SEIS Vertebrate Fauna, Black-throated Finch, and Threatened Fauna Assessment Report

Mine Site
Galilee Coal Project
(Northern Export Facility)

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1. Introduction

1.1. Background and Purpose

Waratah Coal proposes to establish coal mining operations on exploration leases situated approximately 35 kilometers north-west of Alpha, Central Queensland. Waratah Coal proposes both open-cut and underground coal mining operations on the site, supported by the establishment of a new rail line to transport coal to future or existing coal terminals on land within the Port of Abbot Point and the Abbot Point State Development Area (APSDA).

On 28 October 2008, the project was gazetted as a "significant project" under the *State Development and Public Works Organisation Act 1971* (SDPWO Act), and requiring an environmental impact statement (EIS). Terms of reference for the EIS were released in August 2009, and the subsequent EIS was submitted to the Coordinator General, Department of State Development, Infrastructure and Planning (DSDIP) in September 2011.

As part of the EIS review process, both the Commonwealth[1] and State[2] Governments provided comments on the draft EIS, and have requested that additional information be provided. Austecology was commissioned to provide responses to issues raised by both the Commonwealth and State Government requests as they relate to terrestrial fauna issues.

A previous report has provided a preliminary assessment in regard to the endangered Black-throated Finch (southern) *Poephila cincta cincta*, (see Austecology 2011).

This Supplementary Environmental Impact Statement (SEIS) report responds to the following key issues raised by Commonwealth and State Government reviews of the draft EIS:

- Provision of greater fauna survey coverage within remnant vegetation habitats of the Bimblebox Nature Refuge (BBNR) and Lambton Meadows properties, employing standardised survey site-based methodologies;
- Implementation of target surveys for threatened reptiles, and in particular, the Common Death Adder *Acanthophis antarciticus*, Yakka Skink *Egernia rugosa,* and the Brigalow Scaly-foot *Paradelma orientalis*;
- Collation of all available existing fauna data for the study site and integration with the findings of the SEIS fauna survey program; and
- Implementation of dry and wet season target surveys for Black-throated Finch (southern) *Peophila cincta cincta*.

1.2. Summary Study Site Description

The study site encompasses and/or includes part of the following properties: Spring Creek; Kia Ora; Glen Innes; Lambton Meadows; Cavendish; Hobartville; and Saltbush (see Figure 1-1). The predominant land use across study site is cattle grazing. A significant proportion of the study site has been cleared of native vegetation and is maintained as cleared pasture for cattle grazing (e.g. Kia Ora in the north, and Hobartville in the east). A large part of this area has been subject to blade ploughing and the introduction of exotic pasture grasses. In these areas, Buffel Grass (*Pennisetum ciliare*) is dominant.

[1] SEWPaC correspondence to Waratah Coal (dated 1 April 2011) and to the Queensland Coordinator general (dated 26 January 2012).
[2] DERM's submission on the extent to which the EIS was successful in addressing the Terms of Reference (TOR) – dated December 2011.

In contrast, a notable area of woodland habitats (including native remnant and native regrowth) has been retained throughout study site (e.g. Glen Innes within the central sector, and parts of Cavendish and Lambton Meadows in the west) (see Figure 1-1). Generally, these areas are also subject to cattle grazing, though it is apparent, that there are differences in grazing management practices implemented throughout these remnant woodland areas (e.g. differences in stocking rates, retention native pasture, and weed control). Woodland habitats are dominated by eucalypts, principally Silver-leaved Ironbark (*Eucalyptus melanophloia*) and Poplar Box (*Eucalyptus populnea*), and support a diversity of native grasses, though also introduced taxa (e.g. Buffel Grass).

Glen Innes station, within the central sector of the study site, supports the Bimblebox Nature Refuge, gazetted in 2003 under the *Nature Conservation (Protected Areas) Regulation 1994* (SL 2003 No. 82). The majority of its 7,912ha supports Silver-leaved Ironbark and Poplar Box woodland.

The study site is located within the Belyando River catchment, which is part of the larger Burdekin River catchment. The study site is transected by a variety of seasonal watercourses. The Spring Creek system drains the north-west sector of EPC1040. This part of the site supports a variety of mesas and plateaus and vegetation types, including bloodwood open woodlands (dominated by *Corymbia trachyphloia*) and woodlands dominated by Lancewood (*Acacia shirleyi*). The Spring Creek system drains east and north, part of which connects with the Lagoon Creek system (off-site and to the north).

The Lagoon Creek system drains generally northwards through the south-north extent of the study site. The system includes:

- Pebbly Creek - draining east across the central sector of the site (through the Cavendish and Glen Innes properties);
- Beta Creek - which drains northwards through the southern central part of the site (through the Lambton Meadows property);
- Tallarenha Creek – draining northwards through the south-eastern part of the site; and
- Salt Bush Creek - draining north through the eastern areas from the south-eastern sector of the study site.

Both Beta and Tallarenha Creeks join within the central-eastern part of the site to form Lagoon Creek, where it continues to drain in a northerly direction through the north-western corner of the study site. River Red Gum (*Eucalyptus camaldulensis*) is a relatively common feature along these waterways, particularly from about the confluence of Beta and Tallarenha Creeks and northwards (where *Eucalyptus tessellaris* is often a co-dominant within riparian areas). Within these areas, large hollow-bearing trees can be a relatively common feature.

1.3. Study Site and Land Use Context

As noted previously, the predominant land use across the study site is cattle grazing, though it is apparent that grazing management practices differ between properties.

The Desert Uplands was settled by pastoralists during the 1860s and 1870s (DNRW 2006). The majority of land tenure within the surrounding region is leasehold (about 80%) with the remainder comprising freehold, reserves and other tenures in small parcels of land (ANRA 2009). At present, the majority of leasehold land is used for cattle grazing, though lands within the western parts of the region also support sheep grazing (DNRW 2006). Most (94%) of the Desert Uplands bioregion is grazed and this area has not changed appreciably in recent decades (ACRIS 2008).

The so-called "Galilee Basin" extends across the eastern part of the region. Coal measures within this area, which includes the proposed mine site, are subject to a variety of new mining proposals. This includes the "Alpha Coal" and "Kevins Corner" projects proposed by Hancock Coal (both are located adjacent and the north of the study site) and the "Carmichael" project proposed by Adaniapproximately 100km to the north), as well as the "South Galilee Coal Project" proposed by AMCI Pty Ltd and Alpha Coal Pty Ltd (located adjacent and to the south of the study site).

Approximately 160 kilometers to the east of the study site is Emerald, a regional centre for both coal mining operations of the southern Bowen Basin and significant areas of pastoral and agricultural land uses.

1.4. Study Site and Ecological Context

As noted previously, Glen Innes station, within the central sector of the study site, supports the Bimblebox Nature Refuge (BBNR). SL2003 No.82 provides the following description[3]:
"The nature refuge supports —

(a) 6 regional ecosystems, including poplar box and silver-leaved ironbark woodland; and
(b) a large area of intact habitat in a landscape that has been subjected to widespread clearing; and
(c) a diverse range of herbaceous species."

The BBNR is classified as an Environmentally Sensitive Area (ESA) (Category C Nature Refuge) within the Department of Environment and Resource Management's (DERM) ESA mapping. In addition, the DERM mapping identifies a number of small areas as Category B ESAs, being Endangered Regional Ecosystems (REs). These are principally associated with relatively small patches of RE 10.4.3 (*Acacia harpophylla* &/or *Eucalyptus cambageana* open woodland).

Other notable ecological values located within the study site include:

- A large remnant of eucalypt open woodland and several small open woodland patches located within the south-eastern sector and scattered along sections of the eastern boundary;
- Eucalypt open woodland and lancewood woodland on sandstone plateaus and scarps within the north-west corner; and
- Relatively narrow and linear areas of riparian woodland (where hollow-bearing trees are often common) associated with downstream sections of the Lagoon Creek system (north-eastern parts of the study site).

Regional Ecosystem (RE) mapping by DERM (2012a) describes the extent of a possible total of 21 REs occurring within the study site. The diversity of REs has been confirmed by previous field assessments, with only relatively minor ground-truthed differences detected in the extent of DERM-mapped remnant vegetation (Worley Parsons 2009; Unidel 2011a; and the SEIS Flora and Vegetation Report).

The study site is contained within the south-eastern part of the Desert Uplands Bioregion (subregion 4: Jericho; Morgan *et al*. 2002). The Desert Uplands Bioregion (DUB) lies within the eastern margin of the Great Artesian Basin. The DUB covers an area equivalent to about 4% of Queensland (6.89 million hectares), has a semi-arid climate, of variable rainfall[4] (though

[3] *Nature Conservation Legislation Amendment Regulation (N0. 1) 2003.*
[4] Average annual rainfall in the DUB varies from 480 mm in the north-west to 540 mm in the south-east. The rainfall is summer dominant, though with a high annual variability. Shires within the DUB have been drought declared for approximately one year in four since 1964, with the Jericho Shire averaging "drought conditions" one year in five (EPA 2002).

summer dominant), and generally supporting soils of poor structure and low fertility (clay soils, sands and massive earths, and skeletal soils) (Morgan 1999; DERM 2012e).

The sands and massive earths support eucalypt woodlands such as ironbark (*Eucalyptus whitei*, *E. melanophloia*, *E. crebra*), box (*E. populnea*, *E. brownii*), bloodwoods (*Corymbia* spp.) and yellow jacket (*E. similis*), which make up about 86% of the bioregion (ANRA 2009). Vegetation types characteristic of skeletal soils (on ranges, plateaus, scarps, etc.) are dominated by eucalypts, (e.g. narrow-leaved ironbark (*Eucalyptus. crebra*), bendee (*Acacia catenulata*) and lancewood (*A. shirleyi*) (Morgan 1999; ANRA 2009)). Clay soils support brigalow (*Acacia harpophylla*), Dawson River gum (*Eucalyptus cambageana*), gidgee (*A. cambagei*) and blackwood (*A. argyrodendron*) (ANRA 2009). The study site is characterised by vegetation types associated with the sands and massive earths, though comparatively smaller areas of vegetation types are associated with skeletal soils (north-west corner) and clay soils (see Worley Parsons 2009; Unidel 2011a).

Two significant internal drainage basins in the centre of the region form the catchments of Lake Galilee and Lake Buchanan (respectively 115klms and 190klms to the north of the study site). These brackish lakes fill only as a result of above average wet seasons (ANRA 2009). Both wetlands are large, relatively shallow, and brackish, contained with internal drainage systems, are seasonally important habitat and refuge for water birds, and listed as wetlands of national significance (ANCA 1996[5]).

ANRA (2009) describes the most common threatened vegetation types as eucalypt woodlands with a shrubby understorey, followed by brigalow (*Acacia harpophylla*) forests and woodlands and eucalypt woodlands with a grassy understorey. Approximately 40% of the threatened ecosystems occur on alluvial land types with the majority of the remainder on clay downs (ANRA 2009). The major threatening process for threatened ecosystems is grazing followed by broad-scale tree clearing (ANRA 2009). The clearing of approximately 18 per cent of the native vegetation to improve pasture production has had more of an impact on biodiversity in the south of the bioregion (DERM 2012e).

Morgan *et al*. (2002) provides an extensive review of fauna data for the Desert Uplands bioregion[6], and noted that a total of 200 species had been recorded in the Jericho subregion (20 mammals, 54 reptiles, 13 amphibians and 113 birds). The assembled fauna list included a variety of species which were thought to reflect the geographic position of the Jericho subregion, i.e. a significant proportion of the fauna being more commonly distributed to the south-east in the wetter Brigalow Belt North bioregion, and to the west in the lower rainfall Mulga Lands and central Australia. The report also noted that the derived species richness for the subregion may be an underestimate as most fauna surveys had concentrated on the box and ironbark open woodland associations, leaving many regional ecosystems in this subregion under-sampled.

[5] The *Directory of Important Wetlands in Australia* was a cooperative project involving the Australian, state and territory governments and maintained up until 1996. To be considered nationally important, a wetland must meet a set of criteria, including biogeographic representativeness; important ecological or hydrological functions; provision of animal habitat during times of vulnerability or adverse conditions; support for more than 1% of the national population of any taxa; support for threatened taxa or communities; and historical or cultural significance.

[6] Morgan *et al.* (2002) listed 388 vertebrate fauna species from surveys in Desert Upland bioregion. This total comprised 19 mammal species (from 19 families), 116 reptile species (representing 10 families), 24 amphibian species (from three families), and 229 bird species (from 63 families).

1.5. Terminology and Abbreviations

1.5.1. Spatial Descriptions

The *proposed mine site* is located within Waratah Coal's mining tenements (EPC1040 and part of EPC1079), near Alpha in the Galilee Basin, Central Queensland. The southern extent of the proposed mining lease boundary is located approximately 20 kilometers north-west of the township of Alpha. The southernmost extent of the proposed mining operations is located approximately 35 kilometers northwest of Alpha.

For the purposes of this report, the *study site* comprises an area which includes the *mine site* and is part of Waratah Coal's mining tenements (shown as EPC1040 and part of EPC1079 in Figure 1-1). The term *surrounding area* refers generally to the lands surrounding and in the vicinity of the *study site*, including the townships of Alpha, Jericho, Aramac and Clermont.

The *study site* is embedded within the *Desert Uplands Bioregion*. The *Desert Uplands Bioregion* (DUB) is one of 13 biogeographical areas of Queensland, and extends between Blackall and Pentland within central northern Queensland (Morgan 1999). It encompasses approximately 7.033 million hectares of semi-arid environments.

A *survey site* is a location within the *study site* where a set of standardised survey methodologies are applied. Each survey site encompasses an area of approximately four hectares where standardised survey methodologies were regularly repeated or continuously implemented throughout the whole field survey period. Survey sites were selected on the basis that they reflect the fauna habitat characteristics of more widespread habitat types which are representative of the areas to be investigated, and were consistent with the requirements identified from a series of meetings with DERM officers in February 2012.

1.5.2. Terrestrial Fauna and Vegetation

Within this report, *fauna* refers to all vertebrate fauna. Nomenclature used for this study follows Van Dyck & Strahan (2008) for non-flying mammals, Churchill (2008) and Reardon *et al.* (2008) for bats, Christidis & Boles (2008) for birds, Cogger (2000) for amphibians, and Wilson (2009) for reptiles. The common names for frogs follow the nomenclature of Ingram *et al*. (1993). The term *waterbird* refers to those species which are ecologically dependent upon wetlands (after Kingsford & Norman 2002). The term *shorebird* refers to both resident and migratory species which are ecologically dependent upon wetlands and form a subset of the waterbird grouping (after Geering *et al.* 2007).

The conservation status of a species is described in accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) (e.g. *Endangered, Vulnerable,* or *Migratory*) and/or the Queensland *Nature Conservation Act 1992* (NCA) and its regulations and amendments (e.g. *Endangered, Vulnerable, Regionally Vulnerable, Near Threatened*[7] or *Least Concern*). *Threatened* is a common term used to collectively describe *Endangered* and *Vulnerable* species.

Within this report, flora nomenclature follows Bostock & Holland (2010). An *environmental weed* refers to any plant that survives in a natural area where its presence is undesirable, harmful or troublesome to native biodiversity.

[7] Previous reports referred to in this report have included reference to *Rare* species. This conservation status was superseded by the status *Near Threatened* with the introduction of the Nature Conservation (Wildlife) Amendment Regulation (No. 1) 2010.

The definition of a *Regional Ecosystem* (RE) follows that provided by Sattler & Williams (1999), *i.e.* a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil. This definition forms the basis of the Queensland *Vegetation Management Act 1999* (VMA[8]), which also defines the "*pre-clearing extent*" of a regional ecosystem as the extent of the regional ecosystem before it was cleared. *Regrowth vegetation* means woody vegetation that is not remnant as defined under the VMA.

The conservation status (under the VMA) of REs follows that of the Regional Ecosystem Description Database (REDD) published and maintained by DERM (2012c). Each RE is assigned status under the VMA as *Endangered*, Of Concern or *Least Concern*. The status of all REs mapped for Queensland is provided in the VMA Vegetation Management Regulation 2000 (VMR): VMR Schedule 1 - *Endangered* Regional Ecosystems; VMR Schedule 2 - *Of Concern* Regional Ecosystems; and VMR Schedule 3 - *Least Concern* Regional Ecosystems.

A *declared plant* refers to a species declared under the *Land Protection (Pest and Stock Route Management) Regulation 2002* (LPR).

1.5.3. Abbreviations

CITES: Convention on International Trade in Endangered Fauna and Flora
DERM: Queensland Department of Environment and Resource Management
DEWHA: Queensland Department of Environment, Water, Heritage and the Arts
EPA: Queensland Department of Environmental Protection Agency
EPBCA: Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
IUCN: International Union for Conservation of Nature and Natural Resources
LPR: Queensland *Land Protection (Pest and Stock Route Management) Regulation 2002*
MNES: Matter of National Environmental Significance (as defined under the EPBCA)
NCA: Queensland *Nature Conservation Act 1992*
NRM: Queensland Department of Natural Resource Management
QPWS: Queensland Parks and Wildlife Service
RE: Regional Ecosystem
REDD: Regional Ecosystem Description Database
SEWPaC: Commonwealth Department of Sustainability, Environment, Water, Population and Communities
sp.: Species (singular)
spp.: Species (plural)

[8] Under the VMA, remnant vegetation is defined as "vegetation that had at least 70% of the height and 50% of the cover of the dominant stratum, relative to the undisturbed height and cover of that stratum and was dominated by species characteristic of the vegetation's undisturbed canopy" (Wilson *et al.* 2002). Only vegetation that falls within this definition is mapped as a regional ecosystem in Queensland. Mapped regional ecosystems thus include 'vegetation that has not been cleared or has been lightly thinned or vegetation that has been cleared or heavily thinned but substantially regrown (Wilson *et al.* 2002).

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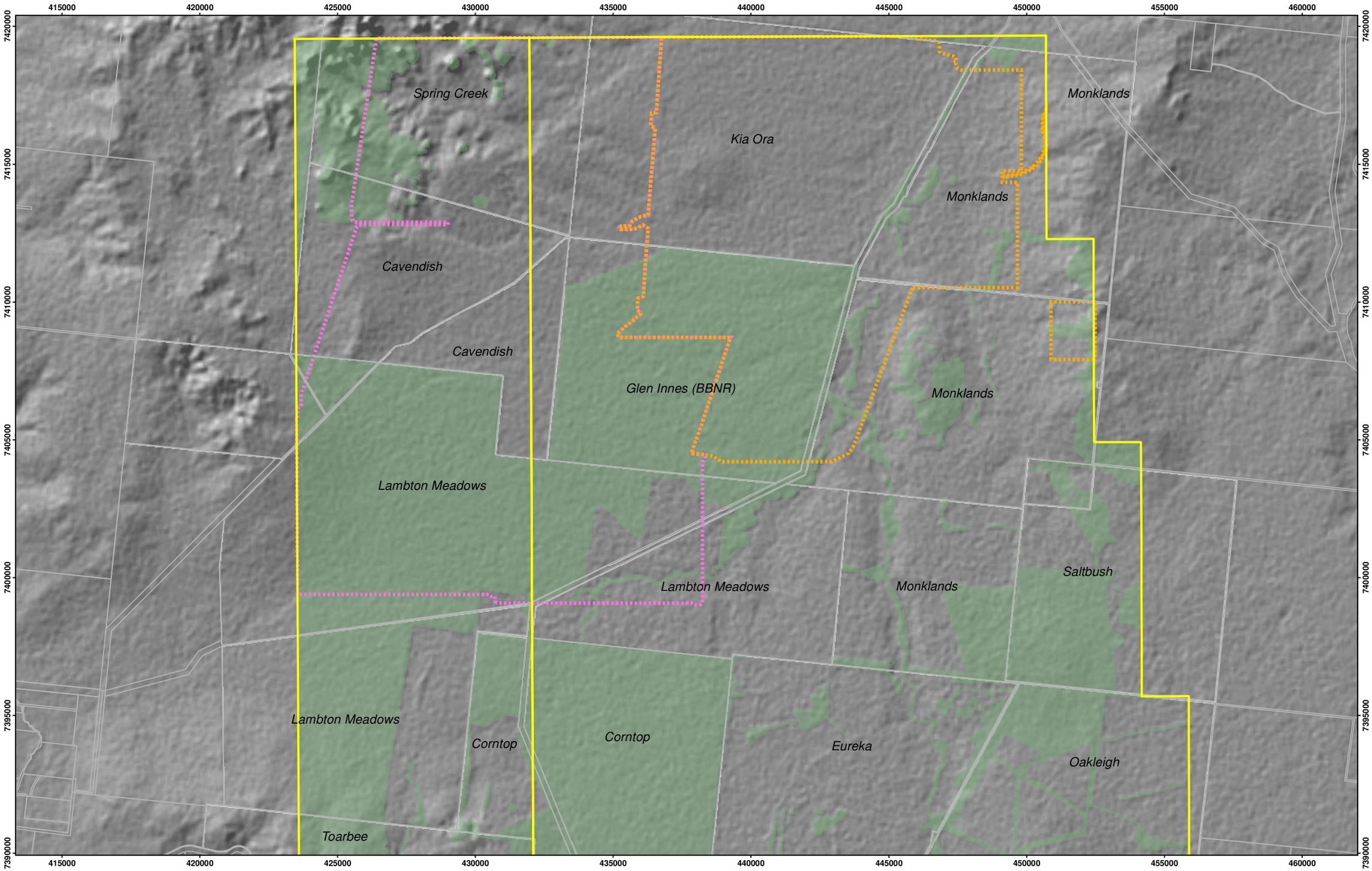

GALILEE COAL PROJECT (Northern Export Facility)

Waratah Coal
THE NEW ENERGY IN COAL

Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source:	Cadastral Boundaries: DERM 2012 Roads & Waterways: Geoscience Australia 2010 Mine Detail: Waratah Coal Pty. Ltd. 2012 Fauna Records: Austecology survey program (2011-2012), Unidel survey program (2009-2010), Birdlife Australia record (2011), Mackay Conservation Council records (EIS submission 2011) Remnant Vegetation: Vegetation Management Act Regional Ecosystems Vers 6.1
Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completness, currency or suiability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
File:	File: WAR20-26-SEIS0019-FIG1-1a-PASTORAL-PROPERTIES-120719 Date: 19/07/2012

0 2,000 4,000 6,000 8,000
Metres

A3 Scale 1:120,000

Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator

EPC1040 & Part of EPC1079
Cadastral Boundary
Probable Clearing Footprint
Subsidence Footprint
Remnant Vegetation

FIGURE 1-1:
PASTORAL PROPERTIES AND EXTENT OF REMNANT VEGETATION

2. Review of Additional Information

Information previously not available during the compilation of the draft EIS, was collated and reviewed. This included data derived from fauna surveys previously implemented by State Government agencies for the study site (e.g. DERM 1998; DERM 1999; QPWS 2000; EPA 2007; and DERM 2011a).

2.1. DERM 1998 Fauna Surveys

The DERM (1998) report provides information on a vertebrate fauna survey implemented during May 1998 on the properties of Glenn Innes, Monklands, and Lambton Meadows (within the study site). The survey undertaken "… as part of a Natural Heritage Fund project to identify and assess the fauna of Silver-leaved Ironbark (*Eucalyptus melanophloia*) and Poplar Box (*Eucalyptus populnea*) woodlands of Central Queensland coordinated by the Emerald Department of Environment".

The survey was undertaken over a four-day period. The following techniques were employed at eight "standard sites":

- Diurnal bird census;
- Diurnal and nocturnal reptile, amphibian, and ground mammal census;
- Nocturnal spotlighting for arboreal mammals;
- Elliott trapping for small terrestrial vertebrates (720 trap nights total)
- Pitfall trapping for small terrestrial vertebrates (144 ptifall nights total); and
- Mammal scats, tracks and traces search.

A variety of other techniques were employed opportunistically within the study area, i.e.:

- Vehicle and walking spotlighting;
- Harp trapping of insectivorous bats (four harp trap nights total);
- Opportunistic vertebrate searches; and
- Identification of animal tracks, feeding marks and bone material.

The survey program provided records for 92 native fauna species, comprising nine mammal, two frog, 16 reptile, and 65 bird species. Five introduced fauna species were recorded, comprising four mammal and one amphibian species.

The report notes that no species listed as endangered, vulnerable or rare under *Nature Conservation (Wildlife) Regulation 1994* were recorded.

2.2. DERM 1999 Fauna Surveys

The DERM (1999) reporting provides the results of a summer replication of the fauna survey undertaken in 1998, though also surveying two additional sites on the Monklands property. The summer survey program provided records for 97 native fauna species, comprising five mammal, six frog, 19 reptile, and 67 bird species. Four introduced fauna species were recorded, comprising three mammal and one amphibian species.

The report notes that no species listed as endangered, vulnerable or rare under *Nature Conservation (Wildlife) Regulation 1994* were recorded.

2.3. EPA 2006 Fauna Surveys

The EPA (2007) report presents the results of a standardised survey of terrestrial vertebrate fauna and assessment of habitat condition on the Lambton Meadows property. The stated aim of the survey was "… to collect information on fauna, flora and habitat condition of various sites at "Lambton Meadows" to act as case study information for the Desert Channels Sustainable Grazing Project". A secondary aim of the survey was to contribute to the development of benchmarks of ecosystems in the Desert Uplands for a Biodiversity Condition toolkit (BioCondition).

The surveys focused on a variety of regional ecosystem (RE) types, and aimed to sample different states of condition across the property within those particular RE types. The survey was undertaken by staff from the Landscape Ecology Unit (Biodiversity Sciences, Environmental Protection Agency) during the period 12 to 24 June 2006.

The survey design used a standardised site-based approach[9], and employed a set combination of Elliott, cage, funnel and pitfall traps with timed day and night searches and bird counts. Incidental fauna records were also collected from across the property and incorporated into the final database.

Eighteen standard sites, three targeted sites and an additional eight incidental sites were completed during the survey. All these sites were within regional ecosystems dominated by silver-leaved ironbark (*Eucalyptus melanophloia*) and/or poplar box (*E. populnea*).

Replicated methodologies and survey effort used at all "standard sites" or suitable target sites included:

- Pitfall Trapping – The pitfall traps consisted of 4 x 20L plastic buckets sunk into the ground in a "T" design, 8m apart, and connected by a 30cm high drift fence. Traps were open for four-days/four- nights;
- Funnel Trapping – Collapsible funnel traps were set along each side of the drift fence at the extremities of the pitfall line;
- Elliott Trapping – Twenty aluminum box traps (Elliott Type "A") were set approximately 10m apart throughout each site. Traps were open for four nights;
- Cage Trapping – Wire cage traps (dimensions 80 x 50 x 50cm) were set at two corners of each site. Traps were open for four nights;
- Diurnal Birds – brief or "snapshot" bird counts were undertaken within the 100 x 100m (1 ha) plot on eight different occasions over four days. Each site had at least four separate counts conducted during the early (0-2hrs after dawn) morning, and the rest during different times of the day;
- Herpetofauna – Active searches for frogs and reptiles were undertaken within 50 x 50m (0.25ha) plot on five separate occasions over five days (three daytime, and two nocturnal searches). Each search was carried out for the equivalent of 20 minutes (e.g. two people for 10 minutes);
- Call Playback for Nocturnal Species – Pre-recorded calls of barking owl, masked/grass owl and sugar glider were broadcast into the plot, to try to draw a territorial response from any of the target species. Each call was played for three minutes, followed by 2 minutes of silence;
- Spotlighting Transect – Primarily used to detect arboreal mammals and macropods but other species also recorded (e.g. reptiles). One observer using a portable 30W spotlight, walking along a 100m transect for 15 minutes; and
- Bat Detection – Ultrasonic bat detectors (Anabat) were installed on each plot for one night.

[9] Report notes "This design, modified from the strategy developed by Dr John Woinarski for bioregional surveys in the Northern Territory, have been widely used throughout savannahs in northern Australia".

Non-standard methods used at suitable standard or targeted sites included

- Harp Trapping – collapsible bat traps ('harp' traps) were used to capture small insectivorous bats. Harp traps were set on roadways or over drainage lines as close as possible to the survey site, in the same habitat type; and
- Identification of tracks and signs.

The location of the standard surveys sites is provided in Figure 3-1.

The report notes that both the weather conditions and seasonal timing were suitable. The survey program provided records for 126 fauna species, comprising 11 native mammals, three introduced mammals, 20 reptiles, one introduced amphibian, and 91 bird species.

The report notes that "The surveys did not result in the detection of any Endangered, Vulnerable or Rare (EVR) species".

2.4. DERM 2011 Fauna Surveys

The DERM (2011) report provides a collation of fauna records for the Bimblebox Nature Refuge Datasets available included the records of CSIRO Division of Sustainable Ecosystems fauna surveys 2003-07; DERM Wildnet data; Birds Australia bird surveys 2003-11; and records of the DERM Nature Refuge Branch survey 19 to 22 November 2011.

The report notes that DERM Nature Refuge Branch staff undertook a survey of four dams on the property for a total of eight person hours over three days, as well as surveying opportunistically elsewhere on the property.

The collated fauna list provides records for 201 native species, comprising 20 mammals, 35 reptiles, 9 frogs, and 137 bird species. Five introduced species were also recorded, i.e. four mammal and one amphibian species.

In regard to threatened fauna, the report notes the following:
- "The landholders have recorded an instance of squatter pigeon Geophaps scripta nesting on the property".
- "During the NR Branch survey an adult blacknecked stork (Near Threatened) was seen at Reid's Dam on the refuge".
- "In May 2011 a sight record of a single black-throated finch – the Endangered nominate subspecies *Poephila cincta cincta* -was reported with a more recent record of a bird calling."

2.5. Alpha Coal Project Fauna Surveys 2011

The AARC (2010) report was prepared as part of the Alpha Coal Project EIS submitted in 2011. The Alpha Coal project is located to the near north of the study site, and encompasses approximately 120,000 hectares[10]. These mining leases are located immediately adjacent and to the north of the study site.

The report notes that "The fauna sampling methodology for the project site was based on 'standard survey' techniques that are used to sample terrestrial and aquatic vertebrate fauna. Sampling of fauna was conducted primarily along transects established in each of the major vegetation communities". A total of 36 fauna transect sites were established on, and

[10] The Hancock Prospecting Pty Ltd project includes MLA 70426 (64,630.6824ha) and MLA 70425 (37,380.8193ha).

surrounding the Project site. Fauna transects were established across the range of vegetation communities present on the project site and surveyed between 2008 and 2010.

