

**ORIGINAL**

Main Roads Western Australia

**Coolgardie - Esperance Highway  
Emu Rocks and Spargoville  
Gravel Pit**

Preliminary Environmental Impact  
Assessment and Biological Survey

Final Report

September 2005



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## Executive Summary

Main Roads Western Australia commissioned GHD Pty Ltd to complete a Preliminary Environmental Impact Assessment (PEIA) for proposed works on the Coolgardie – Esperance Highway near Emu Rocks. The proposed works will improve the horizontal and vertical geometry of the road, minimise flooding impacts, increase passing opportunities and reduce pavement roughness.

The overall project comprises of three components, these being;

- ▶ An upgrade of the intersection of the Coolgardie – Esperance Highway and the Goldfields Highway;
- ▶ Emu Rocks – Widgiemooltha Road upgrade; and
- ▶ The Spargoville Gravel Pit.

A number of desktop assessments including database, literature reviews and consultation with State Government Departments were undertaken to determine the potential environmental impacts of the development. These included identification and reporting of:

- ▶ Rivers, water catchments and drainage;
- ▶ Vegetation – Declared Rare and Priority Flora, Clearing;
- ▶ Weed management;
- ▶ Fauna;
- ▶ Aboriginal heritage;
- ▶ European heritage;
- ▶ Land use; and
- ▶ Construction phase impacts.

This PEIA indicates that the potential for environmental impact is considered to be minimal. During the development of this PEIA, the Department of Conservation and Land Management requested a flora investigation be completed prior to the commencement of works to determine if any Declared Rare or Priority Flora species will be impacted.

GHD completed a Spring flora survey in conjunction with an opportunistic fauna survey on the 12<sup>th</sup> of August 2005. At the survey areas, no Declared Rare Flora species were recorded. However, three Priority Flora species were recorded. Two recognised weed species were recorded; *Carthamnus latanus* (Saffron Thistle) was recorded from the current Emu Rocks pit and Ward's Weed (*Carrichtera annua*) was recorded from all areas examined.

No significant fauna species were recorded during the survey. Fauna habitat is considered to be not significantly impacted by proposed works.



One registered Aboriginal sites has been identified within the study area, however Main Roads has commissioned a separate project to identify any archaeological or ethnographic Aboriginal sites that have the potential to be impacted.



## 1. Introduction

Main Roads Western Australia (Main Roads WA) commissioned GHD Pty Ltd (GHD) to complete a Preliminary Environmental Impact Assessment associated with road upgrades of the Coolgardie – Esperance Highway. The project location is in the vicinity of Emu Rocks (refer Figure 1) and the proposed works comprises of:

- ▶ Emu Rocks intersection upgrade (Ch 54120 – 55090);
- ▶ Emu Rocks – Widgiemooltha Road upgrade (Ch 55090 – 65090); and
- ▶ Spargoville Gravel Pit (SLK 41.40).

This Preliminary Environmental Impact Assessment (PEIA) has been prepared in accordance with Main Roads project brief and:

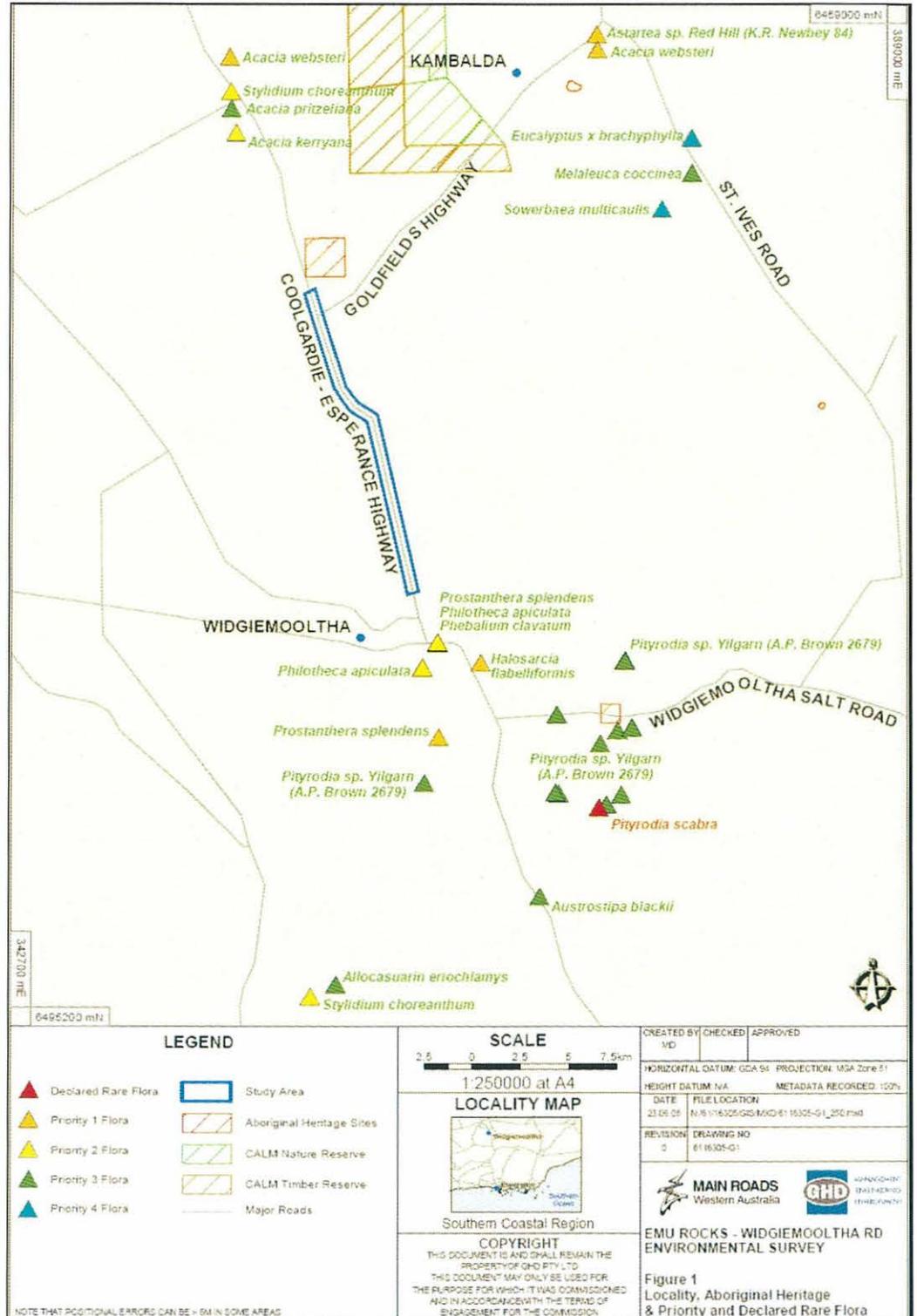
- ▶ describes the significant aspects of the existing environment;
- ▶ includes a flora and fauna field assessment;
- ▶ details the primary environmental and social impacts of the proposed works;
- ▶ provides recommendations for additional investigations to clarify the expected environmental impacts of the proposed works; and
- ▶ recommendations on obtaining the necessary statutory approvals if required.

Based on the information provided by Main Roads, relevant stakeholders and database/literature reviews, the environmental and social aspects discussed in this PEIA include:

- ▶ Rivers, water catchment and drainage;
- ▶ Vegetation – Declared Rare and Priority Flora, Clearing;
- ▶ Weed management;
- ▶ Fauna;
- ▶ Aboriginal heritage;
- ▶ European heritage;
- ▶ Land use; and
- ▶ Construction phase impacts.



**Figure 1 Locality, Aboriginal Heritage & Priority and Declared Rare Flora**





## 2. Project Description and Justification

Main Roads WA has indicated that a section of the Coolgardie – Esperance Highway between Emu Rocks and Widgiemooltha requires modifications in regard to:

- ▶ Horizontal and vertical geometry;
- ▶ Flooding;
- ▶ Passing opportunities; and
- ▶ Pavement roughness.

Sections of the highway currently have a sealed width of 6.8m and Main Roads WA plans to reconstruct (and possibly realign) to a 10m formation (8m seal) to rectify the identified deficiencies.

The intersection of the Coolgardie – Esperance Highway and Goldfields Highways (SLK 54400) is also planned to be upgraded. A widening is proposed for vehicles heading north to safely overtake vehicles turning right at the Coolgardie – Esperance Highway into the Goldfields Highway.

Borrow pits for the earthworks and pavement materials are proposed to be located along the Nepean – Spargoville Road (SLK 41.40) adjacent to the existing Spargo reserve. Main Roads has indicated that the borrow pit will be located within a 1km<sup>2</sup> study area.

Preliminary design drawings have been developed and are presented in Appendix A.



### 3. Environmental Impacts and Management

The following section identifies and discusses the environmental and social issues that are considered to be relevant to the project. This section also includes those issues believed to be necessary to adequately describe the project site. Photographs of project site have been provided by Main Roads and they are shown in Appendix B.

#### 3.1 Climate

The closest meteorological station is located at Kalgoorlie. The recorded climatic data is summarised as follows:

##### **Kalgoorlie – Boulder Airport Weather Station**

|                                       |                                    |
|---------------------------------------|------------------------------------|
| Mean Annual Maximum Temperature Range | 33.6 °C (January) & 16.7 °C (July) |
| Mean Annual Minimum Temperature Range | 18.2 °C (January) & 4.9 °C (July)  |
| Mean Annual Rainfall                  | 268.4mm                            |
| Mean Annual Raindays per year         | 65.6                               |
| Mean Daily Evaporation                | 7.2mm                              |

(Source - Bureau of Meteorology Climatic Averages of Australian Sites)

#### 3.2 Geology, Soils and Topography

The Widgiemooltha 1:250000 Geological Series (Geological Survey of Western Australia, 1988), indicates that underlying geology of the study area consists of metamorphosed felsic volcanic rock overlain in some parts by colluvium.

Main Roads (2001) states that the area is located on heavy clay – gravel soil, with small pockets of ironstone exposed; the area also has local deposits of calcareous gravels and deep sands.

The Widgiemooltha 1:250000 topographic map indicates the terrain of the area is reasonably flat to slightly undulating.



### 3.3 Rivers, Wetlands and Drainage

The 1:250000 Widgiemooltha topographic map was examined to determine the presence of rivers and wetlands, none of which are noted. However, a small unnamed creek does intersect the road but is described as 'mainly dry watercourse'.

#### Recommendation 1:

It is recommended that Main Roads drainage design does not direct road runoff towards the unnamed creek.

#### Recommendation 2:

It is recommended that Main Roads design and construct the works to maintain existing surface water drainage patterns.

#### Recommendation 3:

It is recommended that Main Roads design and construct the project with appropriate erosion control measures to reduce the potential for scour.

### 3.4 Expected Vegetation, Declared Rare and Priority Flora, Threatened Ecological Communities and Vegetation Clearing

#### Vegetation

The vegetation of the area has been mapped by Beard (1976). The vegetation to the north of the intersection of Coolgardie Esperance Highway and Goldfields Highway is comprised of Broombush thicket or mixed woodland. Woodland dominated by Goldfields Blackbutt dominates to the south of the intersection, and in the study area for the gravel pit:

- ▶ Broombush thicket – This is a thicket virtually confined to different species of *Casuarina*, *Acacia* and *Melaleuca* with a "broom bush habit". This description arises from the habit of growth where the stem of the plant divides repeatedly into a large number of thin, largely erect branchlets terminating at the same height and giving a dense, gently domed crown to the bush.
- ▶ Mixed woodland – This woodland consists of a tall open stand of trees with extremely sparse undergrowth. Dominant trees are *Eucalyptus transcidentalis* (Redwood) and *E. flocktoniae* (Merrit).
- ▶ Goldfields Blackbutt woodland – Like the mixed woodland, Goldfields Blackbutt (*Eucalyptus lesouefii*) woodland consists of a tall open stand of trees with extremely sparse undergrowth. *E. transcidentalis* (Redwood) is also dominant in the woodland.



### Declared Rare and Priority Flora Species

The Department for Conservation and Land Management (CALM) was contacted to determine the presence of any Declared Rare or Priority Flora Species that may exist in the project area. Table 1 indicates the results of the search and Table 2 provides a description of the conservation codes.

**Table 1 Declared Rare and Priority Flora Species**

| <b>Species</b>                   | <b>Conservation Code</b> |
|----------------------------------|--------------------------|
| <i>Acacia pritzeliana</i>        | P3                       |
| <i>Acacia websteri</i>           | P1                       |
| <i>Acacia kerryana</i>           | P2                       |
| <i>Allocasuarin eriochlamys</i>  | P3                       |
| <i>Astartea sp. Red Hill</i>     | P1                       |
| <i>Austrostipa blackii</i>       | P3                       |
| <i>Eucalyptus x brachyphylla</i> | P4                       |
| <i>Grevillea phillipsiana</i>    | P1                       |
| <i>Halosarcia flabelliformis</i> | P1                       |
| <i>Melaleuca coccinea</i>        | P3                       |
| <i>Phebalium clavatum</i>        | P2                       |
| <i>Philothea apiculata</i>       | P2                       |
| <b><i>Pityrodia scabra</i></b>   | <b>R</b>                 |
| <i>Pityrodia sp. Yilgarn</i>     | P3                       |
| <i>Prostanthera splendens</i>    | P1                       |
| <i>Sowerbaea multicaulis</i>     | P4                       |
| <i>Stylidium choreanthum</i>     | P2                       |



**Table 2 Conservation Codes and Descriptions**

| 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.  |
| X: Declared Rare Flora - Presumed Extinct Taxa | Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.  |
| 1: 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. |
| 2: 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.  |
| 3: 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.  |
| 4: Priority Four - 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.  |

The search from CALM indicated that four Priority 1, four Priority 2, five Priority 3, two Priority 4 and one Declared Rare Flora (i.e. *Pityrodia scabra*) are found within the general area of the study site (Figure 1).

A further database search of the Commonwealth's Department of Environment and Heritage Protected Matters Search tool revealed that *Pityrodia scabra* (DRF) and *Gastrolobium graniticum* (DRF) are listed as endangered under the Commonwealth's



*Environmental Protection and Biodiversity Conservation Act (1999) (EPBC Act)*. *G. graniticum* was not identified in the CALM database search as being present within the vicinity of the study site. *Pityrodia scabra*, while identified in the CALM database search, has not been recorded in the immediate vicinity of the study site (Figure 1). If these species are impacted, possible referral to the Commonwealth may be required.

During the development of the PEIA, CALM requested a qualified botanist complete a flora and vegetation field assessment of the project area. MRWA commissioned GHD to undertake the flora survey and this was undertaken in August 2005. The complete flora report is included in Appendix C and is summarised in Section 4.

### **Threatened Ecological Communities**

No Threatened Ecological Communities have been identified within the study area.

### **Vegetation Clearing**

The Environment Branch of Main Roads WA has informed GHD that works associated with existing road developments are exempt from the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* until January 2006. Main Roads WA has indicated clearing for stockpiles would occur between June and August 2005. However, if clearing is required after January 2006, a clearing permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* may be required.

## **3.5 Fauna**

The Western Australian Museum's fauna database was accessed to determine the likely presence of fauna in the study area. The results of the database search are shown in Appendix D. The search also revealed that potentially 1 amphibian, 7 bird, 1 mammal and 45 reptile species may exist in study area.

The Wildlife Conservation (Specifically Protected Fauna) Notice 2005 administered by CALM was examined to identify any protected fauna that may be present in the study area. The *Leipoa ocellata* (Mallee Fowl) was identified as Schedule 1 species (fauna that is rare or likely to be extinct) and the *Morelia spilota imbricata* (Southern Carpet Python), Schedule 4 – Other Specifically Protected Fauna.

The Commonwealth Department of Environment and Heritage's Matters of National Environmental Significance database was accessed to determine the presence of any fauna species that may be impacted by the proposed works.

The search identified the following fauna species:

- ▶ Slender – billed Thornbill;
- ▶ Mallee fowl;
- ▶ Fork – tailed Swift;
- ▶ Great Egret;



- ▶ Cattle Egret; and
- ▶ Rainbow bee – eater.

The majority of the project consists of realigning an existing road. For this aspect, it is not expected that the above mentioned species should be impacted. A fauna survey was completed in conjunction with the flora survey, the complete report is included in Appendix C and summarised in Section 4.

**Recommendation 4:**

It is recommended that Main Roads WA develop fauna management strategies to ensure that fauna in the project area is not unduly impacted.

