

Main Roads Western Australia

**Toodyay Road Passing Lanes**

Environmental Impact Assessment

October 2005

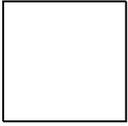


# Contents

1.	Introduction	1
1.1	Project Background	1
1.2	Scope of Work	2
1.3	Existing Documents	2
2.	Environmental Assessment	4
2.1	Physical Environment	4
2.2	Adjoining Landuse	5
2.3	Biological Environment	5
2.4	Aboriginal Heritage	14
2.5	European Heritage	15
2.6	Consultation	16
3.	Potential Environmental, Cultural and Social Constraints or Impacts	18
3.1	Biological Issues	18
3.2	Social and Cultural Issues	20
3.3	Construction Issues	21
3.4	Road Operation and Use	21
4.	Risk Assessment	23
4.1	MRWA Low Impact Environmental Screening	23
4.2	MRWA Environmental Aspects for Referral	23
5.	Summary of Relevant Issues	24
6.	Conclusion and Recommendations	26
6.1	Recommendations	26
7.	References	28

## Table Index

Table 1	Flora Species of Conservation Significance known from the general area around proposed roadworks on Toodyay Road.	9
---------	---	---

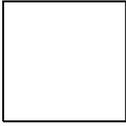


## Figure Index

Figure 1	Toodyay Road Locality Plan	30
----------	----------------------------	----

## Appendices

- A List of Rare Fauna Possible in the Project Area (2005)
- B Environmental Aspects for Referral to the EPA or DEH
- C Convict Station Site Details
- D Field Records of Flora Species Observed During Site Visits in 2002 and 2005



# 1. Introduction

## 1.1 Project Background

Toodyay Road is an important route between Perth and the north-central wheatbelt region of Western Australia with an annual traffic growth rate factor of 6%.

The section of Toodyay Road that is the subject of this report is between the Darling Scarp and Berry Road, east of Gidgegannup. This section is some 30 kilometres in length and passes through the City of Swan and the Shire of Mundaring. There are two sections of road classifications along what is known as Toodyay Road; Highway H33 from Roe Highway to east of Gidgegannup where it meets the future alignment of the Perth – Adelaide Route and Main Road M26 for the remainder of Toodyay Road (Figure 1).

Toodyay Road is nominally aggregate sealed to 7.5 metres with 1.2 metre unsealed shoulders. The road environment is predominantly rural, passing through John Forrest National Park in Red Hill and the townsite of Gidgegannup. Overtaking lanes are provided for both westbound and eastbound traffic at various locations through its length. The road has major T-junctions at Roland Road, Stoneville Road, Bunning Road, Lilydale Road and Bailup Road, with several minor road junctions also in this section of the road.

Complaints have been received documenting road users concern regarding the short length of some passing lanes and there is considerable evidence that trucks pull over onto the shoulder in a number of locations to allow faster moving vehicles to overtake them.

To provide safe passing opportunities Main Roads Western Australia (MRWA) has prepared design concept plans for the construction of passing lanes and a truck bay along Toodyay Road between Red Hill (John Forrest National Park) and Berry Road. This will involve:

- ▶ Passing Lane No. 1: extend existing eastbound passing lane from 5.47 SLK to existing passing lane at 7.24 SLK (H33);
- ▶ Passing Lane No. 2: provide eastbound passing lane from 13.83 SLK to 15.40 SLK (H33);
- ▶ Passing Lane No. 4: provide eastbound passing lane from 6.57 SLK to 8.10 SLK (M26);
- ▶ Truck Bay: improve existing westbound truck embayment at 5.5 SLK (H33); and
- ▶ Lilydale Pit – use of gravel from the pit.

A Preliminary Environmental Impact Assessment (PEIA) (GHD, 2002) and an Environmental Management Plan (EMP) (MRWA, 2003) have previously been produced for Toodyay Road and were used during the delivery of Passing Lane No. 3 in 2004. The Passing Lanes and Truck Bay, listed above, are at the stage of finalising design drawings and tender documents. Construction works for these projects are



scheduled to begin in December 2005, and will be staged with an expectation of completion in April 2006.

MRWA commissioned GHD Pty Ltd (GHD) to prepare an EIA for Passing Lanes 1, 2 and 4, the Truck Bay and the use of gravel from Lilydale Pit. This EIA builds on the existing PEIA (GHD, 2002) and incorporates recent legislation developments, further studies and reports completed for the area and the inclusion of the Lilydale Pit.

## **1.2 Scope of Work**

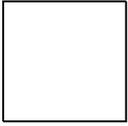
This Environmental Impact Assessment (EIA) will update the existing PEIA (GHD, 2003A) to address the following items:

- ▶ Determine the key environmental aspects to be considered and the scope of investigations required;
- ▶ Description and assessment of the existing environment, including physical, biological, social and aesthetic, heritage, noise, and site contamination;
- ▶ Impact assessment that describes the proposed works and their potential impact on the existing environment, with reference to all features of the project including road and bridgeworks, materials pits, access tracks and spoil sites;
- ▶ Provide all necessary information to obtain, and assist the Project manager in applying for clearances required under legislation provisions, including (but not limited to) those required under the following Act and regulations:
  - *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*;
  - *Conservation and Land Management Act, 1984*;
  - *Wildlife Conservation Act, 1950*;
  - *Heritage of Western Australian Act, 1990*; and
  - *Swan River Trust Act, 1988*
- ▶ Provide a concise report on the results of environmental investigations and clearances obtained; and
- ▶ Provide complete and sufficient information to update the existing EMP (MRWA, 2003) for construction.

## **1.3 Existing Documents**

In preparation of this EIA the following documents have been reviewed and their findings incorporated:

- ▶ PEIA Report (GHD, 2002A);
- ▶ EMP Report (GHD, 2003B);
- ▶ Weed Assessment (*for Passing Lane 1 and Truckbay only*) (ATA Environmental, 2004)
- ▶ Dieback Report (*for Passing Lane 1 and Truckbay only*) (Glevan Consulting, 2004);
- ▶ Revegetation Plan (GHD, 2005);



- ▶ Conservation Plan for Redhill Convict Station (Heritage and Conservation Professionals, 1998); and
- ▶ Toodyay Road Passing Lanes Design Report (KBR, 2005)



## 2. Environmental Assessment

Key environmental factors have been determined with reference to the PEIA prepared by GHD in 2002, the *Toodyay Road Passing Lanes Design Report* (KBR, 2005) and the Revegetation Plan prepared by GHD in 2005.

### 2.1 Physical Environment

#### 2.1.1 Landform and Soils

Passing Lane 1 and the truck bay are situated on the Darling Scarp, which is characterised by very steep slopes, shallow yellow and red earths and massive granite outcropping and boulders (Churchward and McArthur, 1978). Small, localised areas of riverine deposits are probably present along the larger drainage lines in the lower part of the survey area.

Passing Lanes 2, and 4 are situated on the Darling Plateau. Churchward and McArthur (1978) suggest that this area of Toodyay Road incorporates the following landform and soil complexes.

- ▶ Dwellingup: gently undulating landscape with duricrust on ridges, sands and gravels in shallow depressions;
- ▶ Yarragil: valleys on the western part of the plateau, sandy gravels on slopes and orange earths on swampy floors; and
- ▶ Murray: deeply incised valleys with red and yellow earths on slopes and narrow alluvial terraces.

#### 2.1.2 Surface Hydrology and Wetlands

The surface hydrology of Passing Lane 1 is characterised by considerable runoff from the steep, granitic terrain of the Darling Scarp. A tributary of Strelley Brook parallels Passing Lane 1 for some distance, crossing Toodyay Road to the southeast at about SLK 5.9. The Brook crosses Toodyay Road in a number of other areas and occurs mostly as a small, steep sided channel in this location.

Bailup Creek, a tributary of Wooroloo Brook, is in close proximity to the area proposed for Passing Lane 4, but it is unlikely that the construction works will have any direct impacts on this brook. Small drainage lines, located in private property adjacent to the road verge area, lead down into Bailup Brook and are mostly degraded due to the presence of introduced annual and perennial pasture species. The tree species associated with these drainage lines are *Eucalyptus rudis* and *Melaleuca raphiophylla*.

There will be no direct impact on natural drainage in Passing Lane 2, although there is a dampland/drain supporting dampland vegetation on the opposite side of the road to the proposed works.



No natural basin wetlands are shown for the area in the “Wetlands of the Swan Coastal Plain, Volume 2B” (Hill *et al.* 1996), or in the *Revised Draft Environmental Protection (Swan Coastal Plain Wetlands) Policy and Regulations 2004* (EPA, 2004).

## 2.2 Adjoining Landuse

The areas of the proposed passing lanes are contained within the Toodyay Road reserve. The land adjoining Toodyay Road in the vicinity of the Passing Lanes consists primarily of rural and ‘special rural’ lots for Passing Lanes 2 and 4. No residential dwellings are within 200m of the project areas. Passing Lane 1 is surrounded by John Forrest National Park, which is managed by the Department of Conservation and Land Management (CALM).

## 2.3 Biological Environment

The biological environment of the Toodyay Road Passing Lanes, Truck Bay and the Lilydale Pit has been assessed by:

- ▶ GHD 2002: Prepared a PEIA including flora investigations;
- ▶ ATA Environmental (2004): Undertook a weed survey for Passing Lane 1 and the Truck Bay;
- ▶ Glevan Consulting (2004): Completed a Dieback Assessment of Passing Lane 1 and the Truck Bay; and
- ▶ GHD (2005): During the preparation of a Revegetation Plan completed a site visit and also a separate consideration of dieback on all project areas.

