July 2009

REID HIGHWAY AND ALEXANDER DRIVE INTERCHANGE, NORANDA

Biological Survey

Submitted to:
BG&E Pty Ltd
484 Murray Street
PERTH WA 6000

REPORT

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Executive Summary

BG&E Pty Limited (BG&E) commissioned Golder Associates Pty Ltd (Golder) to undertake a biological survey of existing natural habitats on land proposed to be cleared for on and off ramps at the intersection of Reid Highway and Alexander Drive, Noranda.

Golder undertook a desktop investigation and a reconnaissance field survey, in accordance with the Environmental Protection Authority (EPA) (2004) flora and vegetation survey guidance document, to assess the site's biological and ecological conditions.

The literature survey indicated that a range of conservation significant plant and animal species potentially may occur within the project site.

103 plant species in 35 families were identified during the reconnaissance survey.

The following two distinct vegetation communities occur within the Reid Highway - Alexander Drive interchange project site:

- Community A - *Banksia attenuata, Banksia menziesii, Banksia prionotes, Allocasuarina fraseriana* Low Open Woodland.
- Community B - *Melaleuca nesophylla, Acacia* spp*., Eucalyptus erythrocorys* Closed Tall Scrub

The vegetation condition of Community A is considered to be of 'Good' condition. The vegetation condition of Community B, is considered 'Degraded'. Dieback was absent. The project site has been partly cleared and is subject to aggressive and non-aggressive weed invasion, enrichment plantings, soil movement, vehicle activity and rubbish dumping.

Few animal species were observed during the surveys and significant fauna habitat was absent. Ten common bird species and one common skink species were identified during the reconnaissance survey.

Conservation significant communities, habitat or flora and fauna species were not observed within the project site. The project site is not or within an environmentally sensitive area.

All existing vegetation with the project area will be removed through road development. It is likely that the total revegetated area will be equivalent in size to that formerly cleared for the project (i.e., approximately 4 ha). In time, the revegated bush communities will reflect but not replace the original native bush communities.

The proposed Reid Highway/Alexander Drive interchange development is in accordance with the Ten Clearing Principles, as outlined in Schedule 5 of the *Environmental Protection Act* 1986.

There is no requirement for the proposed Reid Highway/Alexander Drive interchange development to be referred to the EPA under the *Environmental Protection Act* 1986 or the Department of the Environment, Water, Heritage and the Arts under the *Environment Protection and Biodiversity Conservation Act* 1999.

There is no additional need for statutory clearances such as for the removal of Declared Rare Flora.

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1.0 INTRODUCTION

1.1 Background

BG&E Pty Limited (BG&E) commissioned Golder Associates Pty Ltd (Golder) to undertake a biological survey of existing natural habitats on land proposed for clearing and development of on and off ramps at the intersection of Reid Highway and Alexander Drive, Noranda (the site). BG&E's Preliminary Environmental Impact Assessment (PEIA) indicated that there was insufficient information regarding the biological and ecological receptors in the area. This information was needed before any vegetation clearance could take place, and therefore a further survey was required.

1.2 Scope of Work

The scope of work involves a desktop investigation and a reconnaissance field survey to assess the site's biological and ecological conditions, and is in accordance with the Environmental Protection Authority (EPA) (2004) flora and vegetation survey guidance document. Clearing and subsequent construction at the site must adhere to the Ten Clearing Principles (*Environmental Protection Act*, 1986, Schedule 5). Vegetation clearance must also not occur within an Environmentally Sensitive Area (ESA), as per the PEIA.

The biological survey will include the following aspects:

- a desktop assessment of the site;
- a field reconnaissance survey of relevant biological aspects and issues including reserves and other relevant land uses;
- an assessment of the project against the *1986 Environmental Protection Act's* 10 Clearing Principles (Schedule 5); and
- discussion of the requirement for referral to statutory authorities or for other clearances for the project if required.

2.0 METHODS

As part of the desktop and site investigations, Golder researched the following:

- Federal and WA State Conservation Significant flora and fauna species databases.
- The Bureau of Meteorology (BOM) for climate information at the site.
- The Australian Soil Resource Information System (ASRIS) for probable risk of Acid Sulfate Soils (ASS) in the area. ASS can influence the ecological communities present and can determine specific site excavation requirements.
- The 1:50,000 Perth Sheet of the Geological Survey of Western Australia Map Series to assess site geology, as this can influence the ecological communities that may inhabit the area.
- The Perth Groundwater Atlas for groundwater depths.
- The Department of Environment and Conservation (DEC) Contaminated Sites database (DEC, 2008a) to ascertain whether there are known contaminated sites in the vicinity of the site. Groundwater or soil contamination near the site could adversely affect the area's ecology.
- The Heritage Council of Western Australia (HCWA) website for information on local heritage listed and protected areas.
- The Department of Indigenous Affairs (DIA) database concerning Aboriginal Heritage sites.

A field reconnaissance survey will also be undertaken that includes a site walkover, opportunistic fauna and flora species documentation, photographic recording and general site characterisation.

3.0 DESKTOP ASSESSMENT

3.1 Site Description

The project area, which comprises the two proposed on and off ramps, is located south of the Reid Highway and Alexander Road intersection in Noranda. The project area consists of two narrow, triangular bushland areas totalling 4.4 ha and is bisected by Alexander Drive. One bushland area of 2.3 ha, comprises induced vegetation established on the landscaped ramp foundations. The second bushland area comprises 2.1 ha of 'natural' native vegetation. Large, open sand flats and numerous unformed tracks occur within the bushland. These bushland areas are to be cleared during project development.

Larger *Banksia* bushland areas of similar character occur across Reid Highway to the north and to the south of the western part of the project area. Residential subdivisions border the eastern part of the project area to the south. The Hellenic Community Nursing Home and St Andrews Grammar School are within 200 m of the project area to the south.

Wetland habitats are absent.

Figure 1 shows the site location.

3.2 Climate

The regional Perth climate typically has mild winters and hot, dry summers (The Bureau of Meteorology (BOM), 2008). Monthly averages indicate that temperatures relevant at the project site range from 8ºC (winter months) to 31.8ºC (summer months).

Mean rainfall ranges from 9 mm during the summer to 165 mm in winter, with mean daily sunshine hours ranging from 5.9 in winter to 11.6 in summer.

Mean temperatures at 9 am range from 11.7ºC (winter months) to 23.7ºC (summer months). Mean temperatures at 3 pm range from 16.8ºC (winter months) to 30.2ºC (summer months).

Figures 2-6 present monthly averages for minimum and maximum temperatures, average rainfall, hours of sunshine, and mean 9 am and 3 pm temperatures.

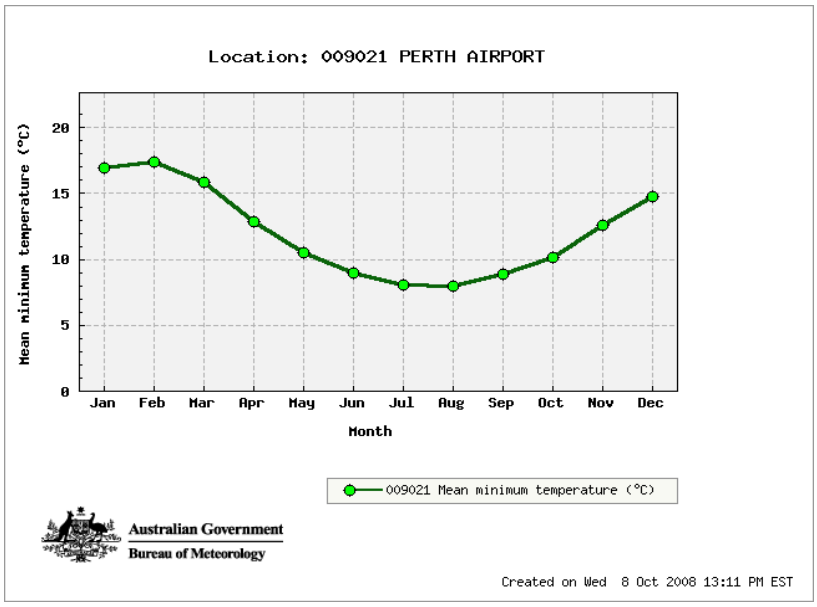

Figure 2: Perth Mean Minimum Temperature (BOM, 2008)

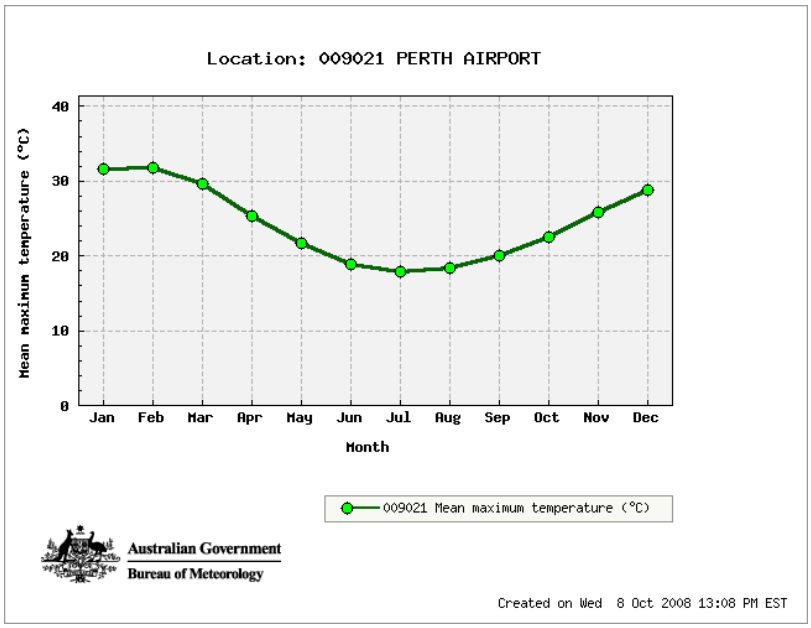

Figure 3: Perth Mean Maximum Temperature (BOM, 2008)