### **3.6 Social Environment**

#### **3.6.1 European and Natural Heritage**

The databases of the Heritage Council of Western Australia and the Commonwealth's Australian Heritage Place Inventory were accessed to determine the presence of any European heritage sites that may be impacted by the proposed works.

No European heritage sites have been identified that will be impacted by the proposed road works.

#### **3.6.2 Aboriginal Heritage**

An Aboriginal heritage field assessment was not undertaken as part of this PEIA. Investigations via the Department of Indigenous Affairs on-line databases revealed that one Registered Aboriginal heritage site is adjacent to the road reserve (i.e. Site 497 – Milbari Nidjuru). A copy of the search is attached in Appendix E.

It is understood that Main Roads WA has commissioned a separate Aboriginal heritage field assessment to determine any issues associated with the proposed road works.

**Recommendation 5:**

It is recommended that Main Roads ensure that the development complies with the *Aboriginal Heritage Act (1972)* and recommendations made from the field assessment report.



### **3.6.3 Land Use**

The Department of Industry and Resources (DoIR) 'Tengraph' database was accessed to determine any mining tenements in the project area. The search revealed that up to four mining tenements traverse the road. The tenements identified are:

- ▶ E15/789;
- ▶ P15/4479;
- ▶ M15/95; and
- ▶ M15/633.

#### **Recommendation 6:**

It was recommended by DoIR that Main Roads liaise with tenements holders prior to the commencement of works.

### **3.7 Pre – Construction and Construction Phase Impacts**

Potential environmental and social impacts likely to require consideration during the construction phase of the project include:

- ▶ Damage to public property (particularly fencing);
- ▶ Clearing;
- ▶ Weeds;
- ▶ Topsoil management;
- ▶ Dust management;
- ▶ Traffic safety and access;
- ▶ Fire management;
- ▶ Fuel and chemical storage; and
- ▶ Rubbish disposal.

These issues will be managed through Main Roads construction phase environmental management measures. The development of a construction phase Environmental Management Plan, which addresses pre-construction issues will ensure the implementation of all project specific environmental and social impact measures.

#### **Recommendation 7:**

It is recommended that Main Roads develop and implement a project specific Environmental Management Plan to address all environmental and social impact management issues throughout the development of the project. These measures shall then be implemented during pre-construction and road construction activities.



## 4. Biological Survey

A qualified botanist and zoologist conducted a field assessment of the project area on the 12<sup>th</sup> of August 2005. Surveys of the flora and vegetation in conjunction with an opportunistic fauna survey within:

- ▶ the Spargoville Gravel Pit (41.40 SLK )
- ▶ Extension and 25 m either side of the Emu Rocks intersection upgrade (Ch 54120 – 55090); and
- ▶ Emu Rocks – Widgiemooltha Road upgrade (Ch 55090 – 65090).

The vegetation and flora surveys recorded the vegetation types, species richness and dominance. The surveys included a consideration of the presence of Declared Rare Flora and Priority Flora and the condition and weed status of the vegetation was noted.

The flora and Fauna Report is included in Appendix C and summarised below.

At the survey areas, no Declared Rare Flora (DRF) species were recorded. Three Priority Flora species are recorded. Priority Plant species are not accorded the same level of protection as DRF.

One Declared Plant, the weed *Carthamnus latanus* (Saffron Thistle) was recorded from the current Emu Rocks pit. Main Roads WA will be required to control this particular plant species to prevent its spread. Given that only one plant was observed, immediate management is suggested before this species can spread into uninfested and healthy adjacent bushland.

Ward's Weed (*Carrichtera annua*) was recorded from all areas examined. However, it was only recorded at the present pit site in pile waste material brought in to the pit. Control of this weed species is recommended to prevent its spread into uninfested and healthy adjacent bushland.

No significant fauna species were recorded during the survey. Fauna habitat is considered to be not significantly affected by proposed works.

### **Recommendation 8:**

It is recommended, that liaison with CALM occurs with regards to the potential clearing of priority species.

### **Recommendation 9:**

It is recommended that a control measures such as herbicides are used to prevent further spread of Saffron Thistle and Wards Weed.



## 5. Consultation

As specified by Main Roads WA, no community consultation was undertaken. However, GHD consulted with the Department of Agriculture, Department of Conservation and Land Management and the Department of Environment. A copy of the correspondence received is contained within Appendix F.

### **Mr Jim Addison - Senior Technical Officer, Department of Agriculture (Kalgoorlie District Office).**

The Department of Agriculture comments centre on any modifications to surface hydrology created by the earthworks i.e.

- ▶ Water deprivation of down-slope vegetation which may lead to death of trees/shrubs;
- ▶ Concentration of overland flows through culverts/floodways which might predispose down-slope soil surfaces to accelerated erosion; and
- ▶ Department of Agriculture would expect the project to require clearing permits if more than one hectare of vegetation is to be cleared. During that application process these surface hydrology issues may receive more attention.

### **Mr Brad Barton – Department of Conservation and Land Management (Goldfield Region).**

- ▶ A search of the CALM's Kalgoorlie Regional database also determined that the *Prostanthera splendens* (P1), *Philothea apiculata* (P2) and *Phebalium clavatum* (P2) also occur in the project area. CALM also indicates that if the project area takes into account salt lake margins, then *Halosarcia flabelliformis* (P1) and *Pityrodia sp Yilgarn* (P3) should be considered.
- ▶ There does not appear to be any known issues relating to restricted vegetation community types that will be impacted by the project; and
- ▶ A field survey by a suitably qualified botanist will be required to determine if any Declared Rare or Priority flora species are likely to be disturbed during the completion of the project. *As previously discussed the field survey was conducted on the 12<sup>th</sup> of August 2005, and the results are contained within this report.*

### **Mr Tim Marelich – Department of Environment (Kalgoorlie Regional Office).**

- ▶ It is recommended by DoE that Main Roads WA consult the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and provide some explanation in the assessment as to which parts of the clearing are exempt from requiring a permit and which parts may require a permit.
- ▶ Dust generation is a potential issue of concern. Information should be provided on the measures that will be put in place to control dust during construction activities.
- ▶ A licence is required to extract groundwater in the Goldfields Groundwater Area.



## 6. Environmental Approvals

### 6.1 Commonwealth Approvals

Referral of the project to the Commonwealth Minister for the Environment under the provisions of the *Environmental Protection and Biodiversity Conservation Act (1999)* may be necessary if threatened flora or fauna are identified within the study areas during the recommended field surveys.

### 6.2 Government of Western Australia

The Department of Environment and the Environmental Protection Authority are responsible for the *Environmental Protection Act (1986)*. A clearing permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* may be required if works commence after January 2006

The biological assessment to meet CALM requirements indicated that no threatened flora or fauna will be impacted as part of the proposed works.

No significant environmental issues have been identified as part of the PEIA or biological assessment. Therefore, referral to the Department of Environment or Environmental Protection Authority is considered not to be required.



## 7. Recommendations

### **Recommendation 1:**

It is recommended that Main Roads drainage design does not direct road runoff towards the unnamed creek.

### **Recommendation 2:**

It is recommended that Main Roads design and construct the works to maintain existing surface water drainage patterns.

### **Recommendation 3:**

It is recommended that Main Roads design and construct the project with appropriate erosion control measures to reduce the potential for scour.

### **Recommendation 4:**

It is recommended that Main Roads WA develop fauna management strategies to ensure that fauna in the project area is not unduly impacted.

### **Recommendation 5:**

It is recommended that Main Roads ensure that the development complies with the *Aboriginal Heritage Act (1972)* and recommendations made from the field assessment report.

### **Recommendation 6:**

As per the Department of Industry and Resources advice, Main Roads WA should liaise with mining tenement holders prior to the commencement of works.

### **Recommendation 7:**

It is recommended that Main Roads develop and implement a project specific Environmental Management Plan to address all environmental and social impact management issues throughout the development of the project. These measures shall then be implemented during pre-construction and road construction activities.

### **Recommendation 8:**

It is recommended, that liaison with CALM occurs with regards to the potential clearing of priority species.

### **Recommendation 9:**

It is recommended that a control measures such as herbicides be used to prevent further spread of Saffron Thistle and Wards Weed.



## 8. References

- Beard J.S (1976), *Plant Life of Western Australia*. Kangaroo Press, New South Wales.
- Geological Survey of Western Australia (1988), *Widgiemooltha 1:250000 Geological Series*, Western Australia.



Appendix A  
Preliminary Design Drawings



Government of  
Western  
Australia



**MAIN ROADS**  
Western Australia

# COOLGARDIE-ESPERANCE HIGHWAY (H010)

## EMU ROCKS INTERSECTION IMPROVEMENTS

54.10 S.L.K. TO 55.10 S.L.K.

SHIRE OF COOLGARDIE (602)

GOLDFIELDS ESPERANCE REGION

# DRAWINGS

**GHD Pty Ltd**

ACN 008 488 373

SUITE 1 / 58 EGAN STREET  
KALGOORLIE, WA, 6430

TELEPHONE: (08) 9021 3444

FAX: (08) 9091 2183

## DRAWING INDEX

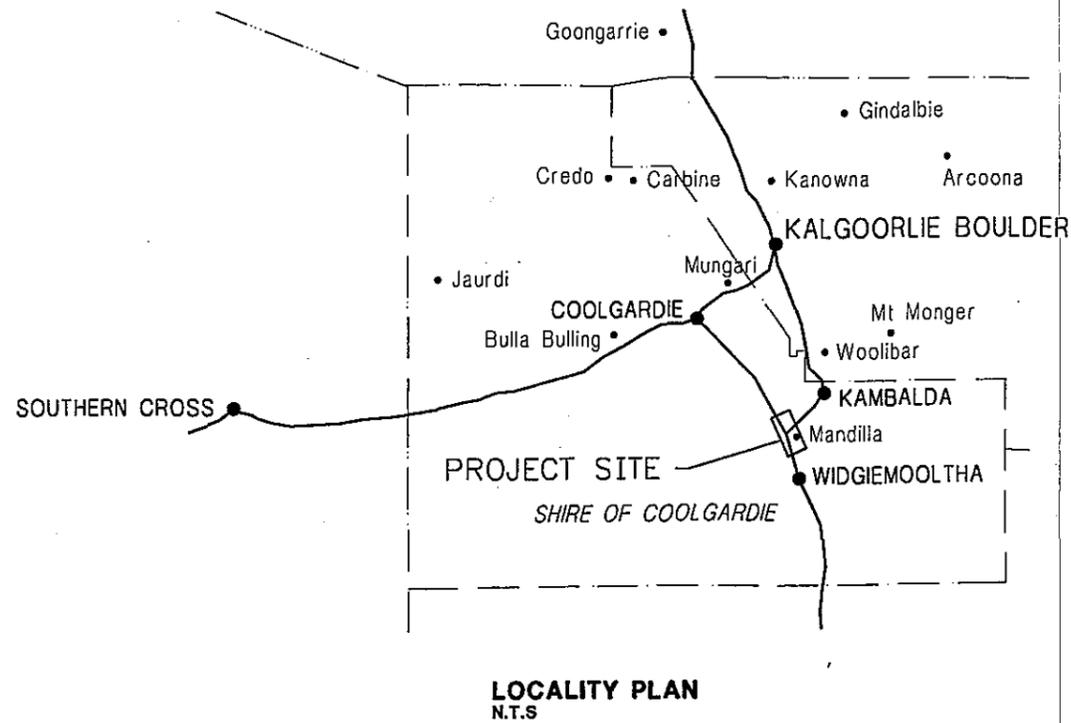
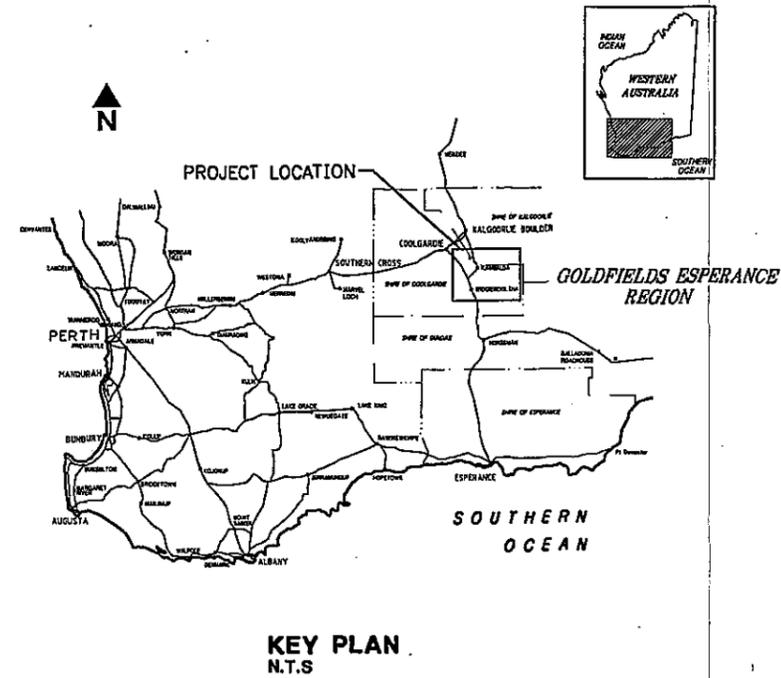
DRG No. DESCRIPTION

### GENERAL DRAWINGS

0405-7031 COVER SHEET  
0405-7032 LOCALITY, KEY PLAN AND DRAWING INDEX

### EMU ROCKS INTERSECTION IMPROVEMENTS

0405-7033 PLAN PROFILE - CHA 54120 TO CHA 54570  
0405-7034 PLAN PROFILE - CHA 54570 TO CHA 55090  
0405-7035 INTERSECTION PLAN  
0405-7036 CROSS SECTIONS - CHA 54120 TO CHA 54300  
0405-7037 CROSS SECTIONS - CHA 54320 TO CHA 54500  
0405-7038 CROSS SECTIONS - CHA 54520 TO CHA 54700  
0405-7039 CROSS SECTIONS - CHA 54720 TO CHA 54900  
0405-7040 CROSS SECTIONS - CHA 54920 TO CHA 55090  
0405-7041 PAVEMENT MARKINGS - MINOR SIGNING AND GUIDEPOSTS  
0405-7042 TYPICAL CROSS SECTIONS



## AMENDMENTS

| No. | DATE     | DESCRIPTION              | APPROVED |
|-----|----------|--------------------------|----------|
| A   | 02/08/04 | ISSUED FOR CLIENT REVIEW | SL       |
| B   | 12/10/04 | ISSUED FOR FINAL REVIEW  | SL       |
| 0   | 18/10/04 | ISSUED FOR CONSTRUCTION  |          |

## NOTES

## REFERENCES

TYPE OF GROUND SURVEY: DIGITAL  
DATE OF CAPTURE: 2004  
ACCURACY: + / - 20mm  
RELEVANT PROJECT GRID: GOLD94 GRID & AHD

### CONSULTANT

**GHD** Suite 1 / 58 Egan Street Kalgoorlie WA 6430  
PO Box 268 Kalgoorlie WA 6430 Australia  
T (08) 9021 3444 F (08) 9021 2183  
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| DESIGNED/DRAWN    | DATE     |
|-------------------|----------|
| TJ MARCH/SA TOOKE | AUG 2004 |
| VERIFIED          | 19/10/04 |
| APPROVED          | 19/10/04 |



