Appendix D

Fauna Values of Empire Oil's Mullering Prospect
EP 432

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Prepared for: Woodman Environmental Consulting Pty Ltd
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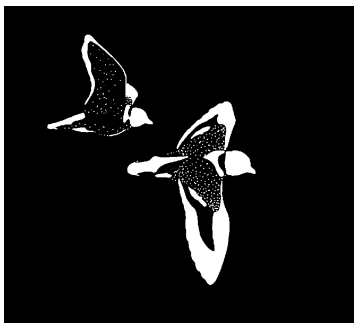

26th May 2006

EXECUTIVE SUMMARY

Empire Oil & Gas NL has proposed to conduct a three dimensional seismic exploration survey of its Mullering prospect EP 432. As part of environmental impact assessment for this survey, a literature review and site inspection were conducted in order to identify fauna values of the site and potential issues with respect to this fauna.

Two hundred and forty-two vertebrate species may occur in the vicinity of the prospect, 34 of which are regarded as of conservation significance. Significant species of concern include the Carpet Python, Rainbow Bee-eater, Ground Parrot and Brush Wallaby, with concern also for freshwater swamp fauna and reintroduced mammals sensitive to predation by Foxes. One invertebrate species of conservation significance (a cricket) may also occur on the prosect.

The majority of the EP 432 prospect is good to excellent quality habitat that is likely to support a relatively intact faunal assemblage. The major impacts of the survey are likely to be associated with clearing and vehicle movement. Roadkill along Cooljarloo and Woolka Roads due to increased traffic may be a special concern from the Carpet Python and Bush Wallaby. The impact of the vibroseis on terrestrial fauna is thought to be minimal. The effects of the survey are likely to be relatively transient, although there should be consideration of the rehabilitation and long-term persistence of survey tracks. Disturbance of the wetland areas (and associated fauna) should be avoided. Other amelioration measures, such as the use of hand-pruning and set-out techniques (for laying geophone lines in sensitive areas), and the timing of clearing, are discussed.

CONTENTS

INTRODUCTION

Empire Oil & Gas NL has proposed to conduct a three dimensional seismic exploration survey in the Mullering region, west-north-west of Cataby, in order to define potential oil and gas reserves in its prospect EP 432. It is expected that approximately 431km of seismic lines will be surveyed, covering an area of 70km^2. Vibroseis trucks will be used as the source of vibrations (sound waves) that travel into the earth and are reflected from subsurface geological structures. The seismic signal is then detected with the use of geophones. It is anticipated that the Mullering Seismic Program will involve the use of three or four vibroseis trucks and three light cable trucks for laying out the geophone lines during this operation. Some vegetation clearing will be required to allow for the passage and operation of the vibroseis trucks and crew. Seismic lines will be approximately 3-4m wide and will be laid out with consideration of environmentally sensitive areas. At least two methods for laying out the geophone lines may be employed: rolling the lines (off the back of a cable truck) and hand clearing and positioning of the lines (in sensitive habitats).

Bamford Consulting Ecologists was commissioned to conduct a literature review and site inspection to assess the potential impact of the proposal on terrestrial fauna.

METHODS

Report structure

The approach taken in this assessment comprises a literature review and predictive assessment of the fauna of conservation significance that are likely to be impacted by the seismic survey of the Mullering EP 432 prospect (given the available project and environmental information). The results and discussion presented are:
Overview – vertebrates. Information on, and lists of, all vertebrate species that are likely to occur in the vicinity of the prospect.
Species of conservation significance – vertebrates. Detailed information and a risk assessment of vertebrate species that are considered to be of conservation significance in the vicinity of the prospect (see also 'Assessment of conservation significance', below).
Invertebrates. An overview of the invertebrates of conservation significance that are likely to occur in the vicinity of the prospect.
Site inspection. Notes on fauna and habitats that were observed during the site inspection.
Impacting processes. A discussion of the likely, potential impacts of the proposed seismic survey, and a discussion of possible amelioration measures.

Level of assessment

The fauna assessment and report preparation were carried out with reference to guidance and position statements published by the WA Environmental Protection Authority (EPA) on fauna surveys and environmental protection, and Commonwealth Biodiversity Legislation (e.g. EPA 2002; e.g. EPA 2004). Reference was also made to guidelines for mining proposals published by the Department of Industry and Resources (DoIR 2006). The report synthesises the results of a literature review and a site inspection and is classified as a Level 1 survey (desktop study, reconnaissance survey) according to the EPA Position Statement No. 3 (EPA 2002).

Personnel

The following personnel were involved in the preparation of this report:

- Dr Mike Bamford *BSc(Biol.), Hons(Biol.), PhD(Biol.*)
- Dr Wes Bancroft *BSc(Zool./Microbiol.), Hons(Zool.), PhD(Zool.)*

The site inspection was undertaken by Wes Bancroft. The report was prepared by Wes Bancroft and Mike Bamford.

Licences and permits

No licences or permits were required for the site inspection and preparation of the current (desktop) report.

Site description

The Mullering prospect EP 432 covers an area of approximately 66.8km^2 and is located approximately 17km WNW of Cataby.

Woodman Environmental Consulting has surveyed and mapped the vegetation of the prospect. A detailed report of the vegetation of the site will be prepared, but the basic vegetation/soil associations identified on the prospect are:

- Dense heaths on grey sands
- Dwarf scrub on grey sands
- Heaths on white, yellow, grey and brown sands
- Seasonally inundated wetlands
- Swamps
- Thickets on grey sands, some with limestone outcropping
- Woodlands and forests on brown and grey sands

The proposed transmission line route falls within the Swan Coastal Plain Bioregion of the Interim Biogeographic Regionalisation for Australia (IBRA) classification system (EA 2000; McKenzie *et al.* 2003). The general features of this region are summarised by McKenzie *et al.* (2003): The region is characterised by "a warm Mediterranean climate and rainfall that ranges between 1000 and 600mm annually. The Swan Coastal Plain Bioregion comprises the Dandaragan Plateau and the Perth Coastal Plain. It includes urban developments associated with the city of Perth, and is dominated by woodlands of banksia and tuart on sandy soils, sheoak on outwash plains, and paperbark in swampy areas. The colluvial and aeolian sand areas represent three phases of Quaternary marine sand dune development (which provide relief), and include a complex series of seasonal fresh water wetlands, alluvial river flats, coastal limestones and several offshore islands. Younger sandy areas and limestones are dominated by heath and/or tuart woodlands, while banksia and jarrah-banksia woodlands are found on the older dune systems. Fine-textured outwash plains at the foot of the Darling Escarpment are extensive only in the south, and were once dominated by *Casuarina obesa*-marri woodlands and Melaleuca shrublands. In the north-east, the plain rises to duricrusted Mesozoic sediments dominated by jarrah woodland. The Dandaragan Plateau is the region's north-eastern corner, and is composed of cretaceous marine sediments mantled by sands and laterites. The plateau is characterised by banksia low woodland, jarrah-marri

woodland, marri woodland, and by scrub-heaths on laterite pavement and gravelly sandplains. A variety of plants, including tuart are endemic to the region."

The Swan Coastal Plain Bioregion falls within the Bioregion Group 1 classification of EPA (2004). This grouping may be relevant for environmental impact assessment purposes.

Literature search/Sources of information

A list of fauna that would be expected to occur in the vicinity of Empire Oil's Mullering prospect EP 432 was generated by searching available databases and literature. These include:

- the Western Australian Museum's 'Faunabase'.
- Birds Australia's database for the second Atlas of Australian Birds.
- the information and species distribution maps provided by Tyler *et al*. (2000), Storr *et al*. (1983; 1990; 1999), Wilson and Swan (2003), Cogger (2000), Johnstone and Storr (1998), Strahan (1995), Menkhorst and Knight (2004) and Churchill (1998).
- the consultants' previous experience of the fauna based on surveys carried out in the general area.

The Faunabase database was searched for the one quarter degree grid block that surrounds the study area (30^{o} 30' to 31^{o} 00'S, and 115° 00' to 115° 30' E). The Birds Australia database was searched for the one degree grid block that surrounds the study area (30^{o} to 31^{o} S, and 115° to 115° E). For additional information and records on threatened species and threatened communities the threatened fauna databases maintained by the Western Australian Department of Conservation and Land Management (CALM) and the federal Department for the Environment and Heritage (Environment Protection and Biodiversity Conservation, EPBC, database) were searched. The search area for the CALM search was a 20 km buffer zone around the area bounded by 30^{o} 39' to 30^{o} 44'S, and 115° 16' to 115° 22' E. The search area for the EPBC database was the area same one quarter degree grid block as the Faunabase search.

Because the seismic surveys on the prospect will not enter marine systems under Commonwealth control, obligate marine animals were excluded from the results presented here. Similarly, some species that were returned by one or more of the data searches have been excluded because their ecology, or the habitat types within the areas of interest, meant that it is highly unlikely that these species would be present. A list of these excluded species is presented in Appendix 4.

Site inspection

The site inspection was carried out on 6th April 2006. The intention of the site inspection was to familiarise the consultants with the environment and fauna habitats of the study area. During the inspection, as much of the lease area was visited as possible in order to give the consultants some familiarity with the area. Particular emphasis was placed on potentially ecologically important, or uncommon, habitats. Notes were made on habitats and opportunistic observations were made on fauna.

Nomenclature and taxonomy

As per the recommendations of EPA (2004), the nomenclature and taxonomic order presented in this report are based on the Western Australian Museum's *Checklist of the Vertebrates of Western Australia*. The authorities used for each vertebrate group are: amphibians and reptiles (Aplin and Smith 2001), birds (Christidis and Boles 1994; Johnstone 2001), and mammals (How *et al.* 2001).

Assessment of conservation significance

The conservation status of fauna species is assessed under Commonwealth and State Acts such as the *Commonwealth Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999 and the *Western Australian Wildlife Conservation Act* 1950. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN 2001). The *WA Wildlife Conservation Act* 1950 uses a set of Schedules but also classifies species using some of the IUCN categories. These categories and Schedules are described in Appendix 1.

