

- *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act).

State legislation includes the:

- *National Parks and Wildlife Act 1972* (SA) (NP&W Act), especially Schedules 7, 8 and 9 as revised in the *National Parks and Wildlife (Miscellaneous) Amendment Act 2000* and in 2008
- *Natural Resources Management Act 2004* (NRM Act), which repeals the Animal and Plant Control (Agricultural Protection and Other Purposes) Act 1986 and the Soil Conservation and Land Care Act 1997 and incorporates the functional requirements of these latter Acts under the NRM Act. The NRM Act establishes provisions for the management of the State's natural resources, including pest plants and animals and the land and water resources.
- *Native Vegetation Act 1991* (SA), *Native Vegetation (Miscellaneous) Amendment Act 2002* and the Native Vegetation Regulations 2003
- *Mining Act 1971*, including its Regulations as the Mines and Works Inspection Regulations 1996 and the Mining Regulations 1998 (for the extractive industry site).

International, Commonwealth and State agreements, policies and strategies relevant to habitats, communities and species include the:

- Convention on Biological Diversity and The National Strategy for the Conservation of Australia's Biological Diversity (ANZECC, Department of the Environment, Sport and Territories 1996)
- National Strategy for the Conservation of Australian Species and Communities Threatened with Extinction (Endangered Species Advisory Committee 1992)
- Threatened Species Strategy for South Australia (Department of Environment and Natural Resources 2007)
- The State Government policy, No Species Loss A Biodiversity Strategy for South Australia 2006–2016 is the key policy for protection of biodiversity in the State and is applicable to the project.

4 Taxonomy and nomenclature

Plant taxonomy and conservation status accords with Barker et al. (2005).

The taxonomy of vertebrates follows the State listings of Robinson and Casperson (2000) as updated by the following sources:

- Birds Christidis and Boles (2008)
- Mammals Menkhorst (2002)

- Reptiles and amphibians Wilson and Swan (2008) as updated by M. Hutchinson, SA Museum, pers. comm. 2008.

Definitions of threat status applied in this report are as follow:

- National EPBC Act definitions
- State Species NPW Act Schedules
- Communities Neagle (1995) and DEH (2005) (no legal status)
- Regional Lang and Kraehenbuehl (2002, 2008 update) for flora and Robinson et al. (2000) and Birds Australia (2003) (no legal status) for fauna.

