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Main Roads Western Australia

Report for South Coast Highway Upgrade (33.5 - 35 SLK) Manypeaks Section 3

Environmental Impact Assessment and Environmental Management Plan

August 2012

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Executive Summary

The South Coast Highway is the major east-west inter-regional route connecting the towns of Ravensthorpe, Boxwood Hill, Jerramungup and Esperance to Albany. Main Roads Western Australia (Main Roads) has commissioned GHD to provide environmental services to determine the environmental impacts and management measures for the proposed upgrade and road realignment of the highway at the Homestead Road intersection (SLK 33.5 to 35). This Environmental Impact Assessment and Environmental Management Plan (EIA and EMP) has been prepared as requested by Main Roads.

Maunsell AECOM (Maunsell) completed a PEIA and EMP for the South Coast Highway upgrade in 2009. This Maunsell report addressed two project areas within the Manypeaks to Cheynes Beach section of the South Coast Highway, SLK 33.5 to 37.7 and SLK 40.2 to 46.3. Relevant information from this report has been used in conjunction with results of GHD's desktop and field investigations in preparation of this EIA and EMP for the Manypeaks Section 3 of the proposed South Coast Highway upgrades.

The key outcomes of the EIA are as follows:

- The estimated 2.4 ha of clearing required for roadworks has been assessed against the Ten Clearing Principles and it is concluded that the Project clearing is "likely to be at variance with Principle "b":
  - The Project is considered to have a significant impact on Black Cockatoo habitat under the *Environmental Protection Biodiversity and Conservation Act 1999* (EPBC Act), with some habitat trees potentially being removed from the Project Area. It is recommended that this project is referred for assessment under the EPBC Act.
  - The Project can be undertaken under the provisions of Main Roads Clearing Permit CPS 818/4 on the basis of the Federal referral.
- This Project does not require referral of to the Western Australia Environmental Protection Authority under Part IV of the *Environmental Protection Act 1986*.
- Vegetation to be impacted by the roadworks is regionally well represented with greater than 30% of its pre-European extent remaining;
- One significant weed species is present within the Project Area, *Asparagus asparagoides* (Bridal Creeper) which is listed as a Weed of National Significance and classed as a P1 Declared Plant under the *Agriculture and Related Resources Protection Act 1976*; and

Main Roads should adopt the environmental management measures detailed in this report and listed in the EMP (Appendix A) during the implementation of the Project to mitigate and manage impacts of construction activities.

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1. Introduction

1.1 Purpose

Main Roads Western Australia (Main Roads) is planning to upgrade the South Coast Highway (Homestead Road intersection) straight line kilometre (SLK) 33.5 to 35 (the Project). The Project is located within the Shire of Albany and occurs approximately 25 kilometres (km) north-east of Albany and approximately 420 km south of Perth (Figure 1).

GHD Pty Ltd (GHD) was commissioned by Main Roads to provide environmental services to determine the environmental impacts and management measures for the Project. This Environmental Impact Assessment and Environmental Management Plan (EIA and EMP) have been prepared as requested by Main Roads.

This EIA is supplementary to the Preliminary Environmental Impact Assessment (PEIA) prepared by Maunsell in March 2009, for this section of the highway (33.5 – 37.7 SLK). This PEIA also identified issues requiring investigation.

1.2 Project Background

The South Coast Highway is the major east-west inter-regional route connecting the towns of Ravensthorpe, Boxwood Hill, Jerramungup and Esperance to Albany. It is also an important heavy haulage route for the agro-forestry, agriculture and mining industries. The development of the agro-forestry and grain carting industry to the east of Albany will lead to increasing volumes of heavy traffic transporting these primary products to the Albany Port.

This section of highway was constructed in 1983 and has deficient formation levels and pavement width with a very rough and hazardous surface. The Homestead Road intersection is currently signed at 90 km/h because it is classed as ‘substandard’.

Main Roads has identified that the Homestead Road intersection of the South Coast Highway requires improvement, due to the existing substandard horizontal and vertical alignment and inadequate width for the traffic volumes and mix that it carries. The intersection also has low pavement strength in a number of places due to significant deterioration including: pavement failures, cracking, shoving and pumping. One contributing factor is the existing formation height which is too low and susceptible to moisture ingress from the surrounding seasonally inundated terrain. Main Roads has nominated the upgrade of this section of the Highway as a priority in their works programme.

Proposed Works

The proposed works involve reconstruction of 1.5 km of road formation with some realignment of substandard vertical and horizontal curves to achieve current standards. There is one intersection within the proposed works which requires reconstruction, being the Homestead Road intersection, which will require realignment in order to suit the new alignment of South Coast Highway. The aim of the works is to provide a section of road network with an improved alignment with suitable seal and shoulder widths to accommodate increasing traffic pressure and volume whilst providing added safety benefits to the community and industry.

The following standards are proposed for the work:

- 7.0m sealed carriageway
- 2x1.0m sealed shoulders
- 2x1.0m unsealed shoulders
- Total seal width 9.0m
- Total pavement width 11.0m
- Fill batter 4H:1V
- Cut batter 2H:1V (but in rock these can be steepened depending on Geotechnical advice)
- Crossfall 3% or as required and governed by horizontal geometry

1.3 Project Area

The Project Area includes the existing highway road reserve in the reconstruction section as well as a small portion of adjacent farmland (Figure 1). The significance of the environmental aspects outside of the Project Area that may be impacted by the proposed roadwork was also considered as part of this assessment.

This assessment did not include any basic raw material source areas nor construction water sources. It is understood that Main Roads will source raw material from existing quarries or other locations.

2. Scope

GHD was commissioned by Main Roads to undertake an Environmental Impact Assessment (EIA) of the proposed Project Area and subsequently prepare an Environmental Management Plan (EMP). It was a requirement of this Project that these documents were prepared using Main Roads environmental guidelines for Environmental Assessment and Approval.

2.1 Environmental Impact Assessment

The preparation of the EIA and subsequent report will include the following:

- Desktop assessment of the Project Area;
- Field study of relevant biological aspects;
- Assess the Project against the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* "Ten Clearing Principles"; and
- Consultation with the regulatory stakeholders to determine requirements as required.

The EIA provides information to assist in obtaining permits or approvals under legislative provisions, including those required under the following Acts and Regulations:

- *Environmental Protection Act 1986.*
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.*
- *Rights in Water and Irrigation Act 1914.*
- *Conservation and Land Management Act 1984.*
- *Wildlife Conservation Act 1950.*
- *Heritage of Western Australia Act 1990.*
- *Swan River Trust Act 1998.*
- *Country Areas Water Supply Act 1947.*

NOTE: the scope of services for this EIA (Manypeaks Section 3) excludes Aboriginal Heritage and Native Title issues and considerations.

Based on an assessment of the Project and a review of previous studies, the relevant environmental and social factors that require consideration for the Project are outlined in Table 1.

Table 1 Environmental Aspects

Environmental Aspects	Relevant		Comments
	Yes	No	
Vegetation – Clearing	✓		Main Roads advises that approximately 2.4 ha of vegetation is proposed to be cleared. Vegetation clearing has been assessed against the Ten Clearing Principles (Section 5.1).
Vegetation – threatened species and communities		✓	Threatened species and communities have been assessed within Section 4.6, 4.7 and 4.9 and no impacts are considered to be caused by the Project
Vegetation – Weeds	✓		Weeds occurring within the area are assessed in Section 4.6.5.
Vegetation – dieback and other diseases or pathogens	✓		A specific Dieback Assessment was undertaken for the Project Area, and discussed in Section 4.9. Dieback Assessment Report is included at Appendix F.
Fauna	✓		Fauna occurring within the Project Area were assessed in Section 4.8. Fauna habitats were identified during the field survey (Section 4.8.4) and assessed *Against the Ten Clearing Principles* (Section 5.1).
Surface Waters/Drainage		✓	No surface water and/or drainages will be impacted by the Project. Section 4.5.2.
Wetlands and waterways		✓	No wetlands and/or waterways will be impacted by the Project. Section 4.5.3.
Groundwater		✓	Groundwater is not considered to be impacted by the Project. Section 4.5.1.
Public Drinking Water Supply		✓	No Public Drinking water supplies will be impacted by the Project. Section 4.5.2.
Reserve and Conservation Areas		✓	No reserves and/or conservation areas will be impacted by the Project. Section 4.9.
Environmentally Sensitive Areas		✓	No ESAs will be impacted by the Project. Section 4.9.
Acid Sulphate Soil		✓	No ASS are present within the Project Area. Section 4.3.
Contaminated Sites		✓	No contaminated sites were present within the Project Area. Section 0.
Air Quality		✓	Significant impacts to air quality are not expected to be caused by undertaking the Project. Refer to EMP Appendix A.
Dust			Significant impacts from dust are not expected to be caused by undertaking the Project. Refer to

			EMP Appendix A.
Noise and Vibration		✓	Significant impacts from noise and vibration are not expected to be caused by undertaking the Project. Refer to EMP Appendix A.
Social Surroundings / Existing Land Use		✓	Social surroundings are not considered to be impacted by the Project. Section 4.11.
Visual impacts		✓	Visual amenity of the area is not considered to be significantly impacted by the Project. Section 4.13.
European Heritage		✓	European Heritage was assessed in Section 4.11.1. No listed sites occur within the Project Area.
Aboriginal Heritage	✓		Aboriginal Heritage was assessed in Section 4.11.2. One listed site (pending registration) occurs within the Project Area.

2.2 Environmental Management Plan

The EMP will be prepared for identified impacts and include the following items:

- planning that minimises the environmental impacts of the works and identifies those responsible for implementation;
- monitoring and maintenance program which assesses the implementation;
- list of commitments identifying management requirements; and
- provide environmental management actions in accordance with results of the EIA report.

3. Methodology

3.1 Environmental Impact Assessment

3.1.1 Desktop Assessment

A desktop assessment was carried out in order to determine the key environmental aspects that may impact the Project Area. The following factors were examined:

- A review of any relevant environmental reports, including the previously completed PEIA;
- A review of the DEC's Environmentally Sensitive Areas;
- A review of the DEC's Threatened Ecological Communities database;
- A review of local and regional significance of plant communities;
- A review of the Department of Environment and Conservation's (DEC's) Rare and Threatened Flora databases;
- A review of the DEC's Threatened Fauna database;
- A review of the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) database for areas listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- A review of European heritage within the Project Area including information from:
  - The Western Australian Heritage Commission;
  - The Australian Heritage Places Inventory; and
  - Records held on Municipal databases.

To assess the existing environment present within the Project Area and its surrounds, GHD has queried a number of desktop sources. The information sources queried for this EIA are provided in Table 2. Dates as to when these sites were accessed are listed in the Reference section of this report.

Table 2 Information sources

Aspect	Information sources
Climate	Bureau of Meteorology website: http://www.bom.gov.au/
Geology and Soils	Geology and Regolith: GeoView WA website: http://mapserver.doir.wa.gov.au/GeoVIEW2/Run.htm?Title=GeoVIEW.WA Geoscience Australia: Geological Survey of Western Australia http://www.geoscience.gov.au/cgi-bin/mapserv?map=/nas/web/ops/prod/apps_www-c/mapserver/geoportal-geologicalmaps/index.map&mode=browse&layer=map250&queryon=true
Acid Sulphate Soils	CSIRO Australian Soil Research Information System (ASRIS): http://www.asris.csiro.au/index_ie.html
Contaminated Sites	DEC Contaminated Study Areas Database: http://www.dec.wa.gov.au/content/view/5627/2295/

Aspect	Information sources
Hydrology	GeoView WA website - inland waters data set. http://mapserver.doir.wa.gov.au/GeoVIEW2/Run.htm?Title=GeoVIEW.WA Native Vegetation Viewer - inland waters dataset. http://maps.dec.wa.gov.au/idelve/nv/index.jsp DoW Geographic Data Atlas- Public Drinking Water Source Areas: http://www.water.wa.gov.au/idelve/dowdataext/index.jsp
Land Use	Natural Resource Management, Shared Land Information Platform (SLIP) online mapping: http://spatial.agric.wa.gov.au/slip/products_view.asp
Reserves and Conservation Areas	DEC *NatureMap* - online mapping: http://naturemap.dec.wa.gov.au/default.aspx
Matters of National Environmental Significance	DSEWPaC: EPBC Act PMST: http://www.environment.gov.au/epbc/pmst/index.html Report: PMST_SMZZLX (Appendix E); Coordinates: -34.84492 118.15261; Buffer: 5 km
Environmentally Sensitive Areas	DEC Native Vegetation Map: http://maps.dec.wa.gov.au/idelve/nv/index.jsp
Flora and Fauna	A search of the Department of Environment and Conservation (DEC) Threatened Flora Database's Declared Rare and Priority Flora List. Geographical Bounding Box: North -34.763341, South -34.883834, East 118.307392, West 118.141368 A search of the DEC Threatened Ecological Communities (TECs) database Geographical Bounding Box: North -34.719448, South -34.915922, East 118.393021, West 118.055646 DSEWPaC: EPBC Act PMST: http://www.environment.gov.au/epbc/pmst/index.html Report: PMST_SMZZLX (Appendix E); Coordinates: -34.84492 118.15261; Buffer: 5 km A review of the DEC's *NatureMap* – to determine vertebrate fauna species lodged in the Museum's collection within and/or adjacent to the Project Area (Appendix E); Method: By Circle; Coordinates: 118°09' 09" E, 34°50' 41" S; Buffer: 5 km
European Heritage	Places Database (State Register of Heritage Places), available from the Heritage Council of Western Australia: http://register.heritage.wa.gov.au DSEWPaC – Australian Heritage Database: http://www.environment.gov.au/cgi-bin/ahdb/search.pl

3.1.2 Field Investigations

Biological Survey

A biological field survey was undertaken by a qualified and experienced ecologist at the Project Area on 30 May 2012, where access was available. Where private land could not be accessed, the survey involved viewing the bushland from the road, which was in close proximity.

The survey involved an assessment of the vegetation types and condition of the vegetation, noting or collecting all flora species visible at the time of survey.

This survey was undertaken with reference to the *Environmental Protection Authority's (EPA) Guidance Statement No. 51* (EPA 2004a) and included:

- an examination on whether the Project Area is within an Environmentally Sensitive Area (ESA) and the native vegetation in the area to be cleared is in a good or better condition than the rest; and
- a review of the local and regional significance of the plant communities in terms of their intrinsic value, extent, rarity and condition;
- a description and location, including mapping, of plant communities within the Project Area. Dominant species in each vegetation type was noted along with any conservation significant flora populations. These communities have been linked to already known, described communities where possible;
- a rating of condition of the vegetation communities or areas using a published rating scale (Keighery, 1994);
- a discussion of the presence, location, extent and impact of any plant pests or diseases. GHD notes that dieback is typically not considered to be relevant outside the south-west of Western Australia;
- an inventory of the vascular plant species in the surveyed area;
- Where field identification of plant taxa was not possible, specimens were collected in a systematic manner so that they could later be identified by comparison with the reference collection held at the Western Australian Herbarium (WAHERB) and by use of identification keys. Nomenclature of the species follows that of the online *FloraBase* program (http://florabase.dec.wa.gov.au/) as it is deemed to contain the most up to date information on flora taxonomy.
- a review of, and search for, native plant species considered to be rare or potentially endangered. Other species of interest, including those of limited distribution or outliers from their known range, should be discussed. Locations of Threatened (Declared Rare) and/or Priority Flora were mapped at a suitable scale;
- an inventory of dominant exotic plants including declared noxious plant species;
- the provision of advice on whether weeds are likely to spread to and result in environmental harm to adjacent areas of native vegetation that is in good or better condition;
- a review of the fauna species considered to be rare or in need of special protection;
- a consideration of the habitat of the Project Area in regard to Black Cockatoo feeding and breeding resources. Areas of trees suitable for breeding were identified;
- identify any other habitats of significance;
- an assessment of the value of the roadside in providing habitat and facilitating movement between conservation area;
- Assessment of the Project against the Environmental Protection Act's Ten Clearing Principles (Schedule 5) detailed in Table 12;
- Assessment of environmental aspects likely to require referral of the Project and advise whether the Project should be referred to the EPA; and)
- Assessment of Matters of National Environmental Significance likely to require referral of the Project and advise whether the Project should be referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC).

Dieback Survey

GHD engaged Great Southern Bio Logic to undertake a *Phytophthora* dieback assessment as part of this Project.

Heritage Survey

GHD completed a desktop heritage assessment as part of this EIA.

A heritage survey was undertaken in conjunction with the PEIA for this Project. NOTE: scope of services for this EIA excludes Aboriginal Heritage and Native Title Considerations, as these are being dealt with separately by Main Roads.

Noise Survey and Modelling

This Project occurs within a rural area and the road works will not significantly alter the noise aspects of the highway. Noise modelling is not required.

Wetland Assessment

GHD completed a desktop wetland assessment as part of this EIA.

Contaminated Sites Assessment

GHD completed a desktop contaminated sites assessment as part of this EIA.

Air Quality Monitoring

This Project occurs within a rural area. One rural residential premise is situated within 100 m of the Project Area. As such, GHD considers that construction activity does not require air quality modelling works.

Dust

This Project occurs within a rural area. One rural residential premise is situated within 100 m of the Project Area. As such, GHD considers that construction activity does not require dust management from a residential perspective. Dust management is considered likely to be required for dust suppression to ensure safe working conditions during construction works.

Acid Sulphate Soil Assessment

GHD completed a desktop acid sulphate soils assessment as part of this Project.

3.1.3 Field Report

The field report:

- provides a summary of the results of environmental investigations and clearances obtained; and
- provides sufficient information to prepare the EMP for construction.

The field report also examines the results of the biological surveys undertaken to allow any proposed clearing of native vegetation to be assessed against the Ten Clearing Principles.

3.1.4 Assessment Limitations

The flora and vegetation survey was carried out in one season, and in one year. Complete flora and vegetation surveys can require multiple surveys, at different times of year, and over a period of a number of years, to enable observation of all species present. Some flora species, such as annuals, are only

available for collection at certain times of the year, and others are only identifiable at certain times (such as when they are flowering). Additionally, climatic and stochastic events (such as fire) may affect the presence of plant species. Species that have a very low abundance in the area are more difficult to locate, due to above factors.