At each of the standard trapping sites the following survey methods were used: habitat assessment; pitfall trapping; funnel trapping; Elliott trapping; ultrasonic bat detection (Anabat); spotlighting; and active searching. Each site was subject to trapping regimes of up to four consecutive nights for pitfall traps and five consecutive nights for all other traps.

Replicated methodologies and survey effort used at all fauna transect sites included:

- Pitfall trapping - Each line consisted of a 20 centimeter (cm) tall wire-mesh drift fence running along the ground and crossing the middle of five 20 litre buckets buried flush with the soil surface. The overall survey effort was 400 pitfall trap nights.
- Funnel trapping - Funnel traps were placed at the end of each drift fence at the pitfall trap-lines and along fallen timber at secondary trap sites. Total funnel trap effort for all surveys was 293 trap nights.
- Elliott trapping - Type A Elliott traps were positioned in two rows at each transect, approximately 100 m apart, with each trap separated by approximately ten metres. The overall survey effort (combining each field survey) was 1709 Elliot trap nights.
- Cage trapping - The overall survey effort for cage trapping was 209 trap nights.
- Microbat surveys - Anabat was utilised throughout surveys, recording micro-bat calls at each vegetation community. The overall Anabat survey effort was 45 nights.
- Bird surveys - A dedicated search for diurnal birds was conducted visually and aurally on mornings and afternoons of the survey in the immediate vicinity of each fauna transect.
- Spotlighting - Two spotlighting techniques were employed. Walking searches provided 67 survey person hours, whilst driving searches provided 48 person hours of survey effort.

A combined total of 156 native fauna species were identified on the project site, comprising 29 mammals, 26 reptiles, nine amphibians, and 92 birds. Eight introduced fauna species were recorded, comprising seven mammal and one amphibian species.

Two threatened fauna species were detected during the survey program. The report noted that the Squatter Pigeon (southern) *Geophaps scripta scripta* was recorded during the survey within the non-remnant grassland vegetation community and that "Extensive areas of habitat suitable for the southern Squatter Pigeon exist on the Project site and within the local region". The Little Pied bat *Chalinolobus picatus* was detected through the Anabat surveys within the silver-leaved ironbark woodland community. No additional information on abundance or record locations is provided in the report.

2.6. Birdlife Australia 2012 Surveys

The aim of the Birdlife SQ (2012) report was to "… fill in the gaps in knowledge of bird distribution" and targeting coal leases, Bimblebox Nature Refuge, National Parks and other conservation areas, and areas where threatened species might be present. Particular emphasis was given to target surveys for the Black-throated Finch (southern) and Squatter Pigeon (southern).

A survey team of 16 volunteers were divided into two survey groups. Both groups surveyed the Bimblebox Nature Refuge, amongst a variety of other sites within the region which the two groups surveyed independently. At all properties the birds were recorded in two types of permanent sites based on the Birds Australia Area Search Methods. Both sites were circular around the central GPS location.

- 2ha/20 minute sites – where bird species and numbers were counted in a 2ha area in a 20 minute period. These sites were located inside the larger 80 ha sites. For all sites a 2ha Search Area Atlas Habitat Form was completed.

- 500m radius sites - where birds species but not numbers, were noted in a 500m radius around a point (~ 80ha) over a period of 60 to 90 minutes.

The survey effort implemented on the Bimblebox Nature Refuge included 13 x 500m Atlas surveys and nine two-hectare Atlas surveys. In addition, five acoustic sensors, from the Queensland University of Technology, were also deployed on Bimblebox Nature Refuge by Dave Stewart. These battery-operated recording devices were set to continuously record for up to seven days.

A total of 96 species were recorded on the Bimblebox nature Refuge site. The following was noted in regard to surveys on the Bimblebox Nature Refuge:

- "Surveys were part of a long-term bird monitoring project that had been established in 2003 and previously re-recorded in 2005 and 2011".
- "The 94 species recorded this time compare favourably to the numbers of 74, 61 and 93 found respectively in 2003, 2005 and 2011".
- "New species have been found during each survey with the total numbers increasing from 74 to 82, 108 and to 122 following the recent visit".
- "With input from other visitors the number of birds now recorded for Bimblebox is 149".

The report notes that no Black-throated Finch (southern) or Squatter Pigeon (southern) were recorded on the Bimblebox Nature Refuge, though Black-throated Finch (southern) was located at 13 sites within the northern parts of the bioregion. The results of the acoustic sensor surveys were not available at the time of the report being produced.

3. SEIS Fauna Survey Program

3.1. Methodology

3.1.1. Existing Information Review

A number of Geographical Information System (GIS) datasets were integrated to assess baseline information. The datasets included:

- Rectified aerial photography, cadastre and lease boundaries (supplied by Waratah Coal) and Google Earth imagery;
- VMA RE and Remnant Vegetation mapping (Version 6.1 – DERM 2012a), Essential Habitat mapping (Version 3.0; DERM 2012a), and Regrowth Vegetation mapping (Version 2.1 – DERM 2011b);
- RE and habitat biodiversity mapping specifically undertaken for the study site (Worley Parsons 2009; Unidel 2011a; and the SEIS Flora and Vegetation Report);
- Biodiversity Planning Assessment reports and mapping (DERM 2012e).

In addition to the GIS datasets, previous searches of public access databases were rerun to update information previously undertaken in preparation of the draft EIS reporting. This included a comprehensive series of searches of the WildNet Wildlife Online database DERM (20121d).

The interrogation of the Wildlife Online database provided a series of extracts centered on the study site, and ultimately providing coverage of an area up to 75 kilometers from the center of the study site (-23.4434 146.3966). To provide additional contextual information, species lists were extracted for the following conservation areas: Snake Ridge National Park; Idalia National Park; Cudmore National Park; Narrien Range National Park; Forest Den National Park; Epping Forest National Park; Mazeppa National Park; and Peak Range National Park. The findings of fauna surveys for the adjoining mining leases and surrounding area, in addition to those assessed in the previous section of this report, were also reviewed (e.g. Kutt 1999; Morgan *et al.* 2002; AARC 2004 and 2010; GHD 2010; Unidel 2011b).

As noted previously, information not available during the compilation of the draft EIS, was collated and reviewed for the SEIS. Fauna records derived from that review have been incorporated within the fauna database for this report, and provided background information to support assessments undertaken as part of the SEIS fauna survey program.

3.1.2. Field Survey Program

The survey program was undertaken during the periods 11 to 15 and 19 to 26 April 2011 (inclusive). The survey team comprised Lindsay Agnew, Ed Meyer, Bruce Thomson and Greg Ford. All members of the survey team were familiar with the type and diversity of habitats on the study site through previous survey experience. Each member of the study team has considerable experience in the design and implementation of fauna surveys, including those for threatened fauna. All investigators have the skills to reliably identify threatened species known or potentially likely to occur within the study site and surrounds, and are suitably experienced in regard to their knowledge of the biology of the target species in order to determine in the field the most appropriate survey methodologies.

All methods required to implement the field survey work, were employed in accordance with Austecology's QPWS Scientific Purposes Permit, DPI Animal Ethics Approvals and DERM

Scientific User Certificate. The design and implementation of the surveys was informed by previous site familiarity, requirements of DERM, and best practice guidelines such as SEWPaC (2011a).

The survey program comprised two main approaches (and supplementary work) which were consistent with the requirements identified from a series of meetings with DERM officers in February 2012[11]. The first required primary survey approach comprised a suite of standardised techniques at each of the survey sites, which replicated the survey protocols applied previously by Unidel (2011a).

The methods and survey effort to be applied at each of the six survey sites were as follows:

- *4-day/4-night pitfall and funnel trapping survey.* Pitfall traps were used to survey reptiles, frogs, and small-sized ground mammals (e.g. dunnarts *Sminthopsis* spp. and planigales *Planigale* spp.) that rarely enter Elliott traps. At each site, the pitfall trap line consisted of five, 20-litre plastic buckets sunk into to the ground approximately five metres apart and connected by a drift fence line (30cm high, embossed, polythene dampcourse). Along each line, eight funnel traps (750mm x 180mm x 180mm) were set in alternate positions to pitfall traps. The traps lines were opened over a continuous period of four-nights/four-days.

- *4-night Elliott box-trap survey.* Small-sized ground mammals were surveyed using Elliott (Type A) traps. At each location, 20 Type A traps (8x10x33cm) were set along a linear transect which optimised sampling coverage of each habitat type at that location. Traps were opened for four consecutive nights at each sampling location. Traps were baited with a peanut butter/rolled oats/honey mix and baits replaced as necessary.

- *Three x 20 minute bird surveys.* At each site, two morning and one afternoon census session was undertaken. Surveys were conducted within two hours of sunrise and sunset. Birds were identified from either direct observation and/or their vocalisation.

- *One person hour of active, diurnal ground searching.* The method involved rolling logs and rocks, and raking soil at the base of trees and shrubs etc. Ground search sessions were conducted during mornings and afternoons under suitable conditions.

- *One survey person hour of active, nocturnal ground searching and spotlighting.* Spotlighting searches were undertaken on foot using 30-watt spotlights and low-wattage headlamps. Depending on the habitat characteristics, approximately half of this search effort was dedicated to arboreal searches with the remaining time spent on ground searches for nocturnal herpetofauna and ground mammals (i.e. bandicoots). Where applicable (typically restricted to control sites), arboreal surveys targeted mammals (i.e. possums and gliders), nocturnal birds (i.e. owls & nightjars), reptiles (i.e. snakes and geckos) and flying mammals (e.g. flying foxes).

- *Overnight microbat call detection surveys.* The survey program for insectivorous bat fauna was undertaken using electronic bat detectors. Remote detection (i.e. equipment programmed for unattended, fixed point, overnight detection of microbat calls) was conducted over one night (app. 12 hours). All recorded calls were sent to Greg Ford for analysis and identification.

The abovementioned component of the survey program was augmented by supplementary surveys, which by their nature, were either not applicable to a systematic survey site

[11] DERM representatives from Threatened Species Partnerships (Brisbane), Biodiversity Planning (Emerald), and Environmental Performance and Coordination Branch (Brisbane).

approach (as it is difficult to replicate the effort) or were undertaken opportunistically. This work included the following:

- *Overnight microbat call detection surveys.* Additional overnight call detection surveys were undertaken at a further five locations.

- *Driving spotlight searches* (driver plus one observer with 100 Watt spotlight) were undertaken from a 4WD along the track system within the study site. These were conducted for a minimum of approximately ½ hour on each of the survey nights. Driving spotlight searches were undertaken primarily to survey for larger arboreal and ground mammals (e.g. macropods, foxes, cats and dogs).

- *Inferential evidence* - Inferential evidence of fauna occurrence was sought and found throughout the study site. This included: visual inspections of trees for trunk scratches/rubbings; searches for both predator and non-predator scats; fauna tracks; and other signs of fauna occurrence (e.g. feeding debris, shed skins, nests, etc.). Only evidence, which could be categorised as definitive, was used to record a species occurrence on the *study area*. Scats or pellets found were either identified in the field (using Triggs 2004) or collected to be sent for identification and content analysis by Barbara Triggs, 'Dead Finish', Victoria.

The second primary survey approach was dedicated to targeted survey work for Vulnerable and Near Threatened species. DERM recommended additional targeted surveys for at least three EVNT reptile species, including the Common Death Adder *Acanthophis antarciticus*, Yakka Skink *Egernia rugosa, Ctenotus capricorni* and Brigalow Scaly-foot *Paradelma orientalis.* The Ornamental Snake *Denisonia maculata* was also included within the suite of target species.

Surveys which were implemented throughout remnant vegetation habitats across the study site, included diurnal hand searches, visual searches, nocturnal headlamp and spotlight searches, and slow driving transects. Particular attention was given to target reptile surveys within the north-western part of the study site, where a three-day/three-night survey was implemented. This area supported potentially suitable habitat for all EVNT reptiles, with the exception of the Ornamental Snake. Whilst uncommon on the study site, small and isolated areas of heavier clay soils (Brigalow on cracking clays) occur and these were targeted as part of the surveys, primarily for Brigalow Scaly-foot and Ornamental Snake.

Visual searches were primarily undertaken primarily during mornings, by walking through potentially suitable habitat and scanning for animals either emerging from refuges or active animals detected/flushed during traverses through suitable habitat. Visual searches were also implemented to target particular refuges of interest, previously detected during other survey activities. Diurnal hand searches were typically undertaken between mid-morning and late afternoon and involved searching for sheltering reptiles and through areas of potentially suitable habitat throughout the study site.

Nocturnal searches were implemented during the early/warmest part of the evening, typically up until 2000hrs. Searches were undertaken on foot using 30-watt spotlights and low-wattage headlamps and were dedicated to ground searches. Slow driving transects along dirt tracks were implemented around last light, though also opportunistically at other times during the evening when transferring between survey areas.

Whilst pitfall and funnel trap lines were not established as a specific part of this program, they were located with remnant vegetation (all six survey sites) which supported potentially suitable habitat for species, including *Ctenotus capricorni*, Brigalow Scaly-foot and Ornamental Snake.

The design and implementation of the field investigation program undertaken for this report was guided by previous survey experience and is considered to be consistent with the survey guidelines as provided in SEWPaC (2011a) and BBRW (2010).

In addition to the abovementioned target surveys, extensive ground searches were undertaken within the rugged sandstone landscape of the Spring Creek (primarily land zone 10), an area of potential habitat suitability for Northern Quoll *Dasyurus hallucatus*. That work included daytime searches for potential den sites and signs of activity, scats and latrines.

3.2. Findings and Interpretation

3.2.1. Field Conditions

Conditions were generally fine and warm to hot throughout the survey period. Nocturnal surveys were implemented under new moon conditions. Temperature ranges (collected during the survey) for both diurnal and nocturnal surveys were considered to a suitable[12]. Whilst no rainfall was recorded during the survey period, above average rainfall had been recorded for all months (January to March 2012) preceding the survey[13]. Overall, conditions for the field program were regarded as suitable for the detection of the widest representation of the fauna assemblage known and/or considered likely to occur within the study site, including all target threatened fauna.

3.2.2. Survey Site and Survey Area Descriptions

A suite of standardised fauna surveys were undertaken at six survey sites which replicated the survey protocols applied previously by Unidel (2011a). The location of these survey sites is shown within Figure 3-1. Appendix A provides a habitat description for each survey site, and Appendix B provides a series of photographs of each survey site. The following provides a summary description of the main habitat attributes of each survey site.

- Survey site 1 was located within mixed eucalypt woodland and *Triodia* grassland in the north-west sector of Lambton Meadows, to the near east of Cavendish Road.
- Survey site 2 was located within open eucalypt woodland with thick understory of shrubs on the western side of Lambton Meadows, south of the powerline easement crossing Cavendish Road.
- Survey site 3 was located within low open shrubland on sandy soils in far north-west corner of the Bimblebox Nature Refuge.
- Survey site 4 was located within *Eucalyptus melanophloia* woodland within the northern sector of the Bimblebox Nature Refuge, and to the south of the powerline easement.
- Survey site 5 was located within remnant brigalow woodland along the eastern boundary of the Bimblebox Nature Refuge.
- Survey site 6 was located within mixed ironbark/poplar box woodland in the south-east corner of the Bimblebox Nature Refuge.

In addition to the site-based survey program, remnant and regrowth vegetation communities were surveyed as part of the additional target investigations for the Black-throated Finch (southern) and other threatened fauna. Austecology (2011) provides descriptions of the terrestrial habitats and wetland habitats surveyed, and the SEIS Flora and Vegetation Report provides a more comprehensive and updated description of these vegetation communities.

[12] Nocturnal surveys: ground temperatures between 19.1 to 23.7^{o}C; and air temperatures between 18.0 and 24^{o}C. Diurnal surveys: ground temperatures between 21.0 to 26.6 ^{o}C; and air temperatures between 20.0 and 27.0 ^{o}C. All temperatures measured in the field.

[13] Monthly rainfall data recorded at the Bureau of Meteorology station 35000, Alpha Post Office.

During the April 2012 SEIS survey program, particular attention was given to surveying the habitats of the Spring Creek area. Located within the north-western sector of the study site, this area is dominated by land zones 7 and 10 landscapes and these contrast strongly with the remainder of the study site. This area drains to the south via a series of seasonal watercourses (variously described as Pebbly Creek/Spring Creek) which ultimately join Lagoon Creek within the eastern part of the study site.

At the centre of this area is Mount Belmont which rises to approximately 480m in height. This isolated plateau (land zone 7) supports a sparse tree canopy dominated by *Eucalyptus thozetiana*, an open understory and sparse ground cover, often dominated by spinifex (*Triodia pungens*). Steeper slopes are rocky and highly dissected outcrops are a feature of the upper slopes and outer fringes of the upper plateau. These areas support a wide diversity of microhabitats suitable for reptiles and cavernous habitat of possible value to species such as the Northern Quoll.

Landscapes to the west are dominated by land zone 10, and are a southern extension of a range extending north and north-west of the study site. Here, sandstone ridges and isolated rises are a feature. Vegetation communities vary considerably throughout this area, where the structure and dominance of the tree canopy varies from low closed woodland to open woodland, and variously dominated by bloodwoods such as *Corymbia leichhardtii*, *Acacia shirleyi*, and/or *A. catenulata*. Ground cover vegetation varies considerably depending on position within the landscape, being generally sparse apart from on soils at the base (or lower slopes) of sandstone rises and associated with a variety of small watercourses and seeps. A feature of this area was the variety of cavernous habitats of the mid and upper slopes, and broad areas of low sandstone outcropping which supported rock slabs.

Surface water was present during the survey period, typically as small pools of water contained within sandstone depressions resulting from groundwater seeps. Evidence of a hot fire event(s) was noted throughout parts of this area. It is understood that the most recent fire occurred in October 2011, and that fires within this landscape occur about every five years (*pers comm.* D. Gordon, Cavendish, 2012*).* For the majority of the regional ecosystems mapped within this area, the DEHP REDD[14] notes that frequent wildfire is a potential threat due to the slow recovery rate of plant cover and the sensitivity to burning of some taxa (e.g. *Acacia shirleyi* and *A. catenulata*).

Whilst habitats to the east of Mount Belmont support low rises, the relief is not as great as observed within the abovementioned areas to the west. The low plateau landscape (mainly land zone 5) of this area is dominated by *Acacia shirleyi* or *A. catenulata* dominated woodland habitats. A sparse tree canopy dominated by *Eucalyptus thozetiana* is typical of the side slopes. Understory and ground cover vegetation density varies throughout these habitats, though sparse ground cover was generally more common. Low rock outcrops were commonly encountered and fallen timber relatively abundant. No surface water was observed during the survey period. This area did not exhibit widespread evidence of the fire event which had affected parts of the western area, though there was evidence of hot fire events having affected the eastern areas in the past.

There are five large dams within the Spring Creek area, and the largest is situated to the near north of Mount Belmont. This water body has been surveyed on a several surveys and provided records of a variety of waterbirds, including two near-threatened species. This site has been previously described as water body #31 (see Austecology 2011).

[14] Queensland Herbarium (2011) Regional Ecosystem Description Database (REDD). Version 6.0b - January 2011, (January 2011) (Department of Environment and Heritage Protection: Brisbane).

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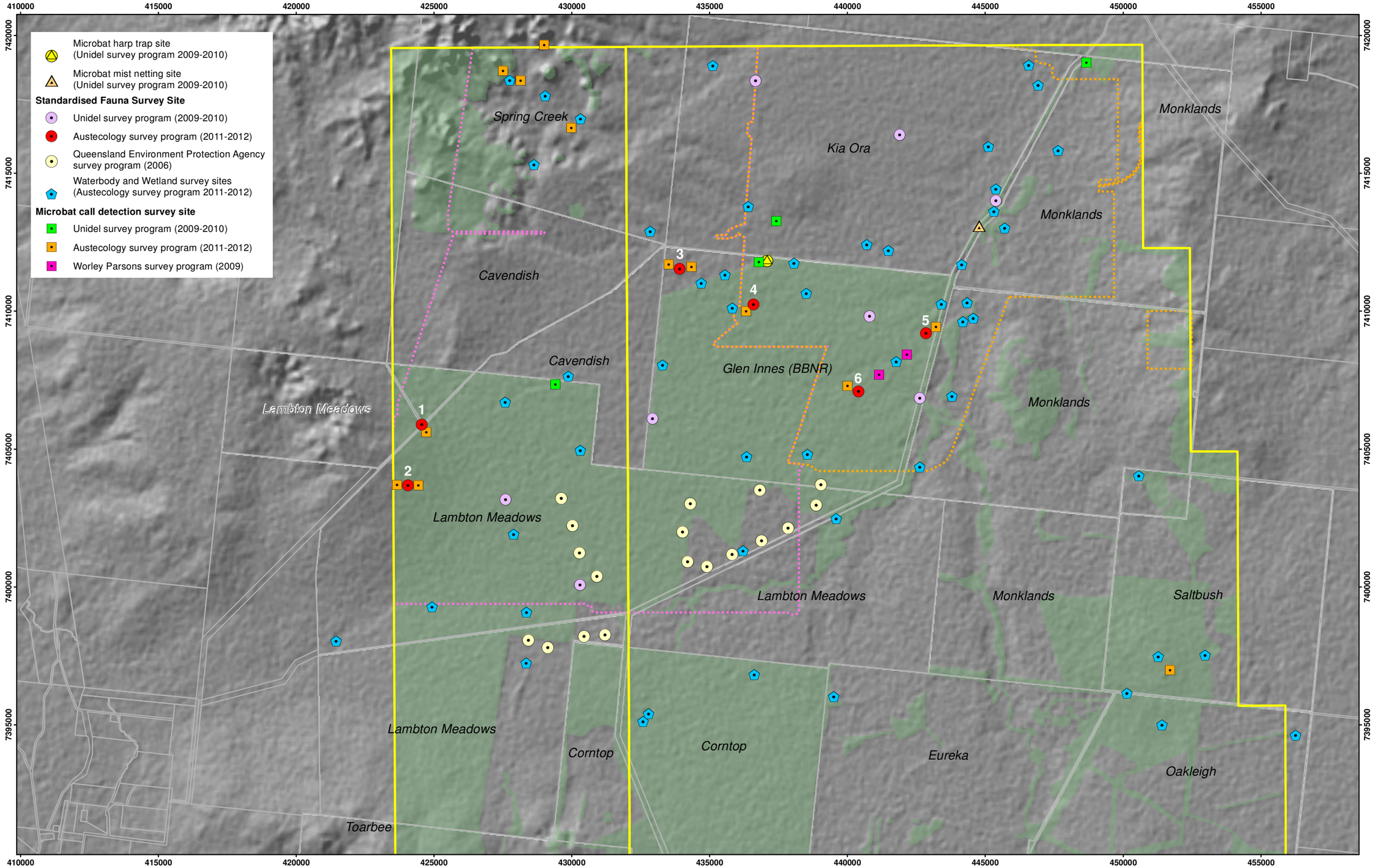


GALILEE COAL PROJECT (Northern Export Facility)

Waratah Coal
THE NEW ENERGY IN COAL

Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source:	Cadastral Boundaries: DERM 2012 Roads & Waterways: Geoscience Australia 2010 Mine Detail: Waratah Coal Pty. Ltd. 2012 Fauna Survey: Austecology survey program (2011-2012), Unidel survey program (2009-2010) Queensland Environment Protection Agency survey program (2006), Worley Parsons survey program (2009) Remnant Vegetation: Vegetation Management Act Regional Ecosystems Vers 6.1 2012
Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
File:	File: WAR20-26-SEIS0017-FIG3-1a-FAUNA-SITES-120801 Date: 1/08/2012

0 2,000 4,000 6,000 8,000
Metres

A3 Scale 1:120,000

Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator

EPC1040 & Part of EPC1079
Cadastral Boundary
Probable Clearing Footprint
Subsidence Footprint
Remnant Vegetation

FIGURE 3-1:
DISTRIBUTION OF FAUNA SURVEY SITES

3.2.3. Fauna Records

A total of 197 fauna species were recorded on the study site during the SEIS April 2012 survey program. The recorded assemblage comprised 28 mammals (including six introduced species)[15], 36 reptiles, eight amphibians (including the introduced Cane Toad *Rhinella marina*), and 125 bird species. Attachment C provides a list of the species recorded.

The results derived from the standardised survey site-based program accounted for approximately 45% of the total number species recorded during the overall survey program. This part of the survey program provided records for seven mammals, 28 reptiles, six amphibians, and 47 bird species. These results included records for two introduced fauna species (House Mouse *Mus musculus* and Cane Toad). No threatened fauna species were recorded as a result of the survey site-based program.

The highest species richness result was recorded at survey site 6 (46 species). The lowest result was derived from survey site 3. Attachment C provides a full list of species recorded at each of the six survey sites.

Attachments C, D, E, and F provide summaries of the key components of the survey site-based program (trapping, diurnal ground searches, nocturnal surveys and bird surveys). The data provided in those Attachments is summarized as follows:

- Bird surveys – the highest level of activity was recorded at survey site 6, with the lowest recorded at surveys sites 2, 3 and 5.
- Diurnal ground searches produced the highest recorded level of activity from survey site 6, though no notable difference with results from survey sites 2 and 5. The poorest result was recorded a survey site 3.
- The highest level of recorded activity during the nocturnal surveys was recorded at survey site 5. Results at other survey sites were notably poorer, though particularly results from survey sites 2, 3 and 4.
- The combined results for the Elliott, pitfall and funnel trapping program were highest at survey sites 6, with notably lower results derived from survey sites 1 and 4.

The differences in the survey results between the survey sites are likely to reflect the variation between the presence/absence and combination of conditions and resources available to fauna within the habitats present.

Table 3-1 Summary of the Overall Survey Program Results

Species Richness	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Standardised survey site program	Overall April Survey Program
Mammals	2	3	2	1	0	3	7	28
Reptiles	10	5	3	9	13	13	28	36
Frogs	1	0	3	2	3	2	6	8
Birds	19	16	14	22	17	28	47	125
Totals	**32**	**24**	**22**	**34**	**33**	**46**	**88**	**197**

[15] i.e. House Mouse *Mus musculus*, Dog *Canis familiaris*, Feral Cat *Felis catus*, Rabbit *Oryctolagus cuniculus*, Pig *Sus scrofa*, and Cattle *Bos taurus.*

Opportunistic surveys contributed a variety of records in addition to the survey site-based program. These largely comprised waterbirds, and notably, records of two *Near Threatened* species, Black-necked Stork *Ephippiorhynchus asiaticus* and Cotton Pygmy Goose *Nettapus coromandelianus.* Both were recorded from a dam in the central northern part of the study site (see Figure 6-1).

A wide variety of reptiles were recorded as part of the target reptile survey program and there was considerable commonality between the results of this program and work implemented as part of the survey site-based program. Only one threatened reptile species was recorded as part of this work, the *Vulnerable* Brigalow Scaly-foot *Paradelma orientalis*. A single animal was recorded from sandstone landscapes of the Spring Creek area, within the north-western part of the study site (see Figure 6-1).

Further information on threatened fauna is provided in Section 6 of this report.

4. Integration and Review of Fauna Survey Results

As noted previously, information not available during the compilation of the draft EIS, was collated and reviewed for the SEIS. Section 3.1 of this report provides a summary review of the survey approaches and results for the study site. Additional resources pertaining to the surrounding area provide context for the results of surveys on the study site.

Attachments H, I, J, and K provide fauna records derived from this review. The key information sources within the database are as follows:

1. In regard to the surrounding area:
   a. Fauna records extracted from the DERM Wildlife Online database for the area within 75 kilometers of the study site; and
   b. Records from fauna surveys which formed part of the Alpha Coal Project 2011 EIS (AARC surveys 2008 to 2010).

2. In regard to the study site:
   a. Records from fauna surveys undertaken by DERM during 1998 and 1999 on the Glenn Innes (Bimblebox Nature Refuge), Monklands, and Lambton Meadows properties;
   b. Records from fauna surveys undertaken by EPA in 2006 on the Lambton Meadows property;
   c. Records from fauna surveys, as compiled by DERM in 2012, for the Bimblebox Nature Refuge, including: CSIRO 2003 to 2007; Birds Australia 2003 to 2011; and DERM Nature Refuge Branch 2011;
   d. Records from fauna surveys which formed part of the draft Galilee Coal Project EIS (Unidel[16] and Worley Parsons[17] surveys 2008 to 2010); and
   e. Records from fauna surveys undertaken for the Galilee Coal Project SEIS (Austecology 2011 to 2012).

For the study site, the reviewed results represent a collection of fauna data over a 15-year period. For some of the information, there was no accompanying information in regard to field methodologies, survey effort and/or frequency, e.g. CSIRO 2003 to 2007 and Birds Australia 2003 to 2011, though both are described elsewhere as “monitoring” programs.

For the remaining information sources, the following can be summarized in regards to the survey data reviewed:

- The data is derived from surveys undertaken throughout the seasonal cycle, included several dry and wet season survey events.
- The data is derived from periods characterised by very dry and wet conditions, i.e. years of above and below median annual rainfall. Survey timing correlated with historical meteorological data drawn from long-term rainfall data[18] (see Figure 4-1).
- From information sources that provide suitable detail, the following conservative conclusions can be drawn:
  - 16 fauna survey events provide a minimum 90 field-survey and 177 survey-person days. The average length of a survey event was almost six days in duration.
  - All 16 survey events have been implemented within the proposed open cut and underground impact zones.

[16] A total of 130 vertebrate species were recorded during this field survey (22 mammals, 15 reptiles, 5 amphibians, and 88 birds).
[17] A total of 69 vertebrate species were recorded during this field survey (7 mammals, 3 reptiles, 4 amphibians, and 55 birds).
[18] Historical annual rainfall data derived from Bureau of Meterology station 35000 (Alpha Post Office) and station 35164 (Monklands property).

- 6 of the 16 survey events (1998 to 2012) have implemented standardised survey site-based methodologies over a minimum four-night/four-day period (and up to six days duration).
  - All included trapping (Elliott, funnel & pitfall traps) and timed bird surveys, diurnal ground searches, and nocturnal surveys.
  - All included additional methodologies such as microbat call detection surveys and searches for indirect evidence of fauna occurrence (e.g. scats, tracks & signs);
  - Five surveys included cage trapping, harp trapping and call-playback surveys.
  - Two survey events included nocturnal mist netting surveys.

The above is considered a substantive survey effort, and only accounts for part of the information sources included in the data review.