The EPBC Act also has lists of migratory species that are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA) and the Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animals). The list of migratory species under the EPBC Act has been revised to include species only, thus excluding family listings (DEH, pers. comm.). Those species listed in JAMBA are also protected under Schedule 3 of the *WA Wildlife Conservation Act*. There is a separate list of marine species under the EPBC Act, but this only applies to land and waters under Commonwealth management. Therefore, marine listings are not included in this report.

The Department of the Environment and Heritage (DEH, formerly Environment Australia) has also supported the publication of reports on the conservation status of most vertebrate fauna species: reptiles (Cogger *et al.* 1993), birds (Garnett and Crowley 2000), monotremes and marsupials (Maxwell *et al.* 1996), rodents (Lee 1995) and bats (Duncan *et al.* 1999). The Threatened Species and Communities Section of Environment Australia has also produced a list of Threatened Australian Fauna, although this list is effectively a precursor to the list produced under the EPBC Act. These publications also use the IUCN categories, although those used by Cogger *et al.* (1993) differ in some respects because this report pre-dates categories reviewed by Mace and Stuart (1994) and revisited since by IUCN (2001).

In Western Australia, the Department of Conservation and Land Management (CALM) has produced a supplementary list of Priority Fauna, being species that are not considered Threatened under the WA Act but for which the Department feels there is cause for concern. Some Priority species, however, are also assigned to the IUCN Conservation Dependent category. Levels of Priority are described in Appendix 1. Assessments in this report are based on the most recent version of the CALM priority list (June 2005).

Fauna species included under conservation acts and/or agreements are formally recognised as of conservation significance under state or federal legislation. Species listed only as Priority by CALM, or that are included in publications such as Garnett

and Crowley (2000) and Cogger *et al.* (1993), but not in State or Commonwealth Acts, are also of recognised conservation significance. In addition, species that are at the limit of their distribution, those that have a very restricted range and those that occur in breeding colonies, such as some waterbirds, can be considered of conservation significance, although this level of significance has no legislative or published recognition and is based on interpretation of distribution information. The WA Department of Environment (formerly the Department of Environmental Protection, DEP) used this sort of interpretation to identify significant bird species in the Perth metropolitan area as part of Perth Bushplan (DEP 2000).

On the basis of the above comments, three levels of conservation significance are recognised in this report:

- *Conservation Significance (CS) 1*: Species listed under State or Commonwealth Acts.
- *Conservation Significance (CS) 2*: Species not listed under State or Commonwealth Acts, but listed in publications on threatened fauna or as Priority species by CALM.
- *Conservation Significance (CS) 3*: Species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution. This level may have links to preserving biodiversity at the genetic level (EPA Position Statement No. 3, EPA 2002). For example, if a population is isolated but a subset of a widespread (common) species, then it may not be recognised as threatened, but may have unique genetic characteristics. Species on the edge of their range, or that are sensitive to impacts such as habitat fragmentation, may also be classed as CS3.

In addition to these statuses, species that have been introduced (Int) or are considered vagrants (Vag) to the study area are also indicated.

RESULTS AND DISCUSSION

Overview - vertebrates

The literature review identified 242 species of vertebrate that may occur in the vicinity of the prospect EP 432. These comprised 4 fish, 11 frogs, 54 reptiles, 147 birds and 26 mammals (Tables 1 to 5). These species reflect the high potential diversity of reptiles and birds in this region (Storr and Johnstone 1988; Maryan 2005). The faunal assemblage is likely to be 'typical' of the northern Swan Coastal Plain assemblage (e.g. Kitchener *et al.* 1978; Storr and Johnstone 1988), but with the distinct influence of wetland areas (particularly for some fish, frog and some bird species) and the close proximity of the western boundary to the coast (particularly for some reptiles).

Freshwater fish

Four species of freshwater fish may occur, including three native and one introduced species (Table 1). All of these species require permanent water for their survival.

Amphibians

Eleven species of frogs are expected to occur in the vicinity of the prospect (Table 2). All but one (*Crinia pseudinsignifera*) of these species have been recorded from nearby areas by Bamford Consulting Ecologists. Most species require wetlands or damplands to breed (with the exception of the Turtle Frog), but also make extensive use of woodlands throughout the remainder of the year.

Reptiles

Fifty-four species of reptiles may occur in the vicinity of the prospect (Table 3). The expected reptile fauna is dominated by legless lizards (8 species), skinks (21 species) and elapid snakes (12 species), many of which show preference for the sandy substrates of the area. Several of these species occur in near-coastal environments (e.g. *Cyclodomorphus celatus*, West Coast Line-spotted Lerista and West Coast Banded Snake) and the close proximity to the coast (*c*. 10 km) of the western boundary of the site may increase the likelihood of the presence of these species.

Birds

One hundred and forty-seven species of birds may occur in the vicinity of the prospect (Table 4). Forty of these species are considered to be vagrants to the area and 34 species are generally dependent on wetland habitats (some of these waterbirds are also considered vagrant, Table 4). A large number of honeyeaters (14 species) may make use of the diverse flora of the region, up to 13 bird of prey species may occur, and it is reasonable to expect a relatively intact banksia woodland bird assemblage (Storr and Johnstone 1988).

Mammals

The mammalian fauna expected to occur in the vicinity of the prospect is depauperate. Twenty-six mammal species are expected; of which eight are bats and six are introduced species. Three species have been reintroduced into the nearby Nambung National Park in conjunction with regional fox baiting (Quenda, Woylie, Tammar) and if not currently present on the prospect may spread to the site in the future.

Eleven species of vertebrate are considered to be locally extinct from the region (Table 6).

Species of conservation significance - vertebrates

Of the 242 species of vertebrate that may occur in the vicinity of the prospect, there are 34 species of conservation significance (11 CS1, 10 CS2 and 13 CS3 species). The number of species in each of the vertebrate classes was:

Actinopterygii (Bony Fish)	2	(2 CS3)
Amphibia (Frogs)	0	
Reptilia (Reptiles)	5	(1 CS1, 2 CS2, 2 CS3)
Aves (Birds)	22	(10 CS1, 4 CS2, 8 CS3)
Mammalia (Mammals)	5	(4 CS2, 1 CS3)

The results of the EBPC and CALM database searches (for species of conservation significance) are presented in Appendices 2 and 3 respectively, but the information provided by these has also been collated in Tables 1 to 5, and Appendix 5.

Species accounts that provide basic information on the vertebrate species of conservation significance (including their conservation status, the reason for their significance, aspects of their ecology, potential threatening processes and the inferred status of the species at the study site) are presented in Appendix 5.

The majority of species of conservation significance are unlikely to be impacted (see Appendix 5) because the area of disturbance is small and dispersed, and the disturbance is likely to be temporary. This assumes that continued use of survey tracks will not take place and they will be rehabilitated. A few species could be affected, however, and are discussed below.

Carpet Python. This large snake is listed as Schedule 4 of the WA Wildlife Conservation Act and occurs in the general region, with a specimen recently run over on Brand Highway between the two Cataby Roadhouses. It is vulnerable to roadkill because it is large and slow-moving, and may be affected by increased traffic along Cooljarloo and Woolka roads. Personnel need to be aware of the significance of this snake.

Rainbow Bee-eater. This species of bird is migratory and constructs nesting burrows in sandy habitats. It often chooses nest sites near areas of human disturbance (e.g. cleared paddocks, track or road edges or verges) and, when present, Rainbow Bee-eaters are obvious and prominent. In the south-west, breeding by Rainbow Bee-eaters is usually from mid-spring to mid-summer, and pairs that return to the same site will regularly construct a new burrow each year. Survey traffic may inadvertently crush burrows. The density of Rainbow Bee-eater nesting burrows in the Mullering prospect EP 432 is unknown, but given the occurrence in nearby areas (W. Bancroft, M. Bamford pers. obs.) it is likely to be relatively low. If surveys are conducted during the breeding period, care should be taken to avoid burrow sites. The impact of surveys outside this period is likely to be negligible.

Brush Wallaby. This species is listed as Priority 5 by CALM, and is highly likely to occur within the Mullering EP 432 prospect. It is vulnerable to roadkill due to increased vehicular traffic along Cooljarloo and Woolka Roads. Vehicle speeds should be kept to a minimum at all times, and limits to speed should be employed wherever possible.

Ground Parrot. Listed as Endangered under the EPBC Act and as Critically Endangered under the WA Wildlife Conservation Act. Its range once extended from north of Perth to Esperance, but the species is now believed to be restricted to Waychinicup, Fitzgerald River and Cape Arid National Parks on the south coast. There was a recent, unconfirmed record near the mouth of the Hill River (between Cervantes and Jurien), suggesting that a northern population may survive. There is some suitable habitat in the prospect (heath, especially with sedges). The species is sensitive to fire and probably predation by Foxes. As its numbers may be very low, any impact would be of concern. Sightings should be reported to conservation agencies.

In addition to the species of conservation significance, two groups of animals may be of particular concern:

Freshwater swamp fauna. The permanent fresh-water swamp on the lease (see Site Inspection, below) is highly likely to support a faunal community and ecological processes that differ to the surrounding areas (e.g. freshwater fish and invertebrates, breeding and refuge sites for amphibians and waterbirds, year-around water source to surrounding fauna). Given the small size of this habitat and the likely important ecological functions that it performs, any disturbance to this area may have disproportionately large effects on the dependent fauna.

Reintroduced mammals sensitive to predation by Foxes. The Quenda, Woylie and Tammar have all been reintroduced to Nambung Nature Reserve, with the success of this reintroduction dependent upon Fox control in the region. The project area is within the Fox control zone and these species may well spread into the prospect over the next few years. Foxes often travel along tracks and are attracted to human activities where they scavenge and may even be fed by personnel. It is important that Foxes not be encouraged and that tracks be rehabilitated as quickly as possible.

Invertebrates

One invertebrate species of conservation significance was returned by the CALM database search (Appendix 3). A species account is provided for this species (the cricket *Austrosaga spinifer*) in Appendix 5.