Flora composition changes over time, with flora species having specific growing periods, especially annuals and ephemerals (some plants lasting for a markedly brief time, some only a day or two). Therefore, the results of future botanical surveys in this location may differ from the results of this survey.

The fauna assessment was aimed at identifying habitat types within the Project Area (mapped during the flora and vegetation survey), particularly in relation to conservation significant species.

3.2 Environmental Management Plan

The purpose of the EMP is to:

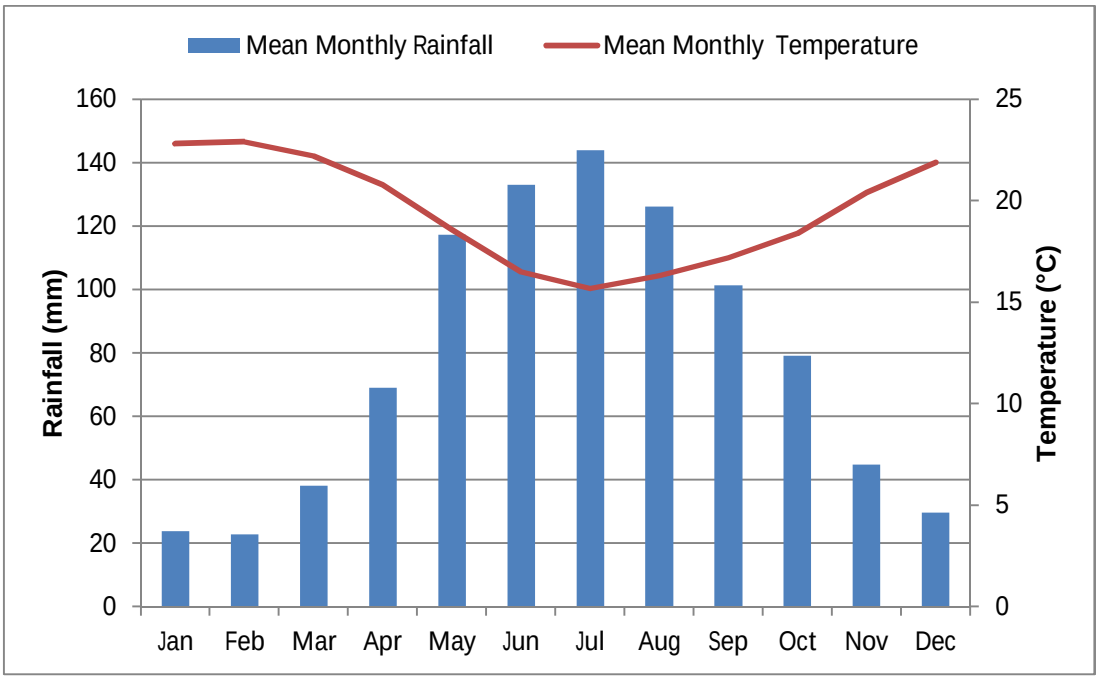
- Provide environmental management actions suitable for inclusion in the tender documentation for Project implementation;
- Provide information directed towards practical management techniques for mitigating impact and maintaining the value of roadsides for conservation of flora and fauna species known to exist within, or use, the surveyed area; and
- Identify offsets where the Project may be at variance with the Ten Clearing Principles.

4. Environmental Assessment

This section describes the existing Project environment, details the expected primary impacts of the proposed works on the environment and details management actions to reduce or manage those impacts. The information included in this section was sourced from database records, literature review, previous studies in the Project Area, and site field survey conducted in 2012.

4.1 Climate

The Project Area is situated on the southern coast of Western Australia, approximately 30 km north-east of Albany. The Albany area has a Mediterranean climate, characterised by warm-dry summers and mild-wet winters. The closest Bureau of Meteorology (BoM) weather station to the Project Area with continuous reliable data is the Albany station (Station Number 9500). A summary of the climatic data (BoM 2012) for this weather station is shown in Graph 1 and summarised below in Table 3.



Graph 1 Mean Rainfall vs Mean Maximum Temperature

Table 3 Climate data for Albany

Mean Annual Maximum Temperature Range	22.9°C (January) and 15.7°C (July)
Mean Annual Rainfall	928.3 mm
Mean Daily Rainfall	22.8 mm (February) and 144.0 mm (July)

(Source: Bureau of Meteorology 2012)

4.2 Geology and Soils

The Project Area occurs within the Jarrah Forrest Interim Biogeographic Regionalisation of Australia (IBRA) region and Southern Jarrah Forrest sub-region. The Jarrah Forrest bioregion is dominated by a duricrusted plateau of the Yilgarn Craton and characterised by jarrah-marri forest on laterite gravels and, in the eastern part, by marri-wandoo woodlands on clayey soils. Eluvial and alluvial deposits in the south support *Agonis* shrublands. In areas of Mesozoic sediments, jarrah forests and various species-rich shrublands occur in a mosaic. The laterite plateau broadens in the Southern Jarrah Forest and slopes gently to the south coast. In the south-east it is almost entirely mantled by sands and is virtually level, which causes poor drainage and numerous wetlands (Hearn et.al. 2002).

4.3 Acid Sulphate Soils (ASS)

The DEC guidelines (DEC 2009) describes ASS as naturally occurring soils and sediments containing sulphide minerals, predominantly pyrite (an iron sulphide). In an undisturbed state below the watertable these soils are benign. If the soils are drained, excavated or exposed by lowering of the water table, the sulphides will react with oxygen to form sulphuric acid. Inappropriate disturbance of these soils can flush acidic leachate to groundwater and surface waters and cause off site environmental impacts.

According to the DEC guidelines (DEC 2009), sites should be investigated for ASS if any of the following works are proposed:

- Soil or sediment disturbance of equal to or greater than 100m^3 in areas depicted in an ASS risk map as “high to moderate risk of ASS occurrence within three metres of natural ground surface” (e.g. construction of roads, drainage works, etc);
- Soil or sediment disturbance of equal to or greater than 100m^3 with excavation from below the natural watertable in areas depicted in an ASS risk map as “moderate to low risk of ASS occurrence within three metres of natural ground surface; and/or
- Lowering of the watertable, whether temporary or permanent (e.g. for groundwater abstraction, dewatering, installation of new drainage, modification to existing drainage), in areas depicted in an ASS risk map as ‘high to moderate risk of ASS occurrence’ or ‘moderate to low risk of ASS occurrence within three metres of natural ground surface'.

The online CSIRO Australian Soil Resource Information System (ASRIS) program (ASRIS 2012) indicated the Project Area occurs in an area that has a low probability of ASS occurring, but with a very low confidence level of the accuracy of this statement due to a lack of surveys in the area.

The Project Area is adjacent to a small depression, with some wetland characteristics. However, it is unlikely that any excavation of soil will occur in this area and the depression does not have characteristics commonly associated with the presence of ASS. As the upgrade is likely to involve raising the road above the existing ground level in this location, the proposed roadworks are unlikely to disturb ASS.

4.4 Contaminated Sites

The DEC's Contaminated Sites database provides a record of known contaminated sites.

The DEC Contaminated Sites database was reviewed to determine the occurrence of any contaminated sites within, or in close proximity to the Project Area. The database showed that there are no known contaminated sites within, or in proximity to, the proposed Project Area (DEC 2012a).

4.5 Hydrology and Drainage

A summary of the Department of Water (DoW) *Geographic Data Atlas* queries undertaken for the Project Area is provided in Table 4.

Table 4 Geographic Data Atlas queries

Aspect	Details	Results
RIWI Groundwater Areas	Groundwater areas proclaimed under the *Rights in Water and Irrigation Act 1914*.	None present within the Project Area.
Groundwater subareas	Groundwater areas are subdivided into groundwater subareas. The subareas are not proclaimed under the Rights in Water and Irrigation Act, but are administrative boundaries used to manage the extraction and licensing of groundwater resources.	The Project Area is sited within the Karri sub-area, located within the Karri groundwater area
Hydrogeology GW Salinity	Groundwater salinity at the watertable. Data extracted from 1:250 000 series Hydrogeological Maps.	Groundwater salinity ranges between 0 mg/L and 1000 mg/L total dissolved salts (TDS) within the Project Area.
RIWI Surface Water Areas	Surface water areas proclaimed under the *Rights in Water and Irrigation Act 1914.*	Two Peoples Bay surface water allocation area, managed by DoW (approximately 3 kilometres south of Project Area)
RIWI Irrigation Districts	Irrigation Districts proclaimed under the *Rights in Water and Irrigation Act 1914*.	None present within the Project Area.
RIWI Rivers	Rivers proclaimed under the *Rights in Water and Irrigation Act 1914.*	None present within the Project Area.
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.*	The Angrove Creek catchment area (not assigned) is located approximately 3 km south-west of the Project Area.
Waterway Management Areas	Areas proclaimed under the *Waterway Conservation Act 1976.*	The Project Area is located within the Albany Waterways Management Area.
Clearing Control	Areas protected by clearing of native	None present within the Project

Aspect	Details	Results
Catchments	vegetation under the *Country Area Water Supply Act 19847* (CAWS Act).	Area.

(Source: Department of Water 2012)

4.5.1 Groundwater

The Project Area is located within the Karri sub-area of the Karri Groundwater area. A search of the DoW, *Geographic Data Atlas* identified that the Project Area does not occur within a proclaimed groundwater or surface water area under the *Rights in Water and Irrigation Act 1914* (RiWi Act). Project works do not include the abstraction of groundwater, however if groundwater abstraction from the area is needed, licencing by the DoW will be required.

The DoW, *Geographic Data Atlas* identified a PDWSA (Angrove Creek catchment area) located approximately three kilometres south-west of the South Coast Highway / Homestead Road intersection.

The DoW, *Geographic Data Atlas* notes groundwater salinity within the Project Area to range between 0 mg/L and 1000 mg/L total dissolved salts (TDS), classifying it as fresh. Issues associated with increased salinity are unlikely to result from implementing the Project due to the narrow width of clearing within the broader landscape.

Construction activities associated with the Project that are likely to impact on groundwater water quality i.e. cause groundwater contamination (e.g. hydrocarbon storage and usage), should be managed through the EMP.

The Project is not expected to impact on local or regional groundwater aquifers.

4.5.2 Surface Water and Protected Catchment Areas

The Project Area is located within the Albany Coast catchment basin within the South West division area of surface water management (DoW 2012). The Project Area does not traverse any ephemeral drainage lines or watercourses proclaimed under the RIWI Act. There are no lakes or watercourses located within 1 km of the Project Area.

Construction activities associated with the Project are unlikely to impact surface water flow and velocity. Therefore this Project is unlikely to cause surface erosion and sediment transportation. Any potential erosion will be mitigated through the EMP.

The Project Area does not occur within a proclaimed surface water area protected under the RIWI Act. As such, a Bed and Banks Permit is not required under this Act prior to disturbance of any watercourses crossed by the highway.

The Project Area does not occur within an Irrigation District

The Project Area does not occur within a Catchment area protected under the *Country Area Water Supply Act* 1947 (CAWS Act). As such, a licence under the CAWS Act is not required for the roadworks clearing.

The proposed works are not expected to alter existing surface water drainage movements (including groundwater recharge). There are no new roadside drains as a result of this Project.

The works will include replacement of five existing culverts over the length of the Project. New roadside table drains will be constructed where required and existing table drains improved as part of the works.

4.5.3 Wetlands

National and Internationally Recognised Wetlands

Wetlands of International Significance are listed under the Ramsar Convention which is an International treaty that covers the conservation of internationally important wetlands. The EPBC Act Protected Matters Search Tool (PMST) indicated that the Project Area does not fall within the catchment of a Ramsar listed site.

There is one Nationally Important Wetland located two kilometres east of the Project Area – Lake Pleasant View System. Lake Pleasant View System comprises three shallow freshwater lakes, about five kilometres apart from each other: Lake Pleasant View, North Sister East and North Sister West. Due to the distance from the Project Area this wetland is not expected to be impacted by roadworks.

State Recognised Wetlands

The Lake Pleasant View System is recognised at the state level, as a wetland of conservation significance.

No Wetlands of International Significance or State wetlands of significance are within the Project Area.

Field assessment

The vegetation present within the Project Area was mapped by GHD, during the field assessment undertaken in May 2012. One vegetation type was mapped as a “disturbed dampland”; this area consisted of very open shrubland of *Melaleuca cuticularis*/*Hakea ceratophylla* and *Allocasuarina humilis* over sedges and introduced herbs. The Project clearing footprint will not impact this dampland area.

4.6 Vegetation

The Australian land mass is divided into 85 bioregions. Each bioregion is a large geographically distinct area of similar climate, geology, landform, vegetation and animal communities. Western Australia supports 26 Interim Biogeographic Regionalisation of Australia (IBRA) regions (DSEWPaC 2012b). The Project Area is situated within the Southern Jarrah Forest Sub-IBRA region of the Jarrah Forest IBRA region.

The Southern Jarrah Forrest Sub-IBRA region is typically characterised by Jarrah (*Eucalyptus marginata*) forest on duricrust plateau and on loam soils of valleys therein: Marri-Wandoo woodlands on drier laterite free soils. In the vicinity of the Manypeaks area, these forests grade into additional vegetation types including Jarrah-Sheoak (*Allocasuarina faseriana*) Low Woodlands and Mallee Heaths in which Eucalypts are prominent (Beard 1981).

4.6.1 Broad Vegetation Types and Regional Extent

For a development proposal to be assessed in terms of the flora and vegetation values that may be impacted upon, an understanding of the extent and status of vegetation communities at the site in question at a regional scale, is required. A widely-used broad scale vegetation classification system that maps and describes vegetation communities in Western Australia is described in Beard (1990).

Broad scale vegetation mapping by Beard (1990) described the vegetation of the Project Area as a *Low forest; jarrah & casuarina (probably Allocasuarina fraseriana)* (vegetation association 994).

Beard mapping has been adapted by Shepherd (2005) and each vegetation complex is presented as a percentage of the pre-European settlement extent which is estimated to be remaining today in each

IBRA region. From data generated by Shepherd (2005), the site vegetation complexes can be categorised as being regionally significant or not.

The Western Australian EPA recognises vegetation associations that are not well represented in reserves as being 'significant'. Vegetation complexes which have 10%-30% of their pre-European extent remaining may be considered regionally significant. Proposals that would impact on a vegetation complex with 10% or less remaining may be formally assessed by the EPA.

From a purely biodiversity perspective (not taking into account any other land degradation issues) there are several key criteria now being applied to vegetation (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% of the pre-European/pre-1750 extent of the vegetation type
- A level of 10% 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
- Such status can be delineated into five (5) classes, where:
- Presumed Extinct: Probably no longer present in the bioregion
- Endangered*: < 10 % of pre-European extent remains
- Vulnerable*: 10 – 30 % of pre-European extent exists
- Depleted*: > 30 % and up to 50 % of pre-European extent exists
- Least Concern: > 50 % pre-European extent exists and subject to little or no degradation over a majority of this area

** or a combination of depletion, loss of quality, current threats and rarity gives a comparable status (Department of Natural Resources and Environment 2002)*

Native vegetation types represented in the survey areas; their extent and reservation status are drawn from the CAR Reserve Analysis 2011 (Government of Western Australia 2011). Extents at the State, IBRA, IBRA sub-region and the Local Government Area (LGA) (City of Albany) level are shown in Table 5.

The Vegetation Association 994, present within the Project Area, is considered to be *Depleted*. The vegetation of the Project Area as mapped by Shepherd (2005) is considered to be well represented with more than 30% of its pre-European extent remaining intact and is therefore categorised as not being regionally significant. However these figures are based on the broad scale vegetation mapping by Beard (1990).

It is therefore considered that the Albany Regional Vegetation Survey (ARVS) report (Sandiford and Barrett, 2010) to be more accurate representation of the Project Area, given its locality within the City of Albany. The EPA has endorsed the ARVS as a key information source to guide land use planning in the Albany Region as the survey report provides a detailed and contemporary regional context of flora and vegetation in the Albany Region (EPA 2011). Use of the ARVS for environmental impact assessment of proposals within the Albany Region is therefore recommended by the EPA (EPA 2011).

The ARVS mapped the vegetation within the Project Area as being two different vegetation types (opposed to the broad scale vegetation mapping by Beard (1990) which only mapped one). The ARVS vegetation types within the Project Area are as follows:

- Marri-Jarrah Forest/Peppermint woodland (vegetation type 10); and
- Hakea spp. Shrubland/Woodland complex (vegetation type 31).

Note: the vegetation type numerals are specific to the ARVS.

The type 31 vegetation is mapped as including the majority of the Project Area, with type 10 being indicated in private property south of the highway and east of Homestead Road. Vegetation type 31 is recorded as having a number of sub-units, and these are not delineated in the mapping. Sub-unit a, which includes the presence of *Eucalyptus staeri* and which is indicated to be present in the general vicinity of the Project Area, is the best match to the Project Area vegetation associations (Table 7).

Sandiford and Barrett calculated the amount of each of the vegetation types within the ARVS area as a percentage of the total remnant vegetation remaining and also calculated their percentage area in conservation reserves. The relevant details for the vegetation types mapped within the Project Area are shown in Table 6.

Based on the ARVS, vegetation within the Project Area is well represented within conservation reserves, and it is therefore considered that the proposed Project clearing will have limited impact on remnant native vegetation types present within the Project Area.

Table 5 Vegetation types and extent – Shepherd (2005)

Code	Total pre-European extent (ha)	2011 Remnant vegetation extent (ha)	% of Pre-European extent	Status
Extent in Western Australia				
994	16,954.92	5,236.12	30.88%	*Depleted*
Extent in IBRA (Jarrah Forrest)				
994	16,407.62	4,949.35	30.16%	*Depleted*
Extent in IBRA sub-region (Southern Jarrah Forrest)				
994	16,407.62	4,949.35	30.16%	*Depleted*
Extent in LGA (City of Albany)				
994	16,954.92	5,236.12	30.88%	*Depleted*

Table 6 Vegetation types and extent – Sandiford and Barrett (2010)

ARVS vegetation type	Current extent remnant vegetation		Extent in conservation reserves		Extent in non reserve	
	Hectares	%	Hectares	%	Hectares	%
10	1597	3.6%	516	32.3%	1081	67.7%
31	2366	5.4%	2021	85.5%	345	14.6%

4.6.2 Project Area Vegetation Associations

Four vegetation associations were delineated at the Project Area in May 2012, based on floristic composition and topography; these are described in Table 7 and mapped in Figure 2.