The integration of the data derived from the abovementioned fauna surveys provides the following information for the study site:

- A total species richness of 297 native fauna species. This total is comprised of 40 mammals, 57 reptiles, 15 frogs, and 185 bird species.
- A total of seven introduced fauna species, i.e.: House Mouse *Mus musculus*, Dog *Canis familiaris*, Feral Cat *Felis catus*, Rabbit *Oryctolagus cuniculus*, Pig *Sus scrofa*, Cattle *Bos Taurus*, and Cane Toad *Rhinella marina.*
- A total of 10 fauna species, listed as threatened under the EPBCA and/or NCA, comprising the following:
  - Koala *Phascolarctos cinereus* – *Vulnerable* EPBCA
  - Little Pied Bat *Chalinolobus picatus* – *Near Threatened* NCA
  - Brigalow Scaly-foot *Paradelma orientalis* – *Vulnerable* EPBCA and NCA
  - Cotton Pygmy Goose *Nettapus coromandelianus* - *Near Threatened* NCA
  - Freckled Duck *Stictonetta naevosa* - *Near Threatened* NCA
  - Black-necked Stork *Ephippiorhynchus asiaticus* - *Near Threatened* NCA
  - Square-tailed Kite *Lophoictinia isura* - *Near Threatened* NCA
  - Squatter Pigeon (southern) *Geophaps scripta scripta* - *Vulnerable* EPBCA and NCA
  - Black-chinned Honeyeater *Melithreptus gularis* - *Near Threatened* NCA
  - Black-throated Finch (southern) *Peophila cincta cincta* – *Endangered* EPBCA and *Vulnerable* NCA

Table 4-1 provides a summary of the species richness results of the key information sources for the study site and surrounding area in Attachments H, I, J, and K. Those attachments provide the detailed fauna lists for each of the seven key data sources (five sources for the study site and two sources for the surrounding area).

Figure 4-2 provides a summary integration of fauna survey results for the study site.

Figure 4-1 Summary of Annual Rainfall Data 1886 to 2011

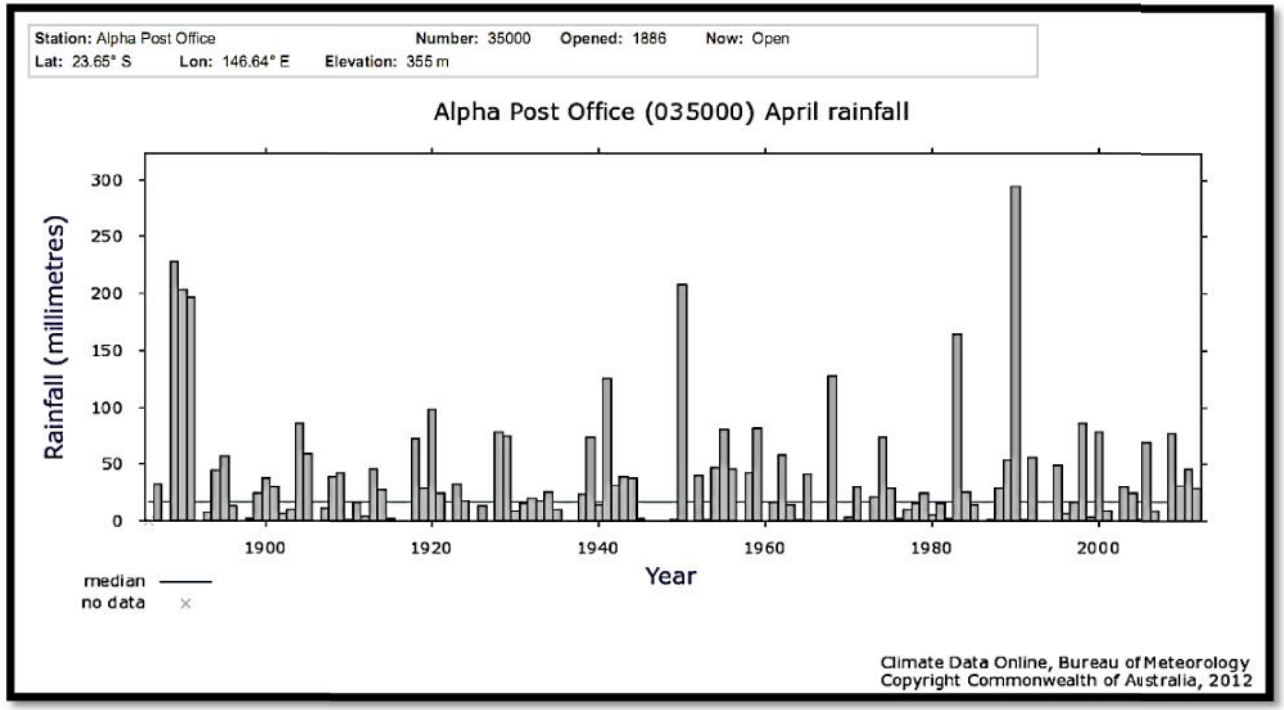
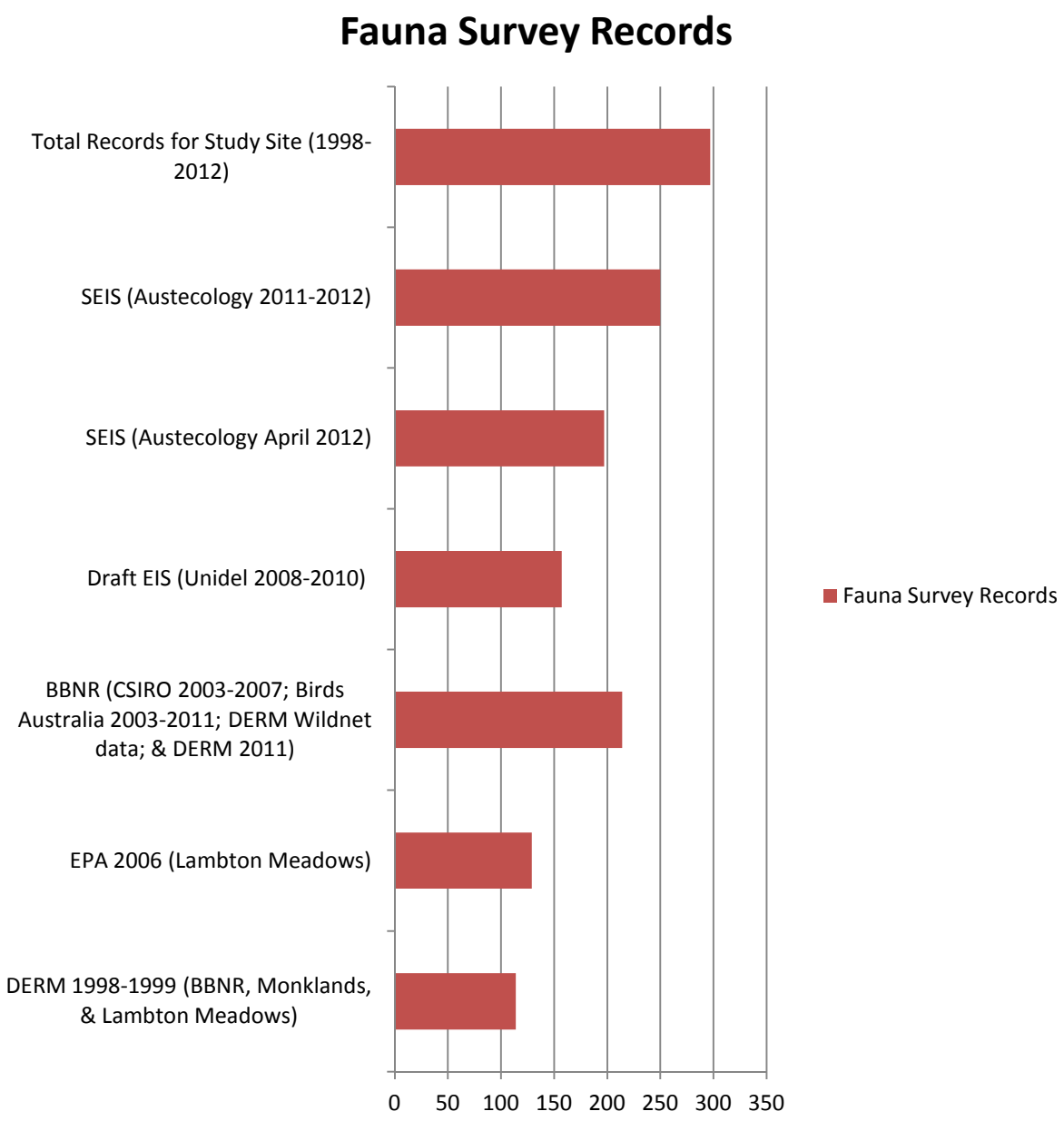


Table 4-1 Tabulation of Fauna Survey Records for Study Site and Surrounding Area

	DERM 2012 Wildlife Online (records within 75km of study site)	Alpha Coal Project EIS (AARC 2008-2010)	DERM 1998-1999 (BBNR, Monklands, & Lambton Meadows)	EPA 2006 (Lambton Meadows)	BBNR records: CSIRO 2003-2007; Birds Australia 2003-2011; DERM Wildnet data; & DERM 2011	Draft EIS (Unidel 2008-2010)	SEIS (Austecology April 2012)	SEIS (Austecology 2011-2012)	Total All surveys for Study Site
Mammals	43	36	15	15	24	30	28	29	**40**
Reptiles	63	26	23	20	35	16	36	45	**57**
Frogs	15	9	7	2	10	6	8	9	**15**
Birds	189	95	69	92	145	105	125	167	**185**
Totals	**310**	**166**	**114**	**129**	**214**	**157**	**197**	**250**	**297**

Figure 4-2 Summary of Fauna Survey Records for Study Site



5. Black-throated Finch Survey Program

5.1. Background and Purpose

The draft EIS for the Galilee Coal project was submitted to SEWPaC for initial comment in March 2011. SEWPaC, in a letter dated 1 April 2011[19], provided comment on a variety of issues, and in particular, the requirement to undertake additional surveys targeting the Black-throated Finch (southern) *Peophila cincta cincta* (hereafter BTF or Black-throated Finch (southern)).

SEWPaC's requirement noted that any target surveys should be undertaken following the survey guidelines outlined, i.e.:

The preferred timing for wet season surveys is the period when ground stored grass seed is at its greatest abundance. This period will vary annually and geographically according to climate and weather patterns. As a rough guide surveys are recommended between November and February in areas south of latitude 23^{o}, such as the mine site and March to May north of 23^{o}, such as the port site. The protocol for water source watching should follow that described for the dry season survey. Targeted searches should involve walk-through surveys within a 600m radius of all water sources, with specific effort devoted to grassland areas, especially those with a woodland/shrubland over-storey. Surveys should include searches for visible signs of black-throated finches and their nests and detection from calls. Justification for the survey timing is required if outside the prescribed survey periods.

To respond to SEWPaC's requirements, Austecology was commissioned by Waratah Coal to design and implement a program to survey for BTF under both dry and wet season conditions. The Austecology (2011) report was prepared as part of the EIS submission to the Queensland Coordinator-General and SEWPaC during mid-2011, and provided preliminary advice on the initial stages of the on-going site survey and habitat assessment program for the Black-throated Finch (southern).

The following SEIS report section, incorporates the results of the Austecology (2011) report with the findings of the remainder of the target survey program for BTF on the study site.

5.2. Assessment Methodology

5.2.1. Existing Information Review

Existing information regarding the potential presence of BTF on the study site and surrounding area was collated and reviewed for the Austecology (2011) report. Where relevant, these were updated for the current reporting, or added to as further information became available during the subsequent period of assessment. The following provides a summary of the resources reviewed as part of the preparation of this report.

Searches of public-access databases were undertaken to locate previous records of the BTF within the wider area surrounding the study site. Databases included:

- DERM (2012d) WildNet Wildlife Online database extracts, including a series of extracts centered on the study site, and ultimately providing coverage of an area up to 75 kilometers from the center of the study site (-23.4434 146.3966). In addition, specific reports were

[19] SEWPaC letter dated 1 April 2011 to Waratah Coal and entitled *Comments on the Draft EIS Establishment of Galilee Coal Mine and Associated Infrastructure, Galilee, Qld.*

extracted for the following areas: Barcaldine Regional Council LGA, Longreach Regional Council LGA; Blackwood National Park, Cudmore NP, Cudmore Resource Reserve, Epping NP, Forest Den, NP, Mazeppa NP, Narrien Range NP, Moorinya NP, Great Basalt Wall NP; Dalrymple NP; and White Mountains NP.
- SEWPaC on-line Protected matters search tool[20], Birds Australia Atlas bird lists (Birdata), and Eremaea Birds[21].

It is understood that the BTF Recovery Team also maintains a database of BTF records, though the details of those records are not available to the public.

Records of the BTF were sought through a review of publicly available assessment reports prepared as part of surveys in the southern sector of the Desert Uplands Bioregion. The review of these reports also provided information on habitat type and condition. These documents included the following:
- Survey and habitat assessment reports for the study site, i.e.: DERM (1998); DERM (1999); QPWS (2000); EPA (2007); Worley Parsons (2009); Unidel (2011a); DERM 2011a; and Birdlife SQ (2012).
- Survey and habitat assessment reports for the surrounding area, e.g.: AARC (2004); GHD (2010); AARC (2010); and Unidel (2011b).
- Bioregional assessment reports, e.g.: Kutt 1999; Morgan *et al*. (2002); ANRA (2009); and DERM (2012e).

A review of the existing information of the life history, biology and distribution of the BTF included, but was not limited to, the following resources: Zann (1976), Immelmann (1982); Blakers *et al.* (1984); Storr (1984); Mitchell (1996); NSW NPWS (1999); Schodde & Mason (1999); Garnett & Crowley (2000); Ley & Cook (2001); Beruldsen (2003); Barrett *et al.* (2003); BTFRP (2004); NSW DECC (2005); TSSSC (2005); Higgins *et al.* (2006); BTFRP (2007); DEWHA (2009 a & b); DERM (2011b); and SEWPaC (2012a). A comprehensive species profile is provided in Austecology (2011).

Existing information regarding the type and extent of the site and surrounds was drawn from the following sources:
- DERM's certified Regional Ecosystem and Remnant Map (DERM 2012a), Regrowth Vegetation Map (DERM 2012b), and Essential Habitat mapping (DERM 2012a);
- Historical aerial photography and current Google satellite imagery; and
- Vegetation assessment reports pertaining to the study site (Worley Parsons (2009), Unidel (2011a), and the SEIS Flora and Vegetation Report), and surrounding area (AARC (2010)).

5.2.2. Target Survey Program

The field investigation program undertaken for this report was guided by previous BTF survey experience and with reference to the guidelines provided within the background paper for EPBCA Policy Statement 3.13 (DEWHA 2009b). Furthermore, it is considered that the survey approach is consistent with the current, key survey guidelines as provided in DEWHA (2010).

Table 5-1 provides a summary of the timing and survey effort for the target survey program. That information outlines a program which provided survey treatments during two separate wet seasons, produced regular surveys under dry-season conditions, and implemented a comprehensive suite of late-dry season water source surveys.

[20] This database is partially predictive, and may not provide verified observations or records. The outputs are based on bioclimatic modeling and so the species returned from the search may not necessarily be present in the search area.
[21] Eremaea Birds is an on-line birding atlas and database, built from lists provided by contributing members.

The survey program provided seven survey events and a total of 62 survey-person days dedicated to target BTF surveys. The survey team comprised Lindsay Agnew, Ed Meyer, Greg Ford, and John Young.

5.2.2.1. 2011 Wet Season Surveys

The details of this survey program were the subject of the Austecology (2011) report. The following provides a summary of that information.

The survey program was undertaken during May 2011 in two discrete events, i.e. 11 to 15 May (inclusive) and 30 to 31 May (inclusive). This program provided 14 person-days of target surveys for BTF, and included the following:

- active roaming searches throughout potentially suitable habitats;
- slow driving transects surveying road-side habitats;
- passive point surveys at potential drinking points; and
- systematic searches for BTF nests throughout potentially suitable habitats.

The 2011 late summer period was characterised by rainfall well above average, and there were numerous locations on the study site where surface water provided potential BTF drinking points. Given the extent of surface water on the study site, only a sub-set of these were subjected to field surveys. These areas were selected on the basis of a combination of the following:

- their location (those separated by more than 500m thus contributing to the widest possible site coverage);
- their character and condition; and/or
- their position, within or immediately adjacent to, habitat of potentially higher value for BTF.

Water source surveys were undertaken throughout the day, i.e. from sunrise through to sunset[22]. Active roaming searches for BTF were undertaken across a wide and representative cross-section of potentially suitable BTF habitat across the study site, though preferential treatment was given to habitats in closer proximity to water sources (e.g. within 1km of such water points)[23]. Searches were undertaken throughout each survey day, with preferential attention given to early mornings and late afternoon periods. All potentially suitable habitats associated with the surveyed water bodies/points on the study site were subject to systematic searches for BTF nests (see Figure 2-1 in Austecology (2011)). Particular attention was given to searching for, and carefully scanning mature trees for hollows and nesting evidence, throughout the small tree layer (if present), and shrub layer (where present). Where it was feasible to do so, all finch-like nests were carefully examined and nest details recorded. Slow driving transects surveying road-side habitats were undertaken during early mornings and/or late afternoons on each survey day to provide further and wider coverage of potentially suitable habitats across the study site (see Figures 5-1 & 5-2).

The location and habitat description for each of the 42 water point sites is provided in Austecology (2011). The location of each of these sites is also included in Figure 3-1 of this report.

[22] Sunrise being approximately 0652hrs and sunset being 1734hrs - Computed using National Mapping Division's sunrise/set program for Alpha (-23°39'00" 146°38'00"), version 2.2, Geoscience Australia.

[23] Survey guidelines in the background paper for EPBCA Policy Statement 3.13 notes that targeted walk through surveys should occur within any sections of the subject land that fall within 600m of seasonal and/or permanent water sources (located on or adjacent to a site).

5.2.2.2. 2011 Dry Season Surveys

Over 37 person days were spent implementing the dry-season target BTF surveys. Survey events were undertaken during July, August, September and October 2011.

The primary survey approach during the period July to September (inclusive) was roaming transect searches throughout potentially suitable habitats. These surveys were replicated during each survey event through a variety of areas (see Figure 5-2). This work was augmented by searches throughout other parts of woodland habitat to provide additional coverage (see Figure 5-2).

The October 2011 survey program was wholly dedicated to census of key water sources on the study site (see Figure 5-3). This program was implemented over a six-day period and provided 19 field-person days of target surveys for BTF.

The October 2011 survey protocol required each investigator to establish themselves at a predetermined observation position within 30 minutes of sunrise, and record all granivore species attending the water body until approximately 30 minutes of sunset[24]. Observation positions had been previously selected to provide complete coverage of the water's edge of each water source. Species and number of birds were recorded in 15-minute time blocks. Two of us (LA and EM) also recorded air temperature at the start of each time block. All observers recorded other weather observations throughout the day (e.g. wind and cloud cover). All of the aforementioned data was recorded on pre-prepared proforma record sheets.

The October 2011 program provided water source surveys at 14 water bodies spread across the potentially suitable habitat on the study site. Of these, six water bodies were each surveyed for two consecutive survey-person days, with the remainder for one survey person day. The survey program was designed to provide "nearest neighbour" survey coverage on each water body within the spatially relevant context on each survey day. None of the water bodies were surveyed by the same observer for more than one day. Figure 5-3 identifies the location of each water body surveyed, and the temporal relationship of the water bodies surveyed on any given day.

5.2.2.3. 2012 Wet Season Surveys

The 2012 wet-season survey was conducted during mid- March 2012 and provided 11 survey-person days of target surveys for BTF.

Active roaming searches for BTF were undertaken throughout a wide and representative cross-section of potentially suitable BTF habitat on the study site, though preferential treatment was given to habitats in closer proximity to water sources[25]. All potentially suitable habitats associated with the surveyed water bodies/points on the study site were subject to systematic searches for BTF nests. Where it was feasible to do so, all finch-like nests were carefully examined and nest details recorded. Slow driving transects surveying road-side habitats were undertaken during early mornings and/or late afternoons on each survey day to provide further and wider coverage of potentially suitable habitats across the study site (see Figure 5-1). The 2012 survey coverage included all of the potentially suitable habitat surveyed during the 2011 wet-season program.

[24] Sunrise being approximately 0545hrs and sunset being 1820hrs - Computed using National Mapping Division's sunrise/set program for Alpha (-23°39'00" 146°38'00"), version 2.2, Geoscience Australia.
[25] i.e. within a search area of approximately one kilometer of water sources within remnant woodland habitat.

Table 5-1 Summary of the Target Black-throated Finch (southern) Survey Program

Survey Event	Survey Dates (inclusive)	Seasonal Conditions	Survey Person Days	Nest Searches	Foot Transects	Driving Transects	Water Source Monitoring
1	11 - 15 May 2011	Late Wet	10	Primary	Primary	Secondary	Minor
2	30 - 31 May 2011	Late Wet	4	Primary	Primary	Secondary	Minor
3	20 - 22 July 2011	Early Dry	6	Secondary	Primary	Secondary	Minor
4	17 - 19 August 2011	Dry	6	Secondary	Primary	Secondary	Minor
5	13 - 16 September 2011	Dry	6	Minor	Primary	Primary	Secondary
6	14 - 20 October 2011	Late Dry	19	Minor	Minor	Minor	Primary
7	14 - 19 March 2012	Wet	11	Primary	Primary	Secondary	Minor
	Total survey person days		**62**				
	Dry-season survey person days		**37**				
	Wet-season survey person days		**33**				

5.2.3. Habitat Assessments and Predictive Modelling of Breeding Habitat

Fieldwork was undertaken to ground-truth previous vegetation mapping and assess habitat values for BTF (Austecology 2011 and the SEIS Flora and Vegetation Report). That work included an assessment of structural complexity of vegetation (tree density, canopy cover, vertical structural complexity), ground cover characteristics (diversity of grasses, density of grasses and height of grass cover); the presence of habitat trees (hollow-bearing trees); and sources of disturbance (adjacent land-use, feral animal evidence, and weed infestation).

An assessment of the condition of all water bodies on the study site was also undertaken (see Austecology 2011). That field work also served to verify the location and condition of the important inputs to preliminary habitat modeling, e.g. extent of preferred regional ecosystems and water sources. From the data available, predictive breeding habitat modelling was completed for the study site and was based on the approach applied in previous studies in the greater Townsville part of the BTF range (see Austecology 2011). The modeling provides a means to forecast the likelihood of BTF populations occurring on a site by portioning the site into areas of high and low probability nesting habitat.

Determining the location and extent of high and low probability habitat areas was based on the proximity of preferred nesting and foraging habitat ("preferred habitat") to permanent water resources[26]. *Higher probability BTF nesting habitat* occurs where preferred habitat is present within 400m of a permanent water resource. Higher probability habitat may be regarded as crucial as it is at these sites that critical life-history stages, namely breeding and recruitment, occur (e.g. Mitchell 1996; NRA 2006). *Lower probability BTF nesting habitat* occurs where preferred habitat is present between 400m to 1000m of a permanent water resource. These areas may form supporting habitat and thus be included within the BTF range. Areas where

[26] Preferred habitat includes those regional ecosystems ("preferred regional ecosystems") as described in the Table 1 of BTFRP (2007) and complimented by those in which the BTF has been recorded in the Desert Uplands Bioregion (e.g. Morgan *et al.* 2002).

preferred habitat was absent within one kilometre of a permanent water source were regarded as *improbable BTF nesting habitat*. Austecology (2011) describes the base data and key assumptions underpinning the modeling. The model output is included in Attachment L of this report.

5.2.4. Survey Program Findings

Surveys targeting Black-throated Finch (southern) (BTF) were carried out during two consecutive wet seasons (2011 and 2012) and also throughout the 2011 dry season. In all, 62 person days were spent surveying the study site and surrounds for BTF[27]. Field coverage of the study site during surveys was considered extensive. A total of 167 native bird species were recorded during this program (see Appendix J).

During targeted surveys, a variety of granivorous bird species were recorded from the study site and surrounds including three grassfinch species: the Plum-headed Finch (*Neochmiamodesta*), Zebra Finch (*Taeniopygia guttata*), and Double-barred Finch (*T. bichenovii*). The BTF was not recorded during surveys.

Of the three finch species recorded, the Double-barred Finch was the most regularly encountered. Double-barred Finches were recorded across much of the Study Site, mostly from remnant and regrowth woodland. Zebra Finches were also recorded from a large number of sites, but at lower abundance than Doubled-barred finch and mostly from regrowth or cleared woodland. Though locally abundant in some areas (with flocks of up to 300 birds), Plum-headed Finches were not as widespread as the Double-barred Finch and Zebra Finch. The extent of occurrence and abundance of Plum-headed Finches was greatest during the 2011 wet season, with numbers declining during the subsequent (2011) dry season. Plum-headed Finches were again commonly recorded (with larger flocks noted) during the 2012 wet-season surveys, though as a general observation, did not appear to be as abundant overall as seen during the 2011 wet-season surveys. Mixed finch flocks were commonly recorded during surveys[28].

As described previously, searches for finch nests were conducted within potentially suitable habitat surrounding stock dams, natural wetlands and water troughs. Finch nests were also recorded opportunistically throughout the survey program. A total of 188 grassfinch nests were located during the survey program including:

- 125 nests attributable to the Double-barred Finch;
- 22 nests attributable to the Zebra Finch;
- 16 nests which, whilst in a largely intact state, could not be confidently attributed to a particular finch species; and.
- vestigial remains of 25 nests which could not be attributed to a particular finch species though were regarded as grassfinch nests.

The majority (85%) of nests recorded during surveys were located at sites between 1.5 and 3m above ground, predominantly in shrubs (e.g. *Carissa* and *Bursaria* spp).

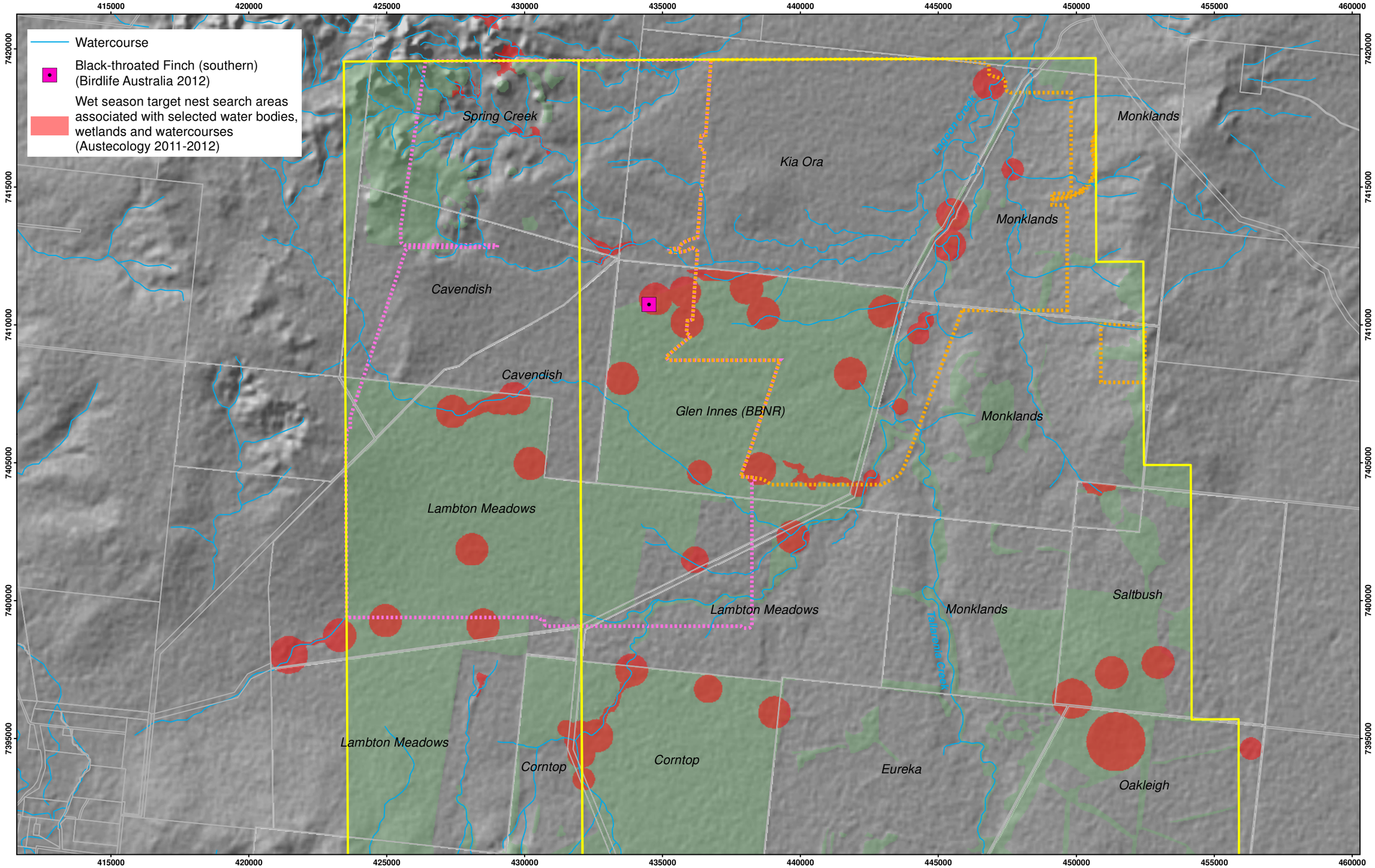
A flock of 15 BTF was reported by Maureen Cooper for an area within the north-western sector of the Bimblebox Nature Refuge (BBNR) (19 May 2011; -23.4119 146.359)[29]. During the second round of 2011 wet-season BTF surveys, specifically dedicated to surveying BBNR, we

[27]Noting that a further 16 survey-person days were implemented during April 2012 SEIS fauna survey program (as previously described in this report) during which bird surveys were conducted.
[28]More often, Zebra and Double-barred Finches; though also Plum-headed and Double-barred Finches; and less often, all three species.
[29]Birds Australia record form# 5086495 provided by Andrew Silcocks, Atlas Project Coordinator on 29 November 2011.

were advised of the location of this record (*pers comm.* Ian Hoch, Glen Innes landowner, 30 May 2011). This area had been searched earlier on the 30th and the same area and wider surrounds were resurveyed during the remainder of that survey event, 12 days after BTF were recorded on BBNR by Maureen Cooper (record location shown on Figure 6-1).