GOLDFIELDS ESPERANCE REGION  
LOWER HANNAN STREET KALGOORLIE WA 6430  
Telephone (08) 9080 1400 Fax (08) 9080 1452

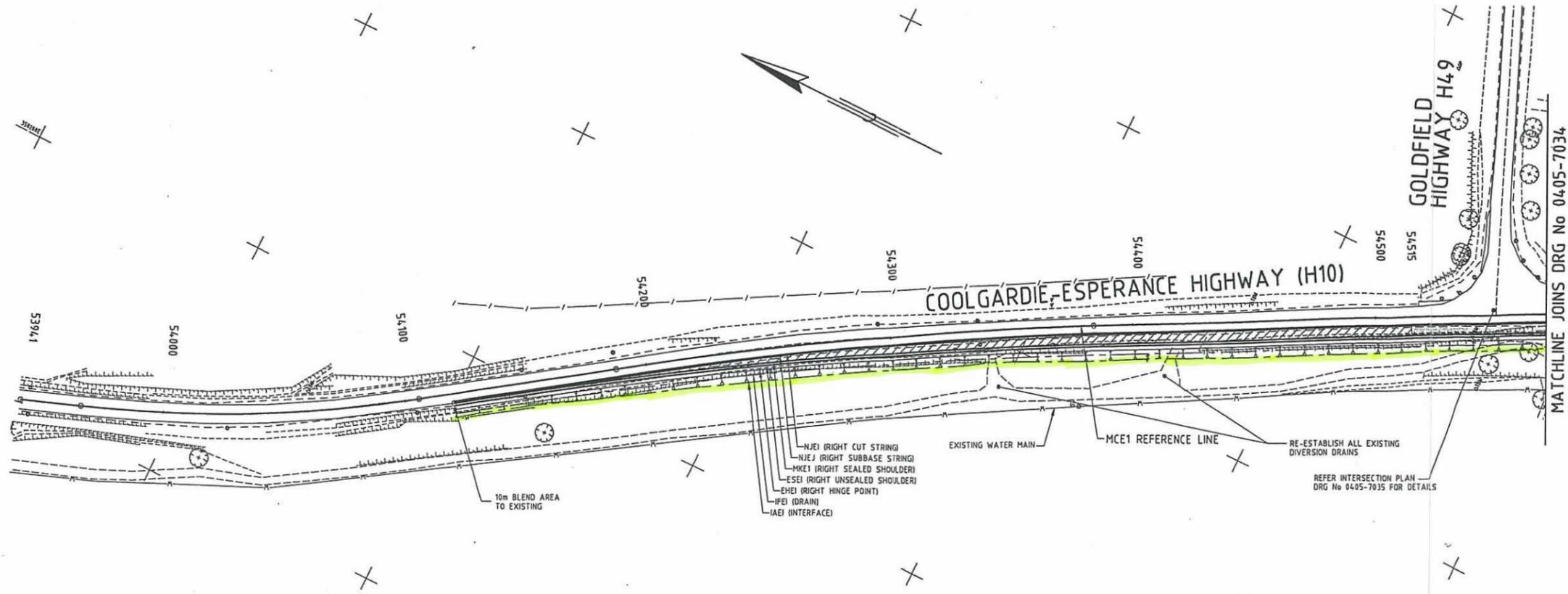
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|------------|------|
|            |      |
| APPROVED   | DATE |
|            |      |

COOLGARDIE-ESPERANCE HWY (H10)  
EMU ROCKS INTERSECTION IMPROVEMENTS  
54.10 SLK TO 55.10 SLK  
INDEX, KEY PLAN AND LOCALITY PLAN

LOCAL AUTHORITY (602) SHIRE OF COOLGARDIE

| DRAWING TYPE | DRAWING NUMBER | AMEND. |
|--------------|----------------|--------|
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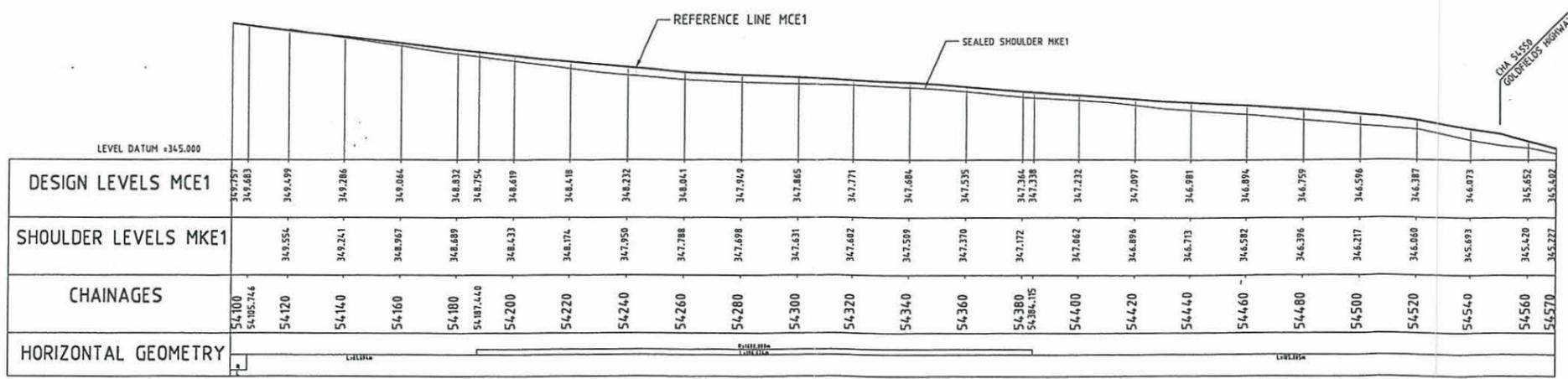
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|----------|------------|-------------|---------|
| 1        | 358387.465 | 6533834.672 | 345.910 |
| 2        | 358369.490 | 6533824.085 | 345.870 |
| 3        | 358359.488 | 6533922.729 | 346.680 |
| 4        | 358510.862 | 6533890.571 | 344.080 |
| 5        | 359027.831 | 6531347.172 | 327.010 |
| 6        | 358072.171 | 6534411.139 | 353.840 |
| 7        | 358745.613 | 6532210.441 | 334.250 |
| 8        | 359027.848 | 6531347.185 | 327.050 |
| 9        | 358514.980 | 6533529.038 | 344.070 |
| 10       | 358599.151 | 6533284.869 | 339.200 |
| 11       | 358496.497 | 6533638.578 | 342.120 |
| 12       | 358359.489 | 6533922.742 | 346.610 |
| 13       | 358387.438 | 6533834.635 | 345.910 |
| 14       | 358369.480 | 6533824.091 | 345.870 |
| 15       | 358157.452 | 6534255.309 | 350.050 |
| 16       | 358745.620 | 6532210.468 | 334.250 |
| 17       | 359027.842 | 6531347.168 | 327.020 |
| 18       | 358072.165 | 6534411.143 | 353.850 |
| 19       | 358510.853 | 6533890.583 | 344.040 |
| 20       | 358369.497 | 6533824.104 | 345.840 |

PLAN  
1:1000



**WARNING:**  
SERVICES AND CADASTRAL BOUNDARY LOCATIONS SHOWN ARE ONLY INDICATIVE AND MUST NOT BE USED FOR EXCAVATION.  
THE "ONE CALL 1100" SYSTEM SHALL BE USED TO OBTAIN ACCURATE SERVICE LOCATIONS.



PROFILE  
H: 1:1000 V: 1:100

**AMENDMENTS**

| No. | DATE     | DESCRIPTION              | APPROVED |
|-----|----------|--------------------------|----------|
| A   | 02/08/04 | ISSUED FOR CLIENT REVIEW | SL       |
| B   | 12/10/04 | ISSUED FOR FINAL REVIEW  | SL       |
| D   | 18/10/04 | ISSUED FOR CONSTRUCTION  |          |

**NOTES**

- REFER TO MK STRING REPORTS FOR SETOUT DETAILS.
- FOR CROSS SECTIONS REFER DRG No 0405-7034 TO 0405-7044.
- FOR TYPICAL CROSS SECTIONS REFER DRG No 0405-7042.
- FOR PAVEMENT MARKINGS & MINOR SIGNING REFER DRG No 0405-7041

**REFERENCES**

TYPE OF GROUND SURVEY: DIGITAL  
DATE OF CAPTURE: 2004  
ACCURACY: +/- 20mm  
RELEVANT PROJECT GRID: GOLD94 GRID & AHD

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MANAGEMENT ENGINEERING ENVIRONMENT

JOB NO 61-14-698 DRAWING PATH N:\61\14\698\CAD\0405-7033 TO 7034.DWG  
DATE AUG 2004

DESIGNED/DRAWN TJ MARCH/SA TOOKE  
VERIFIED Sheldon  
APPROVED Sheldon

Government of Western Australia  
MAIN ROADS Western Australia

GOLDFIELDS ESPERANCE REGION  
LOWER HANNAN STREET KALGOORLIE WA 6430  
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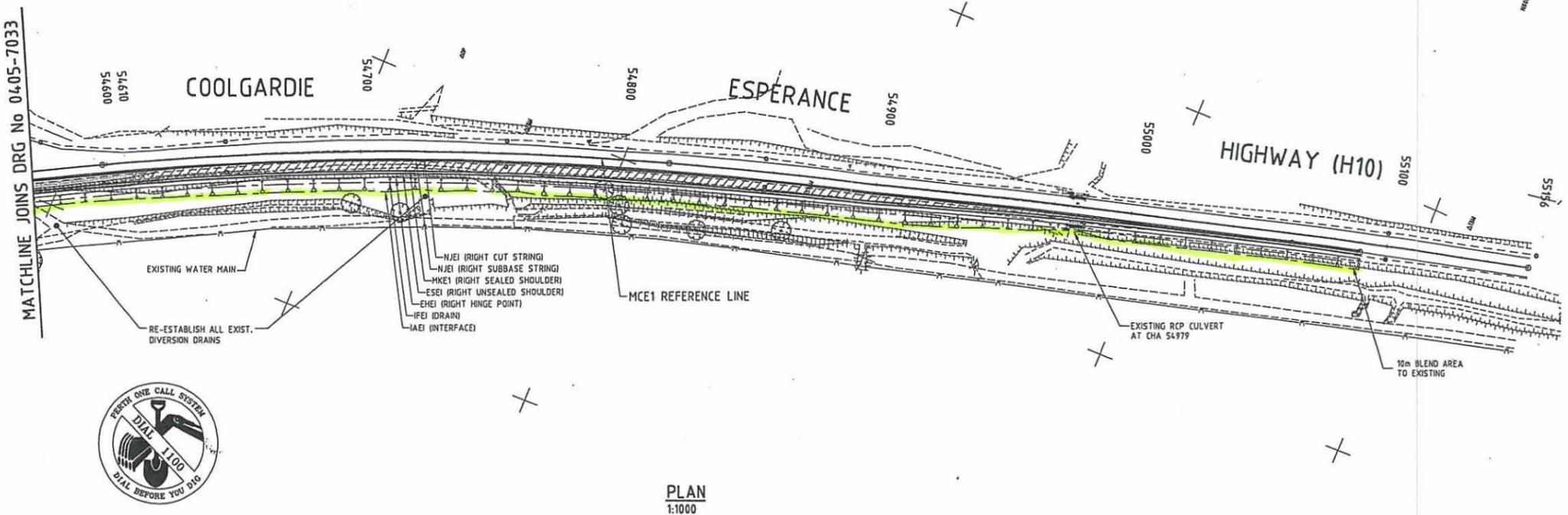
AUTHORISED DATE  
APPROVED

**COOLGARDIE-ESPERANCE HIGHWAY (H10)**  
EMU ROCKS INTERSECTION IMPROVEMENTS  
54.10 SLK TO 55.10 SLK  
PLAN PROFILE  
CHA 54120 TO CHA 54570 - SHEET 1 OF 2

LOCAL AUTHORITY (602) SHIRE OF COOLGARDIE

DRAWING TYPE 04:00 DRAWING NUMBER AMEND.  
FILE NUMBER 0405-7033-0

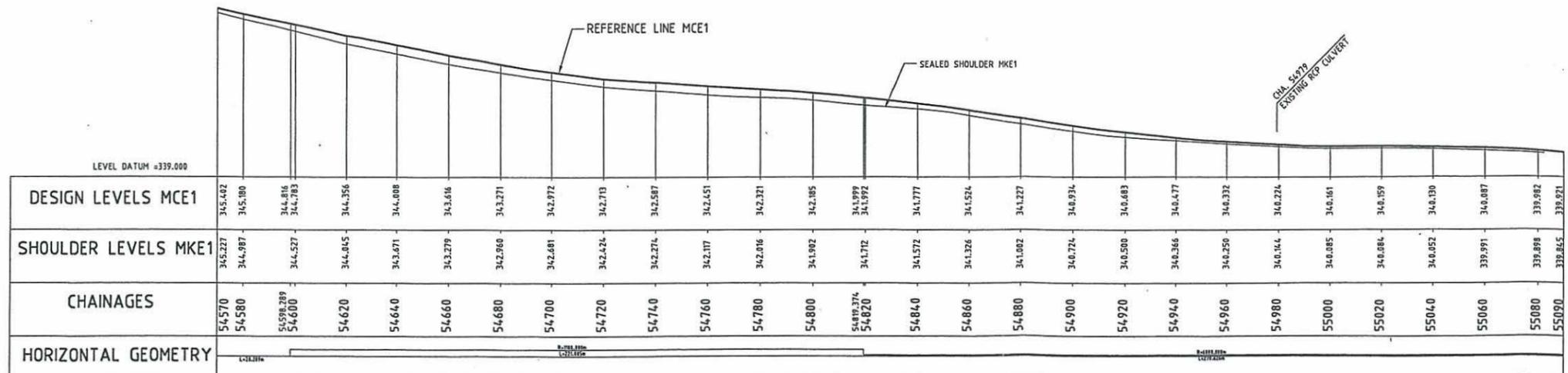
SCALE 1:1000 HORIZ. 1:1000 VERT. 1:100



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**PLAN**  
 1:1000

- PROPOSED WIDENING AND PAVEMENT RECONSTRUCTION  
TWO COAT EMULSION WITH 14mm/7mm AGGREGATE (REFER SPECIFICATION)
- PROPOSED WIDENING AND PAVEMENT RECONSTRUCTION  
40mm INTERSECTION MIX ASPHALT (REFER SPECIFICATION)



**PROFILE**  
 H: 1:1000 V: 1:100

| AMENDMENTS |          |                          |          |
|------------|----------|--------------------------|----------|
| No.        | DATE     | DESCRIPTION              | APPROVED |
| A          | 02/08/04 | ISSUED FOR CLIENT REVIEW | SL       |
| B          | 12/10/04 | ISSUED FOR FINAL REVIEW  | SL       |
| 0          | 18/10/04 | ISSUED FOR CONSTRUCTION  | SL       |

**NOTES**

- REFER TO MX STRING REPORTS FOR SETOUT DETAILS.
- FOR CROSS SECTIONS REFER DRG No 0405-7036 TO 0405-7040.
- FOR TYPICAL CROSS SECTIONS REFER DRG No 0405-7042.
- FOR PAVEMENT MARKINGS & MINOR SIGNING REFER DRG No 0405-7041 AND 0405-7042.