Table 7 Project Area vegetation associations

Vegetation type	Short description	Long description	Photograph	Condition	Comments
1	*Eucalyptus staeri* Mixed Open Forest	*Eucalyptus staeri/Allocasuarina fraseriana* open forest over dense tall shrubland/low forest of *Hakea cucullata* over dense mixed shrubland/sedgeland of *Agonis theiformis* and *Taxandria parviceps* and mixed sedges.		2	This association is the dominant vegetation type at the Project Area and varies in its density of *Eucalyptus staeri* and *Hakea cucullata*. Some areas are dominated with *H. cucculata*, with occasional *E staeri* whereas other areas have a higher percentage of *Allocasuarina fraseriana*.
2	*Corymbia calophylla/ Eucalyptus marginata forest*	*Corymbia callophylla* forest with occasional *Eucalyptus marginata* over open *Banksia grandis* low woodland over tall open shrubland of *Bossiaea linophylla* over dense mixed shrubland/sedgeland.		2	This association occurs in relatively small, lower lying areas of the Project.

Vegetation type	Short description	Long description	Photograph	Condition	Comments
3	*Disturbed dampland*	Very open shrubland of *Melaleuca cuticularis*/Hakea ceratophylla and *Allocasuarina humilis* over sedges and introduced herbs.		4	This association has been altered by disturbance; primarily the tree layer being removed for powerlines. Weed infestation has occurred as a result of this disturbance.
4	*Eucalyptus staeri/Eucalpytus marginata open forest*	Eucalyptus *staeri/Eucalyptus marginata* open forest over *Agonis/Taxandria* shrubland over open sedges		3	This area is similar to association 4 but has been disturbed by grazing over time and appears to have lost some of the shrub layer. Occasional patches of *Kingia australis* and *Xanthorrhoea platyphylla* occur.

4.6.3 Conservation Significant Ecological Communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat. Threatened Ecological Communities (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.

TECs are listed under both State and Federal legislation; Federally-listed TECs are protected under the EPBC Act administered by the DSEWPaC. The DEC maintains a list of TECs for Western Australia; some of these TECs are also protected under the EPBC Act.

Possible TECs that do not meet survey criteria are added to the DEC Priority Ecological Community (PEC) Lists 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.

A search of the EPBC Act PMST (DSEWPaC 2012c) and the DEC TEC and PEC database identified that several PEC occurrences are recorded within 5 km of the Project Area (Figure 2). The closest known PEC (*Taxandria spathulata* Heath) is located 1.7 km south of the Project Area; vegetation types identified within the Project Area are not representative of this PEC with regards to structure or species. There are no TECs or PECs recorded within the Project Area.

No TECs or PECs are expected to be impacted by the Project, due to the distance from the Project Area of the known occurrence.

4.6.4 Vegetation Condition

The vegetation within the Project Area was assessed in May 2012 by a qualified GHD botanist and given a condition rating based on the vegetation condition ratings scale of Keighery (1994). Condition is based on:

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

Vegetation condition consists of six rating levels as outlined below in Table 8.

Table 8 Vegetation condition scale (after Keighery, 1994)

Rating	Description	
1	Pristine	Pristine or nearly so.
2	Excellent	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species.
3	Very Good	Vegetation structure altered, obvious signs of disturbance.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance, retains basic vegetation structure or ability to regenerate it.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost without native species.

The vegetation of the Project Area is generally in *Excellent* condition, with very little weed invasion or other signs of disturbance. There are small areas of weed invasion along road edges and at the edge of the parking bay, but, due to the density of the vegetation, weeds have not penetrated far into the bushland.

Small areas of the bushland have been impacted by other disturbances such as power lines and power infrastructure. This has resulted in the removal of the overstorey layer and has left shrub and herb/sedge layers, some of which have been invaded by pasture weeds.

Vegetation condition mapping is shown in Figure 2.

4.6.5 Weeds and Introduced Species

Weeds of National Significance (WONS)

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 WONS is based on four major criteria:

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

Declared Plants (DP)

Weeds that are, or may become, a problem to agriculture or the environment can be formally classified as Declared Plants under the *Agriculture and Related Resources Protection Act 1976* (AARP Act). The Department of Agriculture and Food Western Australia (DAFWA) maintain a list of Declared Plants for Western Australia. If a plant 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. Declarations specify a category, or categories, for each plant according to the control strategies or objectives which DAFWA believes are appropriate in a particular place.

Among the factors considered in categorising declared plants are:

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

Declared Plants are divided into five classes, which are detailed in Table 9.

Table 9 Declared Plant Control Classes

Control Class Code	Description
P1	Prohibits movement of plants or their seeds within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder.
P2	Eradicate infestation to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.
P3	Control infestation in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants.
P4	Prevent the spread of infestation from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set on all plants.
P5	Infestations on public lands must be controlled.

(Source: Department of Agriculture and Food Western Australia 2012)

Project Area Assessment

The EPBC Act PMST indicated the presence or likely presence of six significant weed species, as listed below:

- **Asparagus asparagoides* (Bridal Creeper);
- **Genista sp. X Genista monspessulana* (Broom);
- **Lycium ferocissimum* (African Boxthorn);
- **Pinus radiata* (Wilding Pine);
- **Rubus fruticosus aggregate* (Blackberry)*; and*
- **Ulex europaeus* (Gorse).

Many of the recorded weed species listed above are typical of disturbed road reserves/agricultural areas in the South West of Western Australia.

Of the weed species identified in the EPBC Act PMST and *NatureMap* the following are listed as WONS: Bridal Creeper, Broom, African Boxthorn, Blackberry and Gorse.

Of the weed species identified in the EPBC Act PMST and *NatureMap* the following are listed as Declared Plants under the ARRP Act: Bridal Creeper (P1), Blackberry (P1, P2 and P4), and Gorse (P1, P2 and P3).

One potentially significant weed species was recorded during the field survey, Bridal Creeper, *Asparagus asparagoides*. This species was recorded as scattered plants, particularly within the *Eucalyptus calophylla* (marri) forest patches. It does not appear to be dominating the vegetation, but is listed as a WONS and is also a P1 species listed under the ARRP Act. The P1 status requires that it is not spread through any mechanism, within its known location.

There is the potential for this weed to be inadvertently transported from the Project Area to distant uninfested locations as a result of roadworks.

4.7 Flora

GHD completed a field flora survey of the Project Area in May 2012. A list of the vascular flora species recorded within the Project Area is presented in Appendix C. Where field identification of flora species was uncertain a sample was collected for comparison with taxonomic literature, online databases and the Western Australian Herbarium (WAHERB) reference collection. The presence of Threatened (Declared Rare) or Priority Flora was assessed.

4.7.1 Flora Diversity

A search of the *NatureMap* records for the Project Area (including a 5 km buffer) indicates a total of 214 plant taxa (including mosses and bryophytes etc.) from 39 families have been previously recorded in the area. The dominant families identified through this search were:

- *Fabaceae* (peas, wattles) 42 taxa;
- *Myrtaceae* (bloodwoods, eucalypts etc.) 28 taxa;
- *Proteaceae* (banksias, grevilleas etc.) 28 taxa; and
- *Cyperaceae* (sedges) 15 taxa.

Results of Field Survey

A total of 59 flora species were recorded at the Project Area. This included 54 native plant taxa and five introduced/weed species.

Dominant families were:

- *Proteaceae* (peas, wattles) 12 taxa;
- *Myrtaceae* (eucalypts, various shrubs) 6 taxa;
- *Cyperaceae* (sedges) 4 taxa; and
- *Restionaceae* (rushes) 4 taxa.

4.7.2 Conservation Significant Flora

Flora species considered to be conservation significant are listed under the Commonwealth EPBC Act and/or the State *Wildlife Conservation Act 1950* (WC Act). 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 trigger referral of a project to the EPA.

A description of Conservation Categories delineated under the EPBC Act is detailed in Appendix B. These are applicable to threatened flora and fauna species.

In addition to the EPBC Act, significant flora in Western Australia is protected by the WC Act. This Act administered by the DEC protects Threatened (Declared Rare) Flora species.

The DEC also maintains a list of Priority Flora species. Conservation codes for flora species are assigned by the DEC to define the level of conservation significance. Priority Flora species are not currently protected under the WC Act. The Priority Flora may be rare or threatened, but cannot be considered for declaration as rare flora until adequate surveys have been undertaken of known sites and the degree of threat to these populations have been clarified. Special consideration is often given to sites that contain Priority Flora, despite them not having formal legilative protection.

A description of the WC Act and DEC's Conservation codes that relate to flora species is provided in Appendix B.

A desktop search of the EPBC Act PMST (Appendix E) identified seven Commonwealth protected flora species that are known to or have the potential to occur within 5 km of the Project Area. Of the seven taxa indicated by the database search, only three are known to occur within 5 km of the Project Area, based on *NatureMap* searches. An assessment of the likelihood for the other taxa to occur within the Project Area is detailed in Table 11.

A desktop search of the DEC's *NatureMap* identified three Threatened (Declared Rare) Flora species, one Priority 1 species, two Priority 2 species, four Priority 3 species, and six Priority 4 species actually recorded within 5 km of the Project.

A search of the DEC Threatened (Declared Rare) Flora Database, the DEC Declared Rare and Priority List and the Western Australian Herbarium (WAHERB) was undertaken for a nearby Main Roads Project (South Coast Highway – Cheynes Section), which overlaps with this Project Area. These searches identified the same conservation significant flora species recorded within 5 km of the Project as the *NatureMap* search.

A summary of the conservation significant flora species identified in the EPBC Act PMST, the DEC Threatened (Declared Rare) Flora Database, the DEC Declared Rare and Priority List, the Western Australian Herbarium (WAHERB) and *NatureMap* is provided in Appendix C.

It should be noted that the DEC and EPBC Act *PMST database does not necessarily represent a comprehensive listing of rare flora in the area. Its comprehensiveness is dependent on the extent of survey carried out within the specified area and the databases are subject to updating and amendment.*

No species listed as Threatened under the EPBC Act or as Threatened (Declared Rare) under the WC Act or listed as Priority Flora species by the DEC were recorded within the Project Area during either the January 2008 or the October 2008 flora surveys undertaken by Maunsell (Maunsell 2009).

Results of Field Survey

No Threatened or Priority Flora species were recorded during the time of survey or are likely to occur within the Project Area. Three Priority Flora species have been recorded in the immediate vicinity of the road junction previously as indicated on the DEC database search. These species are *Eucalyptus goniantha* ssp*. Goniantha, Stylidium gloeophyllum* and *Gonocarpos trichostachyus*. *Eucalyptus goniantha ssp goniantha* was not present in the Project Area, and is unlikely to have been overlooked. *Stylidium gloeophyllum* and *Gonocarpos trichostachyus* are cryptic species which are small and would be difficult to see when not in flower. In summary:

- No Commonwealth protected flora species were recorded or are likely to occur within the Project Area.
- No Threatened (Declared Rare) and Priority Flora species were recorded within the Project Area.
- Two Priority Flora species have been recorded in the area previously but could not be identified during the field survey due to seasonal constraints.

4.8 Fauna

4.8.1 Expected Fauna

A *NatureMap* search identified three mammal, 74 bird, 11 reptile and six amphibian species as having been previously recorded within 5 km of the Project Area (aquatic and marine species that occur within the 5 km buffer area have not been considered as this is a terrestrial assessment only). A copy of the *NatureMap* reports is provided in Appendix E.

4.8.2 Conservation Significant Fauna

Commonwealth

The State conservation level of fauna species and their significance status is currently assessed under State the WC Act - (*Wildlife Conservation (Specially Protected Fauna) Notice 2010(2)*). The federal 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). A description of Conservation Categories delineated under the EPBC Act and the circumstances under which a project will trigger referral to the DSEWPaC are described in Appendix B.

The EPBC Act protects Migratory species that are listed under the following International Agreements:

- Appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a range state under the Convention;
- The Agreement between the Government of Australia and the Government of the people's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA);
- The Agreement between the Government of Japan and the Government of Australia for the Protection of migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); and

- The Agreement between the Republic of Korea and the Government of Australia for the Protection of migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); and

All Migratory Listed birds in the annexes to these bilateral agreements are protected in Australia as matters of national environmental significance under the Commonwealth EPBC Act.

The EPBC Act also protects Marine Listed birds on Commonwealth lands and waters.

The DSEWPaC maintains a database of matters of national environmental significance that are protected under the EPBC Act. An EPBC Act PMST Report was generated for the matters of significance that may occur in, or may relate to, the Project Area (Appendix E). It should be noted that some species that appear in the EPBC Act PMST results are often not likely to occur within the specified area. This search tool provides an approximate guide to matters of national significance that require further investigation. The records from the DEC searches of threatened fauna provide more accurate information for the general area. However, GHD notes that some of the records of the *NatureMap* database are historical and some of the recorded species may now be locally extinct. Additionally these records may include species that are vagrants/opportunistic users or present in the general area but not present within the Project Area due to lack of suitable habitat.

The DSEWPaC Protected Matters database (DSEWPaC 2012c) identified 17 conservation significant fauna species (eight birds – including two listed as migratory, and four mammals) as potentially occurring within 5 km of the Project Area. The *NatureMap* database (DEC 2012b) identified an additional three conservation significant species (two birds and one mammal) as potentially occurring within 5 km of the Project Area. These species are listed in Appendix C.

Five additional fauna species listed as Migratory under the EPBC Act are known or predicted to occur within 5 km of the Project Area (PMST): including two wetland bird species and three marine bird species. The Project Area has very limited habitat for migratory aquatic bird species. The status of the marine bird species is not considered further in this assessment because the Project Area is not a marine environment nor is it near a Commonwealth Marine Area. Four terrestrial species listed as Migratory under the EPBC Act are regarded as having habitat that is likely to occur or may occur within the area, but were not sighted during the 2012 site survey. Migratory species are unlikely to be impacted by the Project due their transient nature and distance of the Project Area from the coast (approximately 10 km).

State

The DEC produces a supplementary list of Priority Fauna, specific to Western Australia, these being species that are not considered Threatened under the WC Act but for which the DEC feels there is cause for concern. These species have no special legislative protection, but their presence would normally be considered relevant to an assessment of the conservation status of an area. Such taxa need further survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna. Levels of Priority are described in Appendix B.

The *NatureMap* search identified the potential presence (within 5 km of the Project Area) of the following DEC Priority-listed terrestrial fauna species:

- *Isoodon obesulus* subsp. *Fusciventer* (Quenda) Priority 5

Likelihood of occurrence

The likelihood of the fauna taxon being present within or within the vicinity of the Project Area is based on known distribution records (particularly that of *NatureMap*) as well as descriptions of preferred habitat from the EPBC Act Species Profile and Threats Database. An assessment on the likelihood of the presence of (as defined in Table 10), and possible impact to conservation significant fauna species is included in Table 11.

Those fauna species listed exclusively as Marine and/or Migratory under the EPBC Act and/or Schedule 3 under the WC Act have not been included in this assessment unless they hold additional status as Threatened fauna. Marine, Migratory and/or Schedule 3 fauna taxa are often common within Western Australia and are not considered to be under threat in this state.

Table 10 Definitions for likelihood of occurrence

Likelihood of occurrence	Definition
Known	Species definitely recorded within the Project Area either from previous records or field survey results.
Likely	Species previously recorded within 5 km and suitable habitat occurs at the Project Area.
Possible	Species previously recorded within 5 km with marginally suitable habitat occurring at the Project Area. OR Species not previously recorded within 5 km, but suitable habitat occurs at the Project Area.
Unlikely	Species previously recorded within 5 km but suitable habitat does not occur at the Project Area.
Highly unlikely	Species not previously recorded within 5 km, but suitable habitat occurs at the Project Area.

The EPBC Act-listed species are likely to be referred to the DSEWPaC, while those with State protection are likely to be referred only to the EPA.

A total of three species (both the EPBC Act-listed and WC Act-listed) were determined to be likely to occur or could possibly occur at the Project Area.

The Project is not considered to have an impact on these fauna due to: the very narrow size of the proposed impact area; the repetition of fauna habitat present in the local and regional area beyond the boundary of the Project Area in like or better condition; and the propensity for the majority of fauna taxa to move away from disturbance and seek more suitable habitat.

Table 11 Fauna likelihood of occurrence assessment

Genus/Species	Source	EPBC Act Status	WC Act Status	DEC Status	Likelihood of Occurrence
Birds					
Atrichornis clamosus Noisy Scrub-bird	EPBC Act PMST	V	S1	EN	Unlikely. Habitat area too small and fragmented.
Botaurus poiciloptilus Australasian Bittern	EPBC Act PMST	EN	S1	EN	Unlikely. Habitat not suitable.
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo	EPBC Act PMST; NatureMap	V	S1	VU	Possible. Feeding and breeding habitat present.
Calyptorhynchus baudinii Baudin's Black-Cockatoo	EPBC Act PMST; NatureMap	V	S1	EN	Possible. Feeding and breeding habitat present.
Calyptorhynchus latirostris Carnaby's Black-Cockatoo	EPBC Act PMST	EN	S1	EN	Possible. Feeding and breeding habitat present.
Dasyornis longirostris Western Bristlebird	EPBC Act PMST	V	S1	VU	Unlikely. In this area the species is restricted to dense coastal vegetation of Waychinicup and Two Peoples Bay Nature Reserves. No specimens have been recorded in the Project Area.
Leipoa ocellata Malleefowl	EPBC Act PMST; NatureMap	V; Mi	S1	VU	Unlikely. No evidence of malleefowl nests and habitat area too small.

Genus/Species	Source	EPBC Act Status	WC Act Status	DEC Status	Likelihood of Occurrence
Pezoporus wallicus flaviventris Western Ground Parrot	EPBC Act PMST; NatureMap	EN; Mi	S1	CR	Unlikely. Habitat area not suitable.
Mammals					
Dasyurus geoffroii Western Quoll	EPBC Act PMST	V	S1	VU	Unlikely. Habitat area small and fragmented.
Parantechinus apicalis Dibbler	EPBC Act PMST	EN	S1	EN	Unlikely. Habitat area small and fragmented.
Pseudocheirus occidentalis Western Ringtal Possum	EPBC Act PMST	V	S1	VU	Unlikely. No evidence of resting dreys during survey and no preferred Agonis species present.
Setonix brachyurus Quokka	EPBC Act PMST	V	S1	VU	Unlikely. This species is associated with dense forests and thickets, and is highly susceptible to predation from cats and foxes (both possibly present within or nearby the study site).