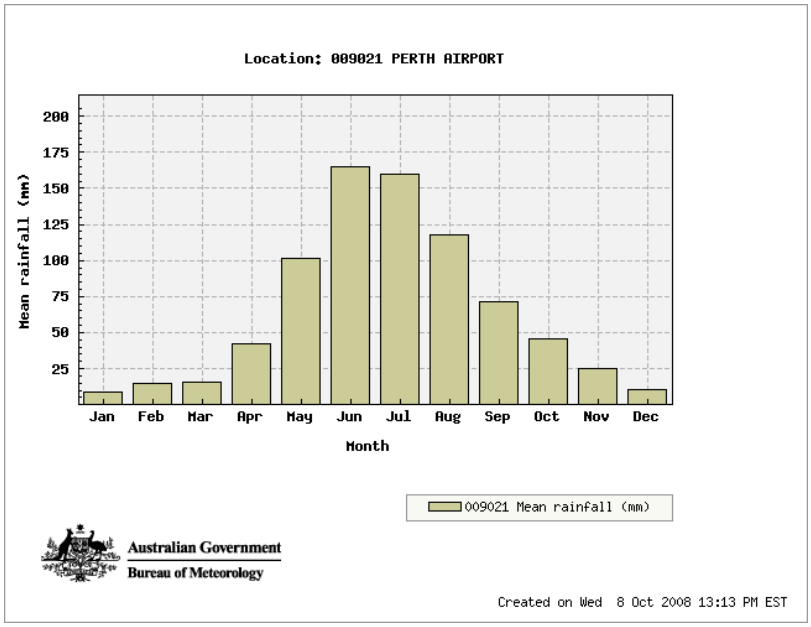

Figure 4: Perth Mean Rainfall (BOM, 2008)

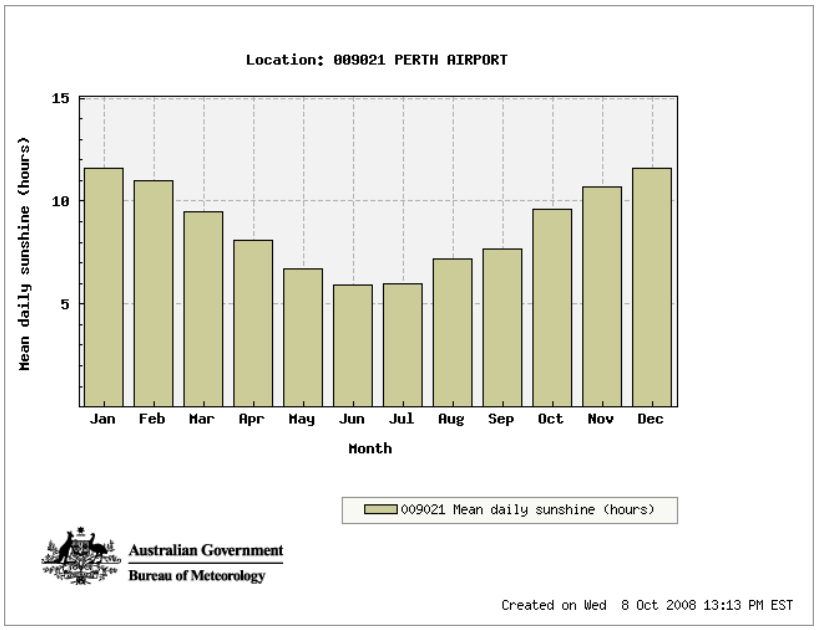

Figure 5: Perth Mean Daily Sunshine Hours (BOM, 2008)

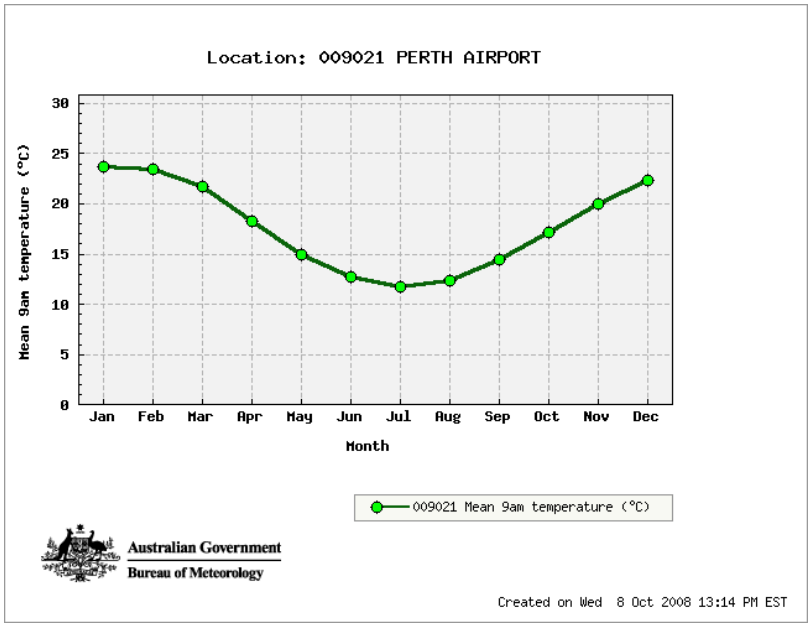

Figure 6: Perth Mean 9 am Temperature (BOM, 2008)

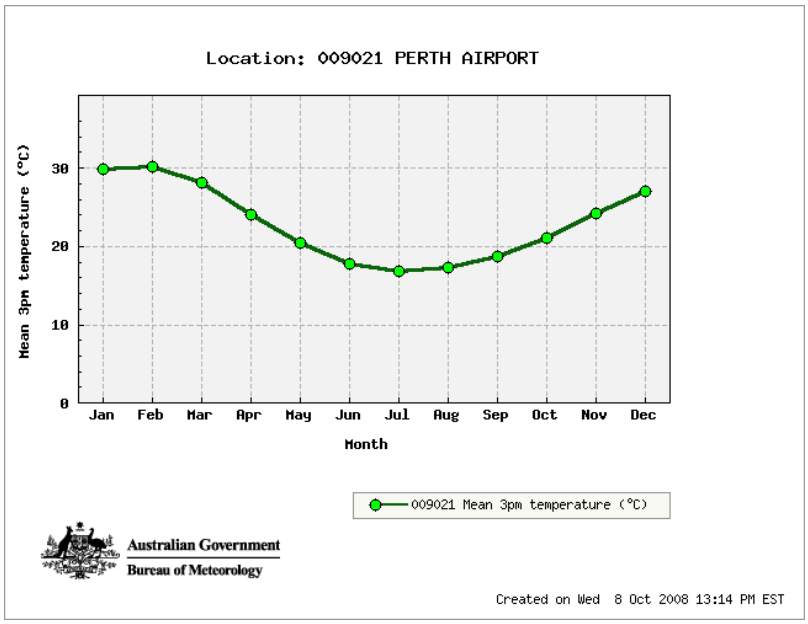

Figure 7: Perth Mean 3 pm Temperature (BOM, 2008)

3.3 Flora and Fauna

3.3.1 Overview

Literature research indicated that site-specific flora and fauna studies have not been undertaken prior to this survey. The site is in the Swan Coastal Plain bioregion. Environments within this bioregion are considered relatively sensitive to the scale and nature of development impacts (EPA, 2004). Although impacts will be severe, i.e., complete loss of vegetation, a 'Level I' survey, which includes background research and a reconnaissance survey, was considered appropriate for the site given its small size and disturbed state. Should conservation significant natural values be identified during the Level I survey, a detailed 'Level 2' survey would be recommended.

3.3.2 Conservation Significant Flora and Fauna

Golder conducted a search of the following for relevant conservation significant flora and fauna species potentially occurring within the project area:

- Federal Department of the Environment, Water Heritage and the Arts' (DEWHA) Environmental Protection and Biodiversity Conservation (EPBC) website for conservation significant species, wetlands and ecological communities known to occur within a 1 km radius around the project location;
- DEC declared rare and priority flora database;
- DEC threatened and priority fauna database; and
- DEC threatened ecological communities' database.

The EPBC website listed four threatened species, seven migratory bird species and 16 invasive plant and animal species within a 1 km search radius (Table 1). Threatened ecological communities were absent. The DEWHA EPBC and DEC TEC, flora and fauna reports are presented as Appendices A-D.

One listed RAMSAR wetland, Forrestdale and Thompson Lakes, is reported within the search radius, but nationally important wetlands are absent. Golder considered the identification of Forrestdale and Thompson Lakes on the register unusual. The appearance of Forrestdale and Thompson Lakes in database searches is a reoccurring anomaly in the system. The lakes appear in searches far from their true location (DEC, 2008 personal communication). Golder has not assessed the lakes and considers the inclusion of

Forrestdale and Thompson Lakes an anomaly, as the lake system is several kilometres to the south of the project site.

Protected Areas such as reserves, conservation areas or areas under regional forest agreements are also absent.

Table 1: Conservation Significant Species within a 1 km Radius of the Site

Scientific Name	Common Name	EPBC	DEC
Threatened Species-Birds			
Calyptorhynchus baudinii	Baudin's Black-Cockatoo, Long-billed Black-Cockatoo	Vulnerable	
Calyptorhynchus latirostris	Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo	Endangered	Schedule 1 – Fauna that is likely to become extinct
Threatened Species-Mammals			
Dasyurus geoffroii	Chuditch, Western Quoll	Vulnerable	
Isoodon obesulus fusciventer	Quenda		Priority Five – Taxa in need of monitoring (conservation dependent)
Macropus irma	Western Brush Wallaby		Priority Four
Threatened Species-Plants			
Amphibromus vickeryae			Priority 1
Cyathochaeta teretifolia			Priority 3
Drosera occidentalis subsp. *occidentalis*			Priority 4
Drosera sidjamesii			Priority 1
Epiblema grandiflorum var. *cyaneum* ms			Declared Rare Flora
Lepidosperma rostratum	Beaked *Lepidosperma*	Endangered	
Threatened Species-Reptiles			
Neelaps calonotos	Black-striped snake		Priority 3
Threatened Species-Invertebrates			
Hylaeus globuliferus	Bee		Priority 3
Synemon gratiosa	Graceful Sunmoth		Schedule 1

Scientific Name	Common Name	EPBC	DEC
Migratory Terrestrial Species-Birds			
Haliaeetus leucogaster	White-bellied Sea-Eagle	Migratory	
Merops ornatus	Rainbow Bee-eater	Migratory	
Migratory Wetland Species-Birds			
Ardea alba	Great Egret, White Egret	Migratory	
Ardea ibis	Cattle Egret	Migratory	
Migratory Marine Species-Birds			
Apus pacificus	Fork-tailed Swift	Migratory	
Ardea alba	Great Egret, White Egret	Migratory	
Ardea ibis	Cattle Egret	Migratory	
Listed Marine Species-Birds			
Apus pacificus	Fork-tailed Swift	Listed - overfly marine area	
Ardea alba	Great Egret, White Egret	Listed - overfly marine area	
Ardea ibis	Cattle Egret	Listed - overfly marine area	
Haliaeetus leucogaster	White-bellied Sea-Eagle	Listed	
Merops ornatus	Rainbow Bee-eater	Listed - overfly marine area	
Invasive Species*-Mammals			
Felis catus	Cat, House Cat, Domestic Cat	Feral	
Oryctolagus cuniculus	Rabbit, European Rabbit	Feral	
Sus scrofa	Pig	Feral	
Vulpes vulpes	Red Fox, Fox	Feral	
Invasive Species*-Plants			
Asparagus asparagoides	Bridal Creeper	WoNS	
Brachiaria mutica	Para Grass	Invasive	
Cenchrus ciliaris	Buffel-grass, Black Buffel-grass	Invasive	

Scientific Name	Common Name	EPBC	DEC
Chrysanthemoides monilifera	Bitou Bush, Boneseed	WoNS	
Genista sp. *X Genista monspessulana*	Broom	Invasive	
Lantana camara	Lantana	WoNS	
Lycium ferocissimum	African Boxthorn, Boxthorn	Invasive	
Olea europaea	Olive, Common Olive	Invasive	
Pinus radiata	Monterey Pine, Radiata Pine	Invasive	
Rubus fruticosus agg.	Blackberry	WoNS	
Salix spp. *except S. babylonica, S. x calodendron & S. x reichardtiji*	Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow	WoNS	
Salvinia molesta	Salvinia	WoNS	

*Selected Invasive Species: Weed species include Weeds of National Significance (WoNS) and introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity.