The relevant aspects of these reports are included below.

### 2.3.1 Vegetation of the General Area

The vegetation of the Darling Scarp and Plateau has been broadly mapped by Beard (1979) and Heddle *et al.* (1980). The vegetation correlates strongly with the varying soils and landform types as noted in 2.1.1 above.

Beard’s mapping divides the project area into two vegetation units: *Corymbia calophylla* (Marri)/*Eucalyptus wandoo* (Wandoo) woodland vegetation on the scarp slopes and in the valleys, and *C. calophylla* / *E. marginata* (Jarrah) forest on the plateau and the foothills. The majority of the vegetation along the section of Toodyay Road, which will be impacted by the construction of the four passing lanes, is of the *Corymbia calophylla* (Marri) – *Eucalyptus wandoo* (Wandoo) vegetation type.

The mapping by Heddle *et al.* (1980) indicates similar vegetation associations as described below:

- Minor valleys of the Darling Plateau: Pindalup and Yarragil complex in low to medium rainfall areas, characterised by open forest of *Eucalyptus marginata*-*Corymbia calophylla* on slopes and open woodland of *E. wandoo*, with some *E. patens* and/or *E. rudis* in the lower gullies.



- Major valleys of the Darling Plateau (combining slopes and floors): Murray and Bindoon Complex in low to medium rainfall areas characterised by a range of vegetation types. The vegetation ranges from open forest of *Eucalyptus marginata* – *Corymbia calophylla* to woodland of *E. wandoo* with *E. rudis* and *E. patens* on the valley floors.

The vegetation of the proposed works areas was divided into the following types as a result of field surveys reported by GHD in 2002:

1. Wandoo (*Eucalyptus wandoo*) woodland with a scattered to medium amount of Marri (*Corymbia calophylla*) over mixed shrubs, grasses, herbs, sedges and introduced species;
2. Areas of revegetation in the road reserve planted (or seeded) by MRWA in the past;
3. Shrub heath on the upper slopes of the Darling Scarp and on the Darling Plateau in the vicinity of the John Forrest National Park; and
4. Roadside drainage areas within the road reserve mostly vegetated with introduced species, some native opportunistic species and/or *Eucalyptus rudis* and *Melaleuca raphiophylla*.

### 2.3.2 Vegetation of the Proposed Overtaking Lanes, Truck Bay and Lilydale Pit

#### Passing Lane 1

The roadside verge vegetation in the area of proposed Passing Lane 1 is a mix of regenerated native species; naturally occurring mixed shrub heath with Marri, and introduced annual and perennial species. Most of the native shrub heath vegetation is located outside of the road reserve (within the boundaries of the John Forrest National Park), on the slopes and on top of the road embankment. The road reserve area has a small drainage channel adjacent to the road (a tributary of Strelley Brook), which includes some introduced species, shrubs, sedges and herbs. The native species recorded in these drainage areas are *Acacia pulchella*, *A. saligna*, *Anigozanthos* sp., *Astartea fascicularis*, *Juncus holoschoenus/pallidus*, *Lepidosperma* sp. and *Viminaria juncea*.

#### Passing Lane 2

This area supports a small area of remnant Wandoo/Marri woodland, with some Jarrah, over mixed shrubs, herbs, *Xanthorrhoea* species (*X. gracilis* and *X. preissii*) and introduced annual and perennial species. The more common species present in the understorey stratum are *Acacia saligna*, *A. willdenowiana*, *Bossiaea ornata*, *Daviesia* sp., *Desmocladius fasciculatus*, *Dianella revoluta*, *Drosera* sp., *Dryandra lindleyana*, *Gastrolobium/Nemcia* sp., *Hakea lissocarpha*, *Hibbertia hypericoides*, *Hovea* sp., *Lechenaultia biloba*, *Lepidosperma* sp., *Lomandra* sp., *Opercularia hispidula/vaginata*, *Philothea spicata*, *Phyllanthus calycinus*, *Pterostylis* sp. and *Stypandra glauca*.



The majority of the area impacted by the proposed overtaking lane is a MRWA revegetation area, which includes planted tree species.

Roadside drainage areas are the most likely to be damaged by the construction activities. These areas are vegetated with a mixture of shrub, sedge, herb, and introduced species with scattered Marri (*Corymbia calophylla*) trees. The dominant shrub species present are *Acacia pulchella*, *A. saligna*, *Agonis linearifolia*, *Astartea fascicularis*, *Lepidosperma* sp., *Melaleuca preissiana* and *Pericalymma ellipticum*. There are also two invasive introduced species present in these damper roadside areas; *Leptospermum laevigatum* (Coast Tea tree; a large shrub to 1m) and a species of *Cyperus* (sedge).

#### **Passing Lane 4**

There are two main vegetation types in this section of Toodyay Road; Marri/Wandoo woodland and areas of past MRWA revegetation. The Marri/Wandoo woodland has the following species present; *Acacia pulchella*, *A. saligna*, *Allocasuarina fraseriana/huegeliana*, *Bossiaea eriocarpa*, *Daviesia* sp., *Dryandra nivea/lindleyana*, *Grevillea synapheae*, *Haemodorum* sp., *Hakea prostrata*, *Kennedia prostrata*, *Lepidosperma* sp., *Lomandra* sp., *Nemcia/Gastrolobium* sp., *Neurachne alopecuroidea*, *Phyllanthus calycinus*, *Tetraria octandra* and *Xanthorrhoea preissii*.

The areas of revegetation by MRWA have the following species present: *Acacia drummondii*, *A. extensa*, *A. lasiocarpa*, *Allocasuarina* sp., *Banksia grandis*, *Calothamnus quadrifidus*, *Eucalyptus leucoxylon* var. *rosea*, *Hakea laurina*, *H. petiolaris*, *H. trifurcata*, *Hypocalymma angustifolium* and *Melaleuca ?radula*.

#### **Truck Bay**

The roadside verge vegetation in the area of the proposed Truck Bay is the same as that of Passing Lane 1. However, the area contains more weed species, and is therefore slightly more degraded.

#### **Lilydale Pit**

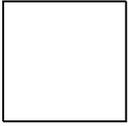
The vegetation of this area is predominantly Jarrah/Allocasuarina. The understorey includes *Banksia grandis*, *Acacia* species, and a range of shrub species typical of the area. The pit area has been in use for many years and the surrounding vegetation has been grazed at some time. Pasture and weed species are present in some areas of remaining bushland and parts of the mined pit have regrown with weed species.

### **2.3.3 Threatened Ecological Communities**

The CALM Threatened Ecological Communities (TEC) database was searched by GHD in 2002 for any records of TECs in the vicinity of Toodyay Road. No records of TECs have been made for the area and none were recognised as a result of the field investigations.

### **2.3.4 Flora**

#### ***Declared Rare and Priority Flora***



The CALM Declared Rare and Priority Flora database was searched for any flora records in the vicinity of Toodyay Road, by GHD in 2002 and updated in 2005. A number of changes to the database have been made between those times. The search highlighted a number of species that have been recorded in the general area of the proposed road works, and which may possibly occur in the Toodyay Road reserve area. These species listed in the CALM 2005 database are given in Table 1.



**Table 1 Flora Species of Conservation Significance known from the general area of the proposed roadworks on Toodyay Road.**

<b>Taxon</b>	<b>Conservation Code</b>	<b>Known Locality(ies)</b>	<b>Preferred Habitat</b>
<i>Acacia oncinophylla</i> subsp. <i>oncinophylla</i>	Priority 3	John Forrest NP, Mogumber, Mundaring, Serpentine	In granitic soils, occasionally on laterite
<i>Adenanthos cygnorum</i> subsp. <i>Chamaephyton</i>	Priority 3	Chidlow, east of Sawyers Valley, Mundaring	In grey-brown sand or lateritic gravel
<i>Anthocercis gracilis</i>	Declared Rare	Mundaring Weir, Dandalup, John Forrest NP	On sandy or loamy soils, around granite outcrops
<i>Aotus cordifolia</i>	Priority 3	Red Hill, Helena Valley, Gidgegannup, Jarrahdale	In peaty soils, swampy areas
<i>Calothamnus rupestris</i>	Priority 4	Red Hill, Gosnells, Boyagin Rock	Skeletal gravel soils, granite outcrops & rocks, hillsides
<i>Cyanicula ixiooides</i> ssp. <i>ixiooides</i>	Priority 4	Beechina, Wooroloo, Toodyay, Gingin	
<i>Darwinia pimeleoides</i>	Priority 4	John Forrest NP, Walyunga, Darlington	Loam & sandy loam over granite, granite outcrops
<i>Diplolaena andrewsii</i>	Priority 2	Swan View, Wooroloo Brook, John Forrest NP	
<i>Gastrolobium crispatum</i>	Priority 1	Gidgegannup, Bindoon, Julimar	
<i>Grevillea flexuosa</i>	Declared Rare	Gidgegannup	Red-brown sand with laterite & gravel, sand over granite, ridgetop plateau & assoc. breakaways
<i>Halgania corymbosa</i>	Priority 3	Gosnells to Gidgegannup, Crossman, Wandering	
<i>Personnia sulcata</i>	Priority 4	John Forrest NP, Bindoon, Wongamine	
<i>Pithocarpa corymbulosa</i>	Priority 2	Red Hill, Lesmurdie NP, Helena Valley	Gravelly or sandy loam amongst granite outcrops
<i>Tetrateca pilifera</i>	Priority 3	Two Rocks Chidlow, John Forrest NP	Gravelly loam-clay soils, among granite rocks
<i>Thelymitra manginiorum</i> ms	Declared Rare	Gidgegannup	
<i>Thelymitra</i> sp. <i>Crystal Brook</i>	Priority 1	Red Hill, Darling Range.	
<i>Thysanotus anceps</i>	Priority 3	John Forrest NP, Brookton Hwy, Mt Lesuer	
<i>Verticordia citrella</i>	Priority 2	Wooroloo, Toodyay	Gravelly loam or sand, low-lying damp areas, swamps



None of the Declared Rare or Priority species which were listed in 2002 were found within the areas of road reserve that will be impacted by construction of Passing Lanes 1 to 4 or the Truck Bay (GHD, 2002). Apart from at Passing lane 1, much of the road reserve area has been previously cleared of its original native vegetation and is now vegetated with opportunistic native species, species used in rehabilitation and/or introduced species.