4.8.3 Introduced Fauna

The EPBC Act PMST indicates a total of three introduced (feral) fauna likely to occur within the vicinity of the Project Area:

- **Felis catus* (Feral Cat);
- **Oryctolagus cuniculus* (Rabbit); and
- **Vulpes vulpes* (Red Fox).

The results of the *NatureMap* search indicate that no introduced fauna taxa have been officially reported within the vicinity of the Project Area.

4.8.4 Fauna Habitat

The Project Area is considered to contain habitat suitable to assist in supporting the following Threatened fauna:

- *Calyptorhynchus banksii naso* (Forest Red-tailed Black-Cockatoo);
- *Calyptorhynchus baudinii* (Baudin's Black-Cockatoo); and
- *Calyptorhynchus latirostris* (Carnaby's Black-Cockatoo).

The majority of the Project Area (approximately 2.35 ha) is feeding habitat for Baudin's and Carnaby's Black Cockatoos, being dominated by species including *Hakea*, marri and *Allocasuarina*. A portion of the Project Area is suitable breeding habitat for all species. This area is represented by vegetation type 2 (*Corymbia calophylla/ Eucalyptus marginata* forest, see Section 3.3) and constitutes approximately 1.0 ha of the directly impacted area.

The fauna habitat in the Project Area is also considered to be present in the local and regional area.

Most of the existing impact to fauna habitat in the Project Area is due to historical vegetation clearing for agricultural purposes, primarily cattle husbandry with some previously cleared areas now planted to bluegums (*Eucalyptus globulus*) for commercial harvesting. The Project is not considered to have a significant impact on these fauna due to:

- The small size of the proposed impact area;
- The amount of fauna habitat present in the local and regional area beyond the boundary of the Project Area in like or better condition; and
- The propensity for the majority of fauna taxa to move away from disturbance such as a road and seek more suitable habitat.

4.9 Environmentally Sensitive Areas (ESAs)

Environmentally Sensitive Areas (ESAs) are declared by a notice under Section 51B of the *Environmental Protection Act 1986*. A search of the DEC's online Native Vegetation Viewer confirmed that there are no ESAs within the Project Area.

The nearest known ESA is Lake Pleasant View, located approximately 2.5 km north-east of the Project Area, due to its distance from the Project Area, this wetland is not expected to be impacted by the Project.

4.10 Reserves and Conservation Areas

Reserves and Conservation Areas are gazetted under Section 51B of the *Environmental Protection Act 1986*. A search of the DEC's online Native Vegetation Viewer confirmed that there are no reserves or conservation areas within or immediately adjacent to, the Project Area.

The nearest DEC estate is Lake Pleasant View Nature Reserve, located approximately 2 km north-east of the Project Area. This reserve will not be impacted upon by the proposed works.

4.11 Heritage

4.11.1 European Heritage

The Australian Heritage Council and the DSEWPaC, is responsible for places of national significance. The Commonwealth Heritage List is a list of natural, indigenous and historic heritage places owned or controlled by the Australian Government.

The *Heritage of Western Australia Act 1990* has legal protections for significant places listed on the State Register of Heritage Places. The State Register deals primarily with Western Australia's built (European) heritage. Other types of heritage, such as indigenous, maritime and natural, are protected by different legislation administered by other State Government Departments. Local Governments are responsible for heritage places that are significant to their local communities and listed on their Municipal Inventories.

Searches of the Australian Heritage Places Inventory and the Heritage Council of WA Places database were conducted to identify any European Heritage Sites within 10 km of the Project Area (DSEWPaC 2012a).

No sites were listed on either of these databases. Additionally, no World Heritage Properties or National Heritage Places were identified through the EPBC Act PMST.

4.11.2 Aboriginal Heritage

Matters regarding management of Aboriginal Heritage are not addressed in this report, as per direction of Main Roads. All matters of Aboriginal Heritage are being dealt with separately by Main Roads.

4.12 Existing Land Use

A power substation is present within part of the road reserve east of Homestead Road along South Coast Highway. Small buildings related to power supply are present on both sides of the road.

Land use adjacent to the Project Area is primarily for agricultural purposes. Cleared farmland supports cattle with some previously cleared areas now planted to bluegums (*Eucalyptus globulus*) for commercial harvesting.

The Proposed roadworks are not expected to alter these existing uses.

4.13 Visual Amenity

The proposed clearing will have some impact on the visual amenity from the highway by opening up the aspect to adjacent land use, particularly existing bluegum plantations. Potential

clearing and roadwork may marginally impact on the landscape character by removing good quality native bushland; however there are significant amounts of bluegum plantations in the area already which are visible from the highway.

4.14 Dieback Management

The Project Area occurs in an area at risk of *Phytophthora cinnamomi,* commonly known as dieback. Dieback is found throughout the southern extent of Western Australia in areas with susceptible plant species that receive rainfall in excess of 400 mm/year (Dieback Working Group, 2010). A *Phytophthora* Dieback Assessment was completed by Great Southern Bio Logic on 21 May 2012.

Results of this assessment conclude that the whole of the Project Area is infested. A copy of the assessment report is included as Appendix F.

The entire Project Area has been classified as infested with *Phytophthora* based on diagnostic evidence collected during the field assessment. The diagnostic evidence included:

- Multiple deaths of susceptible plants representing multiple indicators species distributed across the Project Area;
- An age range of disease deaths demonstrating disease history consistent with the movement of disease through the vegetation over time. Vegetation deaths range from very old deaths through to fresh deaths; and
- The presence of a suitable vector represented by the South Coast highway and adjoining private properties.

The results of this *Phytophthora* dieback survey did not identify any areas within the prescribed Project Area that can be protected from the introduction and spread of Dieback. Therefore the primary objective of Dieback Management for this Project is to ensure the disease is not transported beyond the Project Area.

The most common method of spread of Phytophthora dieback is via the movement of infested soil and plant material from infested areas into uninfested areas, and the most common cause of soil movement is via transport on vehicles, machinery, other equipment and footwear. Introduction of infested soil to an uninfested area will result in the spread of the disease to the uninfested area. Management measures should be implemented during the roadworks, including: cleaning of soil and vegetation from earth-moving machinery prior to entering and leaving the Project Area; avoid clearing and topsoil movement during wet soil conditions.

4.15 Topsoil Management

The management of topsoil during roadworks is important to optimise the use of topsoil resources and to minimise the risk of transporting weeds and / or dieback within and externally to the Project Area. It is recommended that topsoil use and movement of in-situ topsoil during roadworks should be restricted to the limits of the Project Area,

4.16 Revegetation and Landscaping

Opportunities to enhance the areas visual amenity, floral diversity and potential for fauna habitat exist within the Project Area. This could be achieved by revegetating cleared areas within the

corridor with local “provenance” native seed and / or seedlings. There is scope for revegetation once the roadworks are completed and it is recommended that Main Roads develop and implement a Revegetation and Landscape Plan for the Project.

4.17 Pre-construction Works

A number of utility services occur within the Project Area including Telstra cables and pits. These services have been relocated to suit the new design, in readiness for commencement of the works.

4.18 Construction Phase Impacts

Additional minor potential impacts requiring consideration and management during the Projects construction phase include the following:

- construction noise and vibration
- damage to public/private property
- dust lift
- traffic access and safety
- fire management
- chemicals storage and handling
- waste disposal
- These issues are specific to each section of project development and detailed measures to manage them are given in the EMP at Appendix B.
- Construction work should be managed by implementing the EMP and ensuring management measures are included in relevant contractual documents.

Main Roads should incorporate relevant EMP measures and requirements into the Projects tender documentation and site induction material for all personnel and service providers involved.

5. Clearing of Native Vegetation

Clearing of adjacent native vegetation is required to undertake the proposed roadworks (road realignment) and to create a safety clear zone for traffic. The Project clearing area is estimated to be 2.4 ha.

The clearing of any native vegetation is regulated by the DEC and requires a permit under Part V of the *Environmental Protection Act 1998*, except where exemptions apply under Schedule 6 of the Act or are prescribed in the *Environmental Protection (Clearing of Native Vegetation) Regulations 200*4.

Main Roads has been granted a State-wide vegetation clearing permit (Purpose Permit CPS 818/4), under section 51E of the *Environmental Protection Act 1986*, from the DEC. The Purpose Permit allows Main Roads to clear native vegetation for road realignment projects and associated construction activities. The permit requires any proposed clearing of native vegetation to be assessed against the "Ten Clearing Principles" as outlined in the permit.

These principles aim to ensure that all potential impacts resulting from removal of native vegetation can be assessed in an integrated way. The principles address three main environmental areas:

- Biodiversity significance;
- Land degradation;
- Ground and surface water quality.

The Permit does not authorise the clearance of native vegetation for project activities where:

- The clearing may be seriously at variance with the clearing principles;
- Those project activities are incorporated in any proposal that is referred to and assessed under Part IV of the *Environmental Protection Act 1986* by the EPA; or
- Clearing occurs in an Environmentally Sensitive Area

These principles apply to all lands throughout Western Australia. If the project involves significant impacts other than on native vegetation, or the clearing is exempt under Section 51C but is considered to have a significant impact, it should be referred to the EPA for consideration.

Where clearing is or is likely to be at variance with one or more of the "Ten Clearing Principles", then the permit holder must implement an offset in accordance with Part V of the Permit with respect to that native vegetation.

5.1 Assessment against the Ten Clearing Principles

This Project has been assessed against the 'Ten Clearing Principles' (Table 12) and found to be "not likely to be at variance" with any of the Principles, with the exception of Principle "b" at which it is considered to be "likely to be at variance with the Principle".

The proposed Project is considered to have a significant impact on Black Cockatoo habitat under the EPBC Act, with some habitat trees potentially being removed from the Project Area. It is suggested that Main Roads consider discussing the clearing impact of the Project with DSEWPaC officers to determine the need for a referral under the EPBC Act.

Table 12 Assessment against the "Ten Clearing Principles"

Principle	Principle description	Assessment	Outcome	Methodology
(a)	Native vegetation should not be cleared if it comprises a high level of biological diversity.	The native vegetation in the Project Area does not comprise a high level of biological diversity. Fifty five native plant species were recorded in the Project Area and the vegetation type is relatively consistent across the area. No Priority flora species were recorded during the survey, however, the DEC database contains a record of *Gonocarpus trichostachyus* in the area. This species is small and difficult to observe out of its flowering period (Sept - Oct).	The proposal is not likely to be at variance with the Principle.	Desktop assessment for conservation significant and site assessment by GHD ecologist.
(b)	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	The vegetation comprises habitat for the Carnaby's, Baudin's and Forest Red-tailed Black Cockatoos. The vegetation is dominated by a range of Black Cockatoo feed species including Hakea, marri and *Allocasuarina*. No Western Ringtail Possum dreys were noted and the species' key habitat tree, *Agonis flexuosa*, was not present at the Project Area or in adjacent areas.	The proposal is likely to be at variance with the Principle.	Field observations by GHD ecologist. EPBC Act PMST. NatureMap search.
(c)	Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	A desktop search of the EPBC Act PMST, the DEC threatened species database and NatureMap identified 2 Threatened (Declared Rare) flora species (species listed under either the EPBC Act or the WC Act) that have been predicted to occur or documented to occur within 5 km of the Project Area No rare flora species were recorded during the GHD field survey undertaken in May 2012; additionally no rare flora species were identified during either the January 2008 or the October 2008 flora surveys undertaken by Maunsell (Maunsell 2009).	The proposal is not at variance with the Principle.	Rare Flora survey by GHD ecologist. Desktop assessment: GIS data for DEC Declared Rare and priority Flora list, WAHERB, EPBC Act PMST and NatureMap. Maunsell (2009)
(d)	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	No TECs were identified as being present within the Project Area or within a 20 km radius of the Project Area.	The proposal is not at variance with the Principle.	Rare Flora survey (by GHD ecologists and GIS EPBC Act PMST and the DEC's TEC database

Principle	Principle description	Assessment	Outcome	Methodology
(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.	Broad scale vegetation mapping by Beard (1990) indicates that just over 30% of Beard vegetation type 944 remains within the Shire of Albany and the IBRA sub-region. However, mapping by Sandiford and Barrett (2010) as part of the ARVS is considered to provide a more accurate representation of vegetation within the Project Area, given its locality within the City of Albany. The ARVS indicates that the vegetation within the Project Area consists of types 10 and 31. Whilst these vegetation types are not well represented in the Albany Regional area, with less than 10% remaining, they are both well conserved; with over 85% of type 31 and over 30% of type 10 currently existing within conservation reserves. Thus, the proposed Project clearing of approximately 2.4 ha is not considered to be significant as a remnant, due to the extensive clearing and degraded status of the remaining native vegetation present within the broader landscape. Based on the ARVS, vegetation within the Project Area is well represented within conservation reserves, and it is therefore considered that the proposed Project clearing will have limited impact on remnant native vegetation types present within the Project Area.	The proposal is not likely to be at variance with the Principle.	Database information CAR, 2011. Albany Regional Vegetation Survey (ARVS), 2010.
(f)	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	A small, degraded dampland is present in farmland adjacent to the north of the road reserve; this area is primarily cleared it is unlikely that wetland vegetation will be impacted. This identified patch of degraded dampland vegetation is outside of the proposed Project clearing footprint, and therefore will not be impacted by the Project	The proposal is not likely to be at variance with the Principle.	Desktop assessment (GIS and aerial mapping) of known wetlands in the vicinity of the Project Area. Site assessment by GHD staff.
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Vegetation clearing is unlikely to cause appreciable land degradation. Adjacent land is primarily cleared farmland or bluegum plantation. Potential low level impacts are increased weed invasion to adjacent bushland remnants and road runoff. Implementation of the EMP will provide for management of any land degradation impacts.	The proposal is not likely to be at variance with the Principle.	Site assessment by GHD staff.

Principle	Principle description	Assessment	Outcome	Methodology
(h)	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.	There are no conservation reserves within or adjacent to the Project Area. The nearest conservation areas to the Project Area are the Lake Pleasant View and South Sister Nature Reserves, located approximately 2 km north-east and 2.5 km north respectively.	The proposal is not likely to be at variance with the Principle.	Desktop assessment of conservation areas.
(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.	The small area of clearing of native vegetation for the Project is considered unlikely to impact on groundwater. There are no permanent surface water areas within proximity of the Project Area. Road drainage and sedimentation will be managed through design and construction management.	The proposal is not likely to be at variance with the Principle.	Site assessment by GHD staff.
(j)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	The clearing of native vegetation is not considered to cause any alteration to flood duration or flood height due to the small area to be cleared. Additional runoff may be directed into adjacent, existing depressions on farmland.	The proposal is not likely to be at variance with the Principle.	Site assessment by GHD staff.

6. Environmental Management

The Environmental Management Plan (EMP) prepared for the Project is included at Appendix A which collates the management actions detailed in Section 2. The EMP details the environmental management measures to be implemented during roadworks to provide for Main Roads to deliver the Project in an environmentally acceptable manner. This information is presented to be used as a 'stand alone' Construction EMP during the implementation of the Project.

The EMP outlines responsibility for each commitment at the applicable design, construction or operational phase. The commitments outlined in the EMP aim to provide a basis for which performance and compliance can be measured during development of the Project.

6.1 Environmental Management and Quality Plan

The Construction Contractor should prepare a Quality Plan for the Project, which will address the Construction Contractor's management responsibility, authority and communication requirements and clearly detail the Contractor's 'Quality Management Representative' (QMR) role with respect to the Contract in accordance with AS/NZS ISO 9001.

The Quality Plan should be submitted to Main Roads Construction Manager for approval.

6.2 Environmental Monitoring and Compliance

Environmental management commitments detailed in the EMP should be included in relevant contract documents and the Technical Specification prepared for the Project. All Main Roads employees, service authorities, contractors and other personnel employed on the Project should be made aware of the EMP through the site induction and tool box meeting processes.

During the construction phase, compliance with environmental management measures should be regularly monitored. Any non-conformances should be addressed at the first opportunity, while the non-conformance and any improvement actions implemented should be detailed in appropriate construction documentation.

7. Consultation

During the development of this EIA and EMP Main Roads was involved in a number of consultations with the City of Albany. No significant issues were raised and no further consultation is required.

Main Roads has also been in consultation with local landowners with regards to the proposed roadworks, and the required land clearing, and have negotiated new fencing and new driveways for those individuals whom will be impacted by the roadworks.

GHD did not undertake any consultation on behalf of Main Roads for the preparation of this Report.

It is recommended that Main Roads refer the proposal to DSEWPaC with regards to the clearing impact of the Project on Black Cockatoo habitat.

8. Recommendations

8.1 Commonwealth Government

A review of the DSEWPaC Protected Matters online database was conducted as part of preparing this EIA. There are no environmental impacts or issues considered as having a significant impact on matters of national environmental significance, which would render the Project a “Controlled Action” or invoke the Commonwealth EPBC Act.

The proposed Project is considered to have a significant impact on Black Cockatoo habitat under the EPBC Act, with some habitat trees potentially being removed from the Project Area. It is recommended that Main Roads refer the project to DSEWPaC for consideration as a controlled action under the EPBC Act.

8.2 Western Australian Government

8.2.1 Environmental Protection Authority

The Project proposes to upgrade a section of the South Coast Highway.

The EPA provides advice to the State Government on the environmental acceptability of development proposals and statutory planning schemes. Under the provisions of the EP Act the EPA considers referrals and decides whether or not they require formal environmental impact assessment.

Based on the small scale of this Project, associated level of public interest and minimal environmental impact, it is recommended that this Project not be formally referred to the EPA.

Main Roads Purpose Permit (818/6) has been granted to Main Roads under Section 51E of the *Environmental Protection Act 1986*, and allows the clearance of native vegetation for this Project activity. This Permit does not authorise the clearance of native vegetation for project activities where:

- The clearing may be seriously at variance with the clearing principles; or
- Those project activities are incorporated in any proposal that is referred to and assessed under Part IV of the *Environmental Protection Act 1986* by the EPA.