The potential also exists for other short-range endemics to occur in the vicinity of the Mullering prospect EP 432. Harvey (2002) notes that the majority of species that have been classified as short-range endemics have common life history characteristics such as poor powers of dispersal or confinement to discontinuous habitats. Several groups, therefore, have particularly high instances of short-range endemic species: Gastropoda (snails and slugs), Oligochaeta (earthworms), Onychophora (velvet worms), Araneae (mygalomorph spiders), Pseudoscorpionida (pseudoscorpions), Schizomida (schizomids), Diplopoda (millipedes), Phreatoicidea (phreatoicidean crustaceans), and Decapoda (freshwater crayfish). The poor understanding of the taxonomy of many of the short-range endemic species hinders their conservation (Harvey 2002). In the project area, wetlands have the features that mean they may support short range endemic invertebrates. This is a further case for avoiding impacts upon wetlands.

Site inspection

The eastern two-thirds to three-quarters of the Mullering prospect EP 432 are dominated by large tracts of banksia (sandplain) woodland interspersed with considerable areas of low heathland or seasonal dampland vegetation. There is also an apparently permanent wetland to the south-east of the prospect. These habitats are largely pristine, although some areas (particularly in the south-west) have been recently burnt and are regenerating, and there are numerous sand tracks dissecting the site. The westernmost edge of the prospect has been degraded by stock.

Fauna

Twenty-six species were recorded during the site inspection (4 fish, 20 birds, 2 mammals):

Western Minnow	Swan River Goby
Western Pygmy Perch	Mosquitofish [1]
Emu [2]	Western Spinebill
Pacific Black Duck	Grey Shrike-thrush
Common Bronzewing	Magpie Lark
Sacred Kingfisher	Grey Fantail
Splendid Fairy-wren	Willie Wagtail
Western Thornbill	Black-faced Woodswallow
Western Wattlebird	Australian Magpie
Brown Honeyeater	Australian Raven
White-cheeked Honeyeater	Silvereye
Tawny-crowned Honeyeater	
Echidna [3]	Western Grey Kangaroo

[1] introduced species
[2] droppings
[3] diggings

Of these species, two of the fish, the Western Minnow and Western Pygmy Perch, are considered to be of regional conservation significance (CS3). They are both at the northern limit of their range, restricted to a small area of habitat and probably sensitive to disturbance.

Habitat

The wetland/swamp located at *c*. 341000E, 6601000N (GDA 94) is an apparently permanent water source. The four species of fish recorded from this area during the site inspection (see Site Inspection – Fauna, above) are species that are not adapted to tolerate ephemeral systems. Therefore this swamp apparently provides a year-around aquatic habitat and water source to the local fauna. Disruption of this area during the seismic survey is likely to have a significant impact on many species. Alternatively, the fish may disperse into this wetland during periods of high water levels, as all are present in Mullering Brook. Such dispersal may be an essential part of their life cycle and could be disrupted by the creation of tracks that divert water flow.

Areas of low heath throughout the site may provide suitable habitat for Ground Parrot (see Appendix 5), if this species is present in the area. Survey crews should be alert to the possible presence of this species when working in such habitat.

A number of seasonal damplands and drainage lines are present throughout the prospect and are likely to play an important role in the breeding ecology of the amphibian fauna of the site. Disruption of the drainage patterns (e.g. by the clearing of tracks for vehicle passage) may impact up these species.

The coastward dune areas may support species that are typically associated with coastal habitats (e.g. some sand-swimming skinks, see Overview - vertebrates, above), however it is unlikely that the seismic survey methods will significantly impact these species.

Impacting processes

There are several processes that may adversely affect fauna in the seismic survey of the Mullering prospect EP 432. These include:

- Death/injury of fauna during clearing, grading and impacts with vehicles/machinery.
- Loss of habitat (clearing).
- Fragmentation of habitat.
- Disturbance of fauna in nearby areas from light, noise and even personnel feeding selected species.
- Improved access to area by feral species (eg. the Fox will follow tracks).
- Introduction of the dieback fungus *Phytophthora cinnamomi*.

For the purposes of the seismic survey, many of these impacts on fauna are likely to be transient in nature. That is, the survey is a (presumably) once-off occurrence. Further consideration should be given to any longer-term influences (e.g. mining, infrastructure).

Impacts of vehicles and machinery movement or operation, and loss of habitat (clearing)

Vehicle movement and operation may result in the death or injury of fauna as a result of collisions. Clearing of habitat (by this machinery) may result in loss of habitat for fauna. The impact of land clearing on fauna will be roughly proportional to the amount of habitat cleared (although some habitats may be more significant than others). From the site inspection, freshwater wetland areas (particularly those associated with vegetation types W6 of Woodman Environmental Consulting) are likely to be most affected by this process for two reasons:

- Wetlands and surrounding areas are likely to be richer in fauna (both resident and also those sourcing water).
- The total area of this vegetation type is small and therefore any disturbance may be proportionally larger than for more widespread vegetation types.

These potentially sensitive areas should be avoided. If, however, testing is to be conducted in close proximity, then clearing and set-out of geophones should be undertaken by hand.

If the estimates of the total length (431 km) and usual width (4 m) of seismic lines are close to the actual levels, then approximately 1.7 km^2 of the prospect will be directly disturbed by the seismic survey. This equates to approximately 2.6% of the site. The significance of this impact depends on how seismic lines are created and will be greater if lines have to be cleared to mineral earth than if vegetation can be driven over and retained.

Terrestrial animals will usually respond to clearing activity or disturbance in one of two ways: (1) by attempting to take flight in advance of the approaching disturbance, or (2) by maintaining their position (usually in a sheltered or camouflaged location)

until disturbance is imminent. During clearing and grading, some animals, including birds and large mammals, will be able to move away from the source(s) of disturbance because they will take flight early and have the sustained speed and endurance to avoid clearing machinery. Many other species (such as hollow-roosting fauna, frogs, small reptiles, small mammals, and nestling birds) will not be able to escape because they will either opt to maintain or seek a sheltered position, or they will be unable to maintain the speed or endurance required to get themselves fully clear of the machinery.

Several mitigation procedures may be used to reduce the impact of vehicles, machinery and habitat clearing:

- Disturbance of the wetland areas should be avoided (these areas may be logistically difficult to survey in any case).
- Pruning and geophone set-out should be undertaken by hand in potentially sensitive areas.
- Where possible, grading should be avoided and vehicles should drive directly over or through the vegetation. This not only preserves the seedbank (that will assist in rapid regeneration of disturbed sites) but it may also protect small ground-dwelling vertebrates (e.g. frogs, reptiles).
- Vehicle speed should be kept to a minimum at all times, and limits to speed should be employed wherever possible.
- Existing clearings, tracks, firebreaks or degraded habitats should be used in preference to clearing native vegetation. Strong emphasis should be placed on utilising existing tracks for survey purposes.
- Clearing/pruning should be conducted during seasons in which birds are least likely to be nesting (e.g. autumn, early winter).
- If grading is unavoidable, cleared vegetation (including logs and leaf litter) should be stockpiled wherever possible and, following the survey, the surface profile should be re-established and the vegetation should be respread to assist the reestablishment of fauna habitat.
- Areas of disturbance should be minimised through a process of workforce induction and flagging of limits of disturbance, especially within areas of native vegetation.

Habitat fragmentation

Clearing operations not only directly affect fauna in the initial phase but can have long-term implications. It is likely that the seismic survey will cause minor fragmentation over much of the prospect (through the establishment of 3-4 m wide survey tracks). Such fragmentation may be significant for small, terrestrial species and the degree of impact will be governed by the spacing of survey tracks. Establishment of tracks can also lead to habitat degradation (weeds) and gives feral species access into native vegetation. There may also be temporary barriers (e.g. parked equipment, geophone lines) that will restrict fauna movement and temporarily fragment habitats.

Where clearing of native vegetation is unavoidable, fragmentation can be reduced by:

- Removing the edge of bushland (along existing tracks) instead of clearing a path through the centre of the block.
- Minimising obstructions (e.g. equipment on the ground) to the passage of terrestrial fauna.

Disturbance of fauna

Fauna may also be disturbed by the noise, vibration, light or emissions from vehicles or machinery. The vibroseis method appears to be considered a 'low impact' survey method (ENS 2006), and the impact of the vibroseis on terrestrial fauna is considered to be minimal (most concerns with this method pertain to clearing and the physical movement and operation of trucks). General noise and disturbance from vehicle movement and operation will be an issue throughout the survey. To minimise these impacts:

- Lighting should be kept to a minimum.
- Noise should be kept to a minimum and should not exceed EPA noise limit guidelines.
- The feeding of animals, hunting, fire-arms and pets on the site should be prohibited.

Dieback

This fungal disease can be spread by contaminated soil on vehicles and can kill a significant proportion of the plant species in the area. Such death of plants has severe implications for the fauna. Therefore, dieback quarantine measures should be put in place to prevent potentially contaminated vehicles from entering the site.

SUMMARY OF RECOMMENDATIONS

- Disturbance of the wetland areas should be avoided.
- Pruning and geophone set-out should be undertaken by hand in potentially sensitive areas, such as wetlands.
- Where possible, grading should be avoided and vehicles should drive directly over or through the vegetation.
- Vehicle speed should be kept to a minimum at all times, and limits to speed should be employed wherever possible.
- Existing clearings, tracks, firebreaks or degraded habitats should be used in preference to clearing native vegetation.
- Clearing/pruning should be conducted during seasons in which birds are least likely to be nesting (e.g. autumn, early winter).
- If grading is unavoidable, cleared vegetation (including logs and leaf litter) should be stockpiled wherever possible and, following the survey, the surface profile should be re-established and the vegetation should be respread to assist the reestablishment of fauna habitat.
- Areas of disturbance should be minimised through a process of workforce induction and flagging of limits of disturbance, especially within areas of native vegetation.
- The edge of bushland (along existing tracks) should be removed in preference to clearing a path through the centre of the block.
- Obstructions to the passage of terrestrial fauna (e.g. equipment on the ground) should be minimised.
- Lighting should be kept to a minimum.
- Noise should be kept to a minimum and should not exceed EPA noise limit guidelines.
- The feeding of animals, hunting, fire-arms and pets on the construction site should be prohibited.