Habitat likely to support significant species listed in 2002 was thoroughly checked for the presence of any individuals in these genera. Appendix D gives flora species recorded during GHD's site visit in 2002. The search included areas in the road reserve likely to be impacted by the proposed passing lanes, and their immediate surrounds.

A detailed field search for newly listed Declared Rare or Priority species was not undertaken in 2005.

### **2.3.5 Introduced Species**

The majority of the road reserve impacted by the proposed works contains a significant amount of introduced annual and perennial pasture species, due to past agricultural practices. Some of these species are particularly invasive.

ATA Environmental conducted a weed survey of Passing Lane 1, and found a total of 28 weed species within the survey area (2004). One of the weeds identified was Paterson's Curse (*Echium plantagineum*), which is classified with a P1 category throughout the state (Department of Agriculture, 2005). P1 prohibits the movement of the plant and its seeds throughout the state. Four other weeds identified are weeds of high environmental significance as defined in the *Environmental Weed Strategy for Western Australia* (CALM, 1999). These are the Victorian Tea Tree (*Leptospermum laevigatum*), African Lovegrass (*Eragrostis curvula*), Watsonia (*Watsonia meriana*) and Freesia (*Freesia* sp). Weeds with a high rating:

- ▶ Have a high level of invasiveness;
- ▶ Are widely distributed or have a potentially wide distribution; and
- ▶ Their presence results in environmental impacts including changing the structure composition and function of ecosystems.

Passing Lane 2 has a high level of weed invasion as it has been previously cleared and replanted with tree species. The understorey layer is predominantly pasture and weed species. No Declared plants were recorded in the area of Passing Lane 2 but environmental weeds such as African Lovegrass are present.

Passing Lane 4 also has weed species in some sections, with African Lovegrass present within the roadside table drain. No Declared plants or other significant environmental weeds were observed. Some of the area to be impacted is a gravelly-clay cut embankment, which has been rehabilitated with a range of native species and which does not support any herbaceous weed species. However, two non-native species have become naturalised in a limited area: *Eucalyptus leucoxydon* ssp. *rosea*, a South Australian species which appears to have been accidentally introduced in the



drain area, and *Hakea laurina*, from the south coast of WA, which was possibly included in the seed mix or tubestock used on the embankment.

### 2.3.6 Dieback and other Disease Risks

Dieback disease (caused by the fungal pathogen *Phytophthora cinnamomi*) may be present along parts of the road alignment.

Glevan Consulting undertook a dieback assessment of Passing Lane 1 and the Truck Bay (2004). No visual evidence of dieback was recorded. One soil and tissue sample was taken to assist in the assessment process, and returned a negative result. Despite this result, the majority of vegetation on the verges of Toodyay Road in this area is at risk of being infected with dieback.

The vegetation on Passing Lane 2 is almost entirely planted trees, some of which have a low susceptibility to the disease. There is no evidence of dieback presence but the area must be considered as uninterpretable, due to long-term disturbance.

One section of revegetation within the area of Passing Lane 4 has a number of young, planted and seeded, individuals of *Banksia grandis*, which are particularly susceptible to the disease. Some individuals of *Banksia grandis* were recorded as dead or dying during the recent site visit on 7<sup>th</sup> July 2005 but it is believed that the deaths are more likely as a result of drought and plant competition on the rehabilitated embankment. A number of other potentially susceptible plant species in the revegetation area are healthy. Despite this, it is still possible that dieback is present along sections of Passing Lane 4 as the area has been significantly altered and some sections are uninterpretable.

A short visit to the Lilydale Road pit was undertaken by GHD in 2005, in order to consider the risk of dieback spread from gravels in the pit area. Again, most of the area of the pit is uninterpretable due to extensive disturbance and the lack of indicator native plant species. The area above the pit still retains some native vegetation although much of the understorey species have been removed by grazing. Any soil from the pit area would be considered uninterpretable for *Phytophthora* infestation, due to the disturbance and lack of hygiene controls for earthmoving over many years.

### 2.3.7 Fauna

The fauna in the area near the western end of Toodyay Road was reviewed in Dell (1983), and considerable work has been carried out in the John Forrest National Park including a trapping survey in 1990/91 (CALM 1991). Trapping surveys have not extended as far north as Passing Lanes 2 and 4 but the habitat along Toodyay Road is similar. CALM's rare fauna database was searched by GHD in 2005, the rare species listed for the general area are given in Appendix A.

The conservation status of fauna species is assessed under State and Commonwealth Acts; in particular the *Western Australian Wildlife Conservation Act 1950*; *Wildlife Conservation (Specially Protected Fauna) Notice 2003*; and the *Commonwealth Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*. In addition, to species with a formal gazetted conservation status, CALM also maintains a Priority



list of species that are restricted, vulnerable or too poorly known to be considered for gazetting. These species have no formal protection, but their presence would normally be considered. The taxon needs further survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna. These may be trigger species in the Federal *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*.

From this specific information and other general information, the following species with a classified conservation status may be present:

Schedule 1 (Fauna which is Rare or likely to become Extinct)

**Carnaby's Cockatoo (*Calyptorhynchus latirostris*).** This species breeds primarily in the northern and eastern parts of its range and tends to move south and to the coastal belt when not breeding, where it feeds on native shrubs and trees (particularly proteaceous species) as well as pine trees. It is threatened primarily by loss of tree hollows for breeding, particularly in the wheatbelt area. This species is present as a regular seasonal visitor, but there is only a small chance that it might breed in the larger trees (Johnstone and Storr 1998). Recent studies on Carnaby's Cockatoo have indicated that it is known to breed in limited areas on the Swan Coastal Plain and, potentially, in any trees with suitable hollows. Its feeding habits have also developed to include a number of garden species (John Dell, pers. comm. 2005).

**Baudin's Cockatoo (*Calyptorhynchus baudinii*).** This species is primarily a forest dwelling species which feeds on the seeds of marri and other eucalypts. It is not common and has declined due to destruction as a pest in orchards and possibly due to competition for nest hollows, but appears to be secure since much of its forest habitat is still available as native vegetation. This species is a regular seasonal visitor but probably does not breed this far north (Storr, 1991).

**Chuditch (*Dasyurus geoffroi*).** The Chuditch was once common and widespread on the scarp but has declined greatly. It has increased with fox control but is still scarce and present at low densities because individuals occupy very large areas. It would be a resident species, but at a low density.

Species gazetted under the Wildlife Act in Schedule 4, which means "Other specially protected fauna".

**Carpet Snake (*Morelia spilota imbricata*).** This is widespread in the south-west of Western Australia, but rare or threatened in some areas such as the wheatbelt, and is partly gazetted to protect it from illegal capture and unnecessary killing. This is an attractive python which is usually found under logs or rocks and may even be found around human settlements (Wilson and Knowles 1988). It is often killed around human settlements because it is mistaken for a large venomous snake. It is widespread but scarce regionally, and would most likely be found on the granite or in logs. It is probably a resident species but at a low density.

**Peregrine Falcon (*Falco peregrinus*).** The Peregrine Falcon is a very widespread although uncommon species. It is seen occasionally throughout the South-West, but prefers hills, cliffs, river edges and tall trees. This species was previously regarded as



threatened by egg-shell thinning due to pesticides, illegal hunting as a pest, and capture for falconry and the cage trade (Kennedy 1990, Garnett 1992), but has now been deleted from the latest national Action Plan for Australian Birds (Garnett and Crowley 2000). In Western Australia this species is regarded as uncommon but secure, and it is mainly gazetted to protect it from illegal capture. It would be present as occasional birds hunting other birds from the taller trees, but there is only a low chance that it would breed in the largest trees.

In addition to these species that have a formal gazetted conservation status, CALM also maintains a Priority list of species that are restricted, vulnerable or too poorly known to be considered for gazetted. These species have no special protection, but their presence is normally considered.

Priority species, which could be expected to occur, are:

**Brush-tailed Phascogale (*Phascogale tapoatafa*).** This is a Priority 3 species. It is a forest and woodland species that is still widespread but has declined greatly. It is widespread in the scarp and forest area regionally. It is probably a resident species at a low density.

**Crested Shrike-tit (*Falcunculus frontatus*).** This is a Priority 4 species, which is defined as "Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands". This species is scarce regionally, and favours woodlands further east, and particularly Wandoo. It is very scarce along the scarp and probably not resident, but could be found in the Wandoo.

**Brush Wallaby (*Macropus irma*).** This is a Priority 4 species. This species is widespread in the forest as well as other areas including heath on the coastal plain, woodlands and mallee in the south-east. It has declined in total but has recently increased with fox control. It would be a resident species, but at low densities.