The four threatened species are also listed as 'Fauna that is rare or likely to become extinct' on the Wildlife Conservation (Specifically Protected Fauna) Notice 2008(2) published by the WA Minister for the Environment.

Department of Environment and Conservation listed Threatened Ecological Communities or Priority Ecological Communities do not occur within the search area.

3.4 Cultural Heritage

Protected world, indigenous or Australian heritage sites are absent from within a 1 km search radius of the project site (The Heritage Council of Western Australia, 2008; The Department of Indigenous Affairs, 2008).

3.5 Acid Sulfate Soils

The Acid Sulfate Soil (ASS) risk potential at the project site is low to moderate (Figure 8), according to the Australian Soil Resource Information System (ASRIS) and the Western Australian Planning Commission (WAPC) Bulletin 64 (May 2007).

The potential implications of unmanaged excavation in an ASS affected area include the disturbance and possible acidification of an ecosystem that is not adapted to acidic conditions, in addition metals may be mobilised from sediments through the surface water and or groundwater network (receptors), consequently metals may increase to such levels in these receptors that they could pose a risk to environmental and human health.

The risk level that a project may pose with respect to ASS disturbance depends on the nature of the proposed development. Golder understands that the proposed works on site will not be disturbing soils to depths exceeding 3 m below the current ground surface. Groundwater (Section 3.7) is not likely to be

encountered during site excavations and therefore the transport of any acidity, which may be generated by soil disturbance on the site, is likely to be limited to surface water drainage.

3.6 Geology

The 1:50,000 Perth Sheet of the Geological Survey of Western Australia Map Series indicates that the project site is likely to be situated on Bassendean Sands. These sands are very light grey at the surface and yellow at depth, are likely to be fine to medium grained, sub-rounded quartz, and are moderately well sorted with eolian origins.

3.7 Groundwater

The Perth Groundwater Atlases produced in 1997 (Water and Rivers Commission, 1997) (Figure 9) and 2004 (DoE, 2004) (Figure 10) provide a snapshot of groundwater levels for those particular years. The 1997 edition is regarded as showing the recent historical maximum groundwater levels while 2004 data is regarded as indicating the recent historical minimum groundwater level. This information is seasonally dependent and therefore is to be considered a guide only.

In the 1997 Perth Groundwater Atlas (Map 47), ground surface elevation at the site is indicated to be approximately 38 to 48 m AHD. Groundwater level was shown to be approximately 28 to 31 m AHD, or 10 to 15 m below ground surface. The superficial aquifer in the area is at approximately -10 to -13 m AHD or 50 to 60 m below the ground surface. Groundwater flow was to the south-west.

The 2004 Perth Groundwater Atlas (Map 313) indicates that some excavation has taken place in preparation for road building, as evidenced by detailed ground surface elevation contours. Overall ground levels are similar to earlier 1997 data. By 2004, the groundwater level across the site had declined to around 25 to 26 m AHD. Groundwater flow at this time was to the south-south-west.

The 2004 Perth Groundwater Atlas indicates that groundwater salinity is around 500 mg/L TDS. Bassendean Sand transmissivity is approximately 600 m^2/d (Davidson 1995).

It is unlikely that groundwater levels will influence drainage paths and the presence of vegetation within the project site.

3.8 Wetlands and Drainage

An unnamed circular water body is located about 415 m east from the intersection of Reid Highway and Alexander Drive (nominally named ‘Agett Road Wetland’, Figure 1). This circular water body is on the southern side of the Malaga industrial area and is not registered as a wetland. There is another water body near the junction of Malaga Drive and Reid Highway about 1.2 km from the cross-section of Reid and Alexander Drive. Both of these water bodies are likely to be part of the stormwater best management practices for Malaga Industrial area given the proximity and flow gradient. Wetlands are absent from the project site.

The project site, the proposed on and off ramp sites for the Reid Highway, is located either side of Alexander Drive on the southern side of Reid Highway. The project area is limited to a linear distance of approximately 460 m on either side of the intersection of Reid Highway and Alexander Drive. The groundwater flow direction around the project area is predominantly south to south-west, away from these water bodies (Figure 8).

The stormwater runoff flow path is expected to be predominantly subsurface flow (saturated and unsaturated groundwater) as the project area contains approximately 13 m to 22 m of Bassendean Sands above the groundwater table. There is no visible surface drainage path within close proximity to the project site. Residential and industrial developments surround the project site, indicating stormwater would be the main source of surface runoff. This surface runoff is expected to be managed by the Department of Environment (2004) stormwater management guidelines.

3.9 Known Contaminated Sites

The Department of Environment and Conservation (DEC) Contaminated Sites Database (DEC, 2008a), which lists known contaminated sites, did not identify the project site as contaminated. Golder notes that the legislation regarding contaminated site reporting and investigation is relatively new and the DEC database does not yet provide a comprehensive listing of all contaminated sites in Western Australia. The DEC database also does not report suspected contaminated sites that are awaiting investigation or assessment. Information gained from this database should be considered as a guide only.

There were no reporting facilities, airsheds or catchments listed in the National Pollutant Inventory within a 1 km radius of the site.

3.10 Heritage Listing

Information from the Heritage Council of Western Australia indicates the site has not been identified as a place of interest or a heritage listed area.

A search of the extent of Reid Highway revealed Cyril Jackson Senior High School (Bassendean) and Old Lime Kiln (Carine) as Heritage Listed sites. These sites are well outside the bounds of the proposed on and off ramp areas.

A search of the Department of Indigenous Affairs website revealed one site Aboriginal heritage site to the south of the project site. This site is well outside the bounds of the proposed on and off ramps and will therefore not be affected. The Aboriginal Heritage Inquiry is presented in Appendix E.

4.0 FIELD INVESTIGATION

4.1 Flora

A field investigation of the vegetation communities and flora was undertaken during October 2008 at a time when many of the plant species were flowering. A conservative total of 103 plant species in 35 Families were identified during the survey (Appendix F). Table 2 presents a summary of the plant taxa recorded.

Table 2: Flora Summary

	Families	Genera (Genera with non-endemic : endemic species)	Species (non-endemic : endemic species)
Total	35	78	103
Endemism	27 represented	55 represented	76
Non-endemism	13 represented	26 represented	27
Larger Families represented	Myrtaceae	10 (3:9)	18 (3:15)
	Proteaceae	7 (0:7)	12 (0:12)
	Fabaceae	9 (4:6)	16 (4:12)
	Poaceae	8 (6:2)	9 (7:2)

Species of conservation significance, Declared Rare Flora (DRF) or Priority flora were not observed.

Twenty seven non-endemic species were recorded but none are Weeds of National Significance or pose a significant threat to biodiversity.

4.1.1 Vegetation Communities

The following two distinct vegetation communities occur within the Reid Highway - Alexander Drive interchange project site (Figure 11):

- Community A - 'natural' Low Woodland; and
- Community B - an 'induced' Closed Tall Scrub.

4.1.1.1 Community A (Dune Flats)

Community A occurs on dune flats and comprises:

Banksia attenuata, Banksia menziesii, Banksia prionotes, Allocasuarina fraseriana Low Open Woodland.

This *Banksia* dominated vegetation type (Figure 12), to 10 m tall, varies from Low Open Forest to Low Open Woodland over a dense, species-rich, Closed-Open Low Heath dominated by *Mesomelaena pseudostygia, Bossiaea eriocarpa, Gompholobium tomentosum, Stirlingia latifolia* and *Jacksonia furcellata. Eucalyptus calophylla* and *Eucalyptus marginata* subsp. *marginata* also occur in low abundance.

Figure 12: Community A - Banksia Dominated Woodland

Community A is dryland vegetation, representative of the Bassendean Sands system. Gibson *et al.* (1994) describe typical dryland vegetation communities as comprising mixed *Banksia* and *Eucalyptus* woodlands or shrublands that are often species-rich and with low weed frequencies.

Gibson *et al.* (1994) identified '*Banksia attenuata* woodlands over species rich dense shrublands', specifically 'Community type 20a', as a vegetation type that was relatively unreserved and endangered on the southern Swan Coastal Plain. The *Banksia* dominated Low Woodland surveyed in this study has affinities with the threatened Community type 20a of Gibson *et al.* (1994), but differs sufficiently in the canopy and understorey species to be considered a different community type. Similar vegetation types are well represented in the reserve system (Gibson *et al*. 1994). Table 3 presents a comparison of the significant similarities and differences between the two vegetation communities.

This bushland remnant comprising Community A is not considered to be of conservation significance given the small size, narrow shape, weed infestations and disturbance high levels.