Habitat surrounding the record site was also surveyed during each of the subsequent survey events through until mid-April 2012 (record location shown on Figures 5-1 to 5-3). On each occasion, Double-barred Finch, Plum-headed Finch and Zebra Finch were recorded from this area, with the Double-barred Finch the most abundant of these three species. During searches of the record site and surrounds, small numbers of Double-barred Finch and Zebra Finch nests were located. However, despite careful searching and repeated surveys of this area, no BTF or grassfinch nests attributable to BTF were detected during the survey program.

Given the targeted survey effort and the extensive and repeated survey coverage dedicated to detecting BTF, it is concluded that the flock of birds recorded by Maureen Cooper in May 2011, do not appear to be part of a resident or breeding population. That the null result of targeted surveys by others during the SEIS survey period (DERM 2011, Birds SQ 2012) lends support to these conclusions. It is also worth noting that survey activities undertaken since 1998 have not detected BTF within either the BBNR or other remnant woodland habitats on the study site (DERM 1998, DERM 1999, EPA 2007, CSIRO 2003 to 2007; Birds Australia 2003 to 2011; Worley Parsons 2009, and Unidel 2011a (surveys 2008-2010)).



GALILEE COAL PROJECT (Northern Export Facility)

Waratah Coal
THE NEW ENERGY IN COAL

Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source:	Cadastral Boundaries: DERM 2012 Mine Detail: Waratah Coal Pty. Ltd. 2012 Black-throated Finch (southern): Birdlife Australia 2012 Wet season target nest search: Austecology 2011-2012 Remnant Vegetation: Vegetation Management Act Regional Ecosystems Vers 6.1 Watercourses: Vegetation Management Act Queensland Regrowth Other Watercourses Version 2.1 2012
Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
File:	File: WAR20-26-SEIS0020-FIG5-1a-WET-SEASON-NEST-SEARCH-120719 Date: 19/07/2012

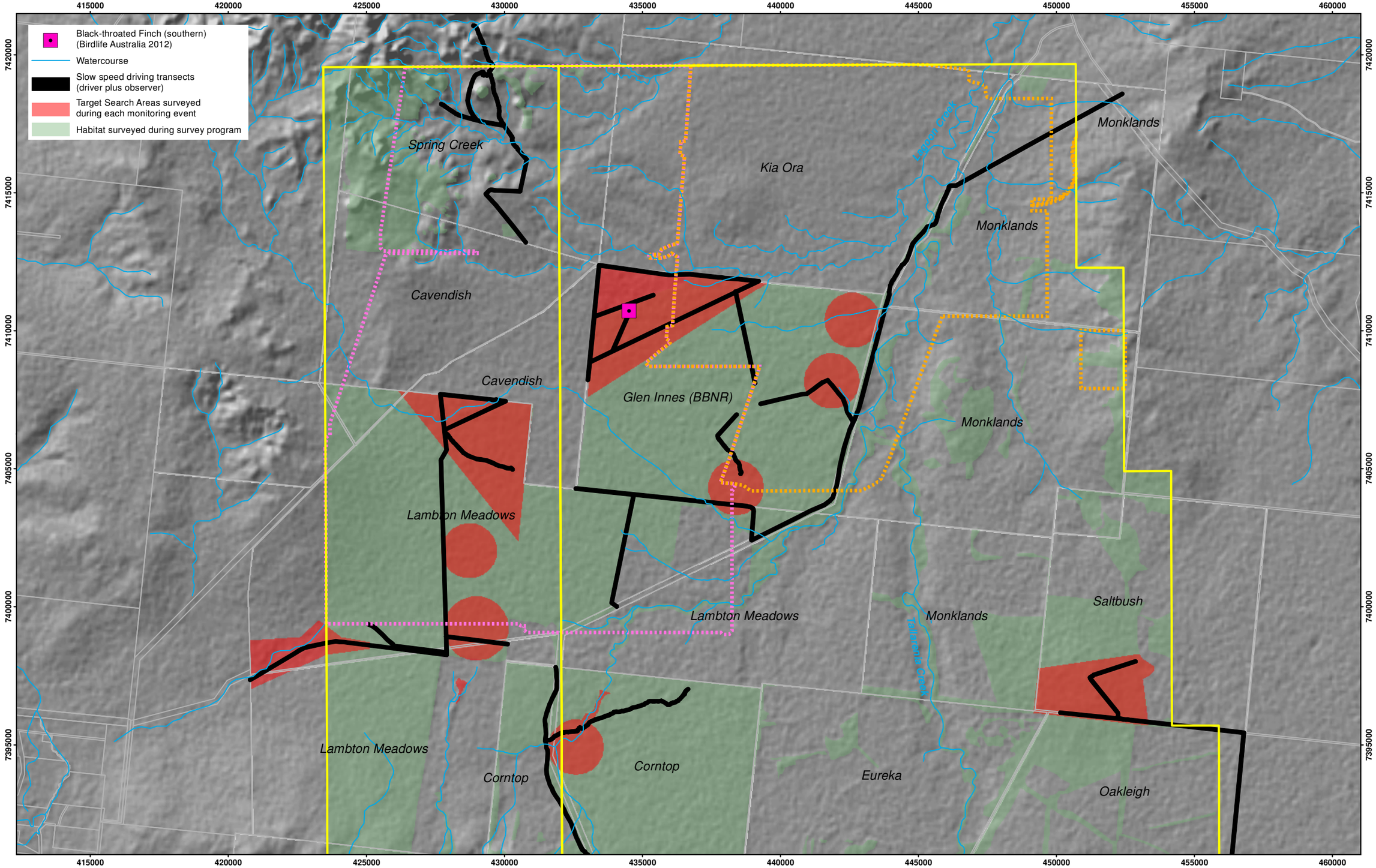
0 2,000 4,000 6,000 8,000 Metres

A3 Scale 1:120,000

Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator

EPC1040 & Part of EPC1079
Cadastral Boundary
Probable Clearing Footprint
Subsidence Footprint
Remnant Vegetation

FIGURE 5-1:
WET SEASON TARGET NEST SEARCH AREAS



GALILEE COAL PROJECT (Northern Export Facility)

Waratah Coal
THE NEW ENERGY IN COAL

Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source:	Cadastral Boundaries: DERM 2012 Mine Detail: Waratah Coal Pty. Ltd. 2012 Black-throated Finch (southern): Birdlife Australia 2012 TargetSearch Areas, Slow Driver Transects: Austecology 2011-2012 Remnant Vegetation: DERM Regional Ecosystems v6.1 2012 Watercourses: Vegetation Management Act Queensland Regrowth Other Watercourses Version 2.1 2012
Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completness, currency or suiability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
File:	File: WAR20-26-SEIS0021-FIG5-2a-TARGET-SEARCH-TRANSECT-120727 Date: 27.07/2012

N

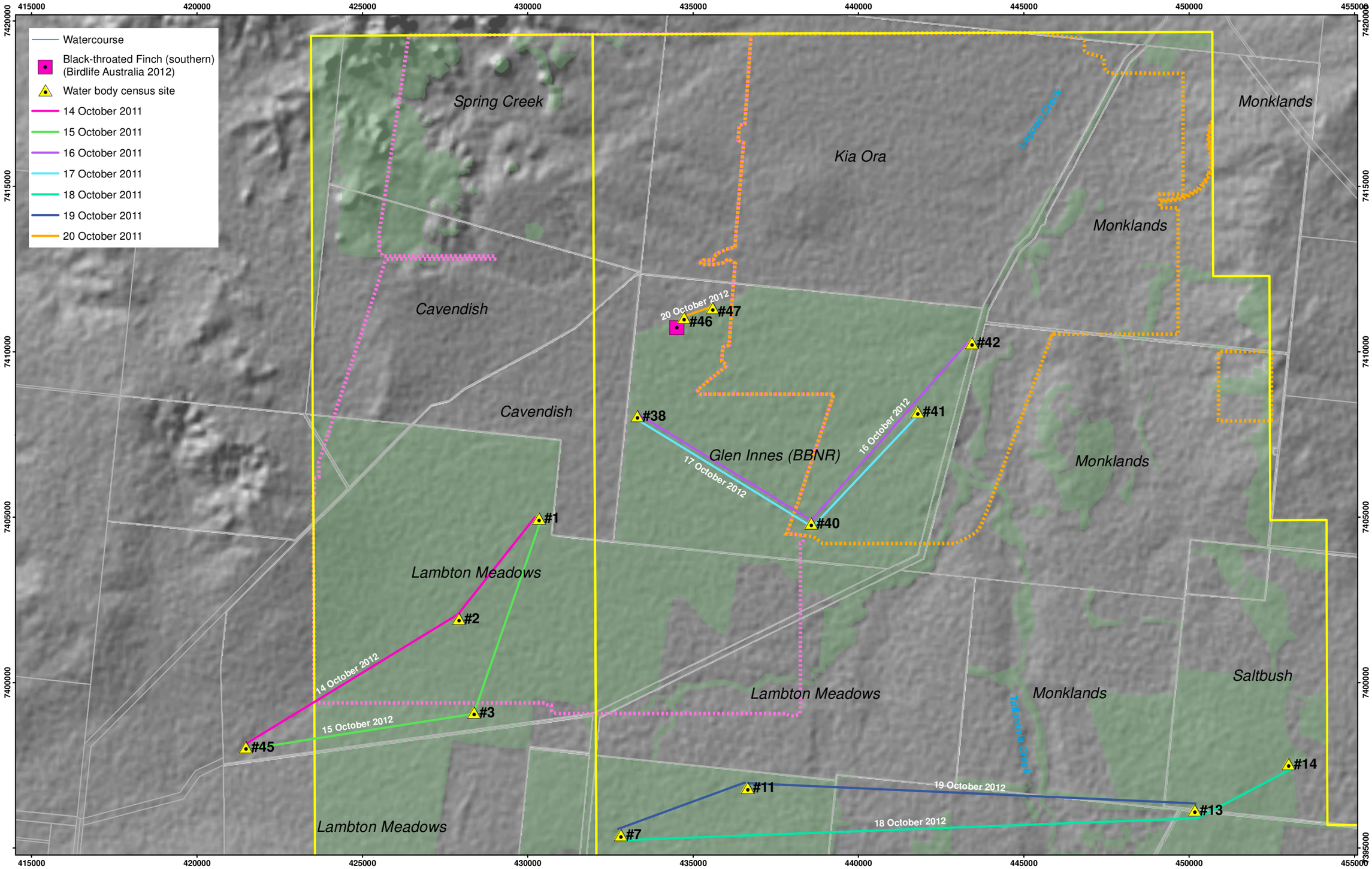
0 2,000 4,000 6,000 8,000
Metres

A3 Scale 1:120,000

Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator

EPC1040 & Part of EPC1079
Cadastral Boundary
Probable Clearing Footprint
Subsidence Footprint
Remnant Vegetation

FIGURE 5-2:
TARGET SEARCH AREAS & TRANSECTS



GALILEE COAL PROJECT (Northern Export Facility)

Waratah Coal
THE NEW ENERGY IN COAL

Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source:	Cadastral Boundaries: DERM 2012 Mine Detail: Waratah Coal Pty. Ltd. 2012 Black-throated Finch (southern): Birdlife Australia 2012 Dry Season water body census sites: Austecology 2011-2012 Remnant Vegetation: Vegetation Management Act Regional Ecosystems Vers 6.1 2012 Watercourses: Vegetation Management Act Queensland Regrowth Other Watercourses Version 2.1
Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completness, currency or suiability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
File:	File: WAR20-26-SEIS0022-FIG5-3a-DRY-SEASON-CENSUS-SITES-120725 Date: 25/07/2012

0 1,700 3,400 5,100 6,800
Metres

A3 Scale 1:100,000

Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator

EPC1040 & Part of EPC1079
Cadastral Boundary
Probable Clearing Footprint
Subsidence Footprint
Remnant Vegetation

FIGURE 5-3:
DRY SEASON WATER-BODY CENSUS SITES

6. Threatened Species

The overall SEIS fauna survey program has provided records of seven threatened fauna species on the study site. The review of existing information has highlighted the records of a further three threatened fauna species.

The following provides discussion of all of these species. Figure 6-1 identifies the location of the threatened species recorded on the study site.

6.1. EPBCA MNES

6.1.1. Koala *Phascolarctos cinereus*

The Koala *Phascolarctos cinereus* is listed as *Vulnerable* under the EPBCA.

A young male koala was recorded during the May 2011 surveys within a large patch of remnant vegetation within the south-eastern part of the study site. At this location, the Koala was located in a young river red gum *Eucalyptus camaldulensis,* where river red gum formed relatively dense regrowth in an area surrounding a seasonal wetland. The record site is located within a remnant of RE 10.5.5a/10.5.12/10.3.27a/11.5.5 (DERM 2012a).

DERM (1998) recorded a Koala on the Monklands property within a site described as a connected strip of *Eucalyptus populnea* woodland. AARC (2010) identify that Koala was recorded on the Alpha Coal project area (to the north of the study site) though no further details are provided.

The findings of the work undertaken by Ellis *et al*. (1995 and 2002) at sites to the north-east (app. 130kms; near Clermont) and south-east (app. 180kms; near Springsure) provide some data which may be applicable to the assessment of Koala habitat on the study site. In the Clermont study, mean home-ranges size for radio-tracked Koalas was 116ha[30], and that the highest proportion of their diet comprised *Eucalyptus populnea* foliage. Tree species representation in the diet composition of Koalas at that study site were, in order of decreasing proportion of the diet, *Eucalyptus populnea, E. crebra, E. terreticornis, E. cambageana, E. melanophloia,* and *Corymbia dallachiana* (Ellis *et al.* 2002). Tree species utilized by Koalas at the Springsure site were (though not ranked in terms of dietary composition): *E. orgadophylla*, *E. crebra*, *E. terreticornis,* and *E. melanophloia* (Ellis *et al*. 1995).

Of those, the following tree species occur on the study site: *Eucalyptus populnea, E. crebra, E. cambageana, E. melanophloia,* and *Corymbia dallachiana*[31].

[30] Mean Koala male home-range of 135.6ha ± 76.6ha and for females, 101.4ha ± 67.1ha, and not significantly different (Ellis *et al.* 2002).

[31] Other Eucalyptus and Corymbia species recorded on the study site are: *Eucalyptus ammophila, E. camaldulensis, Corymbia similis, C. setosa, C. plena, C. clarksoniana, C. erythrophloia, C. tessellaris, C. brachycarpa,* and *C. leichhardtii* (*pers comm.* Rob Friend, 2012).

6.1.2. Brigalow Scaly-foot *Paradelma orientalis*

The Brigalow Scaly-foot *Paradelma orientalis* is listed as *Vulnerable* under both the EPBCA and NCA.

There are no DERM (2012d) records within 75km of the study site and there were no survey records of Brigalow Scaly-foot on the Alpha Coal project area to the near north of the study site (AARC 2010).

One Brigalow Scaly-foot was recorded during the April 2012 target threatened reptile surveys in the north-western (Spring Creek) sector of the study site (see Figure 6-1). It was found under several thick sheets of eucalyptus bark (an ironbark possibly *Eucalyptus drepanophylla*) within low woodland dominated by *Acacia shirleyi*. This area and surrounds supported a mid-dense ground layer and fallen timber was relatively common. Ground rocks were present and there were several larger sandstone outcroppings nearby. The site was located within the mid-slope section of a low rise. Habitat conditions associated with the record site were observed throughout wider surrounding area within this part of the study site. The record site is located within the mapped remnant of RE 10.7.5/10.3.3a/10.3.3b/10.3.27a (DERM 2012a).

6.1.3. Squatter Pigeon (southern) *Geophaps scripta scripta*

The Squatter Pigeon (southern) *Geophaps scripta scripta* is listed as *Vulnerable* under both the EPBCA and NCA. The Squatter Pigeon (southern) is one of a suite of taxa listed in the *Action Plan for Australian Birds 2000* and omitted from the recently released action plan (Garnett *et al* 2010)[32].

No Squatter Pigeons were recorded during the SEIS 2011-2012 survey program on the study site.

AARC (2010) recorded the Squatter Pigeon (southern) on the Alpha Coal project area, noting that birds were located within the non-remnant grassland vegetation community and that "Extensive areas of habitat suitable for the southern Squatter Pigeon exist on the Project site and within the local region". No additional information on abundance or record locations is provided in the report.

DERM (2011b) noted the following "The landholders have recorded an instance of squatter pigeon *Geophaps scripta* nesting on the property. Records at this latitude are referrable to the Vulnerable nominate subspecies *G. s. scripta*". Table 2 of the DERM (2011b) report, titled "Fauna detected on Bimblebox Nature Refuge" attributes the record source as DERM Wildnet data. No other information is provided in the report.

Field coverage of the study site during the SEIS surveys was considered extensive and all members of the study team were experienced in surveys for this species. A variety of pigeons and doves were recorded and the Common Bronzewing *Phaps chalcoptera* was regarded as common. It is unclear what differences there may be between habitats of the study site and the Alpha Coal project area in attempting to reconcile the contrasting survey results.

Given the survey effort and the extensive and repeated survey coverage that has been implemented, it is concluded that the study site did not support a resident population during the 2011-2012 SEIS survey period. Apart from the anecdotal evidence of breeding birds on BBNR, none of the surveys preceding or during the SEIS survey period have resulted in the detection

[32] "Reason not listed in 2010: Revised criteria for Near Threatened: no recent declines and persists at numerous sites across a broad distribution" (Garnett *et al* 2010).

of Squatter Pigeons (DERM 1998, DERM 1999, EPA 2007, CSIRO 2003 to 2007; Birds Australia 2003 to 2011; DERM 2011, Worley Parsons 2009, Unidel 2011a (surveys 2008-2010), and Birds SQ 2012).

6.1.4. Black-throated Finch (southern) *Peophila cincta cincta*

The Black-throated Finch (southern) *Peophila cincta cincta* is listed as *Endangered* under the EPBCA, and as *Vulnerable* under the NCA. Recent assessments by Garnett *et al* (2010) indicate that the Black-throated Finch (southern) meets the current IUCN Red List criteria as *Vulnerable*.

No Black-throated Finch (southern) were detected during the extensive 2011-2012 SEIS target survey program for this subspecies.

6.2. NCA Threatened Species

6.2.1. Little Pied Bat *Chalinolobus picatus*

The Little Pied Bat *Chalinolobus picatus* is listed as *Near Threatened* under the NCA.

There are no DERM (2012d) records within 75km of the study site. The Little Pied Bat was detected within the silver-leaved ironbark woodland on the Alpha Coal project area to the near north of the study site (AARC 2010). No additional information on abundance or record locations is provided in the report.

No Little Pied Bats were recorded during the April 2012 SEIS survey program on the study site. Unidel (2011a) recorded Little Pied Bat at two locations on the study site (see Figure 6-1). One record was drawn from a narrow band of vegetation along Lagoon Creek (north-eastern part of the study site), whilst the other site was located within woodland within the northern part of BBNR[33]. Morgan *et al*. (2002) considered that records reviewed for the Desert Uplands indicated riparian and escarpment habitats may be important for the Little Pied Bat in the bioregion.

6.2.2. Cotton Pygmy Goose *Nettapus coromandelianus*

The Cotton Pygmy Goose *Nettapus coromandelianus* is listed as *Near Threatened* under the NCA. The Cotton Pygmy Goose is one of a suite of taxa listed in the *Action Plan for Australian Birds 2000* and omitted from the recently released action plan (Garnett *et al* 2010)[34].

There are no DERM (2012d) records within 75km of the study site. AARC (2010) did not record this species on the Alpha Coal project area to the near north of the study site.

A Cotton Pygmy Goose was recorded during the April 2012 SEIS surveys on a dam on the Kia Ora property, northern sector of the study site (see Figure 6-1). A wide variety of water bodies had been surveyed, many of these frequently, during the 2011-2012 SEIS survey program. None of these water bodies appear to support the habitat conditions and resources (see Marchant & Higgins 1990) which are typically required by Cotton Pygmy Goose in order to sustain a resident population. Morgan *et al*. (2002) considered this species to be more likely to

[33] Mapped remnant RE10.3.27a/10.3.12a/10.3.3b and RE 10.5.5a/10.5.12 (after DERM 2012a).
[34] "Reason not listed in 2010: Revised criteria for Near Threatened: small population but historical decline has stopped well before the 3-generation limit (21 years) and now appears stable" (Garnett *et al* 2010).

occur within the preferred deep wetlands and water-bodies of the north-eastern parts of the bioregion (associated with the Belyando and Burdekin Rivers).

6.2.3. Freckled Duck *Stictonetta naevosa*

The Freckled Duck *Stictonetta naevosa* is listed as *Near Threatened* under the NCA.

There are no DERM (2012d) records within 75km of the study site. AARC (2010) did not record this species on the Alpha Coal project area to the near north of the study site.

A single bird was recorded during the March 2012 SEIS surveys on a large dam within the north-western (Spring Creek) sector of the study site (see Figure 61-1). Freckled Ducks are known to be dispersive and occurrence beyond principal breeding areas can be irruptive (e.g. Marchant & Higgins 1990). Previous searches of the record site, and those in April 2012 did not detect this species at the record site, or other water bodies on the study site. Morgan *et al*. (2002) noted that within the Alice Tableland subregion, Freckled Duck occurs sporadically in wetlands, riparian areas and artificial water-bodies and population numbers fluctuate with climatic conditions.

6.2.4. Black-necked Stork *Ephippiorhynchus asiaticus*

The Black-necked Stork *Ephippiorhynchus asiaticus* is listed as *Near Threatened* under the NCA.

There is one DERM (2012d) record for the area within 75km of the study site. AARC (2010) did not record this species on the Alpha Coal project area to the near north of the study site.

The Black-necked Stork has been recorded at five separate water bodies during 2011-2012 SEIS survey program (see Figure 6-1). An additional, separate record was also derived from one of these water bodies within the north-west sector of the BBNR (DERM 2011).

The spread of records indicates that there are a variety of artificial water bodies and natural wetlands (e.g. those within the remnant vegetation in the south-east) which this species utilises on the study site. It is probable that this suite of water bodies forms part of the resources (including those off-site) which may be sufficient to support the local presence of birds throughout the year. Morgan *et al*. (2002) considered that within the Desert Uplands, Black-necked Stork is species of possibly little conservation concern, but any further degradation of major lake systems (i.e. Buchanan and Galilee) would impact on the species locally.

6.2.5. Square-tailed Kite *Lophoictinia isura*

The Square-tailed Kite *Lophoictinia isura* is listed as *Near Threatened* under the NCA.

There is one DERM (2012d) record for the area within 75km of the study site. AARC (2010) did not record this species on the Alpha Coal project area to the near north of the study site.

A Square-tailed Kite was recorded during the March 2012 surveys foraging through a woodland remnant within the south-east sector of the study site (see Figure 6-1). During the same survey period, a further two sightings were made on different days, of a Square-tailed Kite (possibly the same individual) associated with remnant vegetation alongside the Capricorn Highway (approximately 15km south of the record location on the study site). Morgan *et al*. (2002) regarded the Square-tailed Kite as a naturally rare species, and uncommon in the Desert Uplands.

6.2.6. Black-chinned Honeyeater *Melithreptus gularis*

The Black-chinned Honeyeater *Melithreptus gularis* is listed as *Near Threatened* under the NCA.

There is one DERM (2012d) record for the area within 75km of the study site. AARC (2010) did not record this species on the Alpha Coal project area to the near north of the study site.

There are six recorded locations for Black-chinned Honeyeater on the study site (see Figure 6-1). Three of these records are of birds located in a large remnant vegetation patch with the south-eastern sector of the study site, and these records were derived from SEIS surveys in March 2012. The other three record sites (from 2003 and 2009) are located within the eastern and southern parts of the BBNR (MCG 2011).

6.3. Species not recorded on the Study Site

The Yakka Skink *Egernia rugosa* is listed as *Vulnerable* under both the EPBCA and NCA, and the skink *Ctenotus capricorni* is listed as *Near Threatened* under the NCA. There is one DERM (2012d) record for each species within the area within 75km of the study site. The Ornamental Snake *Denisonia maculata* is listed as *Vulnerable* under both the EPBCA and NCA, and the Common Death Adder *Acanthophis antarciticus* is listed as *Near Threatened* under the NCA. There are no DERM (2012d) records for either reptile for the area within 75km of the study site. The Northern Quoll *Dasyurus hallucatus* is listed as *Endangered* under the EPBCA. There is one DERM (2012d) record for the area within 75km of the study site. AARC (2010) did not record any of these species on the Alpha Coal project area to the near north of the study site.

In regard to threatened reptiles, target surveys were implemented throughout remnant vegetation habitats across the study site, and included diurnal hand searches, visual searches, nocturnal headlamp and spotlight searches, and slow driving transects. Pitfall and funnel trapping was implemented at six locations within remnant vegetation as part of a parallel component of surveys undertaken in April 2012. Whilst potentially suitable habitat occurs on the study site, none of these species were detected[35]. None of the preceding fauna surveys, undertaken in potentially suitable habitat and including potentially suitable survey methodologies, detected these reptiles (e.g. DERM 1998, DERM 1999, EPA 2007, Worley Parsons 2009, and Unidel 2011a (surveys 2008-2010)).

In regard the Ornamental Snake, there are very small (and isolated) areas of heavier cracking clay soils which support Brigalow, though with poor gilgai development. These and adjacent habitats have been searched under suitable conditions when this species was thought to be active[36]. It is considered unlikely that Ornamental Snakes could be sustained on the study site given the very small and isolated inholdings of "potentially suitable habitat" for this reptile. In regard to Yakka Skink, the only known record within the surrounding area is from a location described as "3km west of Bogantungan"(SEWPaC 2012c), being approximately 75km east of the study site. Field surveys and habitat assessments indicate that potentially suitable habitat for this cryptic species occurs patchily throughout much of the remnant vegetation cover of the study site. Potentially higher habitat suitability values are associated with parts of the BBNR (land zone 5 primarily, the remnant habitat patch on the Saltbush property in the south-east sector (land zone 5), and parts of the remnant vegetation associated with the rugged

[35] Though one of the original suite of target reptile species, the Brigalow Scaly-foot, was detected and that record is discussed in a preceding section of the report.
[36] The author detected active *Denisonia maculata* at a site to the north-east of the study site within days of the April target surveys on the study site.

landscapes of the Spring Creek area (land zones 7 and 10)[37], within the north-west corner of the study site.

The skink *Ctenotus capricorni* is known from sandy areas with spinifex in association with shrub and woodland (Wilson 2009) and is thought to be restricted to sandy open woodlands habitats in the southern Desert Uplands on the Alice Tableland (Morgan *et al*. 2002)[38]. Field assessments indicate that habitat which support similarities to the preferred habitat characteristics, are limited to two areas of relatively young regrowth (both cleared within the past 10 years). These are located in the north-western corner of the BBNR (about 200ha) and a habitat patch (about 300ha) located approximately 3km to the north-west (Cavendish and Spring Creek properties). There are also other small areas of potentially suitable habitat within the north-west corner of the study site (Spring Creek). Within the north-western corner of the study site, rugged sandstone landscapes (land zones 7 and 10) support habitat of comparatively higher potential suitability for the Common Death Adder. The western part of this habitat area has been subjected to a very hot fire event (presumably late 2011). The eastern areas, whilst not affected by the most recent fires, exhibit widespread evidence of hot fire events which may be detrimental to the Common Death Adder (and other threatened reptiles). Inappropriate fire regimes are regarded as a key factor impacting on reptile species targeted as part of the SEIS surveys, and threatened reptiles generally (e.g. QPWS 2001; Richardson 2006; BBRW 2010; and SEWPaC 2012b).

As noted previously, there is a single DERM (2012d) record for Northern Quoll, and this is derived from the Narrien Range National Park (DERM 2011c). Narrien Range National Park covers 7460ha and is located 70 km west of Clermont, and approximately 60km north-east of the study site. There are no records for Cudmore National Park (or Cudmore Resources Reserve) which is located approximately 35km to the north of the study site (DERM 2012d). During the April 2012 survey program, extensive ground searches were undertaken within the rugged sandstone landscape of Spring Creek, an area considered to be of potential habitat suitability for Northern Quoll. That work included daytime searches for potential den sites and signs of activity, scats and latrines. Whilst no confirmatory evidence was located, this area is regarded as potentially suitable, though viability is likely to be diminished due to the evidence of fire history, the widespread presence of Cane Toads, and potentially, broad-scale poisoning within the surrounding area (intended to control wild dogs and dingoes). A variety of ecological studies have suggested that Northern Quolls may be vulnerable to the frequent fires, and poisoning due to ingestion of toads and baits, and that these three factors are potentially involved in the historic decline of the species in northern Australia (e.g. Burnett 1997; Woinarski *et al.* 2008; Hill & Ward 2010; SEWPaC 2012c).

[37] From Sattler & Williams (1999): plains and plateaus on Tertiary land surfaces, generally with medium to coarse textured soils (land zone 5); exposed or shallowly covered duricrusts usually forming mesas or scarps (land zone 7); and plateaus, scarps and ledges with shallow soils on more or less horizontally bedded medium- to coarse-grained sedimentary rocks (land zone 10).

[38] There is one record of *Ctenotus capricorni* for Cudmore National Park, approximately 35km to the north of the study site (DERM 2012d).

