spathulata Shrubland)*			
Landform: Slope - lower	**Drainage:** Good		
Soil Colour & Type: Grey Sand			
Vegetation Condition: Very Good (3)			
Disturbances: Infrastructure, Dieback – dead Banksia and Hakea spp			
Fire Age & Intensity: Old > 5 yrs			
Bare Ground: 2-10	**% Logs:** -	**% Twigs:** 2-10	

% Leaves: 2-10	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -			**% Rocks (>30cm):** -	
Stratum %Cover	**U1:** 2-10	**U2**:	**M1:** 2-10	**M2:** 30-70	**M3:** <2	**G1:** 30-70	**G2:** <2
Height (m)	4-6		2-4	1-2	<1	0.1-0.5	0.05-0.4

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus marginata*		U1	2-10	6
Myrtaceae	*Taxandria spathulata*		M1	2-10	2
Myrtaceae	*Melaleuca striata*		M1	<2T	2.5
Myrtaceae	*Taxandria spathulata*		M2	10-30	1.5
Myrtaceae	*Melaleuca thymoides*		M2	2-10	1.1
Myrtaceae	*Beaufortia anisandra*		M2	2-10	1.2
Myrtaceae	*Agonis theiformis*		M2	<2N	1.1
Myrtaceae	*Melaleuca striata*		M2	<2N	1
Dilleniaceae	*Hibbertia gracilipes*		M3	<2N	0.5
Dilleniaceae	*Hibbertia recurvifolia*		M3	<2T	0.5
Fabaceae	*Acacia browniana* var. *browniana*		M3	<2T	0.4
Proteaceae	*Hakea ferruginea*		M2	2-10	1.6
Fabaceae	*Gompholobium knightianum*		G2	<2T	0.2
Restionaceae	*Mesomelaena tetragona*		G1	<2N	0.5
Fabaceae	*Hovea trisperma*		M3	<2N	0.3
Restionaceae	*Desmocladus fasciculatus*		G1	2-10	0.1
Goodeniaceae	*Dampiera juncea*		G2	<2N	0.2
Fabaceae	*Bossiaea praetermissa*		M3	<2N	0.2
Proteaceae	*Stirlingia latifolia*		M3	<2N	0.3
Rutaceae	*Boronia spathulata*		M3	<2N	0.3
Pittosporaceae	*Billardiera variifolia*		G2	<2T	0.8
Restionaceae	*Chordifex isomorphus*		G1	2-10	0.6
Poaceae	*Amphipogon sp (nf)*		G1	2-10	0.2
Apiaceae	*Xanthosia huegelii*		G2	<2T	0.05
Cyperaceae	*Lepidosperma* aff *squamatum*		G1	<2T	0.4
Cyperaceae	*Schoenus brevisetis*		G1	<2N	0.1
Restionaceae	*Lyginia barbata*		G1	<2N	0.3
Cyperaceae	*Tricostularia compressa*		G1	2-10	0.3

Cyperaceae	*Lepidosperma drummondii*		G1	<2T	0.4
Anarthriaceae	*Anarthria prolifera*		G1	2-10	0.3
Cyperaceae	*Tetraria* sp. Jarrah Forest (R. Davis 7391)		G1	2-10	0.4
Restionaceae	*Mesomelaena stygia* subsp. *stygia*		G1	<2N	0.3
Anarthriaceae	*Anarthria scabra*		G1	2-10	0.4
Haemodoraceae	*Conostylis setigera*		G2	<2N	0.1
Proteaceae	*Grevillea fasciculata*		M3	<2T	0.6
Proteaceae	*Banksia sphaerocarpa* var. *sphaerocarpa*		M3	<2T	0.7
Anarthriaceae	*Anarthria gracilis*		G1	2-10	0.3
Casuarinaceae	*Allocasuarina humilis*		M3	<2T	0.50
Fabaceae	*Hovea trisperma*		M3	<2N	0.5
Restionaceae	*Chordifex sphacelatus*		G1	<2N	0.3
Fabaceae	*Gastrolobium bracteolosum*		M3	<2T	0.4
Dasypogonaceae	*Dasypogon bromeliifolius*		G2	<2N	0.4
Restionaceae	*Hypolaena fastigiata*		G1	<2T	0.2
Colchicaceae	*Burchardia congesta*		G2	<2T	0.4
Orchidaceae	*Thelymitra* sp (nf)		G2	<2T	0.3
Goodeniaceae	*Lechenaultia tubiflora*		G2	<2T	0.2
Fabaceae	*Gompholobium ovatum*		M3	<2T	0.1
Myrtaceae	*Eucalyptus uncinata*		M1	<2T	2
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M2	<2T	1.2
Cyperaceae	*Tetraria octandra*		G1	<2T	0.4
Lindsaeaceae	*Lindsaea linearis*		G2	<2T	0.1

Site	Q13	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 21/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	621299 mE 6158246 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Hakea spp Complex*			
Landform: Slope - lower	**Drainage:** Good		
Soil Colour & Type: Grey Sand Loam			
Vegetation Condition: Excellent (2) - Very Good (3)			
Disturbances: Infrastructure, Dieback			
Fire Age & Intensity: Old > 5 yrs			
Bare Ground: -	**% Logs:** -	**% Twigs:** 2-10	

% Leaves: 2-10	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -			**% Rocks (>30cm):** -	
Stratum %Cover	**U1:** 2-10	**U2**:	**M1:** 10-30	**M2:** 30-70	**M3:** <2	**G1:** 30-70	**G2:** <2
Height (m)	4-5		2-4	1-2	<1	0.1-0.5	0.05-0.2

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus marginata*		U1	2-10	6
Loranthaceae	*Nuytsia floribunda*		M1	<2T	4
Proteaceae	*Hakea trifurcata*		M1	10-30	3.5
Proteaceae	*Banksia grandis*		M1	<2T	2
Proteaceae	*Hakea ferruginea*		M2	2-10	1.8
Myrtaceae	*Taxandria spathulata*		M2	2-10	1.5
Proteaceae	*Banksia mucronulata*		M2	2-10	1.2
Myrtaceae	*Agonis theiformis*		M1	<2N	2
Fabaceae	*Gompholobium venustum*		M2	2-10	1.6
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M3	2-10	0.8
Myrtaceae	*Melaleuca striata*		M3	2-10	0.4
Dilleniaceae	*Hibbertia recurvifolia*		M3	<2N	0.4
Cyperaceae	*Tetraria octandra*		G1	2-10	0.5
Pittosporaceae	*Billardiera variifolia*		M3	<2T	0.7
Cyperaceae	*Tetraria* sp. Jarrah Forest (R. Davis 7391)		G1	30-70	0.6
Dilleniaceae	*Hibbertia gracilipes*		M3	<2N	0.2
Goodeniaceae	*Dampiera juncea*		G2	<2N	0.3
Cyperaceae	*Lepidosperma* aff *squamatum*		G1	<2N	0.4
Anarthriaceae	*Anarthria gracilis*		G1	2-10	0.4
Rutaceae	*Boronia crenulata*		M3	<2N	0.6
Restionaceae	*Desmocladus fasciculatus*		G1	<2N	0.1
Casuarinaceae	*Allocasuarina humilis*		M3	<2T	0.5
Rutaceae	*Boronia spathulata*		G2	<2T	0.3
Poaceae	*Briza maxima*		G1	<2N	0.1
Poaceae	*Amphipogon* sp (nf)		G1	<2N	0.1
Anarthriaceae	*Anarthria prolifera*		G1	<2N	0.6
Cyperaceae	*Schoenus caespititius*		G1	<2N	0.4

Haemodoraceae	*Conostylis setigera*		G2	<2N	0.2
Iridaceae	*Patersonia occidentalis*		G1	<2T	0.3
Myrtaceae	*Darwinia vestita*		M3	<2N	0.5

Site	Q14	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 21/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	620860 mE 6158543 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Banksia Woodland*			
Landform: Hill Crest	**Drainage:** Good		
Soil Colour & Type: Grey Sand			
Vegetation Condition: Very Good (3)			
Disturbances: Infrastructure, Dieback			
Fire Age & Intensity: Old > 5 yrs			
Bare Ground: <2	**% Logs:** -	**% Twigs:** <2	

% Leaves: <2	% Rocks (< 2cm): -	% Rocks (2-30 cm): -	% Rocks (>30cm): -

Stratum %Cover	U1: 2-10	U2:	M1: 2-10	M2: 10-30	M3: 2-10	G1: 30-70	G2: <2
Height (m)	4-5		2-4	1-2	<1	0.1-0.5	0.05-0.2

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	Eucalyptus marginata	0	U1	2-10	4-5
Proteaceae	Banksia coccinea	0	M1	2-10	3
Proteaceae	Hakea corymbosa	0	M1	<2N	2
Myrtaceae	Melaleuca striata	0	M2	10-30	1.3
Restionaceae	Chordifex isomorphus	0	G1	2-10	0.5
Proteaceae	Banksia attenuata	0	M1	<2T	3
Proteaceae	Stirlingia latifolia	0	M3	2-10	0.7
Myrtaceae	Beaufortia empetrifolia	0	M3	<2N	0.8
Proteaceae	Petrophile rigida	0	M3	<2T	0.4
Restionaceae	Mesomelaena tetragona	0	G1	2-10	0.4
Myrtaceae	Melaleuca thymoides	0	M3	<2N	0.4
Anarthriaceae	Anarthria scabra	0	G1	10-30	0.5
Poaceae	Amphipogon sp (nf)	0	G1	2-10	0.1
Asparagaceae	Laxmannia brachyphylla	0	G2	<2N	0.05
Goodeniaceae	Lechenaultia tubiflora	0	G2	<2T	0.1
Stylidiaceae	Stylidium repens	0	G2	<2N	0.05
Proteaceae	Franklandia fucifolia	0	M3	<2N	0.7
Orchidaceae	Caladenia flava subsp. flava	0	G2	<2T	0.05
Proteaceae	Synaphea reticulata	0	M3	<2T	0.4
Restionaceae	Hypolaena fastigiata	0	G1	<2N	0.1
Droseraceae	Drosera scorpioides	0	G2	<2N	0.05
Cyperaceae	Schoenus curvifolius	0	G1	<2N	0.2
Goodeniaceae	Goodenia incana	0	G2	<2T	0.1
Proteaceae	Grevillea fasciculata	0	M3	<2T	0.3
Cyperaceae	Lepidosperma tenue	0	G1	<2T	0.2
Cyperaceae	Schoenus subfascicularis	0	G1	<2T	0.4
Restionaceae	Lyginia barbata	0	G1	<2N	0.3
Cyperaceae	Schoenus brevisetis	0	G1	<2N	0.1

Dasypogonaceae	Dasypogon bromeliifolius	0	G2	<2N	0.3
Myrtaceae	Darwinia vestita	0	M3	<2T	0.3
Haemodoraceae	Conostylis vaginata	0	G2	<2N	0.1
Asparagaceae	Laxmannia sessiliflora	0	G2	<2T	0.05
Goodeniaceae	Dampiera linearis	0	M3	<2N	0.1
Ericaceae	Andersonia simplex	0	M3	<2T	02
Proteaceae	Adenanthos cuneatus	0	M2	2-10	0.7
Ericaceae	Leucopogon elegans subsp. elegans	0	M3	<2T	0.2
Fabaceae	Hovea trisperma	0	M3	<2T	0.3
Proteaceae	Conospermum caeruleum	0	M2	<2N	1.3
Proteaceae	Isopogon longifolius	0	M2	<2T	0.4
Fabaceae	Daviesia incrassata	0	M2	<2T	0.9
Proteaceae	Banksia nutans	0	M2	2-10	1.3
Colchicaceae	Burchardia congesta	0	G2	<2N	0.4
Proteaceae	Banksia repens	0	M3	<2N	0.2
Fabaceae	Chorizema aciculare	0	G2	<2T	0.2
Proteaceae	Petrophile filifolia subsp. filifolia	0	M3	<2N	0.5
Dilleniaceae	Hibbertia recurvifolia	0	M3	<2T	0.1
Asparagaceae	Lomandra hastilis	0	G2	<2T	1.2
Xanthorrhoeaceae	Xanthorrhoea platyphylla	0	M3	<2N	0.8