**Southern Brown Bandicoot or Quenda (*Isodon obesulus fusciventer*).** This is a Priority 5 species. This species is common regionally but is now largely restricted to dense vegetation in wet areas. It has declined in range and numbers, but still occurs over a large area from north of Perth to Esperance. Its decline is mainly due to habitat loss and predation by foxes, and many populations may now be isolated. It is now found mainly in wetter areas because only these provide the dense vegetation, which it requires for shelter from foxes. It is a prolific breeder and has probably been able to survive because of the high production of juvenile animals. It is still relatively common in the scarp valleys, but is rare in John Forrest National Park and probably does not occur in the area of Passing Lanes 1, 2 and 4 because there is little suitable dense habitat.

**Western False Pipistrelle (*Falsistrellus mckenziei*).** This is a Priority 4 species. It is primarily a forest bat but it does occur on the coastal plain as well. It is poorly known but probably common and secure in forest areas. It is probably resident throughout the region.



Two bird species (Rainbow Bee-eater and Fork-tailed Swift) are protected under international treaties. Both are migrants, but both are common and widespread in Australia and require no specific management in Australia. There would be no impact on these species regionally as they disperse widely.

### **2.3.8 Conservation Reserves**

John Forrest National Park in the vicinity of Red Hill is immediately adjacent to the works area associated with Passing Lane 1 and the Truck Bay. This national park may be indirectly impacted by proposed construction works. Direct construction impacts will not occur as all proposed works are within the road reserve, which has mostly re-established native and introduced species, and some remnant native species. Indirect impacts include soil erosion, impacts to a tributary of Strelley Brook, introduction of weeds, and spread of dieback. These aspects will need to be managed.

### **2.3.9 Greenways**

The vegetation corridor along Toodyay Road is part of a recommended Greenway linking the lower Jane Brook-Whiteman Park with the Avon Valley National Park (Alan Tingay and Associates, 1998). Greenways have been proposed to provide vegetated corridors linking remnant bushland throughout the metropolitan area.

Greenways have no legislative status at present, however it is expected that efforts should be made to consider their importance. Green corridors are not inconsistent with vegetated road reserves and the two can easily be accommodated together.

## **2.4 Aboriginal Heritage**

### **2.4.1 Archaeological and Ethnographic Sites**

A search of the Department of Indigenous Affairs database in 2005 indicates that no archaeological or ethnographic sites have been recorded within the project area. However, it is possible that sites do exist within the proposed work areas and detailed field investigation would be required to verify their presence or absence.

### **2.4.2 Native Title Issues**

A search was conducted by the National Native Title Tribunal in 2005 and the results are presented in Table 2.

Table 2: Native Title Claims Covering Toodyay Road.

<b>Shire</b>	<b>NNTT Claim Number</b>	<b>Name of Claim</b>
Swan	WC95/86	Ballaruks People
Swan	WC03/6	Single Noongar Claim (Area 1)



These claims both cover the entire area of the proposed works. These claims have not yet passed the registration test but the claimants may still need to be consulted with regard to proposed works within the claim area.

Native Title is generally extinguished in areas where governments have built roads, schools and undertaken other public works. Therefore, it is likely that Native Title has been extinguished in this area. However, this is a legal issue and as such final confirmation should be sought from a suitably qualified legal practitioner.

## **2.5 European Heritage**

A search was conducted for European heritage sites utilising the databases of the Commonwealth Department of the Environment and Heritage, the Western Australian Heritage Council, the City of Swan and the Shire of Mundaring. The search indicated only one European heritage site in the vicinity of the proposed roadworks. The Redhill Convict Station is registered on the City of Swan heritage register and is in close proximity to Passing Lane 1. The heritage database record for this site is shown at Appendix C.

The Convict Station is located on the northern side of the existing Toodyay Road, adjacent to the John Forrest National Park, between Red Hill and the entrance to the Pioneer Quarry.

The Redhill Convict Station has been the subject of an Archaeological and Architectural Report and Conservation Plan (undertaken by Bush *et al* (1996); and Heritage and Conservation Professionals (1998). The Heritage Council of Western Australia endorsed these documents.

The site remains extant only as a ruin. The Conservation Plan indicates that the area adjacent to the northern side of Toodyay Road is regarded as having considerable conservation significance. However, Passing Lane 1 will have no direct impact on this area.

Archaeological research indicates that the sites of the former oven and soak are probably located on the southern side of Toodyay Road. However, research was unable to provide exact locations. According to the diagrams included in the Conservation Plan, Passing Lane 1 is likely to directly impact the area where the oven is potentially located. It was recommended in the Conservation Plan that MRWA should commission an archaeological investigation of the oven and well sites prior to construction works. This is probably best done while the roadworks are being carried out in case any evidence of the oven or well becomes apparent.

GHD consulted the Heritage Council of Western Australia, and despite endorsement from the council in 1998, the proposed works will require the submission of a Development Referral. The Referral should include a summary of the project, an outline of the potential impacts and any research that has already been undertaken. A representative of the Heritage Council indicated that, as the previous Conservation Plan had been endorsed, the approval to develop would be relatively straightforward.



## **2.6 Consultation**

Key Stakeholders identified during the PEIA and subsequent work include:

- ▶ Department of Conservation and Land Management (CALM) – John Forrest National Park
- ▶ Department of Environment (DoE) – Water catchments, clearing.
- ▶ City of Swan, Shire of Mundaring.
- ▶ Heritage Council of Western Australia – Convict Station.

### **2.6.1 Department of Conservation and Land Management (CALM)**

CALM was previously consulted regarding the area of construction just west of Passing Lane 1 and adjoining John Forrest National Park (GHD 2002). No particular issues were raised with regard to the construction of that passing lane in terms of there being any particular aspects of conservation significance in the works area. However, it was noted that a number of issues should be further investigated and considered in an EMP. These were:

- Threatened flora – a survey should be carried out and the impacts on any species found should be detailed;
- Dieback – a detailed dieback management plan should be developed including a dieback survey by an expert dieback interpreter;
- Vegetation – clearing of vegetation should be minimised and rehabilitation of construction disturbance carried out where appropriate;
- Spoil removal – any spoil to be removed offsite to prevent potential weed and disease spread;
- Weed control – a weed management program should be developed;
- Drainage – any increased drainage should be maintained on site;
- Access – access to John Forest National Park should be maintained; and
- Fire management – should be considered if work is to occur during the wildfire season.

CALM indicated in 2002 (Mr Keith Tressider, pers. comm.), that the area just west of (and downslope of) Passing Lane 1 is dieback free.

It has also been indicated that there is a long-term requirement for CALM to provide public access to the park at the northern end of John Forrest National Park, but there are no plans for where this might occur.

### **2.6.2 Department of Environmental Protection (former) / Department of Environment**

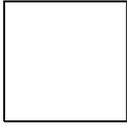
Following the discussions with CALM about another passing lane just west of Passing Lane 1, the former Department of Environmental Protection (DEP) was consulted in 2002 by MRWA and confirmed that, provided that the advice of CALM was followed, there would be no requirement to refer the Passing Lane 1 proposal to the EPA for assessment.



From the above it can be assumed that referral of Passing Lane 1 and the other passing lanes to the EPA will not be required. The DoE (Swan Goldfields Agricultural Region) were also contacted with regard to the need for a Permit to Disturb Bed or Bank for the impacts on minor waterways. Bob Whittaker of this Region noted the small risk of sedimentation from roadworks and the possible impact on downstream landowners, particularly regarding water quality in dams. Details of the proposal have been forwarded to the Region and MRWA should also provide the EMP to the DoE for future reference.

### **2.6.3 Heritage Council of Western Australia**

The Heritage Council of Western Australia was consulted by GHD in regards to Proposed Passing Lane 1 and its potential impact on the Redhill Convict Station. The Heritage Council endorsed the Conservation Plan prepared for MRWA in 1998 by Heritage and Conservation Professionals. However, recommendations made by the Heritage Council are only valid for a period of two years, and therefore there is a requirement to submit a Development Referral.



### 3. Potential Environmental, Cultural and Social Constraints or Impacts

The most significant constraint to the construction of the passing lanes along Toodyay Road is the presence of the road reserve adjacent to John Forrest National Park at Red Hill (Passing Lane 1) and the loss of road reserve vegetation that will occur during the construction of the passing lanes.

All relevant issues will be the subject of management requirements in the Environmental Management Plan for the project.

#### 3.1 Biological Issues

##### 3.1.1 Land Clearing

New legislation under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, proclaimed on 8 July 2004, protects all native vegetation in Western Australia. Under the new law, clearing native vegetation is prohibited, unless a clearing permit is granted by the DoE, or the clearing is for an exempt purpose. These exemptions ensure that low impact day-to-day activities involving clearing or activities that are required under other laws can be undertaken without individual permits or activities. Proponents that wish to clear are required to submit an application if an exemption does not apply. This will be assessed against principles that consider biodiversity, land degradation and water quality. MRWA has an exemption for road widening works until January 2006, except where those works impact an Environmentally Sensitive Area (ESA). As Passing Lane 1 has some potential to indirectly impact the John Forrest National Park, a Clearing Permit will be required for that area, however, it is believed that Passing Lanes 2 and 4 would be exempt. Although Passing Lane 4 passes close to part of Wooroloo Brook, which is mapped as an ESA, there will be no direct impact on the Brook.

##### 3.1.2 Impacts on Wetlands

Passing Lane one has the potential to impact directly on a tributary of Strelley Brook which crosses the road in that area and which runs parallel to the road for some distance. Due to the perceived risks, and based on recent consultation with CALM, MRWA has re-designed the drainage of Passing Lane 1 to avoid having any direct impact on the Brook where it runs parallel to the road. There is a minor risk of erosion and downstream sedimentation within and along the channel, and this will need to be managed carefully through suitable rock armouring and other scour protection mechanisms.