**REFERENCES**

TYPE OF GROUND SURVEY: DIGITAL  
 DATE OF CAPTURE: 2004  
 ACCURACY: +/- 20mm  
 RELEVANT PROJECT GRID: GOLD94 GRID & AHD

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JOB NO 61-14-698 DRAWING PATH N:\61\14\698\CAD\0405-7033 TO 7034.DWG  
 DESIGNED/DRAWN TJ MARCH/SA TOOKE DATE AUG 2004  
 VERIFIED Shandon 19/10/04  
 APPROVED Shandon 19/10/04

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**MAIN ROADS**  
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 LOWER HANNAH STREET KALGOORLIE WA 6430  
 Telephone (08) 9080 1400 Fax (08) 9080 1452

AUTHORISED DATE  
 APPROVED

**COOLGARDIE-ESPERANCE HIGHWAY (H10)**  
 EMU ROCKS INTERSECTION IMPROVEMENTS  
 54.10 SLK TO 55.10 SLK  
**PLAN PROFILE**  
 CHA 54570 TO CHA 55090 - SHEET 2 OF 2

LOCAL AUTHORITY (602) SHIRE OF COOLGARDIE

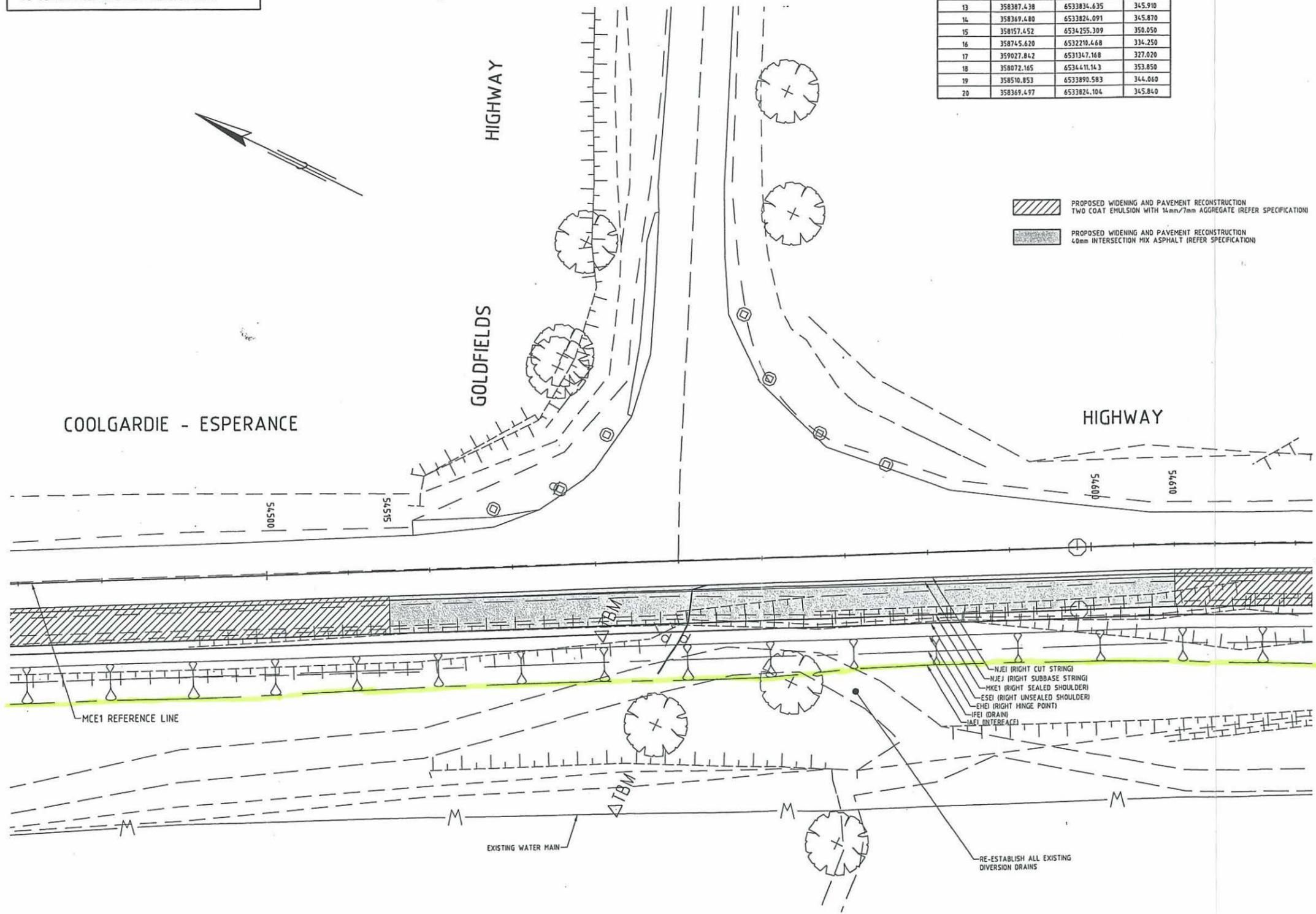
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 FILE NUMBER **0405-7034-0**

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 HORIZ. 1:1000  
 SCALE  
 MICROPLM DATE  
 A 1



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| SURVEY CONTROL POINTS |            |             |         |
|-----------------------|------------|-------------|---------|
| POINT No              | EASTING    | NORTHING    | LEVEL   |
| 1                     | 358387.465 | 6533834.472 | 345.910 |
| 2                     | 358369.490 | 6533824.085 | 345.870 |
| 3                     | 358359.488 | 6533922.729 | 346.680 |
| 4                     | 358510.862 | 6533890.571 | 344.080 |
| 5                     | 359027.831 | 6531347.172 | 327.010 |
| 6                     | 358072.171 | 6534411.139 | 353.840 |
| 7                     | 358745.613 | 6532210.461 | 334.250 |
| 8                     | 359027.848 | 6531347.185 | 327.050 |
| 9                     | 358514.980 | 6533529.038 | 344.070 |
| 10                    | 358599.151 | 6533284.869 | 339.200 |
| 11                    | 358496.497 | 6533638.578 | 342.120 |
| 12                    | 358359.489 | 6533922.742 | 346.660 |
| 13                    | 358387.438 | 6533834.635 | 345.910 |
| 14                    | 358369.480 | 6533824.091 | 345.870 |
| 15                    | 358157.452 | 6534255.309 | 350.050 |
| 16                    | 358745.620 | 6532210.468 | 334.250 |
| 17                    | 359027.842 | 6531347.168 | 327.020 |
| 18                    | 358072.165 | 6534411.143 | 353.850 |
| 19                    | 358510.853 | 6533890.583 | 344.060 |
| 20                    | 358369.497 | 6533824.104 | 345.840 |



- PROPOSED WIDENING AND PAVEMENT RECONSTRUCTION  
TWO COAT EMULSION WITH 14mm/7mm AGGREGATE (REFER SPECIFICATION)
- PROPOSED WIDENING AND PAVEMENT RECONSTRUCTION  
40mm INTERSECTION MIX ASPHALT (REFER SPECIFICATION)

**AMENDMENTS**

| No. | DATE     | DESCRIPTION              | APPROVED |
|-----|----------|--------------------------|----------|
| A   | 02/08/04 | ISSUED FOR CLIENT REVIEW | SL       |
| B   | 12/10/04 | ISSUED FOR FINAL REVIEW  | SL       |
| 0   | 18/10/04 | ISSUED FOR CONSTRUCTION  |          |

**NOTES**

1. REFER TO MX STRING REPORTS FOR SETOUT DETAILS.
2. FOR CROSS SECTIONS REFER DRG No 0405-7036 TO 0405-7040.
3. FOR TYPICAL CROSS SECTIONS REFER DRG No 0405-7042.
4. FOR PAVEMENT MARKINGS & MINOR SIGNING REFER DRG No 0405-7044

**REFERENCES**

TYPE OF GROUND SURVEY: DIGITAL  
 DATE OF CAPTURE: 2004  
 ACCURACY: + / - 20mm  
 RELEVANT PROJECT GRID: GOLD94 GRID & AHD

**CONSULTANT**

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 ENVIRONMENT

JOB NO 61-14-698 DRAWING PATH H:\61\14698\CAD\0405-7035.DWG  
 DESIGNED/DRAWN C ARMSTRONG/SA TOOKE DATE AUG 2004  
 VERIFIED *Sho don* 18/10/04  
 APPROVED *Sho don* 18/10/04

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**MAIN ROADS**  
 Western Australia

**GOLDFIELDS ESPERANCE REGION**  
 LOWER HANMAN STREET KALGOORLIE WA 6430  
 Telephone (08) 9080 1400 Fax (08) 9080 1452

AUTHORISED \_\_\_\_\_ DATE \_\_\_\_\_  
 APPROVED \_\_\_\_\_

**COOLGARDIE-ESPERANCE HIGHWAY (H10)  
 EMU ROCKS INTERSECTION IMPROVEMENTS  
 54.10 SLK TO 55.10 SLK  
 INTERSECTION PLAN  
 CHA 54461 TO CHA 54628**

LOCAL AUTHORITY (602) SHIRE OF COOLGARDIE  
 DRAWING TYPE 04-00 DRAWING NUMBER \_\_\_\_\_ AMEND. \_\_\_\_\_  
 FILE NUMBER **0405-7035-0**

SCALE 1:250 MICROFILM DATE A 1



Appendix B

## Photographs of the Project Site

## PHOTOS EMU ROCKS – WIDGIEMOOLTHA PROJECT



Photo Emu Rocks to Widgiemooltha Project looking south along the Great Eastern Highway. Existing seal width approximately 7m. Planned seal width 8m on 10m wide formation. Guide Post shown in photo are approx 9.8m



Photo Emu Rocks to Widgiemooltha Project Looking South



Possible realignment (minor) required on this curve to improve horizontal geometry



Possible realignment required on inside of curve to improve horizontal geometry. Red line indicates approximate area required for realignment.



Red Line indicates approximate area for realignment



View of vegetation on inside of curve that may need to be cleared to facilitate improvements in the horizontal geometry.



Approximate Clearing Limits to improve horizontal geometry.



Vegetation found throughout project corridor.



Emu Rocks to Widgiemooltha Project looking north along the Great Eastern Highway



Photo of Emu Rocks to Widgiemooltha Project looking south along the Great Eastern highway.

Invert of table drain indicated by green arrow is approximately 7m from the existing road centreline

Red Line indicates approximate edge of new formation.



Photo Emu Rocks to Widgiemooltha Project looking south.  
Red Lines indicate approximate location of the edge of the new formation.



Photo Emu Rocks to Widgiemooltha Project looking south.



Photo Emu Rocks to Widgiemooltha Project looking north



Photo of vegetation at southern end of the project.



Guide Post indicates approximate position of the edge of the new formation. Note grass on edge of roadway will need to be cleared.



Please note line indicates approximate disturbance limits.



Photo showing outlet of a drainage structure looking east.



Photo inlet of drainage structure looking west.

PHOTOS EMU ROCKS INTERSECTION UPGRADE



Photo showing intersection of Goldfields Highway and Coolgardie Esperance Highway (Emu Rocks Intersection). Looking west along the Goldfields Highway.

Centreline of Intersection Ch. 54550

Flagging LHS Ch. 54560

Flagging RHS Ch. 54540



Ch. 54350 Pink Flagging Tape indicates Clearing Limits



Ch. 54350 Looking South. Pink Flagging Tape indicates clearing Limits



Ch. 54350 Looking South along clearing Limits.



Ch. 54450 Clearing Limit



Ch 54450 Looking South



Ch 54450 Looking North Pink Flagging indicates clearing limits.



Ch. 54570 Looking North



Ch. 54570 Looking South



Ch 54600 Looking South



Ch. 54600 Looking North



Ch. 54740 Looking South



Ch 54740 Clearing Limits



Ch 54770 Looking North



Ch 54850 Looking at Clearing Limits Ch 54800



Appendix C

## Flora and Fauna Field Assessment

Main Roads Western Australia

**Spargoville Gravel Pit Extension;  
Emu Rocks Intersection Upgrade;  
and Emu Rocks – Widgiemooltha  
Road Upgrade**

Flora and Fauna Survey

Report

September 2005



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Location of Study Sites

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## Executive Summary

Main Roads Western Australia (MRWA) commissioned GHD Pty Ltd (GHD) to complete a Preliminary Environmental Impact Assessment (PEIA) associated with road upgrades of the Coolgardie – Esperance Highway. During the development of the PEIA the Department of Conservation and Land Management (CALM) requested MRWA undertake a flora and fauna survey of the area of proposed works. MRWA commissioned GHD to undertake a flora and opportunistic fauna survey at the following locations:

- ▶ Spargoville Gravel Pit (41.40 SLK) Extension;
- ▶ Emu Rocks intersection upgrade (Ch 54120 – 55090); and
- ▶ Emu Rocks – Widgiemooltha Road upgrade (Ch 55090 – 65090)

Following the biological survey on the 12<sup>th</sup> August 2005, the following information is presented:

- ▶ At the survey areas, no Declared Rare Flora (DRF) Species were recorded.
- ▶ Three Priority Flora species were recorded. Priority Flora species are not accorded the level of protection accorded to DRF. It is suggested, however, that liaison with the Department of Conservation and Land Management (CALM) occur with regards to the potential clearing of these species.
- ▶ One Declared Plant, the weed *Carthamnus latanus* (Saffron Thistle) was recorded from the current Emu Rocks pit. MRWA will be required to control this particular plant species to prevent its spread.
- ▶ Ward's Weed (*Carrichtera annua*) was recorded from all areas examined. However, it was only recorded at the present pit site in pile waste material brought in to the pit. Control of this weed species is recommended to prevent its spread into uninfested and healthy adjacent bushland.
- ▶ No significant fauna species were recorded during the survey. Fauna habitat is considered to be not significantly affected by proposed works.
- ▶ Appropriate weed management and equipment hygiene practices be maintained to ensure that the transport of weeds is removed or reduced. Where required, control of weed species of high ranking (Declared Plants, "High") should be undertaken to minimise the potential threat shown by these species. This is particularly important when moving equipment from cleared areas to locations where remnant native vegetation occurs. Hygiene practices must be undertaken when entering areas of remnant native vegetation.
- ▶ There are no issues that would trigger the provisions of the Commonwealth *Environmental Protection and Biodiversity Conservation Act, 1999* and therefore referral to the Commonwealths Department of Environment and Heritage is not required.



## 1. Introduction

Main Roads Western Australia (MRWA) commissioned GHD Pty Ltd (GHD) to complete a Preliminary Environmental Impact Assessment (PEIA) associated with road upgrades of the Coolgardie – Esperance Highway. During the development of the PEIA the Department of Conservation and Land Management (CALM) requested MRWA undertake a flora and fauna survey of the area of proposed works. MRWA commissioned GHD to undertake a flora and opportunistic fauna survey at the following locations:

- ▶ Spargoville Gravel Pit (41.40 SLK) Extension;
- ▶ Emu Rocks intersection upgrade (Ch 54120 – 55090); and
- ▶ Emu Rocks – Widgiemooltha Road upgrade (Ch 55090 – 65090)



## 2. Field Survey

### 2.1 Survey Methods – Vegetation and Flora

Surveys of the flora and vegetation in conjunction with an opportunistic fauna survey within the proposed borrow pit site as well as 25 m either side of the centreline of the Emu Rocks intersection upgrade and Emu Rocks to Widgiemooltha Road upgrade were conducted by a qualified botanist and zoologist on 12<sup>th</sup> of August 2005.

This survey recorded vegetation types and dominant species in each vegetation type. A list of species was generated for each vegetation type, with confirmations made at the West Australian State Herbarium. The presence of Declared Rare or Priority Flora was noted and commented upon. The condition and weed status of the vegetation were also noted.

The biological surveys were conducted in accordance with EPA Guidance Statements No. 51 and No. 56.

#### 2.1.1 Spargoville Gravel Pit

Botanical sampling at the Spargoville Gravel Pit area was undertaken using the following methods:

- ▶ Transects were traversed by foot across the site, where vegetation remained relatively homogenous; and
- ▶ Within each vegetation community observed, a 10 x 10 metre quadrat was examined for component flora, with species number and dominance recorded.

#### 2.1.2 Emu Rocks Intersection, Emu Rocks – Widgiemooltha Road Section

Given the relatively impacted nature of roadside vegetation, and the small areas sampled, examination of vegetation and flora was undertaken by traverse along the road edge. Sites were examined on foot and from a vehicle.

### 2.2 Survey Methods - Fauna

A reconnaissance fauna survey was undertaken in conjunction with the flora surveys. Fauna habitat and the targeting of locations deemed to have a higher quality, or providing a specific habitat type were examined in detail. Observation techniques combined opportunistic visual records with aural, tracks, scat and traces survey.

A similar survey was conducted for the presence of fauna, and a consideration of fauna habitat was undertaken in the search area.

### 2.3 Sites Examined

Sites examined are detailed in Table 2. These are located in Figure 1 (Appendix C). Three Quadrats (Q1, Q2, Q3), two Transects (T1, T2), and three traversed site areas



(Existing Pit, New Pit, Intersection, Road Reserve) were examined for component vegetation, flora and fauna.



### 3. Vegetation

#### 3.1 Vegetation Extent, Type and Status

A vegetation type is considered to be under-represented if there is less than 30 percent of its original distribution remaining. Table 1 indicates the native vegetation types represented at the site, their regional extent and reservation status as drawn from Shepherd *et al* (2002). None of the vegetation types recorded from the area are under-represented.

**Table 1 Vegetation Type, Extent and Status of Vegetation Communities, Emu Rocks Survey Area**

| Vegetation Association Number | Beard Code            | Description  | Pre-European Extent (Ha) | Current Extent (Ha) | % Remaining | % IUCN Class I-IV Reserves | % Other Reserves |
|-------------------------------|-----------------------|--|--------------------------|---------------------|-------------|----------------------------|------------------|
| 36                            | acSc                  | Shrublands; thicket, acacia-casuarina alliance   | 429,445                  | 177,262             | 41.3        | 10.8                       | 0.0              |
| 1024                          | ecSc                  | Shrublands; mallee & casuarina thicket   | 854,342                  | 77,984              | 9.1         | 9.0                        | 0.0              |
| 936                           | e <sub>8</sub> Mi     | Medium woodland; salmon gum  | 1,016,210                | 906,826             | 89.2        | 2.3                        | 1.7              |
| 522                           | e <sub>10,11</sub> Mi | Medium woodland; redwood ( <i>Eucalyptus transcontinentalis</i> ) & merrit ( <i>E. flocktoniae</i> ) | 759,523                  | 680,641             | 89.6        | 1.0                        | 0.6              |
| 2009                          | e <sub>10,13</sub> Mi | Medium woodland; redwood & goldfields blackbutt  | 57,606                   | 57,135              | 99.2        | 0.0                        | 21.2             |

Note: The Beard (1976) Map for the survey area lists a vegetation type: Broombush thicket: Casuarina-Acacia-Melaleuca, with the Code "cSc". This code is not in Shepherd, et al. (2002), requiring an approximation or closest fit for an estimation of vegetation type and current extent.