Site	Q15	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 21/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	622629 mE 6163796 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *E adesmophloia over sedges*			
Landform: Plain	**Drainage:** Good		
Soil Colour & Type: Yellow - Grey Sand Loam			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure			
Fire Age & Intensity: Old > 5 yrs			
Bare Ground: 10-30	**% Logs:** -	**% Twigs:** 2-10	
% Leaves: 10-30	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -	**% Rocks (>30cm):** -

Stratum %Cover	U1: 2-10	U2:	M1: <2	M2: 30-70	M3: 10-30	G1: 10-30	G2: <2
Height (m)	4-6		1-2	0.5-1	<0.5	0.1-0.5	0.05-0.2

Family	Taxon	Status	Stratum	Cover %	Height (m)
Anarthriaceae	*Anarthria gracilis*		G1	<2N	0.4
Myrtaceae	*Agonis theiformis*		M3	<2T	0.3
Ericaceae	*Astroloma baxteri*		M3	<2T	0.1
Cyperaceae	*Schoenus caespititius*		G1	<2N	0.2
Myrtaceae	*Hypocalymma strictum*		M3	<2T	0.2
Stylidiaceae	*Stylidium preissii*		G2	<2T	0.05
Asparagaceae	*Lomandra* sp (nf)		G2	<2T	0.2
Myrtaceae	*Eucalyptus adesmophloia*		U1	10-30	2-4
Proteaceae	*Hakea prostrata*		M1	<2N	1.9
Myrtaceae	*Kunzea recurva*		M1	<2N	1.8
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M1	<2N	1.5
Proteaceae	*Hakea corymbosa*		M2	2-10	07
Myrtaceae	*Kunzea recurva*		M2	<2N	0.8
Proteaceae	*Petrophile squamata*		M2	<2T	0.6
Orchidaceae	*Caladenia flava* subsp. *flava*		G2	<2T	0.05
Dilleniaceae	*Hibbertia cunninghamii*		G2	<2T	0.1
Polygalaceae	*Comesperma virgatum*		G2	<2T	0.8
Hemerocallidaceae	*Dianella revoluta*		G2	<2N	0.6
Cyperaceae	*Lepidosperma* aff *squamatum*		G1	2-10	0.5
Poaceae	*Cyperochloa hirsuta*		G1	10-30	0.3
Cyperaceae	*Schoenus laevigatus*		G1	2-10	0.3
Cyperaceae	*Schoenus subfascicularis*		G1	2-10	0.3
Restionaceae	*Desmocladus fasciculatus*		G1	2-10	0.05
Rubiaceae	*Opercularia vaginata*		G2	2-10	0.2
Pittosporaceae	*Billardiera variifolia*		G2	<2T	0.7
Poaceae	*Amphipogon* sp (nf)		G1	<2N	0.3
Proteaceae	*Isopogon attenuatus*		M2	<2T	0.4
Stylidiaceae	*Stylidium rupestre*		G2	<2N	0.05

Thymelaeaceae	*Pimelea brevifolia subsp. brevifolia*		M2	<2T	0.4
Myrtaceae	*Melaleuca subtrigona*		M2	<2T	0.4
Restionaceae	*Harperia lateriflora*		G1	<2N	0.2
Anarthriaceae	*Anarthria gracilis*		G1	<2T	0.2
Proteaceae	*Banksia gardneri* var. *gardneri*		M2	<2T	0.3
Goodeniaceae	*Dampiera leptoclada*		M2	<2N	0.2
Haemodoraceae	*Conostylis setigera*		G2	<2N	0.05
Orchidaceae	*Thelymitra crinita*		G2	<2T	0.2
Pittosporaceae	*Billardiera venusta*		G2	<2T	0.6
Proteaceae	*Isopogon formosus*		M2	<2T	0.4
Goodeniaceae	*Dampiera alata*		G2	<2N	0.2
Rutaceae	*Boronia crenulata*		M2	<2N	0.4
Proteaceae	*Synaphea petiolaris* subsp *petiolaris*		M2	<2T	0.3
Poaceae	*Neurachne alopecuroidea*		G1	<2N	0.2
Fabaceae	*Gompholobium polymorphum*		M2	<2T	0.2
Anarthriaceae	*Anarthria prolifera*		G1	<2N	0.3
Rhamnaceae	*Spyridium majoranifolium*		M2	<2T	0.4
Lamiaceae	*Microcorys lenticularis*		M3	<2T	0.2
Elaeocarpaceae	*Tetratheca pubescens*		G2	<2T	0.3
Proteaceae	*Persoonia striata*		M2	<2T	0.2
Cyperaceae	*Tetraria octandra*		G1	<2T	0.4
Casuarinaceae	*Allocasuarina thuyoides*		M2	<2T	0.5
Cyperaceae	*Schoenus caespititius*		G1	<2N	0.05
Asparagaceae	*Chamaescilla spiralis*		G2	<2T	0.05
Restionaceae	*Mesomelaena stygia* subsp. *stygia*		G1	<2T	0.4
Colchicaceae	*Burchardia congesta*		G2	<2T	0.6
Asparagaceae	*Lomandra nutans*		G2	<2T	0.3
Fabaceae	*Gastrolobium bracteolosum*		M2	<2T	0.5
Hemerocallidaceae	*Agrostocrinum hirsutum*		G2	<2T	0.4
Myrtaceae	*Rinzia schollerifolia*		M2	<2T	0.3
Apiaceae	*Xanthosia singuliflora*		G2	<2T	0.1
Asparagaceae	*Thysanotus multiflorus*		G2	<2T	0.2
Dilleniaceae	*Hibbertia gracilipes*		M3	<2T	0.2

Site	Q16	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 22/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	622650 mE 6164301 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Melaleuca Swamp*			
Landform: Swamp	**Drainage:** Seasonal Wet		
Soil Colour & Type: Grey Sand Loam			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure, Dieback			
Fire Age & Intensity: Old > 5 yrs, minor impact on some trees			
Bare Ground: 10-30	**% Logs:** -	**% Twigs:** 2-10	

% Leaves: 10-30	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -	**% Rocks (>30cm):** -

Stratum %Cover	**U1:** 2-10	**U2**:	**M1:** <2	**M2:** 30-70	**M3:** 10-30	**G1:** 10-30	**G2:** <2
Height (m)	4-6		1-2	0.5-1	<0.5	0.1-0.4	0.05-0.2

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Melaleuca cuticularis*		U1	2-10	4-6
Fabaceae	*Acacia cyclops*		M1	<2T	1.5
Santalaceae	*Exocarpos sparteus*		M1	<2T	1.1
Fabaceae	*Acacia leioderma*		M2	<2T	1
Myrtaceae	*Kunzea recurva*		M2	30-70	1
Fabaceae	*Daviesia incrassata*		M2	2-10	1
Ericaceae	*Andersonia* aff *sprengelioides*		M3	2-10	0.2
Fabaceae	*Gastrolobium bracteolosum*		M3	10-30	0.2
Stylidiaceae	*Stylidium corymbosum*		G2	<2N	0.01
Anarthriaceae	*Anarthria laevis*		G1	<2N	0.3
Cyperaceae	*Schoenus laevigatus*		G1	2-10	0.4
Fabaceae	*Acacia chrysocephala*		M3	2-10	0.2
Poaceae	*Amphipogon* sp (nf)		G2	<2N	0.1
Goodeniaceae	*Goodenia filiformis*		G2	<2N	0.1
Celastraceae	*Stackhousia pubescens*		G2	<2T	0.2
Restionaceae	*Meeboldina kraussii*		G1	<2T	0.4
Pittosporaceae	*Billardiera fusiformis*		G2	<2N	0.4
Fabaceae	*Sphaerolobium medium*		M3	<2N	0.3
Menyanthaceae	*Ornduffia parnassifolia*		G2	<2N	0.05
Cyperaceae	*Tricostularia compressa*		G1	<2N	0.3
Restionaceae	*Lyginia barbata*		G1	<2N	0.4
Cyperaceae	*Lepidosperma* aff *squamatum*		G1	2-10	0.3
Fabaceae	*Gompholobium marginatum*		M3	<2T	0.2
Fabaceae	*Gompholobium burtonioides*		M3	<2T	0.2

Site	Q17	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 22/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	622126 mE 6163414 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Mallee*			
Landform: Plain	**Drainage:** Good		
Soil Colour & Type: Grey Sand Loam			
Vegetation Condition: Excellent (2)			
Disturbances: Dieback			
Fire Age & Intensity: Old > 5 yrs, minor impact to some trees			
Bare Ground: 2-10	**% Logs:** -	**% Twigs:** 2-10	

% Leaves: 2-10	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -	**% Rocks (>30cm):** -

Stratum %Cover	**U1:** 10-30	**U2**:	**M1:** 2-10	**M2:** 2-10	**M3:** <2	**G1:** 30-70	**G2:** <2
Height (m)	8-10		2.5	1-2	<1	0.1-0.5	0.05-0.2

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus adesmophloia*		U1	10-30	8-10
Proteaceae	*Hakea prostrata*		M1	<2T	3
Proteaceae	*Hakea florida*		M1	2-10	2.5
Proteaceae	*Hakea trifurcata*		M1	2-10	2.5
Myrtaceae	*Taxandria spathulata*		M2	2-10	1.6
Proteaceae	*Petrophile squamata*		M2	<2T	1.2
Fabaceae	*Acacia leioderma*		M2	<2T	0.6
Proteaceae	*Hakea corymbosa*		M2	2-10	0.7
Proteaceae	*Banksia gardneri* var. *gardneri*		M3	<2T	0.2
Dilleniaceae	*Hibbertia gracilipes*		M3	<2T	0.2
Proteaceae	*Petrophile divaricata*		M3	<2T	0.3
Casuarinaceae	*Allocasuarina thuyoides*		M3	<2T	0.3
Myrtaceae	*Melaleuca suberosa*		M3	<2T	0.2
Stylidiaceae	*Stylidium rupestre*		G2	<2T	0.05
Haemodoraceae	*Conostylis setigera*		G2	<2T	0.05
Droseraceae	*Drosera platystigma*		G2	<2T	0.1
Restionaceae	*Chordifex laxus*		G1	2-10	0.4
Restionaceae	*Chordifex sphacelatus*		G1	<2T	0.3
Restionaceae	*Harperia lateriflora*		G1	2-10	0.1
Cyperaceae	*Schoenus subfascicularis*		G1	<2T	0.2
Poaceae	*Neurachne alopecuroidea*		G1	<2T	0.05
Poaceae	*Amphipogon* sp (nf)		G1	<2T	0.2
Restionaceae	*Mesomelaena stygia subsp. stygia*		G1	<2T	0.2
Cyperaceae	*Lepidosperma carphoides*		G1	<2T	0.3
Cyperaceae	*Schoenus laevigatus*		G2	10-30	0.4