The works at Passing Lane 4 intersect a minor drainage gully running across the road to the east. There is potential for erosion at this gully but suitable culvert engineering and protection will minimise this risk.



A Permit to Disturb a Bed or Bank is not required due to the small size of the waterways which will be impacted. However, the DoE have been given notice of the location and details of works in case any complaints from downstream landowners are made.

### **3.1.3 Flora and Vegetation Protection**

#### *Declared Rare and Priority Species*

No Declared Rare or priority flora species are listed by CALM as occurring within the road reserve area between Red Hill and Berry Road, and none have been observed during field investigations. It is possible that some of these species will occur in the more intact vegetation of the John Forrest National Park or other patches of remnant vegetation bordering the road reserve. Since none of this vegetation will be destroyed during the construction activities, there will be no known detrimental impacts to any potentially occurring species of conservation significance.

#### *Threatened Ecological Communities*

No listed Threatened Ecological Communities (TECs) are found within the areas of the Passing Lanes or Truckbay and none of the vegetation types recorded match known TEC vegetation descriptions.

#### *Weeds*

There are some significant weeds present in the areas of proposed works. Construction work in the areas which have such weeds present should ensure that soil or spoil from these areas is not spread to other sections of Toodyay Road or areas of native vegetation bordering the road verge. The areas which currently have an infestation of *Leptospermum laevigatum* (Victorian Tea Tree) and *Watsonia meriana*, should be managed through a weed management plan, and monitored following construction works. Targeted weed control is also required in order to achieve successful rehabilitation within the road reserve adjacent to the works areas.

#### *Dieback*

The dieback fungus has not been found to be present within the area of Passing Lane 1 and the truck bay, adjoining John Forrest National Park (Glevan, 2004 and CALM, pers. comm.). However, there is a small chance that dieback may be present in the other passing lane areas and Lilydale Pit. Dieback management should be included as part of an EMP for the works and the details of the recommended dieback hygiene should be discussed with CALM.

No other issues with regard to specific vegetation impose any legislative constraint on the project. Standard design and construction management procedures would be necessary to minimise impacts.

### **3.1.4 Fauna**

The potential impacts of the passing lanes on the fauna are minimal due to the small amounts of habitat in the road reserve and the presence of other significant areas of



habitat within the broader area. No special measures are likely to be necessary to manage fauna.

## **3.2 Social and Cultural Issues**

### **3.2.1 Access and Severance**

The development of the passing lanes is an extension to the existing road service. Therefore, access and severance would not be considered to be a significant issue. The design of the passing lanes takes all road and farm access requirements into account and may involve only temporary impacts on residents and road users.

### **3.2.2 European Heritage**

Passing Lane 1 may potentially impact the site of the underground oven associated with the Redhill Convict Station. It is believed that this oven is under the southern carriageway or shoulder at around SLK 7.050. GHD consulted the Heritage Council of Western Australia, and despite endorsement from the council in 1998, the proposed works will require the submission of a Development Referral. The Referral should include a summary of the project, an outline of the potential impacts and any research that has already been undertaken.

It is recommended that MRWA commission an archaeologist to be present during excavation works in the vicinity of the potential oven location.

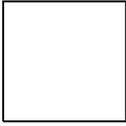
### **3.2.3 Aboriginal Heritage**

No Aboriginal sites, registered on the Department of Indigenous Affairs (DIA) database, have been identified within the study area.

A search of the DIA database does not comprise of a full assessment under the *Aboriginal Heritage Act (1972)*. This would require consultation with Aboriginal people with knowledge of the area (usually, but not necessarily, Native Title Claimants), and an archaeological survey to ascertain whether any previously unrecorded archaeological sites are within the proposed works area. If any significant ethnographic or archaeological sites are found within the proposed works area, a clearance under Section 18 of the Act will be required.

Under the *Aboriginal Heritage Act (1972)*, it is an offence to disturb an Aboriginal heritage site whether it is registered or not. The proponent should be made aware of this in any decision making with respect to whether they should proceed to a full Aboriginal heritage site assessment.

Should any artefacts or other materials of potential indigenous significance be discovered at the site, such as during earthworks, investigations will be required to ascertain the implications of the presence of these materials and the DIA should be notified of the find. This is a requirement under the *Aboriginal Heritage Act, 1972*. Should any skeletal remains be found during earthworks the Western Australian Police should be notified.



### **3.3 Construction Issues**

The possibility of significant construction impacts on adjacent houses and buildings has been considered. Fieldwork and design drawings indicate that there are no residential premises located within 200m of the road.

#### **3.3.1 Noise**

No residential dwellings were seen during the 2005 site visit to be within 200m of the edge of Toodyay Road in any of the areas proposed for the passing lanes. Therefore noise is unlikely to be an issue. Under the Environmental Protection (Noise) Regulations 1997 (DEP, 1997) there is no requirement for the noise from construction activities to be kept under particular limits. However, there are requirements related to working hours, equipment noise and complaints.

#### **3.3.2 Dilapidation**

As above, no residential dwellings were seen during the 2005 site visit to be within 200m of the edge of Toodyay Road in any of the areas proposed for the passing lanes. Therefore a dilapidation study is not believed to be required.

#### **3.3.3 Dust**

Dust will be a potential nuisance factor for road users when the new passing lanes are being constructed. However, dust can be adequately managed using standard techniques.

#### **3.3.4 Protection of Water Quality**

Due to the slopes and soil types considerable runoff may be expected following heavy rain events during the construction period and prior to effective rehabilitation. This must be carefully managed in order to prevent detrimental impacts on the tributaries to the Wooroloo Brook, Strelley Brook and the other ephemeral drainage lines in the area. The main issue of concern will be with regard to turbidity and sedimentation but this can be managed using standard construction techniques.

### **3.4 Road Operation and Use**

This section identifies potential issues associated with the operation and use of the passing lanes.

#### **3.4.1 Potential for Air Pollution**

The levels of traffic identified in this proposal are significantly below any criteria for an air quality assessment. The MRWA Environmental Guideline on Air Quality indicates that a local air quality assessment is not required if :

- ▶ the road traffic levels are predicted to be less than 15,000 vpd for rural areas; or
- ▶ there are no sensitive receptors within 200m of the road centre.



Both of these criteria are found in the areas of all Passing Lanes and the truck bay.

The rural location of this road indicates that existing air quality in this area will be of a very high standard, unless significant wood burning is undertaken for space heating during the winter. The construction of the passing lanes will, in fact, improve traffic flow and therefore have a positive effect on air pollution.

#### **3.4.2 Traffic Noise**

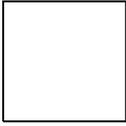
The developments are an extension of the current road. Therefore it would be expected that noise levels would not increase due to the construction of the passing lanes.

#### **3.4.3 Runoff and Drainage Aspects**

Road runoff is likely to be quite substantial due to the soil types, slopes and extent of pavement. This concentrated runoff has the potential to cause considerable scour as well as affecting stream zones and downstream water quality. Some localised dissipation of drainage water may be required to effectively control water flows and reduce the risks of downstream pollution and scouring. Rock protection has been designed for areas at high risk of erosion and this should be satisfactory for reducing the risk of impacts from concentrated runoff.

#### **3.4.4 Visual Impact**

Toodyay Road is located through a largely rural landscape as well as an area of National Park, which, due to its location at the edge of the Darling Scarp (Passing Lane 1), provides exceptional views over the coastal plain. The potential for negative visual impacts as a result of the construction of the passing lanes is considered to be low. MRWA should ensure that during construction that all trees that need to be removed are clearly marked. Once work is completed on the passing lanes, appropriate rehabilitation techniques should be utilised to improve areas adjacent to the works area.



## 4. Risk Assessment

Two risk assessment techniques have been used to consider the significance of the proposed road with regard to a range of issues. These are:

1. MRWA Low Impact Environmental Screening; and
2. MRWA Environmental Aspects for Referral to EPA.

### 4.1 MRWA Low Impact Environmental Screening

As a result of this checklist the project had a small number of aspects that were subject to further assessment and it was therefore not classed as low impact. The potential impacts have been further investigated in the PEIA and this EIA.

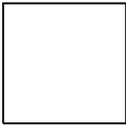
### 4.2 MRWA Environmental Aspects for Referral

MRWA has produced a list of environmental aspects, which, if affected by a road proposal, would require that proposal to be referred to the EPA (see Appendix B). Some of these may also trigger the *Commonwealth Environmental Protection and Biodiversity Conservation Act (1999)* and therefore require the project to be referred to the Department of Environment and Heritage (DEH).

All aspects in this list have been considered with regard to their relevance to the Toodyay Road passing lanes and none are likely to 'trigger' referral to the EPA or the DEH. The potential for impacts on the National Park has been discussed with CALM and the former DEP and the latter have confirmed that referral is not required.

Under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, a Clearing Permit is required for Passing Lane 1, as it may be considered to impact an ESA (John Forrest National Park).

The presence of the Redhill Convict Station site immediately adjoining Passing Lane 1 requires the need for a development referral to the Heritage Council of Western Australia. The potential impacts on the site from the construction of Passing Lane 1 have previously been considered by the Heritage Council but the approval and recommendations have lapsed as it was referred more than 2 years ago.



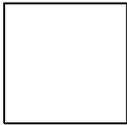
## 5. Summary of Relevant Issues

The following table summarises the relevant potential issues associated with construction of the passing lanes along Toodyay Road. Recommendations are made for the requirement for further study and the potential for formal clearances or special management necessary for each issue.