- Measures should be in place to avoid encouraging Foxes (minimal tracks, no feeding and no food scraps accessible). Contribution to regional Fox control could be considered.
- Dieback quarantine measures should be in place if there is a potential for contaminated vehicles to enter the site.

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TABLES

Table 1. Fish that may occur in the vicinity of the Mullering prospect EP 432. Status is assigned as described in Methods.

Species		Status
GALAXIIDAE (Gallaxiids)		
Galaxias occidentalis	Western Minnow	CS3
NANNOPERCIDAE (Pygmy perches)		
Edelia vittata	Western Pygmy Perch	CS3
GOBIIDAE (Gobies)		
Pseudogobius olorum	Swan River Goby	
POECILIIDAE (Livebearers)		
Gambusia holbrooki	Mosquitofish	Int

Table 2. Amphibians that may occur in the vicinity of the Mullering prospect EP 432. Status is assigned as described in Methods.

Species		Status
HYLIDAE (Tree frogs)		
Litoria adelaidensis	Slender Tree Frog	
Litoria moorei	Motorbike Frog	
MYOBATRACHIDAE (Ground frogs)		
Heleioporus albopunctatus	Western Spotted Frog	
Heleioporus eyrei	Moaning Frog	
Heleioporus psammophilus	Sand Frog	
Limnodynastes dorsalis	Banjo Frog, Pobblebonk	
Neobatrachus pelobatoides	Humming Frog	
Crinia insignifera	Squelching Froglet	
Crinia pseudinsignifera	Bleating Froglet	
Myobatrachus gouldii	Turtle Frog	
Pseudophryne guentheri	Günther`s Toadlet	

Table 3. Reptiles that may occur in the vicinity of the Mullering prospect EP 432. Status is assigned as described in Methods.

Species		Status
CHELUIDAE (Side-necked freshwater turtles)		
Chelodina oblonga	Long-necked Turtle	
AGAMIDAE (Dragons)		
Pogona minor	Western Bearded Dragon	
Rankinia adelaidensis	Western Heath Dragon	
GEKKONIDAE (Geckos)		
Crenadactylus ocellatus	Clawless Gecko	
Diplodactylus alboguttatus	White-spotted Ground Gecko	
Strophurus spinigerus	Soft Spiny-tailed Gecko	
Underwoodisaurus milii	Barking Gecko	
Christinus marmoratus	Marbled Gecko	
PYGOPODIDAE (Legless lizards)		
Aclys concinna	Javelin Legless Lizard	
Aprasia sp. nov. aff. '*fusca*'		CS3
Aprasia repens	Sand-plain Worm-lizard	
Delma fraseri	Fraser's Legless Lizard	
Delma grayii	Gray's Legless Lizard	
Lialis burtonis	Burton's Legless Lizard	
Pletholax gracilis	Keeled Legless Lizard	
Pygopus lepidopodus	Common Scaly-foot	
SCINCIDAE (Skinks)		
Cryptoblepharus plagiocephalus	Fence Skink	
Ctenotus australis	Western Limestone Ctenotus	
Ctenotus catenifer		
Ctenotus fallens	West Coast Ctenotus	
Ctenotus gemmula	Jewelled Ctenotus	CS2
Ctenotus impar	South-western Odd-striped Ctenotus	
Ctenotus pantherinus	Leopard Ctenotus	
Cyclodomorphus celatus		
Egernia kingii	King's Skink	
Egernia multiscutata	Bull Skink	
Egernia napoleonis	Salmon-bellied Skink	
Hemiergis quadrilineata	Two-toed Earless Skink	
Lerista christinae	Bold-striped Four-toed Lerista	
Lerista elegans	West Coast Four-toed Lerista	
Lerista lineopunctulata	West Coast Line-spotted Lerista	
Lerista praepedita	Western Worm Lerista	
Menetia greyii	Common Dwarf Skink	
Morethia lineoocellata	Western Pale-flecked Morethia	
Morethia obscura	Dusky Morethia	
Tiliqua occipitalis	Western Blue-tongue	
Tiliqua rugosa	Bobtail	
VARANIDAE (Monitors and goannas)		
Varanus gouldii	Sand Goanna	
Varanus tristis	Black-headed Monitor	
TYPHLOPIDAE (Blind snakes)		

Ramphotyphlops australis	Southern Blind Snake	
BOIDAE (Pythons)		
Antaresia stimsoni	Stimson`s Python	
Morelia spilota	Carpet Python	CS1
ELAPIDAE (Venomous land snakes)		
Brachyurophis fasciolata	Narrow-banded Shovel-nosed Snake	
Brachyurophis semifasciata	Southern Shovel-nosed Snake	
Demansia psammophis	Yellow-faced Whipsnake	
Echiopsis curta	Bardick	
Neelaps bimaculatus	Black-naped Snake	
Neelaps calonotos	Black-striped Snake	CS2
Notechis scutatus	Tiger Snake	CS3
Parasuta gouldii	Gould`s Snake	
Pseudechis australis	Mulga Snake	
Pseudonaja nuchalis	Gwardar	
Simoselaps bertholdi	Jan`s Banded Snake	
Simoselaps littoralis	West Coast Banded Snake	

Table 4. Birds that may occur in the vicinity of the Mullering prospect EP 432. Status is assigned as described in Methods. Species marked with a superscript 'w' are generally dependent on wetlands and species marked with a superscript 'a' are highly aerial species.

Species		Status
CASUARIIDAE (Cassowaries and emus)		
Dromaius novaehollandiae	Emu	
PHASIANIDAE (Pheasants and allies)		
Coturnix pectoralis	Stubble Quail	
ANATIDAE (Ducks and allies)		
Cygnus atratus	Black Swan [w]	Vag
Tadorna tadornoides	Australian Shelduck [w]	
Chenonetta jubata	Australian Wood Duck [w]	
Anas superciliosa	Pacific Black Duck [w]	
Anas gracilis	Grey Teal [w]	
Aythya australis	Hardhead [w]	Vag
PODICIPEDIDAE (Grebes)		
Tachybaptus novaehollandiae	Australasian Grebe [w]	
Poliocephalus poliocephalus	Hoary-headed Grebe [w]	
ANHINGIDAE (Darters)		
Anhinga melanogaster	Darter [w]	Vag
PHALACROCORACIDAE (Cormorants)		
Phalacrocorax melanoleucos	Little Pied Cormorant [w]	Vag
Phalacrocorax sulcirostris	Little Black Cormorant [w]	Vag
PELECANIDAE (Pelicans)		
Pelecanus conspicillatus	Australian Pelican [w]	Vag
ARDEIDAE (Herons, bitterns and egrets)		
Egretta novaehollandiae	White-faced Heron [w]	
Egretta garzetta	Little Egret [w]	Vag
Ardea pacifica	White-necked Heron [w]	
Ardea alba	Great Egret [w]	CS1
Nycticorax caledonicus	Nankeen Night Heron [w]	
THRESKIORNITHIDAE (Ibises and spoonbills)		
Threskiornis molucca	Australian White Ibis	
Threskiornis spinicollis	Straw-necked Ibis	
Platalea flavipes	Yellow-billed Spoonbill [w]	Vag
ACCIPITRIDAE (Osprey, hawks and eagles)		
Elanus axillaris	Black-shouldered Kite	
Lophoictinia isura	Square-tailed Kite	CS3
Haliastur sphenurus	Whistling Kite	
Circus assimilis	Spotted Harrier	
Circus approximans	Swamp Harrier	
Accipiter fasciatus	Brown Goshawk	
Accipiter cirrhocephalus	Collared Sparrowhawk	
Aquila audax	Wedge-tailed Eagle	
Hieraaetus morphnoides	Little Eagle	
FALCONIDAE (Falcons)		
Falco berigora	Brown Falcon	
Falco longipennis	Australian Hobby	

Falco peregrinus	Peregrine Falcon	CS1
Falco cenchroides	Nankeen Kestrel	
RALLIDAE (Rails, gallinules and coots)		
Gallirallus philippensis	Buff-banded Rail [w]	
Porzana pusilla	Baillon's Crake [w]	Vag
Porzana fluminea	Australian Spotted Crake [w]	Vag
Porzana tabuensis	Spotless Crake [w]	Vag
Porphyrio porphyrio	Purple Swamphen [w]	CS3
Gallinula ventralis	Black-tailed Native-hen	
Fulica atra	Eurasian Coot [w]	
OTIDIDAE (Bustards)		
Ardeotis australis	Australian Bustard	Vag, CS2
TURNICIDAE (Button-quails)		
Turnix velox	Little Button-quail	
Turnix varia	Painted Button-quail	
SCOLOPACIDAE (Curlews, godwits, snipe, sandpipers and allies)		
Tringa nebularia	Common Greenshank [w]	Vag, CS1
Actitis hypoleucos	Common Sandpiper [w]	Vag, CS1
Calidris ruficollis	Red-necked Stint [w]	Vag, CS1
Calidris acuminata	Sharp-tailed Sandpiper [w]	Vag, CS1
RECURVIROSTRIDAE (Stilts and avocets)		
Himantopus himantopus	Black-winged Stilt [w]	Vag
Cladorhynchus leucocephalus	Banded Stilt [w]	Vag
Recurvirostra novaehollandiae	Red-necked Avocet [w]	Vag
CHARADRIIDAE (Lapwings, plovers and dotterels)		
Charadrius ruficapillus	Red-capped Plover [w]	Vag
Elseyornis melanops	Black-fronted Dotterel [w]	Vag
Erythrogonys cinctus	Red-kneed Dotterel [w]	Vag
Vanellus tricolor	Banded Lapwing	Vag
COLUMBIDAE (Pigeons and doves)		
Columba livia	Rock Dove/Feral Pigeon	Int
Streptopelia senegalensis	Laughing Turtle-Dove	Int
Phaps chalcoptera	Common Bronzewing	
Phaps elegans	Brush Bronzewing	CS3
Ocyphaps lophotes	Crested Pigeon	
CACATUIDAE (Cockatoos)		
Calyptorhynchus latirostris	Carnaby`s Cockatoo	CS1
Eolophus roseicapilla	Galah	
Cacatua pastinator	Western Corella	
Cacatua sanguinea	Little Corella	Vag
Nymphicus hollandicus	Cockatiel	Vag
PSITTACIDAE (Parrots)		
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	Vag
Polytelis anthopeplus	Regent Parrot	Vag, CS3
Barnardius zonarius	Australian Ringneck	
Melopsittacus undulatus	Budgerigar	Vag
Pezoporus wallicus	Ground Parrot	CS1
CUCULIDAE (Old world cuckoos)		
Cuculus pallidus	Pallid Cuckoo	
Cacomantis flabelliformis	Fan-tailed Cuckoo	