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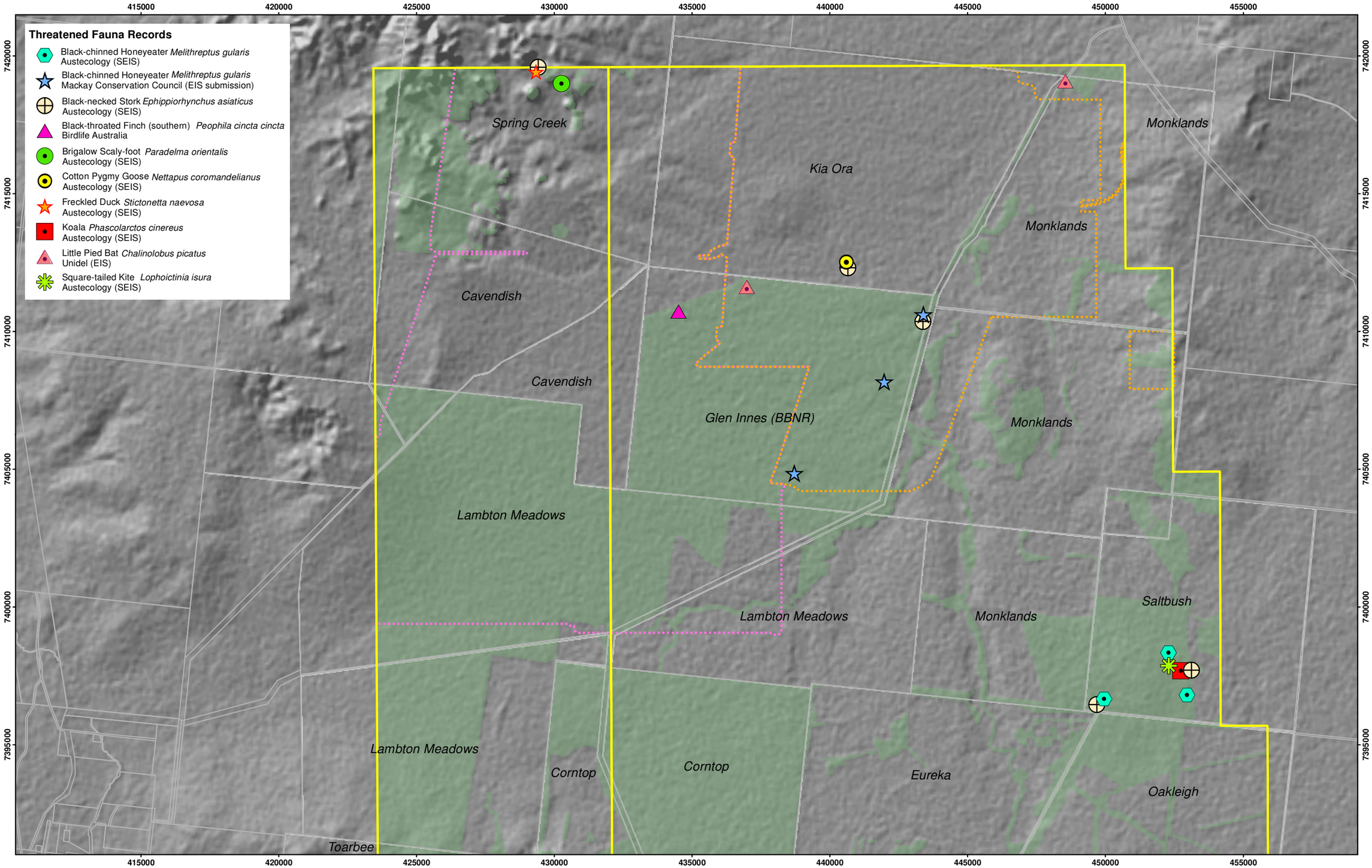


GALILEE COAL PROJECT (Northern Export Facility)

Waratah Coal
THE NEW ENERGY IN COAL

Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source:	Cadastral Boundaries: DERM 2012 Roads & Waterways: Geoscience Australia 2010 Mine Detail: Waratah Coal Pty. Ltd. 2012 Fauna Records: Austecology survey program (2011-2012), Unidel survey program (2009-2010), Birdlife Australia record (2011), Mackay Conservation Council records (EIS submission 2011) Remnant Vegetation: Vegetation Management Act Regional Ecosystems Vers 6.1
Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completness, currency or suiability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
File:	File: WAR20-26-SEIS0018-FIG6-1a-FAUNA-RECORDS-120719 Date: 19/07/2012

0 2,000 4,000 6,000 8,000
Metres

A3 Scale 1:120,000

Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator

EPC1040 & Part of EPC1079
Cadastral Boundary
Probable Clearing Footprint
Subsidence Footprint
Remnant Vegetation

FIGURE 6-1:
THREATENED FAUNA RECORDS

7. Impact Assessment, Mitigation and Offset Strategy

The primary purpose of this section is to provide a supplementary assessment for the key potential direct impacts to fauna. Assessment of a variety of other potential impacts and proposed mitigation measures have been identified and described within the EIS. Many of these, whilst important issues, are not addressed in detail within this SEIS report, as they have been addressed, and can be adequately managed through application of best management practices to be detailed within subsequent management plans as required by any future approval conditions.

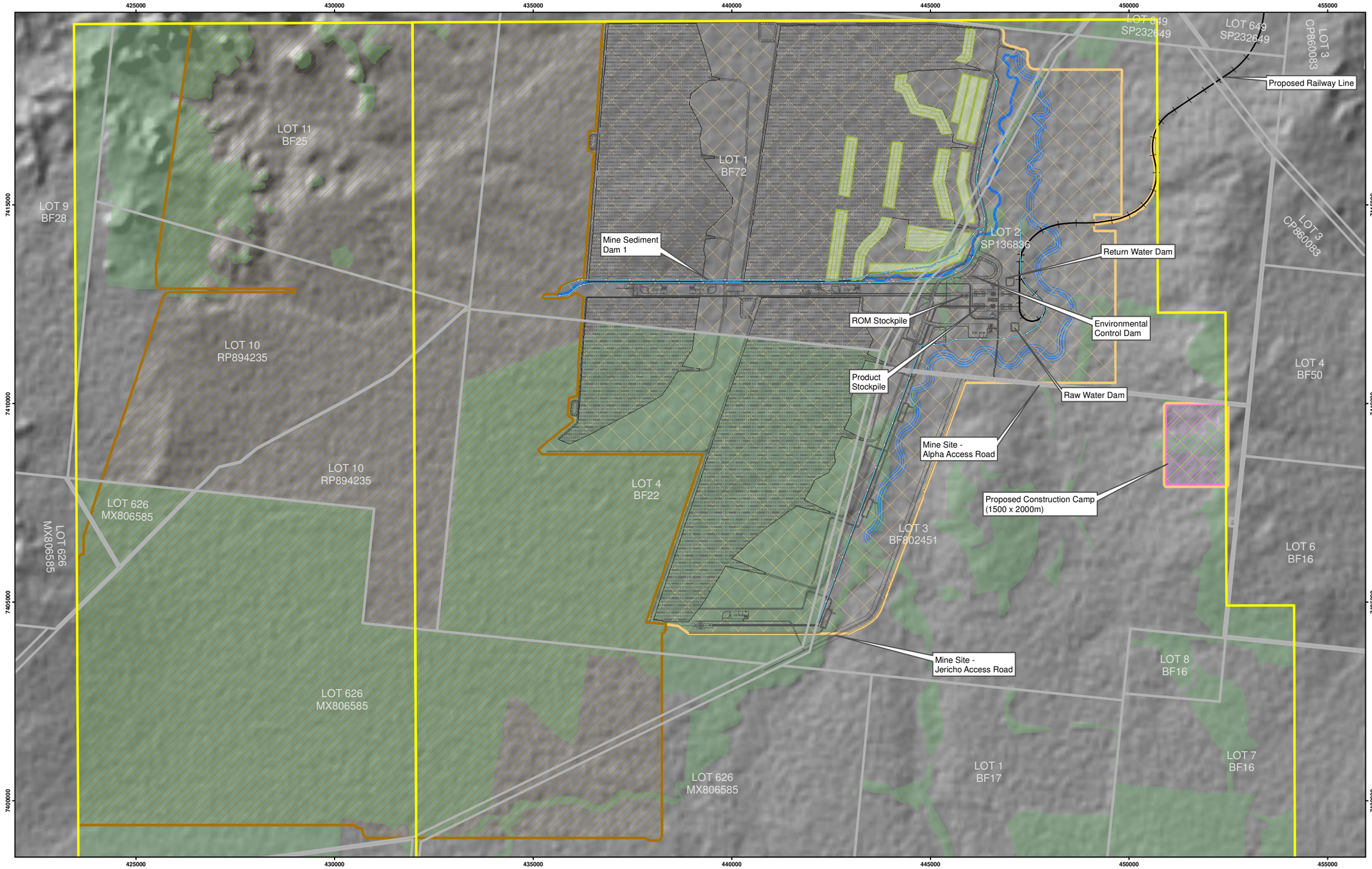
7.1. Assessment of Impacts

This section sets out the impact mechanisms predicted to affect fauna and fauna habitat values within the study site. For the purposes of this assessment, impacts on fauna and fauna habitat values are considered in terms of direct and indirect effects, both short-term and long-term. For example, direct impacts include the loss of habitat as a result of land clearing and development, while indirect impacts are secondary effects such as disturbances to fauna associated with construction and/or operational activities.

Figure 7-1 describes the location and extent of the project disturbance footprint. It includes areas that will be cleared as part of open-cut mining operations and for supporting infrastructure, and areas that will potentially be impacted by subsidence associated with underground mining operations.

A suite of potential direct and indirect impacts have been identified within the project development footprint, and include:

- Direct loss of habitat and resources as a result of vegetation clearing;
- Habitat fragmentation as a result of vegetation clearing which results in direct loss of fauna movement opportunities, though also indirect degradation of retained habitats;
- Habitat degradation associated with land subsidence following underground mining;
- Direct mortality impacts to terrestrial fauna;
- Alteration of fauna behaviour and habitat use resulting from disturbances associated with construction and operational activities (e.g. impacts associated with light, dust, noise and vibration);
- Introduction of exotic weed and pest species to retained habitats; and
- Alteration to fire regimes to retained habitats.



GALILEE COAL PROJECT (Northern Export Facility)

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Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source:	Cadastral Boundaries: DERM 2012 Roads & Waterways: Geoscience Australia 2010 Mine Detail: Waratah Coal Pty. Ltd. 2012 Remnant Vegetation: Vegetation Management Act Regional Ecosystems Vers 6.1 2012
Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completness, currency or suiability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
File:	File: WAR20-26-SEIS0025b-FIG7-1a-MINE-DISTURBANCE-FOOTPRINT-121114 Date: 14/11/2012

0 1,000 2,000 3,000 4,000 5,000
Metres

A3 Scale 1:85,000

Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator

- EPC1040 & Part of EPC1079
- Open Cut Mining Area
- Mine Infrastructure
- Creek Diversions
- Dry Paste Tailings Storage
- Flood Levee
- Probable Clearing Footprint
- Mine Subsidence Footprint
- Remnant Vegetation

FIGURE 7-1:

MINE DISTURBANCE FOOTPRINT

7.1.1. Habitat Loss

The construction phase will necessitate vegetation clearing and land disturbance for the establishment of infrastructure including roads, construction camps, workshops, creek diversions, sediment basins, etc. Vegetation clearing and land disturbance will also occur progressively during the operational phase, including the development open cut pits, spoil dumps etc. The proposed clearing footprint for both the construction and operational phases requires a total area of land disturbance of 16,520ha (see Figure 7-1). This clearing footprint includes approximately 4,877ha of remnant vegetation (see Table 7-1).

The majority of the proposed clearing footprint (approximately 70%) comprises previously cleared lands of comparatively low habitat values for native fauna (11,643ha). Within this landscape, several *Near Threatened* fauna species have been recorded (i.e. Cotton Pygmy Goose and Black-necked Stork). These records are linked to the presence of water bodies, all of which are constructed dams. There are no intrinsically special or notable habitat features associated with these water bodies, though they contribute to a network of water bodies which support these species within the wider area encompassing the study site.

The findings of the SEIS field surveys and habitat assessments indicate that the key habitat areas on the study site are associated with remnant vegetation on the BBNR, western parts of Lambton Meadows, a large habitat patch on Saltbush, and habitats within Spring Creek area in the north-western corner of the study site. Whilst riparian habitats along Lagoon Creek are degraded, these are likely to be locally important in regard to fauna movement opportunities into and out of the study site.

The proposed clearing footprint will significantly impact on two of these areas, i.e. BBNR and riparian habitats of Lagoon Creek. Data reviews identify that approximately 85% of the total species richness recorded on the study site has been recorded on the BBNR. Combined with the results of the SEIS survey program, species richness would be expected to reach approximately 95% of total species records for study site. Within the context of bioregional data, these findings are indicative of a “high” fauna species richness. The results of those data reviews, in combination with the survey findings of Unidel (2011) and the SEIS surveys, indicate that habitat on the BBNR and within the clearing footprint, supports known and/or potentially suitable habitat for a variety of threatened fauna species, i.e. the Koala, Squatter Pigeon (southern), Black-throated Finch (southern), Little Pied Bat, Black-necked Stork, Square-tailed Kite, and Black-chinned Honeyeater.

Whist riparian habitats of Lagoon Creek are degraded, there are habitat values for a variety of fauna. In regard to threatened fauna species, there is a record of the *Near Threatened* Little Pied Bat within the northern extent of these riparian habitats. It is possible, that these riparian habitats also support values for other threatened fauna, including Koala, Black-chinned Honeyeater, and Square-tailed Kite.

Table 7-1 Proposed Clearing Footprint

Remnant Regional Ecosystems and Non-remnant Vegetation	Area (Ha) within Clearing Footprint
Non-remnant Vegetation	11642.50
RE 10.3.27/10.3.12/10.3.3	743.69
RE 10.5.5/10.5.12	3216.22
RE 10.5.5/10.5.12/10.3.27/11.5.5	142.18
RE 10.4.3/10.3.27	51.13
RE 10.7.3/10.5.5/10.7.5	84.38
RE 10.3.27/10.3.28	639.89

7.1.2. Habitat Fragmentation and Loss of Connectivity

Habitat fragmentation is the alteration of previously continuous habitat into spatially separated and smaller patches. Whilst the clearing footprint will result in a reduction of habitat, it does not create any isolated habitat "islands" *per se.* though it does impact on habitat connectivity.

The general interface between habitats of the BBNR and riparian habitats of Lagoon Creek is likely to be of local ecological significance in terms of a habitat linkage between remnant woodland to the west (through BBNR, Lambton Meadows and beyond) and those riparian habitats extending north along Lagoon Creek to the habitat mosaic to the north-east of the study site. Whist riparian habitats of Lagoon Creek are degraded, they support a level of habitat connectivity, and opportunities for wildlife movement into, through, and beyond the study site. The clearing footprint will remove a significant section of the interface and the section of riparian habitat extending northwards along Lagoon Creek.

7.1.3. Habitat Degradation

Potential impacts which may result in degradation of retained habitat arising from construction and operational phase include the following:

- Alteration of local surface and groundwater hydrology which may be linked to large-scale landform modification associated with open-cut mining operations and supporting infrastructure (e.g. creation of creek diversions, and large sediment and tailings dams), and land subsidence following underground mining, etc.
- Creation of 'new" habitat edges will render retained habitats vulnerable to weed invasion, increases in dust exposure and wind-throw, etc.
- Habitat degradation associated with land subsidence;
- Invasion of exotic weed species;
- Introduction of pest animal species; and
- Alteration to fire regimes.

Figure 7-1 describes the location and extent of both the project disturbance (clearing) footprint and the predicted subsidence footprint associated with underground mining operations. Beyond the direct impacts of habitat clearing, there is a suite of threats which may impact on the values of habitat to be retained on the study site. The key sources of degradation are the open cut and underground mining operations, and whilst there is overlap between the suite of potential impacts generated by each of the two mining strategies, there are likely to be some distinct differences in terms of intensity (scale), extent and duration, and the extent to which such impacts can be managed.

For example, the creation of new habitat edges as a result of vegetation clearing is primarily associated with progressive open-cut mining operations and not underground mining operations. Creation of 'new" habitat edges will render retained habitats susceptible to weed invasion, increases in dust exposure and tree wind-throw, etc. Whilst acknowledging there are other potential impacts associated with open cut operations, with the application of best practice management strategies, impacts associated with dust and weeds (and other operational impacts such light, noise, erosion and sediment control) can be successfully managed to minimise long-term degrading impacts to retained habitats.

In contrast, potential impacts to retained habitats associated with land subsidence are primarily associated with progressive underground mining operations and not open-cut mining operations. Subsidence due to underground (longwall) mining can cause deformation of ground surfaces. This can affect natural water flow regimes and water quality, alter ground water hydrology and subsequently generate changes to the condition and extent of a species' habitat

and to the ecological function of both flora and fauna communities (TEC 2007). The resultant impacts can be temporary or long term.

Surfaces directly above extracted underground openings usually subside in the form of a trough, the area of which extends beyond the limits of the underground opening. The amount of subsidence and associated parameters, and the shape of the subsidence trough, are influenced greatly by the size of the panel, the dip of the seam, changes in seam thickness, topography, the existence of remnant pillars or partial extraction, extraction of more than one seam, changes in the geology and the interaction due to adjacent extraction (including above and below) (DME 1995).

Predicative modeling has been undertaken for this aspect of the project (see SEIS Subsidence Technical Report contained in Volume 2 - Appendices). That analysis demonstrates that surface subsidence will develop progressively within each longwall block and will present on the landform surface as a series of trough like depressions. The greatest (maximum) total subsidence is predicted to occur in the surface areas which are affected by the operations in both the B-seam and D-seam operations (see SEIS Subsidence Technical Report).

Based on these assumptions, the maximum depth of subsidence impact from the mining operations will be in the areas where mining in the B-seam and D-seam overlap (i.e. the area where underground mines 1 and 4 overlap), and in the centre region of the longwall blocks in this area. This subsidence area occurs in the north-western section of the mine foot print (see SEIS Subsidence Technical Report). The total cumulative subsidence in this area is predicted to reach a maximum depth of 3.20m, and the average subsidence of between 1.1m to 1.6m across the bulk of the areas to be impacted by subsidence from underground mining (see SEIS Subsidence Technical Report).

The primary impact to fauna habitat values will be linked to the extent and degree of degradation of the woodland tree canopy (refer to assessment within the SEIS Flora and Vegetation Report).

7.2. Impact Mitigation Strategies

The following section identifies the management strategies and measures which are recommended in relation to mitigation of the potential impacts. Implementation of a management measure listed in this section may be relevant to both construction and operation phases of the project. Whilst a variety of recommended management strategies and measures will potentially need to be incorporated within the various issue-specific management plans, they are, for completeness and with relevance to impact mitigation to fauna, listed within this section. Table 7-2 lists and describes (but is not limited to) the suite of management strategies and measures applicable to the project as a whole, and in regard to the primary phase of development.

Of the suite of management plans required, a Fauna Management Plan (FMP) will need to be developed which details the practical strategies and actions, which will be implemented and can be monitored, to address, but not limited to the issues (and protocols) listed below for both common and threatened fauna. The FMP does not override any existing or other approvals associated with the project and needs to be prepared by incorporating, where necessary, all relevant approval conditions into the document. The plan's primary authorship will need to be undertaken by a suitably qualified and experienced zoologist/ecologist.

The FMP will need to give specific regard to the protection and management of habitat values for those threatened fauna species recorded on the study site. The threatened species to be addressed are the Koala, Brigalow Scaly-foot, Squatter Pigeon (southern), Black-throated Finch

(southern), Little Pied Bat, Black-necked Stork, Square-tailed Kite and Black-chinned Honeyeater. Regard to should also be given to the following, the Cotton Pygmy Goose, Freckled Duck and Northern Quoll. The plan is to include, but not be limited to, the following information:

- Management strategies for the protection of those habitat resources and maintenance of resources and conditions to support the longer-term site usage of each species.
- Identification of potential conflicts between the objectives of the threatened species management plan and those of other plan strategies (e.g. bushfire management, extraction site rehabilitation; offset management) and the strategies to eliminate or mitigate potential impacts to threatened species arising from such conflicts.

A further and important objective of the FMP is to identify a monitoring program to assess fauna occurrence within retained habitats. Ideally, monitoring events should be undertaken in a systematic and standardised manner to ensure replicability, and preferably, include a component which is consistent with the site-based survey approach implemented for the EIS/SEIS survey program.

Table 7-2 Impact Mitigation Strategies and Measures

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
No remnant vegetation removal shall occur until relevant approvals have been obtained.	✓	✓	✓					
Clearing boundaries will be delineated on all drawings and in the field to define the extent of authorized/permitted clearing.	✓	✓	✓					
Installation of vegetation clearance markers (e.g. high visibility poly-web fencing) prior to the commencement of vegetation clearance to identify and protect remnant vegetation for retention.	✓		✓	✓				
Clearly define all areas not directly affected by construction/mining activities to delineate limits of disturbance. No unauthorised disturbances should occur outside defined disturbance areas (e.g. dumping of excavated material).	✓	✓	✓	✓				
Areas identified for vegetation clearance are to be clearly defined and detailed in site inductions.	✓		✓					
No clearing is to commence without the presence of a suitably experienced and licensed spotter/catcher.	✓		✓		✓			
Pre-clearing surveys are to be undertaken by suitably experienced and licensed spotter/catchers in advance of remnant vegetation clearing and pre-empting such operations with suitable lead times to ensure that specific management and mitigation measures can be implemented (e.g. avoidance of disturbance to nesting birds).	✓		✓		✓			
The timing of vegetation clearance (particularly areas of remnant vegetation) should be selected in order to minimise impacts (direct and indirect disturbances) to affected fauna habitats during optimum breeding periods.	✓		✓		✓			
Conduct clearing in a sequential manner. The direction of sequential clearing should be away from the disturbance area and towards any retained vegetation or habitat links.	✓		✓		✓			
Along the interface between clearing precincts and retained habitat, trees are to be felled towards the clearing precinct to avoid damage to adjacent retained habitat.	✓		✓	✓				

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
No remnant vegetation clearing is to be conducted between the 1700hrs and 0600hours unless subject to area-specific exemptions identified in the management plan.	✓		✓		✓			
Cleared vegetation is to be stockpiled so as not to impede wildlife, surface drainage and avoid damage to adjacent retained vegetation.	✓		✓		✓	✓		
Cleared material should not be deposited in or adjacent to watercourses. Setbacks to waterways as defined by approval permits need to be adhered to.	✓		✓					
Any proposed site lighting should be designed to ensure that leakage of artificial light onto adjoining retained habitat is avoided.	✓	✓		✓				
Implementation of a comprehensive suite of dust suppression techniques to minimise impacts to areas of retained habitat and rehabilitation which are in proximity to operational areas.	✓	✓	✓					✓
Wildlife assessment/rescue services are to be engaged prior to vegetation clearing, to assess appropriate site clearing approaches to minimise deleterious impacts to fauna. Spotter/catcher services (wildlife handlers) are to be employed during vegetation clearing activities.	✓		✓		✓			
A pre-clearing survey for fauna (not restricted to significant species) is required prior to each stage of clearing to address animal welfare issues and relocation of fauna from clearing path.	✓		✓		✓			
A permit to interfere with wildlife from the Queensland Environment Protection Agency (QEPA) will be required for the wildlife handling activities as will the appropriate Animal Ethics Permit from the Department of Employment, Economic Development and Innovation (DEEDI).	✓	✓	✓		✓			
Spotter/catcher services (wildlife handlers) must only be undertaken by those identified on a current site-specific Damage Mitigation Permit (Removal and Relocation of Wildlife) from the EPA QPWS.	✓	✓	✓		✓			

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
Where badly injured fauna require euthanasia, only personnel suitably licensed shall undertake such actions. The Australian National Health and Medical Research Council's Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (2004) are to be followed when dealing with injured fauna. Alternatively, any injured fauna should be taken to the nearest veterinary clinic.	✓	✓	✓		✓			
Development and implementation of protocols for the relocation of any displaced fauna must be prepared prior to clearing operations.	✓	✓	✓		✓			
A register of fauna incidents/interactions needs to be maintained daily during clearing operations.	✓	✓	✓		✓			
Suitable buffer distances for sensitive locations (e.g. active nest sites, presence of a Koala, etc.) must be established and clearly marked as a 'no go zone' until spotter/catcher has authorised that clearing in the area can commence/continue.	✓		✓		✓			
Habitat trees are to be identified in the field and by plan prior to commencement of clearing operations. These shall be marked and dismantled using a cherry picker and a suitably qualified arborist and spotter/catcher. Hollows containing fauna shall be blocked, removed from the tree and gently lowered to the ground, with species relocated to a pre-identified, suitable site. Areas inaccessible to a cherry picker, requiring hollow removal shall use a hydraulic grabber to remove and gently to the ground.	✓	✓	✓		✓			
All remnant vegetation removed should be reused, either within the offset areas and/or within the rehabilitation areas. Logs and large rocks should be placed in nearby vegetation or adjacent to such vegetation to create shelter habitat for terrestrial fauna species. These 'stock piles' may then be used during later operations to create artificial habitats within rehabilitation areas.	✓	✓	✓					✓
To ensure that the seed bank in removed soil is preserved as much as practical, stockpiling of topsoil will be undertaken in accordance with best practice storage guidelines.	✓	✓	✓					✓
Post-disturbance reconstructed landforms to be contoured to resemble the original local topography as far as practical.		✓						✓

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
A weed management plan will be implemented during both construction and operational phases. Weed control strategies are to be developed and implemented and include, but not be limited to the design and implementation of an ongoing eradication program which targets environmental weeds and an ongoing systematic monitoring program to detect the occurrence of environmental weeds and to assess the success of the control/eradication program.	✓	✓	✓	✓			✓	✓
Prior to commencement of clearing operations, a survey of weed species is to be undertaken in order to identify areas requiring treatment.	✓	✓	✓				✓	
All weed infestations within the construction area are to be treated and/or removed where practical from the clearing precinct prior to clearing.	✓	✓	✓				✓	
All construction machinery entering the site shall be free of soil, weeds, soil pathogens and pest species.	✓	✓					✓	
Designated wash down points for vehicles and plant entering the site will be established and plant will be inspected prior to mobilsation and demobilisation. A register of vehicle approval certification is to be developed and maintained.	✓	✓					✓	
It will be mandatory that vehicles and equipment to be used within areas of retained habitat are subject to a separate, more detailed and comprehensive wash-down before entering such areas. The remainder of the workforce vehicles/equipment will be required to stay on project/site approved roads and designated works areas to minimise contact with weeds.	✓	✓		✓			✓	✓
The proposed development will not deliberately introduce any invasive species. Companion animals (e.g. dogs) are to be banned from all construction and operational areas.	✓	✓	✓				✓	
Feral animal control strategies are to be developed and implemented and include, but not be limited to the design and implementation of an ongoing eradication program which targets pest animals (especially cats, dogs and foxes) and an ongoing systematic monitoring program to detect the occurrence of feral animals and to assess the success of the eradication program.	✓	✓		✓			✓	✓

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
Implementation of a program to ensure strict litter/waste control throughout the construction and operational works on the site. This is to be supported by: site-wide signage; an adequate number of litter bins (which by design exclude birds and vermin); bin clearance on a regular basis; daily maintenance of crib rooms to ensure cleanliness; educational signage within crib rooms on the linkage between poor waste management practices, increases in pest animal populations and subsequent impacts to native fauna.	✓	✓					✓	
Implementation of design features for permanent structures and temporary site facilities (e.g. construction site offices. etc.) which minimise harbourage or roost opportunities for vermin and animal pests.		✓					✓	
Identify barriers to safe fauna movement and remove or modify these barriers where possible (external to the open cut mine and infrastructure operational areas).	✓	✓				✓		
Implement measures to reduce fauna mortality on roads.	✓	✓		✓	✓	✓		
Establishment of fauna exclusion fences to prevent fauna inadvertently re-entering the open cut mine operational areas.	✓	✓			✓	✓		
Monitoring of the movements of, and any incidents involving, the fauna populations will identify if there is the need for erection of fauna exclusion fencing around active quarry. If required, fencing should be designed and located with the assistance of an ecologist.	✓	✓			✓	✓		
The use of barbed wire should be avoided and used only where essential to exclude stock from adjoining pastoral activities. Where the use of barbed wire cannot be avoided, the fence design should incorporate alternate strands of plain wire and barbed wire, e.g. top strand plain wire, middle strand barbed wire and bottom strand plain wire.	✓	✓		✓	✓	✓		
Existing boundary fences associated with any offset areas should be retrofitted to meet the above recommendations (assuming there is no conflict with existing/approved rights of use).	✓	✓		✓	✓	✓		

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
All personnel shall attend environmental training prior to entering the work site. As part of this training, all personnel will be briefed about their obligations to protect fauna.	✓	✓						
Fauna shall not be fed and direct contact with fauna is to be avoided. This includes both native and introduced species.	✓	✓			✓			
Avoiding additional clearing of remnant vegetation for construction vehicle access tracks, truck turning areas and extra workspaces, etc. A track plan is to be developed for areas of retained habitat and rehabilitation. Site protocols are to be established which restrict authorised area access to the approved track network identified with the plan.	✓	✓		✓			✓	✓

7.3. Offset Requirements

A Biodiversity Offset Strategy (the strategy) to address the offset requirements of the Project is being prepared (see SEIS Biodiversity Offsets for the Galilee Coal Project Position paper contained in Volume 2 - Appendices of this SEIS). The strategy aims to compensate for the unavoidable, non-mitigated loss of vegetation and biodiversity values as a result of the Project. The offset policies addressed in the strategy are the *Queensland Biodiversity Offset Policy Version 1* (QBOP) and the *EPBC Act Environmental Offsets Policy Consultation Draft (2011)* (EOP).

The QBOP establishes the requirements for providing offsets to impacts to state significant biodiversity values (SSBV). Under the QBOP any actions which impact on a SSBV requires an offset. The list of SSBVs cited in the QBOP includes:

- Endangered, Of Concern, Threshold and Critically Limited Regional Ecosystems (REs);
- High Value Regrowth containing Of concern or Endangered REs;
- Essential habitat and Essential regrowth habitat;
- Wetlands, Significant Wetlands and Wetland Protection Areas;
- Watercourse vegetation;
- Vegetation required for Connectivity; and
- Protected Plants and Animals,

The draft EOP establishes the framework under which offsets can operate in relation to approvals granted under the EPBCA, and the offset requirements for unavoidable impacts to MNES listed under the EPBCA. Under the draft EOP, values requiring offsets include:

- World heritage properties;
- Wetlands of international importance (Ramsar wetlands);
- Listed threatened species;
- Listed ecological communities;
- Listed migratory species protected under international agreements;
- The Commonwealth marine environment;
- National heritage places; and
- The Great Barrier Reef Marine Park.

A variety of biodiversity values have been assessed for the strategy for the Project. These include:

- Bimblebox Nature Refuge;
- Remnant regional ecosystems, high value regrowth containing regional ecosystems, threshold regional ecosystems, critically limited regional ecosystems;
- Essential habitat and essential regrowth habitat;
- Wetlands, watercourses, and connectivity, and
- Threatened fauna and flora species.

