

**Main Roads Western
Australia**

Report for South Western
Highway Upgrade Harvey

SLK 106.3 to 108.23

Environmental Impact
Assessment and
Environmental Management
Plan

November 2006



Contents

Executive Summary	i
1. Introduction	1
2. Project Description and Justification	3
3. Environmental Impacts and Management	4
3.1 Natural Environment	4
3.2 Social Environment	21
3.3 Pre-construction Phase	22
3.4 Construction Phase	23
3.5 Environmental Compliance and Monitoring	26
4. Consultation	28
4.1 Department of Environment and Conservation	28
5. Environmental Approvals	29
5.1 Commonwealth Government	29
5.2 Government of Western Australia	29
6. References	30

Table Index

Table 1	Key Characteristics of the South Western Highway upgrade project Harvey	3
Table 2	Reserve land within the project area	5
Table 3	Bush Forever Condition Rating (Government of Western Australia, 2000)	6
Table 4	Declared Rare and Priority Flora Species known to exist, or likely to occur within the vicinity of the South Western Highway upgrade project Harvey	7
Table 5	Assessment of Project against Ten Clearing Principles	11
Table 6	Significance Levels for Fauna species – EPBC Act, DEC	16
Table 7	Significant Fauna occurring, or likely to occur within the vicinity of the project area.	17



Appendices

- A Location and Constraints Plan
- B Project Environmental Aspects Table
- C Environmental Management Responsibilities and Actions Table (EMP)
- D Description of DEC's Flora Conservation Codes
- E Vegetation and Rare Flora Survey



Executive Summary

GHD Pty Ltd (GHD) were commissioned by Main Roads South West Region (Main Roads) to prepare an Environmental Impact Assessment and Environmental Management Plan (EIA and EMP) for the proposed South Western Highway upgrade Harvey starting approximately 0.5 km south of Peterson Road and finishing 1.5 km north of Peterson Road (SLK 106.3 – 108.23). The upgrade works include widening of the road and construction of overtaking lanes.

According to the Western Australian Planning Commission (WAPC) Bulletin No. 64 (WAPC, 2003), the likelihood of encountering acid sulphate soils (ASS) in the project area is for the most part *'moderate to low risk of actual acid sulphate soils (AASS) and potential acid sulphate soils (PASS) occurring generally at depths of > 3 m'*. It was not necessary to conduct ASS testing in the area as only the topsoil will be removed during construction.

Land use on the western side of the project area is predominantly agriculture. Two reserves also exist on the western side of the highway, an 'A' class reserve immediately north of Peterson Road and a 'C' class reserve further north. On the eastern side of the project area there are three 'C' class reserves. It is necessary for Main Roads to acquire a small area of private property for completion of the project.

The original vegetation of the Harvey region consisted of the Forrestfield and Guildford complex (Department of Conservation and Environment (DCE), 1980). The percentages of these vegetation complexes remaining (1997/1998) in the System 6/part System 1 area are 17.5% and 5% respectively (Environmental Protection Authority (EPA), 2006). An assessment of the project area conducted on the 26th September 2006 identified that the entire project area had been heavily disturbed by historical agricultural and road establishment activities. The original vegetation structure was no longer present and does not support a functioning vegetation community.

Searches of the DEC flora database and the Western Australian Herbarium (WAHERB) records indicate that three Declared Rare Flora (DRF) species and 21 Priority Flora are known to exist or are likely to occur within the vicinity of the South Western Highway Harvey. None of these species were found in the project area during the spring 2006 flora survey.

A search of Department of Environment and Conservations (DEC's) Threatened Ecological Communities (TECs) database and the Commonwealth *Environmental Protection and Biodiversity Conservation (EPBC) Act* identified no TECs within or adjacent to the project area.

Approximately 1.07 ha of vegetation is required to be cleared for completion of the project. On the basis of the assessment against clearing principles and that the project does not occur within an Environmentally Sensitive Area (ESA), it is considered that the clearing of native vegetation can proceed in accordance with the requirements of Main Roads Statewide project "Clearing Permit" (CPS 818/1) under the *Environmental Protection (Clearing of Native Vegetation) Regulations* (2004).

No declared weeds were observed within the project area, however the field investigation identified a number of common weeds within the project area.

The project area has been considered as *Phytophthora cinnamomi* (dieback) "uninterpretable" as indicator plants are too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi* (CALM, 2003). This rating is a reflection of the absence of native understorey vegetation.



A desktop analysis of threatened fauna species believed to occur in the project area was conducted based on a search of the DEC's Threatened Fauna database. The search identified six Schedule 1, and four priority species as prescribed under the *Wildlife Conservation Act* 1950 as occurring or potentially occurring within the Shire of Harvey in which the project is located. A further eight species as prescribed under the *Environmental Protection and Biodiversity Conservation Act* 1999 (EPBC Act) were also identified (Commonwealth Government of Australia, 1999).

No recorded European heritage sites were identified as occurring within or adjacent to the project site and as such none are expected to be directly impacted by roadworks.

Aboriginal ethnographic and archaeological surveys of South Western Highway from Waroona to Bunbury were completed in 2000 and 2001 respectively. The surveys covered a 200m corridor centred on the road alignment. At the time of the survey, one registered Aboriginal heritage site was recorded in the project area. Wallam's campsite is located at SLK 106.48, 80 m east of the South Western Highway. It is not expected that the roadworks will impact on the site.

A brief investigation of the current land use and recent history of the project area indicates little likelihood of a contaminated site occurring within the project area.

Services have been identified within the project area. Minor Telstra relocations will be necessary for the project.

No environmental impacts identified during the preparation of this EIA and EMP are considered to warrant the referral of the project to the Commonwealth Minister for the Environment under the provisions of the *EPBC Act* or the West Australian Environmental Protection Authority (EPA).



1. Introduction

GHD Pty Ltd (GHD) were commissioned by Main Roads South West Region (Main Roads) to prepare an Environmental Impact Assessment and Environmental Management Plan (EIA and EMP) for the proposed upgrade works on South Western Highway immediately north of Peterson Road, Harvey (SLK 106.3 to 108.23). The location of the project site is shown in Appendix A.

This EIA and EMP has been prepared congruent with Main Roads requirements for the project and:

- » Describes the significant aspects of the existing project environment;
- » Details the primary environmental and social impacts of the proposed works; and
- » Details actions to manage and minimise the identified impacts.

This EIA and EMP has been prepared based on:

- » An inspection of the project site;
- » A review of relevant design documents prepared for the project;
- » Discussions with the Main Roads project manager;
- » A search of Department of Environment and Conservation's (DEC's) Declared Rare and Priority Flora database;
- » A search of DEC's Threatened Fauna database;
- » A relevant literature and database review;
- » A dieback assessment of the project area (2006);
- » A vegetation and rare flora survey of the project area (2006);
- » An opportunistic fauna survey of the project area; and
- » Previous Aboriginal ethnographic and archaeological survey reports.

Environmental and social impacts identified as requiring consideration during the proposed works and therefore addressed in this report are:

- » Acid sulphate soils (ASS);
- » Vegetation – Rare and Priority Flora, Threatened Ecological Communities (TECs) and Vegetation Clearing;
- » Rehabilitation;
- » Weed management;
- » Dieback disease;
- » Topsoil management;
- » Fauna;
- » Land use;
- » Traffic noise;
- » European heritage;



- » Aboriginal heritage;
- » Visual amenity;
- » Contaminated sites;
- » Pre-construction works; and
- » Construction phase impacts – construction noise, vibration, dust, traffic access and safety, fire management, fuel and chemical storage, local community consultation and complaints management and rubbish disposal.



2. Project Description and Justification

South Western Highway at the location specified is currently a single lane carriageway. Main Roads propose to undertake upgrade works, which includes passing lanes and widening of the existing road.

Construction is expected to commence in November 2006.

The key characteristics of the South Western Highway upgrade project Harvey are summarised in Table 1 below.

Table 1 Key Characteristics of the South Western Highway upgrade project Harvey

Issue	Description
Road works length	1930 m (SLK 106.3 – 108.23)
Side Road Intersections	Peterson Road SLK 107.8 Parking Bay SLK 106.8
Clearing Area	1.07 ha



3. Environmental Impacts and Management

The following section identifies and discusses the environmental and social aspects considered relevant to the project and those issues considered necessary to describe the project area. This section also details actions necessary to adequately manage the impacts of the project. A project environmental aspects table detailing potential environmental impacts of the works is included in Appendix B. Relevant environmental management measures and responsibilities are summarised in an environmental management responsibilities and actions table included in Appendix C. Appendix C is designed to be used as a 'stand alone' EMP during the design and implementation of the project.

3.1 Natural Environment

3.1.1 Climate of area

The climate of the project area is best described as Mediterranean with warm dry summers and cool wet winters. The closest Bureau of Meteorology weather-recording station to the project site is located at Wokalup which is 4.6 km south of Harvey. The recorded climate data at Wokalup is summarised below.

Mean Annual Maximum Temperature Range: 16.7 °C (July) to 30.9 °C (January)

Mean Annual Minimum Temperature Range: 7.9 °C (August) to 16.1 °C (February)

Mean Annual Rainfall: 963.7 mm

Mean Annual Rain days per year: 124.8 days

(Bureau of Meteorology, 2004)

3.1.2 Geomorphology, Landform and Soils

The project area is situated on the western Swan Coastal Plain, which occurs from Perth to Dunsborough. The project area traverses the Guildford formation, which is characterised by flat plains with medium textured deposits and yellow duplex soils. The eastern side of the South Western Highway is dominated by the Forrestfield formation, which consists of laterised foothills of the Darling Scarp dominated by gravely and sandy soils. The site contains localised concentrations of heavy minerals with dark yellowish orange, medium to coarse sand (Department of Conservation and Environment (DCE), 1980).

3.1.3 Rivers, Wetlands and Water Issues

There are no rivers located within or within the vicinity of the project area. There are no conservation category or resource enhancement wetlands located within the project area. A multiple use wetland exists to the west of the project area and extends into the project area. Multiple use wetlands are classified as those wetlands with few ecological attributes but which still provide important hydrologic functions (Hill, *et al.* 1996). There are no public drinking water supplies located within the vicinity of the project area.

Action: Main Roads Project Manager / Main Roads Construction Manager



Drainage from road and road reserves into wetland will be managed appropriately.

3.1.4 Acid Sulphate Soils

The Western Australian Planning Commission (WAPC) Bulletin No. 64 identified the likelihood of acid sulphate soils (ASS) occurring within the Swan Coastal Plain. According to the bulletin the likelihood of encountering ASS in the project area is for the most part '*moderate to low risk of actual acid sulphate soils (AASS) and potential acid sulphate soils (PASS) occurring generally at depths of > 3 m*' (WAPC, 2003).