Chrysococcyx osculans	Black-eared Cuckoo	Vag
Chrysococcyx basalis	Horsfield's Bronze-Cuckoo	
Chrysococcyx lucidus	Shining Bronze-Cuckoo	
STRIGIDAE (Hawk owls)		
Ninox novaeseelandiae	Southern Boobook	
TYTONIDAE (Barn owls)		
Tyto alba	Barn Owl	
PODARGIDAE (Australian frogmouths)		
Podargus strigoides	Tawny Frogmouth	
CAPRIMULGIDAE (Nightjars and allies)		
Eurostopodus argus	Spotted Nightjar	
AEGOTHELIDAE (Owlet-nightjars)		
Aegotheles cristatus	Australian Owlet-nightjar	
APODIDAE (Typical swifts)		
Apus pacificus	Fork-tailed Swift [a]	Vag, CS1
HALCYONIDAE (Kingfishers)		
Dacelo novaeguineae	Laughing Kookaburra	Int
Todiramphus pyrrhopygia	Red-backed Kingfisher	Vag
Todiramphus sanctus	Sacred Kingfisher	
MEROPIDAE (Bee-eaters)		
Merops ornatus	Rainbow Bee-eater	CS1
MALURIDAE (Fairy-wrens, emu-wrens and grasswrens)		
Malurus splendens	Splendid Fairy-wren	
Malurus lamberti	Variegated Fairy-wren	
Malurus pulcherrimus	Blue-breasted Fairy-wren	
Malurus leucopterus	White-winged Fairy-wren	
Stipiturus malachurus	Southern Emu-wren	
PARDALOTIDAE (Pardalotes, bristlebirds, scrubwrens, thornbills and allies)		
Pardalotus punctatus	Spotted Pardalote	
Pardalotus striatus	Striated Pardalote	
Sericornis frontalis	White-browed Scrubwren	
Hylacota cauta	Shy Heathwren	CS2
Calamanthus campestris	Rufous Fieldwren	CS2
Smicrornis brevirostris	Weebill	
Gerygone fusca	Western Gerygone	
Acanthiza apicalis	Inland Thornbill	
Acanthiza inornata	Western Thornbill	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	
MELIPHAGIDAE (Honeyeaters)		
Anthochaera carunculata	Red Wattlebird	
Anthochaera lunulata	Western Wattlebird	
Manorina flavigula	Yellow-throated Miner	
Lichenostomus virescens	Singing Honeyeater	
Melithreptus brevirostris	Brown-headed Honeyeater	
Lichmera indistincta	Brown Honeyeater	
Phylidonyris novaehollandiae	New Holland Honeyeater	
Phylidonyris nigra	White-cheeked Honeyeater	
Phylidonyris melanops	Tawny-crowned Honeyeater	
Acanthorhynchus superciliosus	Western Spinebill	
Certhionyx niger	Black Honeyeater	Vag

Certhionyx variegatus	Pied Honeyeater	Vag
Epthianura tricolor	Crimson Chat	Vag
Epthianura albifrons	White-fronted Chat	
PETROICIDAE (Robins)		
Petroica multicolor	Scarlet Robin	CS3
Petroica goodenovii	Red-capped Robin	
Melanodryas cucullata	Hooded Robin	
Eopsaltria griseogularis	Western Yellow Robin	CS3
Eopsaltria georgiana	White-breasted Robin	CS3
NEOSITTIDAE (Sitellas)		
Daphoenositta chrysoptera	Varied Sittella	
PACHYCEPHALIDAE (Whistlers, shrike-thrushes and allies)		
Oreoica gutturalis	Crested Bellbird	CS2
Pachycephala rufiventris	Rufous Whistler	
Colluricincla harmonica	Grey Shrike-thrush	
DICRURIDAE (Monarchs, fantails and drongos)		
Myiagra inquieta	Restless Flycatcher	Vag
Grallina cyanoleuca	Magpie-lark	
Rhipidura fuliginosa	Grey Fantail	
Rhipidura leucophrys	Willie Wagtail	
CAMPEPHAGIDAE (Cuckoo-shrikes and trillers)		
Coracina novaehollandiae	Black-faced Cuckoo-shrike	
Coracina maxima	Ground Cuckoo-shrike	Vag
Lalage sueurii	White-winged Triller	
ARTAMIDAE (Woodswallows, butcherbirds and currawongs)		
Artamus personatus	Masked Woodswallow	Vag
Artamus cinereus	Black-faced Woodswallow	
Cracticus torquatus	Grey Butcherbird	
Cracticus nigrogularis	Pied Butcherbird	
Gymnorhina tibicen	Australian Magpie	
Strepera versicolor	Grey Currawong	Vag, CS3
CORVIDAE (Crows and allies)		
Corvus coronoides	Australian Raven	
Corvus bennetti	Little Crow	Vag
MOTACILIDAE (Old world wagtails and pipits)		
Anthus novaeseelandiae	Richard's Pipit	
PASSERIDAE (Sparrows, weaverbirds, waxbills and allies)		
Taeniopygia guttata	Zebra Finch	Vag
DICAEIDAE (Flowerpeckers)		
Dicaeum hirundinaceum	Mistletoebird	
HIRUNDINIDAE (Swallows and martins)		
Hirundo neoxena	Welcome Swallow	
Hirundo nigricans	Tree Martin	
Hirundo ariel	Fairy Martin	
SYLVIIDAE (Old world warblers)		
Cinclorhamphus mathewsi	Rufous Songlark	
Cinclorhamphus cruralis	Brown Songlark	
ZOSTEROPIDAE (White-eyes)		
Zosterops lateralis	Silvereye	

Table 5. Mammals that may occur in the vicinity of the Mullering prospect EP 432. Status is assigned as described in Methods.

Species		Status
TACHYGLOSSIDAE (Echidnas)		
Tachyglossus aculeatus	Echidna	
DASYURIDAE (Dasyurids)		
Sminthopsis crassicaudata	Fat-tailed Dunnart	
Sminthopsis dolichura	Little Long-tailed Dunnart	
Sminthopsis granulipes	White-tailed Dunnart	
Sminthopsis griseoventer	Grey-bellied Dunnart	
PEREMELIDAE (Bandicoots)		
Isoodon obesulus	Southern Brown Bandicoot, Quenda	CS2
POTOROIDAE (Potoroos and bettongs)		
Bettongia penicillata	Brush-tailed Bettong, Woylie	CS2
PHALANGERIDAE (Brushtail possums)		
Trichosurus vulpecula	Brush-tailed Possum	
MACROPODIDAE (Kangaroos, wallabies and tree kangaroos)		
Macropus eugenii	Tammar, Tammar Wallaby	CS2
Macropus fuliginosus	Western Grey Kangaroo	
Macropus irma	Brush Wallaby	CS2
TARSIPEDIDAE (Honey Possum)		
Tarsipes rostratus	Honey Possum, Noolbenger	
VESPERTILIONIDAE (Vespertillionid bats)		
Chalinolobus gouldii	Gould`s Wattled Bat	
Chalinolobus morio	Chocolate Wattled Bat	
Nyctophilus geoffroyi	Lesser Long-eared Bat	
Nyctophilus timoriensis	Greater Long-eared Bat	
Vespadelus regulus	Southern Forest Bat	
MOLOSSIDAE (Freetail bats)		
Mormopterus sp. (*M. planiceps*: long penis form, part). Regarded as 'Species 4, population O' by Adams *et al*. (1988).	Western Freetail-bat	CS3
Tadarida australis	White-striped Freetail-bat	
MURIDAE (Rats and mice)		
Mus musculus	House Mouse	Int
Pseudomys albocinereus	Ash-grey Mouse, Noodji	
Rattus fuscipes	Western Bush Rat, Moodit	
Rattus rattus	Black Rat	Int
LEPORIDAE (Rabbits and hares)		
Oryctolagus cuniculus	Rabbit	Int
CANIDAE (Dogs and foxes)		
Canis lupus	Dog	Int
Vulpes vulpes	Red Fox	Int
FELIDAE (Cats)		
Felis catus	Cat	Int

Table 6. Species considered to be extinct in the vicinity of the Mullering prospect EP 432.

BOIDAE (Pythons)	
Aspidites ramsayi	Woma
BURHINIDAE (Stone-curlews)	
Burhinus grallarius	Bush Stone-curlew
CINCLOSOMATIDAE (Quail-thrushes and allies)	
Psophodes nigrogularis	Western Whipbird
DASYURIDAE (Dasyurids)	
Dasyurus geoffroii	Chuditch
PEREMELIDAE (Bandicoots)	
Peremeles bougainville	Western Barred Bandicoot, Marl
THYLACOMYIDAE (Bilbies)	
Macrotis lagotis	Bilby
POTOROIDAE (Potoroos and bettongs)	
Bettongia lesueur	Burrowing Bettong, Boodie
Potorous platyops	Broad-faced Potoroo
RODENTIA (Rats and mice)	
Pseudomys fieldi	Shark Bay Mouse
Pseudomys occidentalis	Western Mouse
Pseudomys shortridegii	Heath Rat

APPENDICES

Appendix 1. Categories used in the assessment of conservation status.

IUCN categories (based on review by Mace and Stuart 1994) as used for the Environmental Protection and Biodiversity Conservation (EPBC) Act and the WA Wildlife Conservation Act.

Extinct. Taxa not definitely located in the wild during the past 50 years.

Extinct in the Wild. Taxa known to survive only in captivity.

Critically Endangered. Taxa facing an extremely high risk of extinction in the wild in the immediate future.