In regard to threatened fauna, the process implemented to calculate the offset requirements associated with the Project relied apon the development of modelling to determine habitat values for the suite of threatened fauna species which are known to occur, or may occur on the study site. This modeling was prepared for 15 species listed as threatened under the EPBCA and/or NCA, being:

- Northern Quoll *Dasyurus hallucatus – Endangered* EPBCA
- Koala *Phascolarctos cinereus – Vulnerable* EPBCA
- Little Pied Bat *Chalinolobus picatus – Near Threatened* NCA
- Brigalow Scaly-foot *Paradelma orientalis – Vulnerable* EPBCA and NCA
- the skink *Ctenotus capricorni – Near Threatened* NCA
- Yakka Skink *Egernia rugosa – Vulnerable* EPBCA and NCA

- Common Death Adder *Acanthophis antarciticus – Near Threatened* NCA
- Ornamental Snake *Denisonia maculata – Vulnerable* EPBCA and NCA
- Cotton Pygmy Goose *Nettapus coromandelianus - Near Threatened* NCA
- Freckled Duck *Stictonetta naevosa - Near Threatened* NCA
- Black-necked Stork *Ephippiorhynchus asiaticus - Near Threatened* NCA
- Square-tailed Kite *Lophoictinia isura - Near Threatened* NCA
- Squatter Pigeon (southern) *Geophaps scripta scripta - Vulnerable* EPBCA and NCA
- Black-chinned Honeyeater *Melithreptus gularis - Near Threatened* NCA
- Black-throated Finch (southern) *Peophila cincta cincta – Endangered* EPBCA and *Vulnerable* NCA

To prepare habitat models, following base data for the study site was collated:

- The extent of the project disturbance footprint, including areas that will be cleared as part of open-cut mining operations and for supporting infrastructure, and areas that will potentially be impacted by subsidence associated with underground mining operations.
- VMA RE and Remnant Vegetation mapping (Version 6.1 – DERM 2012a), Essential Habitat mapping (Version 3.1; DERM 2012a), and Regrowth Vegetation mapping (Version 2.1 – DERM 2011b);
- Biodiversity Planning Assessment mapping (DERM 2012e);
- Detailed vegetation community, ground cover, and biocondition assessments implemented at over 60 quaternary sites across the study site in 2012 (SEIS Flora and Vegetation Report); and
- Fauna records and habitat assessments derived from the 2011-2012 SEIS fauna survey program (described previously in this report); and
- Fauna records derived from the EIS survey program (Unidel 2011a) and records and/or habitat assessments drawn from the existing information reviewed for this SEIS report (DERM 1998; DERM 1999; EPA 2007; DERM 2011; MCG 2011; Birdlife SQ 2012; and Birdlife Australia 2012).

The abovementioned data was combined with the following information, where available for each species:

- VMA Essential Habitat Factors derived from extracts of the VMA Essential Habitat factors database (Version 3.1)[39];
- Habitat records for the Desert Uplands Bioregion (e.g. Kutt 1999 and Morgan *et al.* 2002);
- Modeled distribution for threatened reptile species (SEWPaC 2011b);
- Habitat descriptors from key threatened species documents, including recovery plans, policy statements, and species profiles (BTFRP 2007; DEWHA 2009b; Hill & Ward 2010; SEWPaC 2012 a-d); and
- Habitat descriptions within the scientific literature which were regarded as geographically relevant to the study site and surrounding area (e.g. Ellis *et al.* 1995; Kutt 1999; Ellis *et al.* 2002).

A conservative application of modeling criteria was undertaken to account for a variety of assumptions and uncertainties. For example, whilst it is considered that the level of survey effort (in combination with the variety of methodologies) provides a reliable indication that the study site is unlikely to support resident or breeding population of certain species, the potential occurrence of such species cannot be ruled out (e.g. Black-throated Finch). Again, whilst the level of survey work for some species has been extensive, where large areas of potentially suitable habitat are present, there is potential for the undetected presence of a cryptic species, such as the Yakka Skink. Further caution is warranted when assessing the degree of habitat suitability for a wide-ranging species, such as the Northern Quoll.

[39] The habitat factors represent environmental variables for species records released and regulated as version 3.1 on 16/09/2011 under the *Vegetation Management Act* (1999).

Species model outputs were reviewed and where required, refined through assessment by the study team. This final stage of the process was undertaken to resolve areas of Primary and Secondary Habitat Values from each of species habitat models.

Areas included with the Primary Habitat Values category comprised a combination of the following:

- Species recorded within Regional Ecosystem type on the study site;
- Species recorded within Regional Ecosystem type within the Desert Uplands Bioregion.
- Habitat that supports species-specific essential conditions and/or resources for the species e.g. microhabitat requirements such as cracking clays (e.g. Brigalow Scaly-foot), gilgai subject to seasonal inundation (Ornamental Snake), suitable burrowing substrates (e.g. Yakka Skink), large diameter ground logs (e.g. Yakka Skink) or termite mounds (e.g. Northern Quoll), exfoliating sandstone slabs (e.g. Brigalow Scaly-foot), cavernous habitat (e.g. Northern Quoll), sheets of fallen bark (e.g. Brigalow Scaly-foot), drifts of deep leaf litter (e.g. Common Death Adder), proximity to water (e.g. Black-throated Finch (southern)[40] and Squatter Pigeon (southern)[41])
- Habitat type is >50ha in area and/or ecologically connected with other remnant Regional Ecosystems.

Areas included with the Secondary Habitat Values category comprised:

- Species recorded within Regional Ecosystem type within the Desert Uplands Bioregion.
- Habitat where species-specific essential conditions and/or resources were either depauperate or absent.
- Habitat type is <50ha in area and/or does not interface with other remnant Regional Ecosystems.

For some of the 15 threatened fauna species, habitat modeling was either not feasible, or where notable caveats to the resultant output are required, i.e.: Cotton Pygmy Goose, Freckled Duck, Black-necked Stork, and Squatter Pigeon (southern).

Whilst there is a single study site record for the Cotton Pygmy Goose and Freckled Duck (farm dams within non-remnant pastoral land), the study site does not support habitat consistent with the typical requirements of these waterbirds, to enable establishment of resident populations. It is recommended that where possible, offset habitat secured for Black-necked Stork, should include habitat features which may be suitable to both the Cotton Pygmy Goose and Freckled Duck.

The Black-necked Stork has been recorded on both constructed and natural water bodies within both non-remnant and remnant vegetation surrounds. Also, the Black-necked Stork is not known to have a strong association with Regional Ecosystems *per se.* (key modeling data). All natural wetland sites and within remnant vegetation (regarded as comparatively higher value habitat), are located well outside both the mine disturbance and the predicted subsidence footprints (i.e. on Saltbush and Oakleigh properties). Whilst it is recommended that the offset strategy include habitat provisions suitable for the Black-necked Stork, it is not possible to determine the quantum of potential offset habitat from the data available.

For the Squatter Pigeon (southern), there are no clear patterns of association with particular Regional Ecosystems (a key determinant within the species models) or even remnant vegetation cover *per se.* For example, Agnew (2007) reviewed central Queensland Squatter

[40] Following modeling protocols identified in Austecology (2011) for potential breeding habitat, and for non-breeding/dry-season feeding habitat, a proximity buffer of 3km from water bodies, using water bodies known to persist during the end of the dry-season in October 2011.

[41] Based on the findings of Agnew (2007) for a review of central Queensland Squatter Pigeon (southern) records in relation to proximity to water.

Pigeon (southern) records to assess associations with vegetation characteristics. That review found that 48.3% of the records were located within non-remnant environments only, with 13.6% of the total number of records located within remnant vegetation only[42]. The remaining data was associated with a combination of both remnant and non-remnant vegetation.

Whilst a detailed assessment of the non-remnant habitat suitability has not been undertaken, it is feasible that part of that part of that habitat could be included within Secondary Habitat Values category for the Squatter Pigeon (southern). The modeling outputs for remnant habitat suitability have been undertaken, and the result is likely to be a strong overestimate and should be treated with caution in determining an offset liability for the project.

In regards to both the Squatter Pigeon (southern) and Black-throated Finch (southern), the extent of suitable ground feeding conditions and resources will vary seasonally. That the extent of variability in quality, quantity and composition of required grass seed resources cannot be determined without long-term research, a conservative approach has been undertaken in assessing the quantum of habitat which should be subject to offsetting requirements.

Attachment M provides a summary of the essential habitat factors and habitat descriptions of relevance to the above-mentioned data sources and used to develop habitat modeling criteria. Table 7-3 provides a summary integration of the data for Regional Ecosystems on the study site, and areas of these which are subject to either the mine disturbance footprint and/or the predicted subsidence footprint. Table 7-4 provides the final outputs of the offset assessment process for each of 12 threatened species which are either known to occur, or may occur on the study site.

[42] Total number of records analysed was 111. Only records with a location accuracy of <100m were used, though the majority of these records provide location accuracy to ± 10m. Records were assessed in regards to the incidence of remnant and non-remnant vegetation within 200m of record location (see Agnew 2007).

Table 7-3 Regional Ecosystems within Clearing and Predicted Subsidence Footprints

Regional Ecosystem	Total Area on Leases	Area subject to Clearing Footprint	Area subject to Predicted Subsidence Footprint
10.10.1/10.10.4/10.10.3	603.60		116.65
10.10.1/10.10.4/10.7.3/10.7.5	172.85		172.85
10.10.4	31.46		27.08
10.10.4/10.7.5/10.7.3	936.03		444.81
10.10.5/10.10.4/10.10.7/10.10.1	96.39		80.76
10.3.15	132.40		
10.3.27/10.3.12/10.3.3	1861.23	743.69	
10.3.27/10.3.28	4532.03	639.89	1099.90
10.3.27/10.3.28/10.3.14	162.52		
10.3.27/10.3.3	18.44		
10.3.27/10.5.5/10.3.3	20.67		20.62
10.3.28/10.3.27/10.3.14	432.98		356.50
10.3.4/10.3.3/10.3.25	22.56		
10.4.3	32.43		3.23
10.4.3/10.3.27	62.84	51.13	
10.4.3/10.3.27	41.50		
10.4.3/10.5.12	10.43		
10.5.1/10.5.10	1247.63		1242.01
10.5.1/10.5.5	458.01		
10.5.1/10.5.5	702.33		
10.5.10	346.73		
10.5.10/10.3.28/10.3.27	442.27		
10.5.10/10.5.1	374.92		
10.5.10/10.5.5	265.14		
10.5.12/10.5.5	225.35		
10.5.5	32.47		4.14
10.5.5/10.3.27/10.5.12	788.87		3.56
10.5.5/10.5.12	15596.85	3216.22	8844.68
10.5.5/10.5.12/10.3.27/11.5.5	6399.74	142.18	
10.5.5/10.5.12/10.3.28/10.3.27	4986.70		
10.5.5/10.5.12/10.3.3	419.95		
10.5.5/10.5.4/10.5.1/10.7.3	496.83		60.27
10.5.5/10.7.5/10.7.3	89.15		
10.7.3	31.85		25.11
10.7.3/10.5.1	101.44		0.17
10.7.3/10.5.10	24.01		17.35
10.7.3/10.5.5	75.82		
10.7.3/10.5.5	36.51		
10.7.3/10.5.5/10.7.5	113.60	84.38	
10.7.3/10.7.5	5.17		6.54
10.7.3/10.7.5	42.80		
10.7.3/10.7.5	110.02		
10.7.3/10.7.5/10.3.3	99.84		99.84
10.7.5	14.75		14.75
10.7.5/10.3.3/10.3.27	18.95		18.95
11.10.3/11.10.7/11.10.13	0.15		
11.7.2/11.10.7	0.34		
Remnant	**42718.55**	**4877.49**	**12659.76**
Non-remnant	**60542.62**	**11642.50**	**12938.34**
Total Area	**103261.17**	**16519.99**	**25598.10**
Remnant clearing footprint as a % of total remnant		**11.42**	
Remnant subsidence footprint as a % of total remnant			**29.64**

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Table 7-4 Summary of Compensatory Offsets for Threatened Fauna

	Primary Habitat Values	Primary Habitat Values	Secondary Habitat Values	Secondary Habitat Values
Species	**Clearing Footprint**	**Predicted Subsidence Footprint**	**Clearing Footprint**	**Predicted Subsidence Footprint**
Little Pied Bat *Chalinolobus picatus*	1434.71	1480.25	3442.77	11179.52
the skink *Ctenotus capricorni*	3216.22	1598.51	1525.76	10033.16
Yakka Skink *Egernia rugosa*	1422.18	3481.87	589.96	969.02
Squatter Pigeon (southern) *Geophaps scripta scripta*	2789.24	8757.58	2052.75	667.35
Square-tailed Kite *Lophoictinia isura*	4741.97	11631.67	135.51	1028.09
Black-chinned Honeyeater *Melithreptus gularis*	4599.80	11194.28	277.69	1473.17
Brigalow Scaly-foot *Paradelma orientalis*	1473.31	3485.09	589.96	969.02
Koala *Phascolarctos cinereus*	4741.97	10389.66	0.00	1302.79
Black-throated Finch (southern) *Peophila cincta cincta*	2789.24	8757.58	2052.75	667.35
Common Death Adder *Acanthophis antarciticus*	669.00	1007.34	841.96	1636.66
Northern Quoll *Dasyurus hallucatus*	84.38	1045.48	1383.58	1456.39
Ornamental Snake *Denisonia maculata*	33.73	11.95	878.00	1099.90

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Attachment A Survey Site Habitat Descriptions

Survey Site	Habitat Description
Survey Site 1 56 J 508094 7034920	This site was located within mixed eucalypt woodland and *Triodia* grassland in the north-west sector of Lambton Meadows, to the near east of Cavendish Road. The following provides a summary description of the relevant habitat features and condition: • Mixed eucalypt woodland and *Triodia* grassland on sand plain with deep, red sandy loam. Soil surface hard in open grassland with minor development of a biological soil crust. Woodland canopy dominated by ironbark eucalypt and bloodwood species with few hollow-bearing trees. • Mid-dense shrub layer dominated by quinine bush (*Petalostigma pubescens*) and *Carissa* sp. (to around 1.5 m) with sparse to mid-dense cover of kangaroo grass (*Themeda triandra*) and bunch spear grass (*Heteropogon contortus*). • Shrub and grass cover regenerating after recent fire (i.e., fire within the last six months). Intervening areas of open grassland dominated by low spinifex (*Triodia* sp.) regrowth (to around 20 cm in height) with wiregrass (*Aristida* spp.) and silkyhead (*Cymbopogon* sp. cf. *obtectus*) also present. • Local area subject only to light grazing at present. There is evidence of recent fire (i.e., fire in the last 6-12 months) with fire scarring of trees and shrubs to 1.5 m, charred or partially incinerated woody debris, and burnt grass tussocks. Most of the site and surrounding area burnt with only small patches of unburnt *Triodia* left. Shrub and grass layer regenerating well after fire. • Ground mostly bare, with only limited accumulation of leaf litter, and mainly under canopy trees. Coarse woody debris scarce as well. Remaining woody debris charred and, for the most part, firmly affixed to the ground. Ants and termites abundant with ant burrows common across much of site. Fissures and cracks in standing trees mostly filled with sand (due to termites). Very few, if any, flowering trees or shrubs.
Survey Site 2 55 K 437933 7414762	This site was located within open eucalypt woodland with thick understory of shrubs on the western side of Lambton Meadows, south of powerline easement crossing Cavendish Road. A summary description of the relevant habitat features and condition is as follows: • Open woodland with dense shrubby understory on sand plain with deep, red sandy loam. Woodland canopy dominated by yellow jacket (*Eucalyptus assimilis*) and bloodwood (*Corymbia* sp.) with very few hollow-bearing trees. • Sparse low tree layer consisting mainly of budgeroo (*Lysicarpus angustifolius*), red ash (*Alphitonia excelsa*) and quinine bush (*Petaolstigma pubescens*). A dense shrub layer comprising mostly *Acacia* spp. present as well. • Low sparse grass cover with spinifex (*Triodia* sp.) dominating in more open areas. Reasonable cover of leaf litter and other fine organic debris (with leaf litter to ~3 cm deep) under canopy trees. Coarse woody debris scarce. • Part of this site recently burnt (i.e., burnt in the last six months) leaving behind the blackened stems of Acacias killed by fire. Coarse woody debris scarce and charred or partially-incinerated in areas affected by fire. Evidence of previous (older) fire within 'unburnt' area as well, with charred woody debris and charcoal under thick leaf litter. Spinifex recovering well after fire with little evidence of recent grazing. Ants and termites abundant, but less so than survey site 1. Limited flowering/fruiting of understory tress/shrubs (in particular *Acacia* spp and *A. excelsa*), but little or no flowering of canopy trees.
Survey Site 3 55 K 424025 7405973	This site was located within low shrubland in far north-west corner of the Bimblebox Nature Refuge. The following provides a summary description of the relevant habitat features and condition: • Low open shrubland (to ~ 3 m) on sand plain with deep, light reddish-brown loam. Canopy dominated by *Acacia* spp. with small-leaved *Melaleuca* sp. and mallee also present. Dense lower shrub layer of myrtle heath (to ~0.5 m). • Sparse to mid-dense grass cover dominated by *Schizachyrium* sp. Significant amounts of dry matted grass, brush and leaf litter in areas of dense shrub and/or grass cover. Where shrub/grass cover sparse, ground bare, with sparse cover of forbes (including *Goodenia* sp.). Virtually no coarse woody debris. • Currently subject to light grazing only. Previously pulled and burnt, but no evidence of recent fire (i.e., no fire in the last 24 months). Little or no flowering of tree or shrub species (except for the occasional *Acacia* sp.).

Survey Site	Habitat Description
Survey Site 4 55 K 423204 7404499	This site was located within ironbark woodland within the northern sector of the Bimblebox Nature Refuge, and to the south of powerline easement. A summary description of the relevant habitat features and condition is as follows: • Silver-leaved ironbark (*E. melanophloia*) woodland on sand plain with deep, light reddish-brown loam. Soil surface hard with minor development of a biological crust where ground cover scarce. Hollow-bearing trees (living or dead) generally scarce. • Sparse shrub layer of *Carissa* sp. (to ~ 1 m) with scattered dead finish (*Archidendropsis basaltica*) as well. • Mid-dense to sparse grass cover with *Triodia* dominant or co-dominant with wire grass (*Aristida* spp.) and bluegrass (*Bothriochloa* sp.). Silky browntop (*Eualia aurea*) growing up through *Carissa* sp with woodland lovegrass (*Eragrotis soriora*) common in areas with sparser ground cover. Scattered areas with low, cropped buffel grass (*Cenchurus ciliaris*) as well. • Currently subject to light grazing only. No evidence of recent fire, though some evidence of fire in the not-too-distant past (i.e., fire scarred trees and charred woody debris). Significant amount of fallen timber and other coarse woody debris (including shed bark) in some parts of this site. Very little leaf litter, but reasonable cover of dead grass in better-vegetated areas. Very few flowering trees or shrubs (other than single flowering *Corymbia*). Ants and termites common with numerous low termite mounds.
Survey Site 5 55 K 433494 7411703	This site was located within remnant brigalow woodland along eastern boundary of the Bimblebox Nature Refuge. The following provides a summary decription of the relevant habitat features and condition: • Brigalow (*Acacia harpophylla*) woodland with poplar box (*E. populnea*) woodland surrounds on hardened grey-brown clay soil. Moderate development of biological crust in areas with little or no ground cover. Sparse shrub layer comprising mainly low *Carissa* sp. with sparse to dense cover of buffel grass throughout. Numerous hollow-bearing trees in surrounding poplar box woodland, though none within the brigalow woodland itself. • Coarse woody debris (fallen timber and shed bark) abundant in some areas, scarce in others. Currently subject to low-moderate intensity grazing. • No evidence of recent fire. Accumulation of mostly shallow leaf litter around trees, where buffel scarce or absent. Very few, if any, flowering trees or shrubs.
Survey Site 6 55 K 440738 7407434	This site was located within mixed eucalypt woodland in the south-east corner of the Bimblebox Nature Refuge. A summary description of the relevant habitat features and condition is as follows: • Mixed *E. melanophloia* / poplar box (*E. populnea*) woodland and *Triodia* grassland on sand plain with deep, light brown loam. Canopy dominated by *E. melanophloia*. • Tree-hollows not uncommon; present in larger living *E. melanophloia* and *E. populnea*. Small tree/shrub layer (2-5 m) including *Carissa* sp., *Acacia* spp., *Eremophila* spp. and myrtle (*Psydrax* sp.). • Mid-dense to sparse grass cover comprising mostly *Triodia* interspersed with patches of buffel grass. In open areas, soil surface hard with minor development of a biological crust. • No evidence of recent fire and little evidence of grazing. Coarse woody debris generally scarce with mostly shallow leaf litter under trees and shrubs. Very few flowering trees or shrubs. Low abundance of termite mounds.

Attachment B Photographs of Fauna Habitats

April 2012 Survey Site 1

April 2012 Survey Site 2

April 2012 Survey Site 3

April 2012 Survey Site 4

April 2012 Survey Site 5

April 2012 Survey Site 5

October 2011 Water Body Survey Site 1

October 2011 Water Body Survey Site 2

October 2011 Water Body Survey Site 3

October 2011 Water Body Survey Site 45

October 2011 Water Body Survey Site 38

October 2011 Water Body Survey Site 40

October 2011 Water Body Survey Site 41

October 2011 Water Body Survey Site 42

October 2011 Water Body Survey Site 7

October 2011 Water Body Survey Site 11

October 2011 Water Body Survey Site 13

October 2011 Water Body Survey Site 14

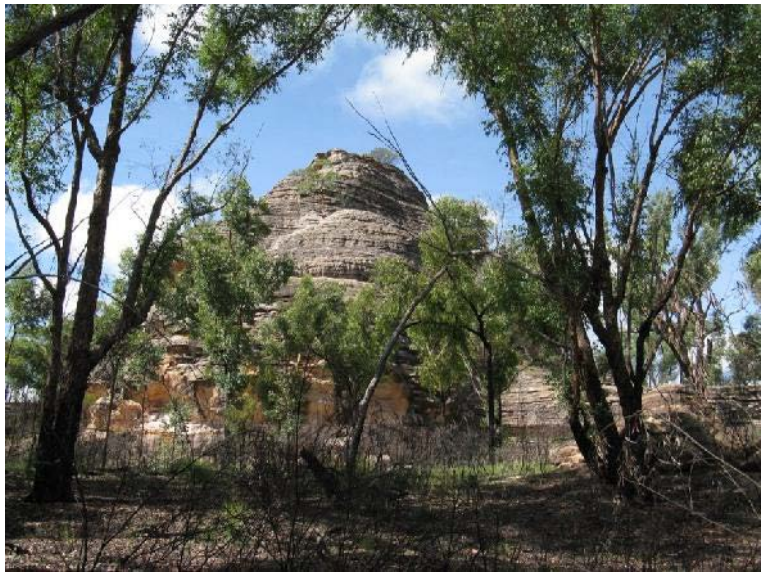
October 2011 Water Body Survey Site 46

October 2011 Water Body Survey Site 47

Spring Creek area – north-western corner of Study Site

Above left –view from Mt Belmont looking north over waterbody where Freckled Duck and Black-necked Stork were recorded. Distant low rise on right-hand side of view shows general location of Brigalow Scaly-foot record site. **Above right** – habitat where Brigalow Scaly-foot was recorded. **Below** – Mt Belmont supports RE 10.7.5, rocky slopes and cavernous habitat suitable for several of the threatened reptiles surveyd for in the Spring Creek area.

Spring Creek area – north-western corner of Study Site



Habitats to the west of Mt Belmont. This area supports rugged sandstone landscapes which are potentially suitable for several threatened fauna targeted in the survey program. Evidence of the impact of a hot fire (October 2011) was widespread. It is understood that the area is subject to a fire about every five years.

A total of 62 person days were spent during surveying Black-throated Finch (southern) and their nests (May 2011 to March 2012). No evidence of BTF or their nests were detected. The Double-bar Finch was the most regularly encountered of the three grassfinches recorded on the study site (including Zebra Finch and Plum-headed Finch). A total of 188 grassfinch nests were located during the survey program of which 67% were attributable to the Double-barred Finch.

Attachment C Summary of Survey Site Species Richness Results

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Totals
Aepyprymnus rufescens	Rufous Bettong						1	**1**
Mus musculus	House Mouse		1					**1**
Petaurus breviceps	Sugar Glider		1				1	**2**
Pseudomys desertor	Desert Mouse		1	1	1			**3**
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat			1			1	**2**
Sminthopsis macroura	Stripe-faced Dunnart	1						**1**
Trichosurus vulpecula	Common Brushtail Possum	1						**1**
Amphibolurus nobbi	Nobbi	1	1		1	1		**4**
Carlia munda			1		1	1	1	**4**
Carlia pectoralis					1			**1**
Carlia sp.		1		1			1	**3**
Cryptoblepharus pannosus					1	1		**2**
Crytophis boshmai	Carpentaria Snake					1		**1**
Ctenophorus nuchalis	Central Netted Dragon	1	1				1	**3**
Ctenotous sp.		1			1			**2**
Ctenotus ingrami		1						**1**
Ctenotus leonhardii						1		**1**
Ctenotus pantherinus	Leopard Ctenotus	1						**1**
Ctenotus robustus				1				**1**
Ctenotus taeniolatus	Copper-tailed Skink	1						**1**
Diplodactylus vittatus	Wood Gecko						1	**1**
Diporiphora australis		1	1			1	1	**4**
Gehyra dubia					1	1	1	**3**
Gehyra dubia					1	1	1	**3**
Heteronotia binoei	Bynoe's Gecko					1	1	**2**
Lerista fragilis			1					**1**
Menetia greyii						1	1	**2**
Morethia boulengeri					1			**1**
Morethia taeniopleura	Fire-tailed Skink						1	**1**
Nephrurus asper	Prickly Knob-tailed Gecko				1		1	**2**
Oedura monilis	Ocellated Velvet Gecko					1		**1**
Oedura rhombifer		1						**1**
Parasuta dwyeri	Hooded Snake						1	**1**
Strophurus williamsi	Soft-spined Gecko	1		1		1	1	**4**
Varanus tristis	Black-tailed Monitor					1		**1**
Cyclorana novaehollandiae	Eastern Snapping-Frog			1				**1**
Limnodynastes terraereginae	Scarlet-sided Pobblebonk			1				**1**
Litoria caerulea	Green Treefrog					1		**1**
Litoria rubella	Naked Treefrog				1			**1**
Platyplectrun ornatus	Ornate Burrowing-Frog					1	1	**2**
Rhinella marina	Cane Toad	1		1	1	1	1	**5**
Acanthagenys rufogularis	Spiny-cheeked Honeyeater		1		1		1	**3**
Acanthiza chrysorrhoa	Yellow-rumped Thornbill						1	**1**
Acanthiza nana	Yellow Thornbill					1		**1**
Aegotheles cristatus	Australian Owlet-nightjar	1	1		1			**3**
Aprosmictus erythropterus	Red-winged Parrot						1	**1**
Artamus minor	Little Woodswallow	1			1	1		**3**
Artamus personatus	Masked Woodswallow				1			**1**
Chthonicola sagittata	Speckled Warbler						1	**1**
Climacteris picumnus	Brown Treecreeper						1	**1**
Colluricincla harmonica	Grey Shrike-thrush		1			1	1	**3**
Coracina novaehollandiae	Black-faced Cuckoo-shrike				1	1	1	**3**
Coracina papuensis	White-bellied Cuckoo-shrike						1	**1**
Corvus orru	Torresian Crow		1	1		1		**3**
Cracticus nigrogularis	Pied Butcherbird	1	1	1	1			**4**

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Totals
Cracticus torquatus	Grey Butcherbird	1	1		1			**3**
Dicaeum hirundinaceum	Mistletoebird	1				1	1	**3**
Dromaius novaehollandiae	Emu						1	**1**
Falco berigora	Brown Falcon				1		1	**2**
Geopelia humeralis	Bar-shouldered Dove						1	**1**
Geopelia striata	Peaceful Dove					1	1	**2**
Gerygone fusca	White-throated Gerygone					1		**1**
Gymnorhina tibicen	Australian Magpie			1	1			**2**
Lichenostomus leucotis	White-eared Honeyeater						1	**1**
Lichenostomus penicillatus	White-plumed Honeyeater						1	**1**
Lichenostomus plumulus	Grey-fronted Honeyeater	1		1			1	**3**
Lichenostomus virescens	Singing Honeyeater	1	1	1	1		1	**5**
Lichmera indistincta	Brown Honeyeater						1	**1**
Malurus lamberti	Variegated Fairy-wren		1	1	1	1		**4**
Malurus leucopterus	Red-backed Fairy-wren			1			1	**2**
Melanodyras cullata	Hooded Robin	1						**1**
Microeca fascinans	Jacky Winter				1		1	**2**
Oreocia gutturalis	Crested Bellbird		1		1			**2**
Pachycephala rufiventris	Rufous Whistler	1	1	1	1	1	1	**6**
Pardalotus striatus	Striated Pardalote	1	1		1	1	1	**5**
Petroica goodenovii	Red-capped Robin		1					**1**
Phaps chalcoptera	Common Bronzewing		1	1				**2**
Philemon corniculatus	Noisy Friarbird	1			1	1	1	**4**
Platycercus adscitus	Pale-headed Rosella	1		1	1			**3**
Plectorhyncha lanceolata	Striped Honeyeater	1	1		1			**3**
Pomatostomus temporalis	Grey-crowned Babbler				1	1		**2**
Rhipidura fuliginosa	Grey Fantail	1			1	1	1	**4**
Rhipidura leucophrys	Willie Wagtail	1	1	1	1	1	1	**6**
Smicrornis brevirostris	Weebill	1	1	1	1	1	1	**6**
Taeniopygia bichenovii	Double-barred Finch	1				1	1	**3**
Trichoglossus haematodus	Rainbow Lorikeet			1			1	**2**
Turnix velox	Little Button-quail	1		1				**2**
Tyto alba	Eastern Barn Owl	1						**1**
Totals		**32**	**24**	**22**	**34**	**33**	**46**	