As the road upgrade will only require the topsoil to be removed, approximately 100 mm, it was not necessary to conduct ASS testing in the area.

3.1.5 Reserves and Conservation Areas

Details of reserves located within the study area are shown in Table 2. The locations of the reserves can be seen in Appendix A. The proposed roadworks are not anticipated to directly impact these reserves.

Table 2 Reserve land within the project area

Reserve Number	Land Use/Purpose	Vesting	Size (ha)
R22977	Common (Class C)	Department for Planning and Infrastructure	354.57
R32829	Car Racing (Class C)	Department for Planning and Infrastructure	7.60
R44819	Sewage Treatment (Class C)	Department for Planning and Infrastructure	2.13
R35043	Drainage (Class C)	Department for Planning and Infrastructure	0.88
R16804	Picnic Ground and Resting Place (Class A)	Department for Planning and Infrastructure	3.36

3.1.6 Vegetation

The original vegetation of the Harvey region consisted of the Forrestfield and Guildford complex. The Forrestfield complex consisted of open forest of marri-wandoo-jarra on the heavier gravel soils and of jarrah-marri-sheoak on the sandier soils. A mixture of open-forest of marri-wandoo-jarra and woodland of wandoo dominates the Guildford complex (DCE, 1980). The percentages of these vegetation complexes remaining (1997/1998) in the System 6/part System 1 area are 17.5% and 5% respectively (EPA, 2006).

An assessment of the project area was conducted on the 26th September 2006. This assessment identified that the entire project area had been heavily disturbed by historical agricultural and road establishment activities. The original vegetation structure was no longer present and does not support a functioning vegetation community. Appendix E gives the results of the vegetation and rare flora survey.



The vegetation condition rating ranged from 5 (Degraded) immediately adjacent to the road reserve (SLK 106.3-106.5) to as 6 (Severely Degraded) within the remaining area. Table 3 describes the condition ratings.

Given the original vegetation structure is no longer present in the project area, clearing for this project will not reduce the proportions of Forrestfield and Guildford complexes noted above.

Table 3 Bush Forever Condition Rating (Government of Western Australia, 2000)

Rating	Description	
1	Pristine	Pristine or nearly so.
2	Excellent	Vegetation structure intact, disturbance affecting individual species, and weed 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	Severely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost without native species.

3.1.7 Rare and Priority Flora

Searches of the DEC flora database and the Western Australian Herbarium (WAHERB) records indicate that the following Declared Rare Flora (DRF) and Priority Flora are known to exist or are likely to occur within the vicinity of the South Western Highway Harvey (Table 4). This included three DRF species, however none of these (or any other DRF species) were found in the project area during the spring flora survey. The locations of DRF and Priority Flora can be seen in Appendix A. A description of DEC's Flora Conservation Codes can be seen in Appendix D.

During the flora survey 27 families, 53 species and 20 common weeds/introduced species were found. These have been listed in Appendix E.



Table 4 Declared Rare and Priority Flora Species known to exist, or likely to occur within the vicinity of the South Western Highway upgrade project Harvey

Taxon (species or subspecies)	Conservation Code (CALM)	Description	Preferred Habitat	Known Localities
<i>Diuris micrantha</i>	R	Tuberous, perennial, herb, 0.3–0.6 m high. Fl. Yellow, brown, Sep–Oct.	Brown loamy clay. Winter-wet swamps, in shallow water.	Medina, Yarloop, Yunderup, Manjimup, Bowelling, Meelon
<i>Drakaea elastica</i>	R	Tuberous, perennial, herb, 0.12–0.3 m high. Fl. Red, green, yellow, Oct–Nov.	White or grey sand. Low-lying situations adjoining winter-wet swamps.	Gingin-Busselton, Lake Guraga, East of Albany, Narrikup, Gull Rock NP
<i>Synaphea stenoloba</i>	R	Caespitose shrub, 0.3–0.45 m high. Fl. Yellow, Aug–Oct.	Sandy or sandy clay soils. Winter-wet flats, granite.	Pinjarra
<i>Caladenia uliginosa</i> subsp. <i>Patulens</i>	P1	Tuberous, perennial, herb, 0.2–0.35 m high. Fl. Green, cream, Sep–Oct.	Clay loam and gravel. Well drained soils amongst dense shrubs.	Harvey, Nannup
<i>Carex tereticaulis</i>	P1	Monoecious, rhizomatous, tufted perennial, grass-like or herb (sedge), 0.7 m high. Fl. Brown, Sep–Oct.	Black peaty sand.	Dardanup, Bridgetown, Blackwood River, Guildford, (Harvey)
<i>Synaphea odocoileops</i>	P1	Tufted, compact shrub, 0.2–0.5 m high. Fl. Yellow, Aug–Oct.	Brown-orange loam & sandy clay, granite. Swamps, winter-wet areas.	Serpentine, Elgin, Byford, Wagerup



Taxon (species or subspecies)	Conservation Code (CALM)	Description	Preferred Habitat	Known Localities
<i>Acacia oncinophylla</i> subsp. <i>Patulifolia</i>	P2	Shrub, 0.5–2.5(–3) m high, ‘minni-ritchi’ bark, phyllodes 4–9 cm long, 3–6 mm wide. Fl. Yellow, Aug–Dec.	Granitic soils, occasionally on laterite.	Gosnells, North Dandalup, Wagerup, Bridgetown (Winnejup)
<i>Apodasmia ceramophila</i>	P2	Rhizomatous, perennial, herb (rush-like), ca 0.35 m high. Fl. Sep–Oct.	Sandy & clayey soils. Swamps, saline clay flats.	Lake Muir, Yarloop, Cookernup, Kent River, Wamballup
<i>Boronia capitata</i> subsp. <i>Gracilis</i>	P2	Slender shrub, 0.3–0.6(–3) m high, branches pilose. Fl. Pink, Jun–Nov.	White/grey or black sand. Winter-wet swamps, hillslopes.	Harvey, Busselton, Yarloop, Cowaramup, Waroona
<i>Acacia semitrullata</i>	P3	Slender, erect, pungent shrub, (0.1–)0.2–0.7(–1.5) m high. Fl. Cream, white, May–Oct.	White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas.	Yallingup, Donnybrook, Harvey, Yarloop, Collie
<i>Dillwynia dillwynioides</i>	P3	Decumbent or erect, slender shrub, 0.3–1.2 m high. Fl. Red, yellow, orange, Aug–Dec.	Sandy soils. Winter-wet depressions.	Harvey, Pinjarra, Yunderup, Gingin, Perth
<i>Grevillea prominens</i>	P3	Spreading shrub, 0.5–1.7 m high, 0.3–1 m wide. Fl. Cream, white, Sep–Oct.	Gravelly loam. Along creeklines.	E of Harvey, Mt William, Collie
<i>Haloragis tenuifolia</i>	P3	Erect or prostrate annual, herb, 0.05–0.5 m high. Fl. Brown, red, Sep–Dec.	Grey sand, clay. Winter wet flats.	Ruabon, Maddington, Harvey, Pinjarra, Upper Swan, Gingin, Cooljarloo, (Woorooloo, Midland, Byfields Mill), Mt Helena
<i>Hemigenia microphylla</i>	P3	Slender shrub, 0.4–1.8 m high. Fl. Blue, purple, Sep–Dec.	Sandy clay, peaty clay, granite. Winter-wet depressions.	Waroona, Walpole, Austin Bay, Harvey, Kent River



Taxon (species or subspecies)	Conservation Code (CALM)	Description	Preferred Habitat	Known Localities
<i>Myriophyllum echinatum</i>	P3	Erect annual, herb, 0.02–0.03 m high. Fl. Red, Nov. Clay.	Winter-wet flats.	Tutunup, Austin Bay NR, Ruabon, Harvey, Waroona, Busselton
<i>Rhodanthe pyrethrum</i>	P3	Erect, slender annual, herb, 0.05–0.2 m high. Fl. White, yellow, Oct–Dec.	Clay, sandy clay. Winter-wet depressions, clay pans, swamps.	Bullsbrook, Boyanup, Kenwick, Waterloo, Harvey, Eaton, Denmark
<i>Schoenus</i> sp. Waroona	P3	Tufted annual, grass-like or herb (sedge), 0.02–0.06 m high. Fl. Brown, red, green, Oct–Nov.	Clay or sandy clay. Winter-wet flats.	Kenwick, Harvey, Waroona, Austin Bay
<i>Stylidium trudgenii</i>	P3	Desc. Unavailable, Fl. Oct–Nov		Ellenbrook, Scott River, Gingilup Swamp, Harvey
<i>Acacia flagelliformis</i>	P4	Rush-like, erect or sprawling shrub, 0.3–0.75(–1.6) m high. Fl. Yellow, May–Sep.	Sandy soils. Winter-wet areas.	Harvey, Eaton, Bunbury, Capel, Busselton, Donnybrook
<i>Caladenia longicauda</i> subsp. <i>Clivicola</i>	P4	Tuberous, perennial, herb, 0.3–0.5 m high. Fl. White, green, yellow, Sep–Oct.	Clayey loam, gravel, sand. Granite outcrops.	Harvey, Dardanup, Dunsborough, Pinjarra, Lesmurdie, Cape Naturaliste
<i>Caladenia speciosa</i>	P4	Tuberous, perennial, herb, 0.35–0.6 m high. Fl. White, pink, Sep–Oct.	White, grey or black sand.	Myalup, Eaton, Yarloop, Ludlow, Gingin, Capel
<i>Conostylis pauciflora</i> subsp. <i>Pauciflora</i>	P4	Rhizomatous, stoloniferous perennial, grass-like or herb, 0.1–0.35 m high. Fl. Yellow, Aug–Oct.	Grey sand, limestone. Hillslopes, consolidated dunes.	Yarloop, Dawesville, Yalgorup NP



Taxon (species or subspecies)	Conservation Code (CALM)	Description	Preferred Habitat	Known Localities
<i>Hemigenia platyphylla</i>	P4	Spreading shrub, 0.2–1.5 m high. Fl. Blue, purple, Sep–Nov.	Sandy & loamy soils. Granite rocks, slopes.	Mt Bakewell, Stirling Range, Wandering, Harvey
<i>Senecio leucoglossus</i>	P4	Erect annual, herb, to 1.3 m high. Fl. White, Aug–Dec.	Gravelly lateritic or granitic soils. Granite outcrops, slopes.	Mundaring, Harvey, Mt Saddleback, Dwellingup, Darling Range, Wheatley



3.1.8 Threatened Ecological Communities

Ecological communities are defined as ‘naturally occurring biological assemblages that occur in a particular type of habitat’ (English and Blythe, 1997). 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 may be protected under the Commonwealth *Environmental Protection and Biodiversity Conservation (EPBC) Act* (Commonwealth Government of Australia, 1999) and their potential loss or disturbance can trigger this legislation.