Table 3: Vegetation Community Comparison

Key Characteristics	Community A (current study)	Community Type 20a (Gibson *et al.* 1994)
Vegetation type	*Banksia attenuata, Banksia menziesii, Banksia prionotes, Allocasuarina fraseriana* Low Woodland over a dense, species-rich, Closed-Open Low Heath dominated by *Mesomelaena pseudostygia, Bossiaea eriocarpa, Gompholobium tomentosum, Stirlingia latifolia* and *Jacksonia furcellata*	*Banksia attenuata* woodlands over species rich dense shrublands
Common canopy species	*Banksia attenuata, Banksia menziesii, Banksia prionotes, Allocasuarina fraseriana*	*Banksia attenuata*
Other tree species present	*Eucalyptus calophylla* and *Eucalyptus marginata* subsp. *marginata*	Absent
Common shrubs as listed in Gibson *et al.* (1994)	11 (61%) species shared	18 species listed
Common herbs as listed in Gibson *et al.* (1994)	9 (31%) species shared	29 species listed
Species richness	103 species (76 endemic : 27 non-endemic) recorded on site	67.4 species/site
Diverse shrub layer with *Mesomelaena pseudostygia*	present	present
Weed frequency	27 species (26% of species present)	low
Species that differentiate Community 20a from other sub-groups	2 of 5 species (*Synaphea spinulosa, Stylidium calcaratum*)	*Alexgeorgea nitens, Daviesia nudiflora, Synaphea spinulosa, Hibbertia racemosa, Stylidium calcaratum*

4.1.1.2 Community B (Sand Slopes)

Community B occurs on the landscaped slopes of the pre-formed ramp foundations and comprises:

Melaleuca nesophylla, Acacia spp.*, Eucalyptus erythrocorys* Closed Tall Scrub.

This vegetation type to seven metres tall is variable and includes Closed Tall Scrub over a mixed Open Heath of *Hakea trifurcata, Jacksonia floribunda, J. furcellata, Hypocalymma* spp. and *Adenanthos cygnorum.*

There is very little understorey or ground-cover structure to this vegetation community. It is an artificial community association due to former vegetation restoration works and site landscaping, and is not of conservation significance.

4.1.2 Non-Endemic and Weed Species

Twenty-five non-endemic plant species were observed within the project area. Nineteen of these species are considered environmental weeds in Western Australia (CALM, 1999). Table 4 lists environmental weeds present within the project area, their weed characteristics and significance ranking. No Weeds of National Significance (WONS) were observed within the project area.

Most of the non-endemic species occur in localised clumps or infestations around the margins of the less disturbed native vegetation and in association with the recent ramp earthworks. Many herbaceous weed species have established from garden waste dumped from passing vehicles or adjacent housing. Several species, e.g., Mindiyed, Sydney Golden Wattle, Geraldton Wax and Red Cap Gum are native species outside of their natural range, which are cultivated and planted in private gardens and amenity sites around Perth. These weed infestations could be controlled relatively easily at present as part of a site-led weed management programme.

The grasses Perennial Veldt Grass, Silvery Hairgrass and Annual Veldt Grass are the most widespread weed species within the project area. These species are rated as 'High', 'Moderate' and 'Moderate' environmental weeds respectively in CALM 1999 and are the species most likely to proliferate and threaten the sustainability of the species-rich *Banksia* woodlands present.

Weed species, as seeds or vegetative plant fragments, may be windblown or bird dispersed into the native bushland areas immediately to the south and across the Reid Highway; however the surrounding residential gardens would provide a far greater environmental weed source than the relatively small project site. A weed management plan that addresses the following should be undertaken as part of site development:

- Direct control of existing weeds;
- Weed hygiene during construction;
- Post-construction monitoring for a limited period; and
- Follow up weed control.

Table 4: Environmental Weed Species On-site, 2008[1]

Plant Family	*Species Name*	Common Name	Distribution[2]	Invasiveness[3]	Impacts[3]	Rating[3]
Fabaceae	*Lupinus cosentinii*	Sandplain Lupin	Yes	Yes	Yes	High
Geraniaceae	*Pelargonium capitatum*	Rose Pelargonium	Yes	Yes	Yes	High
Poaceae	*Bromus diandrus*	Ripgut Brome	Yes	Yes	Yes	High

Plant Family	*Species Name*	Common Name	Distribution[2]	Invasiveness[3]	Impacts[3]	Rating[3]
Poaceae	*Cortaderia selloana*	Pampas Grass	Yes	Yes	Yes	High
Poaceae	*Ehrharta calycina*	Perennial Veldt Grass	Yes	Yes	Yes	High
Aizoaceae	*Carpobrotus edulis*	Pigface	Yes	Yes		Moderate
Asteraceae	*Arctotheca calendula*	Capeweed	Yes	Yes		Moderate
Asteraceae	*Urospermum picroides*	False Hawkbit	Yes	Yes		Moderate
Asteraceae	*Ursinia anthemoides*	Ursinia	Yes	Yes		Moderate
Iridaceae	*Gladiolus caryophyllaceus*	Wild Gladiolus	Yes	Yes		Moderate
Onagraceae	*Oenothera drummondii*	Beach Evening Primrose	Yes	Yes		Moderate
Poaceae	*Aira cupaniana*	Silvery Hairgrass	Yes	Yes		Moderate
Poaceae	*Avena barbata*	Bearded Oat	Yes	Yes		Moderate
Poaceae	*Briza maxima*	Quaking Grass	Yes	Yes		Moderate
Poaceae	*Ehrharta longiflora*	Annual Veldt Grass	Yes	Yes		Moderate
Asphodelaceae	*Trachyandra divaricata*	Dune Onion Weed	Yes			Mild
Euphorbiaceae	*Euphorbia dendroides*	-				Low
Fabaceae	*Trifolium angustifolium*	Narrowleaf Clover				Low
Plantaginaceae	*Plantago lanceolata*	Ribwort Plantain				Low
Apiaceae	*Foeniculum vulgare*	Fennel				TBA
Asteraceae	*Hypochaeris radicata*	Flatweed				N/A

Plant Family	*Species Name*	Common Name	Distribution[2]	Invasiveness[3]	Impacts[3]	Rating[3]
Fabaceae	*Acacia longifolia* subsp. *longifolia*	Sydney Golden Wattle				N/A
Fabaceae	*Chamaecytisus palmensis*	Tree Lucerne				N/A
Myrtaceae	*Melaleuca nesophylla*	Mindiyed				N/A
Myrtaceae	*Eucalyptus erythrocorys*	Red Cap Gum				N/A
Ochidaceae	*Disa bracteata*	South African Orchid				N/A

Note:

1) Source: Department of Conservation and Land Management, 1999.

2) Weed assessment criteria in terms of their environmental impact on biodiversity.

- **Invasiveness** ability to invade bushland in good to excellent condition or ability to invade waterways (Score as yes or no).
- **Distribution** – wide current or potential distribution including consideration of known history of wide spread distribution elsewhere in the world (Score as yes or no).
- **Environmental Impacts** – ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community (Score as yes or no).
- **TBA** – Ranking has yet to be advised.
- **N/A** – Not considered an environmental weed of actual or potential significance in WA.

3) Weed rating in terms of their environmental impact on biodiversity.

- **High** – 'Yes' for all three criteria. Rating a weed species as high would indicate prioritising this weed for control and/or research i.e., prioritising funding to it.
- **Moderate** – 'Yes' for two of the above criteria. Rating a weed species as moderate would indicate that control or research effort should be directed to it if funds are available, however it should be monitored (possibly a reasonably high level of monitoring).
- **Mild** – 'Yes' for one of the criteria. A mild rating would indicate monitoring and control where appropriate.
- **Low** – Does not score for any of the criteria. A low ranking would mean that this species would require a low level of monitoring.

4.1.3 Vegetation Condition

Vegetation community condition was assessed using the six vegetation condition rating scale of Keighery (1994).

The vegetation condition of Community A, the more natural of the two communities present, is considered to be of 'Good' condition. In places, vegetation clearance for tracks, both aggressive and non-aggressive weed invasion and rubbish dumping has adversely affected the adjacent vegetation structure. Vegetation distanced from such disturbance factors is in a better relative condition and retains the inherent ability to regenerate.

The vegetation condition of Community B, is considered 'Degraded'. Large–scale vegetation clearance, aggressive and non-aggressive weed invasion, enrichment plantings and soil movement has significantly altered the natural vegetation structure and ability for natural vegetation community regeneration.

4.1.4 Plant Pests and Diseases

Vegetation health throughout the site was investigated for the presence, location, extent and effect of plant pests or diseases. No evidence of diseased plants was observed. Recent heavy vehicle activity has caused minor damage to branches of several woody species. A 3 m wide fire-break along the residential boundary appeared to have been recently sprayed with herbicide as most vegetation was browning or dead (Figure 13).

Figure 13: Fire-Break Vegetation Sprayed with herbicide

Plant senescence due to *Phytophthora* dieback was investigated. Susceptible species (DEC, 2008b) were used as indicator species for dieback presence. Multi-aged dead/browning individuals or groups within healthy vegetation were absent. Indicator species targeted were *Adenanthos cygnorum* (Woolly Bush), *Allocasuarina fraseriana* (Sheoak), *Banksia grandis* (Bull Banksia), *B. attenuata* (Slender Banksia), *B. menziesii* (Firewood Banksia) *Xanthorrhoea* species (Grasstree) and *Conospermum stoechadis* (Smoke Bush).

Recent heavy vehicle activity within the vegetation has the potential to introduce and spread dieback-inducing *Phytophthora* spores. *Phytophthora* hygiene and management practises should be considered for future works in the area.

4.2 Fauna

A fauna trapping programme was not undertaken. Incidental observations were made during local searching and in association with the flora survey. Few animal species were observed during the surveys and significant fauna habitat was absent. Ten common bird species and one common skink species were identified during the survey (Appendix G). A variety of bird species may overfly and use the vegetation within the site from time to time but there are larger and better quality bush remnants in the vicinity and it is unlikely that birds will settle for long. Noise pollution and light disturbance from passing vehicles and residential activities is also likely to prevent birds, especially cryptic species, from nesting and breeding within the area.

A range of animal pest species (refer Table 1) are likely to be present and will have almost certainly depleted any native fauna populations. Although some residential fencing exists, invasive species are able to travel relatively unhindered through the project area and could readily disperse.

It is likely that greater species diversity would be recorded with more comprehensive fauna surveys however it is considered unlikely that conservation significant species are present. The project area is relatively small, is bounded by a major road and residential subdivision, and has undergone considerable disturbance in recent years.

5.0 MANAGEMENT AND REHABILITATION

All existing vegetation with the project area will be lost through road development. Approximately half this vegetation was planted and landscaped following former earthworks. The vigorous growth of planted vegetation shows that site rehabilitation is a viable option following the proposed road works. Exposed areas should be replanted and landscaped following the successful methods used for earlier revegetation operations. Planted species should be endemic to the Swan Coastal Plain and exclude introduced and visually attractive species such as those previously used (e.g., Geraldton Wax and Mindiyed).