Endangered. Taxa facing a very high risk of extinction in the wild in the near future.

Vulnerable. Taxa facing a high risk of extinction in the wild in the medium-term future.

Near Threatened. Taxa that risk becoming Vulnerable in the wild.

Conservation Dependent. Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.

Data Deficient (Insufficiently Known). Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.

Least Concern. Taxa that are not Threatened.

Schedules used in the WA Wildlife Conservation Act.

Schedule 1. Rare and Likely to become Extinct.

Schedule 2. Extinct.

Schedule 3. Migratory species listed under international treaties.

Schedule 4. Other Specially Protected Fauna.

WA Department of Conservation and Land Management Priority species
(species not listed under the Conservation Act, but for which there is some concern).

Priority 1. Taxa with few, poorly known populations on threatened lands.

Priority 2. Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.

Priority 3. Taxa with several, poorly known populations, some on conservation lands.

Priority 4. Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change.

Priority 5. Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years (IUCN Conservation Dependent).

Appendix 2. Results of the EPBC Threatened Species Database search. EPBC categories are explained in Appendix 1.

Endangered	
Calyptorhynchus latirostris	Carnaby's Cockatoo
Vulnerable	
Ctenotus lancelini	Lancelin Island Skink
*Leipoa ocellata**	Malleefowl
Dasyurus geoffroii	Chuditch
Migratory	
Haliaeetus leucogaster	White-bellied Sea-Eagle

* also listed as migratory.

Appendix 3. Results of the CALM Threatened Species Database search. The number of records of each species within the search area (see Methods) is shown. CALM categories are explained in Appendix 1.

Schedule 1		
Botaurus poiciloptilus	Australasian Bittern	1
Leipoa ocellata	Malleefowl	1
Calyptorhynchus latirostris	Carnaby`s Cockatoo	12
Schedule 4		
*Morelia spilota imbricata**	Carpet Python	2
Falco peregrinus	Peregrine Falcon	1
Priority 3		
Austrosaga spinifer	Cricket	2
Priority 4		
Ardeotis australis	Australian Bustard	5
Macropus irma	Brush Wallaby	4
Priority 5		
Isoodon obesulus	Southern Brown Bandicoot, Quenda	7
Bettongia penicillata	Woylie	2
Macropus eugenii	Tammar	3

* also listed as a Priority 4 species.

Appendix 4. Species returned by one or more of the database searches or literature sources that have been omitted from the expected species lists (Tables 1 to 5) because of habitat or range limitations (see Methods).

GEKKONIDAE (Geckos)	
Diplodactylus granariensis	Western Stone Gecko
Diplodactylus polyophthalmus	Spotted Stone Gecko
Gehyra variegata	Variegated Dtella
PYGOPODIDAE (Legless lizards)	
Delma australis	
SCINCIDAE (Skinks)	
Ctenotus lancelini	Lancelin Island Skink
Ctenotus schomburgkii	
TYPHLOPIDAE (Blind snakes)	
Ramphotyphlops waitii	
ELAPIDAE (Venomous land snakes)	
Pseudonaja affinis	Dugite
MEGAPODIIDAE (Megapodes)	
Leipoa ocellata	Malleefowl
PHASIANIDAE (Pheasants and allies)	
Coturnix ypsilophora	Brown Quail
ANATIDAE (Ducks and allies)	
Oxyura australis	Blue-billed Duck
Biziura lobata	Musk Duck
Anas rhynchotis	Australasian Shoveler
Anas castanea	Chestnut Teal
Malacorhynchus membranaceus	Pink-eared Duck
PODICIPEDIDAE (Grebes)	
Podiceps cristatus	Great Crested Grebe
SULIDAE (Boobies and allies)	
Morus serrator	Australasian Gannet
PHALACROCORACIDAE (Cormorants)	
Phalacrocorax varius	Pied Cormorant
Phalacrocorax carbo	Great Cormorant
ARDEIDAE (Herons, bitterns and egrets)	
Egretta sacra	Eastern Reef Egret
THRESKIORNITHIDAE (Ibises and spoonbills)	
Plegadis falcinellus	Glossy Ibis
ACCIPITRIDAE (Osprey, hawks and eagles)	
Pandion haliaetus	Osprey
Haliaeetus leucogaster	White-bellied Sea-Eagle
SCOLOPACIDAE (Curlews, godwits, snipe, sandpipers and allies)	
Limosa limosa	Black-tailed Godwit
Limosa lapponica	Bar-tailed Godwit
Tringa glareola	Wood Sandpiper
Heteroscelus brevipes	Grey-tailed Tattler
Arenaria interpres	Ruddy Turnstone
Calidris subminuta	Long-toed Stint
Calidris ferruginea	Curlew Sandpiper

HAEMATOPODIDAE (Oystercatchers)	
Haematopus longirostris	Pied Oystercatcher
CHARADRIIDAE (Lapwings, plovers and dotterels)	
Pluvialis squatarola	Grey Plover
Thinornis rubricollis	Hooded Plover
GLAREOLIDAE (Pratincoles)	
Stiltia isabella	Australian Pratincole
LARIDAE (Skuas, gulls, terns and allies)	
Catharacta lonnbergi	Brown Skua
Larus pacificus	Pacific Gull
Larus novaehollandiae	Silver Gull
Sterna caspia	Caspian Tern
Sterna bergii	Crested Tern
Sterna dougallii	Roseate Tern
Sterna nereis	Fairy Tern
Sterna anaethetus	Bridled Tern
Chlidonias hybridus	Whiskered Tern
PSITTACIDAE (Parrots)	
Neophema petrophila	Rock Parrot
PARDALOTIDAE (Pardalotes, bristlebirds, scrubwrens, thornbills and allies)	
Pyrrholaemus brunneus	Redthroat
Acanthiza uropygialis	Chestnut-rumped Thornbill
MELIPHAGIDAE (Honeyeaters)	
Acanthagenys rufogularis	Spiny-cheeked Honeyeater
Lichenostomus ornatus	Yellow-plumed Honeyeater
Lichenostomus leucotis	White-eared Honeyeater
Epthianura aurifrons	Orange Chat
POMATOSTOMIDAE (Babblers)	
Pomatostomus superciliosus	White-browed Babbler
CINCLOSOMATIDAE (Quail-thrushes and allies)	
Psophodes occidentalis	Chiming Wedgebill
PACHYCEPHALIDAE (Whistlers, shrike-thrushes and allies)	
Pachycephala pectoralis	Golden Whistler
ARTAMIDAE (Woodswallows, butcherbirds and currawongs)	
Artamus leucorhynchus	White-breasted Woodswallow
Artamus cyanopterus	Dusky Woodswallow
SYLVIIDAE (Old world warblers)	
Acrocephalus stentoreus	Clamorous Reed-Warbler
Megalurus gramineus	Little Grassbird
DASYURIDAE (Dasyurids)	
Sminthopsis gilberti	Gilbert`s Dunnart

Appendix 5. Species of conservation significance.

The following accounts provide basic information on the one invertebrate and 33 vertebrate species of conservation significance that includes their conservation status, the reason for their significance, aspects of their ecology, potential threatening processes and the inferred status of the species at the study site. Information presented has been collated from a number of references: Storr *et al*. (1983; 1990; 1999; 2002), Marchant and Higgins (1990; 1993), Cogger *et al*. (1993), Lee (1995), Strahan (1995), Higgins and Davies (1996), Maxwell *et al*. (1996), Churchill (1998), Debus (1998), Johnstone and Storr (1998; 2005), Morgan *et al.* (1998), Duncan *et al*. (1999), Higgins (1999), Cogger (2000), DEP (2000), Garnett and Crowley (2000), Allen *et al.* (2003), Burbidge (2004), Menkhorst and Knight (2004) and DEH (2006).

Invertebrates

Species :	*Austrosaga spinifer*	Conservation status:	**CS2**
Common name:	None.		
Habitat:	Heath.		
Notes:	Listed as Priority 3 by CALM, and is of concern because little is known of the populations of this species of cricket. It is found in heath habitats near Perth and Cervantes.		
Status on site:	Uncertain.		

Reptiles

Species :	*Aprasia* sp. nov. aff. '*fusca*'	Conservation status:	**CS3**
Common name:	None.		
Habitat:	Sands.		
Notes:	*A*. sp. nov. aff. '*fusca*' is a currently undescribed species that has been recorded from the central west coast of Western Australia (Maryan 2005). This species has affinities to *A. fusca*.		
Status on site:	Uncertain.		
Species :	*Ctenotus gemmula* (Swan Coastal Plain)	Conservation status:	**CS2**
Common name:	Jewelled Ctenotus (Swan Coastal Plain)		
Habitat:	Pale sands with heath and *Banksia* spp. or mallee woodlands.		
Notes:	Listed as Priority 3 by CALM. This species has two disjunct populations: on the Swan Coastal Plain, where it is scarce and of concern; and on the Lower-west Coastal Plain (Albany to Esperance), where it is not currently listed as a threatened or priority species.		
Status on site:	An outlying population is known from Cataby so this species may be present on the prospect but is unlikely to be significantly impacted.		
Species :	*Morelia spilota imbricata*	Conservation status:	**CS1**
Common name:	Carpet Python (south-western population)		
Habitat:	Undisturbed bushland and rocky outcrops.		
Notes:	Listed as Specially Protected under the WA Wildlife Conservation Act and also as Priority 4 by CALM and is of concern because this subspecies has declined dramatically in the face of urban development and land clearing. *M. spilota imbricata* occurs in the south-western of WA, south of a line that runs from approximately Geraldton in the north-west to Eyre		

	in the south-east. It is often arboreal and preys on birds, other reptiles and small to medium size mammals. At least six other subspecies of *M. spilota* are recognised around Australia.		
Status on site:	The species is known from the area. It is unlikely to be significantly impacted but may be vulnerable to roadkill from increased traffic..		
Species :	*Neelaps calonotos*	Conservation status:	**CS2**
Common name:	Black-striped Snake		
Habitat:	Dunes and sand plains with heath or eucalypt or banksia woodlands.		
Notes:	Listed as Priority 3 by CALM, and is of concern because this species is restricted to an area between Lancelin and Mandurah (east to Gingin and Riverton). *N. calonotos* was previously listed under the WA Wildlife Conservation Act but is now thought to be abundant on *Banksia* sandplain. It is, however, still threatened by encroaching land development.		
Status on site:	Likely to be present but unlikely to be significantly impacted.		
Species :	*Notechis scutatus*	Conservation status:	**CS3**
Common name:	Tiger Snake		
Habitat:	Wetland or dampland areas, streams and swamps.		
Notes:	*N. scutatus* is common and sometimes abundant throughout the south-west of Western Australia (from the Gingin area to Point Malcolm, east of Esperance). A recent, outlying record from north of Jurien (M. Bamford, pers. obs.) suggests that this species may occur further north than previously thought. If present in the Cataby region, this would represent an intermediate point between the currently published range (Storr *et al.* 2002) and the Jurien record.		
Status on site:	Uncertain, although suitable habitat exists within the prospect.		