Orchidaceae	*Pterostylis recurva*		G1	<2T	4
Cyperaceae	*Lepidosperma* aff *squamatum*		G2	10-30	0.4
Cyperaceae	*Schoenus obtusifolius*		G1	<2T	0.2
Orchidaceae	*Thelymitra crinita*		G2	<2T	0.3
Restionaceae	*Desmocladus fasciculatus*		G1	2-10	0.1
Myrtaceae	*Astartea glomerulosa*		M3	<2T	0.3
Poaceae	*Rytidosperma setaceum*		G1	<2T	0.1
Rutaceae	*Boronia crenulata*		M3	<2T	0.2
Orchidaceae	*Caladenia flava* subsp. *flava*		G2	<2T	0.05
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M3	<2N	0.5
Pittosporaceae	*Billardiera variifolia*		M3	<2T	0.4
Anarthriaceae	*Anarthria prolifera*		MG1	<2N	0.5
Rubiaceae	*Opercularia vaginata*		G2	<2T	0.2
Proteaceae	*Isopogon attenuatus*		M3	<2T	0.4
Myrtaceae	*Agonis theiformis*		M3	<2T	0.7
Pittosporaceae	*Billardiera venusta*		M3	<2T	0.2
Poaceae	*Amphipogon debilis*		G1	2-10	0.05
Goodeniaceae	*Dampiera alata*		G2	<2T	0.2
Ericaceae	*Astroloma pallidum*		M3	<2T	0.1
Proteaceae	*Persoonia striata*		M3	<2T	0.1
Ericaceae	*Leucopogon obovatus* subsp. *revolutus*		M3	<2T	0.3
Rutaceae	*Boronia spathulata*		M3	<2T	0.3
Dasypogonaceae	*Calectasia grandiflora*		M3	<2T	0.1
Orchidaceae	*Thelymitra graminea*		G2	<2T	0.2
Poaceae	*Austrostipa hemipogon*		G1	<2T	0.4
Cyperaceae	*Tetraria* sp. Blackwood River (A.R. Annels 3043)	P3	G1	<2T	0.2
Anarthriaceae	*Anarthria gracilis*		G1	<2T	0.2
Ericaceae	*Astroloma tectum*		M3	<2T	0.3
Cyperaceae	*Schoenus caespititius*		G1	<2N	0.2

Site	Q18	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 22/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	622573 mE 61619785 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Mixed Mallee*			
Landform: Slope - lower	**Drainage:** Good		
Soil Colour & Type: Yellow - Grey Sand Loam			
Vegetation Condition: Excellent (2)			
Disturbances: Infrastructure			
Fire Age & Intensity: Old > 5 yrs			
Bare Ground: 2-10	**% Logs:** -	**% Twigs:** <2	

% Leaves: <2	**% Rocks (< 2cm):** <2	**% Rocks (2-30 cm):** 2-10	**% Rocks (>30cm):** <2

Stratum %Cover	**U1:** 10-30	**U2**: 2-10	**M1:** 2-10	**M2:** 10-30	**M3:** 10-30	**G1:** 70+	**G2:** <2
Height (m)	4-5	2-3	2-2.5	1-1.5	0.2-0.5	0.1-0.4	0.05-0.2

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus preissiana* subsp. *preissiana*		U1	2-10	2.5
Myrtaceae	*Eucalyptus angulosa*		U1	10-30	4
Proteaceae	*Hakea prostrata*		M1	2-10	3
Proteaceae	*Hakea trifurcata*		M2	2-10	1.5
Myrtaceae	*Taxandria spathulata*		M2	10-30	1.5
Myrtaceae	*Agonis theiformis*		M2	<2T	1.2
Myrtaceae	*Melaleuca suberosa*		M3	2-10	0.4
Dilleniaceae	*Hibbertia gracilipes*		M3	2-10	0.4
Proteaceae	*Banksia dryandroides*		M3	<2T	0.5
Proteaceae	*Hakea marginata*		M3	<2T	0.4
Proteaceae	*Hakea corymbosa*		M3	<2T	0.7
Proteaceae	*Banksia armata*		M3	<2T	0.2
Cyperaceae	*Tetraria octandra*		G1	<2N	0.2
Anarthriaceae	*Anarthria gracilis*		G1	2-10	0.2
Cyperaceae	*Tetraria* sp. Jarrah Forest (R. Davis 7391)		G1	2-10	0.4
Restionaceae	*Mesomelaena tetragona*		G1	<2N	0.6
Cyperaceae	*Lepidosperma* aff *squamatum*		G1	2-10	0.3
Restionaceae	*Chordifex sphacelatus*		G1	10-30	0.2
Myrtaceae	*Melaleuca subtrigona*		M3	<2T	0.4
Rutaceae	*Boronia spathulata*		M3	<2T	0.4
Casuarinaceae	*Allocasuarina microstachya*		M3	<2T	0.4
Proteaceae	*Petrophile divaricata*		M3	<2N	0.2
Stylidiaceae	*Stylidium hirsutum*		G2	<2T	0.3
Fabaceae	*Gompholobium polymorphum*		M3	<2T	0.7
Haemodoraceae	*Conostylis setigera*		G2	<2N	0.1
Cyperaceae	*Cyathochaeta equitans*		G1	<2T	0.4

Proteaceae	*Synaphea petiolaris* subsp *petiolaris*		M3	<2T	0.2
Restionaceae	*Desmocladus fasciculatus*		G1	2-10	0.1
Proteaceae	*Banksia arctotidis*		M3	<2N	0.1
Droseraceae	*Drosera platystigma*		G2	<2N	0.05
Goodeniaceae	*Dampiera alata*		G2	<2T	0.2
Colchicaceae	*Burchardia congesta*		G2	<2T	0.2
Haemodoraceae	*Haemodorum simplex*		G2	<2T	0.4
Fabaceae	*Gompholobium venustum*		M3	<2T	0.5
Iridaceae	*Patersonia maxwellii*		G2	<2T	0.1
Lauraceae	*Cassytha glabella*		G2	<2T	CLIMB
Cyperaceae	*Schoenus brevisetis*		G1	<2N	0.05
Dasypogonaceae	*Calectasia grandiflora*		M3	<2T	0.1
Asparagaceae	*Thysanotus pseudojunceus*		G2	<2T	0.05
Ericaceae	*Astroloma tectum*		M3	<2T	0.2
Fabaceae	*Chorizema aciculare*		M3	<2T	0.3
Casuarinaceae	*Allocasuarina thuyoides*		M3	<2T	0.4
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M3	<2T	0.4
Droseraceae	*Drosera menziesii*		G2	<2T	0.2
Casuarinaceae	*Allocasuarina humilis*		M3	<2T	0.2
Goodeniaceae	*Dampiera juncea*		G2	<2T	0.1
Asparagaceae	*Thysanotus multiflorus*		G2	<2T	0.1
Stylidiaceae	*Stylidium rupestre*		G2	<2N	0.1
Restionaceae	*Chordifex isomorphus*		G1	<2N	0.4
Myrtaceae	*Darwinia vestita*		M3	<2T	0.2
Poaceae	*Neurachne alopecuroidea*		G1	<2T	0.1
Restionaceae	*Harperia lateriflora*		G1	<2N	0.1
Goodeniaceae	*Lechenaultia formosa*		G2	<2T	0.05
Restionaceae	*Mesomelaena stygia* subsp. *stygia*		G1	<2N	0.1
Proteaceae	*Grevillea fasciculata*		M3	<2T	0.3
Myrtaceae	*Verticordia habrantha*		M3	<2T	0.3
Myrtaceae	*Rinzia schollerifolia*		M3	<2T	0.05
Cyperaceae	*Schoenus subflavus* subsp long leaves (KL Wilson 2865)		G1	<2T	0.05
Loganiaceae	*Phyllangium paradoxum*		G2	<2T	0.05

Site	Q19	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 22/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	622178 mE 6160728 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Hakea spp Complex*			
Landform: Slope - middle	**Drainage:** Good		
Soil Colour & Type: Yellow - Grey Sand Loam			
Vegetation Condition: Excellent (2) - Very Good (3)			
Disturbances: Infrastructure, Dieback			
Fire Age & Intensity: Old > 5 yrs			
Bare Ground: 2-10	**% Logs:** -	**% Twigs:** 2-10	

% Leaves: 10-30	**% Rocks (< 2cm):** <2	**% Rocks (2-30 cm):** <2	**% Rocks (>30cm):** 2-10

Stratum %Cover	**U1:** 2-10	**U2**:	**M1:** 2-10	**M2:** 30-70	**M3:** 2-10	**G1:** 30-70	**G2:** <2
Height (m)	8-10		2-3	2-2	0.1-0.6	0.1-0.5	0.05-0.5

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus marginata*		U1	2-10	5-10
Casuarinaceae	*Allocasuarina fraseriana*		U1	<2T	6
Proteaceae	*Hakea trifurcata*		M1	<2T	2
Proteaceae	*Hakea corymbosa*		M1	2-10	2-3
Myrtaceae	*Taxandria spathulata*		M2	30-70	1.5
Myrtaceae	*Melaleuca thymoides*		M2	2-10	1.2
Myrtaceae	*Agonis theiformis*		M2	<2T	1.2
Proteaceae	*Lambertia inermis*		M2	<2T	1.8
Proteaceae	*Banksia armata*		M2	<2T	1
Proteaceae	*Stirlingia latifolia*		M3	<2N	0.5
Proteaceae	*Banksia brunnea*		M3	<2N	0.6
Anarthriaceae	*Anarthria prolifera*		G1	10-30	0.6
Anarthriaceae	*Anarthria scabra*		G1	2-10	0.6
Poaceae	*Amphipogon* sp (nf)		G1	2-10	0.1
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*		M3	2-10	0.4
Restionaceae	*Mesomelaena tetragona*		G1	<2N	0.1
Casuarinaceae	*Allocasuarina humilis*		M3	<2T	0.4
Cyperaceae	*Tetraria octandra*		G1	<2N	0.2
Goodeniaceae	*Dampiera juncea*		G2	<2N	0.3
Rutaceae	*Boronia spathulata*		M3	<2N	0.6
Proteaceae	*Banksia repens*		M3	<2N	0.3
Polygalaceae	*Comesperma virgatum*		G2	<2N	0.3
Proteaceae	*Petrophile rigida*		M3	<2N	0.6
Restionaceae	*Desmocladus fasciculatus*		G1	<2N	0.1
Lauraceae	*Cassytha glabella*		G2	<2N	CLIMB
Restionaceae	*Mesomelaena tetragona*		G1	<2N	0.6
Cyperaceae	*Lepidosperma* aff *squamatum*		G1	2-10	0.4
Restionaceae	*Chordifex sphacelatus*		G1	2-10	0.2

Dilleniaceae	*Hibbertia gracilipes*		M3	<2N	0.2
Proteaceae	*Banksia sessilis*		M2	<2T	1.2
Fabaceae	*Chorizema rhombeum*		M3	<2T	0.2
Haemodoraceae	*Conostylis setigera*		G2	<2N	0.05
Fabaceae	*Hovea trisperma*		M3	<2T	0.2
Proteaceae	*Banksia gardneri* var. *gardneri*		M3	2-10	0.2
Myrtaceae	*Darwinia vestita*		M3	<2T	0.1
Proteaceae	*Banksia sphaerocarpa* var. *sphaerocarpa*		M3	<2T	0.4
Proteaceae	*Isopogon longifolius*		M3	<2T	0.4
Restionaceae	*Hypolaena fastigiata*		G1	<2N	0.1
Ericaceae	*Astroloma tectum*		G1	<2T	02
Proteaceae	*Adenanthos cuneatus*		M3	<2T	0.3
Cyperaceae	*Schoenus caespititius*		G1	<2N	0.2
Phyllanthaceae	*Poranthera huegelii*		G2	<2T	0.1
Asparagaceae	*Lomandra nigricans*		G2	<2T	0.1
Fabaceae	*Gompholobium knightianum*		M3	<2T	0.1
Myrtaceae	*Beaufortia anisandra*		M3	<2T	0.6
Cyperaceae	*Schoenus brevisetis*		G1	<2N	0.05
Dasypogonaceae	*Dasypogon bromeliifolius*		G2	<2T	0.4
Proteaceae	*Banksia grandis*		M3	<2T	1
Proteaceae	*Banksia arctotidis*		M3	<2T	0.1

Site	Q20	Project: South Coast Hwy - Kojaneerup	
Type: Quadrat	**Size:** 10 x 10	**Date:** 22/10/2015	**Described by:** MT and MD
Co-ordinates: MGA 50	621585 mE 6159731 mN		
Location: South Coast Hwy near Cheynes Beach Road			
Vegetation Type: *Hakea spp Complex*			
Landform: Valley	**Drainage:** Seasonal Wet		
Soil Colour & Type: Grey Sand Loam			
Vegetation Condition: Excellent (2) - Very Good (3)			
Disturbances: Infrastructure, Dieback			
Fire Age & Intensity: Old > 5 yrs			
Bare Ground: 2-10	**% Logs:** -	**% Twigs:** 2-10	