<b>Issue</b>	<b>Further Study Required</b> <b>Yes/no</b>	<b>Possible Clearance or Special Management Required</b>
<b>Biological Issues</b>		
Impact on the National Park	No	Relates to other biological issues and rehabilitation. Should involve ongoing consultation with CALM.
Impact on Declared Rare Flora, Priority flora and TECs	No	No
Impact on fauna and habitat	No	No
Land clearing	Possible	A Clearing Permit for Passing Lane 1 is required under the <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i> .
Weeds	No	Weed Management Program should be developed for rehabilitation works and control of significant environmental weeds.
Dieback	No	Discuss the requirements for dieback hygiene with CALM for Passing Lane 1 and truck bay.
<b>Social Issues</b>		
Severance and access	No	No
Aboriginal Heritage	No	Section 18 clearance under the Aboriginal Heritage Act if significant sites are disturbed.



<b>Issue</b>	<b>Further Study Required Yes/no</b>	<b>Possible Clearance or Special Management Required</b>
European Heritage	Possible	Potential impacts on Convict Station Site. Requires further consultation with the Heritage Council and a Development Referral.
<b>Construction and Road Use Issues</b>		
Impact on water quality	No	Standard runoff management and erosion protection techniques to be employed.
Noise	No	No
Dilapidation	No	No
Visual Impact	No	Design and rehabilitation requirements only.
Rehabilitation	No	Landscape Design and Revegetation Plans have been developed (KBR, 2005 and GHD, 2005)



## 6. Conclusion and Recommendations

Most of the issues highlighted in this report with regard to construction of the passing lanes along Toodyay Road can be adequately managed using standard design and construction techniques. There are no obvious major constraints to the construction or operation of the road in terms of clearances that would be difficult to achieve or which would require innovative design to become acceptable.

The most significant biological issue is in the area of Passing Lane 1, which adjoins the boundary of John Forrest National Park. MRWA's previous discussions with CALM and the former DEP regarding an overtaking lane at (SLK 4.88 to SLK 5.48) indicated that referral was not required and it is therefore considered that referral will not be required for Passing Lanes 1, 2, 4 or the truck bay. However, ongoing discussion with CALM should occur in relation to the acceptance of weed and dieback hygiene commitments and proposed rehabilitation adjacent to John Forrest National Park. Given suitable management of drainage and dieback and an agreed revegetation plan it is not expected that this issue would prevent the project proceeding. There are no other triggers that would mandate the project being referred to the EPA or the DEH. A detailed Environmental Management Plan is being developed to ensure adequate management of all relevant environmental impacts.

A Clearing Permit will be required for Passing Lane 1 as it adjoins an ESA. This will require details on drainage management during and after construction works, vegetation protection details and rehabilitation plans.

One European heritage site exists within the vicinity the road reserve at Passing Lane 1. This site is referred to as Redhill Convict Station. It is unlikely that the convict station ruin will be impacted by construction of Passing Lane 1, however archaeological research indicates that an oven is possibly present within the proposed Passing Lane 1 area, mostly likely beneath the existing road shoulder. Consultation with the Heritage Council indicates that a Referral Document will be required prior to approval for construction.

No Aboriginal heritage sites have been previously identified within the works area, however, standard precautions should be taken for management of any archaeological material which may be uncovered during construction.

Social issues such as severance, noise increase and risk of crashes and spills along the road would not increase due to the construction of the passing lanes.

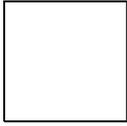
### 6.1 Recommendations

The following are recommendations for completion of the environmental and heritage assessment of the proposed passing lane project and to ensure that all potential issues have been addressed.

1. Develop a Weed Management Program to control specific weeds in Passing Lane 1 and to maximise the change of successful rehabilitation in all passing lane areas.



2. Implement the EMP which is being developed for the project; and
3. Carry out further consultation with:
  - CALM in relation to ongoing impacts on the John Forrest National Park,
  - the DoE with regard to the required Clearing Permit; and
  - the Heritage Council of Western Australia regarding a Development Referral for the convict site.

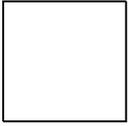


## 7. References

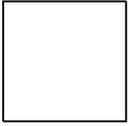
- Alan Tingay and Associates (1998). *A Strategic Plan for Perth's Greenways. Final Report*. Alan Tingay and Assoc. Perth.
- ATA Environmental, 2004. *Weed Survey: Toodyay Road*. Appendix C in KBR, 2005. *Toodyay Road Passing Lanes Design Report*. KBR, Perth.
- Beard, J.S. (1979). *The Vegetation of the Perth Area. Figure and Explanatory Memoir, 1:250,000*. Vegmap Publications, Perth.
- Bush, F., Gibbs, M. and Stephens, J. (1996). *The Toodyay Road Redhill Convict Road Station; an Archaeological and Architectural Assessment*. Prepared for Main Roads and the Shire of Swan, January 1996.
- CALM (1991). *Flora and Fauna Survey of the John Forrest National Park and Red Hill Area. Report to the Heritage Council*. Department of Conservation and Land Management, Perth, June 1991.
- CALM (1994). *John Forrest National Park Management Plan 1994-2004. Report to NPNCA*. Department of Conservation and Land Management, Perth.
- CALM, 1999. *Environmental Weed Strategy for Western Australia*. Department of Conservation and Land Management, Perth.
- Churchward, H.M and McArthur, W.M. (1978). *Darling System, Landforms and Soils. Division of Land Resources Management, CSIRO*. Perth.
- Department of Agriculture, 2005. *Declared Plants Search*. [[http://agwdsrv02.agric.wa.gov.au/dps/version02/01\\_plantsearch.asp](http://agwdsrv02.agric.wa.gov.au/dps/version02/01_plantsearch.asp)] viewed 27 June 2005.
- Department of Environmental Protection (1997). *Environmental Protection (Noise) Regulations 1997. Summary of the Regulations*, Government of Western Australia.
- Dell, J. (1983). *The importance of the Darling Scarp to fauna*. In J.D. Majer (Ed.), Scarp Symposium. WAIT Environmental Studies Group, Report No. 10.
- EPA, 2004. Revised Draft Environmental Protection (Swan Coastal Plain Wetlands) Policy and Regulations 2004. EPA, Perth.
- Garnett, S. (Ed.) (1992). *Threatened and extinct birds of Australia*. Royal Australasian Ornithologists Union, Report No. 82.
- Garnett, S.T. and G.M. Crowley (2000). *The Action Plan for Australian Birds*. 2000. Environment Australia, Canberra.
- GHD (2002) *Toodyay Road Passing Lanes 1 to 4 - Preliminary Environmental Impact Assessment*. Report prepared for Main Roads Western Australia.
- GHD (2005). *Toodyay Road Passing Lanes Revegetation Plan*. Report prepared for Main Roads Western Australia.



- Glevan Consulting, 2004. *Phytophthora cinnamomi – Assessment Results and Management recommendations*. Glevan Consulting, Perth.
- Hedde, E.M., Loneragan O.W. and Havel, J.J. (1980). *Vegetation Complexes of the Darling System Western Australia*. In: Atlas of Natural Resources, Darling System Western Australia. Department of Conservation and Environment, 1980.
- Heritage and Conservation Professionals (1998). *Redhill Convict Station, Toodyay Road. Conservation Plan*. Prepared for Main Roads Western Australia.
- Hill, A.L., Semeniuk, C.A., Semeniuk, V and Del Marco, A. (1996). *Wetlands of the Swan Coastal Plain, Volume 2B*. Water and Rivers Commission and Department of Environmental Protection, WA.
- Johnstone, R.E. and G.M. Storr (1998). *Handbook of Western Australian Birds*. Volume 1. Non-Passerines. W.A. Museum, Perth.
- KBR, 2005. *Toodyay Road Passing Lanes Design Report*. KBR, Perth.
- Kennedy, M. (Ed.) (1990). *A Complete Reference to Australia's Endangered Species*. Simon and Schuster, Sydney.
- Main Roads Western Australia (2003). *Toodyay Road Passing Lanes Environmental Management Plan*. Unpublished report, Main Roads Western Australia.
- Storr, G.M. (1991). *Birds of the South-West Division of Western Australia*. Records of the Western Australian Museum, Supp. No. 35.
- Wilson, S.K. and D.G. Knowles (1988). *Australia's Reptiles*. Collins, Sydney.



**Figure 1 Toodyay Road Locality Plan**



Appendix A

List of Rare Fauna Possible in the  
Project Area (2005)



**APPENDIX A            List of the rare vertebrate fauna species recorded in the CALM rare fauna database.**

**Schedule 1 (Fauna which is Rare or likely to become Extinct)**

**Chuditch (*Dasyurus geoffroi*)** This species occurs in the area in question and is becoming more common in areas of jarrah-wandoo forest that are baited to control exotic predators. It is classified as 'Vulnerable' under the *EPBC Act*.

**Carnaby's Cockatoo (*Calyptorhynchus latirostris*)** This species is a seasonal visitor in the area in question. It feeds extensively on the proteaceous shrublands where they have been retained. It is classified as "Endangered" under the *EPBC Act*.

**Baudin's Cockatoo (*Calyptorhynchus baudinii*)** This species is resident in the tall eucalypt forest to the south of Mundaring and a seasonal visitor in areas around John Forest National Park and further north. It is classified as "Endangered" under the *EPBC Act*.

**Schedule 4 (Fauna which is Otherwise Specially Protected)**

**Peregrine Falcon (*Falco peregrinus*)** This species may occur as a vagrant in the area in question, either in open woodlands or around the quarries located in the area in question.