Revegetated areas should be monitored for sustainability, i.e., gaps from failed plantings should be replaced and invasive weed species eradicated before they are able to establish.

It is likely that the total revegetated area will be equivalent in size to that formerly cleared for the project. In time, the revegated bush communities will reflect but not replace the original native bush communities.

6.0 REQUIREMENT FOR REFERRAL OR OTHER CLEARANCES

The proposed Reid Highway/Alexander Drive interchange development is in accordance with the Ten Clearing Principles, as outlined in Schedule 5 of the *Environmental Protection Act* 1986. Table 5 addresses the Clearing Principles with regards to the interchange development.

Table 5: Reid Highway Interchange Development with Respect to the 10 Clearing Principles

Clearing Principle	Site Characteristic
Native vegetation should not be cleared if:	
it comprises a high level of biological diversity;	Over 100 plant species were identified but 26% of these are non-endemic species. Very few fauna species were observed or are likely to be present.
it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia;	The habitat is not unique. It does not comprise the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia
it includes, or is necessary for the continued existence of, rare flora;	Rare flora does not occur within the site.

Clearing Principle	Site Characteristic
it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community;	Threatened ecological communities do not occur within the site.
it is significant as a remnant or native vegetation in an area that has been extensively cleared;	Bushlands with similar characteristics are adequately represented in the reserve system.
it is growing in, or in association with, an environment associated with a watercourse or wetland;	Watercourses and wetlands are absent.
the clearing of the vegetation is likely to cause appreciable land degradation;	Vegetation clearance is unlikely to cause appreciable land degradation. The site is small and flat; erosion will be negligible. Exposed surfaces will be rehabilitated as part of the road development project.
the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area;	Any adverse effects from vegetation clearance will be contained within the site. Conservation areas do not occur in adjacent lands.
the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water; or	The highway development will implement appropriate stormwater management practises. Vegetation clearance will not degrade the quality of surface or underground water.
the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	Vegetation clearance will not affect flood incidence of intensity.

There is no requirement for the proposed Reid Highway/Alexander Drive interchange development to be referred to the EPA under the *Environmental Protection Act* 1986 or the Department of the Environment, Water, Heritage and the Arts under the *Environment Protection and Biodiversity Conservation Act* 1999.

There is no additional need for statutory clearances such as for the removal of Declared Rare Flora.

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Report Signature Page

GOLDER ASSOCIATES PTY LTD

Kassey Truesdale
Environmental Scientist

Dr. Rob Jessop
Senior Ecological Scientist

KT/RJ/sp

A.B.N. 64 006 107 857

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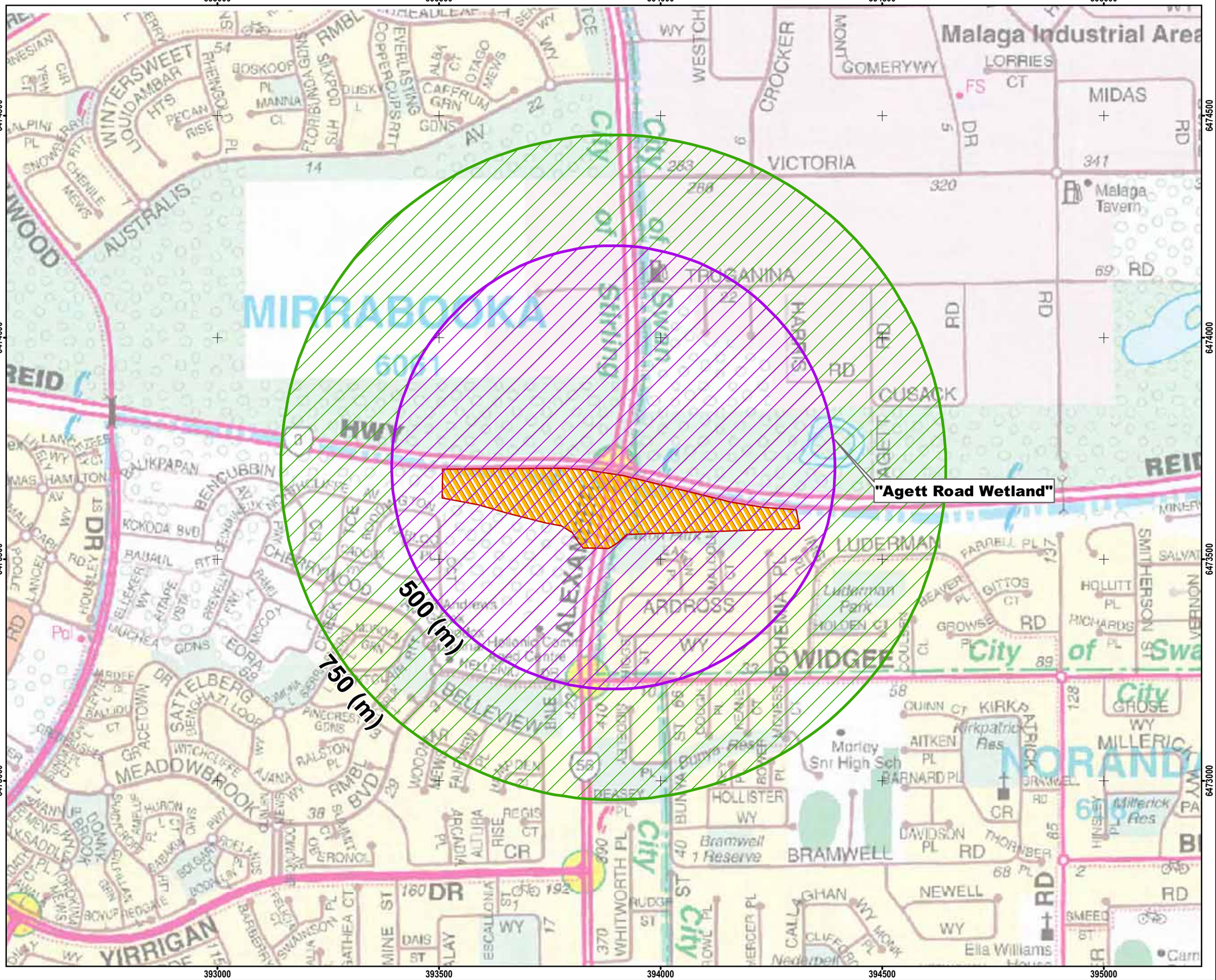


Perth Metropolitan Area

Project Boundary

N
W E
S

0 50 100 200 300 metres

A3 SCALE 1:8,000

Datum GDA94, Projection MGA94, Zone 50

CLIENT	**Peter Couglain BG&E**
PROJECT	**087643444 001 R REV0**
DATE	**13/08/08**
DRAWN	**JOR**
APPROVED	**JJH**

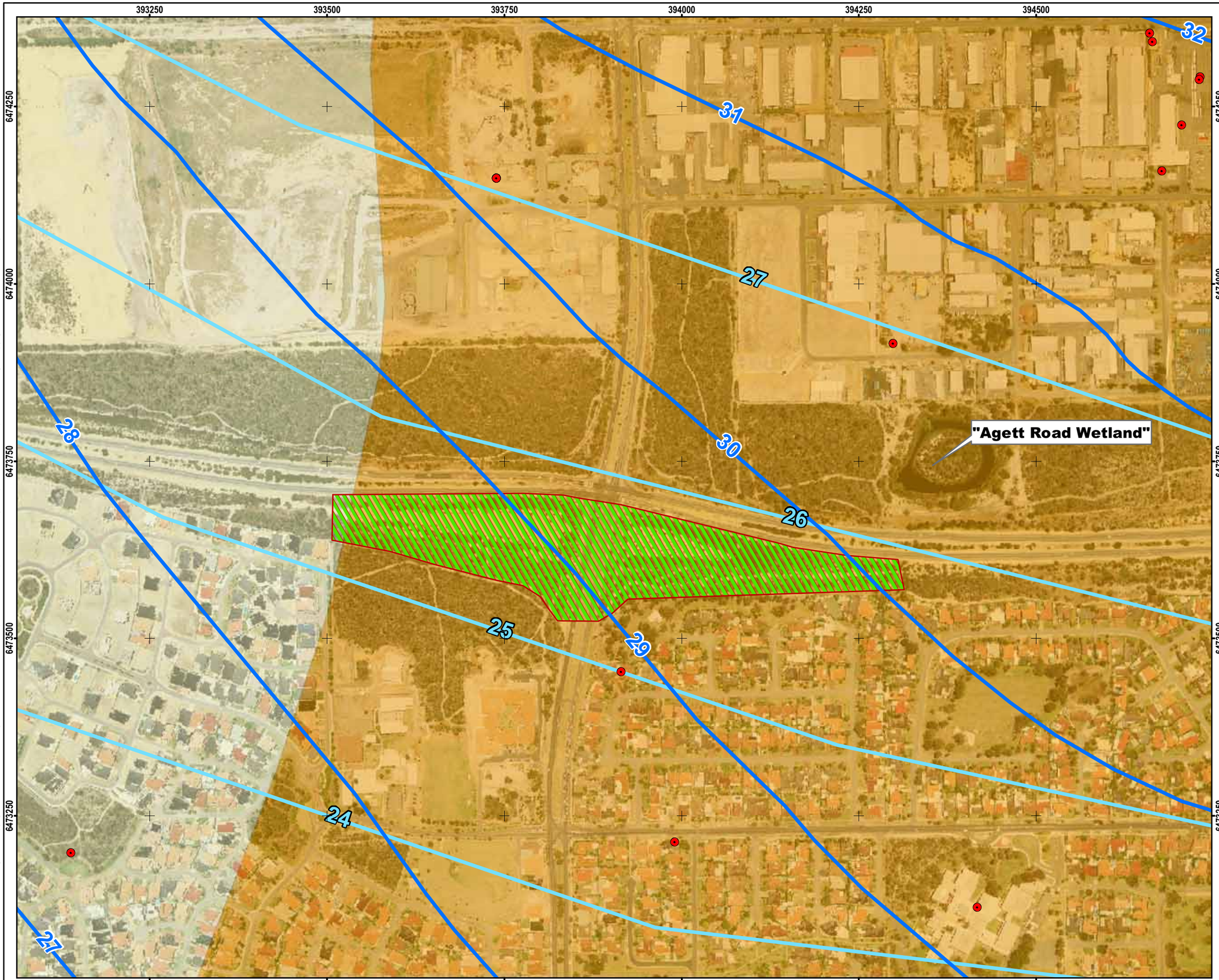
Golder Associates
Level 2, 1 Havelock Street Ph: +618 9213 7600
West Perth WA 6005 Fx: +618 9213 7611