% Leaves: 2-10	**% Rocks (< 2cm):** -	**% Rocks (2-30 cm):** -	**% Rocks (>30cm):** -

Stratum %Cover	**U1:** 2-10	**U2**:	**M1:** 2-10	**M2:** 10-30	**M3:** 10-30	**G1:** 30-70	**G2:** 2-10
Height (m)	5-8		2-3	1-2	0.2-1	0.2-0.6	0.1-0.6

Family	Taxon	Status	Stratum	Cover %	Height (m)
Myrtaceae	*Eucalyptus marginata*		U1	2-10	8
Myrtaceae	*Taxandria parviceps*		M1	2-10	2.5
Myrtaceae	*Taxandria spathulata*		M1	2-10	2.5
Proteaceae	*Hakea corymbosa*		M1	<2T	2.5
Myrtaceae	*Kunzea recurva*		M1	<2T	2.5
Myrtaceae	*Melaleuca thymoides*		M2	2-10	1.6
Myrtaceae	*Agonis theiformis*		M2	2-10	1.1
Fabaceae	*Acacia browniana* var. *browniana*		M3	<2T	0.4
Proteaceae	*Hakea ceratophylla*		M3	2-10	0.4
Proteaceae	*Stirlingia latifolia*		M3	2-10	0.6
Restionaceae	*Mesomelaena tetragona*		G1	10-30	0.4
Cyperaceae	*Tricostularia exsul*		G1	<2N	0.4
Restionaceae	*Lyginia imberbis*		G1	2-10	0.3
Restionaceae	*Hypolaena exsulca*		G1	2-10	0.2
Haemodoraceae	*Conostylis setigera*		G2	<2N	0.05
Restionaceae	*Harperia lateriflora*		G1	<2N	0.1
Restionaceae	*Desmocladus fasciculatus*		G1	<2N	0.1
Poaceae	*Amphipogon* sp (nf)		G1	2-10	0.1
Anarthriaceae	*Anarthria prolifera*		G1	2-10	0.3
Asparagaceae	*Lomandra* sp (nf)		G2	<2T	0.2
Droseraceae	*Drosera menziesii*		G2	<2N	0.3
Dasypogonaceae	*Dasypogon bromeliifolius*		G2	2-10	0.4
Rutaceae	*Boronia spathulata*		M3	<2N	0.4
Goodeniaceae	*Dampiera juncea*		G2	<2N	0.2
Cyperaceae	*Schoenus laevigatus*		G1	2-10	0.4
Haemodoraceae	*Conostylis serrulata*		G2	<2T	0.2
Fabaceae	*Pultenaea verruculosa*		M3	<2T	0.2
Dilleniaceae	*Hibbertia gracilipes*		M3	<2T	0.3

Proteaceae	*Hakea ferruginea*		M2	<2T	1.5
Anarthriaceae	*Anarthria gracilis*		G1	<2N	0.2
Myrtaceae	*Pericalymma spongiocaule*		M3	<2T	0.4
Restionaceae	*Chordifex laxus*		G1	<2T	0.1
Proteaceae	*Petrophile squamata*		M3	2-10	0.8
Apiaceae	*Xanthosia huegelii*		G2	<2T	0.05
Proteaceae	*Banksia arctotidis*		M3	<2T	0.05
Lindsaeaceae	*Lindsaea linearis*		G2	<2N	0.05
Proteaceae	*Banksia repens*		M3	<2T	0.1
Cyperaceae	*Tetraria* sp. Blackwood River (A.R. Annels 3043)	P3	G1	<2N	0.1
Ericaceae	*Leucopogon obovatus subsp. revolutus*		M3	<2T	0.4
Polygalaceae	*Comesperma ciliatum*		G2	<2T	0.2

Kojaneerup – Photo Points / Rapid Assessment Sites

Photo Point 1 – Low plain with grey sand.

Shrubs 1 -2 m (30-70 %): *Taxandria spathulata, Kunzea recurva* and *Hakea cucullata*

Sedges (30 – 70 %): *Mesomelaena tetragona, Tricostularia sp., C. equitans, Anarthria gracilis, Chordifex sphacelatus, Desmocladus fascicularis, Schoenus obtusifolia*

Photo Point 2: Low plain on sand

Mallee: 4-6 m (10-30%): *Eucalyptus marginata and Eucalyptus adesmophloia*

Shrubs 1-2 m (10-30%): *Taxandria spathulata, Agonis theiformis, Hakea ferruginea*

Photo Point 3 *Eucalyptus* Mallee transition into Hakea spp Complex

Mallee (2-10%): *Eucalyptus. staeri / E. marginata*

Shrubs > 2 m (2-10%): *Hakea trifurcata*

Shrubs 1-2 m (2-10%): *Isopogon phylicoides, H. ceratophylla, Banksia nutans, H. ruscifolia, B. attenuate, Xanthorrhoea platyphylla*

Photo Point 4: *Eucalyptus* Mallee transition into *Hakea* spp Complex

Mallee: *Eucalyptus staeri*

Shrubs: *Banksia attenuata, Taxandria spathulata, Jacksonia spinosa, Banksia grandis, Melaleuca striata, Petrophile teretifolia*

Photo Point 5 – *Eucalyptus* Mallee

Patch of Eucalyptus adesmophloia

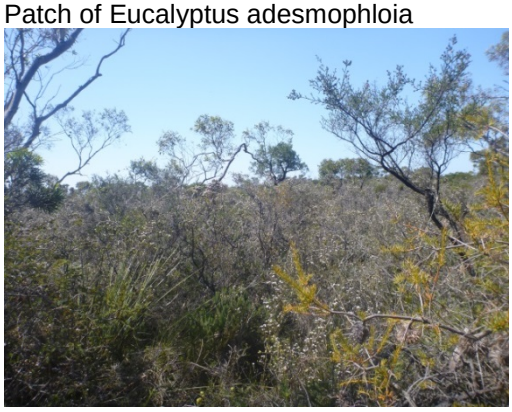

Photo Point 6- *Eucalyptus* over sedges

Photo Point 7 *Eucalyptus* Mallee over Heath

Photo Point 8 Patch of *Hakea* spp within *Eucalyptus* Mallee.

Hakea marginata, H. laurina, Isopogon cuneatus

Photo Point 9 Swamp

Shrubs surrounding – *Melaleuca cuticularis*

Sedges (30 – 70 % cover): *Chorizandra enodis, Meeboldina kraussii, Tetraria sp Jarrah Forest.*

Shallow water present: approx.. 10 cm in depth

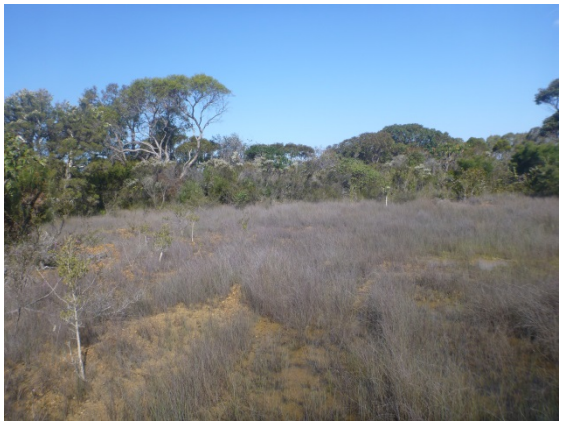

Photo Point 10 – drainage showing potential *Centrolepis caespitosa* habitat

Photo Point 11 – *Eucalyptus* Mallee over Heath

Recent burn (<5 years)

Eucalyptus adesmophloia, Melaleuca subtrigona, M. pulchella, M. suberosa, Daviesia incrassata, Hakea prostrata, Banksia repens, Darwinia vestita.

Photo Point 12 – *Eucalyptus* Mallee over Heath

Recent burn (<5 years)

Acacia leioderma, Xanthorrhoea platyphylla Hakea corymbosa, Gastrolobium bracteolosum.

Photo Point 13 – *Eucalyptus* Mallee over Heath

Recent burn (<5 years)

Photo Point 14 – *Melaleuca cuticularis* in drainage line

Photo Point 15 – *Banksia baxteri* Shrubland on sand

Shrubs: 2- 4m (2-10%): *Banksia baxteri, Banksia attenuata*

1-2 m (30-70 %): *Jacksonia spinosa, Agonis theiformis, Melaleuca striata, Adenanthos cuneatus, Leucopogon* spp,

Sedges: C. *avenacea, Anarthria scabra, A. prolifera.*

Dieback likely: Condition 3

Photo Point 16 – *Banksia Shrubland* into *Taxandria parviceps* transitional area.

Photo Point 17 - Ecotonal area with *Taxandria* transitional and *Banksia* Shrubland.

>30% Proteaceae species possible dieback.

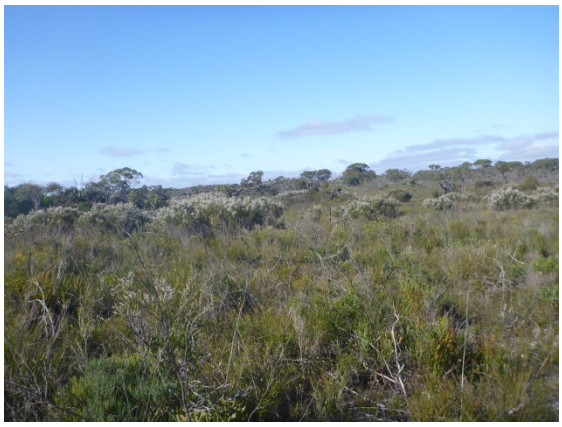

Photo Point 18 Swamp – *Kunzea recurva*

Taxandria parviceps around outer edge of swamp with *K. recurva*

Photo Point 19 Degraded Banksia

Shrubs: *B. attenuata, B. coccinea, Jacksonia spinose, Melaleuca striata, Adenanthos cuneatus. Leucopogon* spp.

Sedges: *Anarthria scabra*

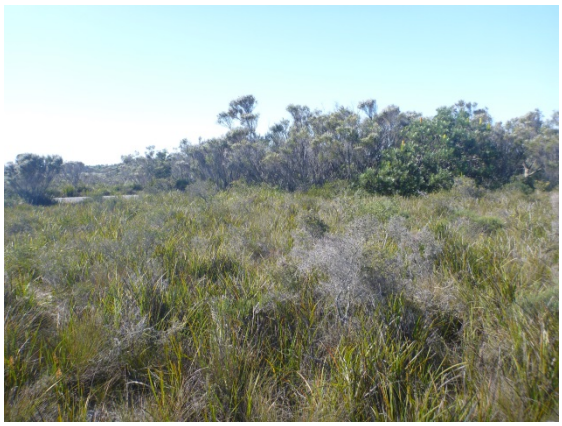

Photo Point 20 *Eucalyptus adesmophloia* over *Taxandria spathulata* and *Anarthria laevis*

Photo Point 21 *Eucalyptus occidentalis* patch

Tree (to 12 m): *Eucalyptus occidentalis*

Shrub 2-4 m (30-70 %): *Melaleuca rhaphiophylla, Melaleuca densa, Kunzea recurve, Hakea sulcate*

Sedges (30-70 %): *Anarthria laevis, Meeboldina kraussii, Tetraria sp Blackwood (P), Lepidosperma striatum, Schoenus subfascicularis, Chordifex laevis, Baumea articulate.*

Surrounding the *E. occidentalis* is an area of *E. adesmophloia*

Photo Point 22 *Eucalyptus adesmophloia* over *Taxandria spathulata. Anarthria scabra*

Photo Point 23 *Hakea* spp Complex

Senescing – expected that in time Proteaceae species would exceed 30 % cover

Photo Point 24 Degraded Banksia Shrubland

Mallee (2-10%): *Eucalyptus marginata, E. staeri*

Shrubs 1-2 m (10-30 %): *Taxandria spathulata, Melaleuca thyoides, Melaleuca striata, Agonis theiformis, Banksia dryandroides, Kingia australis, Petrophile spp.*

Shrubs < 1 m (2-10%): Hakea corymbosa, Daviesia incrassate, Allocasuarina humilis, Xanthorrhoea platyphylla, Banksia nutans, Banksia armata, Melaleuca suberosa, Banksia sphaerocarpa.