No TECs listed under the *EPBC Act* or DEC’s TEC database occur within the study area.

3.1.9 Assessment Against Clearing Principles

Any clearing of native vegetation will require a permit under Part V of the *Environmental Protection Act* (1986), except where an exemption applies under Schedule 6 of the Act or is prescribed by regulation in the *Environmental Protection (Clearing of Native Vegetation) Regulations* (2004), and not in an Environmentally Sensitive Area (ESA). Consultation of the DEC’s web based Native Vegetation Map Viewer and field investigations confirmed that the upgrade project does not occur within an ESA.

Clearing applications are assessed against ten principles outlined in Schedule 5 of the *Environmental Protection Amendment Act* (2003). These principles aim to ensure that all potential impacts resulting from removal of native vegetation can be assessed in an integrated way.

An examination of the Ten Clearing Principles applied against the finding of this vegetation and flora assessment is undertaken below (Table 5).

Table 5 Assessment of Project against Ten Clearing Principles

Principle Number	Principle	Assessment	Outcome
(a)	Native vegetation should not be cleared if it comprises a high level of biological diversity	The original vegetation in the project area is no longer present and was rated as degraded to severely degraded. This rating reflects the low level of biodiversity present in the project area.	Vegetation may be considered to be cleared
(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	Given the vegetation condition ratings above and observations made during the site inspection, the project area does not comprise any linkages or habitat necessary for maintaining indigenous WA fauna.	Vegetation may be considered to be cleared



Principle Number	Principle	Assessment	Outcome
I	Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora	No DRF were recorded during the 2006 spring flora survey. Although three DRF species were listed as likely to occur within the vicinity of the project area, clearing for the project does not occur in their "preferred habitat" of winter-wet swamps/flats.	Vegetation may be considered to be cleared
(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 found to be present in the project area and the area is not classed as an ESA.	Vegetation may be considered to be cleared
(e)	Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared	Given the original vegetation structure (Forrestfield and Guildford complexes) was no longer present in the project area as a result of historic clearing and disturbance activities, clearing for this project will not impact significant remnant vegetation.	Vegetation may be considered to be cleared
(f)	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	The native vegetation within the project area is not associated with any watercourse or wetland.	Vegetation may be considered to be cleared
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	The clearing of native vegetation is unlikely to cause alteration in the adjacent cleared lands. Waterlogging, wind and soil erosion are unlikely to be increased due to the clearing of native vegetation for the project.	Vegetation may be considered to be cleared
(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 will be no impact on conservation areas. An 'A' class reserve (picnic ground and resting place) is located in the vicinity of the project area however the area of vegetation to be cleared does not contribute significantly to the environmental values or linkages of this reserve.	Vegetation may be considered to be cleared



Principle Number	Principle	Assessment	Outcome
(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	Due to the minor amount of clearing of native vegetation there is unlikely to be any deterioration in the quality of surface or underground water.	Vegetation may be considered to be cleared
(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	Due to the minor amount of clearing of native vegetation there is unlikely to be increase in flood peak height or increase in duration or extent of flood intensity.	Vegetation may be considered to be cleared

On the basis of the assessment against clearing principles and that the project does not occur within an Environmentally Sensitive Area (ESA), it is considered that it is possible for the clearing of native vegetation to proceed in accordance with the requirements of Main Roads Statewide project "Clearing Permit" (CPS 818/1) under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

On-ground works will be conducted to minimise clearing / avoid clearing of mature trees within the project area.

Action: Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor

Clearing for works will be conducted as detailed below.

During road works, damage to any existing native vegetation will be avoided as far as practicable.

Action: Main Roads Construction Manager / Construction Contractor

Prior to the start of clearing operations, the clearing line will be marked on the ground and checked by the Construction Manager to ensure that the clearing areas are correctly defined. Trees of particular significance that are to be conserved will be clearly marked prior to the commencement of clearing.

Action: Main Roads Construction Manager / Construction Contractor

Trees to be removed will be felled in a manner that ensures they fall within the approved clearing area.

Action: Main Roads Construction Manager / Construction Contractor

Mature trees especially will be conserved as far as practicable and will not be disturbed for temporary works such as access tracks, spoil areas or site offices. Vehicles and equipment will not be parked or driven over native vegetation beyond the clearing boundaries.

Action: Main Roads Construction Manager / Construction Contractor

Any damage caused by the Construction Contractor to the vegetation, landforms or fauna habitat outside of the works area will be rehabilitated at the contractor's cost. If environmental damage beyond the



works area is identified Main Roads will withhold the payment of monies due to the contractor, where the extent of the damage exceeds \$5000, determined at the following rates:

- » For damaged trees greater than 3 m in height - \$1000 each;
- » For damaged trees and shrubs up to 3 m in height - \$500 each; and
- » For damaged grassland, open soil areas, rock faces and landforms, and habitats in general - \$10 per square metre.

Action: Main Roads Construction Manager / Construction Contractor

All cleared timber will be disposed of off-site in private property. Cleared vegetation will be disposed of at an approved landfill site. No burning of cleared vegetation will be permitted within the project area.

Action: Main Roads Project Manager / Main Roads Construction Manager

3.1.10 Rehabilitation

No major revegetation has been planned for this section of the South Western Highway, however Main Roads Project Manager advised that there may be some scope for minor revegetation.

Action: Main Roads Project Manager

3.1.11 Weed management

The field investigation of the project area identified a number of common weeds within the project area. These are included in Appendix E. No declared plants were identified in or adjacent to the project area. The implementation of standard vehicle and machinery hygiene measures during road works will ensure that no additional weed species are transported to, or from, the project area. All site employees should be advised of the following hygiene measures:

- » All clearing, topsoil stripping/spreading and gravel cartage activities should be conducted under dry soil conditions.
- » All road construction plant and machinery should be cleaned free of all soil and vegetative material:
 - prior to arrival within the project area; and
 - prior to departing the project area.
- » Clean down may comprise of the use of a brush and/or compressed air to remove clods of soil and/or soil water slurry. A metal bar or spade may be used to remove compacted soil where necessary. Dust adhering to the sides of vehicles does not need to be removed.

Action: Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor

3.1.12 Dieback disease (*Phytophthora cinnamomi*)

The project area has been considered as “uninterpretable” as indicator plants are too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi* (CALM, 2003). This rating is a reflection of the totally destroyed understorey with its absence of native vegetation.

Dieback infestations spread through bushland either naturally, through soil water movement, or artificially through vector movement of soil on vehicles, during fencing or firebreak/track maintenance and



occasionally via foot traffic. Precautionary dieback hygiene management is recommended for the project area adjacent to the "A" class reserve.

- » Machinery and vehicles will be clean of soil and vegetative material on entry each time they enter the project area;
- » No clean down points (hygiene boundaries) are required within the project area;
- » No new cut-off drains will be developed along the length of the project area;
- » Utilise existing drainage lines over the length of the project area; and
- » Topsoil will be stored and respread within the section that it was stripped from to minimise the potential to spread dieback and/or weeds.

Action: Main Roads Project Manager / Main Roads Project Designer / Main Roads Construction Manager / Construction Contractor / DEC

3.1.13 Topsoil Management

After the completion of clearing activities, topsoil will be stripped to a depth of approximately 100 mm from the project area.

Action: Main Roads Construction Manager / Construction Contractor

Topsoil will be stored and respread within the section that it was stripped from to minimise the potential to spread dieback and/or weeds.

Action: Main Roads Construction Manager / Construction Contractor

Precautions need to be taken so as to not introduce weed species into the topsoil during construction and to maximise the use of the topsoil.

Action: Main Roads Construction Manager / Construction Contractor

3.1.14 Fauna

The conservation status of fauna species is assessed under State and Commonwealth Acts, in particular the Western Australian *Wildlife Conservation Act* (1950) and the Commonwealth's *EPBC Act* (1999). Significant fauna likely to occur in the project area have been identified by the *EPBC Act* Protected Matters Search Tool (2005).

The significance levels for fauna used in the *EPBC Act* are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN). This list includes a number of Migratory and Marine bird species known to forage on wetland habitats.

In Western Australia, the DEC has significant levels for fauna classified in a series of schedules. The DEC also produces a supplementary list of Priority Fauna, being species that are not considered threatened under the Western Australian *Wildlife Conservation Act* but for which the DEC feels there is a cause for concern. These species have no special protection, but their presence would normally be considered. Priority fauna species are those in need of further survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

An explanation of significance levels for fauna is detailed in Table 6. Significant fauna species occurring, or considered likely to occur, within the project area are listed in Table 7.



Field investigations for the presence of fauna indicated that no native fauna species or potential habitat were present within the project area. It can be said that the native vegetation within the project area does not provide significant habitat for fauna species.

Table 6 Significance Levels for Fauna species – EPBC Act, DEC

Status	Significance Level	Definition
EPBC Act	Extinct	Taxa not definitely located in the wild during the past 50 years
	Extinct in the Wild	Taxa only known to survive in captivity
	Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future
	Endangered	Taxa facing a very high risk of extinction in the wild in the near future
	Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term
	Near Threatened	Taxa that risk becoming Vulnerable in the wild
	Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
	Data Deficient (insufficiently known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
EPBC Act	Least Concern	Taxa that are not considered Threatened
	Migratory	<p>Taxa that are listed in</p> <p>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;</p> <p>the Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (CAMBA); and</p> <p>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).</p> <p>Listed migratory species also include any native species identified in an international agreement approved by the Commonwealth Environment Minister. The Minister may approve an international agreement for this purpose if satisfied that it is an agreement relevant to the conservation of migratory species.</p>
	Marine	species is the list established under s248 of the EPBC Act.



Status	Significance Level	Definition
DEC	Schedule 1	"...fauna that is rare or likely to become extinct, are declared to be fauna that is in need of special protection."
	Schedule 2	"...fauna that is presumed to be extinct, are declared to be fauna that is in need of special protection."
	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."
	Schedule 4	"...fauna that is in need of special protection, otherwise than for the reasons mentioned [in Schedule 1 – 3]"
DEC	Priority 1	Taxa with few, poorly known populations on threatened lands.
	Priority 2	Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc.
	Priority 3	Taxa which are known from few specimens or sight records, some of which are on lands not under immediate threat of habitat destruction or degradation.
	Priority 4	Rare taxa. Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.
	Priority 5	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Table 7 Significant Fauna occurring, or likely to occur within the vicinity of the project area.