Birds

Species :	*Ardea alba*	Conservation status:	**CS1**
Common name:	Great Egret		
Habitat:	Estuaries, tidal flats, rivers, freshwater lakes, sewage ponds and dams.		
Notes:	Listed as Migratory under the EPBC Act. Common and widespread throughout Australia (except deserts). *A. alba* forages in aquatic habitats for fish, amphibians, and invertebrates.		
Status on site:	This species is dependent on wetland areas and may possibly present in suitable habitat on site, but is unlikely to be significantly impacted.		
Species :	*Lophoictinia isura*	Conservation status:	**CS3**
Common name:	Square-tailed Kite		
Habitat:	Heathlands, woodlands, forests, rainforests, timbered watercourses, hills and gorges.		
Notes:	Although not listed as a threatened or priority species, *L. isura* is listed as a wide ranging species that is locally extinct on the Swan Coastal Plain by DEP (2000). This species occurs in most habitats around Australia, with the exception of the most arid, treeless regions. Southern breeding birds migrate north during the southern winter, returning again to breed the following spring.		
Status on site:	Known to occur in nearby areas (W. Bancroft and M. Bamford, pers. obs.) this species is highly likely to be present, but is also a highly mobile		

species that is unlikely to be significantly impacted.

Species :	*Falco peregrinus*	Conservation status:	**CS1**
Common name:	Peregrine Falcon		
Habitat:	Cliffs, gorges, timbered watercourses, and tall man-made infrastructure.		
Notes:	Listed as Specially Protected under the WA Wildlife Conservation Act. *F. peregrinus* is cosmopolitan but uncommon throughout Australia and prefers sites with tall perches (such as gorges, trees or power poles).		
Status on site:	Individuals may foraging over the site. Unlikely to be significantly impacted.		
Species :	*Porphyrio porphyrio*	Conservation status:	**CS3**
Common name:	Purple Swamphen		
Habitat:	Swamps, lakes, shallow rivers, lawns and sewage ponds.		
Notes:	*P. porphyrio* is not listed as a threatened or priority species and is common throughout Australia (except for arid and some semi-arid regions). This species is listed as CS3, here, because breeding colonies exist in the Cataby region.		
Status on site:	Known from the region and may be present in wetland or seasonal dampland areas. Unless breeding occur on the prospect, this species is unlikely to be significantly impacted.		
Species :	*Ardeotis australis*	Conservation status:	**CS2**
Common name:	Australian Bustard		
Habitat:	Grasslands, spinifex, open scrublands and pastoral lands.		
Notes:	Listed as Priority 4 by CALM, and is of concern because this species has declined in abundance in recent times as a result of land clearing, grazing, illegal shooting and the introduction of feral predators, and requires continued monitoring. *A. australis* is a nomad of northern, western and inland Australia and is common in areas away from human settlement. They forage terrestrially for fruits, seeds and invertebrates.		
Status on site:	Was noted as a regular summer visitor to region in small numbers in the 1980s to 1990s (M. Bamford pers. obs.), so may be a seasonal visitor to the prospect, but is unlikely to be significantly impacted.		
Species :	*Tringa nebularia*	Conservation status:	**CS1**
Common name:	Common Greenshank		
Habitat:	Estuaries, tidal flats, mangroves, rivers, wetlands, sewage ponds and saltfields.		
Notes:	Listed as Migratory under the EPBC Act. *T. nebularia* breeds from Scotland to Siberia and migrates to arrive in Australia from August to October, returning to the breeding grounds by May or June. *T. nebularia* occurs in association with wetland or aquatic habitats throughout Australia (except in the central deserts) where it feeds predominantly on aquatic insects.		
Status on site:	This species is a summer migrant and dependent on wetland areas, so may be present if suitable habitat (i.e. seasonal swampland) is available in late spring and early summer. May be disturbed if present, but unlikely to be significantly impacted.		
Species :	*Actitis hypoleucos*	Conservation status:	**CS1**
Common name:	Common Sandpiper		
Habitat:	Estuaries, tidal flats, mangroves, rivers, wetlands, sewage ponds and saltflats.		
Notes:	Listed as Migratory under the EPBC Act. *A. hypoleucos* breeds from		

	British Isles to Siberia and migrates to arrive in Australia from July, returning to the breeding grounds by April. *A. hypoleucos* prefers stony or pebbly substrates associated with water bodies and is uncommon, though widespread, throughout Australia (except in the central deserts). *A. hypoleucos* may congregate in groups but is most commonly observed singly.
Status on site:	This species is a summer migrant and dependent on wetland areas, so may be present if suitable habitat (i.e. seasonal swampland) is available in late spring and early summer. May be disturbed if present, but unlikely to be significantly impacted.
Species :	*Calidris ruficollis* Conservation status: **CS1**
Common name:	Red-necked Stint
Habitat:	Tidal flats, estuaries, salt marshes, beaches, wetlands and sewage ponds.
Notes:	Listed as Migratory under the EPBC Act. *C. ruficollis* breeds in Arctic Siberia and northern Alaska and migrates to arrive in Australia by August, returning to the breeding grounds by May. *C. ruficollis* is one of the most abundant migrant waders to Australia, where it is common in suitable habitat throughout the country (excluding deserts). *C. ruficollis* usually forages and roosts in small to very large flocks.
Status on site:	This species is a summer migrant and dependent on wetland areas, so may be present if suitable habitat (i.e. seasonal swampland) is available in late spring and early summer. May be disturbed if present, but unlikely to be significantly impacted.
Species :	*Calidris acuminata* Conservation status: **CS1**
Common name:	Sharp-tailed Sandpiper
Habitat:	Tidal flats, estuaries, salt marshes, beaches, wetlands and sewage ponds.
Notes:	Listed as Migratory under the EPBC Act. *C. acuminata* breeds in Arctic Siberia and migrates to arrive in Australia by August, returning to the breeding grounds by May. *C. acuminata* prefers freshwater environments. It has been recorded from coastal and inland wetlands throughout Australia but is more abundant in the south.
Status on site:	This species is a summer migrant and dependent on wetland areas, so may be present if suitable habitat (i.e. seasonal swampland) is available in late spring and early summer. May be disturbed if present, but unlikely to be significantly impacted.
Species :	*Phaps elegans* Conservation status: **CS3**
Common name:	Brush Bronzewing
Habitat:	Dense scrub, heath and woodland.
Notes:	Although not listed as a threatened or priority species, *P. elegans* is at the northern limit of its range in the region.
Status on site:	Highly likely to be present (probably in low numbers), particularly in dense thickets and near wetland areas. Unlikely to be significantly impacted.
Species :	*Calyptorhynchus latirostris* Conservation status: **CS1**
Common name:	Carnaby`s Cockatoo
Habitat:	Open forests and woodlands, Kwongan heath, sand plains, suburban vegetation and pine plantations.
Notes:	Listed as Endangered under the EPBC and WA Wildlife Conservation Acts. *C. latirostris* occurs in the south-west of Western Australia, approximately south-west of a line between the Murchison River (near

	Kalbarri) and Cape Arid National Park (east of Esperance). This species generally breeds in inland areas, moving to cooler, coastal areas for the non-breeding period (late spring to mid-winter). Land clearing and degradation has reduced available breeding sites (tree hollows) and fragmented breeding and feeding sites. Feral bees, galahs and corellas out-compete *C. latirostris* for nesting hollows. Illegal trapping and smuggling also threaten this species.
Status on site:	Likely to be present during non-breeding periods when this species may feed on proteaceous species. Nesting trees are unlikely to occur in the prospect. Unlikely to be significantly impacted.
Species :	*Polytelis anthopeplus anthopeplus* Conservation status: **CS3**
Common name:	Regent Parrot (western population)
Habitat:	Farmlands, timbered watercourses, woodland clearings, forests and mallee.
Notes:	Assessed as 'Lower Risk (Least Concern)' by Garnett and Crowley (2000) because a decline in population density has been observed in at least half the range of this subspecies, but density has also increased in other parts of the range. Clearing for agriculture and the death of suitable nest trees (particularly *Eucalyptus salmonophloia*) due to salinity may be responsible for the decline in the WA wheatbelt. *P. a. anthopeplus* occurs in the south-west of Western Australia. An eastern states' subspecies, *P. a. monarchoides,* is also recognised.
Status on site:	May occur as a vagrant but is unlikely to be significantly impacted.
Species :	*Pezoporus wallicus flaviventris* Conservation status: **CS1**
Common name:	Ground Parrot (western population)
Habitat:	Low shrubby heath.
Notes:	Listed as Endangered under the EPBC Act and as Critically Endangered under the WA Wildlife Conservation Act and is of concern because clearing and grazing have removed a considerable areas of habitat, and fire, foxes and cats seriously threaten the remaining population. The range of *P. w. flaviventris* once extended from north of Perth to Esperance, but the species is now restricted to Waychinicup, Fitzgerald River and Cape Arid National Parks. There was a recent, unconfirmed, anecdotal record of a *P. w. flaviventris* near the mouth of the Hill River (between Cervantes and Jurien).
Status on site:	Uncertain. Suitable habitat is available in the prospect area. Any sightings of this species should be reported to conservation agencies.
Species :	*Apus pacificus* Conservation status: **CS1**
Common name:	Fork-tailed Swift
Habitat:	Aerial habitats throughout Australia.
Notes:	Listed as Migratory under the EPBC Act. *A. pacificus* breeds in Siberia and the Himalayas and migrates to arrive in Australia in October, returning to the breeding grounds by May or June. Movements within Australia are in response to weather patterns, with this species often following thunderstorms. It is a highly aerial species that rarely comes to ground.
Status on site:	May occur as a foraging vagrant over the site but is highly unlikely to be significantly impacted.
Species :	*Merops ornatus* Conservation status: **CS1**
Common name:	Rainbow Bee-eater