#### 3.2 Threatened Ecological Communities

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English and Blythe, 1997). Threatened Ecological Communities (TECs) are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community (i.e. Presumed Totally Destroyed, Critically Endangered, Endangered, and Vulnerable). Some TECs are protected under the Commonwealth *Environmental Protection and Biodiversity Act, 1999 (EPBC Act)*. Although TECs are not formally protected under the *Wildlife Conservation Act 1950*, the loss of, or disturbance to, some TECs trigger the EPBC Act. The Environmental Protection Authority's position on TECs states that proposals that result in the direct loss of TECs are likely to be formally assessed.



No Threatened Ecological Communities were recorded in the study area.

### 3.3 Vegetation Condition Rating

The vegetation communities and their condition ratings are detailed below. The vegetation condition was assessed in accordance with the Bush Forever (2000) Vegetation Condition Rating. A description of this rating scale is included below. The vegetation ranged from "Good to Excellent" condition, with most areas in "Very Good" condition. Generally, the area exhibits soil and vegetation degradation from grazing by livestock and feral goats and previous land clearing activities (including timber harvesting and small scale mining operations). There is little evidence of weed invasion with only three species of weed recorded for the area.

This scale recognises a level of intactness of vegetation which is defined by the following :

- ▶ completeness of structural levels;
- ▶ extent of weed invasion;
- ▶ historical disturbance from tracks and other clearing or dumping;
- ▶ the potential for natural or assisted regeneration.

The scale therefore consists of six rating levels as below :

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

Condition Ratings are allocated to each site examined in this survey, and are listed in Table 2.



**Table 2 Vegetation Communities and Vegetation Condition for the Emu Rocks Section of the Coolgardie to Esperance Highway**

| Site  | Location   | Vegetation Community   | Vegetation Condition   | Sites Surveyed                               |
|---|--|--|--|--|
| Spargoville Gravel Pit (41.40 SLK) Extension              | <i>The area north of the current Spargoville Gravel Pit to the Spargoville-Nepean road</i> | <i>Eucalyptus griffithsii</i> (Grey Gum) and <i>Eucalyptus salubris</i> (Gimlet) over mixed shrubs dominated by <i>Dodonaea stenozyga</i> , <i>Acacia pritzeliana</i> and <i>Eremophila virgata</i> in the lower lying areas to the south. Replaced by <i>Eucalyptus sheathiana</i> and Gimlet over <i>Acacia</i> species on the northern facing slopes. This area has a diverse range of species including some priority species. | 2 – evidence of previous logging. Site in healthy condition with no weed invasion.   | Quadrat 1, Quadrat 2, Transect 1, Transect 2 |
|   | <i>The Spargoville Gravel Pit</i>  | The surrounds of the pit contain species of <i>Melaleuca</i> , <i>Acacia</i> and <i>Allocasuarina</i> .<br><br>Within the pit area itself few species occur. Dumped material piles contain species not naturally occurring at the pit site.  | 3 – presence of some weeds, disturbances from machinery in the outskirts. 6 – completely degraded within the pit, presence of introduced and Declared weed species | Existing Pit                                 |
|   | <i>The area south of the Spargoville Gravel Pit – the proposed new pit area</i>            | Mixed <i>Acacia</i> , <i>Allocasuarina</i> and <i>Melaleuca</i> shrubland, with <i>Thryptomene urceolaris</i> and <i>Leucopogon</i> species over hammock grass. There was little variation in species over the area.   | 2 – evidence of past fire in some areas.   | Quadrat 3<br>New Pit                         |
| Emu Rocks intersection upgrade (Ch 54120 – 55090)         |  | The vegetation was dominated by salmon gum ( <i>Eucalyptus salmon</i> ) with the occasional Blackbutt over saltbush species ( <i>Atriplex</i> species) and weed species.   | 3-4 – presence of weed species   | Intersection                                 |
| Emu Rocks – Widgiemooltha Road upgrade (Ch 55090 – 65090) |  | The vegetation was dominated by salmon gum ( <i>Eucalyptus salmon</i> ) with over mixed chenopods, <i>Acacia jennerae</i> and disturbance response species.  | 4 – historically disturbed area.   | Road Reserve                                 |



## 4. Flora

Plants that could not be confidently named in the field were collected, pressed and compared with Western Australian Herbarium specimens for formal identification. Collections of specimens that may have been Priority Species were made to ensure their correct identification. Plant specimens were also collected from the existing basecourse pits for an examination of likely colonising species. Weed species (where present) were also collected to ensure correct identification and examined for their potential as Declared Plant species.

A list of all taxa collected and identified is provided in Appendix A, delineated by site surveyed. A total of 108 taxa representing 35 families of flora were identified during the survey. The final list is likely to be a reasonable reflection of perennial plant species present, with scattered annual species observed at their flowering peak during the survey periods (August). The southern Goldfields has received a lower than average winter rainfall, affecting the germination and growth of annual species.

The families that were the most represented at the survey sites were:

- ▶ Myrtaceae (eucalypts, melaleucas): 17 taxa
- ▶ Chenopodiaceae (saltbush, bluebush): 12 taxa
- ▶ Mimosaceae (wattles): 12 taxa
- ▶ Myoporaceae (eremophilas): 6 taxa
- ▶ Proteaceae (grevillea, hakea): 6 taxa

Individual genera were also dominant across the study sites, notably:

- ▶ *Acacia*: 12 species
- ▶ *Eucalyptus*: 10 species
- ▶ *Eremophila*: 6 species
- ▶ *Atriplex*, *Maireana*, and *Melaleuca*: 4 species each.

### 4.1 Significant Flora

The results of the CALM DRF and Priority Flora search are indicated in the PEIA document.

Of the plant species recorded from the survey area, three species are considered to be significant. No Declared Rare Flora was recorded from the survey area. The significant flora species are all Priority flora species:

- ▶ *Acacia pritzeliana*: Priority 3
- ▶ *Grevillea phillipsiana*: Priority 1
- ▶ *Melaleuca coccinea*: Priority 3



*Acacia pritzeliana* and *Grevillea phillipsiana* were recorded from north of the present pit site at the Spargoville – Nepean Road turnoff. Consultation with Main Roads personnel (Jake Loveday, *pers. comm.*) indicates that this area is not considered a priority for gravel search. Focus for gravel search was to the south of the present pit area. *Melaleuca coccinea* was recorded from the area to the south of the present pit.

No Declared Rare or Priority Flora species were recorded from either the Emu Rocks – Coolgardie-Esperance Highway Intersection, or along the road reserve area towards Widgiemooltha.

## 4.2 Weed Species

Of the taxa recorded, only three species are identified as an exotic or introduced/ornamental species: *Sonchus oleraceus* (Sowthistle), and two species of *Cuscuta* (Lesser Dodder). *Salsola kali* (Roly poly) is a native species often described as a weed plant (Hussey *et al.*, 1997), and was also located in this survey. None of the weed species recorded in the Martinick McNulty survey were recorded in this survey.

Given the lack of weed species recorded from this flora survey, it is suggested that hygiene practices be maintained to ensure that no other weeds and undesirable plant species are introduced to the region. Given the remoteness of the location, the maintenance of a minimal weed presence through best practice procedures should be relatively straightforward.

### 4.2.1 Declared Weeds

Declared weeds are those which have been listed by the Department of Agriculture under the *Agriculture and Related Resources Protection Act (1972)* as being of particular significance, usually because of their risk to agriculture. If these species are present, the landowner or manager is required to carry out weed control to a specified extent and to prevent the further spread or movement of them.

One Declared species was present in the study area. A single plant of *Carthamnus lanatus* (Saffron Thistle) was recorded from the existing pit area adjacent to a pile of deposited waste material piles. The category and explanation of Declared Plant ranking are detailed below (Table 3, Table 4).

**Table 3 Saffron Thistle Category in Western Australia**

|   |
|---|
| <b>Category: P3</b>   |
| <u>Location:</u> For the municipal districts of Albany (C), Augusta-Margaret River (S), Broomehill (S), Bunbury (C), Busselton (S), Capel (S), Carnamah (S), Collie (S), Coorow (S), Cranbrook (S), Cunderdin (S), Dardanup (S), Denmark (S), Donnybrook-Balingup (S), Dowerin (S), Dumbleyung (S), Gnowangerup (S), Harvey (S), Katanning (S), Kellerberrin (S), Kojonup (S), Koorda (S), Mandurah (C), Mount Marshall (S), Murray (S), Plantagenet (S), Serpentine-Jarrahdale (S), Tambellup (S), Tammin (S), Trayning (S), Wagin (S), Waroona (S), West Arthur (S), Woodanilling (S), Wyalkatchem (S). |
| <b>Category: P1</b>   |
| <u>Location:</u> for the whole of the State   |



**Category: P4**

**Location:** For the municipal districts of Ashburton (S), Beverley (S), Boddington (S), Brookton (S), Broome (S), Bruce Rock (S), Carnarvon (S), Chittering (S), Coolgardie (S), Corrigin (S), Cuballing (S), Cue (S), Dalwallinu (S), Dandaragan (S), Derby-West Kimberley (S), Dundas (S), East Pilbara (S), Esperance (S), Exmouth (S), Gingin (S), Goomalling (S), Halls Creek (S), Jerramungup (S), Kalgoorlie/Boulder (C), Kent (S), Kondinin (S), Kulin (S), Lake Grace (S), Laverton (S), Leonora (S), Meekatharra (S), Menzies (S), Merredin (S), Moora (S), Mount Magnet (S), Mukinbudin (S), Murchison (S), Narembeen (S), Narrogin (S), Ngaanyatjaraku (S), Northam (S), Northam (T), Nungarin (S), Pingelly (S), Port Hedland (T), Quairading (S), Ravensthorpe (S), Roebourne (S), Sandstone (S), Shark Bay (S), Toodyay (S), Upper Gascoyne (S), Victoria Plains (S), Wandering (S), Westonia (S), Wickiepin (S), Williams (S), Wiluna (S), Wongan-Ballidu (S), Wyndham-East Kimberley (S), Yalgoo (S), Yilgarn (S), York (S).

**Table 4 Declared Plant Category Explanations**

|   |  |
|---|--|
| <p><b>P1</b></p> <p><b>REQUIREMENTS</b></p> <p>Prohibits movement</p>   | <p>The movement of plants or their seeds is prohibited within the State.</p> <p>This prohibits the movement of contaminated machinery and produce including livestock and fodder.</p>  |
| <p><b>P3</b></p> <p><b>REQUIREMENTS</b></p> <p>Aims to control infestation by reducing area and/or density of infestation</p>       | <p>The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.</p> <p>Treat to destroy and prevent seed set all plants:-</p> <ul style="list-style-type: none"> <li>• Within 100 metres inside of the boundaries of the infestation</li> <li>• within 50 metres of roads and highwater mark on waterways</li> <li>• within 50 metres of sheds, stock yards and houses</li> </ul> <p>Treatment must be done prior to seed set each year.</p> <p>Of the remaining infested area:-</p> <p>Where plant density is 1-10 per hectare treat 100% of infestation.</p> <p>Where plant density is 11-100 per hectare treat 50% of infestation.</p> <p>Where plant density is 101-1000 per hectare treat 10% of infestation.</p> <p>Properties with less than 2 hectares of infestation must treat the entire infestation.</p> <p>Additional areas may be ordered to be treated.</p> |
| <p><b>P4</b></p> <p><b>REQUIREMENTS</b></p> <p>Aims to prevent infestation spreading beyond existing boundaries of infestation.</p> | <p>The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.</p> <p>Treat to destroy and prevent seed set all plants:-</p> <ul style="list-style-type: none"> <li>• within 100 metres inside of the boundaries of the infested property</li> <li>• within 50 metres of roads and highwater mark on waterways</li> <li>• within 50 metres of sheds, stock yards and houses</li> </ul> <p>Treatment must be done prior to seed set each year. Properties with less than 2 hectares of infestation must treat the entire infestation.</p> <p>Additional areas may be ordered to be treated.</p>  |



|                        |   |
|------------------------|---|
| Special considerations | In the case of P4 infestations where they continue across property boundaries there is no requirement to treat the relevant part of the property boundaries as long as the boundaries of the infestation as a whole are treated. There must be agreement between neighbours in relation to the treatment of these areas . |
|------------------------|---|

Ward's Weed (*Carrichtera annua*) was recorded from all areas examined. However, it was only recorded at the present pit site in pile waste material brought in to the pit. Control of this weed species is recommended to prevent its spread into uninfested and healthy adjacent bushland.



## 5. Fauna

An opportunistic fauna survey was undertaken in conjunction with the flora survey on the 12<sup>th</sup> of August 2005. A total of 17 bird species and two mammal species were recorded during the survey. No reptile, fish, or amphibian species were recorded from the project area.

A fauna list including species previously recorded (according to records held by the Western Australian Museum) in the area and those observed during the survey is included in Appendix B.

### **Nomenclature**

Field observations were undertaken using a range of references, and the nomenclature for taxonomic orders and animal names was sourced on information provided by the Western Australian Museum's online FaunaBase program (Western Australian Museum, 2005).

### **5.1 Significant Fauna**

Significant Fauna species are identified in the PEIA document. However, none of the species observed during the opportunistic fauna survey are considered as Rare or Priority species by CALM, or listed as significant under the EPBC Act.

### **5.2 Habitat Value**

All three proposed sites for material extraction are located in slightly upland areas. No water sources, natural or otherwise, were seen in the vicinity of the sites. Evidence exists that given enough rainfall, gullies and ephemeral creeklines adjacent to and running through the sites would flow, and potentially hold water in small pools before evaporating to dryness.

As individual sites, the development of the proposed pit and road upgrade will not impact severely on the existing animal habitat of the area. Due to a disruption in the natural overland flow of water bringing nutrients to the grove, changes are likely for downslope vegetation structure.

Also of note, at the existing pit are a number of fauna scratchings and burrows (mostly reptile) are present in piles of pushed up material. The natural soil condition of these areas is particularly stony, and burrowing activities through the softer, pushed up material is made easier for resident fauna.

The excavation of the basecourse pits will alter the natural runoff regimes of the areas, increasing the pooling capacity of significant runoff, and providing a temporary water resource for local fauna populations.

Fauna habitat is not considered to be significantly affected by proposed works.



## 6. Summary and Conclusions

At the survey areas, no Declared Rare Flora Species were recorded. Three Priority Plant species are recorded. Priority Flora species are not accorded the level of protection accorded to DRF. It is suggested, however, that liaison with CALM occur with regards to the potential clearing of these species.

One Declared Plant, the weed *Carthamnus latanus* (Saffron Thistle) was recorded from the current Emu Rocks pit. MRWA will be required to control this particular plant species to prevent its spread. It is recommended that a herbicide treatment as recommended by the Department of Agriculture, Western Australia (see [http://agwdsrv02.agric.wa.gov.au/dps/version02/01\\_plantview.asp?page=7&contentID=55](http://agwdsrv02.agric.wa.gov.au/dps/version02/01_plantview.asp?page=7&contentID=55) for details) for control. Given that only one plant was observed, immediate management is suggested before this species can spread into uninfested and healthy adjacent bushland.

Ward's Weed (*Carrichtera annua*) was recorded from all areas examined. However, it was only recorded at the present pit site in pile waste material brought in to the pit. Control of this weed species is recommended to prevent its spread into uninfested and healthy adjacent bushland.

No significant fauna species were recorded during the survey. Fauna habitat is considered to be not significantly affected by proposed works.