The Project has been assessed as “likely to be at variance” with Principle “b” of the Ten Clearing Principles, due to potentially removal of Black Cockatoos habitat trees from the Project Area. As per the above recommendation, Main Roads should refer the Project to DSEWPaC for consideration as a controlled action under the EPBC Act.

8.2.2 Department of Environment and Conservation

This Project was found to be at variance with Principle “b” of the 10 Clearing Principles. GHD considers that the Main Roads Purpose Permit (818/6) is adequate for the clearing requirements of this Project.

9. References

Australian Soil Resource Information System (2012) *ASRIS* database [Online] http://spatial.agric.wa.gov.au/slip/ accessed May 2012.

Beard J.S (1981) *Vegetation Survey of Western Australia.*

Bureau of Meteorology Australia (2012) *Climate Statistics for Australian Locations: Summary Statistics* Albany [Online] http://www.bom.gov.au/climate/data/index.shtml (station number 9500) accessed May 2012.

Commonwealth Government of Australia (1999) *Environmental Protection and Biodiversity Conservation Act*, Canberra.

Department of Agriculture and Food (2012) *Declared Plants Search* [Online] http://agspsrv95.agric.wa.gov.au/dps/version02/01_plantsearch.asp accessed June 2012.

Department of Conservation and Land Management (2001): *Phytophthora cinnamomi* and disease caused by it, Volume two Interpreter Guidelines for Detection, Diagnosis and Mapping.

Department of Environment and Conservation (2003): *Phytophthora cinnamomi* and disease caused by it, Volume one, management guidelines.

Department of Environment and Conservation (2009). Identification and Investigation of Acid Sulphate Soils and Acidic Landscapes. Contaminated Sites Branch, Environmental Regulation Division. Perth, Western Australia.

Department of Environment and Conservation (2012a) *Contaminated Sites database* [Online] http://portal.environment.wa.gov.au/portal/34343 accessed May 2012.

Department of Environment and Conservation (2012b) *NatureMap; Mapping Western Australia's Biodiversity*. Search By Area. [Online] http://naturemap.dec.wa.gov.au accessed May 2012

Department of Environment and Conservation (2012c). Native Vegetation Map Viewer [Online] http://portal.environment.wa.gov.au/portal/ accessed May 2012.

Department of Indigenous Affairs. (2012). Aboriginal Heritage Inquiry System [Online] http://www.dia.wa.gov.au/Heritage--Culture/Sites--Surveys/Aboriginal-Heritage-Inquiry-System accessed May 2012.

Department of Mines and Petroleum (2012) GeoVIEW.WA [Online] http://mapserver.doir.wa.gov.au/GeoVIEW2/viewer.htm?Title=GeoVIEW.WA accessed May 2012.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011). *Environmental Protection and Biodiversity Conservation Act 1999* draft referral guidelines for three threatened black cockatoo species. Department of Sustainability, Environment, Water, Population and Communities. Australian Government Canberra

Department of Sustainability, Environment, Water, Population and Communities (2012a) *Australian Heritage Database* [Online] http://www.environment.gov.au/cgi-bin/ahdb/search.pl accessed May 2012.

Department of Sustainability, Environment, Water, Population and Communities (2012b) Biogeographic Regionalisation of Australia Version (IBRA) 6.1 [Online] http://www.environment.gov.au/parks/nrs/science/ibra.html accessed May 2012.

Department of Sustainability, Environment, Water, Population and Communities (2012c) *Protected Matters Search Tool* [Online] http://www.environment.gov.au/epbc/pmst/index.html accessed May 2012.

Department of Water (2012) *Geographic Data Atlas* [Online] http://www.water.wa.gov.au/idelve/dowdataext/index.jsp accessed May 2012.

Environmental Protection Authority (2000) Environmental Protection of Native Vegetation in Western Australia, Clearing of native vegetation, with particular reference to the agricultural area. Position Statement No. 2. Environmental Protection Authority. Perth, Western Australia.

Environmental Protection Authority (2004) Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*.

Environmental Protection Authority (2011) Environmental Protection Bulletin No. 13, *Guidance for the use of the Albany Regional Vegetation Survey in Environmental Impact Assessment*, May 2011.

Geoscience Australia (2012) 1:250000 Maps [Online] http://www.geoscience.gov.au/cgi-bin/mapserv?map=/nas/web/ops/prod/apps_www-c/mapserver/geoportal-geologicalmaps/index.map&mode=browse&layer=map250&queryon=true accessed May 2012.

Government of Western Australia (1914) *Rights in Water and Irrigation Act 1914*, State Law Publisher, Perth, Western Australia.

Government of Western Australia (1947) *Country Areas water Supply Act 1947*, State Law Publisher, Perth, Western Australia.

Government of Western Australia (1950) *Wildlife Conservation Act 1950*, State Law Publisher, Perth, Western Australia.

Government of Western Australia (1972) *Aboriginal Heritage Act 1972*, State Law Publisher, Perth, Western Australia.

Government of Western Australia (1976) *Agriculture and Related Resources Protection Act 1976*. State Law Publisher. Perth, Western Australia.

Government of Western Australia (1986) *Environmental Protection Act 1986*, State Law Publisher, Perth, Western Australia.

Government of Western Australia (1997) *Environmental Protection Noise Regulations 1997*, State Law Publisher, Perth, Western Australia.

Government of Western Australia (2004) *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, State Law Publisher, Perth, Western Australia.

Government of Western Australia (2011) Comprehensive, Adequate and Representative Reserve Systems for Forests in Western Australia: CAR Analysis Report 2011 [Online] https://www2.landgate.wa.gov.au/c/document_library/get_file?uuid=bbf8b148-8ad4-4c39-bb3f-7a960372858d&groupId=10136 accessed May 2012.

Government of Australia (2012) *Weeds in Australia* [Online] http://www.weeds.gov.au/cgi-bin/weedsearch.pl accessed June 2012.

Hearn, Roger; Williams, Kim; Comer, Sarah; Brett Beecham (2002) *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002*. "Jarrah Forest 2 (JF2 – Southern Jarrah Forest subregion)". The Department of Conservation and Land Management., January 2002.

Heritage Council of WA (2008) Places Database (State Register of Heritage Places) [Online] http://register.heritage.wa.gov.au accessed May 2012.

Keighery, B.J. (1994). Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc.). Nedlands, Western Australia.

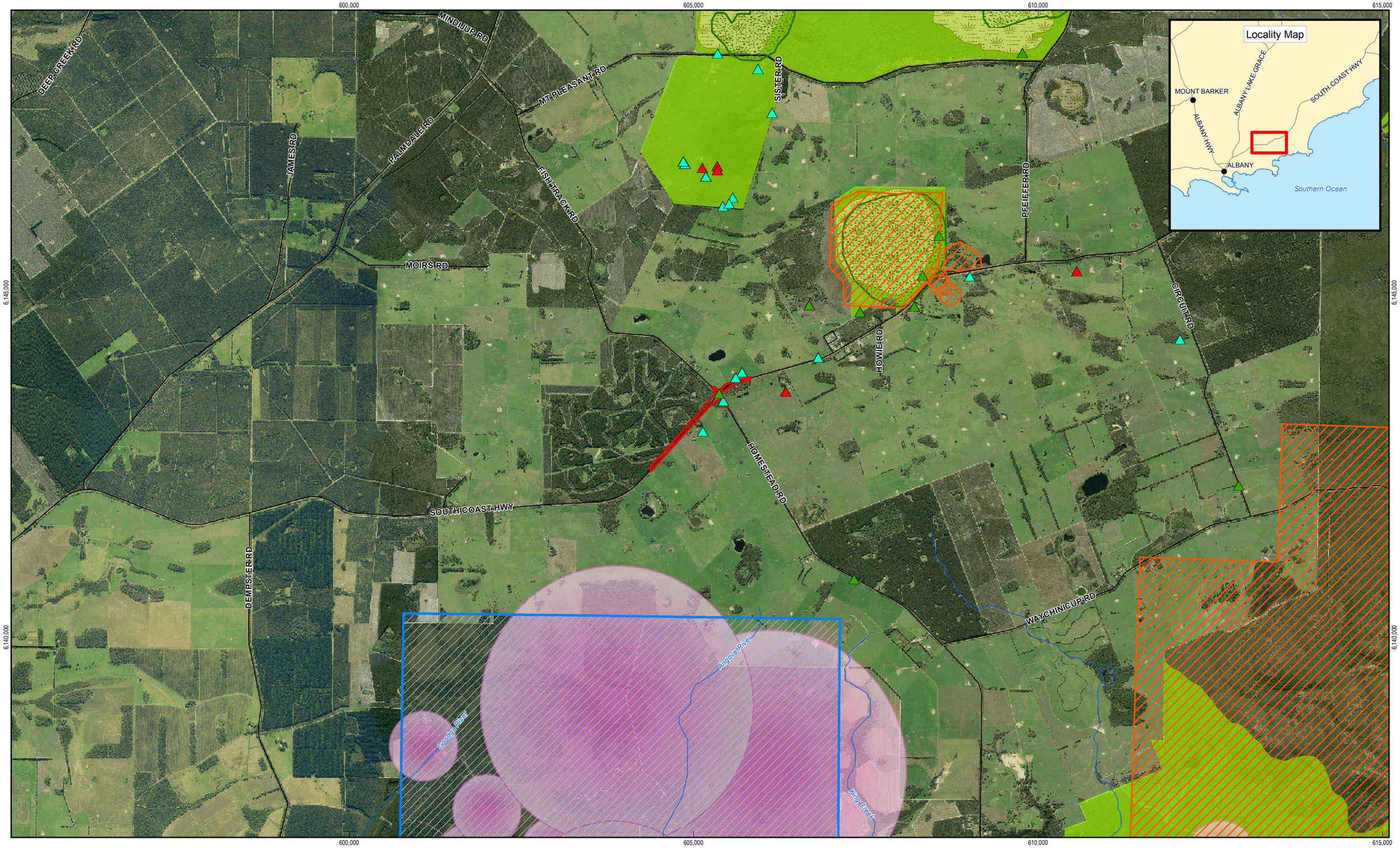
Maunsell Australia Pty Ltd (2009) *Preliminary Environmental Impact Assessment (PEIA) and Environmental Management Plan (EMP), South Coast Highway Upgrade, Main Roads Western Australia.*

Natural Resource Management in Western Australia (2008) *Shared Land Information Platform* (SLIP) online mapping [Online] http://spatial.agric.wa.gov.au/slip/products_view.asp accessed May 2012.

Sandiford, E.M. and Barrett, S (2010) *Albany Regional Vegetation Survey*. Extent, Type and Status.

Shepherd, D.P. (2005) Vegetation association data. Unpublished spreadsheets from the Department of Environment and Conservation.

Figure 1
Project Locality Plan



1:50,000 (at A3)

0 0.25 0.5 1 1.5 2 2.5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Threatened and Priority Flora

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

- Roads
- Rivers

Ecological Communities

- Threatened
- Priority

- DEC Estates
- Environmentally Sensitive Areas
- Wetlands
- Aboriginal Heritage Sites
- Public Drinking Water Source Areas

- Study Area

GHD

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Main Roads WA - ETS
Mt Manypeaks EIA

Job Number	61-28243
Revision	0
Date	21 Jun 2012

Location and environmental constraints

Figure 1

G:\61\28243\GIS\Maps\MXD\6128243_G002_Rev0.mxd

Data source: GHD: Study Area - 20120525; DEC: Threatened and Priority Flora - 20120502, Wetlands - 20120424, Ecological Communities - 20120501, Environmentally Sensitive Areas - 20120508, DEC Estates - 20120507; MRWA: Roads - 20120507; GA: Geodata Topo 250k Series III - 2006; Landgate: Manypeaks Breaksea 2010 Mosaic, DoW: Public Drinking Water Source Areas - 20120424, Rivers - 20120424; DIA: Aboriginal Heritage Sites - 20120424. Created by: mczekaj

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Figure 2

Site Vegetation Types & Condition

604,300 604,600 604,900 605,200

6,143,100 6,142,800 6,142,500

2 3 6 2 SOUTH COAST HWY

Locality Map
FISH TRACK RD
MANYPEAKS
SOUTH COAST HWY
HOMESTEAD RD

1:3,000 (at A3)

0 15 30 60 90 120 150

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

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

Vegetation Type
- VT 1
- VT 2
- VT 3
- VT 4
- CD

Vegetation Condition
- 1 Pristine or Nearly so
- 2 Excellent
- 3 Very Good
- 4 Good
- 5 Degraded
- 6 Completely Degraded
- Study Area

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Vegetation type and condition

Job Number	61-28243
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Date	01 Aug 2012

Sheet 1 of 2

Figure 2

G:\61\28243\GIS\Maps\MXD\6128243_G003_Rev1.mxd

Data source: MRWA: Roads - 20120507; GHD: Study Area - 20120620, Vegetation Type - 20120620, Vegetation Condition - 20120620; DEC: Threatened and Priority Flora - 20120502; Landgate: Manypeaks Breaksea 2010 Mosaic - 20120524; GA: Geodata Topo 250K Series III - 2006. Created by: mczekaj

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1:3,000 (at A3)

0 15 30 60 90 120 150

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

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

Vegetation Type
- VT 1
- VT 2
- VT 3
- VT 4
- CD

Vegetation Condition
- 1 Pristine or Nearly so
- 2 Excellent
- 3 Very Good
- 4 Good
- 5 Degraded
- 6 Completely Degraded
- Study Area

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Vegetation type and condition

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Date 01 Aug 2012

Sheet 2 of 2
Figure 2

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Data source: MRWA: Roads - 20120507; GHD: Study Area - 20120620, Vegetation Type - 20120620, Vegetation Condition - 20120620; DEC: Threatened and Priority Flora - 20120502; Landgate: Manypeaks Breaksea 2010 Mosaic - 20120524; GA: Geodata Topo 250K Series III - 2006. Created by: mczekaj

Appendix A

Environmental Management Plan

Environmental Management Plan (EMP)

Management Measure		Expected Outcome	Responsibility
1.0	**Overall Project**		
Environmental Management			
1.1	Main Roads' Great Southern Region is responsible for the South Coast Highway upgrade (Manypeaks Section 3) in line with the environmental management measures detailed in this EMP.	Implement the Project on the South Coast Highway (Manypeaks Section 3) in accordance with this EMP.	Main Roads Project Manager
1.2	Compliance with this EMP should be monitored throughout the design and development of the Project.	Monitor compliance with the EMP and provide for feedback for continuous improvement.	Main Roads Project Manager / Environmental Officer
1.3	Main Roads should incorporate relevant EMP measures and requirements into the Projects tender documentation and site induction material for all personnel and service providers involved.	Environmental management measures included in relevant Project documentation and site inductions.	Main Roads Project Manager
2.0	**Pre-construction \ Design Phase**		
2.1	Main Roads should consider discussing the clearing impact of the Project with DSEWPaC to determine the need for a referral under the EPBC Act.	Compliance with DEWHA approval requirements	Main Roads Project Manager / Environmental Officer
2.2	The road design should be such to maintain existing surface water flows and incorporate appropriate erosion control measures.	Maintain existing surface water drainage flows and stabilise soil surface at watercourses.	Main Roads Project Manager
2.3	Identified significant weed species (Bridal Creeper) should be treated with herbicide prior to the commencement of roadworks.	Eradicate Declared Weeds and prevent spread of weeds outside of the Project Area.	Main Roads Project Manager
2.4	Main Roads should ensure that all of the agencies and contractors involved with service re-locations are provided a copy of the EMP and comply with its management requirements.	Management of potential environmental impacts during pre-construction works.	Main Roads Project Manager / Services Re-locators

Management Measure		Expected Outcome	Responsibility
Environmental Management and Quality Plan			
2.5	The Construction Contractor should prepare an Environmental Management and Quality Plan for the Project, which will address the Construction Contractor's management responsibility, authority and communication requirements and clearly detail the Contractor's 'Quality Management Representative' (QMR) role with respect to the Contract in accordance with AS/NZS ISO 9001.	Environmental issues are adequately understood and managed throughout the Project, and environmental impacts are minimised.	Main Roads Project Manager / Construction Contractor
3.0	**Construction Phase Management**		
Workforce Inductions and Education			
3.1	Site inductions and tool box meetings for construction staff and contractors should include details of environmental management requirements for the Project (as detailed below):	Ensure that all site personnel and contractors are aware of potential site environmental impacts and their required management	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor
Wetlands and Watercourses			
3.2	Impacts on wetlands and water courses should be managed by: Design the road to maintain existing surface water flows and incorporate appropriate erosion control measures No on-site storage of fuel, oils and other contaminant materials should be permitted within 100 m of a watercourse or wetland during road construction Spill clean-up kits should be kept on site for the clean-up of any accidental spillages of hydrocarbons	Minimise potential impacts on wetlands and watercourses	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor

	Management Measure	Expected Outcome	Responsibility
	Major vehicle and plant servicing should not be conducted on the Project site Any minor servicing to be undertaken should be in a cleared area at least 100 m from any watercourse or wetland		
	Vegetation Clearing and Fauna Management		
3.3	Clearing operations should be managed in the following manner: Clearing should be kept to the minimum required for construction activities and to provide a safe clear zone The limits of clearing should be clearly marked with works conducted to minimise clearing and avoid disturbance to native vegetation and potential fauna habitat outside of the clearing limits Significant trees to be retained shall be clearly marked prior to the start of clearing operations Trees to be removed should be felled in a manner that ensures they fall within the approved clearing envelope Cleared vegetation should be chipped on-site for use in site rehabilitation and soil stabilisation Cleared vegetation should be restricted to the limits of the Project Area Existing cleared areas should be utilised for locating site access, site offices and infrastructure, and lay-down areas The clearing area should be searched for fauna prior to the commencement of clearing operations by an experienced and qualified fauna spotter Hollows in trees should be inspected for fauna and eggs prior to clearing If any native fauna is disturbed during clearing it should be allowed to make its own way to adjacent vegetated areas, and if injured DEC or a registered fauna carer should be contacted for advice	Minimise clearing impact, manage any fauna impacts and re-use cleared vegetation. Minimise spread of weeds and disease.	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor

	Management Measure	Expected Outcome	Responsibility
	Excavations and trenches should only be kept open for the minimum period necessary, with escape ramps installed if left open overnight and for extended periods. Trenches should be regularly inspected for fauna present and prior to backfilling. Any trapped fauna should be safely removed to adjacent habitats No burning of cleared vegetation will be permitted on site No pets, firearms or traps should be allowed on the construction site		
Topsoil and Weed Management			
3.4	The movement of topsoil should be restricted to the limits of the Project Area.	Minimise the spread of weeds within and adjacent to the Project Area.	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor
3.5	Topsoil should be stockpiled for revegetation purposes on completion of roadworks.	Improve visual amenity, conserve resources.	Main Roads Construction Manager / Construction Contractor
Dieback Management			
3.6	Earth-moving machinery should be cleaned of soil and vegetation prior to entering and leaving the Project Area		
3.7	Clearing and topsoil movement during wet soil conditions should be avoided.		
3.8	The movement of plant, machinery and other vehicles should be restricted to the limits of the areas to be cleared.	Minimise the risk of spreading *Phytophthora* dieback within and adjacent to the Project Area.	Main Roads Project Manager / Main Roads Construction Manager / Construction Contactor

Management Measure		Expected Outcome	Responsibility
Damage to Public Property, Noise and Vibration			
3.9	The Construction Contractor should nominate a person responsible for reviewing and monitoring all operations in order to prevent or minimise the impact of vibration, noise, dust and other forms of pollution on property and to the public.	Minimise impacts of road works on property and the public.	Main Roads Construction Manager / Construction Contractor
3.10	The Construction Contractor should write to the owners/occupants of properties within 200 m of the limits of the work site, informing them of the nature and timing of the works and providing contact details for complaints. Main Roads Superintendent will approve a copy of the letter, mailing list and delivery dates prior to the commencement of road works.	Minimise impacts of road works on property and the public.	Main Roads Construction Manager / Construction Contractor
3.11	The Construction Contractor should provide occupants of adjacent properties with at least 24 hours warning when construction work is planned outside the hours of 7:00 am and 7:00 pm or on Sundays or public holidays.	Minimise impacts of road works on property and the public.	Main Roads Construction Manager / Construction Contractor
3.12	The Construction Contractor should detail in the Quality Plan, procedures for dealing with complaints regarding public nuisance or property damage. These procedures must ensure that the Superintendent is informed in a timely manner of any such complaint, the progress made in dealing with it, and of the reinstatement or repairs to damage carried out.	Minimise impacts of road works on property and the public.	Main Roads Construction Manager / Construction Contractor
Construction Noise			
3.13	The Construction Contractor should observe its obligations under the *Environmental Protection Act 1986*, the Environmental Protection (Noise) Regulations 1997 and section 6 of AS 2436 – 1981: Guide to Noise Control on Construction, Maintenance and Demolition Sites.	Minimise and manage construction noise.	Main Roads Construction Manager / Construction Contractor

Management Measure		Expected Outcome	Responsibility
3.14	For construction work between 7:00 am and 7:00 pm (excluding Sunday and public holidays), the construction contractor should minimise the effects of noise on the occupants of adjacent properties. This may include using silenced plant, operating plant as far away as practicable from occupied properties, or by limiting working hours on those construction activities which generate significant noise.	Minimise and manage construction noise.	Main Roads Construction Manager / Construction Contractor
3.15	At least seven days prior to any after-hours construction work commencing, the Construction Contractor should submit an approved Noise Management Plan to Main Roads Superintendent for approval. The Noise Management Plan will be approved by the Chief Executive Officer of the Shire of Albany and will include, but not be limited to, the following requirements: Details of, and reasons for, construction work which is outside the normal daytime operating hours; Details of activities likely to result in noise emissions above the assigned noise levels; Predictions of construction noise levels; Details of noise control measures to be implemented;	Minimise and manage construction noise.	Main Roads Construction Manager / Construction Contractor
	Procedures for on-site monitoring; Plans for notifying the occupiers of adjacent properties; and Plans for complaint response.		
Vibration			
3.16	The Construction Contractor should take all necessary precautions during its operations to limit ground particle velocities from vibratory compaction or percussion equipment so that they do not become a public nuisance or result in property damage.	Minimise and manage vibration impacts.	Main Roads Construction Manager / Construction Contractor

Management Measure		Expected Outcome	Responsibility
3.17	The use of vibrating rollers in vibratory mode will not be permitted within the nominated distances of any building as detailed below: All residential buildings – 50 m Old / historic buildings or where residents show concern – 100 m	Minimise and manage vibration impacts.	Main Roads Construction Manager / Construction Contractor
3.18	Prior to the start of any operation that may cause vibration or result in damage, the Construction Contractor should conduct property inspections to establish their pre-works condition.	Minimise and manage vibration impacts.	Main Roads Construction Manager / Construction Contractor
3.19	The Construction Contractor is liable for any vibration damage caused to buildings and property adjacent to the works, and will take all necessary precautions to prevent such damage. If damage is caused due to the Construction Contractor's operations, they are responsible to take all necessary action to rectify the damage.	Rectify vibration impacts caused by construction activities.	Main Roads Construction Manager / Construction Contractor
Dust Management			
3.20	The Construction Contractor should employ construction methods that will keep dust lift to a minimum, and as required provide for the management of fugitive dust such as by watering of the works area and of roads, streets and other areas immediately adjacent to the works.	Minimise dust lift and impacts of dust and safety on the public.	Main Roads Construction Manager / Construction Contractor
Traffic Access and Safety			
3.21	Access to private properties should be maintained at all times during roadworks.	Maintain access to adjacent private properties.	Main Roads Construction Manager / Construction Contractor
Fire Management			
3.22	No burning will be permitted on the Project site.	Reduce fire risk throughout site activities.	Main Roads Construction Manager / Construction Contractor

Management Measure		Expected Outcome	Responsibility
3.23	Machines and vehicles should be restricted and parked within designated cleared areas.	Reduce the fire risk during construction phase.	Main Roads Construction Manager / Construction Contractor
3.24	The Construction Contractor should confirm and adhere to any specific requirements for fire prevention requested by the Shire Albany, Department of Environment and Conservation and the Fire and Emergency Services Authority of WA.	Comply with stakeholder agency requirements.	Main Roads Construction Manager / Construction Contractor
Hydrocarbon and Hazardous Chemical Storage			
3.25	No on-site storage of hydrocarbons (fuel, oils etc) and other contaminant materials should be permitted.	Minimise contamination impacts from storage of hydrocarbons and hazardous chemicals.	Main Roads Construction Manager / Construction Contractor
3.26	Materials required for the clean-up of any accidental spillages should be maintained on-site and personnel shall be trained/experienced in their use.	Adequate resources maintained on-site ensure timely clean-up of any accidental spillage.	Main Roads Construction Manager / Construction Contractor
3.27	Major vehicle and plant servicing should not be conducted on the Project site. Any minor servicing to be undertaken should be in a cleared area at least 100m from any watercourse.	Avoid impacts from accidental spills when servicing vehicles.	Main Roads Construction Manager / Construction Contractor
Waste Disposal			
3.28	Domestic and site generated waste will not be disposed of by burning. All waste associated with the Project shall be collected daily and disposed of at an authorised waste site, or site agreed with the Shire of Albany.	Waste managed and disposed of appropriately. Construction site left clean.	Main Roads Construction Manager / Construction Contractor.
Environmental Monitoring			

Management Measure		Expected Outcome	Responsibility
3.29	During the Projects construction phase, compliance with environmental management measures will be regularly monitored. Any non-conformances will be addressed at the first opportunity, while the non-conformance and any improvement actions implemented will be detailed in appropriate construction superintendent documentation.	Monitor compliance with environmental management measures.	Main Roads Project Manager / Main Roads Construction Manager
4.0	**Post Construction**		
Revegetation			
4.1	Main Roads should consider revegetating cleared areas adjacent to the newly constructed road to maintain/improve the visual amenity from the highway.	Address ant visual impacts from Project clearing to improve visual amenity.	Main Roads Project Manager
Weed Management			
4.2	Longer-term management of weeds within the Project Area will be conducted during the annual herbicide and weed management program conducted by Main Roads Term Network Contractor.	On-going weed monitoring and management within the Project Area.	Main Roads Term Network Contractor

Appendix B

Conservation Codes

EPBC Act

WC Act

DEC

EPBC Act Fauna Conservation Categories

Listed threatened species and ecological communities

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a species listed in any of the following categories:

- extinct in the wild,
- critically endangered,
- endangered, or
- vulnerable.

Critically endangered and endangered species

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

- lead to a long-term decrease in the size of a population, or
- reduce the area of occupancy of the species, or
- fragment an existing population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of a population, or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- interfere with the recovery of the species.
- *Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a critically endangered or endangered species by direct competition, modification of habitat, or predation.

Vulnerable species

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- lead to a long-term decrease in the size of an important population of a species, or
- reduce the area of occupancy of an important population, or
- fragment an existing important population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of an important population, or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat*, or

- interferes substantially with the recovery of the species.

An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a vulnerable species by direct competition, modification of habitat, or predation.*

Listed migratory species

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a listed migratory species. Note that some migratory species are also listed as threatened species. The criteria below are relevant to migratory species that are not threatened.

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or
- result in invasive species that is harmful to the migratory species becoming established* in an area of important habitat of the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

An area of important habitat is:

- habitat utilized by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or
- habitat utilized by a migratory species which is at the limit of the species range, or
- habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an ecologically significant proportion of the population varies with the species (each circumstance will need to be evaluated).

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a migratory species by direct competition, modification of habitat, or predation.*

Environmental Protection and Biodiversity Conservation Act 1999 IUCN Conservation Codes

Code	Conservation Category	Definition
EX	*Extinct*	Taxa not definitely located in the wild during the past 50 years.
EXw	*Extinct in the Wild*	Taxa known to survive only in captivity.
CR	*Critically Endangered*	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
EN	*Endangered*	Taxa facing a very high risk of extinction in the wild in the near future.
VU	*Vulnerable*	Taxa facing a high risk of extinction in the wild in the medium-term.
T	*Near Threatened*	Taxa that risk becoming Vulnerable in the wild.
C	*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.
D	*Data Deficient (Insufficiently Known)*	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
L	*Least Concern*	Taxa that are not considered Threatened.

Western Australian *Wildlife Conservation Act 1950* Conservation Codes

Code	Conservation Code for Threatened Fauna	Description
S1	Schedule 1	"…fauna that is rare or likely to become extinct, are declared to be fauna that is in need of special protection."
S2	Schedule 2	"…fauna that is presumed to be extinct, are declared to be fauna that is in need of special protection."
S3	Schedule 3	"…birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is in need of special protection."
S4	Schedule 4	"…fauna that is in need of special protection, otherwise than for the reasons mentioned [in Schedule 1 – 3]"

Conservation Codes for Western Australian Flora and Fauna

Conservation Code		Description
T	Threatened	**Listed as Schedule 1 under the *Wildlife Conservation Act 1950*** ◗ Fauna that is rare or is likely to become extinct ◗ Declared Rare Flora - Extant Taxa that have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such. Threatened fauna and flora (Schedule 1) are further ranked by the DEC according to their level of threat using IUCN Red List criteria: **CR:** Critically Endangered - considered to be facing an extremely high risk of extinction in the wild. **EN:** Endangered - considered to be facing a very high risk of extinction in the wild. **VU:** Vulnerable - considered to be facing a high risk of extinction in the wild.
X	Presumed Extinct	**Listed as Schedule 2 under the *Wildlife Conservation Act 1950*** Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
IA	Birds protected under an international agreement	**Listed as Schedule 3 under the *Wildlife Conservation Act 1950*** Birds that are subject to an agreement between governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction.
S	Other Specially Protected Fauna	**Listed as Schedule 4 under the *Wildlife Conservation Act 1950*** Fauna that is in need of special protection, otherwise than for the reasons mentioned in the above schedules.
Taxa that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora and Priority Fauna 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. Taxa that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These taxa require regular monitoring. Conservation Dependent species are placed in Priority 5.		
P1	Priority One	**Poorly-known taxa** Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

Conservation Code		Description
P2	Priority Two	**Poorly-known taxa** Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3	Priority Three	**Poorly-known taxa** Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4	Priority Four	**Rare, Near Threatened and other taxa in need of monitoring** (a) Rare. Taxa 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 taxa are usually represented on conservation lands. (b) Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	Priority Five	**Conservation Dependent taxa** Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

(Source: Department of Environment and Conservation)

Appendix C

Flora

Flora Database Searches

Site Survey Flora List

Results of Conservation Significant Flora Database Searches

Family	Genus/species	EPBC Act Status	WC Act Status	DEC Status	Description	Preferred Habitat	Likelihood of Occurrence in Project Area	Cited
Centrolepidaceae	*Centrolepis caespitosa*	EN		P4	Tufted annual, herb (forming a rounded cushion up to 25 mm across). Flowers: (October to December).	White sand, clay. Salt flats, wet areas.	Unlikely. Habitat not suitable.	EPBC Act PMST
Cyperaceae	*Schoenus sp. Grey Rhizome*			P1				NatureMap
Droseraceae	*Drosera fimbriata* Manypeaks Sundew	VU		P4	Erect tuberous, perennial, herb, 0.05-0.15 m high. Flowers: white (September to October).	White sand, granite.	Possible. Known to occur within 5 km of Project Area according to NatureMap search. However, no similar habitat present within Project Area and not recorded during field assessment	EPBC Act PMST
Epacridaceae	*Andersonia pinaster*		S1	VU	Erect, slender shrub, 0.2-0.6 m high. Flowers: blue (July to November).	Grey/white sand, sandy clay, granite. Winter-wet slopes, outcrops, hills.	Unlikely. No suitable habitat. Not recorded during field survey and unlikely to be overlooked.	NatureMap; WAHERB
Ericaceae	*Sphenotoma drummondii* Mountain Paper-heath	EN	S1	EN	Tufted shrub, 0.15-0.5 m high. Flowers: white (September to December).	Stony or shallow soils over granite or quartzite. Steep rocky slopes, crevices of rocks.	Unlikely. No suitable habitat. Not recorded during field survey and unlikely to be overlooked.	EPBC Act PMST

Family	Genus/species	EPBC Act Status	WC Act Status	DEC Status	Description	Preferred Habitat	Likelihood of Occurrence in Project Area	Cited
Goodeniaceae	*Goodenia filiformis* *Thread-leaved Goodenia*			P3	Erect to ascending, slender perennial, herb, 0.1-0.25 m high, leaves linear-terete, entire, c. 1 mm wide; sepals ovate, 1.5-2 mm long; indusium c. 0.7 mm long. Flowers: yellow (November - December or January).	Sandy soils. Winter-wet depressions.	Possible. Habitat potenially suitable. Not recorded but could have been overlooked due to size and flowering time.	NatureMap
Haemodoraceae	*Conostylis misera* Grass Conostylis	EN	S1	VU	Rhizomatous, tufted perennial, grass-like or herb, 0.05-0.18 m high. Flowers: yellow (October to November).	White or grey sand, sandy loam. Winter-wet flats.	Unlikely. Habitat not suitable. Not recorded during field assessment and unlikely to be overlooked.	EPBC Act PMST
Haloragaceae	*Gonocarpus trichostachyus*			P3	Erect to spreading perennial, herb, 0.05-0.17 m high. Flowers: red-purple (September - October).	Sandy soils	Possible. Habitat potenially suitable. Not recorded but could have been overlooked due to size and flowering time.	NatureMap; WAHERB
Myrtaceae	*Calothamnus microcarpus*			P2	Erect, compact or spreading shrub, 0.6-1 m high. Flowers: red (September to November).	Lateritic clay, sandy soils	Unlikely. Not recorded during field survey and unlikely to be overlooked.	NatureMap

Family	Genus/species	EPBC Act Status	WC Act Status	DEC Status	Description	Preferred Habitat	Likelihood of Occurrence in Project Area	Cited
Myrtaceae	*Eucalyptus acies* Woolburnup Mallee			P4	Straggly shrub (low mallee), 1-3.5 m high, bark smooth, grey. Flowers: cream/white (September to November).	Sand, skeletal soils. Quartzite hills, granite boulders.	Unlikely. No suitable habitat. Not recorded during field survey and unlikely to be overlooked.	NatureMap
Myrtaceae	*Eucalyptus goniantha subsp. goniantha* Jerdacuttup Mallee			P4	Mallee or tree (rarely), 1.5-10 m high, bark smooth, shedding. Flowers: cream/white (September to November or January to February).	Sand, sandy clay, often over weathered granite & laterite. Coastal areas.	Possible. Potentially present within close proximity of the survey area, however not recorded within the Project Area.	Nature Map; WAHERB
Proteaceae	*Banksia brownii* Feather-leaved Banksia	EN	S1	CR	Bushy, non-lignotuberous shrub or tree (small), 1-6 m high. Flowers: cream, brown/orange-red (March to July).	Sand over laterite, gravel, loam over granite. In gullies.	Unlikely. Known to occur within 5 km of Project Area according to NatureMap search but not recorded during the field survey and unlikely to be overlooked.	EPBC Act PMST
Proteaceae	*Banksia serra* Serrate-leaved Dryandra			P4	Erect, slender, non-lignotuberous shrub, 1-4(-7) m high. Flowers: yellow (July to September).	Gravel, sand or clay loam over laterite. Hillslopes	Unlikley. Not recorded during the field survey and unlikely to be overlooked.	NatureMap

Family	Genus/species	EPBC Act Status	WC Act Status	DEC Status	Description	Preferred Habitat	Likelihood of Occurrence in Project Area	Cited
Proteaceae	*Isopogon uncinatus* Hook-leaf Isopogon	EN	S1	CR	Tufted spreading or prostrate, non-lignotuberous shrub, 0.05-0.4 m high. Flowers: yellow/cream (October to November).	Loam or sand on granite, peaty sand. Swampy depressions, hillslopes.	Unlikely. Known to occur within 5 km of Project Area according to NatureMap search but not recorded during field assessment and unlikely to be overlooked.	EPBC Act PMST
Restionaceae	*Chordifex abortivus* Manypeaks Rush	EN	S1	VU	Rhizomatous, erect perennial, herb, to 0.5 m high. Flowers: brown (September to October).	Sand. Low rises & undulating areas.	Unlikely. Known to occur 12 km from Project Area according to NatureMap search. Not recorded during field survey and unlikely to be overlooked.	EPBC Act PMST
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. Flowers: yellow (December).	Grey to white sand or brown sandy clay loam over laterite. Gentle slopes or winter wet depressions. Mallee or Melaleuca shrubland.	Possible. Habitat potenially suitable. Not recorded but could have been overlooked due to size and flowering time.	NatureMap