Genus	Species	Common Name	EPBC Act Status	DEC Status
<i>Calyptorhynchus</i>	<i>banksii naso</i>	Forest Red-tailed Black-Cockatoo		Schedule 1
<i>Calyptorhynchus</i>	<i>baudinii</i>	Baudin's Black-Cockatoo	Vulnerable	Schedule 1
<i>Calyptorhynchus</i>	<i>latirostris</i>	Carnaby's Black-Cockatoo	Endangered	Schedule 1
<i>Dasyurus</i>	<i>geoffroii</i>	Chuditch/Western Quoll	Vulnerable	Schedule 1
<i>Egernia</i>	<i>stokesii badia</i>	Western Spiny-tailed Skink		Schedule 1



Genus	Species	Common Name	EPBC Act Status	DEC Status
<i>Myrmecobius</i>	<i>fasciatus</i>	Numbat	Vulnerable	Schedule 1
<i>Phascogale</i>	<i>calura</i>	Red-tailed Phascogale	Endangered	Schedule 1
<i>Setonix</i>	<i>brachyurus</i>	Quokka	Vulnerable	Schedule 1
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Vulnerable	
<i>Haliaeetus</i>	<i>leucogaster</i>	White-bellied Sea-eagle	Migratory, Marine	
<i>Apus</i>	<i>pacificus</i>	Fork-tailed Swift	Marine	
<i>Ardea</i>	<i>alba</i>	Great Egret	Marine	
<i>Ardea</i>	<i>ibis</i>	Cattle Egret	Marine	
<i>Merops</i>	<i>ornatus</i>	Rainbow Bee-eater	Marine	
<i>Tyto novaehollandiae</i>	<i>novaehollandiae</i>	Masked Owl		Priority 3
<i>Hydromys</i>	<i>chrysogaster</i>	Water-rat		Priority 4
<i>Macropus</i>	<i>irma</i>	Western Brush Wallaby		Priority 4
<i>Isodon</i>	<i>obesulus fusciventer</i>	Quenda		Priority 5

3.1.15 Likelihood of Significant Fauna Species Occurrence

A consideration of the likelihood of occurrence of significant fauna in the project area is detailed below:

Forest Red-tailed Black-Cockatoo:

The Forest Red-tailed Black-Cockatoo species is essentially a cockatoo of the Jarrah forest but also uses Marri woodlands for foraging, with Marri seeds (along with jarrah) being its principal food source (Johnstone and Kirkby, 1999). This species is currently classified as Schedule 1 on the DEC Threatened Fauna list.

The Forest Red-tailed Black Cockatoo is locally extinct on the Swan Coastal Plain in Perth Metropolitan Area (Government of Western Australia, 2000). This species was previously widespread on the Swan Coastal Plain but has suffered a range reduction concurrent with the clearing of land following European settlement. The project area has not been considered as significant to the maintenance or provision of habitat for this species.

Baudin's Black-Cockatoo:

Baudin's Black-Cockatoo, also known as the Long-billed Black-Cockatoo, is found in the southwest of Western Australia in the forest and woodlands of Jarrah (*Eucalyptus marginata*), Karri (*E. diversicolor*) and Marri (*Corymbia calophylla*). The primary food source of this cockatoo is the seeds of the Marri (Garnett and Crowley, 2000). This species has been impacted by the removal of large Marri throughout its range as this provides a food source. Baudin's Black-Cockatoo has been listed as Endangered under



the federal *EPBC Act*. This species is locally extinct on the majority of the Swan Coastal Plain, and would not be expected to utilise the project area.

Carnaby's Black-Cockatoo:

Carnaby's Black-Cockatoo, also known as the Short-billed Black-Cockatoo, is distributed across the southwest of Western Australia in uncleared or remnant areas of eucalypt woodland and shrubland or kwongan heath. Breeding usually occurs in the wheatbelt region of Western Australia, with flocks moving to the higher rainfall coastal areas to forage after the breeding season. These black cockatoos feed on the seeds of a variety of native plants, including *Allocasuarina*, *Banksia*, *Dryandra*, *Eucalyptus*, *Grevillea* and *Hakea*, and some introduced plants, including *Pinus*. They will also feed on the nectar from flowers of a number of species, and on insect larvae. Carnaby's Black-Cockatoo has been listed as Endangered under the federal *EPBC Act*. This species may use the adjacent areas occasionally for feeding, but the project area does not appear to be one of the prime feeding or potential nesting areas for Carnaby's Black-Cockatoos.

Chuditch:

The Chuditch is the largest carnivorous marsupial in Western Australia. This species occupies a wide range of habitats including woodlands, riparian vegetation, beaches and deserts. The Chuditch formerly ranged over nearly 70% of Australia but now retains only a patchy distribution through the Jarrah forest and mixed Karri/Marri/Jarrah forest of southwestern WA. This reduction in range and decline in population numbers have been caused by habitat alteration, impacts from the introduction of foxes and cats, hunting and poisoning (CALM, 2005). This species is currently listed as Vulnerable on the *EPBC Act*. Chuditch have not occurred on the Swan Coastal Plain since the 1930s and would not be expected to occur within the project area as it lacks suitable habitat.

Western Spiny-tailed Skink:

Most occupied sites occur in York Gum (*Eucalyptus loxophleba*) woodland. Some occupied sites can be found in Gimlet (*Eucalyptus salubris*) and Salmon Gum (*Eucalyptus salmonophloia*) woodland. Habitat sites require hollow fallen logs and a low intensity of grazing by domestic stock. Preferred refuges consist of piles of several overlapping hollow logs that provide a combination of basking and shelter sites. This habitat is not present in the project area, therefore it is unlikely that this skink would inhabit the area.

Numbat:

The numbat is a small, banded, diurnal marsupial that feeds solely on termites. This species once ranged widely in southern semi-arid and arid Australia, distributed within a number of vegetation types. However, the numbat's current distribution is limited to Dryandra and Perup/Kingston area east of Manjimup and a number of nature reserves into which it has been reintroduced. This species occupies a number of habitat types including Jarrah forest, open eucalypt woodland, banksia woodland and tall closed shrubland (CALM, 2005). The numbat has been threatened by a number of factors since European colonisation of Western Australia; these factors include predation by foxes, clearing of native vegetation and changed fire regimes. This species is now listed as Threatened on both the *Wildlife Conservation Act 1950* and the *EPBC Act*. This species is locally extinct on the Swan Coastal Plain and would not be expected to occur within the project area that lacks suitable habitat.



Red-tailed Phascogale:

The Red-tailed Phascogale's range is currently restricted to the wheatbelt of Western Australia. The EPBC protected matters search tool includes this species in the Perth Metropolitan region but this is erroneous as there are no historical records of this species as far west as the Perth region. The project area does not contain suitable habitat or linkages for this fauna, therefore this species is unlikely to be present.

Quokka:

The Quokka is a small macropod that inhabits low lying scrub or dense heath and swamps with dense vegetation (Maxwell *et al.*, 1996). This species is a browser, with peppermint (*Agonis flexuosa*) and *Thomasia* species being dominant in their diet (CALM, 2005). The range of the Quokka once extended across the southwest of Western Australia; however, with the impact of colonization and the introduction of predators such as the fox this range has been highly reduced. This species is locally extinct on the Swan Coastal Plain and would not be expected to occur within the project area.

Western Ringtail Possum:

The main determinants of suitable habitat appear to be the presence of peppermint trees (*Agonis flexuosa*) either as the dominant tree or as an understorey component of eucalypt forest or woodland. No peppermint trees occur in the project area and the absence of understorey vegetation provides no linkages for this species to frequent the area.

Migratory / Marine Species:

There are a number of migratory and marine listed species that may be found within the project area, however these are likely to occur within the project area as vagrants.

Rainbow Bee-eater:

The Rainbow Bee-eater was not observed on site. There would be no impact on this species regionally as they disperse widely even across urban areas and are highly migratory, wintering in the north of Australia, and offshore islands, including New Guinea. This species is not restricted for nesting habitat in the southwest region, as they will build nesting tunnels in sandy slopes in a variety of areas, including disturbed sites. This species is not listed as a significant species under state laws.

Masked Owl:

The Masked Owl is listed as a Priority 3 under state law. No potential habitat or feeding areas for this species were noted during the field investigation. Given the mobility of this avi-fauna and degraded vegetation in the project area, the project is unlikely to impact upon this species.

Water Rat:

This fauna can be found along waterways and estuaries. It takes food from water, swimming underwater to find aquatic insects, fish, crustaceans and mussels. Snails, frogs, birds' eggs, and water birds may also be taken. It is one of Australia's only two amphibious mammals (the platypus is the other). Preferred habitat is in burrows alongside river and lake banks. No such habitats occur in the project area.

Western Brush Wallaby:

The Western Brush Wallaby is a medium sized macropod, is a grazer found primarily in open forest and woodland. This species was once very common in the southwest of Western Australia but has



undergone a reduction in range and a significant decline in abundance in its current habitat. The decline in populations of this species has resulted from extensive clearing within its original distribution and from predation of juvenile Western Brush Wallabies by foxes (CALM, 2005).

This species is not protected under legislation but is listed as a Priority 4 species by DEC, which means it is a species in need of monitoring.

The Western Brush Wallaby occurs on the Swan Coastal Plain only in a select number of large vegetation remnants, peripheral to urban areas (Government of Western Australia, 2000). This species was not identified during the fauna survey, and would be unlikely to occur within the project area.

Quenda:

The Quenda is an omnivorous marsupial that occurs in the southwest of Western Australia. This species prefers areas with dense understorey vegetation, particularly around swamps and along watercourses. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. On the Swan Coastal Plain Quenda are often associated with wetlands (CALM, 2005).

The Quenda is a Priority 5 species, which means that it is not considered threatened but is subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years. Quenda populations on the Swan Coastal Plain are threatened by development in this region, which has resulted in loss of habitat.

The condition and type of vegetation present and its level of disturbance throughout the project area is such that none of the listed species are expected to be threatened by the proposed works. However, the project will be designed and implemented to minimise vegetation clearing to that which is practicable for the safe construction and operation of the road.

Action: Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor

3.2 Social Environment

3.2.1 European Heritage

A desktop study of European heritage sites was conducted on the project area and no European heritage sites were located within or in close proximity to the study area.

3.2.2 Aboriginal Heritage

An ethnographic survey of South Western Highway from Waroona to Bunbury was completed in August 2000 (Goode and Northover, 2000). An archaeological survey of South Western Highway from Waroona to Bunbury was completed in April 2001 (Harris, 2001). These comprised of surveys of a 200m corridor centred on the road alignment.

The ethnographic survey involved field consultations with appropriate Aboriginal community representatives, and an archival and historical research. At the time of the survey, one Aboriginal heritage site was recorded in the project area, Wallam's campsite.