Habitat:	Open woodlands, sand ridges, sand pits, riverbanks, beaches, dunes, cliffs, mangroves and man-made grassed fields.
Notes:	Listed as Migratory under the EPBC Act. *M. ornatus* occurs year-around in the tropics, with a southward migration, to both south-eastern and south-western Australia, in early spring. Southern birds return north in autumn. When present, *M. ornatus* is common and prominent in natural and altered environments.
Status on site:	Highly likely to be present and may nest (burrow) in sandy soils throughout the prospect. Clearing or traffic may disturb nesting burrows.
Species :	*Hylacota cauta whitlocki* Conservation status: **CS2**
Common name:	Shy Heathwren (south-western population)
Habitat:	Mallee, native pine, heath with *Banksia* or *Leptospermum* spp.
Notes:	Listed as Priority 4 by CALM and is of concern because agricultural clearing has removed large tracts of suitable habitat. Degraedation (by stock) and fragmentation are threatening persisting remnants. *H. c. whitlocki* lives in dense shrubs and feeds close to the ground for invertebrates. *H. c. whitlocki* occurs in the south-west and south-east of Western Australia.
Status on site:	May be present, as suitable habitat is available. Unlikely to be significantly impacted.
Species :	*Calamanthus campestris montanellus* Conservation status: **CS2**
Common name:	Rufous Fieldwren (western wheatbelt population)
Habitat:	Saltbush, bluebush, spinifex, roly-poly bush and low shrubs.
Notes:	Listed as Priority 4 by CALM and is of concern because agricultural clearing has removed large tracts of suitable habitat. Habitat degradation by stock and weeds continues to threaten this species. *C. c. montanellus* occurs in the south-west and wheatbelt regions of Western Australia.
Status on site:	Recorded in the general area, especially in heath, but unlikely to be significantly impacted.
Species :	*Petroica multicolor campbelli* Conservation status: **CS3**
Common name:	Scarlet Robin (south-western population)
Habitat:	Forests, woodlands, watercourses, parks, orchards and urban gardens.
Notes:	Assessed as 'Lower Risk (Least Concern)' by Garnett and Crowley (2000) because habitat clearance and fragmentation has reduced the range of this species. Three other subspecies of *P. multicolor* occur in Australia, but none in Western Australia.
Status on site:	Recorded in the general area but unlikely to be significantly impacted.
Species :	*Eopsaltria griseogularis* Conservation status: **CS3**
Common name:	Western Yellow Robin
Habitat:	Open forests, woodlands, coastal scrubs and dense mallee.
Notes:	Although not listed as a threatened or priority species, *E. griseogularis* is listed as a habitat specialist with a reduced range on the Swan Coastal Plain by DEP (2000).
Status on site:	May be present but unlikely to be significantly impacted.
Species :	*Eopsaltria georgiana* Conservation status: **CS3**
Common name:	White-breasted Robin
Habitat:	Dense vegetation, coastal thickets, drainage lines, heaths and forest undedrstoreys.
Notes:	Although not listed as a threatened or priority species, *E. georgiana* is listed as a wide ranging species that is locally extinct (at least in the

	vicinity of the metropolitan area) on the Swan Coastal Plain by DEP (2000). This species is uncommon on the sandplain north of Perth although there is an isolated, northern population in the Lesueur region, north of Jurien (CALM 1995).
Status on site:	Present in vegetation around wetlands in the general area but unlikely to be significantly impacted as long as impacts upon such habitat are minimised.

Species :	*Oreoica gutturalis gutturalis*	Conservation status:	**CS2**
Common name:	Crested Bellbird (southern population)		
Habitat:	Arid scrublands, saltbush, mallee, spinifex, and woodlands.		
Notes:	Listed as Priority 4 by CALM and is of concern because land clearing has removed most of the suitable habitat for this species and it is particularly sensitive to habitat fragmentation. *O. g. gutturalis* occurs in a strip from near Geraldton on the west coast, through the wheatbelt to the southern coast of Western Australia, east of Esperance.		
Status on site:	Recorded in the general area but unlikely to be significantly impacted.		

Species :	*Strepera versicolor*	Conservation status:	**CS3**
Common name:	Grey Currawong		
Habitat:	Forests and woodlands, heaths, orchards.		
Notes:	Although not listed as a threatened or priority species, *S. versicolor* is listed as a wide ranging species that is locally extinct (at least in the vicinity of the metropolitan area) on the Swan Coastal Plain by DEP (2000). This species occurs throughout southern Australia. *S. versicolor* is uncommon on the sandplain north of Perth.		
Status on site:	May occur as a vagrant but is highly unlikely to be significantly impacted.		

Mammals

Species :	*Isoodon obesulus fusciventer*	Conservation status:	**CS2**
Common name:	Southern Brown Bandicoot, Quenda		
Habitat:	Sandy soils with low ground cover. Prefers areas that are regularly burnt. Highest densities occur in association with wetlands and damplands.		
Notes:	Listed as Priority 5 by CALM and is of concern because habitat clearing and fragmentation, fire, and predation by foxes, cats and domestic dogs threaten this species. *I. o. fusciventer* occurs in the south-west of Western Australia. Two other subspecies are recognised, neither of which occurs in Western Australia.		
Status on site:	May be present, as suitable habitat exists within the prospect. *I. o. fusciventer* has been reintroduced into the nearby Nambung National Park in conjunction with regional Fox baiting and if not currently present on the prospect may spread to the site in the future. Impacts uncertain but probably low as long as Fox baiting continues. Tracks have the potential to allow Foxes to enter bushland areas.		

Species :	*Bettongia penicillata*	Conservation status:	**CS2**
Common name:	Brush-tailed Bettong, Woylie		
Habitat:	Dry sclerophyll forest with dense shrubs.		
Notes:	Listed as Priority 5 by CALM and is of concern because habitat clearing and fragmentation, fire, predation by foxes and cats, and competition with introduced herbivores (e.g. rabbits, stock) threaten this species. The only		

	natural populations of this species occur in the south-west of Western Australia, at Dryandra State Forest (near Narrogin) and the areas surrounding Perup (east of Manjimup) and Tutanning (north-east of Narrogin) nature reserves. *B. penicillata* has been reintroduced into predominantly fox-baited habitat at Batalling (between Collie and Darkan) state forest, Boyagin (north-east of Wandering) and Nambung (near Cervantes) nature reserves, Julimar (near Bindoon) conservation park and small numbers have been introduced into the northern Jarrah forest. Fox baiting has successfully increased the existing populations of this species.
Status on site:	May be present, as suitable habitat exists within the prospect. *B. penicillata* has been reintroduced into the nearby Nambung National Park in conjunction with regional fox baiting and if not currently present on the prospect may spread to the site in the future. Impacts uncertain but may be sensitive to an increase in Fox abundance.
Species :	*Macropus eugenii derbianus* Conservation status: **CS2**
Common name:	Tammar, Tammar Wallaby (Western Australian population)
Habitat:	Dry sclerophyll forest with dense thickets (especially *Melaleuca* or *Gastrolobium*), dense coastal heath.
Notes:	Listed as Priority 5 by CALM and is of concern because of fox predation and the loss of suitable thickets due to habitat clearing. Remnant populations exist at sites in the wheatbelt that have been subject to fox control. These include: Dryandra State Forest (near Narrogin); Perup (east of Manjimup), Boyagin (north-east of Wandering), Tutanning (north-east of Narrogin) and Nambung (near Cervantes) nature reserves; Batalling (between Collie and Darkan) state forest, Fitzgerald River (east of Bremer Bay) National Park and areas near Pingelly and Hopetoun.
Status on site:	May be present, as suitable habitat exists within the prospect. *M. e. derbianus* has been reintroduced into the nearby Nambung National Park in conjunction with regional fox baiting and if not currently present on the prospect may spread to the site in the future. Impacts uncertain but may be sensitive to an increase in Fox abundance.
Species :	*Macropus irma* Conservation status: **CS2**
Common name:	Brush Wallaby, Kwoora
Habitat:	Open dry sclerophyll forests with open, seasonal wet flats with low grasses and open scrub.
Notes:	Listed as Priority 5 by CALM and is of concern because it is threatened by habitat clearing and fragmentation, predation by foxes and illegal hunting. *M. irma* occurs in the south-west of Western Australia, from approximately Geraldton to Esperance.
Status on site:	Highly likely to be present. May be sensitive to roadkill due to increased traffic.
Species :	*Mormopterus* sp. (*M. planiceps*: long penis form, part). Regarded as 'Species 4, population O' by Adams *et al*. (1988). Conservation status: **CS3**
Common name:	Western Freetail-bat
Habitat:	Tall forests, open woodland, mallee and coastal heath.
Notes:	Although not listed as a threatened or priority species, there is currently a major revision of many *Mormopterus* species and subspecies throughout Australia. This species, the 'Western Freetail-bat', occurs in south

	western Western Australia, from approximately Lancelin to Kalgoorlie to Eyre (including the wheatbelt), and represents the south-western population of the species formerly recognised as *M. planiceps*. Two other populations of *M. planiceps* are informally recognised as individual taxa: the 'Southern Freetail-bat' (*M. planiceps*: long penis form, part) of south-eastern Australia, and the 'Inland Freetail-bat' (*M. planiceps*: short penis form) of arid and semi-arid southern Australia (including Western Australia).
Status on site:	May be present, as suitable habitat is present within the prospect. Unlikely to be significantly impacted.