Family	Genus/species	EPBC Act Status	WC Act Status	DEC Status	Description	Preferred Habitat	Likelihood of Occurrence in Project Area	Cited
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. Flowers: orange/yellow (October - December).	Sandy clay loam, granite. Winter wet depressions, or fringing outcrops. Agonis, mallee, or Hakea shrubland with sedges	Possible. Habitat potenially suitable. Not recorded but could have been overlooked due to size and flowering time.	NatureMap; WAHERB
	Acacia declinata			P3	Dense, intricately branched, prostrate, pungent shrub, 0.2-0.4 m high. Flowers: yellow (August to September).	Loamy or sandy clay.	Unlikely. Not recorded during the field survey and unlikely to be overlooked.	NatureMap

Site Survey Flora Species List

Family	Genus/species	Status
Anthericaceae	*Agrostocrinium scabrum*	
Apiaceae	*Xanthosia candida*	Introduced
Apiaceae	*Xanthosia rotundifolia*	
Asparagaceae	*Asparagus asparagoides*	
Casuarinaceae	*Allocasuarina fraseriana*	
Casuarinaceae	*Allocasuarina humilis*	
Cyperaceae	*Lepdiosperma squamatum*	
Cyperaceae	*Mesomelaena stygia ssp stygia*	Introduced
Cyperaceae	*Mesomelaena tetragona*	
Cyperaceae	*Tricostularia neesii var elatior*	
Dasypogonaceae	*Kingia australis*	
Dasypogonaceae	*Lomandra micrantha*	
Dasypogonaceae	*Lomandra purpurea*	
Droseraceae	*Drosea macrantha ssp macrantha*	
Droseraceae	*Drosera platystima*	
Epadridaceae	*Leucopogon australis*	
Epadridaceae	*Leucopogon verticillatus*	Introduced
Fabaceae	*Acacia browniana var intermedia*	Introduced
Fabaceae	*Acacia longifolia*	
Fabaceae	*Bossiaea eriocarpa*	
Fabaceae	*Bossiaea linophylla*	
Fabaceae	*Pultenaea ?aspathaloides*	
Haemodoraceae	*Haemodorum sp*	
Iridaceae	*Patersonia occidentalis*	
Juncaceae	*Juncus pallidus*	
Juncaceae	*Juncus sp*	
Lauraceae	*Cassytha sp*	
Loranthaceae	*Nuytsia floribunda*	Introduced
Myrtaceae	*Agonis theiformis*	
Myrtaceae	*Beaufortia empetrifolia*	

Family	Genus/species	Status
Myrtaceae	*Corymbia calophylla*	
Myrtaceae	*Eucalyptus marginata*	
Myrtaceae	*Eucalyptus staeri*	
Myrtaceae	*Taxandria parviceps*	
Phytolaccaceae	*Phytolacca octandra*	
Pittosporaceae	*Billardiera laxiflora*	
Poacaeae	*Briza maxima*	
Poacaeae	*Briza minor*	
Poacaeae	*Cyathochaeta avenacea*	
Poacaeae	*Cynodon dactylon*	
Poacaeae	*Eragrostis curvula*	
Proteaceae	*Banksia biterax*	
Proteaceae	*Banksia grandis*	
Proteaceae	*Banksia sphaerocarpa ssp sphaerocarpa*	
Proteaceae	*Grevillea fasciculata*	
Proteaceae	*Hakea amplexicaulis*	
Proteaceae	*Hakea ceratophylla*	
Proteaceae	*Hakea cucullata*	
Proteaceae	*Hakea linearis*	
Proteaceae	*Hakea lasiantha*	
Proteaceae	*Isopogon formosus*	
Proteaceae	*Hakea horned*	
Proteaceae	*Petrophile diversifolia*	
Restionaceae	*Anarthria prolifera*	Introduced
Restionaceae	*Desmocladus castaneus*	
Restionaceae	*Desmocladus fasciculatus*	
Restionaceae	*Desmocladus flexuosus*	
Rubiaceae	*Opercularia hispidula*	
Rutaceae	*Boronia ?spathulata*	
Xanthorrhoeaceae	*Xanthorrhoea platyphylla*	

Appendix D

Fauna

Fauna Database Searches

Results of Conservation Significant Fauna Database Searches

Family	*Species*	Common Name	EPBC Act Status	WC Status	DEC Status	Cited
Birds						
Atrichornithidae	*Atrichornis clamosus*	Noisy Scrub-bird	V	S1	EN	EPBC Act PMST
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	EN	S1	EN	EPBC Act PMST
Cacatuidae	*Calyptorhynchus banksii naso*	Forest Red-tailed Black-Cockatoo	V	S1	VU	EPBC Act PMST; NatureMap
Cacatuidae	*Calyptorhynchus baudinii*	Baudin's Black-Cockatoo	V	S1	EN	EPBC Act PMST; NatureMap
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Black-Cockatoo	EN	S1	EN	EPBC Act PMST
Pardalotidae	*Dasyornis longirostris*	Western Bristlebird	V	S1	VU	EPBC Act PMST
Megapodiidae	*Leipoa ocellata*	Malleefowl	V; Mi	S1	VU	EPBC Act PMST; NatureMap
Psittacidae	*Pezoporus wallicus flaviventris*	Western Ground Parrot	EN; Mi	S1	CR	EPBC Act PMST; NatureMap
Falconidae	*Falco peregrinus*	Peregrine Falcon		S4	S	NatureMap
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	Mi; Ma			EPBC Act PMST
Meropidae	*Merops ornatus*	Rainbow Bee-eater	Mi; Ma			EPBC Act PMST
Ardeidae	*Ardea alba*	Great Egret	Mi; Ma			EPBC Act PMST

Family	*Species*	Common Name	EPBC Act Status	WC Status	DEC Status	Cited
Ardeidae	*Ardea ibis*	Cattle Egret	Mi; Ma			EPBC Act PMST
Apodidae	*Apus pacificus*	Fork-tailed Swift	Mi; Ma			EPBC Act PMST
Mammals						
Dasyuridae	*Dasyurus geoffroii*	Chuditch, Western Quoll	V	S1	VU	EPBC Act PMST
Dasyuridae	*Parantechinus apicalis*	Dibbler	EN	S1	EN	EPBC Act PMST
Petauridae	*Pseudocheirus occidentalis*	Western Ringtail Possum	V	S1	VU	EPBC Act PMST
Macropodidae	*Setonix brachyurus*	Quokka	V	S1	VU	EPBC Act PMST
Peramelidae	*Isoodon obesulus subsp. fusciventer*	Quenda			P5	NatureMap

Appendix E

Desktop Searches

EPBC Protectect Matters Search Tool

NatureMap

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

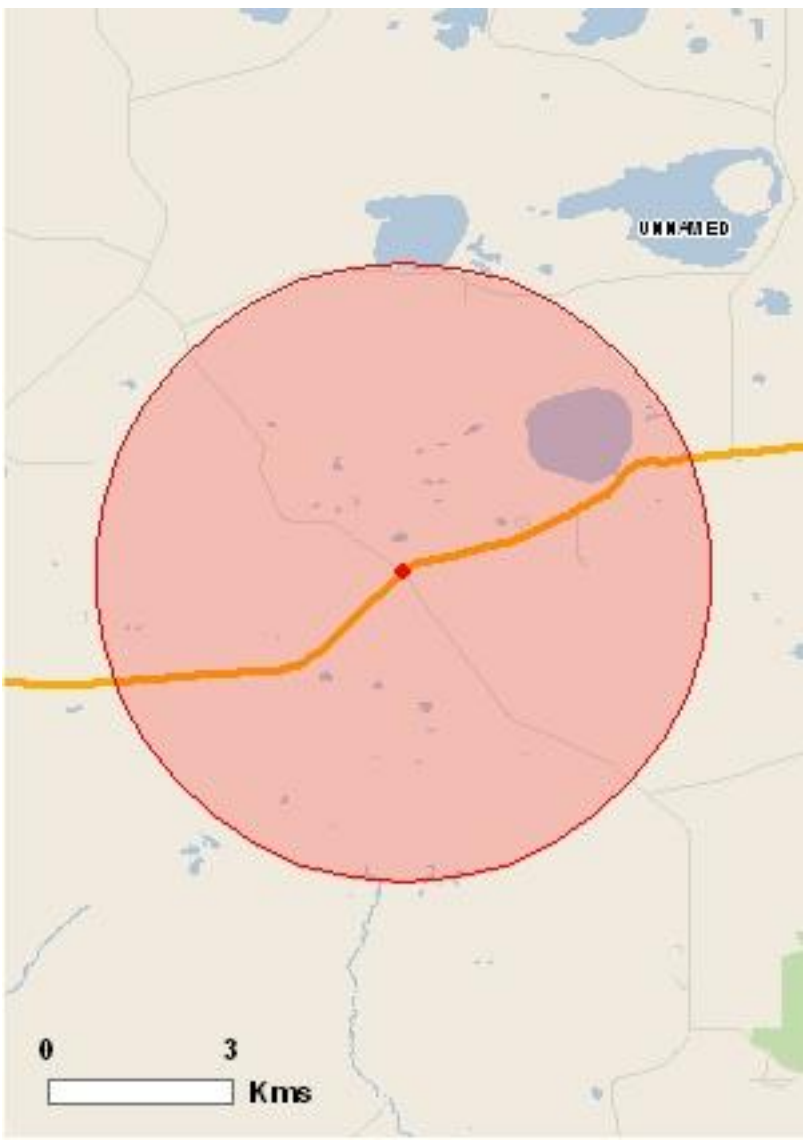
EPBC Act Protected Matters Report

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 about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Report created: 13/06/12 13:21:02



Coordinates

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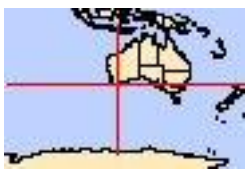

Summary

Matters of National Environment 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 - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	20
Migratory Species:	9

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 and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

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.

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. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	5
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

Place on the RNE:	2
State and Territory Reserves:	3
Regional Forest Agreements:	None
Invasive Species:	9
Nationally Important Wetlands:	1

Details

Matters of National Environmental Significance

Threatened Species		[Resource Information]
Name	Status	Type of Presence
BIRDS		
Atrichornis clamosus		
Noisy Scrub-bird [654]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo [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 likely to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Pezoporus wallicus flaviventris		
Western Ground Parrot [26024]	Endangered	Species or species habitat may occur within area
FISH		
Galaxias truttaceus hesperius		
Spotted Galaxias (western subspecies), Western Spotted Galaxias, Western Trout Galaxias [81282]	Critically Endangered	Species or species habitat likely to occur within area
MAMMALS		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Parantechinus apicalis		
Dibbler [313]	Endangered	Species or species habitat may occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum [25911]	Vulnerable	Species or species habitat likely to occur within area
Setonix brachyurus		
Quokka [229]	Vulnerable	Species or species habitat may occur within area
PLANTS		
Banksia brownii		
Brown's Banksia, Feather-leaved Banksia [8277]	Endangered	Species or species habitat known to occur within area
Centrolepis caespitosa		
[6393]	Endangered	Species or species habitat likely to occur within area
Chordifex abortivus		
Manypeaks Rush [64868]	Endangered	Species or species habitat likely to occur within area
Conostylis misera		
Grass Conostylis [21320]	Endangered	Species or species habitat likely to occur within area
Drosera fimbriata		
Manypeaks Sundew [18749]	Vulnerable	Species or species habitat known to occur within area
Isopogon uncinatus		
Hook-leaf Isopogon [20871]	Endangered	Species or species habitat known to occur

Name	Status	Type of Presence
		within area
Sphenotoma drummondii [21160]	Endangered	Species or species habitat likely to occur within area

Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Pezoporus wallicus flaviventris Western Ground Parrot [26024]	Endangered	Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [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 may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species

Name	Threatened	Type of Presence
		habitat may 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

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
[Angove Creek Catchment Area](#)	WA	Indicative Place
[East Kalgan Wetland System](#)	WA	Indicative Place

State and Territory Reserves [Resource Information]

Name	State
Lake Pleasant View	WA
North Sister	WA
South Sister	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,

Name	Status	Type of Presence
Mammals		
[Felis catus](#) Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
[Oryctolagus cuniculus](#) Rabbit, European Rabbit [128]		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
[Lycium ferocissimum](#) African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area

Name	Status	Type of Presence
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

Nationally Important Wetlands	[Resource Information]
Name	State
Lake Pleasant View System	WA

Coordinates

-34.84492 118.15261

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 Heritage and Register of National Estate properties, Wetlands of International 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

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

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.

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:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts

-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA 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
-State Forests of NSW
-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.

Department of Sustainability, Environment, Water, Population and Communities
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NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Catherine Wharton on 13/06/2012

Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 118°09' 09" E,34°50' 41" S
Buffer 5km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	12255	*Acacia declinata*		P3	
2.	17586	*Andersonia pinaster*		T	
3.	24358	*Atrichornis clamosus (Noisy Scrub-bird)*		T	
4.	1806	*Banksia brownii (Feather-leaved Banksia)*		T	
5.	32084	*Banksia serra (Serrate-leaved Dryandra)*		P4	
6.	24345	*Botaurus poiciloptilus (Australasian Bittern)*		T	
7.	5419	*Calothamnus microcarpus*		P2	
8.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo)*		T	
9.	3096	*Drosera fimbriata (Manypeaks Sundew)*		P4	
10.	5546	*Eucalyptus acies (Woolburnup Mallee)*		P4	
11.	11458	*Eucalyptus goniantha subsp. goniantha (Jerdacuttup Mallee)*		P4	
12.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
13.	24475	*Falco peregrinus subsp. macropus*		S	
14.	6167	*Gonocarpus trichostachyus*		P3	
15.	7508	*Goodenia filiformis (Thread-leaved Goodenia)*		P3	
16.	24153	*Isoodon obesulus subsp. fusciventer (Quenda)*		P5	
17.	2242	*Isopogon uncinatus*		T	
18.	33379	*Leucopogon altissimus*		P3	
19.	16273	*Schoenus sp. Grey Rhizome (K.L. Wilson 2922)*		P1	
20.	17893	*Stylidium daphne*		P2	
21.	20691	*Stylidium gloeophyllum*		P4	

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 F

Dieback Assessment Report

Phytophthora Dieback Assessment and Associated Management Plan for the South Coast Highway Upgrade – Manypeaks

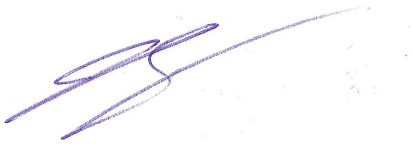
May 2012

Prepared for:

GHD
10 Victoria Street
Bunbury
WA, 6230

Report Date: 5 June 2012
Project Ref: GSBL069-Dieback Survey and MP_SCH Manypeaks-V1

Written and Submitted By



Jeremy Spencer
Senior Environmental Scientist

RECORD OF DISTRIBUTION

No. of copies	Report File Name	Report Status	Date	Prepared for:	Initials
1	GSBL069-Dieback Survey and MP_SCH Manypeaks_V1	V1	5 June 2012	GHD	JS
1	GSBL069-Dieback Survey and MP_SCH Manypeaks_V1	V1	5 June 2012	Great Southern Bio Logic	JS

CONTENTS

LIST OF ATTACHMENTS

Figures

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EXECUTIVE SUMMARY

Main Roads WA is currently in the process of upgrading the South Coast Highway in the vicinity of Manypeaks through to the Cheynes Beach turnoff, City of Albany, between straight line kilometre (SLK) 33.5 and SLK 46.3. It is understood that the assessed area is to be cleared to allow for the completion of proposed road construction works.

Great Southern Bio Logic was engaged by GHD to undertake a *Phytophthora* dieback survey and develop an associated disease distribution report and hygiene management plan. The disease distribution information is required to ensure that any infested soils can be appropriately managed during the clearing and construction process so that the *Phytophthora* Dieback disease is not spread by Main Roads WA activities.

The survey of approximately 1.5km situated to the west of Homestead Rd was performed on May 21 2012 by a DEC accredited *Phytophthora* dieback interpreter who collected disease distribution evidence from across the project area and also collected three soil and tissue samples from indicator plant species deaths. The information collected during the site visit has been used to classify the entire project area as infested.

Accordingly, the operational hygiene strategies are designed to ensure that infested soils and plant material are managed in a manner that restricts the spread of the disease to other areas outside the project area that may be uninfested by *Phytophthora*.

1 INTRODUCTION

1.1 Background

Main Roads is currently in the process of upgrading the South Coast Highway in the vicinity of Manypeaks through to the Cheynes Beach turnoff, City of Albany, between straight line kilometre (SLK) 33.5 and SLK 46.3. As a part of current planning for ongoing construction, Main Roads are performing environmental surveys of vegetation extending from Homestead Road, approximately 1.5km to the west. These surveys include the assessment of *Phytophthora* dieback, which is the subject of this report.

It is understood that the assessed area is to be cleared to allow for the completion of proposed road construction works. The disease distribution information is required to ensure that any infested soils can be appropriately managed during the clearing and construction process so that *Phytophthora* Dieback disease is not spread by Main Roads activities.

Phytophthora dieback is an introduced soil borne plant pathogen that affects up to 50% of native plant species within Western Australia. In favourable conditions, dieback can result in the collapse of entire vegetation communities. *Phytophthora* dieback is introduced to an area in a variety of ways but most commonly via transportation of infested soil on vehicles, machinery and equipment. Once introduced to an area the dieback will spread through soil via water movement and root to root contact resulting in large infestations causing significant impact to native vegetation communities. There is currently no practical method of eradication of the pathogen.

Great Southern Bio Logic was engaged by GHD to undertake the required dieback survey and develop the associated disease distribution report and hygiene management plan.