Proposed Reid Highway - Alexander Drive Intersection Upgrade

LOCALITY PLAN

FIGURE **1**

File Location: J:\.. 087643444_001_R_F0001_Rev0



Legend

DoW Registered Groundwater Extraction Site

High to moderate ASS disturbance risk (<3m from surface)

Moderate to low ASS disturbance risk (<3m from surface)

No known ASS disturbance risk (<3m from surface)

Perth GW Atlas 2004 GW Level (mAHD)

Perth GW Atlas 1997 GW Level (mAHD)

Project Boundary

N

0 25 50 100 150 200 metres

A3 SCALE 1:5,000

Datum GDA94, Projection MGA94, Zone 50

CLIENT	**Peter Couglain BG&E**
PROJECT	**087643444 001 R Rev0**
DATE	**18/11/08**
DRAWN	**JOR**
APPROVED	**JJH**

Golder Associates
Level 2, 1 Havelock Street West Perth WA 6005
Ph: +618 9213 7600
Fx: +618 9213 7611

Proposed Reid Highway - Alexander Drive Intersection Upgrade

HYDROLOGY AND ACID SULFATE SOILS DISTURBANCE RISK

FIGURE **8**

File Location: J:\.. 087643444_001_R_F0008_Rev0

Approximate area of investigation

"Agett Road Wetland"

Project Boundary

LEGEND:
- 20 — ESTIMATED MAXIMUM WATERTABLE CONTOURS IN METRES ABOVE AHD
- 40 — NATURAL SURFACE CONTOURS IN METRES ABOVE AHD
- -10 — CONTOURS ON BASE OF SUPERFICIAL FORMATIONS IN METRES AHD
- WATER CORPORATION MAIN DRAINAGE

N

0 100 200 300 400 metres

A3 SCALE 1:10,000

Datum GDA94, Projection MGA94, Zone 50

CLIENT	Peter Couglain BG&E
PROJECT	087643444 001 R Rev0
DATE	18/11/08
DRAWN	BH
APPROVED	JJH

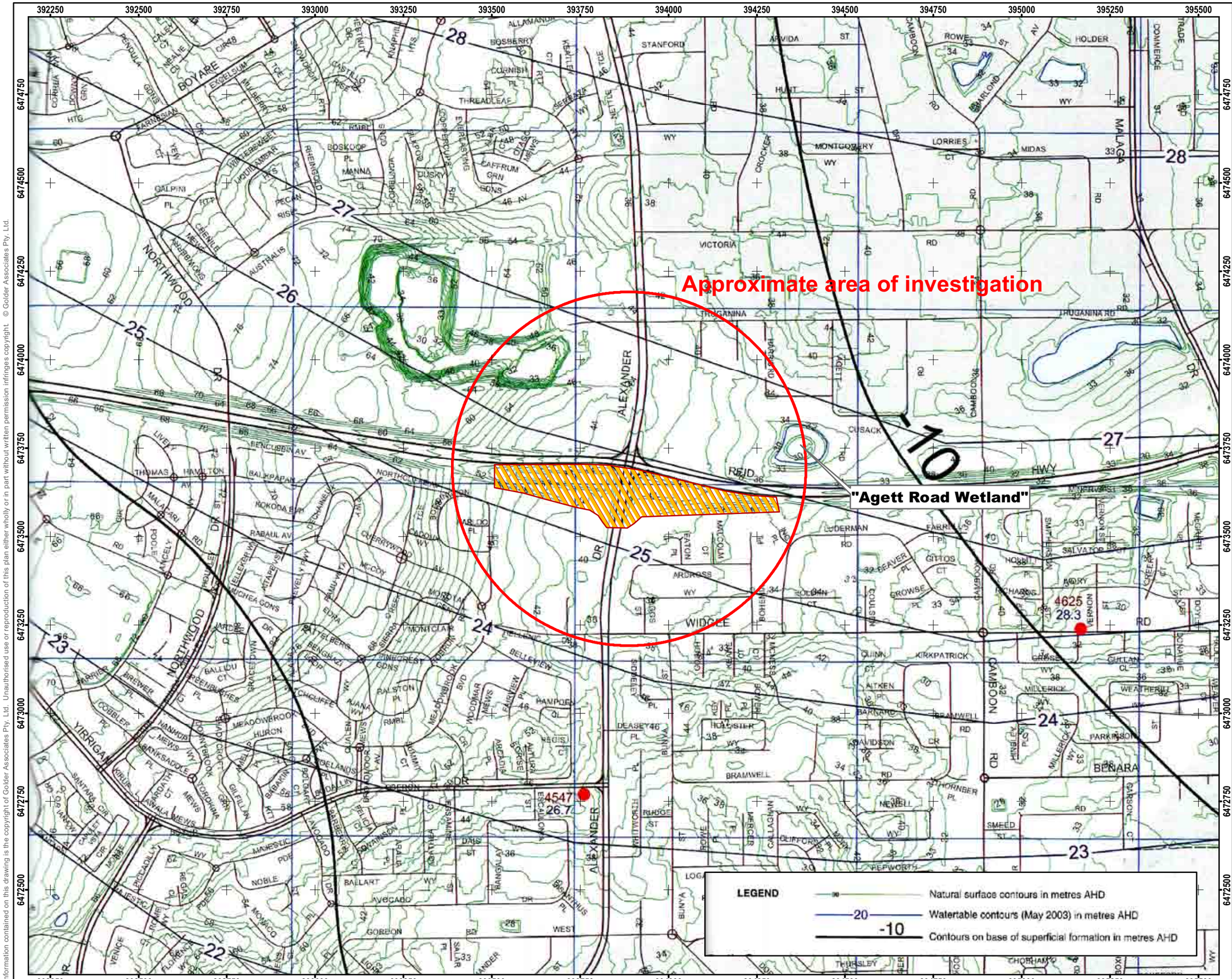
Golder Associates
Level 2, 1 Havelock Street Ph: +618 9213 7600
West Perth WA 6005 Fx: +618 9213 7611

Proposed Reid Highway - Alexander Drive Intersection Upgrade

PERTH GROUNDWATER ATLAS 1997 - EXTRACT FROM MAP 47

FIGURE 9

File Location: J:\.. 087643444_001_R_F0009_Rev0



Project Boundary

N

0 100 200 300 400 metres

A3 SCALE 1:10,000

Datum GDA94, Projection MGA94, Zone 50

CLIENT	Peter Couglain BG&E
PROJECT	087643444 001 R REV0
DATE	17/11/08
DRAWN	BH
APPROVED	JJH

Golder Associates
Level 2, 1 Havelock Street Ph: +618 9213 7600
West Perth WA 6005 Fx: +618 9213 7611

Proposed Reid Highway - Alexander Drive Intersection Upgrade

PERTH GROUNDWATER ATLAS 2004 - EXTRACT FROM MAP 313

FIGURE 10

File Location: J:\.. 087643444_001_R_F0010_Rev0

Legend

- Project Boundary
- Communtiy B (Landscaped)
- Community A (Native)
- Cleared Land

NOTES:

Community A -

Banksia attenuata, Banksia menziesii, Banksia prionotes, Allocasuarina fraseriana
Low Open Woodland.

Community B -

Melaleuca nesophylla, Acacia spp., Eucalyptus erythrocorys
Closed Tall Scrub

N

0 12.5 25 50 75 100
metres

A3 SCALE 1:3,000

Datum GDA94, Projection MGA94, Zone 50

CLIENT	**Peter Couglain BG&E**
PROJECT	**087643444 001 R REV0**
DATE	**18/11/08**
DRAWN	**JOR**
APPROVED	**JJH**

Golder Associates
Level 2, 1 Havelock Street Ph: +618 9213 7600
West Perth WA 6005 Fx: +618 9213 7611

Proposed Reid Highway - Alexander Drive Intersection Upgrade

VEGETATION COMMUNITIES

FIGURE **11**

File Location: J:\.. 087643444_001_R_F0011_Rev0

APPENDIX A

Department of the Environment, Water, Heritage and the Arts Database Report

Environmental Reporting Tool

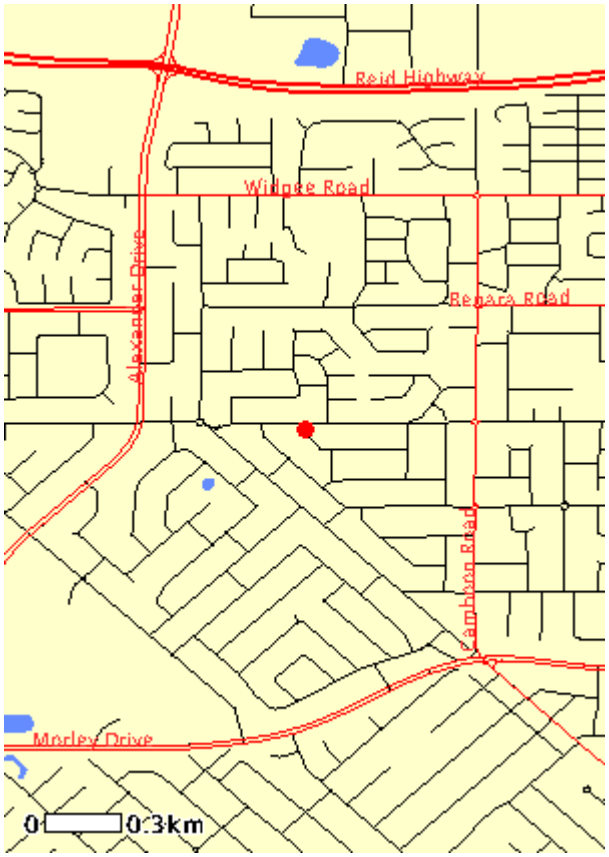
8 October 2008 14:25

Database Report

This report includes places of national environmental significance that are registered in the Department of the Environment and Water Resources' databases, for the selected area. The information presented here has been provided by a range of groups across Australia, and the accuracy and resolution varies.