Wallam's campsite is located outside of the project area at SLK 106.48 and 80m east of the South Western Highway, in a bush reserve. The camp is located at the base of a stand of red gum trees with a tree-lined embankment to the east. The proposed roadworks are not expected to impact this Aboriginal heritage site.

If material likely to be of interest to the Aboriginal community is uncovered during construction works then works should immediately cease within 50 m of the material and the Department of Indigenous Affairs (DIA) advised immediately. If skeletal material is uncovered during works then the WA Police Service should also be advised immediately.

Action: Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor

3.2.3 Land Use

The land use on both sides of South Western Highway within the project area is predominantly broad scale agriculture. Reserves, as discussed above, occur in the area.

3.2.4 Traffic noise

The closest residential building to the project area is located north of Peterson Road and is approximately 100m west of the South Western Highway. As this building is located 100m from the project area there is no anticipated increase in traffic noise at the adjacent residential property.

3.2.5 Land Acquisition and Fencing

For completion of the project it will be necessary to acquire land adjacent to the South Western Highway. New fences will be installed in the areas in which land is acquired, however no clearing will be necessary for the installation of these fences.

Action: Main Roads Land Acquisition Manager

3.2.6 Visual Amenity

The existing view shed will not be significantly impacted by the proposed roadworks as there will only be a small amount of clearing.

Minimising and avoiding clearing of vegetation to that which is practicable for the safe construction and operation of the alignment can reduce impacts on the current viewshed.

Action: Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor

3.2.7 Contaminated Sites

No potential contaminated sites were identified within the project area during the preparation of this EIA and EMP.

3.3 Pre-construction Phase

Minor Telstra relocations will occur during this project however no clearing will be necessary.



Action: Service Authorities

3.4 Construction Phase

The impact of the proposed roadworks to through traffic will be minimised by the management of temporary environmental and social impacts that are likely to occur during the road construction phase. The following issues will need to be considered:

- » Environmental management;
- » Construction noise;
- » Vibration;
- » Dust;
- » Traffic safety and access;
- » Fire management;
- » Fuel and chemical storage; and
- » Rubbish disposal.

3.4.1 Environmental Management and Quality Plan

The Construction Contractor will 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.

Action: Construction Contractor

The Quality Plan will be submitted to the Main Roads Construction Manager for approval within twenty-eight days of award of the Contract or ten days of Possession of Site being granted, whichever is the earlier.

Action: Construction Contractor

The Construction Contractor will 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.

Action: Main Roads Construction Manager / Construction Contractor

3.4.2 Construction Noise

The Construction Contractor will 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* (1981).

Action: Main Roads Construction Manager / Construction Contractor

For construction work between 7:00 am and 7:00 pm (excluding Sunday and public holidays), the construction contractor will 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.

Action: Main Roads Construction Manager / Construction Contractor

At least seven days prior to after-hours construction work commencing, the Construction Contractor will submit an approved Noise Management Plan to Main Roads Superintendent for approval. The Noise Management Plan will be approved by the Chief Executive Officer (CEO) of the Shire of Harvey 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;
- » Procedures for on-site monitoring;
- » Plans for notifying the occupiers of adjacent properties; and
- » Plans for complaint response.

Action: Main Roads Construction Manager / Construction Contractor

3.4.3 Vibration

The Construction Contractor will 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.

Action: Main Roads Construction Manager / Construction Contractor

The use of vibrating rollers in vibratory mode will not be permitted within the nominated distances of any building as detailed below:

Type of Property	Distance (m)
All residential properties	50
Old and historic buildings, or where residents show concern	100

Action: Main Roads Construction Manager / Construction Contractor

Prior to the start of any operation that may cause vibration or result in damage, the Construction Contractor will conduct property inspections to establish their pre-works condition.

Action: Main Roads Construction Manager / Construction Contractor

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.



Action: Main Roads Construction Manager / Construction Contractor

3.4.4 Dust

There is likely to be some dust lift generated during the construction works and as a result of passing traffic. The Construction Contractor will employ construction methods that will keep dust lift to a minimum, and as required provide for the management of dust such as by watering of the works area and of roads, streets and other areas immediately adjacent to the works.

Action: Main Roads Construction Manager / Construction Contractor

Where it is found that vehicles leaving the site have dropped excessive soil material onto other sections of the South Western Highway these sections will be swept to reduce the potential for dust generation and maintain traffic safety.

Action: Main Roads Construction Manager / Construction Contractor

3.4.5 Traffic Access and Safety

To ensure the safe access of traffic through the construction site the Construction Contractor will develop and implement a Traffic Management Plan (TMP) congruent with the current Australian Standard Manual 1742.3 of Uniform Traffic Control Devices: Part 3 Traffic Control Devices for Works On-Road (Standards Australia) and the current Main Roads *Traffic Management Requirements for Works on Roads* (Main Roads Western Australia, 2002). The TMP should be submitted to the Construction Manager for approval within twenty-eight days of Award of Contract or within ten days of Possession of Site being granted or prior to the commencement of works, whichever is earlier.

Action: Main Roads Construction Manager / Construction Contractor

The Construction Contractor must submit with the TMP a Certificate of Compliance certifying that the TMP has been prepared and/or reviewed by an appropriately qualified person as defined in the current Main Roads publication *Traffic Management Requirements for Works on Roads* (Main Roads Western Australia, 2002).

Action: Main Roads Construction Manager / Construction Contractor

All traffic control measures will be in place and fully operational before the Construction Contractor commences any work activity that affects existing roadways.

Action: Main Roads Construction Manager / Construction Contractor.

3.4.6 Fire Management

The risk of igniting a fire during roadworks will be minimised and managed by compliance with the management measures detailed below.

Machines and vehicles will be restricted to designated cleared areas.

Action: Main Roads Construction Manager / Construction Contractor

The Construction Contractor will conform to any specific requirements for fire prevention requested by the Shire of Harvey, DEC and/or the Fire and Emergency Services Authority (FESA).



Action: Main Roads Construction Contractor / Construction Contractor

During road construction activities the following fire management requirements will be complied with:

- » All plant and vehicles operating over vegetation will have exhaust systems in good working order;
- » All machinery will be shut down during periods of extreme fire hazard as advised by DEC or the Shire of Harvey; and
- » All machinery will be fitted with fire extinguishers.

Action: Main Roads Construction Manager / Construction Contractor

3.4.7 Fuel and Chemical Storage

No on-site storage of fuel, oils and other contaminant materials will be permitted during road construction. Chemicals required for the cleanup of any accidental spillages will be maintained on-site.

Action: Main Roads Construction Manager / Construction Contractor

Major vehicle and plant servicing will not be conducted within the project area.

Action: Main Roads Construction Manager / Construction Contractor

3.4.8 Rubbish Disposal

Domestic site rubbish will not be disposed of by burning. All domestic rubbish and other rubbish will be disposed of at an authorised waste disposal site, or a site agreed with the Shire of Harvey.

Action: Main Roads Construction Manager / Construction Contractor

3.5 Environmental Compliance and Monitoring

Main Roads is responsible for the upgrade of the South Western Highway immediately north of Peterson Road, Harvey in line with the environmental management measures detailed in this EIA and EMP.

Action: Main Roads Project Manager

Environmental management measures detailed in this EIA and EMP will be included in the technical specifications prepared for the project.

Action: Main Roads Project Manager

During the project, 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 superintendence documentation.

Action: Main Roads Project Manager / Main Roads Construction Manager

The preparation and implementation of the Rehabilitation and Landscape Plan for the project is the responsibility of the Main Roads Project Manager and the Main Roads Regional Manager. Details on the progress of the landscaping works will be provided to the Environmental Protection Authority (EPA) and Main Roads Environment Manager on request.



Action: Main Roads Regional Manager / Main Roads Project Manager

Monitoring the success of the Rehabilitation and Landscape Plan will be conducted for a minimum period of three years from the time of implementation. Additional works and/or remedial action will be taken to ensure the success of the landscaping works.

Action: Main Roads Regional Manager / Main Roads Project Manager



4. Consultation

4.1 Department of Environment and Conservation

No formal consultation was undertaken during this study. The DEC was contacted to complete a number of database searches within the study area during the preparation of this EIA and EMP. The results of these are within this EIA report and include the following:

- » Declared Rare and Priority Flora database;
- » WA Herbarium Specimens database;
- » Threatened and Priority Fauna database; and
- » TECs database.



5. Environmental Approvals

5.1 Commonwealth Government

A review of the Department of Environment and Heritage (DEH) online database was conducted as part of preparing this EIA and EMP. No environmental impacts or issues considered being of National Environmental Significance that would render the project to be considered as a 'Controlled Action' or invoke the Commonwealth *EPBC Act* were identified for the project.

As such, formal referral of the South Western Highway upgrade project Harvey to the Commonwealth Minister for the Environment is not considered warranted.

5.2 Government of Western Australia

Based on findings from this EIA and field investigations there are no environmental issues associated with this project area that would require referral to the EPA. The clearing of vegetation required for this project will not contravene the 10 clearing principles. It is expected that clearing approval can be undertaken in accordance with Main Roads Statewide project 'Clearing Permit' (CPS 818/1) under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.



6. References

- Australian Standard (1981). *Guide to Noise Control on Construction, Maintenance and Demolition Sites*, Standards Australia, NSW, AS 2436.
- Bureau of Meteorology Australia (2004). *Climatic Averages for Australian Sites: Shire of Harvey Weather Station*, [Online], Bureau of Meteorology, available from: <http://www.bom.gov.au/climate/>, accessed: 7th August 2006.
- Commonwealth Government of Australia (1999). *Environmental Protection and Biodiversity Conservation Act*, Department of Environment and Heritage, Canberra.
- Department of Conservation and Land Management (CALM) (2005). *Fauna Species Profiles*, [online], available from: http://www.naturebase.net/plants_animals/fauna_profiles_splash.html, accessed 26/9/06.
- Department of Conservation and Land Management (CALM) (2003). *Phytophthora cinnamomi and disease caused by it. Volume 1 – Management Guidelines*, CALM 2003.
- Department of Conservation and Environment (1980). *Atlas of Natural Resources Darling System Western Australia*, University of Western Australia Press, Perth.
- English, V and Blythe, J. (1997). *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*, Unpublished report for the Department of Conservation and Land Management to Environment Australia.
- Environmental Protection Authority (2006). *Guidance for the Assessment of Environmental Factors*, No. 10, Western Australia.
- Environmental Protection Authority (2004). *Environmental Protection (Clearing of Native Vegetation) Regulations*, Western Australia.
- Garnett, S.T. and Crowley, G.M. (2000). *The Action Plan for Australian Birds 2000*, Environment Australia, Canberra, ACT.
- Goode, Brad and Northover, Joe (2000). *Ethnographic Survey of South Western Highway, Waroona to Bunbury*, Western Australia.
- Government of Western Australia (1950). *Wildlife Conservation Act (WA)*, State Law Publisher, Perth, Western Australia.
- Government of Western Australia (1986). *Environmental Protection Act (WA)*, State Law Publisher, Perth, Western Australia.
- Government of Western Australia (1997). *Environmental Protection Noise Regulations*, State Law Publisher, Perth, Western Australia.
- Government of Western Australia (2000). *Bush Forever Volume 1. Policies, Principles, Processes*, Department of Environmental Protection, Perth, Western Australia.
- Government of Western Australia (2000). *Bush Forever Volume 2. Directory of Bush Forever Sites*, Department of Environmental Protection, Perth, Western Australia.
- Harris, Jacqueline (2001). *Report of an Archaeological Survey on South Western Highway Waroona to Bunbury*, Quartermaine Consultants.