Attachment D Results for the Standardised Site-based Trapping Program

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Totals
Mus musculus	House Mouse		5					**5**
Pseudomys desertor	Desert Mouse		4	6	1			**11**
Sminthopsis macroura	Stripe-faced Dunnart	1						**1**
Varanus tristis	Black-tailed Monitor					1		**1**
Diporiphora australis		3	2			1	1	**7**
Amphibolurus nobbi	Nobbi				2	3		**5**
Strophurus williamsi	Soft-spined Gecko						1	**1**
Diplodactylus vittatus	Wood Gecko						1	
Cryptoblepharus pannosus						1		**1**
Ctenotus taeniolatus	Copper-tailed Skink	1						**1**
Ctenotus pantherinus	Leopard Ctenotus	2						**2**
Ctenotus robustus				1				**1**
Carlia pectoralis					1			**1**
Carlia munda					2	2	1	**5**
Lerista fragilis			1					**1**
Menetia greyii						1	1	**2**
Morethia taeniopleura	Fire-tailed Skink						2	**2**
Litoria rubella	Naked Treefrog				1			**1**
Platyplectrun ornatus	Ornate Burrowing-Frog					1	1	**2**
Rhinella marina	Cane Toad			3		2	6	**11**
Totals		**7**	**12**	**10**	**7**	**12**	**14**	**61**

Attachment E Standardised Site-based Diurnal Ground Search Results

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Totals
Menetia greyii			1	1		1	1	**4**
Amphibolurus nobbi	Nobbi	1	4			6		**11**
Gehyra dubia					1	1		**2**
Carlia munda			2		7	1	1	**11**
Heteronotia binoei	Bynoe's Gecko					2	10	**12**
Cryptoblepharus pannosus					4			**4**
Morethia boulengeri					1			**1**
Ctenotus ingrami		1						**1**
Carlia sp.		1		1			1	**3**
Ctenotus leonhardii						1		**1**
Ctenotous sp.		1			1			**2**
Nephrurus asper	Prickly Knob-tailed Gecko				1			**1**
Ctenophorus nuchalis	Central Netted Dragon	2	3				1	**6**
Totals		**6**	**10**	**2**	**15**	**12**	**14**	**59**

Attachment F Standardised Site-based Nocturnal Survey Results

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Totals
Aegotheles cristatus	Australian Owlet-nightjar	1	1		1			**3**
Petaurus breviceps	Sugar Glider		1				1	**2**
Trichosurus vulpecula	Common Brushtail Possum	1						**1**
Tyto alba	Eastern Barn Owl	1						**1**
Oedura rhombifer		2						**2**
Strophurus williamsi	Soft-spined Gecko	1		1		1		**3**
Rhinella marina	Cane Toad	1		1	1	2		**5**
Limnodynastes terraereginae	Scarlet-sided Pobblebonk			1				**1**
Cyclorana novaehollandiae	Eastern Snapping-Frog			1				**1**
Gehyra dubia					1	6	2	**9**
Oedura monilis	Ocellated Velvet Gecko					1		**1**
Crytophis boshmai	Carpentaria Snake					1		**1**
Litoria caerulea	Green Treefrog					5		**5**
Nephrurus asper	Prickly Knob-tailed Gecko						1	**1**
Aepyprymnus rufescens	Rufous Bettong						1	**1**
Parasuta dwyeri	Hooded Snake						1	**1**
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat			1			1	**2**
Totals		**7**	**2**	**5**	**3**	**16**	**7**	**40**

Attachment G Results for the Standardised Site-based Bird Surveys

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Totals
Platycercus adscitus	Pale-headed Rosella	1		2	3			**6**
Pachycephala rufiventris	Rufous Whistler	3	3	1	6	7	9	**29**
Gymnorhina tibicen	Australian Magpie			2	3			**5**
Cracticus nigrogularis	Pied Butcherbird	1	3	1	1			**6**
Corvus orru	Torresian Crow		1	1		1		**3**
Acanthagenys rufogularis	Spiny-cheeked Honeyeater		3		7		1	**11**
Plectorhyncha lanceolata	Striped Honeyeater	2	2		6			**10**
Oreocia gutturalis	Crested Bellbird		2		1			**3**
Cracticus torquatus	Grey Butcherbird	3	2		3			**8**
Smicrornis brevirostris	Weebill	9	1	1	21	2	11	**45**
Pardalotus striatus	Striated Pardalote	3	5		6	1	3	**18**
Philemon corniculatus	Noisy Friarbird	1			2	1	3	**7**
Pomatostomus temporalis	Grey-crowned Babbler				5	3		**8**
Acanthiza nana	Yellow Thornbill					4		**4**
Lichenostomus plumulus	Grey-fronted Honeyeater	3		5			5	**13**
Coracina novaehollandiae	Black-faced Cuckoo-shrike				2	1	1	**4**
Lichenostomus virescens	Singing Honeyeater	6	5	2	2		6	**21**
Colluricincla harmonica	Grey Shrike-thrush		3			4	2	**9**
Rhipidura fuliginosa	Grey Fantail	3			2	1	5	**11**
Rhipidura leucophrys	Willie Wagtail	2	1	1	1	1	2	**8**
Dicaeum hirundinaceum	Mistletoebird	1				6	8	**15**
Turnix velox	Little Button-quail	1		2				**3**
Melanodyras cullata	Hooded Robin	3						**3**
Taeniopygia bichenovii	Double-barred Finch	2				2	4	**8**
Aegotheles cristatus	Australian Owlet-nightjar	1			1			**2**
Malurus leucopterus	Red-backed Fairy-wren			2			3	**5**
Falco berigora	Brown Falcon				1		1	**2**
Malurus lamberti	Variegated Fairy-wren		4	4	3	1		**12**
Trichoglossus haematodus	Rainbow Lorikeet			12			7	**19**
Artamus personatus	Masked Woodswallow				1			**1**
Lichmera indistincta	Brown Honeyeater						3	**3**
Aprosmictus erythropterus	Red-winged Parrot						1	**1**
Acanthiza chrysorrhoa	Yellow-rumped Thornbill						11	**11**
Geopelia striata	Peaceful Dove					1	2	**3**
Geopelia humeralis	Bar-shouldered Dove						1	**1**
Gerygone fusca	White-throated Gerygone					1		**1**
Artamus minor	Little Woodswallow	2			1	1		**4**
Lichenostomus leucotis	White-eared Honeyeater						1	**1**
Chthonicola sagittata	Speckled Warbler						1	**1**
Microeca fascinans	Jacky Winter				1		1	**2**
Geopelia cuneata	Diamond Dove				1			**1**
Climacteris picumnus	Brown Treecreeper						1	**1**
Dromaius novaehollandiae	Emu						1	**1**
Lichenostomus penicillatus	White-plumed Honeyeater						5	**5**
Coracina papuensis	White-bellied Cuckoo-shrike						1	**1**
Petroica goodenovii	Red-capped Robin		1					**1**
Phaps chalcoptera	Common Bronzewing		1	1				**2**
Totals		**47**	**37**	**37**	**80**	**38**	**100**	**339**

Attachment H Mammal Species Database for the Study Site and Surrounding Area

Column 1 – Status - E = Endangered; V = Vulnerable; NT = Near Threatened (EPBCA entry capitalised; NCA entry lower case). Species without entries in '**Status'** column are listed as Least Concern under the NCA. # = introduced species.

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Column 5 - Lambton Meadows - 2007 QEPA Survey Records (Landscape Ecology Unit; 2006).

Column 6 - Bimblebox Nature Refuge Survey Records (DERM 2012 compilation of the following sources: CSIRO 2003-2007; Birds Australia 2003-2011; DERM Wildnet data; & DERM Nature Refuge Branch 2011)).

Column 7 - Galilee Coal Project - 2010 EIS Survey Records (Worley Parsons 2009 & Unidel 2008 - 2010).

Column 8 - Galilee Coal Project - **2012 Supplementary EIS Survey Records** (Austecology 2011 - 2012).

Zoological Name	Common Name	1	2	3	4	5	6	7	8
TACHYGLOSSIDAE									
Tachyglossus aculeatus	Short-beaked Echidna		1	1	1	1	1	1	1
DASYURIDAE									
Dasyurus hallucatus	Northern Quoll	**E**	1						
Planigale maculata	Common Planigale		1						
Planigale tenuirostris	Narrow-nosed Planigale		1						
Sminthopsis macroura	Stripe-faced Dunnart		1	1		1	1		1
Sminthopsis murina	Common Dunnart		1				1		1
PHASCOLARCTIDAE									
Phascolarctos cinereus	Koala	**V**	1	1	1		1		1
ACROBATIDAE									
Acrobates pygmaeus	Feathertail Glider								
PETAURIDAE									
Petaurus breviceps	Sugar Glider		1	1			1	1	1
Petaurus norfolcensis	Squirrel Glider		1						
PSEUDOCHEIRIDAE									
Petauroides volans	Greater Glider		1						
PHALANGERIDAE									
Trichosurus vulpecula	Common Brushtail Possum		1	1				1	1
POTOROIDAE									
Aepyprymnus rufescens	Rufous Bettong		1	1			1	1	1
MACROPODIDAE									
Lagorchestes conspicillatus	Spectacled Hare-wallaby		1	1			1	1	1
Macropus dorsalis	Black Striped Wallaby								
Macropus giganteus	Eastern Grey Kangaroo		1	1	1	1	1	1	1
Macropus r. robustus	Euro		1	1		1	1	1	1
Macropus rufus	Red Kangaroo		1	1	1	1	1	1	1
Petrogale herberti	Herbert's Rock-wallaby		1						
Wallabia rufogriseus	Red-necked Wallaby			1					
Wallabia bicolor	Swamp Wallaby		1	1			1	1	
PTEROPODIDAE									
Pteropus scapulatus	Little Red Flying-fox			1					1
RHINOLOPHIDAE									
Rhinolophus megaphyllus	Eastern Horseshoe-bat		1						

Zoological Name	Common Name	1	2	3	4	5	6	7	8
EMBALLONURIDAE									
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat		1	1	1	1	1	1	1
Taphozous troughtoni	Troughton's Sheathtail-bat		1	1				1	
MOLOSSIDAE									
Austronomus australis	White-striped Freetail-bat		1	1	1		1	1	1
Chaerephon jobensis	Northern Freetail-bat		1	1				1	
Mormopterus eleryi				1					
Mormopterus beccarii	Beccari's Freetail-bat		1	1				1	1
Mormopterus species 3	Inland Freetail-bat		1	1				1	
Mormopterus sp.	a Freetail-bat				1				
VESPERTILIONIDAE									
Chalinolobus gouldii	Gould's Wattled Bat		1	1		1	1	1	1
Chalinolobus morio	Chocolate Wattled Bat		1	1				1	1
Chalinolobus picatus	Little Pied Bat	**nt**		1				1	
Nyctophilus bifax	Northern Long-eared Bat						1		
Nyctophilus geoffroyi	Lesser Long-eared Bat					1			
Nyctophilus gouldi	Gould's Long-eared Bat		1						
Nyctophilus sp.	unknown Long-eared Bat			1				1	1
Scotorepens balstoni	Inland Broad-nosed Bat		1	1				1	1
Scotorepens greyii	Little Broad-nosed Bat		1	1		1	1	1	1
Vespadelus baverstocki	Inland Forest Bat			1				1	1
Vespadelus pumilis	Inland Cave Bat			1					
Vespadelus troughtoni	Eastern Cave Bat		1	1					
Vespadelus vulturnus	Little Forest Bat		1					1	
Vespadelus sp.	a Forest Bat				1				
MURIDAE									
Leggadina forresti	Forest's Mouse		1		1				
Mus musculus	House Mouse	**#**	1	1	1	1	1		1
Pseudomys delicatulus	Delicate Mouse		1	1	1		1		
Pseudomys desertor	Desert Mouse		1		1		1	1	1
Pseudomys hermannsburgensis	Sandy Inland Mouse					1	1		
Pseudomys patrius	Eastern Pebble-mound Mouse								
CANIDAE									
Canis familiaris	Dog	**#**	1	1				1	1
Canis lupus dingo	Dingo		1		1	1	1	1	1
Vulpes vulpes	Fox	**#**							
FELIDAE									
Felis catus	Feral Cat	**#**	1	1	1	1	1	1	1
LEPORIDAE									
Oryctolagus cuniculus	Rabbit	**#**	1	1		1	1	1	1
EQUIDAE									
Equus asinus	Donkey	**#**							
Equus caballus	Brumby	**#**							
SUIDAE									
Sus scrofa	Pig	**#**	1	1	1	1	1	1	1
BOVIDAE									
Bos taurus	Cattle	**#**	1	1				1	1
Capra hircus	Goat	**#**	1						
CERVIDAE									
Cervus elaphus	Red Deer	**1**							
Total Number of Species			**43**	**36**	**15**	**15**	**24**	**30**	**29**

Attachment I Reptile Species Database for the Study Site and Surrounding Area

Column 1 – Status - E = Endangered; V = Vulnerable; NT = Near Threatened (EPBCA entry capitalised; NCA entry lower case). Species without entries in '**Status'** column are listed as Least Concern under the NCA. # = introduced species.

Column 2 - Surounding Area - 2012 DERM Wildlife Online Records (within 75km of Galilee Coal Project site).

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Column 5 - Lambton Meadows - 2007 QEPA Survey Records (Landscape Ecology Unit; 2006).

Column 6 - Bimblebox Nature Refuge Survey Records (DERM 2012 compilation of the following sources: CSIRO 2003-2007; Birds Australia 2003-2011; DERM Wildnet data; & DERM Nature Refuge Branch 2011)).

Column 7 - Galilee Coal Project - 2010 EIS Survey Records (Worley Parsons 2009 & Unidel 2008 - 2010).

Column 8 - Galilee Coal Project - **2012 Supplementary EIS Survey Records** (Austecology 2011 - 2012).

Zoological Name	Common Name	1	2	3	4	5	6	7	8
CHELODINA									
Chelodina longicollis	Eastern Long-necked Tortoise		1				1		
GEKKONIDAE									
Diplodactylus conspicillatus	Fat-tailed Diplodactylus		1		1	1	1	1	1
Diplodactylus tessellatus	Tessellated Gecko			1					
Diplodactylus vittatus	Wood Gecko		1						1
Gehyra catenata			1		1			1	
Gehyra dubia			1	1		1	1		1
Hemidactylus frenatus	Asian House Gecko	#		1			1		
Heteronotia binoei	Bynoe's Gecko		1	1	1	1	1	1	1
Lucasium steindachneri	Steindachneri's Gecko		1	1	1	1	1	1	1
Nephrurus asper	Prickly Knob-tailed Gecko		1			1	1		1
Oedura monilis	Ocellated Velvet Gecko		1		1				1
Oedura rhombifer			1				1		1
Rhynchoedura oranata	Beaked Gecko		1			1	1	1	
Strophurus williamsi	Soft-spined Gecko		1			1	1	1	1
PYGOPODIDAE									
Delma tincta			1						
Lialis burtonis	Burton's Snake-lizard		1	1			1	1	1
Paradelma orientalis	Brigalow Scaly-foot	**Vv**							1
Pygopus lepidopodus	Common Scaly-foot						1		
Pygopus schraderi	Hooded Scaly-foot		1						
AGAMIDAE									
Amphibolurus gilberti	Gilbert's dragon		1				1	1	
Amphibolurus nobbi	Nobbi		1	1			1	1	1
Chlamydosaurus kingii	Frill-neck Lizard			1					
Ctenophorus nuchalis	Central Netted Dragon		1	1		1	1	1	1
Diporiphora australis			1	1	1	1	1	1	1
Pogona barbata	Bearded Dragon		1	1	1	1	1		1
VARANIDAE									
Varanus gouldii	Gould's Goanna		1	1					
Varanus tristis	Black-tailed Monitor		1		1	1	1		1
SCINCIDAE									
Carlia foliorum			1						
Carlia munda			1	1		1			1

Zoological Name	Common Name	1	2	3	4	5	6	7	8
Carlia pectoralis			1	1					1
Carlia schmeltzii			1						1
Cryptoblepharus carnabyi sensu lato					1	1			1
Cryptoblepharus pannosus			1				1	1	1
Cryptoblepharus virgatus sensu lato	Wall Skink		1	1	1				
Ctenotus capricorni		**nt**	1						
Ctenotus herbetoir				1		1	1		1
Ctenotus ingrami			1						1
Ctenotus pantherinus	Leopard Ctenotus		1	1	1	1	1	1	1
Ctenotus leonhardii			1		1		1	1	1
Ctenotus robustus			1	1	1		1	1	1
Ctenotus strauchii			1						
Ctenotus taeniolatus	Copper-tailed Skink		1						1
Egernia rugosa	Yakka Skink	**Vv**	1						
Egernia striolata	Tree Skink		1						
Eremiascincus richardsonii	Broad-banded Sand Swimmer		1		1				
Eremiascincus fasciolatus	Narrow-banded Sand Swimmer		1						
Eulamprus tenuis									1
Lerista fragilis			1		1	1	1		1
Lerista punctatovittata			1			1			1
Lerista timida			1						
Menetia timlowi			1						
Menetia greyii			1	1	1	1	1		1
Morethia boulengeri			1		1		1		1
Morethia taeniopleura	Fire-tailed Skink		1	1			1		1
Proablepharus tenuis			1						
Tiliqua scincoides	Eastern Blue-tongued Lizard		1	1	1		1		1
TYPHLOPIDAE									
Ramphotyphlops ligatus			1						
Ramphotyphlops unguirostris			1						
BOIDAE									
Antaresia maculosa	Spotted Python		1	1					1
Aspidites melanocephalus	Black-headed Python		1	1				1	1
COLUBRIDAE									
Boiga irregularis	Brown Tree Snake		1				1		1
Dendrelaphis punctulata	Common Tree Snake		1						1
ELAPIDAE									
Crytophis boshmai	Carpentaria Snake		1		1	1	1		1
Demansia psammophis	Yellow-faced Whip Snake		1	1			1		1
Furina ornata	Orange-naped Snake		1						1
Hoplocephalus bitorquatus	Pale-headed Snake		1	1	1		1		1
Pseudechis australis	King Brown Snake		1						1
Pseudonaja textilis	Eastern Brown Snake		1	1					1
Brachurophis australis	Coral Snake		1		1		1		
Parasuta dwyeri	Hooded Snake		1		1		1		1
Suta suta	Myall Snake		1		1	1	1		
Total Number of Species			**63**	**26**	**23**	**20**	**35**	**16**	**45**

Attachment J Amphibian Species Database for the Study Site and Surrounding Area

Column 1 – Status - E = Endangered; V = Vulnerable; NT = Near Threatened (EPBCA entry capitalised; NCA entry lower case). Species without entries in '**Status'** column are listed as Least Concern under the NCA. # = introduced species.

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Column 5 - Lambton Meadows - 2007 QEPA Survey Records (Landscape Ecology Unit; 2006).

Column 6 - Bimblebox Nature Refuge Survey Records (DERM 2012 compilation of the following sources: CSIRO 2003-2007; Birds Australia 2003-2011; DERM Wildnet data; & DERM Nature Refuge Branch 2011)).

Column 7 - Galilee Coal Project - 2010 EIS Survey Records (Worley Parsons 2009 & Unidel 2008 - 2010).

Column 8 - Galilee Coal Project - **2012 Supplementary EIS Survey Records** (Austecology 2011 - 2012).

Zoological Name	Common Name	1	2	3	4	5	6	7	8
HYLIDAE									
Cyclorana brevipes	Superb Collared-Frog		1		1				
Cyclorana novaehollandiae	Eastern Snapping-Frog		1		1		1		1
Litoria alboguttata	Greenstripe Frog		1	1			1		1
Litoria caerulea	Green Treefrog		1	1	1		1	1	1
Litoria fallax	Eastern Sedgefrog			1					
Litoria inermis	Bumpy Rocketfrog		1	1			1	1	1
Litoria latopalmata	Broad-palmed Rocketfrog		1	1					
Litoria rothii	Red-eyed Treefrog							1	
Litoria rubella	Naked Treefrog		1		1		1		1
MYOBATRACHIDAE									
Crinia deserticola	Chirping Froglet								1
Platyplectrun ornatus	Ornate Burrowing-Frog		1	1	1		1	1	
Limnodynastes peronii	Striped Marshfrog		1				1		
Limnodynastes tasmaniensis	Spotted Grass Frog			1					1
Limnodynastes terraereginae	Scarlet-sided Pobblebonk		1						1
Notaden bennettii	Holly Cross Frog		1		1	1	1		
Neobatrachus sudelii	Meowing Frog		1						
Pseudophryne major	Great Brown Broodfrog		1				1	1	
Uperoleia rugosa	Chubby Gungan		1	1					
BUFONIDAE									
Rhinella marina	Cane Toad	#	1	1	1	1	1	1	1
Total Number of Species			**15**	**9**	**7**	**2**	**10**	**6**	**9**

Attachment K Bird Species Database for the Study Site and Surrounding Area

Column 1 – Status - E = Endangered; V = Vulnerable; NT = Near Threatened (EPBCA entry capitalised; NCA entry lower case). Species without entries in '**Status'** column are listed as Least Concern under the NCA. # = introduced species.

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Column 3 – Alpha South Coal Project - 2010 EIS Survey Records (AARC 2008 - 2010).

Column 4 - Glenn Innes, Monklands, & Lambton Meadows Survey Records (DERM 1998-1999).

Column 5 - Lambton Meadows - 2007 QEPA Survey Records (Landscape Ecology Unit; 2006).

Column 6 - Bimblebox Nature Refuge Survey Records (DERM 2012 compilation of the following sources: CSIRO 2003-2007; Birds Australia 2003-2011; DERM Wildnet data; & DERM Nature Refuge Branch 2011)).

Column 7 - Galilee Coal Project - 2010 EIS Survey Records (Worley Parsons 2009 & Unidel 2008 - 2010).

Column 8 - Galilee Coal Project - **2012 Supplementary EIS Survey Records** (Austecology 2011 - 2012).

Zoological Name	Common Name	1	2	3	4	5	6	7	8
CASUARIIDAE									
Dromaius novaehollandiae	Emu		1	1	1		1	1	1
PHASIANIDAE									
Coturnix pectoralis	Stubble Quail								1
Coturnix ypsilophora	Brown Quail		1	1	1		1		1
ANATIDAE									
Anas gracilis	Grey Teal		1	1		1	1	1	1
Anas superciliosa	Pacific Black Duck		1	1			1	1	1
Aythya australis	Hardhead		1				1	1	1
Chenonetta jubata	Australian Wood Duck		1	1		1	1	1	1
Malacorhynchus membranaceus	Pink-eared Duck								1
Cygnus atratus	Black Swan		1						1
Dendrocygna arcuata	Wandering Whistling-Duck		1						1
Dendrocygna eytoni	Plumed Whistling-Duck		1				1	1	1
Nettapus coromandelianus	Cotton Pygmy Goose	**nt**							1
Stictonetta naevosa	Freckled Duck	**nt**							1
Anas rhynchotis	Australasian Shoveler								1
PODICIPEDIDAE									
Podiceps cristatus	Great Crested Grebe		1				1	1	1
Tachybaptus novaehollandiae	Australasian Grebe		1				1		1
Poliocephalus poliocephalus	Hoary-headed Grebe		1						1
ANHINGIDAE									
Anhinga melanogaster	Darter		1	1		1	1	1	1
PHALACROCORACIDAE									
Phalacrocorax carbo	Great Cormorant		1					1	
Phalacrocorax melanoleucos	Little Pied Cormorant		1				1	1	1
Phalacrocorax sulcirostris	Little Black Cormorant		1	1			1		1
Phalacrocorax varius	Pied Cormorant		1				1	1	1
PELECANIDE									
Pelecanus conspicillatus	Australian Pelican		1	1			1	1	1
ARDEIDAE									
Ardea alba	Great Egret		1	1			1		1
Ardea intermedia	Intermediate Egret		1	1				1	1
Ardea pacifica	White-necked Heron		1	1			1	1	1
Egretta novaehollandiae	White-faced Heron		1	1				1	1

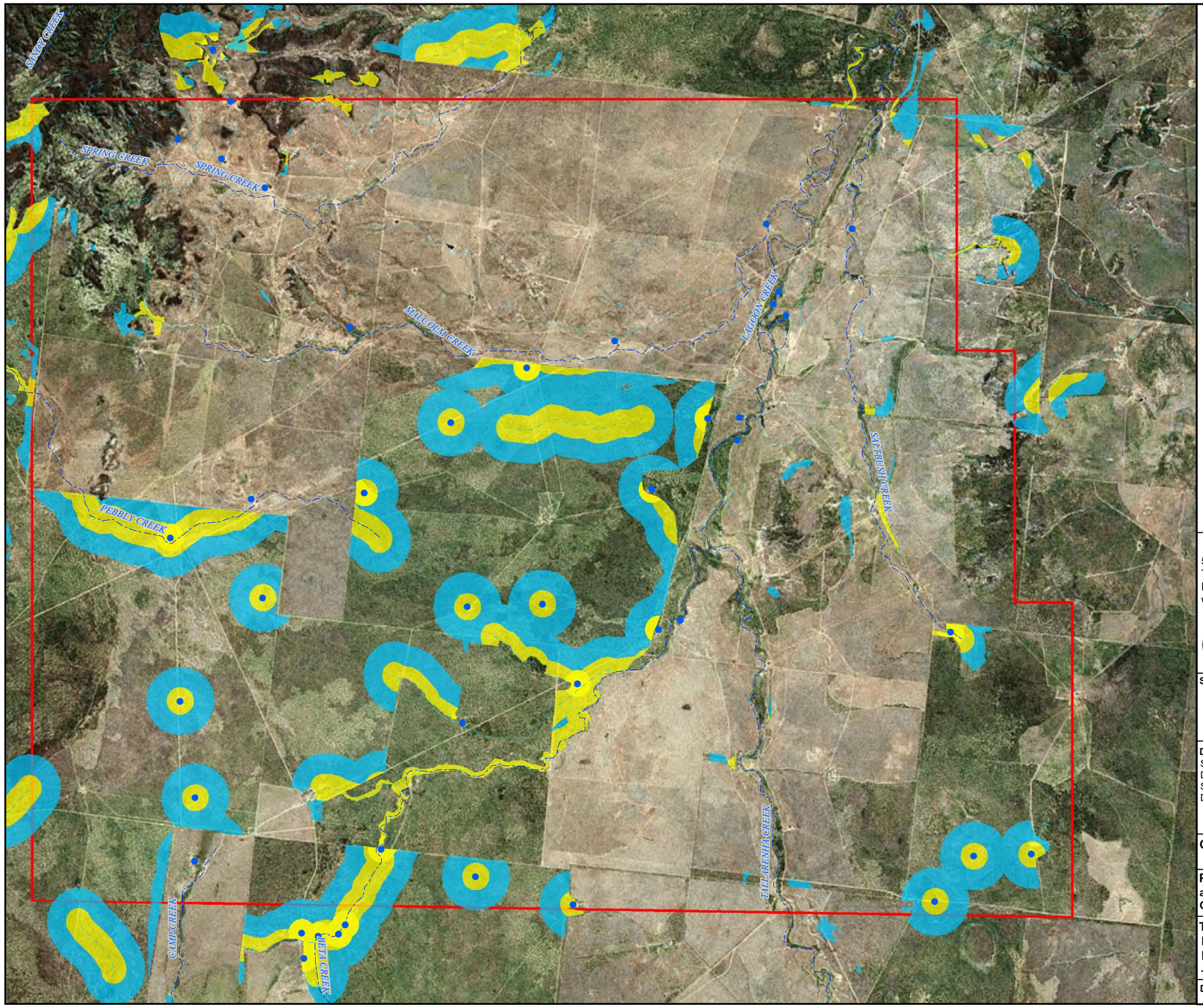
Zoological Name	Common Name	1	2	3	4	5	6	7	8
Nycticorax caledonicus	Nankeen Night Heron		1	1	1		1	1	1
THRESKIORNITHIDAE									
Platalea flavipes	Yellow-billed Spoonbill			1			1		1
Platalea regia	Royal Spoonbill		1						1
Threskiornis molucca	Australian White Ibis		1	1			1		1
Threskiornis spinicollis	Straw-necked Ibis		1	1			1		1
Plegadis falcinellus	Glossy Ibis								1
CICONIIDAE									
Ephippiorhynchus asiaticus	Black-necked Stork	**nt**	1				1		1
ACCIPITRIDAE									
Accipiter cirrhocephalus	Collared Sparrowhawk		1				1		1
Accipiter fasciatus	Brown Goshawk		1		1	1	1	1	1
Aquila audax	Wedge-tailed Eagle		1	1	1	1	1	1	1
Aviceda subcristata	Pacific Baza		1						
Circus assimilis	Spotted Harrier		1						1
Elanus axillaris	Black-shouldered Kite			1			1	1	1
Elanus scriptus	Letter-winged Kite		1						
Hamirostra melanosternon	Black-breasted Buzzard		1						1
Haliastur sphenurus	Whistling Kite		1	1	1		1	1	1
Hieraaetus morphnoides	Little Eagle		1				1		1
Lophoictinia isura	Square-tailed Kite	**nt**	1						1
Milvus migrans	Black Kite		1				1	1	1
FALCONIDAE									
Falco berigora	Brown Falcon		1	1	1	1	1	1	1
Falco subniger	Black Falcon		1				1		
Falco cenchroides	Nankeen Kestrel		1	1	1	1	1	1	1
Falco longipennis	Australian Hobby		1	1		1			1
Falco peregrinus	Peregrine Falcon		1					1	1
GRUIDAE									
Grus rubicunda	Brolga		1	1			1	1	1
RALLIDAE									
Fulica atra	Eurasian Coot		1						1
Gallinula tenebrosa	Dusky Moorhen								1
Porphyrio porphyrio	Purple Swamphen		1						1
OTIDIDAE									
Ardeotis australis	Australian Bustard		1	1		1	1	1	1
JACANIDAE									
Irediparra gallinacea	Comb-crested Jacana								1
SCOLOPACIDAE									
Calidris acuminata	Sharp-tailed Sandpiper								1
TURNICIDAE									
Turnix velox	Little Button-quail		1			1	1		1
Turnix pyrrhothorax	Red-chested Button-quail		1		1		1		1
BURHINIDAE									
Burhinus grallarius	Bush Stone-curlew		1	1	1	1	1	1	1
RECURVIROSTRIDAE									
Himantopus himantopus	Black-winged Stilt		1						1
CHARADRIIDAE									
Elseyornis melanops	Black-fronted Dotterel		1	1			1	1	1
Erythrogonys cinctus	Red-kneed Dotterel		1				1	1	
Vanellus miles	Masked Lapwing		1	1		1	1	1	1
Vanellus tricolor	Banded Lapwing		1	1			1	1	1
GLAREOLIDAE									
Stiltia isabella	Australian Pratincole								1