Search Type:	Point
Buffer:	1 km
Coordinates:	-31.87972,115.883

Report Contents: Summary >> Details >> Caveat >> Acknowledgment



Biodiversity

Threatened Species:	4
Migratory Species:	7
Listed Marine Species:	5
Invasive Species:	16
Whales and Other Cetaceans:	None
Threatened Ecological Communities:	None

Heritage

World Heritage Properties:	None
Australian Heritage Sites:	None

Wetlands

Ramsar sites: **(Internationally important)**	1
Nationally Important Wetlands:	None

National Pollutant Inventory

Reporting Facilities:	None

Airsheds:	None
Catchments:	None
Protected Areas	
Reserves and Conservation Areas:	None
Regional Forest Agreements:	None

Biodiversity		
Threatened Species [Dataset Information]	Status	Comments
Birds		
Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-Cockatoo	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo	Endangered	Species or species habitat likely to occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll	Vulnerable	Species or species habitat likely to occur within area
Plants		
Lepidosperma rostratum Beaked Lepidosperma	Endangered	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Comments
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area

Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Listed Marine Species [Dataset Information]	Status	Comments
Birds		
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Invasive Species [Dataset Information]	Status	Comments
Selected Invasive Species: Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.		
Mammals		
Felis catus Cat, House Cat, Domestic Cat	Feral	Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit	Feral	Species or species habitat likely to occur within area
Sus scrofa Pig	Feral	Species or species habitat may occur within area
Vulpes vulpes Red Fox, Fox	Feral	Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper	WoNS	Species or species habitat likely to occur within area

Brachiaria mutica Para Grass	Invasive	Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass	Invasive	Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed	WoNS	Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom	Invasive	Species or species habitat may occur within area
Lantana camara Lantana	WoNS	Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn	Invasive	Species or species habitat may occur within area
Olea europaea Olive, Common Olive	Invasive	Species or species habitat may occur within area
Pinus radiata Monterey Pine, Radiata Pine	Invasive	Species or species habitat may occur within area
Rubus fruticosus agg. Blackberry	WoNS	Species or species habitat may occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtiji Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow	WoNS	Species or species habitat may occur within area
Salvinia molesta Salvinia	WoNS	Species or species habitat may occur within area
Wetlands		
Wetlands of International Importance (Ramsar sites) [Dataset Information]		
FORRESTDALE & THOMSONS LAKES		Within same catchment as Ramsar site

Caveat

The information presented here has been drawn from a range of sources, compiled for a variety of purposes. Details of the coverage of each dataset are included in the metadata [Dataset Information] links above.

Acknowledgment

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria

- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Department of the Environment, Water, Heritage and the Arts
GPO Box 787 Canberra ACT 2601 Australia
Telephone: (02) 6274 1111

APPENDIX B

Department of Environment and Conservation Flora Report

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DECLARED RARE AND PRIORITY FLORA LIST
6 October 2008

SPECIES / TAXON	CONS CODE	DEC REGION	DISTRIBUTION	FLOWER PERIOD
Amphibromus vickeryae	1	SW	Beechboro	Dec
Cyathochaeta teretifolia	3	SW,WA	Whiteman Park, Lake Gnangara, Ellenbrook, Muchea, Denbarker, Yelverton	Dec
Drosera occidentalis subsp. *occidentalis*	4	SW,SR	Gingin-Pinjarra, Palgarup, Darling Range, Kenwick, Wattle Grove, Beechboro	Nov-Dec
Drosera sidjamesii x	1	SW	Gnangarra, Wanneroo, Beechboro	Nov-Mar
Epiblema grandiflorum var. *cyaneum* ms	R	SW,WA	Malaga, Walpole	Nov,Dec

APPENDIX C

Department of Environment and Conservation Threatened Ecological Community Report

From: Podesta, Mia [Mia.Podesta@dec.wa.gov.au]
Sent: Friday, 14 November 2008 10:06 AM
To: Jessop, Rob
Subject: Results of TEC/PEC Search - Reid Hwy (Golder)

Attachments: Conditions of supplying TEC and PEC data.pdf; TEC-PEC_metadata.pdf
Hi Rob,

I refer to your request on the 13th of November 2008 for information on threatened and priority ecological communities occurring within the search area co-ordinates provided.

A search was undertaken on the Department's Threatened Ecological Communities database. Please note that there are no known occurrences of threatened ecological communities recorded within this boundary.

However, there are also occurrences of the following ecological community within approximately 5km of your search area:

- The 'Endangered' threatened ecological community – '*Banksia attenuata* woodland over species rich dense shrublands (SCP20a)'

A description for this community can be found in 'A Floristic Survey of the southern Swan Coastal Plain' by Gibson et al, 1994.

Please note not all priority ecological communities are currently recorded on our database. You may like to view the current list in related documents at http://www.dec.wa.gov.au/management-and-protection/threatened-species/wa-s-threatened-ecological-communities.html.

Attached are the conditions under which this information has been supplied. The information supplied should be regarded as an indication only of the threatened and priority ecological communities that may be present.

It would be appreciated if any occurrences of threatened and priority ecological communities encountered by you in the area could be reported to this Department to ensure their ongoing management.

An invoice for $110 (including GST) for the supply of this information will be forwarded.

Mia

Mia Podesta
Ecologist - Threatened Ecological Community Database
Department of Environment and Conservation, Kensington
Ph: 9334 0116
Fax: 9334 0300
Email: Mia.Podesta@dec.wa.gov.au

APPENDIX D

Department of Environment and Conservation Fauna Report

31.8225 °S 115.8232 °E / 31.9079 °S 115.9381 °E Malaga area (plus ~3km buffer)

*	Date	Certainty	Seen	Location Name	Method

Schedule 1 - Fauna that is rare or is likely to become extinct

Calyptorhynchus latirostris — Carnaby's Black-Cockatoo — *1 records*

This species moves around seasonally in flocks to feeding areas in proteaceous scrubs and heaths and eucalypt woodlands as well as pine plantations. Breeding occurs in winter/spring, mainly in the eastern forests and wheatbelt where they can find mature hollow-bearing trees to nest in.

2003	1		Koondoola	Day sighting

Synemon gratiosa — Graceful Sunmoth — *10 records*

This species has been recorded in a few locations from Wanneroo to Mandurah and is under great pressure from land development.

2002	1	1	Koondoola	Day sighting
2002	1	1	Koondoola	Day sighting
2002	1	1	Koondoola	Day sighting
2003	1	1	Koondoola	Day sighting
2004	1	1	Alexander Heights	Day sighting
2004	1	1	Marangaroo	Day sighting
2004	1	1	Marangaroo	Day sighting
2004	1	1	Marangaroo	Day sighting
2004	1	1	Koondoola	Day sighting
2008	1	1	Koondoola	Day sighting

Priority Three: Taxa with several, poorly known populations, some on conservation lands

Neelaps calonotos — Black-striped Snake — *10 records*

	1	1	Bedford Park	Caught or trapped
	1	1	Beechboro	Caught or trapped
	1	1	Guildford	Caught or trapped
	1	1	Inglewood	Caught or trapped
1952	1	1	Inglewood	Caught or trapped
1954	1	1	Mt Yokine	Caught or trapped
1962	1	1	Embleton	Caught or trapped
1964	1	1	Dianella	Caught or trapped
1968	1	1	Dianella	Caught or trapped
1969	1	1	Dianella	Caught or trapped

Hylaeus globuliferus — (bee) — *1 records*

This species of native bee is known to feed on the flowers of Adenanthos cygnorum in particular but has also been collected from the flowers of Grevillea cagiana, Banksia grossa and Banksia attenuata.

1957	1	1	Mt Yokine	

Priority Four: Taxa in need of monitoring

Macropus irma — Western Brush Wallaby — *2 records*

This species occurs in areas of forest and woodland supporting a dense shrub layer.

2002	1	1	Koondoola	Day sighting
2003	1		Koondoola	Day sighting

31.8225 °S 115.8232 °E / 31.9079 °S 115.9381 °E Malaga area (plus ~3km buffer)

*	*Date*	*Certainty*	*Seen*	*Location Name*	*Method*

Priority Five: Taxa in need of monitoring (conservation dependent)

Isoodon obesulus fusciventer **Quenda** *5 records*

This species prefers areas with dense understorey vegetation, particularly around swamps and along watercourses, that provides ample protection from predators.

2002	1	1	Beechboro	Dead
2002	1	1	Noranda	Dead
2003	2	0	Koondoola	Diggings
2004	1	4	Whiteman	Caught or trapped
2004	1	8	Whiteman	Caught or trapped

***** Information relating to any records provided for listed species:-
Date: date of recorded observation
Certainty (of correct species identification): 1=Very certain; 2=Moderately certain; and 3=Not sure.
Seen: Number of individuals observed.
Location Name: Name of reserve or nearest locality where observation was made
Method: Method or type of observation

APPENDIX E

Department of Indigenous Affairs Aboriginal Heritage Inquiry

Search Criteria

1 sites in a search polygon. The polygon is formed by these points (in order):

MGA Zone 50	
Northing	Easting
6474198	393301
6474281	394753
6472945	394749
6472933	393194

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, 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.

Copyright

Legend

Restriction

N	No restriction
M	Male access only
F	Female access

Access

C	Closed
O	Open
V	Vulnerable

Coordinate Accuracy

Accuracy is shown as a code in brackets following the site coordinates.

[Reliable]	The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
[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.