Sedges (30-70%): Anarthria scabra, C. avenacea, Anarthria prolifera, Lyginia barbata

Photo Point 25 Degraded *Banksia* Shrubland

Eucalyptus adesmophloia Mallee (2-10 %)

Shrubs 1-2 m (10-30%): *Taxandria parviceps, Melaleuca striata, Melaleuca thyoides, Hakea prostrata, Hakea trifurcata.*

Shrubs <1 (10-30%): *Petrophile* and *Hakea* spp.,, *Xanthorrhoea platyphylla*.

Sedges (2-10%): *Anarthria prolifera, Hypolaena exsulca.*

Photo Point 26 *Banksia* shrubland on sand

? dieback condition 3

Mallee (2-10%): *Eucalyptus staeri, E. marginata*

Shrubs > 2 m (2-10%): *Banksia attenuate, Agonis theiformis, Acacia subcaerulea*

Shrubs 1-2 m (10-30%): *Melaleuca striata, Melaleuca thyoides, Adenanthos cuneatus, Banksia coccinea*

Sedges (30-70%): *Anarthria scabra*

Photo Point 27 *Hakea* spp complex

Shrubs > 2m (2-10%): *Hakea cucullata, Hakea prostrata*

Shrubs 1-2 m (30-70 %): *Taxandria spathulata, Banksia nutans, Hakea ceratophylla.*

Photo Point 28 *Hakea* spp complex

Mallees at 2-10% (*Eucalyptus marginata/ E. adesmophloia*)

S >2: 20-10%: *Hakea cucullata, H. trifurcata*

S 1-2m: 10-30%: *Taxandria spathulata, Agonis theiformis, Allocasuarina humilis, Melaleuca striata, Banksia spp.*

Photo Point 29 - *Hakea* spp complex

Photo Point 30 *Hakea* spp Complex

Mallee: *Eucalyptus marginata*

Shrubs > 2 m (30-70 %): *Hakea ferruginea, H. trifurcate, H. lasiantha*

Shrubs 1-2 m (10-30%): *Acacia subcaerulea, Agonis theiformis,*

Sedges (10-30 %): *Acacia prolifera, Lepidosperma aff squamata, Mesomelaena tetragona.*

Photo Point 31 – *Hakea* spp with small area of Taxandria at road culvert

Small area of *Taxandria parviceps* at culvert location. Then transitions into *Hakea* spp Complex.

Photo Point 32 – *Hakea* spp Complex

Patch that contains *Banksia sessilis, Taxandria spathulata* is dominant in the shrub layer.

Photo Point 33 - *Hakea* spp with *Taxandria spathulata*

Photo Point 34 *Taxandria parviceps* dampland surrounding a Sedgeland

Taxandria parviceps (up to 3 m) 30-70 to 10-30%

Shrubs 1-2m: 2-10%: *Adenanthos obovatus, Pericalymma spongiocaule, Hakea ceratophylla, Kunzea recurva.*

Sedge 30-70%: *Schoenus subfascicularis, Schoenus laevigatus, Mesomelaena tetragona, M. gracilipes, Chordifex laxus, H. exsulca, Anarthria prolifera.*

Photo Point 35 - *Hakea* spp complex

Shrubs > 2 m (30-70%): *Hakea ferruginea, Hakea lasiantha*

Shrubs < 1m (10-30%): Taxandria spathulata, Hakea ceratophylla, Banksia mucronata,

Sedges (30-70%): Lepidosperma drummondii, Anarthria prolifera.

Photo Point 36 - *Hakea* spp complex

Mid slope with a small patch of *Corymbia calophylla.*

Shrubs > 2m (10-30%): *Taxandria parviceps, Hakea cucullata, Acacia subcaerulea, Jacksonia spinose, Banksia grandis*

Shrubs 1-2 (30-70%): *Grevillea fascicularis, Agonis theiformis, Melaleuca striata*

Shrubs <1m: *Andersonia caerulea, Leucopogon pp. Darwinia vestita, Actinodium* sp. Fitzgerald River.

Sedges (10-30%): C*. avenacea, Anarthria scabra*

Photo Point 37 - Low heath

Transition from *Hakea* spp into Low Heath

Shrubs 1-2m (10-30%): *Taxandria parviceps, Jacksonia spinosa, Adenanthos obovatus, Acacia subcaerulea, Adenanthos cuneatus.*

Shrubs: 1m (10-30%): *Pimelea longifolia, Actinodium sp. Fitzgerald River, Andersonia caerulea, Melaleuca thuyoides, Hypocalymma strictum, Sphaerolobium* spp.

Herbs: *Stylidium scandens, Stylidium hirsutum, Drosera* spp.

Sedges: *Schoenus efoliatus, Anarthria laevis, Mesomelaena tetragona*

Photo Point 38 - *Hakea* spp complex

Burnt but regenerating

Mallee/Tree: *Eucalyptus marginata, Allocasuarina fraseriana*

Shrubs 1-2 m (10-30%): *Hakea cucullata, Banksia mucronata*

Shrubs <1 m (30-70%): *Taxandria spathulata, Kunzea recurva, Actinodium sp Fitzgerald River, Petrophile formosus*

Photo Point 39 - *Kunzea* swamp in surrounds with Melaleuca preissiana near Highway.

Shrubs: *Melaleuca preissiana, Melaleuca densa, Kunzea recurva, Taxandria parviceps*.

Sedges: *C. avenacea, Meeboldina tephrina, Lepyrodia muirii, Anarthria laevis*

Photo Point 40 *Eucalyptus marginata* woodland

Hill crest with exposed laterite

Tree 10-12m (30-70%): *Eucalyptus marginata*

Shrubs > 2m (10-30%): *Agonis theiformis, Bossiaea linophylla, Acacia subcaerulea*

Shrubs 1-2 m (10-30%): *Banksia grandis, Xanthorrhoea platyphylla*

Shrubs <1m (2-10%): *Boronia crenulata, Petrophile formosus, Petrophile diversifolia, Leucopogon obovatus subsp revolutus, Leucopogon propinquus*

Herbs*: Opercularia hirsute, Xanthosia singuliflora*

Sedges *(2-10%): Tremulina tremula, Loxocarya cinerea, Lepidosperma spp.*

Photo Point 41 Degraded area

Condition 5-6

Pasture grasses – *Briza maxima, Avena spp.*

Photo Point 42 *Taxandria parviceps / Kunzea recurva* damp area.

Condition 4

Photo Point 43 - Degraded *Banksia*

Condition 3-4. Possible dieback. Less than 30 % Proteaceae.

Shrubs (30-70%): *Jacksonia spinosa, Melaleuca striata, Taxandria parviceps, Adenanthos cuneatus*

Sedges (30-70%): *Anarthria scabra*

Photo Point 44 - *Banksia baxteri* Shrubland

Shrubs > 2 m (70+ in stand): *Banksia baxteri, Banksia attenuata.*

Shrubs in surrounding vegetation: *Banksia coccinea, Taxandria parviceps, Banksia attenuata, Adenanthos cuneatus, Melaleuca striata, Jacksonia spinose, Agonis theiformis, Beaufortia anisandra.*

Herbs: *Dasypogon bromeliifolius, Xanthosia rotundifolia*

Sedges: *Anarthria scabra, C. avenacea, Anarthria prolifera, Lepidosperma drummondii.*

Photo Point 45 *Banksia* Shrubland

Condition 3-4 ? dieback

Shrubs 1-2 m (2-10%): *Melaleuca striata, Melaleuca thymoides, Xanthorrhoea platyphylla, with scattered Banksia attenuata and Banksia coccinea.*

Shrubs <1m (30-70%): Beaufortia empetrifolia, Adenanthos cuneatus, Agonis theiformis, Melaleuca striata, Leucopogon elegans.

Herbs: Dasypogon brome, Xanthosia rotundifolia

Sedges (30-70 %): Anarthria scabra, C. avenacea, Lyginia imberbis, Lepidosperma aff squamata.

Photo Point 46– Degraded *Banksia*

Jacksonia spinosa, Melaleuca striata with occasional scattered *Banksia* spp. Groundlayer typical of *Banksia* community with *Dasypogon bromeliifolius, Anarthria scabra* and *C. avenacea.*

Photo Point 47 *Taxandria parviceps* drainage line

Likely to be winter wet – *Melaleuca preissiana, Taxandria linearifolia, Taxandria parviceps (*30-70%) with sedges dominated by *Meeboldina scariosa* (30-70%).

Photo Point 47 *Hakea* spp Complex

Previously disturbed – possibly a borrow pit. Regenerating.

Photo Point 49 – *Hakea* spp Complex

Shrubs >2 m (10-30%): *Hakea cucullata, Banksia grandis, Lambertia inermis*

Shrubs 1 – 2 m (30-70%): *Melaleuca striata, Banksia mucronata, Xanthorrhoea platyphylla*

Sedges (10-30%): dominated by *Anarthria prolifera*

Photo Point 50 - *Melaleuca preissiana* in drainage line

Weeds present – C 3-4

Photo Point 51 *Melaleuca preissiana* swamp

Weeds present C 3-4

T1: 6-8m: 10-30%: *Melaleuca preissiana*

Shrubs: 2-10%: *Banksia littoralis, Taxandria parviceps*

Ground: 30-70%: *Juncus pallidus, Baumea articulata with grasses.*

Photo Point 52 – *Banksia* Shrubland

Condition 3-4

Melaleuca striata, Beaufortia empetrifolia, Adenanthos cuneatus, Banksia attenuata.

<30% Proteaceae spp – likely dieback

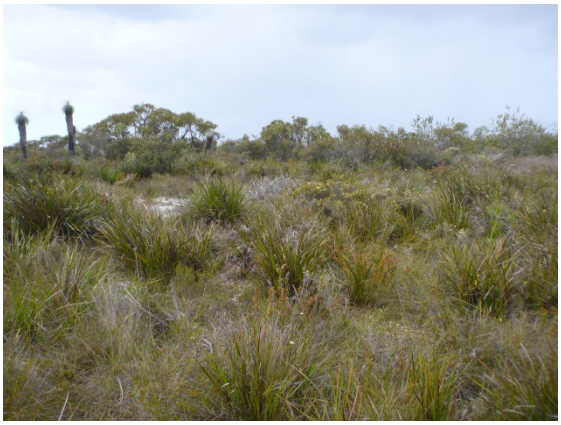

Photo Point 53 - Banksia shrubland

Condition 2

T1: 2-10 %: *Eucalyptus staeri*

S >2m: 30-70%: *Banksia baxteri, B. attenuata*

S1-2: 2-10%: *Melaleuca striata, Hakea corymbosa, Hakea cucullata, Adenanthos cuneatus, Agonis theiformis, Banksia grandis.*

Sedges: Anarthria scabra, A. prolifera, C. avenacea

Herbs: *Dasypogon bromeliifolius*,

Photo Point 54 *Hakea* spp Complex

Condition 2

Photo Point 55 -*Melaleuca* swamp / drainage line

Condition 4

Species present: *Melaleuca pulchella, Petrophile squamata, Kunzea recurva, Hakea sulcata, Pinus radiata*, Hakea tuberculata*. *Avena barbata*, Lagurus ovata*, Briza maxima*, Eragrostis curvula**

Photo Point 56 *Hakea* spp in damp

Condition 3

Hakea tuberculata, Melaleuca pulchella, Petrophile squamata, Kunzea recurva, Hakea sulcata, Ficinia nodosa, Gahnia ancistrophylla

Photo Point 57 - Melaleuca swamp

Condition 4

Melaleuca preissiana and *M. cuticularis* with introduced grasses.