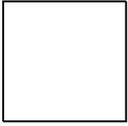
**Carpet Python (*Morelia spilota imbricata*)** This species is known to occur in upland areas throughout this part of the Darling Scarp wherever remnant vegetation has been retained.

**Priority Taxa**

**Brush-tailed Phascogale (*Phascogale tapoatafa*) P3** This species occurs in the tall eucalypt forests around Mundaring and areas to the north but is generally at low densities.

**Quenda (*Isoodon obesulus fusciventer*) P5** This species has been recorded from the area in question in locations with low dense heath vegetation and jarrah and marri forest, particularly in riparian habitats.

**Western Brush Wallaby (*Macropus irma*) P4** This species still occurs in the larger patches of native shrubland within the area in question.



Appendix B

# Environmental Aspects for Referral to the EPA or DEH



## Types of Environmental Aspects

A road project that has environmental aspects from the following lists will most likely require referral to the EPA. These aspects may be considered in terms of biophysical, pollution prevention and social surroundings.

Factor	Description	<i>Present on Toodyay Road</i>
Native remnant vegetation	Areas recommended for protection in the System's 'Red Book' reports in non-Perth metropolitan regions.	<i>No</i>
	Areas identified in Bush Forever, which supersedes the System's 'Red Book' reports in areas of overlap.	<i>No</i>
	Land vested in the National Parks and Nature Conservation Authority for the purpose of Conservation of Flora and Fauna, National Park or Conservation Park.	<i>Adjoins John Forrest National Park at Passing Lane 1 and truck bay</i>
	Areas recommended by the Department of Conservation and Land Management and endorsed by Government for inclusion in Department of Conservation and Land Management's Estate.	<i>No</i>
	Land reserved as "Parks and Recreation" under the Metropolitan Region Scheme.	<i>No</i>
	Areas managed for multiple uses where conservation is a defined use.	<i>No</i>
	Land reserved under the Regional Forest Agreement CAR reserve system	<i>No</i>
	Areas with rare vegetation communities, or assemblages considered by the EPA not adequately represented in secure conservation reserves (including Threatened Ecological Communities).	<i>No</i>
	Land containing declared rare flora and fauna and the habitats of declared rare fauna.	<i>None observed</i>
	Vegetation in regional areas where there is less than 20% remnant vegetation remaining within the local authority area.	<i>No</i>
	Vegetation in regional areas which is considered to poorly represented according to definitions within the Environmental Protection Authority Position Statement No.2 "Environmental Protection of Native Vegetation in Western Australia"	<i>No</i>
	Vegetation which includes species of declared rare and priority flora where specific clearance has not been obtained from Department of Conservation and Land Management for the clearing of this vegetation.	<i>None known</i>



Factor	Description	<i>Present on Toodyay Road</i>
<b>Wetlands</b>	Lakes nominated for protection in the Environmental Protection (Swan Coastal Plain Lakes) Policy gazetted in December 1992.	<i>No</i>
	Conservation and Resource Management category wetlands.	<i>No</i>
	Wetlands nominated for protection in the Draft Environmental Protection Policy for Lakes and Swamps of the South West Agricultural Zone.	<i>No</i>
	Wetland areas recommended for protection in the System's 'Red Book' reports not within the area covered by Bushplan.	<i>No</i>
	Conservation wetlands identified in Bush Forever, which supersedes the System's 'Red Book' reports in areas of overlap.	<i>No</i>
	Wetlands on land vested in the National Parks and Nature Conservation Authority for the purpose of Conservation of Flora and Fauna, National Park or Conservation Park, or areas recommended, and endorsed by Government, for inclusion in Department of Conservation and Land Management estate for conservation purposes.	<i>No</i>
	Wetlands in areas reserved as "Parks and Recreation" under the Metropolitan Region Scheme.	<i>No</i>
	Wetlands with rare vegetation communities considered by the EPA not adequately represented in secure conservation areas, or rare flora and fauna (and their habitats) especially east of the Swan Coastal Plain.	<i>No</i>
	Wetlands recognised by international agreement because of their importance primarily for waterbirds and their habitats. (eg: RAMSAR, JAMBA, CAMBA).	<i>No</i>
	<b>Watercourses and rivers</b>	Watercourses recommended for protection in the System's 'Red Book' reports not within the area covered by Bushplan.
Watercourse wetlands identified in Bush Forever, which supersedes the System's 'Red Book' reports in areas of overlap.		<i>No</i>
Watercourses containing lakes protected under the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992.		<i>Strelley Brook Wooroloo Brook</i>



Factor	Description	<i>Present on Toodyay Road</i>
	Watercourses on land vested in the National Parks and Nature Conservation Authority for the purpose of Conservation of Flora and Fauna, National Park or Conservation Park or areas recommended, and endorsed by Government, for inclusion in the Department of Conservation and Land Management estate for conservation purposes.	<i>A minor tributary of Strelley Brook at passing Lane 1</i>
	Watercourses in areas reserved as “Parks and Recreation” under the Metropolitan Region Scheme.	<i>No</i>
	Watercourses with rare vegetation communities considered by the EPA not adequately represented in secure conservation areas, or rare flora and fauna (and their habitats).	<i>No</i>
Estuaries and inlets Coastlines and near shore marine areas	In general, all estuaries are of interest to the EPA, however, certain estuaries have specific management agencies which have statutory and advisory roles to play in their protection. These include the: <ul style="list-style-type: none"> <li>• Peel Inlet - Harvey Estuary,</li> <li>• Leschenault Inlet,</li> <li>• Albany and Princess Royal Harbour,</li> <li>• Wilson Inlet, and</li> <li>• Swan - Canning Estuary.</li> </ul>	<i>N/A</i>
	Areas recommended for protection in the Systems ‘Red Books’ reports.	<i>N/A</i>
	Coastline containing mangroves.	<i>N/A</i>
	Areas identified by the Department of Conservation and Land Management for inclusion on the List of Wetlands of International Importance (RAMSAR Convention).	<i>N/A</i>
	Coastline areas (including marine areas) recommended by Department of Conservation and Land Management, and endorsed by Government for inclusion in Department of Conservation and Land Management's estate for conservation purposes.	<i>N/A</i>
	Coastline in areas reserved for “Parks and Recreation” under the Metropolitan Region Scheme.	<i>N/A</i>
	Coastline areas with rare vegetation communities considered by the EPA not adequately represented in secure conservation areas, or rare flora and fauna (and their habitats).	<i>N/A</i>
	Coastline where recreational use is high, such as beaches in the metropolitan region.	<i>N/A</i>



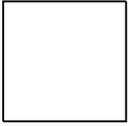
Factor	Description	Present on Toodyay Road
	Significant landforms including Beach Ridge Plain, Coastal Dunes (generally within 100 m of the shore) and Karst landforms.	N/A
Catchments with special requirements	Lake Clifton	N/A
	Western Swamp Tortoise Habitat	N/A
	Forrestdale Lakes	N/A
	Wetlands and their associated environmental management areas, associated with Jandakot and Gngara Mounds.	N/A

Table E.1 Biophysical Aspects cont ...

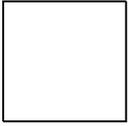
<u>Factor</u>	<u>Description</u>	Present on Toodyay Road
<u>Contaminated soils</u>	<u>Existing areas of soil contamination that may be disturbed by future construction of road transport infrastructure.</u>	<i>Not known, highly unlikely</i>
<u>Noise and Vibration</u>	<u>Potential impacts on residential areas due to the relationship between the location of road transport infrastructure with respect to residential areas or other sensitive facilities such as hospitals and the like.</u>	<i>No</i>
<u>Public water source areas - groundwater and surface water</u>	<u>Priority 1 &amp; 2, Gngara Mound.</u>	<i>No</i>
	<u>Priority 1 &amp; 2, Jandakot Mound.</u>	<i>No</i>
	<u>Water &amp; Rivers Commission gazetted groundwater areas outside the Perth metropolitan area.</u>	<i>No</i>
	<u>All surface catchments where water is collected for public water supply purposes.</u>	<i>No</i>

Table E.2 Pollution Prevention Aspects

<u>Factor</u>	<u>Description</u>	Present on Toodyay Road
<u>Aboriginal heritage</u>	<u>Sites of Aboriginal significance due to ethnographic or archaeological issues.</u>	<i>None recorded.</i>
<u>European Heritage</u>	<u>Sites listed by the Australian Heritage Commission or the Register of Heritage Places.</u>	<i>No</i>
<u>Adjacent land uses</u>	<u>Land uses and zonings, which could be affected by road proposals.</u>	<i>No</i>



Appendix C  
**Convict Station Site Details**



Appendix D

# Field Records of Flora Species Observed During Site Visits in 2002 and 2005



### **Passing Lane Number 1 and Truck Bay: Eastbound from SLK 5.62 to SLK 7.28.**

This section of overtaking lane 1 was assessed from the boundary of John Forrest National Park with Toodyay Road, to 150-200 metres east of the site entrance to the Pioneer Quarry on Red Hill, a distance of approximately 1.4 kilometres. The species listed were recorded from the road verge area and the adjacent area to the road verge. Some of the species recorded were naturally occurring, whilst others are considered to be revegetation species planted by MRWA in the road verge area in the past. There are also a number of introduced annual and perennial pasture species present in the road verge area and beyond.

Species present in the section of road verge from 150 – 200 metres east of Pioneer Quarry entrance till main quarry entrance:

*Acacia nervosa*, *A. pulchella*, *A. saligna*, *Anigozanthos* sp., *Astroloma pallidum*, *Chorizema ? dicksonii*, *Corymbia calophylla*, *Gastrolobium/Nemcia* sp., *Hakea cristata/undulata*, *H. lissocarpha*, *H. trifurcata*, *Hibbertia hypericoides*, *Lepidosperma* sp., *Lomandra* sp., *Mesomelaena tetragona*, *Neurachne alopecuroidea*, *Patersonia occidentalis*, *Philothea spicata*, *Pimelea suaveolens*, *Santalaceae* sp., *Synaphea* sp. and *Xanthorrhoea preissii*.