## 7. References

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Appendix A  
Flora List



**Table 5 List of Observed Flora, delineated by each study site**

| Family         | Genus                | Species                              | Common Name       | Status | Q1 | Q2 | Q3 | T1 | T2 | Ex Pit | New Pit | Inter | Road |
|----------------|----------------------|--------------------------------------|-------------------|--------|----|----|----|----|----|--------|---------|-------|------|
| Amaranthaceae  | <i>Ptilotus</i>      | <i>exaltatus</i>                     | Royal Mulla-Mulla |        |    |    |    |    |    |        |         | X     | X    |
| Amaranthaceae  | <i>Ptilotus</i>      | <i>obovatus</i>                      | Cotton Bush       |        |    |    |    |    |    |        |         | X     |      |
| Anthericaceae  | <i>Thysanotus</i>    | <i>manglesianus</i>                  | Fringed Lily      |        | X  |    |    | X  |    |        |         |       |      |
| Apiaceae       | <i>Platysace</i>     | <i>trachymenioides</i>               |                   |        |    |    | X  |    |    | X      |         |       |      |
| Apocynaceae    | <i>Alyxia</i>        | <i>buxifolia</i>                     | Dysentery Bush    |        |    |    |    | X  |    |        |         | X     |      |
| Asteraceae     | <i>Carthamnus</i>    | <i>lanatus</i>                       | Saffron Thistle   | DP     |    |    |    |    |    |        | X       |       |      |
| Asteraceae     | <i>Cratystylis</i>   | <i>subspinescens</i>                 | Spiny Grey Bush   |        |    |    |    |    |    |        |         |       | X    |
| Asteraceae     | <i>Olearia</i>       | <i>axillaris</i>                     |                   |        |    |    |    |    |    |        |         | X     |      |
| Asteraceae     | <i>Olearia</i>       | <i>muelleri</i>                      | Goldfields Daisy  |        |    |    |    | X  |    |        |         |       | X    |
| Boraginaceae   | <i>Halgania</i>      | <i>andromedifolia</i>                |                   |        |    |    | X  |    |    | X      |         |       |      |
| Brassicaceae   | <i>Carrichtera</i>   | <i>annua</i>                         | Wards Weed        |        |    |    |    |    |    |        | X       | X     | X    |
| Caesalpinaceae | <i>Senna</i>         | <i>artemisioides ssp. filifolia</i>  |                   |        | X  |    |    | X  |    |        |         |       |      |
| Caesalpinaceae | <i>Senna</i>         | <i>artemisioides ssp. x coriacea</i> |                   |        |    |    |    |    |    |        | X       | X     | X    |
| Casuarinaceae  | <i>Allocasuarina</i> | <i>?campestris</i>                   |                   |        |    |    | X  |    | X  | X      |         |       |      |
| Casuarinaceae  | <i>Allocasuarina</i> | <i>acutivalvis</i>                   |                   |        |    |    |    | X  |    |        |         |       |      |
| Chenopodiaceae | <i>Atriplex</i>      | <i>nummularia</i>                    | Old Man Saltbush  |        |    |    |    |    | X  |        |         | X     | X    |
| Chenopodiaceae | <i>Atriplex</i>      | <i>semibaccata</i>                   | Berry Saltbush    |        |    |    |    |    |    |        | X       | X     |      |
| Chenopodiaceae | <i>Atriplex</i>      | <i>stipitata</i>                     | Mallee Saltbush   |        |    |    |    |    |    |        | X       |       |      |



| Family          | Genus                 | Species                    | Common Name           | Status | Q1 | Q2 | Q3 | T1 | T2 | Ex Pit | New Pit | Inter | Road |
|-----------------|-----------------------|----------------------------|-----------------------|--------|----|----|----|----|----|--------|---------|-------|------|
| Chenopodiaceae  | <i>Atriplex</i>       | <i>vesicaria</i>           | Bladder Saltbush      |        |    |    |    |    |    |        | X       | X     | X    |
| Chenopodiaceae  | <i>Enchylaena</i>     | <i>tomentosa</i>           | Barrier Saltbush      |        |    |    |    |    |    |        |         | X     |      |
| Chenopodiaceae  | <i>Maireana</i>       | <i>carcosa</i>             | Cottony Bluebush      |        |    |    |    | X  |    |        |         |       |      |
| Chenopodiaceae  | <i>Maireana</i>       | <i>pyramidata</i>          | Sago Bush             |        |    |    |    |    |    |        |         |       | X    |
| Chenopodiaceae  | <i>Maireana</i>       | <i>sedifolia</i>           | Pearl Bluebush        |        |    |    |    |    |    |        |         | X     | X    |
| Chenopodiaceae  | <i>Maireana</i>       | <i>triptera</i>            | Three-winged Bluebush |        |    |    |    | X  |    |        |         | X     | X    |
| Chenopodiaceae  | <i>Salsola</i>        | <i>tragus</i>              |                       |        |    |    |    |    |    |        |         | X     | X    |
| Chenopodiaceae  | <i>Sclerolaena</i>    | <i>diacantha</i>           |                       |        |    |    |    | X  |    |        |         | X     | X    |
| Chenopodiaceae  | <i>Sclerolaena</i>    | <i>obliquicuspis</i>       |                       |        |    |    |    | X  |    |        |         | X     |      |
| Cupressaceae    | <i>Callitris</i>      | <i>tuberculata</i>         |                       |        |    |    | X  |    | X  | X      |         |       |      |
| Dilleniaceae    | <i>Hibbertia</i>      | <i>ancistrophylla</i>      |                       |        |    |    |    |    | X  |        |         |       |      |
| Epacridaceae    | <i>Leucopogon</i>     | <i>aff. sp. Clyde Hill</i> | clayde Hill?          |        |    |    |    |    |    | X      |         |       |      |
| Epacridaceae    | <i>Leucopogon</i>     | <i>hamulosus</i>           |                       |        |    |    | X  |    |    | X      |         |       |      |
| Epacridaceae    | <i>Leucopogon</i>     | <i>inflexifolius</i>       |                       |        |    |    | X  |    |    | X      |         |       |      |
| Frankeniaceae   | <i>Frankenia</i>      | <i>?sessilis</i>           |                       |        |    |    |    | X  |    |        |         |       |      |
| Frankeniaceae   | <i>Frankenia</i>      | <i>sp.</i>                 |                       |        |    |    |    |    |    |        | X       |       |      |
| Goodeniaceae    | <i>Dampiera</i>       | <i>tenuicaulis</i>         | Slender Dampiera      |        |    |    |    |    | X  |        |         |       |      |
| Goodeniaceae    | <i>Scaevola</i>       | <i>spinescens</i>          |                       |        | X  | X  |    | X  | X  |        |         | X     | X    |
| Goodeniaceae    | <i>Velleia</i>        | <i>discophora</i>          | Cabbage poison        |        |    |    |    |    | X  |        |         |       |      |
| Gyrostemonaceae | <i>Codonocarpus</i>   | <i>cotiniifolius</i>       | Native Poplar         |        |    |    |    |    |    |        | X       |       |      |
| Haloragaceae    | <i>Glischrocaryon</i> | <i>flavescens</i>          |                       |        |    |    |    |    |    |        | X       |       |      |



| Family      | Genus               | Species                                | Common Name   | Status | Q1 | Q2 | Q3 | T1 | T2 | Ex Pit | New Pit | Inter | Road |
|-------------|---------------------|--|---------------|--------|----|----|----|----|----|--------|---------|-------|------|
| Lamiaceae   | <i>Prostanthera</i> | <i>incurvata</i>                       |               |        |    |    |    |    |    | X      |         |       |      |
| Lamiaceae   | <i>Westringia</i>   | <i>rigida</i>                          |               |        | X  |    |    | X  |    |        |         |       | X    |
| Malvaceae   | <i>Sida</i>         | <i>calyxhymentia</i>                   |               |        |    |    |    |    |    |        | X       |       |      |
| Mimosaceae  | <i>Acacia</i>       | <i>acuminata</i>                       |               |        |    | X  |    | X  | X  |        |         | X     |      |
| Mimosaceae  | <i>Acacia</i>       | <i>burkittii</i>                       |               |        |    |    |    | X  |    |        |         |       |      |
| Mimosaceae  | <i>Acacia</i>       | <i>chrysellia</i>                      |               |        |    |    |    | X  |    |        |         |       |      |
| Mimosaceae  | <i>Acacia</i>       | <i>colletoides</i>                     | Wait-A-While  |        |    |    |    |    |    |        |         |       | X    |
| Mimosaceae  | <i>Acacia</i>       | <i>erinacea</i>                        |               |        |    | X  |    | X  | X  |        |         |       | X    |
| Mimosaceae  | <i>Acacia</i>       | <i>hemiteles</i>                       | Tan Wattle    |        |    |    |    |    |    |        |         |       | X    |
| Mimosaceae  | <i>Acacia</i>       | <i>inaequiloba</i>                     | Baderi        |        |    |    |    |    |    |        | X       |       |      |
| Mimosaceae  | <i>Acacia</i>       | <i>jennerae</i>                        |               |        |    |    |    |    |    |        | X       | X     | X    |
| Mimosaceae  | <i>Acacia</i>       | <i>lasiocalyx</i>                      | Silver Wattle |        |    |    |    |    |    | X      |         |       |      |
| Mimosaceae  | <i>Acacia</i>       | <i>pritzeliana</i>                     |               | P3     | X  |    |    | X  |    |        |         |       |      |
| Mimosaceae  | <i>Acacia</i>       | <i>sp.</i>                             |               |        |    |    |    |    |    |        |         | X     |      |
| Mimosaceae  | <i>Acacia</i>       | <i>uncinella</i>                       |               |        |    |    |    |    | X  |        |         |       |      |
| Myoporaceae | <i>Eremophila</i>   | <i>aff. clarkei</i>                    |               |        |    |    |    |    | X  |        |         |       |      |
| Myoporaceae | <i>Eremophila</i>   | <i>glabra</i>                          | Tar Bush      |        |    |    |    |    |    |        | X       | X     |      |
| Myoporaceae | <i>Eremophila</i>   | <i>oppositifolia ssp. angustifolia</i> |               |        |    | X  |    | X  | X  |        |         |       |      |
| Myoporaceae | <i>Eremophila</i>   | <i>scoparia</i>                        | Broom Bush    |        |    |    |    |    |    |        |         | X     | X    |
| Myoporaceae | <i>Eremophila</i>   | <i>sp.</i>                             |               |        |    |    |    |    | X  |        |         |       |      |
| Myoporaceae | <i>Eremophila</i>   | <i>virgata</i>                         |               |        | X  |    |    | X  |    |        |         | X     |      |



| Family           | Genus               | Species                   | Common Name           | Status | Q1 | Q2 | Q3 | T1 | T2 | Ex Pit | New Pit | Inter | Road |
|------------------|---------------------|---------------------------|-----------------------|--------|----|----|----|----|----|--------|---------|-------|------|
| Myrtaceae        | <i>Calothamnus</i>  | <i>gilesii</i>            |                       |        |    |    | X  |    | X  | X      |         |       |      |
| Myrtaceae        | <i>Eucalyptus</i>   | <i>celastroides</i>       |                       |        |    |    |    |    |    |        |         |       | X    |
| Myrtaceae        | <i>Eucalyptus</i>   | <i>eremophila</i>         | Tall Sand Mallee      |        |    |    |    |    | X  |        |         |       |      |
| Myrtaceae        | <i>Eucalyptus</i>   | <i>griffithsii</i>        | Griffiths Grey Gum    |        | X  |    |    | X  |    |        |         |       | X    |
| Myrtaceae        | <i>Eucalyptus</i>   | <i>leptopoda</i>          |                       |        |    |    |    |    |    | X      |         |       |      |
| Myrtaceae        | <i>Eucalyptus</i>   | <i>lesouefii</i>          | Goldfields Black Butt |        |    |    |    |    |    |        |         | X     |      |
| Myrtaceae        | <i>Eucalyptus</i>   | <i>salmonophloia</i>      | Salmon Gum            |        |    |    |    |    |    |        |         | X     | X    |
| Myrtaceae        | <i>Eucalyptus</i>   | <i>salubris</i>           | Gimlet                |        | X  | X  |    | X  | X  |        |         |       |      |
| Myrtaceae        | <i>Eucalyptus</i>   | <i>sheathiana</i>         | Ribbon Barked Gum     |        |    | X  |    | X  | X  |        |         |       |      |
| Myrtaceae        | <i>Eucalyptus</i>   | <i>transcontinentalis</i> | Redwood               |        |    |    |    | X  |    |        |         |       |      |
| Myrtaceae        | <i>Eucalyptus</i>   | <i>oleosa</i>             | Giant Mallee          |        |    |    |    |    | X  |        |         |       |      |
| Myrtaceae        | <i>Leptospermum</i> | <i>?roei</i>              |                       |        |    |    |    |    |    | X      |         |       |      |
| Myrtaceae        | <i>Melaleuca</i>    | <i>coccinea</i>           |                       | P3     |    |    |    |    | X  |        |         |       |      |
| Myrtaceae        | <i>Melaleuca</i>    | <i>hamulosa</i>           |                       |        |    |    |    |    | X  |        |         |       |      |
| Myrtaceae        | <i>Melaleuca</i>    | <i>sheathiana</i>         | Boree                 |        |    |    |    |    |    |        |         |       | X    |
| Myrtaceae        | <i>Melaleuca</i>    | <i>uncinata</i>           | Broombrush            |        |    |    |    |    |    | X      |         |       |      |
| Myrtaceae        | <i>Thryptomene</i>  | <i>urceolaris</i>         |                       |        |    |    | X  |    |    | X      |         |       |      |
| Phormiaceae      | <i>Dianella</i>     | <i>revoluta</i>           | Flax Lily             |        |    |    |    |    |    | X      |         |       |      |
| Pittosporumaceae | <i>Pittosprum</i>   | <i>angustifolium</i>      | Native Apricot        |        |    |    |    |    |    |        |         | X     |      |
| Poaceae          | <i>Amhipogon</i>    | <i>turbinatus</i>         |                       |        |    |    |    |    |    |        |         | X     |      |
| Poaceae          | <i>Austrostipa</i>  | <i>elegantissima</i>      |                       |        |    |    |    | X  |    |        |         |       |      |



| Family      | Genus               | Species              | Common Name       | Status | Q1 | Q2 | Q3 | T1 | T2 | Ex Pit | New Pit | Inter | Road |
|-------------|---------------------|----------------------|-------------------|--------|----|----|----|----|----|--------|---------|-------|------|
| Poaceae     | <i>Eragrostis</i>   | <i>curvula</i>       | African Lovegrass |        |    |    |    |    |    |        |         | X     | X    |
| Proteaceae  | <i>Banksia</i>      | <i>elderiana</i>     | Swordfish Banksia |        |    |    |    |    |    | X      |         |       |      |
| Proteaceae  | <i>Grevillea</i>    | <i>haplantha</i>     |                   |        |    |    |    |    |    | X      |         |       |      |
| Proteaceae  | <i>Grevillea</i>    | <i>paradoxa</i>      |                   |        |    |    | X  |    |    | X      |         |       |      |
| Proteaceae  | <i>Grevillea</i>    | <i>phillipsiana</i>  |                   | P1     |    |    |    | X  |    | X      |         |       |      |
| Proteaceae  | <i>Persoonia</i>    | <i>coriacea</i>      |                   |        |    |    |    |    |    | X      |         |       |      |
| Proteaceae  | <i>Persoonia</i>    | <i>helix</i>         |                   |        |    |    |    |    |    | X      |         |       |      |
| Rhamnaceae  | <i>Cryptandra</i>   | <i>aridicola</i>     |                   |        |    |    |    |    |    | X      |         |       |      |
| Rhamnaceae  | <i>Prostanthera</i> | <i>?althoferi</i>    |                   |        |    | X  |    | X  | X  |        |         |       |      |
| Rhamnaceae  | <i>Prostanthera</i> | <i>grylloana</i>     |                   |        |    |    |    | X  |    |        |         |       |      |
| Rhamnaceae  | <i>Stenanthemum</i> | <i>stipulosum</i>    |                   |        | X  |    |    | X  |    |        |         |       |      |
| Rutaceae    | <i>Phebalium</i>    | <i>canaliculatum</i> |                   |        |    |    |    |    | X  |        |         |       | X    |
| Rutaceae    | <i>Phebalium</i>    | <i>lepidotum</i>     |                   |        |    |    |    |    |    | X      |         |       |      |
| Rutaceae    | <i>Phebalium</i>    | <i>tuberculosum</i>  |                   |        | X  |    |    | X  |    |        |         |       |      |
| Santalaceae | <i>Exocarpos</i>    | <i>aphyllus</i>      | Leafless ballart  |        |    |    |    | X  |    |        |         | X     |      |
| Santalaceae | <i>Exocarpos</i>    | <i>sparteus</i>      | Broom Ballart     |        |    |    |    |    |    | X      |         |       |      |
| Santalaceae | <i>Santalum</i>     | <i>acuminatum</i>    | Quandong          |        |    |    |    | X  |    |        |         |       | X    |
| Santalaceae | <i>Santalum</i>     | <i>spicatum</i>      | Sandalwood        |        |    |    |    |    |    |        |         |       | X    |
| Sapindaceae | <i>Dodonaea</i>     | <i>lobulata</i>      | Bead Hopbush      |        |    |    |    |    | X  |        |         | X     |      |
| Sapindaceae | <i>Dodonaea</i>     | <i>microzyga</i>     |                   |        | X  | X  |    | X  | X  |        |         |       |      |
| Sapindaceae | <i>Dodonaea</i>     | <i>stenozyga</i>     |                   |        | X  |    |    | X  |    |        |         |       |      |



| Family         | Genus              | Species             | Common Name     | Status | Q1 | Q2 | Q3 | T1 | T2 | Ex Pit | New Pit | Inter | Road |
|----------------|--------------------|---------------------|-----------------|--------|----|----|----|----|----|--------|---------|-------|------|
| Solanaceae     | <i>Solanum</i>     | <i>orbiculatum</i>  |                 |        |    |    |    |    |    | X      |         |       |      |
| Solanaceae     | <i>Solanum</i>     | <i>plicatile</i>    |                 |        |    |    |    |    |    |        | X       |       |      |
| Sterculiaceae  | <i>Keraudrenia</i> | <i>integrifolia</i> | Common Firebush |        |    |    |    |    | X  |        |         |       |      |
| Thymelaeaceae  | <i>Pimelea</i>     | <i>microcephala</i> |                 |        |    |    |    |    |    | X      |         | X     |      |
| Violaceae      | <i>Hybanthus</i>   | <i>epacroides</i>   |                 |        |    |    |    |    |    |        | X       |       |      |
| Zygophyllaceae | <i>Zygophyllum</i> | <i>eremaeum</i>     |                 |        |    |    |    | X  |    |        |         |       | X    |