Photo Point 58 *Hakea* spp Complex

Condition 2

Photo Point 59 - Sedgeland

Photo Point 60 - Sedgeland

Photo Point 61 *Hakea* spp damp

Condition 2-3. *Hakea corymbosa* over sedges

Photo Point 62 *Hakea* spp Complex

Condition 2-3

Area with impeded drainage

Taxandria spathulata dominated – possible dieback

Photo Point 63 *Banksia* Shrubland

Condition 3: Nearing 30 % cover of Proteaceae species. Possible dieback

T1: 2-10%: *Eucalyptus staeri/ E marginata*

S<2m: 2-10%: *Taxandria parviceps, Hakea corymbosa, Banksia attenuata*

S 1-2 m: 10-30%: *Beaufortia empetrifolia, Agonis theiformis, Melaleuca striata, Melaleuca thyoides, Adenanthos cuneatus*

Gnd: 30-70%: *Anarthria scabra* dominant

Photo Point 64 *Kunzea* Swamp

Photo Point 65 – *Hakea* spp Complex

Old gravel pit area Condition 4

Photo Point 66 – *Banksia* Shrubland

Condition 3-4

Less than 30 % Proteaceae species

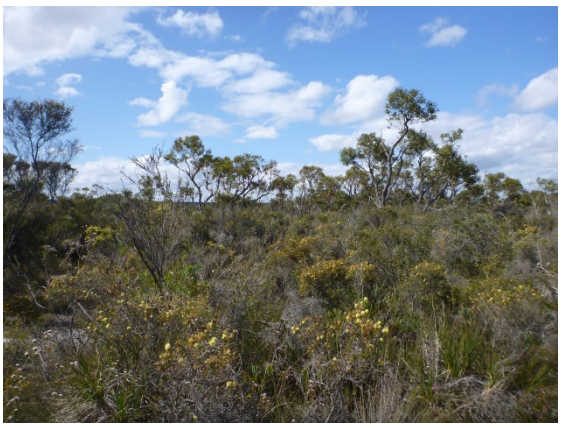

Photo Point 67 – *Hakea* spp Complex with *Taxandria*

Taxandria spathulata dominant with *Hakea corymbosa, Xanthorrhoea platyphylla, Lambertia inermis, Banksia armata, Melaleuca striata, Beaufortia anisandra, Melaleuca thyoides.* Occasional *Hakea cucullata.*

Photo Point 68 – *Banksia* Shrubland

Condition 3-4

Photo Point 69-Pasture with regrowth

c

Photo Point 70 – *Eucalyptus* Mallee over Heath

Photo Point 71 – *Eucalyptus* Mallee over Heath

Photo Point 72 – Hakea spp Complex A

Condition 2. Burnt in past 2-5 years. *Hakea cucullata* dominated.

Photo Point 73 – *Hakea* spp Complex A

Condition 2. Burnt in past 2-5 years. *Hakea cucullata* dominated.

Photo Point 74 – *Hakea* spp Complex A

Transition into *Taxandria* dowlslope. Condition 2. Burnt in past 2-5 years.

Photo Point 75 - *Taxandria parviceps* / *Hakea* spp transitional area.

Recent burn (previous 2 years)

Photo Point 76 – Transition from *Taxandria drainage* into *Banksia* Shrubland.

Condition 3-4. Less than 30 % cover proteaceae. Some scattered *B. attenuata* and *A. cuneatus*.

Photo Point 77 – *Hakea* spp Complex

Condition 2.

E. marginata, *Hakea cucullata , T. parviceps*.

Photo Point 78 - *Taxandria parviceps* in a minor drainage line.

S1-2m: 30-70%: *Taxandria parviceps*

S: >1m: 10-30%: *T. spathulata, Kunzea recurva, Petrophile squamata, Hakea ceratophylla,*

Sedge: 30-70%: *Mesomelaena tetragona, Tetraria sp.*

Transitions into *Hakea* spp complex.

Photo Point 79 – *Hakea* spp Complex A

Condition 2. Burnt in past 2-5 years. *Hakea cucullata* dominated. *Gonocarpus trichostachyus* present.

Photo Point 80 – *Hakea* spp Complex A

Condition 2. Burnt in past 2-5 years. *Hakea cucullata* dominated. Top of rise.

Photo Point 81 – *Hakea* spp Complex A

Condition 2. Burnt in past 2-5 years. *Hakea cucullata* dominated.

Photo Point 82 – *Hakea* spp Complex A

E. marginata and E. staeri

Shrubs: > 2m (30-70%): *H. ferruginea, H. lasiantha*

Shrubs <2 m (10-30 %): *T. spathulata, A. theiforimis, Kunzea recurva, Banksia mucronata.*

Sedge (30-70%): *C. isomophus, L. drummondii, A. prolifera.*

Photo Point 83 – *Hakea* spp Complex A

Lower slope – *Hakea* spp with some *Banksia* spp transitioning.

Photo Point 84 – *Hakea* spp Complex A

Patch within *Hakea* spp A that has *Taxandria spathulata* becoming dominant in the shrub layer. May be due to dieback.

Photo Point 85 – *Hakea* spp Complex A

Photo Point 86 – *Hakea* spp Complex

Photo Point 87 – *Hakea* spp with a Sedgeland

Condition: 2

Sedges at 70 % - 100 % cover including: *Baumea articulata, Aphelia sp., Schoenus laevigatus, Ficinia nodosa, Chorizandra enodis*

Photo Point 88 – *Banksia* Shrubland

Burnt 2 years Banksia on sand

Condition 2-3 – dieback / fire

Resprouting E*. marginata, Nuytsia floribunda*

S<1m: 2-10%: *Melaleuca thyoides, Agonis theiformis, Jacksonia spinosa, Taxandria spathulata, Leucopogon gibbosa, Banksia baxteri, Hakea sulcata, Banksia grandis*

Sedges: 30-70%: *Anarthria scabra, Caustis dioica, Anarthria prolifera, C. avenacea, Lepyrodia hermaphrodita.*

Photo Point 89 – *Banksia* Shrubland

Banksia on sand

C 2-3 Dieback and Fire

Banksia attenuata, B. sphaerocarpa

Taxandria parviceps begins to come in as move downslope

Photo Point 90 – *Banksia* Shrubland

Transition area with Hakea spp complex, *Banksia* on sand and *Taxandria* on lower slope.

C2-3

Burnt in last 2 years.

Photo Point 91 – *Banksia* Shrubland

Mosaic / transition from *Banksia* to *Hakea* spp

Condition 2-3

Photo Point 92 *Hakea* spp behind wetland

Condition 2

T1: 10-30%: *E. marginata / E. staeri*

S: <2m: 10-30%: *Hakea ferruginea, H. trifurcata*

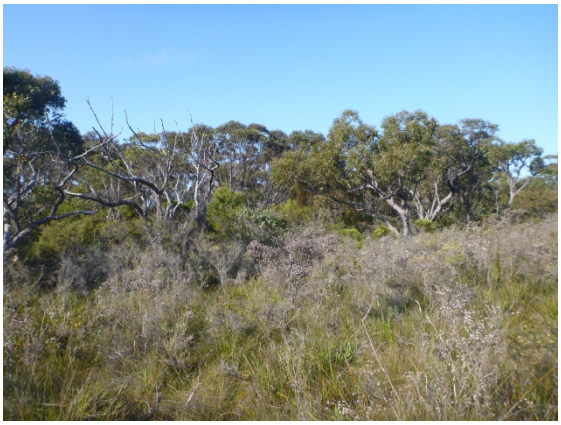

Photo Point 93 *Hakea* spp Complex

Condition 2. Lower to mid slope.

Hakea ferruginea and *H. trifurcata* dominant in shrub layer.

Photo Point 94 Patch of degraded

Condition 6

Pinus radiata, Eragrostis curvula, Briza min and max, Ficinia nodosa, Hypochaeris glabra, Ehrharta longifolia, Avena barbata

Photo Point 95 – *Hakea spp Complex*

Condition 2. Hakea cucullata and H. ferruginea

Photo Point 96 – *Banksia* Shrubalnd

Condition 3-4. Less than 30% Proteaceae likely due to dieback.

Banksia attenuata and *B. coccinea* present.

Photo Point 97 Hakea spp on low flats

Condition 2-3

Photo Point 98 Hakea spp Complex

Photo Point 99 *Hakea* spp Complex

Photo Point 100 *Hakea* spp Complex

Photo Point 101 *Hakea* spp Complex

Condition 2

Hakea cucullata, H. baxteri, H. trifurcata, H. lasiantha, Lambertia inermis, H. ferruginea, Taxandria spathulata.

Photo Point 102 *Hakea* spp complex

Condition 2.

Photo Point 103 Sump with *Kunzea recurva* over Sedgeland

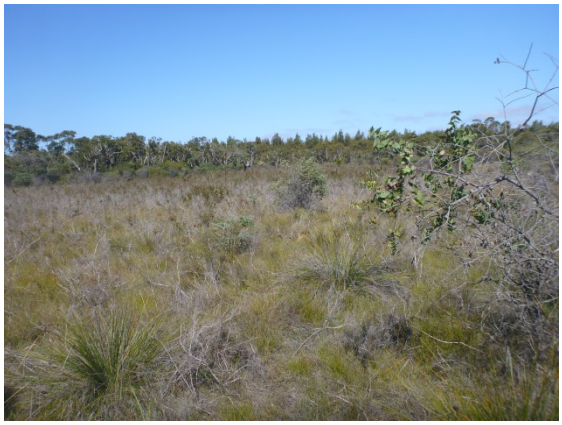

Photo Point 104 *Hakea* spp complex

Condition 2.

Photo Point 105 – *Hakea* spp with *Taxandria*

Emergent Eucalypts and *Hakea cucullata*.

Shrub 1-2 (30-70 %): *Taxandria spathulata, Melaleuca striata, M. thyoides, H. corymbosa*.

Photo Point 106 *Taxandria parviceps* in drainage line with transitional area.

Photo Point 107 - *Hakea* spp with *Taxandria*

Photo Point 108 – *Banksia* Shrubland

Condition 3-4

Photo Point 109 – *Actinodium* Heath/ *Taxandria* drainage

Photo Point 110 – *Banksia* Shrubland

Burnt 2 years

Photo Point 111 – *Eucalyptus* over Heath

Burnt < 2 years

Photo Point 112 – *Banksia* Shrubland / *Hakea* mosaic. Condition 2-3.

Species: *Taxandria spathulata, Banksia nutans, Banksia attenuata, Hakea trifurcata, Adenanthos cuneatus, Melaleuca striata, Agonis theiformis, Hakea corymbosa, Anarthria scabra.*

Photo Point 113 – *Hakea* spp Complex

Condition 3 – evidence of dieback

Taxandria spathulata dominant with other shrubs: *Hakea cucullata, Hakea trifurcata, Banksia mucronata, Allocasuarina humilis, A. thyoides*

Photo Point 114 *Banksia* Shrubland mosaic with *Hakea* spp

Condition 3-4 possible dieback. Less than 30 % Proteaceae species.

Photo Point 115 – *Eucalyptus* Mallee over sedgeland

Photo Point 116 - *Eucalyptus* Mallee over sedgeland

Photo Point 117 – *Banksia* Shrubland

Condition 3

Mosaic – pattern with 2 Kwongkan TEC indicator species present. But not at 30 % for entire area.

Species include: *Banksia attenuata, Taxandria parviceps, Melaleuca striata, M. thyoides, Hypocallymma strictum, Adenanthos cuneatus, Petrophile divaricata, Daypogon bromellifolius, Anathria scabra.*

Photo Point 118 - *Hakea* spp Complex

Photo Point 119 – *Hakea* spp with *Taxandria*

Photo Point 120 – *Hakea* spp with *Taxandria*

Photo Point 121 – *Hakea* spp Complex

C2 – burnt in past 2 years

Lambertia inermis, H. ferruginea dominant in Shrubs

Photo Point 122 – Sedgeland

Baumea articulata Swamp.