Hill, A.L., Semeniuk, C.A., Semeniuk, V. and del Marco, A. (1996). *Wetlands of the Swan Coastal Plain. Volume 2 : Wetland Mapping, Classification and Evaluation – Wetland Atlas*, Prepared for the Water and Rivers Commission and the Department of Environmental Protection, Perth, Western Australia.

Johnstone, R.E. and Kirkby, T. (1999), *Food of the Forest Red-Tailed Black Cockatoo Calyptorhynchus Banksii* Naso in South-west Western Australia, *Western Australian Naturalist*: 22, pp. 167-177.

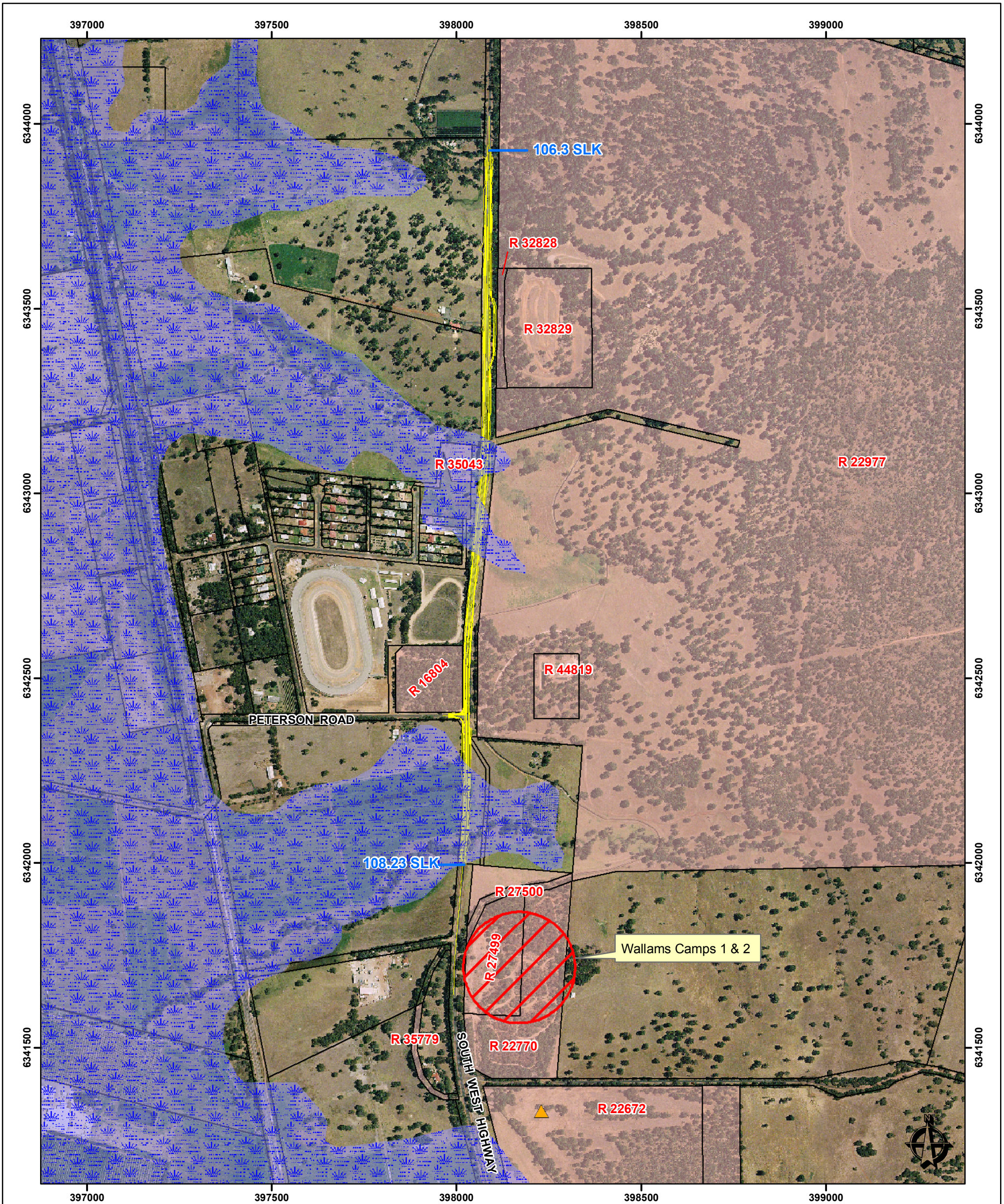
Main Roads Western Australia (2002). *Traffic Management Requirements for Works on Roads*, Perth, Western Australia.

Maxwell, S., Burbidge, A. and Morris, K. (Eds) (1996). *Action Plan for Australian Marsupials and Monotremes*. Prepared for the Australasian Marsupial and Monotreme Specialist Group IUCN Species Survival Commission.

Western Australian Planning Commission (2003). *Planning Bulletin No. 64*, [Online], available from: www.wapc.wa.gov.au, accessed 8th August 2006.



Appendix A
Location and Constraints Plan



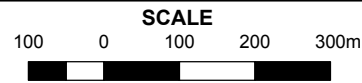
LEGEND

- Cadastre
- Cadastre (Reserves)
- Passing Lane Design
- Public Drinking Water Source Areas
- Geomorphic Wetlands Evaluation**
- Conservation
- Multiple Use
- No longer a wetland
- Resource Enhancement

■ Aboriginal Heritage Sites

Department of Environment and Conservation

- Declared and Priority Rare Flora**
- ▲ (R) Declared Rare Flora - Extant Taxa
- ▲ Priority 1 - Poorly Known Taxa
- ▲ Priority 2 - Poorly Known Taxa
- ▲ Priority 3 - Poorly Known Taxa
- ▲ Priority 4 - Rare Taxa



LOCALITY MAP



COPYRIGHT

THIS DOCUMENT IS AND SHALL REMAIN THE PROPERTY OF GHD PTY LTD
THIS DOCUMENT MAY ONLY BE USED FOR THE PURPOSE
FOR WHICH IT WAS COMMISSIONED AND IN ACCORDANCE
WITH THE TERMS OF ENGAGEMENT FOR THE COMMISSION

CREATED BY ML	CHECKED	APPROVED
HORIZONTAL DATUM: GDA 94		PROJECTION: MGA ZONE 50
HEIGHT DATUM: NA		METADATA RECORDED: 100%
DATE 01.11.06	FILE LOCATION N:\6118188\gis\mxds\6118188-G5_rev1.mxd	
REVISION 0	DRAWING NO 6118188-G5	



Main Roads WA

South West Highway Upgrade -
Harvey Location and Constraints Plan

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS AERIAL PHOTOGRAPHY SOURCED FROM DLI - 2004 BUNBURY MOSAIC
ABORIGINAL HERITAGE SOURCED DEPARTMENT OF INDUSTRY AND RESOURCES SEPT 2006



Appendix B
Project Environmental Aspects Table



Environmental Aspect	Potential Impact	Management Measure	Phase
Environmental Approvals	Based on the results of this EIA, no DEH or EPA approvals are required for the proposed project. However the clearing of native vegetation should be done under Main Roads Statewide purpose clearing permit (CPS 818/1).	Seek approval for clearing under Main Roads Statewide purpose clearing permit (CPS 818/1)	Design
Acid Sulphate Soils (ASS)	No identified impacts due to ASS within or adjacent to the project area.	N/A	N/A
Reserve Areas	Three 'C' class Reserves are located east and a 'C' class Reserve and an 'A' class Reserve are located west of the South Western Highway in the project area, however these are not expected to be impacted by the project.	Minimise impact on reserve areas by adhering to clearing limits.	Construction
Wetlands	No conservation category or resource enhancement wetlands exist within the project area. A multiple use wetland exists to the west and within the project area.	Drainage from road and road reserves into wetland will be managed appropriately.	Design and Construction
Vegetation Clearing	Clearing of 1.07 ha of vegetation is required for implementation of the project.	Minimise and manage clearing. Seek approval for clearing under Main Roads Statewide purpose clearing permit (CPS 818/1)	Design and Construction
Rare Flora	No identified Rare or Priority Flora expected to be impacted by the road works.	N/A	N/A



Environmental Aspect	Potential Impact	Management Measure	Phase
Threatened Ecological Communities (TECs)	No TECs were identified within the project area.	N/A	N/A
Revegetation and Rehabilitation	No major revegetation will be occurring, however minor revegetation may occur upon completion of the project.	Develop and Implement a Revegetation and Landscape Plan. Species used in revegetation will be locally occurring indigenous plant species. Monitor success of revegetation and take corrective action if necessary.	Design and Post-construction Post-construction
Weed Management	Common weed species observed within the project area. No Declared Weed Species observed within the project area.	Manage topsoil movement. Implement machine and vehicle hygiene measures.	Construction
Dieback	Introduction and spread of dieback to any uninfested areas within the "A" class reserve.	Manage topsoil movement. Implement machine and vehicle hygiene measures.	Construction
Topsoil Management	Strip topsoil as a component of road works.	Manage topsoil stripping and re-use.	Construction
Fauna	No species of conservation significance are at threat of extinction or significant disturbance as a result of the proposed road works.	Minimise and manage clearing.	Design and Construction
Land use	Potential impact on adjacent land use during road works.	Manage works to minimise impact and maintain adjacent land use.	Construction