Where P1 = Priority 1, P3 = Priority 3, DP = Declared Plant (weed), \* = introduced, weed species



Appendix B  
Fauna List



**Table 6 List of Observed Fauna**

| Family               | Genus                | Species                | Common Name               | Status |
|----------------------|----------------------|------------------------|---------------------------|--------|
| <b>Birds</b>         |                      |                        |                           |        |
| Accipitridae         | <i>Aquila</i>        | <i>audax</i>           | Wedge-tailed Eagle        |        |
| Alcedinidae          | <i>Ocyphaps</i>      | <i>lophotes</i>        | Crested Pigeon            |        |
| Campephagidae        | <i>Coracina</i>      | <i>novaehollandiae</i> | Black-faced Cuckoo-Shrike |        |
| Casuariidae          | <i>Dromaius</i>      | <i>novaehollandiae</i> | Emu                       |        |
| Corvidae             | <i>Corvus</i>        | <i>coronoides</i>      | Australian Raven          |        |
| Cracticidae          | <i>Cracticus</i>     | <i>torquatus</i>       | Grey Bucherbird           |        |
| Cracticidae          | <i>Cracticus</i>     | <i>tibicen</i>         | Australian Magpie         |        |
| Cracticidae          | <i>Strepera</i>      | <i>versicolor</i>      | Grey Currawong            |        |
| Dicruridae           | <i>Rhipidura</i>     | <i>leucophrys</i>      | Willie Wagtail            |        |
| Dicruridae           | <i>Grallina</i>      | <i>cyanoleuca</i>      | Magpie-Lark, Mudlark      |        |
| Falconidae           | <i>Falco</i>         | <i>cenchroides</i>     | Australian Kestrel        |        |
| Hirundinidae         | <i>Hirundo</i>       | <i>neoxena</i>         | Welcome Swallow           |        |
| Meliphagidae         | <i>Lichenostomus</i> | <i>virescens</i>       | Singing Honeyeater        |        |
| Meliphagidae         | <i>Phylidonyris</i>  | <i>albifrons</i>       | White-fronted Honeyeater  |        |
| Pachycephalidae      | <i>Colluricincla</i> | <i>harmonica</i>       | Grey Shrike-thrush        |        |
| Psittacidae          | <i>Cacatua</i>       | <i>roseicapilla</i>    | Galah                     |        |
| Psittacidae          | <i>Platycercus</i>   | <i>zonarius</i>        | Australian Ringneck       |        |
| <b>Amphibians</b>    |                      |                        |                           |        |
| No Frogs Observed    |                      |                        |                           |        |
| <b>Fish</b>          |                      |                        |                           |        |
| No Fish Observed     |                      |                        |                           |        |
| <b>Mammals</b>       |                      |                        |                           |        |
| Macropodidae         | <i>Macropus</i>      | <i>rufus</i>           | Red Kangaroo              |        |
| Leporidae            | <i>Oryctolagus</i>   | <i>cuniculus</i>       | European Rabbit           | *      |
| <b>Reptiles</b>      |                      |                        |                           |        |
| No Reptiles Observed |                      |                        |                           |        |

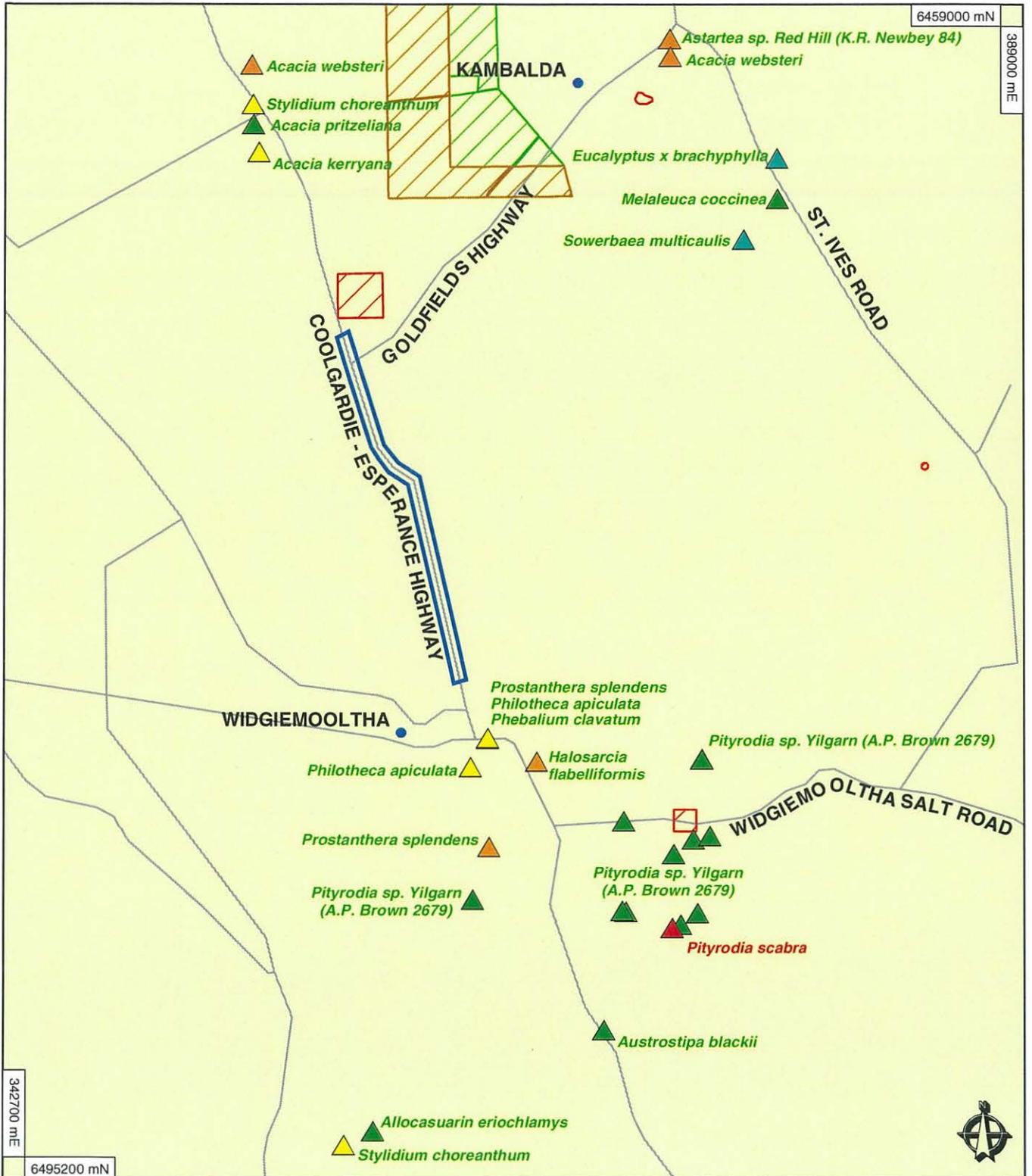
where \* = introduced, feral



Appendix C

## Plates

Study Location, Photographs of Study Sites



**LEGEND**

- ▲ Declared Rare Flora
- ▲ Priority 1 Flora
- ▲ Priority 2 Flora
- ▲ Priority 3 Flora
- ▲ Priority 4 Flora
- Study Area
- Aboriginal Heritage Sites
- CALM Nature Reserve
- CALM Timber Reserve
- Major Roads



**LOCALITY MAP**



Southern Coastal Region

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|--------------------------|---|-------------------------|
| CREATED BY<br>MD         | CHECKED   | APPROVED                |
| HORIZONTAL DATUM: GDA 94 |   | PROJECTION: MGA Zone 51 |
| HEIGHT DATUM: N/A        |   | METADATA RECORDED: 100% |
| DATE<br>23.06.05         | FILE LOCATION<br>N:/61/16305/GIS/MXD/6116305-G1_250.mxd |                         |
| REVISION<br>0            | DRAWING NO<br>6116305-G1                                |                         |



**EMU ROCKS - WIDGIEMOOLTHA RD ENVIRONMENTAL SURVEY**

**Figure 1**  
 Locality, Aboriginal Heritage & Priority and Declared Rare Flora

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS



**Plate 1.** Quadrat 1. Photograph looking South East. *Eucalyptus griffithsii*, *E. salubris* over *Dodonaea stenozyga*, *Prostanthera incurvata*, *Acacia pritzeliana*.



**Plate 2.** Quadrat 2. Photograph looking South East. *Eucalyptus sheathiana*  
*Acacia chrysellia*, *Scaevola spinescens*.



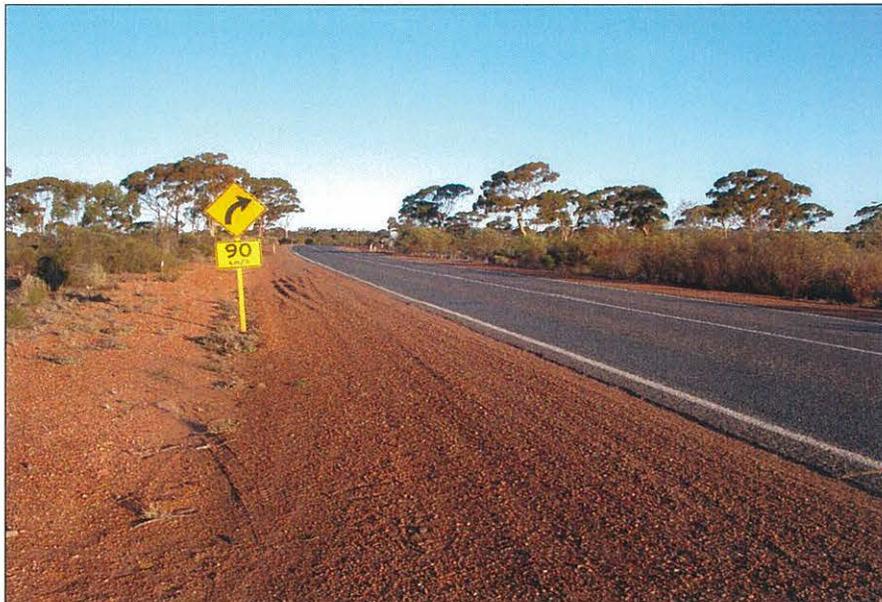
**Plate 3.** Quadrat 3. Photograph looking South East. *Allocasuarina campestris*, *Grevillea paradoxa*, *Callitris tuberculata*, over *Leucopogon* spp., *Thryptomene urceolaris*, *Amphipogon turbinatus* .



**Plate 4.** Panorama of Existing Spargoville Pit looking south towards New Pit area.



**Plate 5.** Panorama of Emu Rocks Intersection



**Plate 6.** Photograph looking South of Road Reserve where bend is to be improved.



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|         |          |                     |           |                    |           |      |
|         |          |                     |           |                    |           |      |
|         |          |                     |           |                    |           |      |



Appendix D  
**Fauna Database Search**

**Amphibians**

|                                |                                   |
|--------------------------------|-----------------------------------|
| <i>Neobatrachus kunapalari</i> | Kunapalari Frog or Wheatbelt Frog |
|--------------------------------|-----------------------------------|

**Birds**

|                              |                           |
|------------------------------|---------------------------|
| <i>Acanthiza uropygialis</i> | Chestnut-tailed Thornbill |
|------------------------------|---------------------------|

|                                       |  |
|---------------------------------------|--|
| <i>Aquila morphnoides morphnoides</i> |  |
|---------------------------------------|--|

|                              |               |
|------------------------------|---------------|
| <i>Dicaeum hirundinaceum</i> | Mistletoebird |
|------------------------------|---------------|

|   |                      |
|---|----------------------|
| <i>Eopsaltria australis griseogularis</i> | Western Yellow Robin |
|---|----------------------|

|                               |                                 |
|-------------------------------|---------------------------------|
| <b><i>Leipoa ocellata</i></b> | <b>Mallee Fowl (Schedule 1)</b> |
|-------------------------------|---------------------------------|

|                             |                          |
|-----------------------------|--------------------------|
| <i>Malurus pulcherrimus</i> | Blue-breasted Fairy-wren |
|-----------------------------|--------------------------|

|                                |         |
|--------------------------------|---------|
| <i>Smicromnis brevirostris</i> | Weebill |
|--------------------------------|---------|

**Mammals**

|                              |                      |
|------------------------------|----------------------|
| <i>Cercartetus concinnus</i> | Western Pygmy-possum |
|------------------------------|----------------------|