Fringing: *Melaleuca cuticularis, E. occidentalis, Hakea tuberculata, Kunzea recurva, Hakea sulcata.*

Swamp: *Baumea articulata, Lepyrodia muirii*

Photo Point 123 *Hakea* and Taxandria spathulata

Forms mosaic with Banksia species – possible dieback resulting in loss of some Proteaceous shrubs

Photo Point 124 Marri Woodland

Tree (10-12 m) (30-70%): *Corymbia calophylla*

Shrubs > 2 m (2-10%): *Bossiaea linophylla, Hakea florida*

Photo Point 125 – Weed incursion from road verge

Photo Point 126 Mixed Mallee

Mallee (30-70%): *Eucalyptus lehmanniana, E. preissiana subsp preissiana*

Shrubs: Xanthorrhoea platyphylla, Banksia tenuis, Acacia drummondiana

Ground: Gahnia aristata

Photo Point 127 – *Hakea* spp / *Taxandria* Complex

Mallee – *E. adesmophloia, E. staeri, E. marginata*

Shrubs: *Hakea cucullata, Hakea trifurcata, Hakea tuberculata, Taxandria spathulata, Agonis theiformis, Allocasuarina humilis, Melaleuca striata*.

Photo Point 128 Mixed Mallee

Mallee (10-30 %): *Eucalyptus angulosa*

Shrubs 1-2 m (30-70%): *Taxandria spathulata, Hakea trifurcate, Hakea tuberculata*

Shrubs <1m (2-10 %): *Hakea marginate, Banksia dryandroides, Melaleuca subtrigona, Banksia armata, Banksia repens.*

Sedges (70+%): *Mesomelaena tetragona, Anarthria gracilis, Tetraria sp Jarrah Forest, Lepidosperma striata, Chordifex sphacelatus*

Appendix E – Fauna data

Fauna species list

Fauna likelihood of occurrence guidelines

Fauna likelihood of occurrence assessment

Fauna species recorded in the Study Area during the field survey

Family	Species	Common Name	Status
Birds			
Acanthizidae	*Acanthiza apicalis*	Inland Thornbill	
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	
Acanthizidae	*Calamanthus campestris*	Rufous Fieldwren	
Acanthizidae	*Smicrornis brevirostris*	Weebill	
Accipitridae	*Haliastur sphenurus*	Whistling Kite	
Ardeidae	*Egretta novaehollandiae*	White-faced Heron	
Artamidae	*Cracticus tibicen*	Australian Magpie	
Artamidae	*Cracticus torquatus*	Grey Butcherbird	
Artamidae	*Strepera versicolor*	Grey Currawong	
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Black Cockatoo	S2, E
Cacatuidae	*Eolophus roseicapillus*	Galah	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	
Columbidae	*Phaps chalcoptera*	Common Bronzewing	
Corvidae	*Corvus coronoides*	Australian Raven	
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	
Cuculidae	*Cacomantis pallidus*	Pallid Cuckoo	
Cuculidae	*Chalcites basalis*	Horsefield Bronze-cuckoo	
Falconidae	*Falco berigora*	Brown Falcon	
Falconidae	*Falco cenchroides*	Nankeen Kestrel	
Halcyonidae	*Dacelo novaeguineae*	Kookaburra	Intro
Hirundinidae	*Petrochelidon nigricans*	Tree Martin	
Maluridae	*Malurus splendens*	Splendid Fairy-wren	
Maluridae	*Stipiturus malachurus*	Southern Emu-wren	

Family	Species	Common Name	Status
Meliphagidae	*Acanthorhynchus superciliosus*	Western Spinebill	
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	
Meliphagidae	*Lichenostomus leucotis*	White-eared Honeyeater	
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater	
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	
Meliphagidae	*Melithreptus brevirostris*	Brown-headed Honeyeater	
Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	
Petroicidae	*Microeca fascinans*	Jacky Winter	
Psittacidae	*Barnardius zonarius semitorquatus*	Twenty-eight Parrot	
Psittacidae	*Neophema elegans*	Elegant Parrot	
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	
Timaliidae	*Zosterops lateralis*	Silvereye	
Reptiles			
Elapidae	*Elapognathus coronatus*	Western Crowned Snake	
Elapidae	*Notechis scutatus*	Tiger Snake	
Scincidae	*Ctenotus labillardieri*	Red-legged Ctenotus	
Scincidae	*Egernia napoleonis*	South-western Crevice-skink	
Scincidae	*Hemiergis peronii peronii*	Peron's Earless Skink	
Scincidae	*Tiliqua rugosa rugosa*	Bobtail	
Varanidae	*Varanus rosenbergi*	Heath Monitor	
Mammals			

Family	Species	Common Name	Status
Canidae	*Vulpes vulpes*	Red Fox	Intro
Felidae	*Felis catus*	Cat	Intro
Leporidae	*Oryctolagus cuniculus*	Rabbits	Intro
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	
Peramelidae	*Isoodon obesulus fusciventer*	Southern Brown Bandicoot, Quenda	P5
Amphibians			
Amphibia	*Crinia glauerti*	Clicking Froglet	
Amphibia	*Heleioporus eyrei*	Moaning frog	
Amphibia	*Heleioporus psammophilus*	Sand Frog	

Key

Intro – Introduced species to Western Australia

E – Endangered under EPBC Act

S2 – Schedule 2 (Endangered) under the WC Act

P5 – Priority 5 with DPaW

Definitions for fauna likelihood of occurrence assessment

Assessment outcome	Description
Present	Species recorded during the field survey or from recent, reliable records from within the Project Area.
Likely	Species are likely to occur in the Project Area where there is suitable habitat within the Project Area and there are recent records of occurrence of the species in close proximity to the Project Area. OR Species known distribution overlaps with the Project Area and there is suitable habitat within the Project Area.
Unlikely	Species assessed as unlikely include: Those species previously recorded within 10 km of the Project Area, however: There is limited habitat in the Project Area (i.e. the type, quality and quantity of the habitat is generally poor or restricted). The suitable habitat within the Project Area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the Project Area. OR Those species that have a known distribution overlapping with the Project Area, however: There is limited habitat in the Project Area (i.e. the type, quality and quantity of the habitat is generally poor or restricted). The suitable habitat within the Project Area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the Project Area
Highly unlikely	Species that are considered highly unlikely to occur in the Project Area include: Those species that have no suitable habitat within the Project Area. Those species that have become locally extinct, or are not known to have ever been present in the region of the Project Area.

Conservation significant fauna likelihood of occurrence assessment within the Project Area

Common name (species name)	Status		Search		Description & habitat requirements	Likelihood of occurrence
	WC Act/ DPaW	EPBC Act	Nature Map	EPBC PMST		
Birds						
Noisy Scrub-bird (*Atrichornis clamosus*)	En	V	x	x	The Noisy Scrub-bird is endemic to Western Australia and occurs at two locations in the south-west; on the mainland in coastal areas from Two Peoples Bay Nature Reserve to Cheyne Beach; and on Bald Island, which lies close to the coast off Cheynes Beach (Danks et al. 1996; Gilfillan et al. 2007). It inhabits ecological communities that support a dense understorey or lower stratum of sedges and shrubs, a dense accumulation of leaf litter and an abundant population of litter-dwelling invertebrates. It mainly occurs in low closed forests 5-15 m in height that are dominated by Eucalyptus or Agonis and Banksia littoralis and occur in the steep and wetter gullies, and drainage lines of hills and granite (DotE 2015).	Unlikely There are no known records within 5 km of the Study Area. Populations of the Noisy Scrub-bird are generally concentrated along the coastal strip south and east of the Project Area at Mount Gardner, Mount Manypeaks, Waychinicup and Cheyne Beach.
Australasian Bittern (*Botaurus poiciloptilus*)	En	E	x	x	The Australasian Bittern occurs mainly in densely vegetated freshwater wetlands and, rarely, in estuaries or tidal wetlands. The species favours foraging in tall, dense vegetation in shallow permanent or seasonal fresh water. In the southwest of Western Australia the Bittern is now largely confined to coastal areas especially along the south coast where it is found in beds of tall rush mixed with or near short fine sedge or open pools (Burbridge 2004). It also occurs around swamps, lakes, pools, rivers and channels fringed with lignum Muehlenbeckia, canegrass, Eragrostis or other dense vegetation (Marchant and Higgins 1990). It occasionally ventures into areas of open water or onto banks.	Unlikely There are no permanent freshwater pools or wetlands within the Project Area. While there are a number of winter-wet drainage lines and wetlands scattered throughout the Study Area, the habitat available would provide marginal habitat for the Bittern.

Common name (species name)	Status		Search		Description & habitat requirements	Likelihood of occurrence
	WC Act/ DPaW	EPBC Act	Nature Map	EPBC PMST		
Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)	Vu	V	x	X	The Forest Red-tailed Black Cockatoo is endemic to the south-west humid and subhumid zones of Western Australia. Within their range they forage in jarrah and marri woodlands and forest and edges of karri forests including wandoo and blackbutt. They are thought to breed in October/November (or in March/April in years with good autumn rainfall) in woodland or forest, or isolated trees that were part of a forest, nesting in hollows in live or dead trees of marri, karri, wandoo, bullich, Eucalyptus megacarpa, blackbutt, E. patens, tuart and jarrah. They roost in tall jarrah, marri, blackbutt, tuart and introduced eucalypt trees within or on the edges of forests (Commonwealth of Australia 2012).	Likely Suitable foraging habitat and some potential breeding habitat present within the Study Area. The Study Area lies within the south-eastern extent of the modelled distribution of where the Forest Red-tailed Black Cockatoo may occur (Commonwealth of Australia 2012).
Baudin's Black Cockatoo (*Calyptorhynchus baudinii*)	En	V	x	x	The Baudin's Black Cockatoo breeds from August/September to February/March in the eucalypt forests of the south western humid and subhumid zones. From March flocks migrate north to the central and northern parts of the Darling Scarp for the non-breeding season. Some flocks also move on to the southern Swan Coastal Plain and south coast during the non-breeding season. They forage in eucalypt woodlands and forest, and proteaceous woodland and heath. Outside the breeding season, may feed in fruit orchards and Pinus spp. (Commonwealth of Australia 2012).	Likely Suitable foraging habitat and potential breeding habitat present within the Study Area. There are two records of this species within 5 km of the Study Area (Naturemap 2007-). The Study Area lies within the south-eastern extent of the modelled distribution of where the Baudin's Black Cockatoo is likely to occur. The Study Area is outside of its predicted breeding range (Commonwealth of Australia 2012).

Common name (species name)	Status		Search		Description & habitat requirements	Likelihood of occurrence
	WC Act/ DPaW	EPBC Act	Nature Map	EPBC PMST		
Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)	En	E	x	x	The Carnaby's Black Cockatoo breeds from July/August to January/February generally in woodland or forest, but also in former woodland or forest now present as isolated trees. They breed in the semi-arid and sub-humid interior ("wheatbelt") and some locations along the south and west coasts. They nest in hollows in live or dead trees of salmon gum, wandoo, tuart, jarrah, flooded gum, York gum, powderbark, karri and marri. They forage on native shrubland, kwongan heathland and woodland dominated by proteaceous plant species such as Banksia spp., Hakea spp. and Grevillea spp. Also forages in pine plantations, eucalypt woodland and forest that contain foraging species. Also individual trees and small stands of these species (Commonwealth of Australia 2012).	Present This species was recorded within the Study Area during the fauna survey. Evidence of foraging was recorded on Marri nuts. Suitable foraging habitat occurs throughout the Study Area and a number of potential breeding trees are present. The Study Area occurs within the modelled distribution and breeding range for the Carnaby's Black Cockatoo (Commonwealth of Australia 2012).
Western Bristlebird (*Dasyornis longirostris*)	Vu	V	x	x	The Western Bristlebird is endemic to Western Australia and is now restricted to some of the dense low heaths from Two Peoples Bay to Hopetoun, although there are some translocated birds in the Walpole area (Nevill 2008). They require low heath, mostly very dense with little to no overstorey. It spends most of its time on or near the ground, taking insects from low shrubs or in leaf litter (Nevill 2008).	Unlikely There is suitable habitat for the Western Bristlebird present within the Study Area. There are four records of this species within 5 km of the Study Area, south of Cheyne Road (Naturemap 2007-). While there is some suitable habitat present in the Study Area, the species is generally restricted to the coastline at Two Peoples Bay and Cheyne Beach area.