Environmental Aspect	Potential Impact	Management Measure	Phase
Traffic Noise Impact	No anticipated increase in traffic noise at the adjacent residential property.	N/A	N/A
European Heritage	No identified European Heritage sites within or adjacent to the project area.	N/A	N/A
Aboriginal Heritage	No impacts anticipated. Section 18 not warranted by the DIA for this project.	N/A	N/A
Land Acquisition and Fencing	Land will be acquired from private property adjacent to the South Western Highway in the project area.	Land that is to be acquired from private property will be acquired under the provisions of the WA <i>Land Administration Act 1997</i> .	Design and Pre-Construction
		Where land is acquired from private property, Main Roads will replace existing fences.	Construction
Visual Amenity	The existing visual view shed is not expected to be significantly impacted by the proposed works.	Minimise clearing to that which is practicable.	Design and Construction
		Develop the Rehabilitation and Landscape Plan with the minimisation of the visual impacts of the project in mind.	Design
Contaminated Sites	No potential contaminated sites identified within the project area.	N/A	N/A
Pre-Construction	Minor Telstra relocations will be required throughout the road works.	Comply with environmental management measures during pre-construction activities and at any time a service provider is involved in works within the project area.	Design, Construction and Post-construction



Environmental Aspect	Potential Impact	Management Measure	Phase
Construction	Various impacts as a result of road works.	Manage impacts of road works according to EMP.	Construction
Monitoring	Monitor compliance with management measures.	Main Roads will regularly monitor compliances with environmental management measures outlined in the project specific EMP.	Construction



Appendix C

Environmental Management Responsibilities and Actions Table (EMP)



	Management Measure	Expected Outcome	Responsibility
1.0	Overall Project		
	Project Environmental Management		
1.1	Main Roads South West Region is responsible for the construction of the South Western Highway upgrade in line with the environmental management measures detailed in this EIA and EMP.	Implement the construction of the South Western Highway Upgrade Project as detailed in this EIA and EMP.	Main Roads Project Manager
1.2	Environmental management measures detailed in this EIA and EMP will be included in the technical specifications prepared for the project.	Document in contract documentation / specification environmental management measures.	Main Roads Project Manager
2.0	Pre-construction \ Design Phase		
	Approvals		
2.1	If the project is not formally assessed by the EPA Main Roads should seek to have the project clearing approved under the Main Roads Statewide project 'Clearing Permit' (CPS 818/1).	Obtain approval for clearing.	Main Roads Project Manager
	Land Acquisition and Fencing		
2.2	Land that is to be acquired from private property will be acquired under the provisions of the <i>WA Land Administration Act (1997)</i> .	Land acquired from private property will be done so in accordance with the relevant Act.	Main Roads Land Acquisition Manager
2.3	Where land is acquired from private property existing fences will be replaced by Main Roads, with the type of fence to be determined in consultation with the individual landowners.	Replace existing fences.	Main Roads Project Manager
	Revegetation and Rehabilitation		
2.4	Revegetation will include seed and/or seedlings that are 'provenance true' and sourced from local seed stock. Revegetation will be completed as soon after road works as possible.	Rehabilitate and revegetate sections of the South Western Highway where possible.	Main Roads Project Manager



Management Measure	Expected Outcome	Responsibility
Wetlands		
2.5 Drainage from road and road reserves into wetland will be managed appropriately.	Minimise impacts on wetland.	Main Roads Project Manager / Main Roads Construction Manager
Fauna		
2.6 The project will be designed and implemented to minimise vegetation clearing to that which is practicable for the safe construction and operation of the road and bridge.	Minimise clearing impacts on fauna and habitats within and adjacent to the project area.	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor
Visual Amenity		
2.7 Impacts on the current view-shed will be minimised by the minimisation of clearing of remnant vegetation to that which is practicable for the safe construction and operation of the alignment.	Minimise impacts on view-shed.	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor
Service Relocations		
2.8 Environmental management measures detailed in this EIA and EMP that are applicable for the works relating to the service relocations will be complied with by the relevant service providers.	Implement environmental management measures during service relocations.	Service Authorities
3.0 Construction Phase		
Vegetation Clearing		
3.1 On-ground works will be modified to minimise / avoid clearing of mature trees within the project area.	Ensure clearing is kept to the minimum necessary for the safe and efficient construction and operation of the road.	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor
3.2 During road works, damage to existing remnant vegetation will be avoided as far as practicable. Clearing should be restricted to 1 m from the edge of works.	Ensure clearing is kept to the minimum necessary for the safe and efficient construction and operation of the road.	Main Roads Construction Manager / Construction Contractor



Management Measure	Expected Outcome	Responsibility
3.3 Prior to the start of clearing operations, the clearing line will be marked on the ground and checked by the Construction Manager to ensure that the clearing areas are correctly defined. Trees of particular significance that are to be conserved will be clearly marked prior to the commencement of clearing.	Ensure clearing is kept to the minimum necessary for the safe and efficient construction and operation of the road.	Main Roads Construction Manager / Construction Contractor
3.4 Trees to be removed will be felled in a manner that ensures they fall within the approved clearing area.	Minimise clearing impact.	Main Roads Construction Manager / Construction Contractor
3.5 Mature trees especially will be conserved as far as practicable and will not be disturbed for temporary works such as access tracks, spoil areas or site offices. Vehicles and equipment will not be parked or driven over tree roots.	Minimise clearing impact.	Main Roads Construction Manager / Construction Contractor
3.6 Any damage caused by the Construction Contractor to the vegetation, landforms or fauna habitat outside of the works area will be rehabilitated at the contractor's cost. If environmental damage beyond the works area is identified Main Roads WA will withhold the payment of monies due to the contractor, where the extent of the damage exceeds \$5000, determined at the following rates: For damaged trees greater than 3 m in height - \$1000 each; For damaged trees and shrubs up to 3 m in height - \$500 each; and For damaged grassland, open soil areas, rock faces and landforms, and habitats in general - \$10 per square metre.	Minimise clearing impact.	Main Roads Construction Manager / Construction Contractor
3.7 All cleared timber will be disposed of off-site in private property. Cleared vegetation will be disposed of at an approved landfill site. No burning of cleared vegetation will be permitted within the project area.	Minimise clearing impact.	Main Roads Construction Manager / Construction Contractor



Management Measure	Expected Outcome	Responsibility
Weed Management		
<p>3.8 The implementation of the following vehicle and machinery hygiene measures during road works will ensure that no additional weed species are transported to, or from, the project area:</p> <p>All site employees should be advised of the following hygiene measures</p> <p>All clearing, topsoil stripping/spreading and gravel cartage activities should be conducted under dry soil conditions</p> <p>All road construction plant and machinery should be cleaned free of all soil and vegetative material:</p> <ul style="list-style-type: none">– prior to arrival at the project site– prior to departing the project site <p>Clean down may comprise of the use of a brush and/or compressed air to remove clods of soil and/or soil water slurry. A metal bar or spade may be used to remove compacted soil where necessary. Dust adhering to the sides of vehicles does not need to be removed.</p>	Minimise the introduction and spread of weeds.	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor



Management Measure	Expected Outcome	Responsibility
Dieback Management		
3.9 The following precautions should be undertaken during construction to minimise the introduction and spread of dieback: <ul style="list-style-type: none">» Machinery and vehicles will be clean of soil and vegetative material on entry each time they enter the project area;» No clean down points (hygiene boundaries) are required within the project area;» No new cut-off drains will be developed along the length of the project area;» Utilise existing drainage lines over the length of the project area; and Topsoil will be stored and respread within the section that it was stripped from to minimise the potential to spread dieback and/or weeds.	Minimise the introduction and spread of dieback.	Main Roads Project Manager / Main Roads Project Designer / Main Roads Construction Manager / Construction Contractor / DEC
Topsoil Management		
3.10 After completion of clearing activities, topsoil will be stripped. Topsoil free of weeds will be reused and spread over the embankment as soon as practical in the location it was removed from.	Manage topsoil during works.	Main Roads Construction Manager / Construction Contractor
Land use		
3.11 Impacts on existing land uses will be kept to a practicable minimum during road works.	Minimise impacts of works on adjacent private property owners.	Main Roads Construction Manager / Construction Contractor



Management Measure	Expected Outcome	Responsibility
Aboriginal Heritage		
3.12 If material likely to be of interest to the Aboriginal community is uncovered during construction works then works should immediately cease within 50 m of the material and the DIA advised immediately. If skeletal material is uncovered during works then the WA Police Service should also be advised immediately.	Ensure any Aboriginal heritage materials identified during works are managed appropriately.	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor
Environmental Management and Quality Plan		
3.13 The Construction Contractor will 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.	Ensure adequate environmental management during construction works.	Construction Contractor
3.14 The Quality Plan will be submitted to Main Roads Superintendent for approval within twenty-eight days of award of the Contract or ten days of Possession of Site being granted whichever is the earlier.	Ensure adequate environmental management during construction works.	Construction Contractor
Damage to Public Property, Noise and Vibration		
3.15 The Construction Contractor will 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 the public.	Minimise impacts of road works on property and the public.	Main Roads Construction Manager / Construction Contractor
3.16 The Construction Contractor will 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
3.17 The Construction Contractor will also 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



Management Measure	Expected Outcome	Responsibility
3.18 The Construction Contractor will 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		
3.19 The Construction Contractor will observe its obligations under the <i>Environmental Protection Act 1986</i> , the <i>Environmental Protection (Noise) Regulations 1997</i> 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
3.20 For construction work between 7:00 am and 7:00 pm (excluding Sunday and public holidays), the construction contractor will 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



Management Measure	Expected Outcome	Responsibility
<p>3.21 At least seven days prior to after-hours construction work commencing, the Construction Contractor will 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 Harvey and will include, but not be limited to, the following requirements:</p> <p>Details of, and reasons for, construction work which is outside the normal daytime operating hours</p> <p>Details of activities likely to result in noise emissions above the assigned noise levels</p> <p>Predictions of construction noise levels</p> <p>Details of noise control measures to be implemented</p> <p>Procedures for on-site monitoring</p> <p>Plans for notifying the occupiers of adjacent properties, and</p> <p>Plans for complaint response.</p>	<p>Minimise and manage construction noise.</p>	<p>Main Roads Construction Manager / Construction Contractor</p>
Vibration		
<p>3.22 The Construction Contractor will 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.</p>	<p>Minimise and manage vibration impacts.</p>	<p>Main Roads Construction Manager / Construction Contractor</p>
<p>3.23 The use of vibrating rollers in vibratory mode will not be permitted within the nominated distances of any building as detailed below:</p> <ul style="list-style-type: none"> » All residential buildings – 50 m » Old / historic buildings, or where residents show concern – 100 m 	<p>Minimise and manage vibration impacts.</p>	<p>Main Roads Construction Manager / Construction Contractor</p>
<p>3.24 Prior to the start of any operation that may cause vibration or result in damage, the Construction Contractor will conduct property inspections to establish their pre-works condition.</p>	<p>Minimise and manage vibration impacts.</p>	<p>Main Roads Construction Manager / Construction Contractor</p>