Status

L	Lodged	IR	Insufficient Information (as assessed by Site Assessment Group)
I	Insufficient Information	PR	Permanent register (as assessed by Site Assessment Group)
P	Permanent register	SR	Stored data (as assessed by Site Assessment Group)
S	Stored data		

Site Assessment Group (SAG)

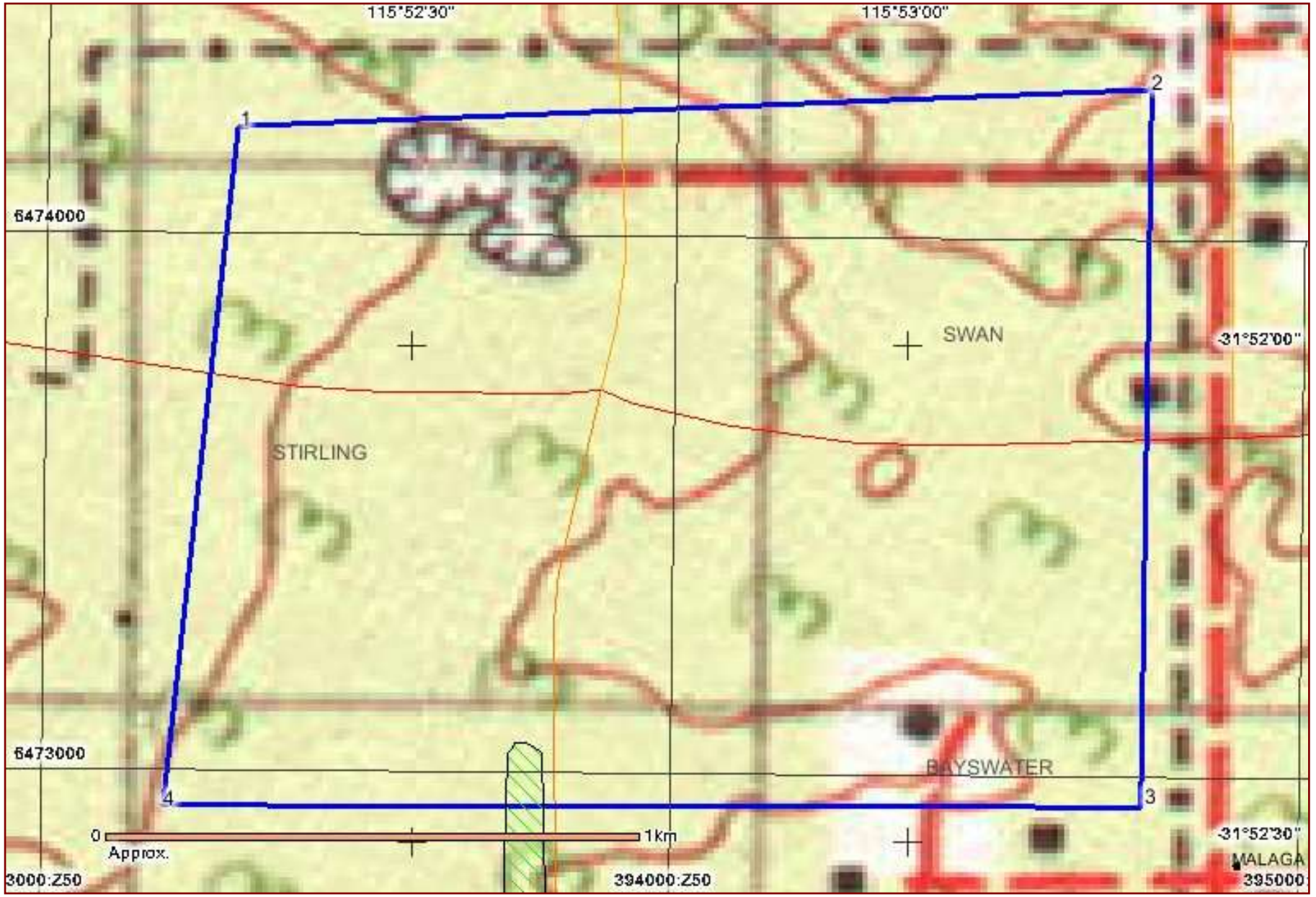
Sites lodged with the Department are assessed under the direction of the Registrar of Aboriginal Sites. These are not to be considered the final assessment.

Final assessment will be determined by the Aboriginal Cultural Material Committee (ACMC).

Spatial Accuracy

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.

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
3167	S	O	N	Deasey Place W	Artefacts / Scatter			393769mE 6472880mN Zone 50 [Reliable]	S00693



Legend

- Highlighted Area
- Town
- Map Area
- Search Area

APPENDIX F
Plant Species List

PLANT SPECIES LIST

Plant Family	*Species Name*	Common Name
Aizoaceae	*Carpobrotus edulis**	Pigface
Amaranthaceae	*Ptilotus polystchyus* var. *polystachyus*	Prince-of-Wales Feather
Anthericaceae	*Thysanotus manglesianus*	Mangle's Fringed Lily
Apiaceae	*Foeniculum vulgare**	Fennel
Asphodelaceae	*Trachyandra divaricata**	Dune Onion Weed
Asteraceae	*Arctotheca calendula**	Capeweed
	*Hypochaeris radicata**	Flatweed
	Podotheca angustifolia	Sticky Longheads
	Podotheca gnaphalioides	Golden Long-heads
	Rhodanthe chlorocephala subsp. *rosea*	Common Everlasting
	*Urospermum picroides**	False Hawkbit
	*Ursinia anthemoides**	Ursinia
Boryaceae	*Borya sphaerocephala*	Pincushions
Casuarinaceae	*Allocasuarina fraseriana*	Sheoak
	Allocasuarina humilis	Dwarf Sheoak
Colchicaceae	*Burchardia congesta*	Milkweed
Cyperaceae	*Baumea juncea*	Bare Twigrush
	Mesomelaena pseudostygia	Semaphore Sedge
Dasypogonaceae	*Calectasia narragara*	Star of Bethlehem
	Dasypogon bromeliifolius	Pineapple Bush
Dilleniaceae	*Hibbertia hypericoides*	Yellow Buttercups
Droseraceae	*Drosera erythrorhiza*	Red Ink Sundew
	Drosera menziesii subsp. *penicillaris*	-
Epacridaceae	*Conostephium pendulum*	Pearl Flower
	Lysinema ciliatum	Curry Flower
Euphorbiaceae	*Euphorbia dendroides**	-

Plant Family	*Species Name*	Common Name
Fabaceae	*Acacia celastrifolia*	Glowing Wattle
	Acacia longifolia subsp. *longifolia**	Sydney Golden Wattle
	Acacia pulchella var. *glaberrima*	Prickly Moses
	Bossiaea eriocarpa	Common Brown Pea
	*Chamaecytisus palmensis**	Tree Lucerne
	Daviesia decurrens	Prickly Bitter-pea
	Daviesia divaricata	-
	Daviesia triflora	-
	Gompholobium capitatum	-
	Gompholobium tomentosum	Hairy Yellow Pea
	Hardenbergia comptoniana	Native Wisteria
	Jacksonia floribunda	Holly Pea
	Jacksonia furcellata	Grey Stinkwood
	Jacksonia sternbergiana	Stinkwood
	*Lupinus cosentinii**	Sandplain Lupin
	*Trifolium angustifolium**	Narrowleaf Clover
Geraniaceae	*Pelargonium capitatum**	Rose Pelargonium
Goodeniaceae	*Dampiera linearis*	Common Dampiera
	Lechenaultia floribunda	Free-flowering Leschenaultia
	Scaevola repens	-
Haemodoraceae	*Anigozanthos humilis* subsp. *humilis*	Catspaw
	Conostylis aculeata subsp. *aculeata*	-
	Conostylis setigera	Bristly Cottonhead
Iridaceae	*Gladiolus caryophyllaceus**	Wild Gladiolus
	Patersonia occidentalis	Purple Flag
Lamiaceae	*Hemiandra linearis*	Speckled Snakebush

Plant Family	*Species Name*	Common Name
Loranthaceae	*Nuytsia floribunda*	Christmas Tree
Myrtaceae	*Beaufortia squarrosa*	Sand Bottlebrush
	Callistemon phoeniceus	Lesser Bottlebrush
	Calothamnus quadrifidus	One-sided Bottlebrush
	Calytrix leschenaultii	-
	*Chamelaucium uncinatum**	Geraldton wax
	Eremaea pauciflora var. *pauciflora*	-
	Eucalyptus calophylla	Marri
	Eucalyptus erythrocorys	Red Cap Gum
	Eucalyptus ficifolia	Red-flowering Gum
	Eucalyptus marginata subsp. *marginata*	Jarrah
	Hypocalymma angustifolium	White Myrtle
	Hypocalymma robustum	Swan River Myrtle
	Kunzea recurva	Curved-leaf Kunzea
	*Melaleuca nesophylla**	Mindiyed
	Melaleuca ryeae	-
	Melaleuca seriata	-
	Melaleuca trichophylla	-
Ochidaceae	*Disa bracteata**	South African Orchid
	Thelymitra macrophylla	Scented Sun Orchid
Onagraceae	*Oenothera drummondii**	Beach Evening Primrose
Oxalidaceae	*Oxalis perennans*	Native Oxalis
Plantaginaceae	*Plantago lanceolata**	Ribwort Plantain
Poaceae	*Aira cupaniana**	Silvery Hairgrass
	Amphipogon turbinatus	-
	Austrostipa elegantissima	Feather Speargrass
	*Avena barbata**	Bearded Oat

Plant Family	*Species Name*	Common Name
	*Briza maxima**	Quaking Grass
	*Bromus diandrus**	Ripgut Brome
	*Cortaderia selloana**	Pampas Grass
	*Ehrharta calycina**	Perennial Veldt Grass
	*Ehrharta longiflora**	Annual Veldt Grass
Proteaceae	*Adenanthos cygnorum*	Common Woollybush
	Banksia attenuata	Slender Banksia
	Banksia grandis	Bull Banksia
	Banksia ilicifolia	Holly-leaved Banksia
	Banksia menziesii	Firewood Banksia
	Banksia prionotes	Acorn Banksia
	Conospermum stoechadis subsp. *stoechadis*	Common Smokebush
	Hakea trifurcata	Two-leaf Hakea
	Petrophile linearis	Pixie Mops
	Petrophile macrostachya	-
	Stirlingia latifolia	Blueboy
	Synaphea spinulosa subsp. *spinulosa*	-
Restionaceae	*Desmocladus flexuosus*	-
Sapindaceae	*Dodonaea viscosa*	Sticky Hopbush
Stylidiaceae	*Stylidium calcaratum*	Book Trigger Plant
Thymelaeaceae	*Pimelea sulphurea*	Yellow Banjine
Violaceae	*Hybanthus calycinus*	Wild Violet
Xanthorrhoeaceae	*Xanthorrhoea preissii*	Grasstree
	Xanthorrhoeae brunonis subsp. *brunonis*	Grasstree

* Indicates non-endemic species in Western Australia.

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APPENDIX G
Fauna Species List

FAUNA SPECIES LIST

Family	*Species Name*	Common Name
BIRDS		
Artamidae	*Gymnorhina tibicen dorsalis*	Australian Magpie
Columbidae	*Streptopelia senegalensis**	Laughing Turtle-dove
Corvidae	*Corvus coronoides*	Australian Raven
Dicruridae	*Grallina cyanoleuca*	Magpie-lark
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird
	Anthochaera lunulata	Western Wattlebird
	Lichenostomus virescens	Singing Honeyeater
	Lichmera indistincta	Brown Honeyeater
	Phyalidonyris nigra	White-cheeked Honeyeater
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet
REPTILES		
Scincidae	*Cryptoblepharus plagiocephalus*	Fence Skink

* Indicates non-endemic species in Western Australia.

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APPENDIX H

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LIMITATIONS

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Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associates Pty Ltd
Level 2, 1 Havelock Street
West Perth Western Australia 6005
Australia
T: +61 8 9213 7600

Golder Associates