1.2 Objective

It is understood that the objective of the *Phytophthora* dieback assessment is to provide information required by Main Roads to assist with the completion of road upgrade works with minimal environmental impact. The management recommendations included in this report have been developed to satisfy the objective of not spreading the pathogen from the project area.

1.3 Scope of Works

The scope of works undertaken to achieve the project objective include:

1. Undertake a field assessment to determine presence or absence of *Phytophthora* dieback within the designated interpretable works area;
2. Develop maps illustrating the location of *P. cinnamomi* infestations, uninfested and uninterpretable areas;
3. Identify potential management impacts due to the presence/absence of *P. cinnamomi*;
4. Develop management recommendations regarding mitigation and appropriate management of environmental impacts; and
5. Develop project specific hygiene management plans (including hygiene maps) suitable for inclusion in an Environmental Management Plan. Hygiene Plans have been

developed in accordance with the *Phytophthora cinnamomi* and the disease caused by it. Volume 1 – Management Guidelines (CALM 2003).

1.4 Site Characteristics

The project area as shown in Figure 1 is situated on the South Coast Highway, City of Albany, to the west of the Manypeaks townsite, extending approximately 1.5km from Homestead Road in a westerly direction. It consists of slightly undulating land, intersected by several small drainage lines with a locally significant ridge at the eastern end. The total length of the project area is approximately 1.5km and includes remnant native vegetation within the South Coast Highway Road Reserve that ranges from being completely degraded through to excellent/very good in condition (Maunsell/AECOM, 2009).

1.4.1 Climate

The nearest Bureau of Meteorology recording station is located in the town of Manypeaks however complete climate data is not available for this site. The next closest station with relevant data is located in Albany, approximately 50km to the west. Data for Albany shows an average annual rainfall of 931.4mm with the wettest months being June and July. The warmest months are January and February. It is anticipated that the rainfall across the project area would be less than the annual rainfall for Albany. This is supported by the Manypeaks Bureau of Meteorology recording station which shows that the annual rainfall recorded in 2011 was 878.7mm. As *Phytophthora* distribution is closely related to rainfall, this is an important statistic and it is considered that this average rainfall figure is well within the accepted rainfall zone for *Phytophthora* occurrence.

1.4.2 Vegetation

The vegetation along the alignment varied in accordance with soil type, land use and other minor influences. The project area also includes areas of significantly disturbed land which have been classified as unmappable for *Phytophthora* as it is not possible to identify the disease in highly disturbed areas.

As reported in 2009 (Maunsell/AECOM, 2009), the vegetation within the project area can be classified as woodland and forest, shrubland and heath or as herblands. The detailed vegetation information is provided in the Preliminary EIA and EMP (Maunsell/Aecom, 2009) and the field observations made by Great Southern Bio Logic while onsite support these classifications. The dominant vegetation communities within the project area included:

- Low Open Woodland; *Eucalyptus staeri* and *E. marginata* over tall open shrubland of *Hakea cucullata, Taxandria parviceps* and *Xanthorrhoea platyphylla*;
- Tall open scrub dominated by *Hakea cucullata* over open heath of *Taxandria parviceps* over mixed sedges; and
- Open to closed herbland dominated by *Xanthorrhoea platyphylla* and mixed sedges.

Dominant indicator species commonly occurring in the interpretable sections of the alignment included:

- *Adenanthos obovatus;*

- *Banksia grandis;*
- *Leucopogon verticillatus;*
- *Xanthorrhoea platyphylla;* and
- *Patersonia occidentalis.*

Other indicator species identified in the interpretable sections of the alignment included:

- *Banksia. Nutans;*
- *Dasypogon bromeliifolius;* and
- *Lambertia inermis.*

2 METHOD

The *Phytophthora* dieback assessment of the project area was performed by a Department of Environment and Conservation (DEC) accredited interpreter. Interpretation was performed with reference to the manual "*Phytophthora cinnamomi and the disease caused by it- Volume 2: Interpreters Guidelines for Detection, Diagnosis and Mapping, (CALM, 2001)*".

The field based interpretation was performed as a linear assessment using the health of plant species known to be susceptible to the disease as indicators of disease presence and absence. Interpretation was limited to the extent of the remaining native vegetation communities. Areas with visual symptoms and patterns of the disease are classified as infested while those without visual evidence are classified as uninfested. Areas with insufficient indicator species are classified as uninterpretable. A soil and vegetation sampling program was also conducted to verify the field based classifications.

All areas of cleared agricultural land were determined to be unmappable. The unmappable boundaries are identified by the edge of clearing and have not been demarcated in the field.

Soil and vegetation samples were collected for analysis in accordance with the procedures detailed in "*Phytophthora cinnamomi and the disease caused by it - Volume 2: Interpreters Guidelines for Detection, Diagnosis and Mapping, (CALM, 2001)".* Sampling equipment was sterilized prior to and after sampling to ensure there was no cross contamination. Samples were taken from recent plant deaths in areas believed to be infested. Soil material was collected from around the roots on all sides of the plant death and also from underneath if possible. Sections of plant roots were also removed from all sides and combined with sampled soil in a heavy duty plastic bag. Samples were irrigated with deionised water to stimulate *Phytophthora* activity if soil was very dry. Samples were sent via overnight courier to the DEC Vegetation Health Service (VHS) laboratory in Kensington for analysis.

The management plan and associated recommendations has been developed in accordance with *Phytophthora cinnamomi and the disease caused by it. Volume 1 – Management Guidelines (CALM 2003)*, which is suitable for Main Roads WA construction and operational activities to ensure appropriate hygiene practices are implemented by Main Roads WA staff and contractors.

3 ASSESSMENT CRITERIA

DEC guidelines identify three potential disease hygiene categories based on presence/absence of the disease, or the unknown disease status of an area. An area can have an unknown disease status if the vegetation at the site is not susceptible to the disease or it cannot be assessed because of disturbance, eg fire; as a result, even if the pathogen is present, there may be no visible signs. Such areas are classified as uninterpretable.

The three possible disease categories are listed and described below:

Infested – Areas of vegetation, identified and assessed by an accredited disease interpreter, that show visible signs of infestation through the presence of associated susceptible plant deaths in a pattern consistent with *Phytophthora*. Evidence of the infestation may be supported by positive recoveries of *Phytophthora* via laboratory analysis.

Uninfested - Areas of vegetation, identified and assessed by an accredited disease interpreter, that are free from the disease. Uninfested areas must contain susceptible species in numbers that would allow detection of the disease if it were present.

Uninterpretable – Areas within the study area that cannot be determined to be infested or uninfested. Such areas may:

- Consist of vegetation that does not contain susceptible species;
- Have been recently burnt, removing all evidence of disease symptoms; or
- Be areas of cleared land, recently disturbed areas or areas of non-native vegetation.

Following the determination of disease categories, protectable areas are identified to determine areas where disease hygiene is required to protect regions that are free from the disease and are not threatened by autonomous spread.

Protectable areas are defined in *Phytophthora cinnamomi and disease caused by it, Volume II Interpreter Guidelines* (CALM, 2001) as areas that:

- Have greater than 600mm of annual rainfall;
- Are determined to be free from *Phytophthora cinnamomi;*
- Are positioned in the landscape and are of sufficient size that they will not be engulfed by *Phytophthora* via autonomous spread. Such an area is defined as being greater than 4ha with a minimum axis of 100m, and not down slope of an infested area;
- Have controllable human vectors; and
- Include high conservation and/or socio economic values.

4 RESULTS AND DISCUSSION

Disease diagnosis and interpretation was performed as per the methodology described in Section 2 during a site assessment conducted by a DEC accredited Interpreter on Monday May 21 2012. Detailed disease distribution information for the project area is presented in Figure 2.

The area is slightly undulating, low lying and is intersected by several minor drainage lines which cross the existing road alignment. There is a large and locally dominant ridge system situated to the east and the project area terminates on the top of this ridge. The vegetation consisted predominantly of open woodland with areas of shrub within the drainage lines. *X. platyphylla* was the dominant disease indicator species however there were also suitable numbers of *L. verticillatus* and *B. grandis*. There were large areas where the vegetation was significantly disturbed or cleared. This would typically result in these areas being classified as unmappable, however, due to the influence of disease identified in areas situated upslope of unmappable regions, the disease distribution has been extrapolated to include these regions in accordance with the accepted principles of disease spread.

The entire area has been classified as infested with *Phytophthora* based on diagnostic evidence collected from across the entire area of interpretable vegetation. The diagnostic evidence included:

- Multiple deaths of susceptible plants representing multiple indicators species distributed across the project area;
- An age range of disease deaths demonstrating disease history consistent with the movement of disease through the vegetation over time. Vegetation deaths range from very old deaths through to fresh deaths; and
- The presence of a suitable vector represented by the South Coast highway and adjoining private properties.

In two locations towards the eastern end of the project area the density of indicator species was insufficient to allow interpretation based on visual disease symptoms. Despite the lack of indicator species these areas have been classified as infested rather than uninterpretable. This classification is justified based on the topographical location and small size of the areas. Both areas are situated downslope of infested sites and have a diameter less than 100m so they would not be classified as protectable, as per the assessment criteria presented in Section 3.

Typically disease distribution information has an operational lifespan of three years and requires a field based re-check of disease boundaries after 12 months. As the entire area is classified as infested this information will not change and so there is no operational time limit restricting the use of this information.

4.1 Sample Program

Sample locations are shown in Figure 2 and the VHS sample analysis report is provided as Appendix A.

Three samples were collected from recent deaths with sampled material including soil and root tissue. The selected sample sites are considered to be representative of typical disease expression identified broadly across the entire project area. All of these samples returned positive results for the presence of *Phytophthora* and support the on-ground interpretation for to classification of the entire project area as infested.

5 OPERATIONAL HYGIENE RECOMMENDATIONS

The results of this *Phytophthora* dieback survey did not identify any areas within the prescribed project area as shown in Figure 2 that can be protected from the introduction and spread of dieback. As a result, the primary objective of the hygiene requirements outlined below is to ensure the disease is not transported beyond the project area.

The most common method of spread of *Phytophthora* dieback is via the movement of infested soil and plant material from infested areas into uninfested areas, and the most common cause of soil movement is via transport on vehicles, machinery, other equipment and footwear. Introduction of infested soil to an uninfested area will result in the spread of the disease to the uninfested area.

In order for Main Roads to perform the required clearing and construction works in a sustainable manner the hygiene strategies below will need to be implemented across the entire project area.

5.1 General Operational Hygiene Recommendations

- All machinery, vehicles, equipment and materials must be effectively cleaned down prior to leaving the site at any time during or following completion of construction works.
- All cleared vegetation should be mulched and re-used within the project area or transported to and disposed of at a Class I or Class II landfill facility. **Vegetative material cleared within the project area must not be allowed to enter areas of native vegetation or adjoining land.**
- All soil removed from within the project area should be reused onsite. **Soil material sourced from within the project area must not be allowed to enter areas of native vegetation or adjoining land.**

5.2 Effective Clean Down Standards

Effective cleandown locations should be within the infested project area on well drained sites that do not drain towards external uninfested areas or uninterpretable areas. They should be situated as close to the boundaries of the project works as practical.

Effective clean down involves the removal of all soil and plant material from machinery, vehicles, equipment, tools and footwear so it cannot be transported. Attention needs to be given to removing soil and plant material from under vehicles and machinery, especially from running boards, belly plates, spare tyres and wheels.

If operations are conducted in dry soil conditions the requirements for clean down are reduced as the soil material does not readily adhere, and clean down can be performed using a stiff brush or compressed air.

Mud and soil should be removed from footwear with a stick or brush, and the amount of water used should be minimised. All mud/soil should be collected in a bag/bucket and disposed of in a site that is already infested. Drainage from clean down areas needs to be controlled so

that effluent from clean down operations does not drain into uninfested or uninterpretable areas.

Hand held equipment, tools and footwear can be sterilised using methylated spirits. Place methylated spirits in a spray bottle, spray to cover all surfaces and allow a few minutes for it to soak in. Other equipment can be sterilised by soaking in a disinfectant such as bleach (active ingredient sodium hypochlorite). Dilute the bleach (1 part bleach to 10 parts water), soak the tools for a few minutes then rinse, following the manufacturer's safety instructions.

Water can be sterilised by adding 6ml of sodium hypochlorite (bleach or pool chlorine) to every 10L of water. Safety instruction should be followed.

5.3 Dry Soil Conditions

Dry soil conditions are when soil moisture content of open ground or on unsealed roads is not high enough to allow soil material to adhere to vehicles, machinery equipment and footwear. The level of soil moisture required for soils to be classified as dry soil varies between soil types however a general rule commonly applied is that greater than 5mm of rainfall over a 24 hour period will result in moist soil conditions.

6 REFERENCES

Bureau of Meteorology (BoM) (2012): http://www.bom.gov.au/climate/data/

Department of Conservation and Land Management (CALM) (2001): *Phytophthora cinnamomi and disease caused by it, Volume two Interpreter Guidelines for Detection, Diagnosis and Mapping***,** CALM July 2001.

Department of Environment and Conservation (CALM) (2003): *Phytophthora cinnamomi and disease caused by it, Volume 1, management guidelines,* CALM 2003.

Maunsell & AECOM (2009): *Preliminary Environmental Impact Assessment (PEIA) and Environmental Management Plan (EMP) – South Coast Highway Upgrade,* Unpublished Report, Maunsell/AECOM 2009

7 LIMITATIONS

This report was prepared for GHD, for Main Roads, for the purposes set out in the scope of works and it is not intended that any other person use or rely on the contents of this report.

Whilst the information contained in the Report is accurate to the best of our knowledge and belief, Great Southern Bio Logic and its agents cannot guarantee the completeness or accuracy of any of the descriptions or conclusions based on the information supplied to it or obtained during the site investigations, site surveys, visits and interviews. Furthermore, field and / or regulatory conditions are subject to change over time, and this should be considered if this report is to be used after any significant time period after its issue.

Great Southern Bio Logic and its agents have exercised reasonable care, skill and diligence in the conduct of project activities and preparation of this report. However, except for any non-excludable statutory provision, Great Southern Bio Logic and its agents provide no warranty in relation to its services or the report, and is not liable for any loss, damage, injury or death suffered by any party (whether caused by negligence or otherwise) arising from or relating to the services or the use or otherwise of this Report.

This report must be read, copied, distributed and referred in its entirety.

Figures

Phytophthora Dieback Assessment and Associated Management Plan for the South Coast Highway Upgrade – Manypeaks

Great Southern Bio Logic
environmental solutions

Ref: GSBL069
Date: 4/06/2012

Image Source: Landgate Travellers Atlas 2009

Figure 1: Regional Location

Phytophthora Dieback Assessment and
Associated Management Plan for the
South Coast Highway Upgrade – Manypeaks
Prepared for GHD on behalf of Main Roads WA

N

1:250,000

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

0 5 Kilometers

Figure 2: Phytophthora disease distribution, South Coast Highway - Manypeaks, showing sample locations

Great Southern Bio Logic
environmental solutions

Ref: GSBL069

Date: 5/06/2012

Image Source: Many_Peaks_MRWA

Phytophthora Dieback Assessment and
Associated Management Plan for the
South Coast Highway Upgrade – Manypeaks
Prepared for GHD on behalf of Main Roads WA

Legend

Disease category
- Infested

Sample Location
- Positive

N

1:10,000

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

0 200 Meters

Appendix A
VHS Sample Analysis Report

VEGETATION HEALTH SERVICE - PHYTOPHTHORA SAMPLE INFORMATION SHEET

SEND TO: Vegetation Health Service, Science Division – D.E.C., 17 Dick Perry Ave KENSINGTON 6151 **Phone**: (08) 9334 0317 **Fax:** (08) 9334 0114

CONTACT DETAILS of sender

Name Jeremy Spencer

Fax No. _____ Phone No.0400113093

DEC Office or Company Name - Great Southern Bio Logic

GDA (1)
GDA 94 ____

Job Type (Please indicate)
Private (P)

VHS USE ONLY	
Date received	24/5/2012
Date faxed	phoned 31/5 & 1.6.12

VHS Identification Number (VHS USE ONLY)	Sample Date	Sample label (Give location, eg. Forest Block or Shire, etc. and sample number)	Plant species sampled	Site Impact (2)	Zone 50 or 51	Map Reference (3)	Land Tenure (4)	RESULT s/s root (5)	RESULT bait (5)
VHS27300	21-05-12	Homestead Rd Sample 1	Composite sp	L	50	E 604971 N 6143101	Other		CIN
VHS27301	21-05-12	Homestead Rd Sample 2	Composite sp	L	50	E 605445 N 6143549	Other		CIN
VHS27302	21-05-12	Homestead Rd Sample 3	X. platyphylla sp	L	50	E 605469 N 6143380	Other		CIN
						E _ _ _ _ _ _ N _ _ _ _ _ _ _			
						E _ _ _ _ _ _ N _ _ _ _ _ _ _			
						E _ _ _ _ _ _ N _ _ _ _ _ _ _			
						E _ _ _ _ _ _ N _ _ _ _ _ _ _			

NOTES:

1. Please tick this box if your map references are supplied in the **GDA 94** standard. If not, please specify the datum used.
2. Site impact - Low, Moderate, or High (as in the Dieback Interpreter's Manual).
3. An MGA map reference with prefixes **must** be supplied for all samples.
4. Land Tenure - State Forest (SF), National Park (NP), Reserve (R), Westrail (W), Private (P), Gravel Pit (GP), or other. (Other - describe in comments below).
5. Result codes used – CIN = *Phytophthora cinnamomi*, MUL = *P. multivora*, CRY = *P. cryptogea*, PI = *P. inundata*, ARE = *P. arenaria*, ELO = *P. elongata*, THE = *P. thermophila*, = *P. megasperma*, PN = *P. nicotianae*, CON = *P. constricta*, NEG = negative, SUB = subcultured for further tests

PM

Please Note: a). NEG results cannot be used to represent a total absence of *Phytophthora* in the sampled area. b). Information from your samples will be incorporated into the VHS database.

COMMENTS:

Sth Coast Hway Main Roads Reserve

GHD

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1	C.Wharton	F.Hannon	Fionnuala Hannon	F.Hannon	Fionnuala Hannon	06/08/12
2	C.Wharton	S.McSevich		F.Hannon	Fionnuala Hannon	27/08/12

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