**Reptiles**

|   |                                  |
|---|----------------------------------|
| <i>Brachyuropis fasciolata fasciolata</i> | Narrow-banded shovel-nosed snake |
|---|----------------------------------|

|                                  |                             |
|----------------------------------|-----------------------------|
| <i>Brachyuropis semifasciata</i> | Southern shovel-nosed snake |
|----------------------------------|-----------------------------|

|  |                |
|--|----------------|
| <i>Crenadactylus ocellatus ocellatus</i> | Clawless Gecko |
|--|----------------|

|                              |                        |
|------------------------------|------------------------|
| <i>Ctenophorus cristatus</i> | Crested Bicycle Dragon |
|------------------------------|------------------------|

|                            |                    |
|----------------------------|--------------------|
| <i>Ctenophorus ornatus</i> | Ornate Rock Dragon |
|----------------------------|--------------------|

|                                |                       |
|--------------------------------|-----------------------|
| <i>Ctenophorus reticulatus</i> | Western Netted Dragon |
|--------------------------------|-----------------------|

|                              |                  |
|------------------------------|------------------|
| <i>Ctenophorus salinarum</i> | Salt Lake Dragon |
|------------------------------|------------------|

|                               |                               |
|-------------------------------|-------------------------------|
| <i>Ctenophorus scutulatus</i> | Lozenge-marked Bicycle Dragon |
|-------------------------------|-------------------------------|

|  |                            |
|--|----------------------------|
| <i>Cyclodomorphus melanops elongatus</i> | Eastern Slender Bluetongue |
|--|----------------------------|

|                        |                     |
|------------------------|---------------------|
| <i>Delma australis</i> | Marbled-faced Delma |
|------------------------|---------------------|

|                              |                         |
|------------------------------|-------------------------|
| <i>Delma fraseri fraseri</i> | Fraser's Legless Lizard |
|------------------------------|-------------------------|

|                                       |                        |
|---------------------------------------|------------------------|
| <i>Demansia psammophis psammophis</i> | Yellow-faced Whipsnake |
|---------------------------------------|------------------------|

|  |                       |
|--|-----------------------|
| <i>Diplodactylus granariensis granariensis</i> | Wheatbelt Stone Gecko |
|--|-----------------------|

|                            |                     |
|----------------------------|---------------------|
| <i>Diplodactylus maini</i> | Main's Ground Gecko |
|----------------------------|---------------------|

|                              |                 |
|------------------------------|-----------------|
| <i>Diplodactylus pulcher</i> | Beautiful Gecko |
|------------------------------|-----------------|

|                         |                          |
|-------------------------|--------------------------|
| <i>Egernia depressa</i> | Pygmy Spiny-tailed Skink |
|-------------------------|--------------------------|

|                        |                          |
|------------------------|--------------------------|
| <i>Egernia formosa</i> | Goldfields Crevice Skink |
|------------------------|--------------------------|

|                         |                        |
|-------------------------|------------------------|
| <i>Egernia inornata</i> | Unadorned Desert Skink |
|-------------------------|------------------------|

|                                 |                   |
|---------------------------------|-------------------|
| <i>Egernia multiscutata bos</i> | Bull-headed Skink |
|---------------------------------|-------------------|

|                                   |              |
|-----------------------------------|--------------|
| <i>Eremiascincus richardsonii</i> | Banded Skink |
|-----------------------------------|--------------|

|                         |                        |
|-------------------------|------------------------|
| <i>Gehyra variegata</i> | Variegated Tree Dtella |
|-------------------------|------------------------|

|   |   |
|---|---|
| <i>Hemiergis initialis initialis</i>    | Five-toed Earless Skink   |
| <i>Hemiergis peronii peronii</i>        | Four-toed Earless Skink   |
| <i>Heteronotia binoei</i>               | Bynoe's Gecko   |
| <i>Lerista muelleri</i>                 |   |
| <i>Menetia greyii</i>                   | Common Dwarf Skink  |
| <i>Moloch horridus</i>                  | Thorny Devil  |
| <b><i>Morelia spilota imbricata</i></b> | <b>Southern Carpet Python (Schedule 4 – Other Specifically Protected Fauna)</b> |
| <i>Morethia butleri</i>                 |   |
| <i>Nephrurus laevisissimus</i>          | Smooth Knob-tailed Gecko  |
| <i>Parasuta gouldii</i>                 | Gould's snake   |
| <i>Parasuta monachus</i>                | Monk snake  |
| <i>Pseudechis australis</i>             | Mulga snake   |
| <i>Pseudonaja affinis affinis</i>       | Dugite  |
| <i>Pseudonaja modesta</i>               | Dugite  |
| <i>Pseudonaja nuchalis</i>              | Gwardar   |
| <i>Pygopus lepidopodus</i>              | Common Scaly-foot   |
| <i>Ramphotyphlops australis</i>         |   |
| <i>Ramphotyphlops bicolor</i>           |   |
| <i>Ramphotyphlops bituberculatus</i>    |   |
| <i>Simoselaps bertholdi</i>             | Jan's banded snake  |
| <i>Suta fasciata</i>                    | Rosen's snake   |
| <i>Tympanocryptis cephalata</i>         | Earless Pebble Dragon   |
| <i>Varanus gouldii</i>                  | Gould's Sand Monitor  |
| <i>Varanus tristis tristis</i>          | Black-headed Monitor  |



Appendix E  
**Aboriginal Heritage**

# REGISTER OF ABORIGINAL SITES



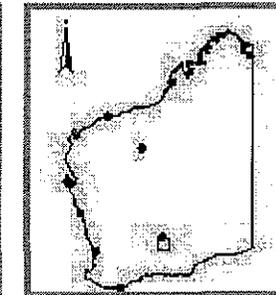
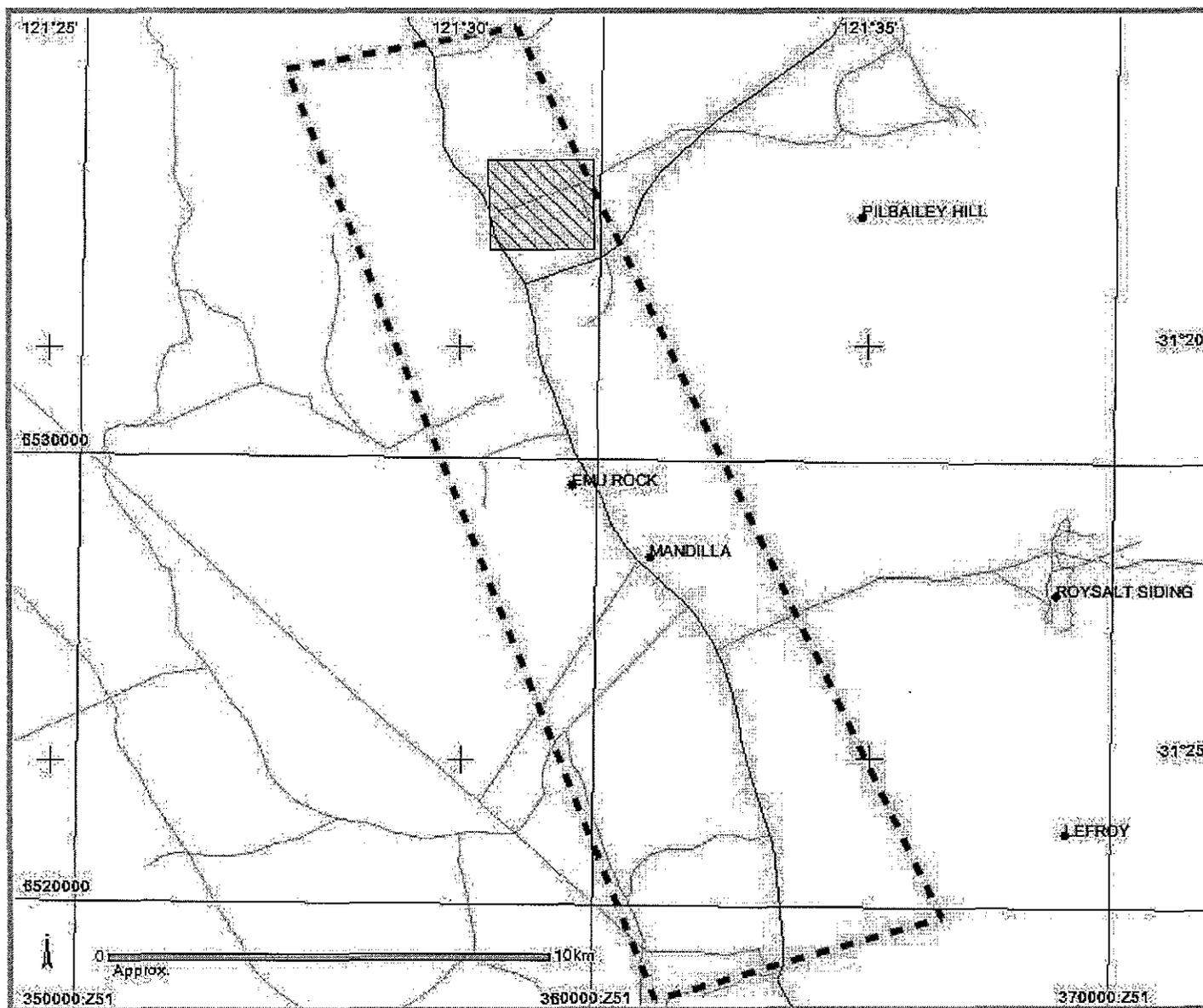
|   |   |
|---|---|
| <p><b>Search Criteria</b></p> <p>MGA Coordinates (Zone 51)<br/>         Easting: 353881 Northing: 6538685<br/>         Easting: 358319 Northing: 6539687<br/>         Easting: 366766 Northing: 6519786<br/>         Easting: 361254 Northing: 6517854<br/>         Easting: 353881 Northing: 6538685</p> | <p><b>Disclaimer</b></p> <p>Copyright in the information contained herein is and shall remain the property of the Government of Western Australia. All rights reserved. This includes, but is not limited to, information from the Register of Places and Objects (often known as the 'Sites Register') established and maintained under the <i>Aboriginal Heritage Act 1972 (AHA)</i>.</p> <p>Aboriginal sites exist that are not recorded on the Sites Register, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.</p> |
|---|---|

|   |                      |               |               |                  |                    |          |                    |                      |        |                      |               |              |   |
|---|----------------------|---------------|---------------|------------------|--------------------|----------|--------------------|----------------------|--------|----------------------|---------------|--------------|---|
| <p><b>Legend</b></p> <table border="0"> <tr> <td><b>Restriction</b></td> <td><b>Status</b></td> <td><b>Access</b></td> </tr> <tr> <td>N No Restriction</td> <td>I Interim Register</td> <td>C Closed</td> </tr> <tr> <td>M Male Access Only</td> <td>P Permanent Register</td> <td>O Open</td> </tr> <tr> <td>F Female Access Only</td> <td>S Stored Data</td> <td>V Vulnerable</td> </tr> </table> | <b>Restriction</b>   | <b>Status</b> | <b>Access</b> | N No Restriction | I Interim Register | C Closed | M Male Access Only | P Permanent Register | O Open | F Female Access Only | S Stored Data | V Vulnerable | <p>Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.</p> <p>Reliable – The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.</p> <p>Unreliable – The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.</p> |
| <b>Restriction</b>  | <b>Status</b>        | <b>Access</b> |               |                  |                    |          |                    |                      |        |                      |               |              |   |
| N No Restriction  | I Interim Register   | C Closed      |               |                  |                    |          |                    |                      |        |                      |               |              |   |
| M Male Access Only  | P Permanent Register | O Open        |               |                  |                    |          |                    |                      |        |                      |               |              |   |
| F Female Access Only  | S Stored Data        | V Vulnerable  |               |                  |                    |          |                    |                      |        |                      |               |              |   |

| Site ID | Status | Access | Restriction | Site Name       | Site Type                   | Additional Info | Informants                                      | Coordinates  | Site No. |
|---------|--------|--------|-------------|-----------------|-----------------------------|-----------------|---|--|----------|
| 497     | P      | C      | M           | MILBARI NIDJURU | Ceremonial,<br>Mythological |                 | *Registered Informant names available from DIA. | -31.3123 S /<br>121.5088 E,<br>358103mE<br>6534825mN Zone 51<br>[Unreliable] | W02250   |

# REGISTER OF ABORIGINAL SITES

## SITE SEARCH MAP



**Legend**

- Selected Site
- Town
- Map Area
- Search Area

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### 1 Aboriginal Heritage Sites found in Polygon

- MGA Coordinates (Zone 51)
- Easting: 353881 Northing: 6538685
  - Easting: 358319 Northing: 6539687
  - Easting: 366766 Northing: 6519786
  - Easting: 361254 Northing: 6517854
  - Easting: 353881 Northing: 6538685



Appendix F

# Correspondence from State Government Departments



"MARELICH Tim"  
<tim.marelich@environment  
.wa.gov.au>

16/06/2005 03:30 PM

To <anagle@ghd.com.au>

cc

bcc

Subject Preliminary Environmental Impact Assessment

To protect GHD and staff, all electronic mail sent or received via GHD's data systems is automatically filtered and may be examined at the discretion of management, without prior notification to the sender or recipient. Confidential information should not be sent by electronic mail as the security of this information cannot be guaranteed.

History: This message has been replied to.

Andrew.

I have had a quick look at the proposal you forwarded to me on June 8th regarding the Goldfields Highway and Coolgardie-Esperance Highway Roadworks

#### *Clearing of Native Vegetation*

I believe that the main area of concern to the DoE based on the information you have provided is the clearing of native vegetation that is proposed to occur as part of the road widening and realignment activities as well as the borrow pit (section 1.3).

I suggest that you consult the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 and provide some explanation in your assessment as to which parts of the clearing are exempt from requiring a permit and which parts may require a permit. If a permit is required it is good to get the application in early.

#### *Dust*

Dust generation is a potential issue of concern. Information should be provided on what measures will be put in place to control dust during construction activities. I am assuming the a portion of the water being used for construction will be used for dust suppression purposes.

#### *Groundwater Extraction*

A licence is required to extract groundwater in the Goldfields Groundwater Area. If water from road construction is to be extracted from Magellan's bore a letter should be provided by Magellan authorising the use of the water. It should also stipulate the estimated quantity to be used. If the volume is significant enough a licence amendment may be required.

If you have any questions in this regard please telephone me on 9021 3243.

Regards

*Tim Marelich*  
*Acting Program Manager*  
*Department of Environment*  
*Kalgoorlie Office*  
*ph: 9021 3243*  
*fax: 9021 3529*

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"Addison, Jim"  
<jaddison@agric.wa.gov.au  
>  
09/06/2005 10:45 AM

To "Andrew Nagle (GHD)" <anagle@ghd.com.au>  
cc  
bcc

Subject MRWA Wiluna-Magellan and Emu Rocks

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History:  This message has been replied to.

Greetings Andrew

Any concerns we might have would centre on any modifications to surface hydrology created by the earthworks.

The two major issues are;

1. water privation of down-slope vegetation which may lead to death of trees/shrubs
2. concentration of overland flows through culverts/floodways which might predispose down-slope soil surfaces to accelerated erosion

The Wiluna-Magellan project will be the more critical in these regards as landscapes in the area have relatively low water infiltration rates and can be subjected to intense summer storms.

I would expect both projects to require clearing permits if more than one hectare of vegetation is to be cleared. During that application process these surface hydrology issues would receive more attention.

I apologise for the brief nature of this response but time presses

Cheers jim

Jim Addison  
Senior Technical Officer  
Department of Agriculture  
Kalgoorlie District Office  
Ph. (08) 9088 6017 Fax (08) 9088 6034  
(PO Box 417 Kalgoorlie WA 6430)

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Our Ref: Brad Barton  
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Fax:  
Email:

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Mr A Nagle  
Senior Environmental Scientist  
GHD Pty Ltd  
PO Box Y3106  
PERTH WA 6832

Dear Andrew

**Preliminary Environmental Impact Assessment Goldfields Highway (Wiluna to Magellan) and Coolgardie-Esperance Highway (Emu Rocks)**

Thank you for your fax and subsequent email of the 8 June 2005 detailing the preliminary Environmental Impact Assessment for the above mention projects.

As explained to you during our telephone conversation on the same day the Department of Conservation and Land Management (CALM) has legislative responsibility in these areas with regard to the Conservation and Land Management Act 1984 and the Wildlife Conservation Act 1950.

CALM Goldfields Region has reviewed your documentation and information supplied by CALM's Wildlife Branch and provide the following comments;

- **Wiluna**

*Eremophila congesta* P1, *Eremophila flaccida* subsp *clementii* P1, *Euryomyrtus inflata* P1 are all found within the local area and listed on Wildlife Branch's database search. The additional record of *Stackhousia clementii* P1 (found along drainage lines) is recorded on our regional database.

There does not appear to be any known issues relating to restricted vegetation community types that will be impacted by this project.

Field surveys by a suitably qualified botanist will be required to determine if any of these species are likely to be disturbed during the completion of this project.

## Goldfields-Esp H'way

*Prostanthera splendens* P1, *Philothea apiculata* P2 and *Phebalium clavatum* P2 are all known from the local area (and noted on our regional database and not Wildlife branch's database search) and if the project involves any areas around the margins of salt lakes then *Halosarcia flabelliformis* P1 and *Pityrodia* sp Yilgarn P3 need to be considered.

There does not appear to be any known restricted vegetation community types that occur in the area that this project will impact upon.

Field surveys by a suitably qualified botanist will be required to determine if any of these species are likely to be disturbed during the completion of this project.

The creation of a new borrow pit for earthworks and pavement material and access to a "naturally occurring ridge" as a gravel source for this project requires a floristic survey by a suitably qualified botanist to assess vegetation and floristics.

For all floristic surveys it is a requirement that voucher specimens be collected and submitted to the Western Australian Herbarium.

There are no known outbreaks of soil borne diseases (e.g. Dieback) in the Goldfields Region, however machinery should be cleaned of soil prior to transport to the work locations to reduce the risk of the spread of disease and weeds.

In general the activities do not impact on CALM estate and no issues should exist with minor widening of either area of road corridor.

Please contact Brad Barton at this office should you need additional information.

Yours faithfully



Ian Kealley  
Regional Manager

10 June 2005

CC: Norm Caporn, Environmental Protection, CALM, Kensington



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| 0       | A Nagle | M Goldstone | <i>PP. R. C. Napier</i> | A Napier           | <i>R. C. Napier</i> | 29/9/05 |
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