Zoological Name	Common Name	1	2	3	4	5	6	7	8
LARIDAE									
Chlidonias hybridus	Whiskered Tern								1
COLUMBIDAE									
Geopelia cuneata	Diamond Dove		1	1		1	1	1	1
Geopelia humeralis	Bar-shouldered Dove		1				1	1	1
Geopelia striata	Peaceful Dove		1	1	1	1	1	1	1
Geophaps scripta scripta	Squatter Pigeon (sth. subsp.)	**Vv**	1	1			1		
Leucosarcia melanoleuca	Wonga Pigeon		1						
Ocyphaps lophotes	Crested Pigeon		1	1	1	1	1	1	1
Phaps chalcoptera	Common Bronzewing		1	1		1	1	1	1
CACATUIDAE									
Cacatua galerita	Sulphur-crested Cockatoo		1	1	1	1	1	1	1
Cacatua roseicapilla	Galah		1	1	1	1	1	1	1
Calyptorhynchus banksii	Red-tailed Black Cockatoo		1	1			1	1	1
Calyptorhynchus funereus	Yellow-tailed Black Cockatoo						1		
Nymphicus hollandicus	Cockatiel		1	1	1	1	1		1
PSITTACIDAE									
Alisterus scapularis	Australian King Parrot		1						
Aprosmictus erythropterus	Red-winged Parrot		1	1	1	1	1	1	1
Melopsittacus undulatus	Budgerigar		1	1		1	1		1
Platycercus adscitus	Pale-headed Rosella		1	1	1	1	1	1	1
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet		1	1					
Trichoglossus haematodus	Rainbow Lorikeet		1	1	1	1	1	1	1
CUCULIDAE									
Cacomantis flabelliformis	Fan-tailed Cuckoo					1			
Cacomantis variolosus	Brush Cuckoo		1				1		1
Centropus phasianinus	Pheasant Coucal		1	1			1	1	1
Chrysococcyx basalis	Horsfield's Bronze-Cuckoo		1		1	1	1		1
Chrysococcyx lucidus	Shining Bronze-Cuckoo		1			1	1		1
Chrysococcyx osculans	Black-eared Cuckoo		1			1	1		
Cuculus pallidus	Pallid Cuckoo		1				1		1
Eudynamys scolopacea	Common Koel		1						
Scythrops novaehollandiae	Channel-billed Cuckoo		1				1		1
STRIGIDAE									
Ninox connivens	Barking Owl		1		1				
Ninox novaeseelandiae	Southern Boobook		1	1	1	1	1	1	1
TYTONIDAE									
Tyto alba	Eastern Barn Owl		1			1	1	1	1
PODARGIDAE			1						
Podargus strigoides	Tawny Frogmouth			1	1	1	1	1	1
EUROSTOPIDAE									
Eurostopodus argus	Spotted Nightjar		1	1		1			1
Eurostopodus mystacalis	White-throated Nightjar		1						
AEGOTHELIDAE									
Aegotheles cristatus	Australian Owlet-nightjar		1		1	1			1
APODIDAE									
Apus pacificus	Fork-tailed Swift		1						
ALCEDINIDAE									
Ceyx azureus	Azure Kingfisher			1					
HALCYONIDAE									
Dacelo leachii	Blue-winged Kookaburra		1		1		1	1	1
Dacelo novaeguineae	Laughing Kookaburra		1	1	1		1	1	1
Todiramphus macleayii	Forest Kingfisher		1	1	1		1		1
Todiramphus pyrrhopygia	Red-backed Kingfisher		1		1	1	1	1	1

Zoological Name	Common Name	1	2	3	4	5	6	7	8
Todiramphus sanctus	Sacred Kingfisher		1	1	1		1		1
MEROPIDAE									
Merops ornatus	Rainbow Bee-eater		1	1	1		1	1	1
CORACIIDAE									
Eurystomus orientalis	Dollarbird		1	1	1		1	1	1
CLIMACTERIDAE									
Climacteris affinis	White-browed Treecreeper		1						
Climacteris picumnus	Brown Treecreeper		1	1	1	1	1	1	1
PTILINORHYNCHIDAE									
Ptilonorhynchus nuchalis	Great Bowerbird		1						
Chlamydera maculata	Spotted Bowerbird		1	1		1	1	1	1
ACANTHIZIDAE									
Acanthiza apicalis	Inland Thornbill		1		1	1	1	1	1
Acanthiza chrysorrhoa	Yellow-rumped Thornbill		1	1	1	1	1	1	1
Acanthiza nana	Yellow Thornbill		1			1	1	1	1
Acanthiza pusilla	Brown Thornbill		1						
Acanthiza reguloides	Buff-rumped Thornbill		1				1	1	1
Acanthiza uropygialis	Chestnut-rumped Thornbill		1			1	1		
Chthonicola sagittata	Speckled Warbler		1			1	1		1
Gerygone olivacea	Western Gerygone		1		1	1	1	1	1
Gerygone fusca	White-throated Gerygone		1		1	1	1	1	1
Sericornis frontalis	White-browed Scrubwren		1						
Smicrornis brevirostris	Weebill		1	1	1	1	1	1	1
PARDALOTIDAE									
Pardalotus striatus	Striated Pardalote		1	1	1	1	1	1	1
Pardalotus punctatus	Spotted Pardalote		1						
Pardalotus rubricatus	Red-browed Pardalote		1				1		1
MALURIDAE									
Malurus cyaneus	Superb Fairy-wren		1	1					
Malurus lamberti	Variegated Fairy-wren		1	1	1	1	1	1	1
Malurus leucopterus	Red-backed Fairy-wren		1	1	1		1	1	1
Malurus melanocephalus	White-winged Fairy-wren		1						1
MELIPHAGIDAE									
Acanthorhynchus tenuirostris	Eastern Spinebill		1						
Acanthagenys rufogularis	Spiny-cheeked Honeyeater		1		1	1	1	1	1
Entomyzon cyanotis	Blue-faced Honeyeater		1	1	1	1	1	1	1
Epthianura tricolor	Crimson Chat		1						
Lichenostomus chrysops	Yellow-faced Honeyeater		1						
Lichenostomus fuscus	Fuscous Honeyeater						1		
Lichenostomus keartlandi	Grey-headed Honeyeater		1				1	1	
Lichenostomus leucotis	White-eared Honeyeater		1			1	1		1
Lichenostomus penicillatus	White-plumed Honeyeater		1	1	1	1	1	1	1
Lichenostomus plumulus	Grey-fronted Honeyeater		1		1	1	1		1
Lichenostomus virescens	Singing Honeyeater		1	1	1	1	1	1	1
Lichmera indistincta	Brown Honeyeater		1			1	1		1
Manorina flavigula	Yellow-throated Miner		1		1	1	1	1	1
Manorina melanocephala	Noisy Miner		1	1			1	1	
Meliphaga lewinii	Lewin's Honeyeater		1						
Melithreptus albogularis	White-throated Honeyeater		1	1					
Melithreptus brevirostris	Brown-headed Honeyeater		1						
Melithreptus gularis	Black-chinned Honeyeater	**nt**	1				1		1
Philemon citreogularis	Little Friarbird		1		1		1	1	1
Philemon corniculatus	Noisy Friarbird		1	1	1	1	1	1	1
Plectorhyncha lanceolata	Striped Honeyeater		1		1	1	1	1	1

Zoological Name	Common Name	1	2	3	4	5	6	7	8
POMATOSTOMIDAE									
Pomatostomus temporalis	Grey-crowned Babbler		1	1	1	1	1	1	1
NEOSITTIDAE									
Daphoenositta chrysoptera	Varied Sittella		1	1	1	1	1	1	1
CAMPEPHAGIDAE									
Coracina maxima	Ground Cuckoo-shrike		1	1		1	1		1
Coracina novaehollandiae	Black-faced Cuckoo-shrike		1	1	1	1	1	1	1
Coracina papuensis	White-bellied Cuckoo-shrike		1			1	1		1
Coracina tenuirostris	Cicadabird		1		1				
Lalage sueurii	White-winged Triller		1	1		1	1	1	1
Oreocia gutturalis	Crested Bellbird		1			1	1	1	1
PACHYCEPHALIDAE									
Colluricincla harmonica	Grey Shrike-thrush		1			1	1	1	1
Pachycephala pectoralis	Golden Whistler			1			1		
Pachycephala rufiventris	Rufous Whistler		1	1	1	1	1	1	1
ORIOLIDAE									
Oriolus sagittatus	Olive-backed Oriole		1		1	1	1		1
Sphecotheres viridis	Figbird		1		1		1		
ARTAMIDAE									
Artamus cinereus	Black-faced Woodswallow		1	1		1	1	1	1
Artamus cyanopterus	Dusky Woodswallow		1	1		1	1	1	1
Artamus leucorynchus	White-breasted Woodswallow		1	1		1			1
Artamus minor	Little Woodswallow		1		1	1	1	1	1
Artamus personatus	Masked Woodswallow		1			1	1	1	1
Artamus superciliosus	White-browed Woodswallow		1			1	1	1	1
Cracticus nigrogularis	Pied Butcherbird		1	1	1	1	1	1	1
Cracticus torquatus	Grey Butcherbird		1	1	1	1	1	1	1
Gymnorhina tibicen	Australian Magpie		1	1	1	1	1	1	1
Strepera graculina	Pied Currawong		1				1	1	1
DICRURIDAE									
Dicrurus bracteatus	Spangled Drongo		1			1	1		
RHIPIDURIDAE									
Rhipidura fuliginosa	Grey Fantail		1	1		1	1	1	1
Rhipidura leucophrys	Willie Wagtail		1	1	1	1	1	1	1
CORVIDAE									
Corvus coronoides	Australian Raven		1	1	1	1	1	1	1
Corvus orru	Torresian Crow		1	1	1	1	1	1	1
MONARCHIDAE									
Grallina cyanoleuca	Magpie-lark		1	1	1	1	1	1	1
Myiagra inquieta	Restless Flycatcher		1			1	1	1	1
Myiagra rubecula	Leaden Flycatcher		1	1	1		1		1
CORORACIDAE									
Corvus bennetti	Little Crow		1						
Corcorax melanorhamphos	White-winged Chough		1	1		1			1
Struthidea cinerea	Apostlebird		1	1	1	1	1	1	1
PETROICIDAE									
Microeca fascinans	Jacky Winter		1	1	1	1	1	1	1
Petroica goodenovii	Red-capped Robin		1	1		1	1		1
Melanodyras cullata	Hooded Robin		1	1		1	1	1	1
ALAUDIDAE									
Mirafra javanica	Singing Bushlark		1		1		1		1
CISTICOLIDAE									
Cisticola exilis	Golden-headed Cisticola								1
ACROCEPHALIDAE									

Zoological Name	Common Name	1	2	3	4	5	6	7	8
Acrocephalus stentoreus	Australian Reed-Warbler								1
MEGALURIDAE									
Cincloramphus cruralis	Brown Songlark		1				1	1	1
Cincloramphus mathewsi	Rufous Songlark		1			1	1	1	1
TIMALIIDAE									
Zosterops lateralis	Silvereye		1						
HIRUNDINIDAE									
Cheramoeca leucosternus	White-backed Swallow		1						1
Hirundo ariel	Fairy Martin		1				1	1	1
Hirundo neoxena	Welcome Swallow								1
Hirundo nigricans	Tree Martin		1	1		1	1		1
NECTARINIIDAE									
Dicaeum hirundinaceum	Mistletoebird		1		1	1	1	1	1
Nectarina jugularis	Olive-backed Sunbird		1						
ESTRILDIDAE									
Lonchura castaneothorax	Chestnut-breasted Mannikin		1						
Neochmia modesta	Plum-headed Finch		1	1	1				1
Taeniopygia bichenovii	Double-barred Finch		1	1		1	1	1	1
Taeniopygia guttata	Zebra Finch		1	1		1	1	1	1
Peophila cincta cincta	Black-throated Finch (southern)	**Ee**	1				1		
PASSERIDAE									
Passer domesticus	House Sparrow	**#**	1						
MOTACILLIDAE									
Anthus novaeseelandiae	Australasian Pipit		1	1		1	1	1	1
Total Number of Species			**189**	**95**	**69**	**92**	**145**	**105**	**167**



Legend

- Surveyed water sources which are known/likely to support water for at least 4 months
- Higher probability BTF nesting habitat occurs where preferred habitat is present within 400m of a permanent water resource
- Lower probability BTF nesting habitat occurs where preferred habitat is present within 400-1000m of a permanent water resource
- Study Area

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austecology

SCALE:

0 1.5 3 6
Kilometres

DATA SOURCE:
Source:EPA Regional Ecosystems Digital Database, Version 6.0, 2009©
Source:Department of Mines and Energy, Digital Database, 2011©

CLIENT: Waratah Coal Pty Ltd.

PROJECT: Black-throated Finch Survey and Habitat Assessments for EPC 1040, Galilee Basin, Central Queensland.

TITLE:
Figure 4.2
Black-throated Finch Nesting Habitat – Predictive Model Outputs.

DATE: 09-06-11 **SIZE:** A3

Attachment M Threatened Species Habitat Modelling Data

Data Sources: VMA Essential Habitat Factors database extracts under user licence (June 2012, EHP); Morgan *et al*. 2002; SEWPaC (SEWPaC 2011b, 2012 a-d), Kutt *et al.* 2003, Ellis *et al.* 1995 and 2002; 2007 Recovery Plan (BTRF 2007); and 2010 Recovery Plan (Hill & Ward 2010).

Species	Habitat Descriptors
Little Pied Bat *Chalinolobus picatus*	**VMA Essential Habitat Database (Habitat Factors)** - REs: 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.7, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.3.17, 10.3.19, 10.3.20, 10.3.21, 10.3.22, 10.3.23, 10.3.25, 10.3.27, 10.3.28, 10.3.29, 10.3.30, 10.3.31, 10.4.1, 10.4.2, 10.4.3, 10.4.4, 10.4.5, 10.4.6, 10.4.7, 10.4.9, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.6, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.6, 10.7.7, 10.7.8, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.9.6, 10.9.7, 10.9.8, 10.10.1, 10.10.2, 10.10.3, 10.10.4, 10.10.5, & 10.10.7. Vegetation Community: Dry open forest and woodland (e.g. *Eucalyptus melanophloia, E. populnea, E. crebra, E. moluccana, E. tereticornis, Corymbia citriodora, C. tessellaris*), in more arid areas found in riparian areas (E. *camaldulensis, E. microtheca*), and mulga (*Acacia aneura*) and escarpment (*A. shirleyi*); also brigalow forest, *Callitris/Allocasuarina* with *E. dealbata/E. fibrosa*, and chenopod shrubland. Altitude: Sea level to 850m. **Morgan et al. 2002** - REs: 10.3.6, 10.3.14, & 10.7.3. The records from the Desert Uplands indicate riparian and escarpment habitats are important for the species in the bioregion.
the skink *Ctenotus capricorni*	**VMA Essential Habitat Database (Habitat Factors) -** REs: 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.7, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.3.17, 10.3.19, 10.3.20, 10.3.21, 10.3.22, 10.3.23, 10.3.25, 10.3.27, 10.3.28, 10.3.29, 10.3.30, 10.3.31, 10.4.1, 10.4.2, 10.4.3, 10.4.4, 10.4.5, 10.4.6, 10.4.9, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.6, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.6, 10.7.7, 10.7.8, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.9.6, 10.9.7, 10.9.8, 10.10.1, 10.10.2, 10.10.3, 10.10.4, 10.10.5, & 10.10.7. Vegetation Community: Semi-arid, open woodland/shrubland with understorey of shrubs, soft tussock grasses and *Triodia* hummock grass. Altitude: 100-400m. Other: Sandy substrates. **Morgan et al. 2002** - REs: 10.3.27, 10.5.1, 10.5.5, 10.5.11, & 10.5.12. Restricted to sandy open woodlands habitats in the southern Desert Uplands on the Alice Tableland.
Yakka Skink *Egernia rugosa*	**VMA Essential Habitat Database (Habitat Factors)** - REs: 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.3.17, 10.3.19, 10.3.20, 10.3.21, 10.3.22, 10.3.23, 10.3.25, 10.3.27, 10.3.28, 10.3.30, 10.3.31, 10.4.1, 10.4.2, 10.4.3, 10.4.4, 10.4.5, 10.4.6, 10.4.7, 10.4.9, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.6, 10.7.7, 10.7.8, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.9.6, 10.9.8, 10.10.1, 10.10.2, 10.10.3, 10.10.4, 10.10.5, & 10.10.7. Vegetation Community: Among dense ground vegetation, fallen timber or rock outcrops, in open and low closed scrub, sandplain areas, woodland (brigalow), open dry sclerophyll (ironbark) and lancewood forest. Altitude: 100-400m. **SEWPaC** - Known to occur in open dry sclerophyll forest, woodland and scrub. The core habitat of this species is within the Mulga Lands and Brigalow Belt South Bioregions. Occurs in a wide variety of vegetation types within Queensland Regional Ecosystem Land Zones: LZ 3 Alluvium (river and creek flats), LZ 4 Clay plains (not associated with current alluvium), LZ 5 Old loamy and sandy plains, LZ 7 Ironstone jump-ups, LZ 9 Undulating country on fine-grained sedimentary rocks, and LZ 10 Sandstone ranges.
Black-necked Stork *Ephippiorhynchus asiaticus*	**VMA Essential Habitat Database (Habitat Factors)** - REs: All regional ecosystems within the stream/wetland buffer as determined by VMA code. Vegetation Community: Extensive semi-permanent to permanent shallow wetlands - swamps, lakes and wet heathlands with some tall emergent vegetation associated with coastal wetlands (including tidal flats & mangroves), river floodplains and open woodland (eucalypt and melaleuca); also uses irrigated lands, sewage ponds and grassland. Nest in wide stick platform in top of tree or stump (up to 30m high) in isolated part of freshwater swamp. Altitude: Sea level to 1000m. **Morgan et al. 2002** - REs: 10.3.2, 10.3.6, 10.3.10, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.4.8, & 10.5.5.

Species	Habitat Descriptors
Squatter Pigeon (southern) *Geophaps scripta scripta*	**VMA Essential Habitat Database (Habitat Factors)** - REs: 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.19, 10.3.20, 10.3.27, 10.3.28, 10.3.30, 10.3.31, 10.4.3, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.2, 10.7.3, 10.7.5, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.10.1, 10.10.3, 10.10.4, 10.10.5, & 10.10.7. Vegetation Community: Dry eucalypt woodland (including poplar box, spotted gum, yellow box, acacia and callitris), with sparse short grass, often on sandy areas near to permanent water; grassy eucalypt woodlands. Nest on ground near or under grass tussock, log or low bush. Position in landscape: Gravelly ridges, traprock and river flats. **Morgan et al. 2002** - REs: 10.3.1, 10.3.10, 10.3.12, 10.3.13, 10.3.14, 10.3.2, 10.3.22, 10.3.28, 10.3.3, 10.3.4, 10.3.6, 10.3.7, 10.3.9, 10.4.8, 10.5.11, 10.5.5, 10.7.1, 10.7.10, 10.7.7, & 10.9.2.
Square-tailed Kite *Lophoictinia isura*	**VMA Essential Habitat Database (Habitat Factors)** - REs: 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.19, 10.3.20, 10.3.27, 10.3.28, 10.3.30, 10.3.31, 10.4.3, 10.4.7, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.2, 10.7.3, 10.7.5, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.10.1, 10.10.3, 10.10.4, 10.10.5, & 10.10.7. Vegetation Community: Open eucalypt forest and woodland (grassy or shrubby and including riparian) (*Corymbia citriodora/henyri, Eucalyptus pilularis,* ironbark), subtropical rainforest, mallee and heathland; > 500mm rainfall p.a. Nest 12-30m above ground in mature tree (*Eucalyptus, Corymbia* or *Angophora* spp.) in or near forest or woodland along or near watercourse. Altitude: Sea level to 500m. **Morgan et al. 2002** - REs: 10.3.14, 10.5.1, & 10.5.5. Uncommon in the Desert Uplands and records are all from the north east.
Black-chinned Honeyeater *Melithreptus gularis*	**VMA Essential Habitat Database (Habitat Factors)** - REs: 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.19, 10.3.20, 10.3.26, 10.3.27, 10.3.28, 10.3.29, 10.3.30, 10.3.31, 10.4.3, 10.4.7, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.6, 10.5.7, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.2, 10.7.3, 10.7.5, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.10.1, 10.10.2, 10.10.3, 10.10.4, 10.10.5, & 10.10.7. Vegetation community: Mostly in canopy of dry eucalypt forest and woodland (especially bloodwood – *Corymbia citriodora*, ironbark – *Eucalyptus sideroxylon* and box – *E. moluccana*, *E. albens* associations on western slopes, especially where rainfall 400-700mm pa), also callitris and melaleuca woodland, riparian eucalypts (*E. tereticornis, E. camaldulensis*) and acacia scrub; in northern areas in tall stringybark & bloodwood woodlands; grassy open *E. melanophloia* and shrubby open *E. similis* woodlands. Nest in outermost and topmost foliage of tree (usually eucalypt); 1-25m above ground. Altitude: 100-500m. **Morgan et al. 2002** - REs: 10.3.8, 10.5.1, & 10.7.11. The Desert Uplands is a broad area of intergradation between the southern rare/near threatened sub-species and the northern common sub-species. It is not clear which is present in the bioregion.
Cotton Pygmy-goose *Nettapus coromandelianus*	**VMA Essential Habitat Database (Habitat Factors)** - REs: All regional ecosystems within the stream/wetland buffer as determined by VMA code. Vegetation community: Still, deep, permanent, freshwater lagoon, swamp (e.g. paperbark) and river covered with aquatic herbage, e.g. *Nymphaea* and *Hydrilla* spp.; seasonal shift in habitat use – swamps & creeks (wet), lagoon (wet-early dry) and river/lake (late dry). Altitude: 100-500m. **Morgan et al. 2002** - REs: 10.3.3, 10.3.6, 10.3.13, 10.3.14, 10.4.8, & 10.5.5. Generally more likely to occur in wetlands and artificial water bodies of Subregion 3 (e.g. Lake Powlathanga), though may occur sporadically and seasonally in other wetlands like Caukingburra Swamp.

Species	Habitat Descriptors
Brigalow Scaly-foot *Paradelma orientalis*	**VMA Essential Habitat Database (Habitat Factors) -** REs: 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.7, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.3.17, 10.3.19, 10.3.20, 10.3.21, 10.3.22, 10.3.23, 10.3.25, 10.3.27, 10.3.28, 10.3.29, 10.3.30, 10.3.31, 10.4.1, 10.4.2, 10.4.3, 10.4.4, 10.4.5, 10.4.6, 10.4.7, 10.4.9, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.6, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.6, 10.7.7, 10.7.8, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.9.6, 10.9.7, 10.9.8, 10.10.1, 10.10.2, 10.10.3, 10.10.4, 10.10.5, & 10.10.7. Vegetation community: Under logs and ground debris in acacia (Acacia harpophylla & A. falciformis) woodland, or eucalypt (e.g. Corymbia citriodora, Eucalyptus crebra, or *E. populnea*) woodland and open forest with sparse grass cover or *Callitris/Allocasuarina* subcanopy; also vine thicket; low open *Acacia cambagei* woodland and *Eremophila mitchellii* shrubland with tussock grass understorey. Altitude: Sea level to 800m. Position in landscape: Grey/black cracking clay alluvial, sandy clay or sandstone substrates. **Morgan et al. 2002** - REs: 10.3.25, 10.3.4, 10.9.2. Outlying records in the Desert Uplands in Acacia woodlands in eastern flowing catchments. **SWEWPaC** - Core habitat occurs mostly within the Brigalow Belt South bioregion. Found in a wide variety of remnant and non-remnant open forest to woodland habitats. Known to persist in highly disturbed vegetation types, for example those areas invaded by Buffel Grass (*Cenchrus ciliaris*), Parthenium (*Parthenium hysterophorus*), and other weeds. Occurs within the following Queensland Regional Ecosystem Land Zones: LZ 3 - Alluvium river and creek flats, LZ 4 - Clay plains not associated with current alluvium; LZ 5 - Old loamy and sandy plains; LZ 7 - Ironstone jump-ups, LZ 8 - Basalt plains and hills (only where close to the interface with LZ 10), LZ 9 - Undulating country on fine-grained sedimentary rocks, and LZ 10 - Sandstone ranges. **Kutt et al. 2003** - Gidgee *Acacia cambagei* woodland with occasional *Eremophila* and *Carissa*, and a ground cover of forbs and grasses with abundant fallen timber on cracking alluvial clays (Ulcanbah Station).
Koala *Phascolarctos cinereus*	**VMA Essential Habitat Database (Habitat Factors) -** There are no habitat factors listed as this species as it is not listed as a threatened species under the NCA outside of the south-east Queensland bioregion. **Morgan et al. 2002** - REs: 10.3.1, 10.3.2, 10.3.4, 10.3.5, 10.3.6, 10.3.7, 10.3.9, 10.3.10, 10.3.11, 10.3.14, 10.3.27, 10.3.28, 10.5.1, 10.5.5, & 10.7.1. **Ellis et al. 2002 –** Fodder trees, in order of decreasing proportion of the diet: *Eucalyptus populnea, E. crebra, E. terreticornis, E. cambageana, E. melanophloia*, and *Corymbia dallachiana* (Clermont). **Ellis et al. 1995 –** Fodder tree species (though not ranked in terms of dietary composition): *E. orgadophylla, E. crebra, E. terreticornis*, and *E. melanophloia* (Springsure).
Black-throated Finch (southern) *Poephila cincta cincta*	**VMA Essential Habitat Database (Habitat Factors) -** REs: 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.3.17, 10.3.19, 10.3.20, 10.3.21, 10.3.22, 10.3.23, 10.3.25, 10.3.27, 10.3.28, 10.3.30, 10.3.31, 10.4.1, 10.4.2, 10.4.3, 10.4.4, 10.4.5, 10.4.6, 10.4.9, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.6, 10.7.7, 10.7.8, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.9.6, 10.9.8, 10.10.1, 10.10.2, 10.10.3, 10.10.4, 10.10.5, & 10.10.7. Grassy open woodland dominated by Eucalyptus, Acacia and Melaleuca spp. (e.g. *E. platyphylla, E. erythrophloia, E. melanophloia, E. brownii, E. whitei, E. similis, E. camaldulensis, Corymbia plena, C. dallachiana, C. setosa, M. viridiflora, M. leucodendra*) with high diversity ground cover of perennial grasses (e.g. *Heteropogon, Themeda, Bothriochloa, Eulalia, Enneapogon, Triodia, Triopogon, Chrysopogon, Aristida*) and shrub layer usually sparse or absent. Nest in topmost twiggy branches of eucalypt, occasionally in tree hollow or termite mound, up to 12m above ground. Altitude: 50-350m. **Morgan et al. 2002** - REs: 10.3.6, 10.3.9, 10.3.13, 10.3.28, 10.4.8, 10.5.1, 10.5.5, & 10.7.11. **2007 Recovery Plan** - REs: 10.3.6, 10.3.9, 10.3.13, 10.3.28, 10.4.8, 10.5.1, 10.5.5, & 10.7.11.
Freckled Duck *Stictonetta naevosa*	**VMA Essential Habitat Database (Habitat Factors)** - REs: All regional ecosystems within the stream/wetland buffer as determined by VMA code. Vegetation community: Quiet freshwater lake, lagoon, swamp (swampy grassland) and saline lake; breed on ephemeral/permanent inland wetlands with extensive cumbungi *Typha* spp. and lignum *Muehlenbeckia cunninghamii/florulenta*; in non-breeding or dry periods move to large permanent wetlands. Altitude: Sea level to 200m. **Morgan et al. 2002** - REs: 10.3.6, 10.3.14, 10.3.15, 10.3.23, & 10.5.5. Occurs sporadically in wetlands, riparian areas and artificial water-bodies. Population numbers fluctuate with climatic conditions. Thought to be relatively stable, though difficult to assess. Its occurrence in Subregion 2 in both woodland and wetland systems, suggest this species visits the Lake and riparian areas during wet periods and occasionally utilises large artificial dams and water points.

Species	Habitat Descriptors
Common Death Adder *Acanthophis antarcticus*	**VMA Essential Habitat Database (Habitat Factors) -** REs: 10.3.5, 10.3.6, 10.3.7, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.3.17, 10.3.19, 10.3.20, 10.3.21, 10.3.22, 10.3.23, 10.3.25, 10.3.27, 10.3.28, 10.3.29, 10.3.30, 10.3.31, 10.4.1, 10.4.2, 10.4.3, 10.4.4, 10.4.5, 10.4.6, 10.4.7, 10.4.9, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.6, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.6, 10.7.7, 10.7.8, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.9.6, 10.9.7, 10.9.8, 10.10.1, 10.10.2, 10.10.3, 10.10.4, 10.10.5, & 10.10.7. Vegetation community: Under deep leaf litter or low foliage in shrubland (heathland), woodland and tall forest, especially undisturbed eucalypt forest. Altitude: Sea level to 950m. **Morgan et al. 2002** - REs: 10.3.27 & 10.10.5.
Northern Quoll *Dasyurus hallucatus*	**VMA Essential Habitat Database (Habitat Factors) -** There are no habitat factors listed as this species is not listed as a threatened species under the NCA. **SEWPaC** - Habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Rocky habitats are usually of high relief, often rugged and dissected. Eucalypt forest or woodland habitats usually have a high structural diversity containing large diameter trees, termite mounds or hollow logs for denning purposes. Dens are made in rock crevices, tree holes or occasionally termite mounds. **2010 Recovery Plan** - Northern quolls do not have highly specific habitat requirements and occur in a variety of habitats across their range. Therefore habitat critical to survival is that where northern quolls are least exposed to threats or least likely to be in the future. Given the threats outlined (Cane Toads, feral predators, inappropriate fire regimes, broad-scale baiting, hunting, & disease), two particular broad habitat types fall into this category: rocky areas and offshore islands.
Ornamental Snake *Denisonia maculata*	**VMA Essential Habitat Database (Habitat Factors)** - There are no REs listed for the Desert Uplands Bioregion. Vegetation community: Under litter/fallen timber and in wide soil cracks, in riparian woodland/open forest and shrub/woodland including Brigalow *Acacia harpophylla*. Altitude: 100-450m. Position in landscape: Near freshwater waterholes/creeks. Soils: Deep cracking clay and sandy loam substrates. **SEWPaC** - Known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions in Queensland Regional Ecosystem Land Zone 4, but also lake margins and wetlands. Refuge habitat during dry periods typically within soil cracks on gilgai mounds within the habitat area. Preferred habitat is within, or close to, habitat that is favoured by its prey - frogs.

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