Management Measure	Expected Outcome	Responsibility
3.25 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		
3.26 The Construction Contractor will employ construction methods that will keep dust lift to a minimum, and as required provide for the management of 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
3.27 Where it is found that vehicles leaving the site have dropped excessive soil material onto South Western Highway these sections will be swept on an as needs basis to reduce the potential for dust generation and maintain traffic safety.	Minimise dust lift and impacts of dust and safety on the public.	Main Roads Construction Manager / Construction Contractor
Traffic Access and Safety		
3.28 To maintain safe thoroughfare of local traffic during all road works, the Construction Contractor will develop and implement a Traffic Management Plan congruent with Australian Standard Manual 1742.3 of Uniform Traffic Control Devices: Part 3 Traffic Control Devices for Works On-Road (Standards Australia, 2002).	Maintain safe thoroughfare of local traffic on South Western Highway.	Main Roads Construction Manager / Construction Contractor
3.29 The Traffic Management Plan will conform to the Main Roads Traffic Management Requirements for Works on Roads. The TMP will be submitted to Main Roads for approval within twenty-eight days of Award of Contract, ten days within Possession of Site being granted or prior to the commencement of works, whichever is the earlier.	Maintain safe access for through traffic and local traffic movements.	Main Roads Construction Manager / Construction Contractor
3.30 The Construction Contractor must submit with the Plan a Certificate of Compliance certifying that the Traffic Management Plan has been prepared and/or reviewed by an appropriately qualified person as defined in the Main Roads publication Traffic Management Requirements for Works on Roads (2002).	Maintain safe access for through traffic and local traffic movements.	Main Roads Construction Manager / Construction Contractor



	Management Measure	Expected Outcome	Responsibility
3.31	All traffic control measures will be in place and fully operational before the Construction Contractor commences any work activity that affects existing roadways.	Maintain safe access for through traffic and local traffic movements.	Main Roads Construction Manager / Construction Contractor
Fire Management			
3.32	No burning will be permitted within the project area.	Reduce the fire risk as a result of construction works.	Main Roads Construction Manager / Construction Contractor
3.33	Machines and vehicles will be restricted to designated cleared areas.	Reduce the fire risk as a result of construction works.	Main Roads Construction Manager / Construction Contractor
3.34	The Construction Contractor will confirm with any specific requirements for fire prevention requested by the Shire of Harvey, Department of Environment and Conservation and/or the Fire and Emergency Services Authority.	Comply with local fire management requirements.	Main Roads Construction Manager / Construction Contractor
Fuel and Chemical Storage			
3.35	No on-site storage of fuel, oils and other contaminant materials will be permitted during bridge and road construction. Chemicals required for the clean up of any accidental spillages will be maintained on-site.	Avoid hazardous chemical storage on the project site and maintain chemicals required for the clean up of any accidental spillages.	Main Roads Construction Manager / Construction Contractor
3.36	Major vehicle and plant servicing will not be conducted on the project site.	Avoid the occurrence of oil spillage from vehicle servicing on-site.	Main Roads Construction Manager / Construction Contractor



Management Measure	Expected Outcome	Responsibility
Rubbish Disposal		
3.37 Domestic site rubbish will not be disposed of by burning. All domestic rubbish, campsite effluent and other rubbish will be disposed of at an authorised waste disposal site, or a site agreed with the Shire of Harvey.	Ensure that rubbish is disposed of appropriately.	Main Roads Construction Manager / Construction Contractor.
Monitoring		
3.38 During the project, 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 superintendence documentation.	Monitor compliance with environmental management measures.	Main Roads Project Manager / Main Roads Construction Manager
4.0 Post Construction		
Weed Management		
4.1 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 management within the project area.	Main Roads Term Network Contractor
Monitoring		
4.2 The preparation and implementation of the Rehabilitation and Landscape Plan for the project is the responsibility of the Project Manager and the Main Roads Regional Manager. Details on the progress of the landscaping works will be provided to the EPA and Main Roads Manager Environment on request.	Monitor and report on the success of the revegetation works according to the Rehabilitation and Landscaping Plan.	Main Roads Regional Manager / Main Roads Project Manager
4.3 Monitoring the success of the Rehabilitation and Landscape Plan will be conducted for a minimum period of three years from the time of implementation. Additional works and/or remedial action will be taken to ensure the success of the landscaping works.	Monitor and improve, if necessary, the success of the Rehabilitation and Landscape Plan.	Main Roads Regional Manager / Main Roads Project Manager



Appendix D

Description of DEC's Flora Conservation Codes



Conservation Codes and Descriptions for CALM Declared Rare and Priority Flora Species

Conservation Code	Description
R: Declared Rare Flora – Extant Taxa	Taxa which 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.
P1: Priority One – Poorly Known Taxa	Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2: Priority Two – Poorly Known Taxa	Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3: Priority Three – Poorly Known Taxa	Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.
P4: Priority Four – Taxa in need of monitoring	Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.



Appendix E
Vegetation and Rare Flora Survey



Family	Genus	Species	Common Name	Status
Anthericaceae	<i>Laxmannia</i>	<i>squarrosa</i>		
Asteraceae	<i>Arctotheca</i>	<i>calendula</i>	Cape Weed	*
Asteraceae	<i>Conyza</i>	sp.		
Asteraceae	<i>Hypochaeris</i>	<i>glabra</i>	Smooth Catsear	*
Asteraceae	<i>Lactuca</i>	<i>serriola</i>	Prickly Lettuce	*
Brassicaceae	<i>Raphanus</i>	<i>raphanistrum</i>	Wild Radish	*
Casuarinaceae	<i>Allocasuarina</i>	<i>humilis</i>	Dwarf Sheoak	
Colchicaceae	<i>Burchardia</i>	<i>congesta</i>	Common Milkmaid	
Cucurbitaceae	<i>Citrullus</i>	<i>lanatus</i>	Pie Melon	*
Cyperaceae	<i>Lepidosperma</i>	<i>leptostachyum</i>		
Cyperaceae	<i>Mesomelaena</i>	<i>tetragona</i>	Semaphore Sedge	
Dennstaedtiaceae	<i>Pteridium</i>	<i>esculentum</i>	Bracken	
Dilleniaceae	<i>Hibbertia</i>	<i>huegelii</i>		
Dipsacaceae	<i>Scabiosa</i>	<i>atropurpurea</i>	Purple Pincushion	*
Euphorbiaceae	<i>Phyllanthus</i>	<i>calycinus</i>	False Boronia	
Goodeniaceae	<i>Lechenaultia</i>	<i>biloba</i>	Blue Leschenaultia	
Goodeniaceae	<i>Scaevola</i>	<i>calliptera</i>		
Haemodoraceae	<i>Conostylis</i>	<i>aculeata</i>	Prickly Conostylis	
Iridaceae	<i>Watsonia</i>	sp.		*
Laminaceae	<i>Hemigenia</i>	<i>incana</i>	Silky Hemigenia	
Meliaceae	<i>Melia</i>	<i>azedarach</i>	White Cedar	* (Planted)
Mimosaceae	<i>Acacia</i>	<i>saligna</i>	Orange Wattle	
Myrtaceae	<i>Agonis</i>	<i>flexuosa</i>	Peppermint	* (Planted)
Myrtaceae	<i>Corymbia</i>	<i>calophylla</i>	Marri	
Myrtaceae	<i>Eucalyptus</i>	<i>marginata</i>	Jarra	
Myrtaceae	<i>Eucalyptus</i>	<i>wandoo</i>		
Myrtaceae	<i>Eucalyptus</i>	<i>globulus</i>	Blue Gum	* (Planted)
Oleaceae	<i>Olea</i>	<i>europa</i>	Olive Tree	*
Oxalidaceae	<i>Oxalis</i>	<i>pes-caprae</i>	Soursob	*
Papilionaceae	<i>Bossiaea</i>	<i>eriocarpa</i>	Common Brown Pea	



Family	Genus	Species	Common Name	Status
Papilionaceae	<i>Daviesia</i>	<i>divaricata</i>	Marno	
Papilionaceae	<i>Kennedia</i>	<i>coccinea</i>	Coral Vine	
Papilionaceae	<i>Kennedia</i>	<i>prostrata</i>	Scarlet Runner	
Poaceae	<i>Austrostipa</i>	sp. (nf.)		
Poaceae	<i>Avena</i>	<i>barbata</i>	Bearded Oat	*
Poaceae	<i>Briza</i>	<i>maxima</i>	Blowfly Grass	*
Poaceae	<i>Ehrharta</i>	<i>longiflora</i>	Annual Veldt Grass	*
Poaceae	<i>Ehrharta</i>	<i>calycina</i>	Perennial Veldt Grass	*
Poaceae	<i>Eragrostis</i>	<i>curvula</i>	African Lovegrass	*
Poaceae	<i>Pennisetum</i>	<i>clandestinum</i>	Kikuyu Grass	*
Primulaceae	<i>Anagallis</i>	sp. (nf.)		
Proteaceae	<i>Conospermum</i>	<i>stoechadis</i>	Common Smokebush	
Proteaceae	<i>Dryandra</i>	<i>lindleyana</i>		
Proteaceae	<i>Grevillea</i>	sp.		* (Planted)
Proteaceae	<i>Grevillea</i>	sp. (076)		
Proteaceae	<i>Hakea</i>	<i>prostrata</i>	Harsh Hakea	
Proteaceae	<i>Hakea</i>	<i>ruscifolia</i>	Candle Hakea	
Restionaceae	<i>Hypolaena</i>	<i>exsulca</i>		
Solanaceae	<i>Lycium</i>	<i>ferocissimum</i>	African Boxthorn	*
Xanthorrhoeaceae	<i>Xanthorrhoea</i>	<i>preissii</i>	Grass Tree	
Xanthorrhoeaceae	<i>Xanthorrhoea</i>	<i>gracilis</i>	Graceful Grass Tree	
Zamiaceae	<i>Macrozamia</i>	<i>riedlei</i>	Zamia	

* denotes weed or introduced species

nf. Not flowering

27 Families, 53 species

20 weed / introduced species



Dominant Families	Taxa
Poaceae	7
Proteaceae	6
Myrtaceae	5
Asteraceae	4
Papilionaceae	4



GHD Pty Ltd ABN 39 008 488 373

1st Floor 10 Victoria Street
Bunbury WA 6230

T: 08 9721 0700 F: 08 9721 0777 E: bunmail@ghd.com.au

© **GHD Pty Ltd 2006**

This document is and shall remain the property of GHD Pty Ltd. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	K. Roehner / B. Rikli	B. Rikli	<i>B. Rikli</i>	Neil McCarthy	<i>N. McCarthy</i>	29/9/06
1	K. Roehner	B. Rikli	<i>B. Rikli</i>	R. Pearson	<i>R. Pearson</i>	3/11/06