Species present in the section of road verge from the Pioneer Quarry entrance to the boundary with the John Forrest National Park near the Red Hill convict station site:

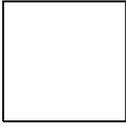
*Acacia pulchella*, *Allocasuarina humilis*, *Andersonia lehmanniana*, *Anigozanthos* sp., *Apiaceae* sp., *Astartea fascicularis*, *Corymbia calophylla*, *Cryptandra arbutiflora/glabriflora*, *Dampiera* sp. (*D. ? lavandulacea*), *Daviesia* sp., *Diuris brumalis*, *Drosera* sp., *Dryandra bipinnatifida*, *D. nivea/lindleyana*, *D. sessilis*, *D. squarrosa/armata*, *Gastrolobium* sp., *Grevillea endlicheriana*, *G. synapheae*, *Hakea lissocarpha*, *Hakea* sp., *H. trifurcata*, *Hibbertia* sp., *H. hypericoides*, *Hovea trisperma*, *Juncus* sp. (*J. ? pallidus*), *Kennedia prostrata*, *Lechenaultia biloba*, *Lepidosperma* sp., *Leucopogon* sp., *Lomandra* sp.1, *L. sp. 2*, *Mesomelaena tetragona*, *Patersonia occidentalis*, *Pentapeltis peltigera*, *Petrophile biloba*, *Sollya heterophylla*, *Stylidium amoenum*, *S. bulbiferum*, *Thomasia* sp., *Thysanotus patersonii*, *Trichocline spathulata*, *Trymalium ledifolium* and *Viminaria juncea*.

Two introduced species, which are potentially invasive environmental weeds in this section of proposed roadworks are *Nerium oleander* (Oleander) and *Watsonia* sp. (*W. ? meriana*).

### **Passing Lane Number 2: Eastbound from SLK 13.3 to SLK 15.77.**

The section of Toodyay Road, which was assessed during the site visit for this passing lane, was from the intersection with Stoneville Road to the intersection with Morecombe Road, a distance of approximately 2.0 kilometres. Species present in this area are:

*Acacia nervosa*, *A. pulchella*, *A. saligna*, *A. wildenowiana*, *Agonis linearifolia*, *Astartea fascicularis*, *Boronia/Philothea* sp., *Bossiaea ornata*, *Calothamnus quadrifidus*, *Casuarina obesa*, *Corymbia calophylla*, *Daviesia horrida/preissii*, *Desmocladius flexuosus/fasciculatus*, *Dianella revoluta*, *Drosera* sp., *Dryandra nivea/lindleyana*, *Eucalyptus marginata*, *E. wandoo*, *Gastrolobium/Nemcia* sp., *Grevillea bipinnatifida*, *Hakea lissocarpha*, *H. undulata/cristata*, *Hibbertia hypericoides*, *Hovea pungens*, *Hypocalymma angustifolium*, *Lechenaultia biloba*, *Lepidosperma* sp., *Lomandra* sp., *Melaleuca*



*preissiana*, *Mesomelaena tetragona*, *Opercularia hispidula*, *Pericalymma ellipticum*, *Phyllanthus calycinus*, *Pterostylis* sp., ?*Styandra glauca*, *Xanthorrhoea preissii* and *X. gracilis*.

Environmental weed species present in this section of proposed roadworks are *Acacia baileyana/decurrens*, *Corymbia citriodora*, *Cyperus* sp., *Leptospermum laevigatum* and *Watsonia ? meriana*.

#### **Passing Lane Number 4: Eastbound from SLK 6.50 to SLK 8.17.**

The section of Toodyay Road, which was assessed during the site visit for this passing lane was from the intersection with Berry Road to the Wooroloo Brook bridge crossing. This covers a distance of approximately 1.7 kilometres. The first section of roadside vegetation was native remnant vegetation up until a MRWA marker peg stamped with the figure SLK 8.0. The species recorded in this section of remnant vegetation are:

*Acacia nervosa*, *A. pulchella*, *A. saligna*, *Austrostipa elegantissima*, *Bossiaea eriocarpa*, *Burchardia umbellata/multiflora*, *Daviesia* sp., *Desmocladius flexuosus/fasciculatus*, *Dianella revoluta*, *Dryandra nivea/lindleyana*, *Eucalyptus wandoo*, *Grevillea ? synapheae*, *Haemodorum* sp., *Hakea prostrata*, *Hibbertia* sp., *Kennedia prostrata*, *Lepidosperma* sp., *Leucopogon oxycedrus/propinquus*, *Lomandra* sp., *Orchidaceae* sp., *Phyllanthus calycinus*, *Tetraria ? octandra* and *Xanthorrhoea preissii*.

The next section of the road verge, for a distance of approximately 150 – 160 metres from the SLK 8.0 peg, is an area of past MRWA rehabilitation, with the following species present:

*Acacia drummondii*, *A. extensa*, *A. lasiocarpa*, *Allocasuarina fraseriana/huegeliana*, *Allocasuarina* sp., *Banksia grandis*, *Calothamnus quadrifidus*, *Drosera* sp., *Dryandra* sp., *Eucalyptus leucoxydon* var. *rosea*, *E. wandoo*, *Gastrolobium/Nemcia* sp., *Hakea cristata/undulata*, *H. laurina*, *H. lissocarpha*, *H ? petiolaris*, *H. trifurcata*, *Hypocalymma angustifolium*, *Melaleuca ? radula* and *Patersonia ? occidentalis*.

After the area vegetated with rehabilitational species, the road verge is once again vegetated with remnant native species for a distance of approximately 120 – 150 metres. Most of the area occupied with remnant native vegetation is outside the area of future impacts from the construction of the passing lane, although some of the opportunistic native species which are present in the road verge (likely to have germinated in this area as a result of past disturbance, and more freely available water due to the roadside drain beside the road), will need to be removed for construction of the passing lane. These opportunistic native species present in the roadside drain area are *Lepidosperma* sp., *Styidium* sp., *Neurachne alopecuroidea* and ? *Casuarina obesa*. The species present in the remnant native vegetation are; *Acacia pulchella*, *Allocasuarina fraseriana/huegeliana*, *Corymbia calophylla*, *Daviesia* sp.1, *Daviesia* sp. 2, *Eucalyptus wandoo*, *Gastrolobium/Nemcia* sp., *Kennedia prostrata/carinata*, *Lepidosperma* sp., *Lomandra* sp., *Melaleuca raphiophylla/preissiana*, *Neurachne alopecuroidea* and *Phyllanthus calycinus*.

Another small area of rehabilitation vegetation after this remnant native vegetation is present for approximately 80 metres. There are a mix of native and rehabilitation species present in the road verge. The species recorded as present are; *Acacia drummondii*, *A. pulchella*, *Allocasuarina humilis*, *Banksia grandis*, *Bossiaea ornata*, *Calothamnus quadrifidus*, *Corymbia calophylla*, *Dianella revoluta*, *Dryandra polycephala*, *Eucalyptus marginata*, *E. wandoo*, *Hakea cristata/undulata*, *H. laurina* and *H. trifurcata*.

As the Wooroloo Brook drainage line is approached (heading west down Toodyay Road), there are many more individuals present of *Banksia grandis*, *Callistemon* sp., and *Melaleuca raphiophylla* (Swamp Paperbark). Other species present are a mixture of remnant native species and rehabilitation species. The following taxa are present; *Acacia pulchella*, *A. saligna*, *Astroloma pallidum*, *Bossiaea ornata*,



*Callistemon phoeniceus*, *Calothamnus quadrifidus*, *Corymbia calophylla*, *Dampiera ? lavandulacea*, *Daviesia* sp., *Dryandra* sp., *Eucalyptus marginata*, *E. wandoo*, *Hakea lissocarpha/erinacea*, *H. prostrata*, *Hypocalymma angustifolium*, *Juncus ? pallidus*, *Macrozamia riedlei*, Orchidaceae sp., *Pentapeltis peltigera*, *Stypandra glauca*, *Trichocline spathulata* and *Xanthorrhoea preissii*.

The opposite side of Toodyay Road (across from the side where construction works will be undertaken) was also assessed to see if there were any intact areas of vegetation or flora species of conservation significance present in the road reserve area. This side of Toodyay Road was mostly very degraded with only few native species present, and the remainder of the area dominated by introduced annual and perennial species. The native species present are *Eucalyptus marginata*, *E. wandoo*, *Hakea prostrata*, *Acacia pulchella* and *A. saligna*. A minor drainage line draining into the Wooroloo Brook was vegetated with *Eucalyptus rudis* over *Typha domingensis* and weed species (*Eragrostis curvula* and *Schinus terebinthifolia*). Other native species present include; *Acacia nervosa*, *Daviesia* sp., *Dianella revoluta*, *Gastrolobium/Nemcia* sp., *Hypocalymma angustifolium*, and *Lepidosperma* sp.



**GHD Pty Ltd** ABN 39 008 488 373

GHD House, 239 Adelaide Tce. Perth, WA 6004

P.O. Box Y3106, Perth WA 6832

T: 61 8 6222 8666 F: 61 8 6222 8555 E: permail@ghd.com.au

© **GHD Pty Ltd 2005**

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	M. Toner	A. Napier		A. Napier		
1	M Toner	A Napier		A Napier		