Common name (species name)	Status		Search		Description & habitat requirements	Likelihood of occurrence
	WC Act/ DPaW	EPBC Act	Nature Map	EPBC PMST		
Malleefowl (*Leipoa ocellata*)	Vu	Vu		x	The Malleefowl is a quiet, shy and wary bird. It inhabits semi-arid and arid zones of temperate Australia, where it occupies shrublands and low woodlands that are dominated by mallee vegetation. It occurs in other habitat types including eucalypt or native pine Callitris woodland, acacia shrublands, Broombush Melaleuca uncinata vegetation or coastal heathlands (DotE 2015b).	Unlikely There are no known records of this species within 40 km of the Study Area.
Western Ground Parrot (*Pezoporus flaviventris*)	Cr	CE		x	The Ground Parrot inhabits low, fry or swampy, near-coastal heathlands on sandplains and uplands in areas that receive 400-500 mm of rainfall annually (DotE 2015b). The Ground Parrot feed almost entirely on the ground, bending grasses and sedges down to beak height to eat the seeds. This species calls mostly 20 minutes or so after sunset before flying to its roosting site. It calls well before sunrise as much as 90 minutes and will then fly to its feeding areas, so chances of seeing flying birds are very remote. Throughout their range they require dense low heath (Nevill 2008). In 2009, the species was known to occur in two geographically separate subpopulations, a small subpopulation in Fitzgerald River National Park and the other, estimated at 100 individuals, occurred in Cape Arid National Park and Nuytsland Nature Reserve (Burbidge and Blyth cited in Murphy et al. 2011; Gilfillan et al. 2009). A third, subpopulation was present in the Mount Manypeaks-Waychinicup area in the early to late 1990s (Burbidge et al. 1997; Gilfillan et al. 2009; McNee 1999), but has not been recorded since 2004 (Barth & Chemello 2007; Newbey et al. 2006).	Unlikely This species is extremely endangered, with only very small restricted populations remaining. The Study Area is not located near either of these populations and therefore it is highly unlikely that the species would occur. The Western Ground Parrot has previously been recorded at Cheynes Beach during the 1990's, approximately 16 km south-east of the Project Area, although it is not currently known to still occur there.

Common name (species name)	Status		Search		Description & habitat requirements	Likelihood of occurrence
	WC Act/ DPaW	EPBC Act	Nature Map	EPBC PMST		
Western Whipbird (western heath) (*Psophodes nigrogularis nigrogularis*)	En	V	x	x	The western heath subspecies of the Western Whipbird is known only to occur in one small population in south Western Australia, in the Two-Peoples Bay- Mt Manypeaks region. The population at Two Peoples Bay-Mt Manypeaks region is estimated as less than 100 pairs and occurs in dense coastal heath (Simpson and Day, 2004, Smith, 1991). The preferred habitat is thicket, a two to three metre high formation of varied floristic composition. Other vegetation associations are used infrequently, although all nests are usually found in dense heath adjacent to areas of thicket (Smith, 1991).	Likely There is one previous record (in 2000) of the Western Whipbird within the Study Area (DPaW 2015). Although there is suitable habitat for this species within the Study Area, it is generally restricted to dense coastal heath in the Two-Peoples Bay and Mount Manypeaks region. Other nearby records of this species include one approximately 5 km south of the Study Area south of Cheyne Road and 13 km south at Waychinicup Beach.
Migratory Birds						
Great Egret, White Egret (*Ardea modesta*)	S5	Mi		x	The Eastern Great Egret has been reported in a wide range of wetland habitats (for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial). These include swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs. The Eastern Great Egret may retreat to permanent wetlands or coastal areas when other wetlands are dry (for example, during drought). This may occur annually in some regions with regular wet and dry seasons or erratically where the availability of wetland habitat is also erratic (DotE 2015b).	Unlikely The Great Egret is widespread in Australia and occurs in a wide range of wetland habitats. The wetland areas within the Study Area may provide some suitable habitat for the Great Egret however it is not considered representative of significant habitat for this species. The Study Area is not considered suitable breeding habitat.

Common name (species name)	Status		Search		Description & habitat requirements	Likelihood of occurrence
	WC Act/ DPaW	EPBC Act	Nature Map	EPBC PMST		
Cattle Egret (*Ardea ibis*)	S5	Mi		x	The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures. It uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation and abundant aquatic flora. They are also sometimes observed in swamps with tall emergent vegetation (DotE 2015b).	Unlikely The wetland areas within the Study Area may provide some suitable habitat for the Cattle Egret however it is not considered representative of significant habitat for this species. The Study Area is not considered suitable breeding habitat.
Rainbow Bee-eater (*Merops ornatus*)	S5	Mi		x	The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It also inhabits sand dune systems in coastal areas and at inland sites that are in close proximity to water (Morcombe 2004). The Rainbow Bee-eater is also common in cleared and semi-cleared habitats, orchards and is regularly recorded in other disturbed habitats including roadside vegetation (DotE 2015b).	Likely There is some suitable habitat present within the Study Area. The Rainbow Bee-eater is a common and widespread migrant throughout Australia with a large habitat range.
Grey Wagtail (*Motacilla cinerea*)	S5	Mi		x	European and Asian species that migrates in winter south to Indonesia and New Guinea, rarely reaching Australia. Has been recorded on widely separated parts of the Australian coast, including NE Qld, the NT and near Adelaide, SA. Usually found near fresh streams, but also on mown grass, ploughed land or new sewage ponds (Morcombe 2003).	Highly unlikely There are no known records of this species in the south-west of Western Australia. The Project Area is considered to be outside of its currently known distribution.

Common name (species name)	Status		Search		Description & habitat requirements	Likelihood of occurrence
	WC Act/ DPaW	EPBC Act	Nature Map	EPBC PMST		
Osprey (*Pandion haliaetus*)	S5	Mi		x	The Osprey occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They may occur over non typical habitats when travelling to and from foraging sites (DotE 2015c).	Unlikely The Study Area is not considered representative of significant habitat for this species.
Mammals						
Chuditch, Western Quoll (*Dasyurus geoffroii*)	Vu	V		x	The Chuditch inhabits eucalypt forest (especially jarrah), dry woodland and mallee shrublands. In jarrah forest, Chuditch populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest. Most diurnal resting sites in sclerophyll forest consist of hollow logs or earth burrows (Van Dyke & Strahan, 2008). This species can travel large distances, has a large home range and is sparsely populated through a large portion of its range.	Unlikely There are no known records of Chuditch within 30 km of the Study Area. The linear and fragmented nature of the Study Area and presence of feral cats and foxes would significantly reduce the likelihood of this species occurring.
Southern Brown Bandicoot, Quenda (*Isoodon obesulus fusciventer*)	P5		x		The Quenda prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. The species often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyck and Strahan 2008).	Present Suitable habitat with dense cover is present throughout the Study Area. This species has previously been recorded within 1 km of the Study Area (in 1970) (Naturemap 2007-). Diggings attributed to the bandicoot were observed in the Study Area during the survey.

Common name (species name)	Status		Search		Description & habitat requirements	Likelihood of occurrence
	WC Act/ DPaW	EPBC Act	Nature Map	EPBC PMST		
Western Brush Wallaby (*Macropus irma*)	P4		x		The Western Brush Wallaby is a grazer found primarily in open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland, and is uncommon in karri forest. This species was once common in the south-west of Western Australia but has undergone a reduction in range and a decline in abundance in its current habitat. (Van Dyke & Strahan 2008).	Likely There is suitable habitat for this species within the Study Area. The Western Brush Wallaby has previously been recorded within 1 km of the Study Area (in 1959), with other scattered records in the local region (Naturemap 2007-).
Dibbler (*Parantechinus apicalis*)	En	E		x	Dibblers have been recorded over an extensive area and it is likely that they can occupy a diverse range of habitats (Friend, 2004). However, the species seem to prefer vegetation with a dense canopy greater than 1 m high which has been unburnt for at least 10 years or more (Baczocha & Start 1997). Typically, captures have been on sandy substrates although occasional records are on laterite soils	Unlikely There is a population of Dibblers south-east of Study Area at Cheyne Beach, with records approximately 15 km south-east of the Study Area. The dense scrub throughout the Study Area could be considered suitable habitat for this species but given the linear and fragmented nature of the study area, presence of cats and foxes and no previous records nearby, it is unlikely the Dibbler present.
Western Ringtail Possum (*Pseudocheirus occidentalis*)	En	E	x	x	The Western Ringtail Possum occurs in and near coastal peppermint tree (Agonis flexuosa) forest and tuart dominated forest with a peppermint tree understorey from Bunbury to Albany. Also occurs in jarrah forest and jarrah-marri forest associated with peppermint tree (Van Dyck and Strahan, 2008).	Unlikely The Western Ringtail Possum has previously been recorded approximately 5 km south of the Study Area, south of Cheyne Road however there is limited suitable habitat present within the Study Area. No evidence of the presence of this species (scats) was recorded.

Common name (species name)	Status		Search		Description & habitat requirements	Likelihood of occurrence
	WC Act/ DPaW	EPBC Act	Nature Map	EPBC PMST		
Quokka (*Setonix brachyurus*)	Vu	V	x	x	Dense forests and thickets, streamside vegetation, heaths and shrublands Agonis linearifolia-dominated swamps in the jarrah forest. The northern extent of the current distribution on the mainland is in the jarrah forest immediately south-east of the Perth metropolitan area, from where it extends southward through the southern jarrah, marri and karri forests to the south coast, but largely confined throughout to areas receiving an annual rainfall of 1,000 millimetres or more (Van Dyck and Strahan, 2008).	Unlikely The Quokka has previously been recorded in the Mt Manypeaks and Two Peoples Bay area; however the population is known to be relatively small. This species is also associated with dense forests and thickets, is highly susceptible to predation from cats and foxes (both present within the Study Area). There is suitable habitat for this species within the Study Area. Given the linear and fragmented nature of the Study Area and presence of cats and foxes, it is unlikely this species is present within the Study Area.

***Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act):**

CE Critically Endangered

E Endangered

V Vulnerable

Mi Migratory

***Wildlife Conservation Act 1950* (WC Act)**

CR Critically Endangered

En Endangered

Vu Vulnerable

S5 Species protected under International Agreement (Schedule 5)

*Conservation codes are also presented in Appendix B.

Department of Parks and Wildlife (DPaW)

P1 Priority 1

P2 Priority 2

P3 Priority 3

P4 Priority 4

P5 Priority 5

References

Department of the Environment (DotE) 2015, *Species Profile and Threats Database (SPRAT)*, retrieved October 2015, from http://www.environment.gov.au/cgi-bin/sprat/public/.

Potential Black Cockatoo habitat trees recorded in the Study Area

Tree Species	Easting	Northing	Number of hollows	Observations
Corymbia calophylla	621943	6161707	0	
Corymbia calophylla	621931	6161732	0	Evidence of feeding on marri nuts
Corymbia calophylla	621927	6161731	0	
Corymbia calophylla	621502	6160160	0	Evidence of feeding on marri nuts
Corymbia calophylla	619909	6154361	0	
Corymbia calophylla	619889	6154320	0	
Corymbia calophylla	619893	6154322	0	Evidence of feeding on marri nuts
Eucalyptus marginata	619884	6154288	0	
Eucalyptus marginata	616858	6149822	0	
Eucalyptus marginata	616914	6149912	0	
Eucalyptus marginata	616861	6149787	0	
Eucalyptus marginata	616848	6149787	0	
Eucalyptus marginata	616781	6149716	0	

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