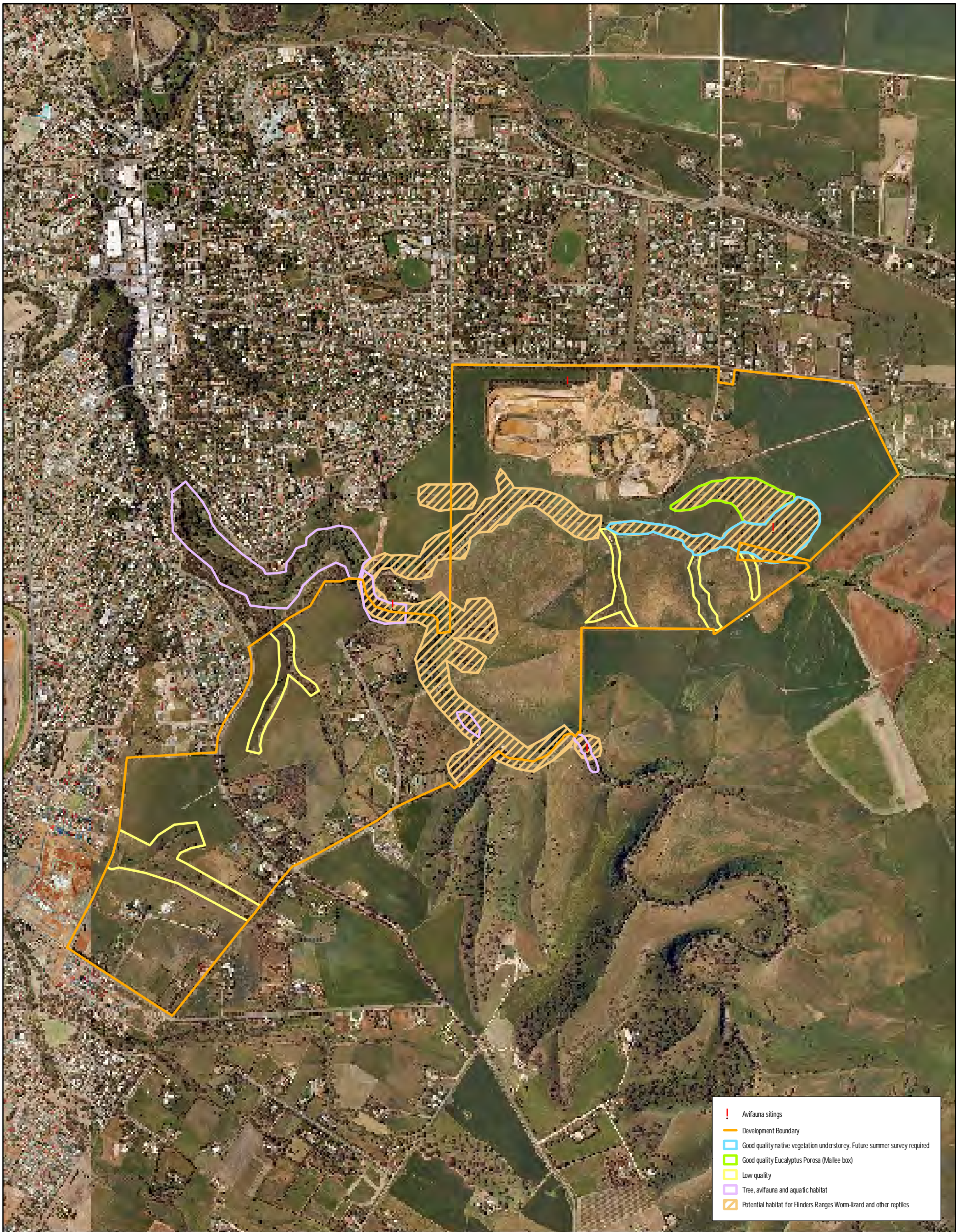
5 Methodology

Following review of an aerial photograph of the site, a reconnaissance survey of the site was undertaken in August and September 2008 by Dr Bob Anderson and Sarah Reachill. This survey involved a general assessment of all of the site and identification of areas of potential conservation significance. Specific areas of potential interest, such as riparian, rocky and remnant woodland sites, were reviewed on foot. These included sections of the South Para River and an unnamed tributary of the River, plus areas of remnant *Eucalyptus porosa* woodland to the east of the site. Site-specific and incidental observations of all species observed were recorded for the site and surrounding area. The results of the initial survey are described in KBR (2008).

Following on from the initial survey it was determined that much of the site is anthropogenic and provides habitat primarily for introduced plants and for a few common flora and fauna species only. However, there are smaller areas of higher quality habitat for flora and fauna species, as illustrated on Figure 1. These include:

- the rocky creekline (the unnamed tributary of the South Para River referred to above) which traverses the site in a north to south direction and veering east to west in the northern portion of the site. This represented potential habitat for the nationally threatened Flinders Ranges Worm Lizard (*Aprasia pseudopulchella*) and a number of other reptile species.
- riparian areas of the South Para River, primarily for avifauna and aquatic species.
- areas of remnant native woodland and grassland, for bats, some avifauna and possibly, a few reptile species, including species dependent on spider burrows. This could include the Adelaide bluetongue lizard (*Tiliqua adelaidensis*).

An active search of the site was undertaken on 21 to 23 November (dawn and day surveys) and 27 and 28 December 2008 (dawn and dusk surveys) and 16 January 2009. Each survey reviewed the vegetation, flora and habitat areas on the site. Specific faunal groups surveyed by observation on each occasion included:



- ! Avifauna sightings
- Development Boundary
- Good quality native vegetation understorey. Future summer survey required
- Good quality Eucalyptus Porosa (Mallee box)
- Low quality
- Tree, avifauna and aquatic habitat
- ▨ Potential habitat for Flinders Ranges Worm-lizard and other reptiles



K 0 100 200 400 600 800 1,000
Metres 1:15,000 @A3

SOURCE Aerial photography and cadastre provided by Delfin Lend Lease		
GIS FILE	PROJECTION	DATE
G:\AEN814\KBR data\AEN814-G-GIS-001-RevB.mxd	MGA 94 Zone 54	27 January 2008

Kellogg, Brown & Root Pty Ltd
KBR
 Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317
 186 Greenhill Rd, Parkside SA 5063
 Drawn by SJR

TITLE	
Figure 1 Areas of biological significance	
DRAWING No.	Rev
AEN814-G-GIS-001	C

- mammals and avifauna (terrestrial and riparian)
- amphibians
- reptiles.

Conditions at the time of each assessment were cool for November, cool mornings and evenings and warm days during December and hot and dry for the week preceding the January survey. Mallee box was flowering in November and River red gum was flowering in December and January. These trees provided key attractants for woodland bird species. Remnant pools of water were present in the South Para River section of the site in November and December, but not in January. Water was not present in the unnamed tributary of the River during all of the surveys.

Areas of loose rocks and rock outcrop, especially those in and surrounding the watercourses, were thoroughly investigated by rock turning to ascertain the presence of ground fauna.

Observations of all flora and fauna species were recorded as field notes.

Further survey of the site using various trapping methods is anticipated to be undertaken in 2009.

Limitations

The western areas of the proposed development were specifically excluded from the assessment by the Client. The area assessed is that shown on Figure 1.

The assessment was undertaken during the third consecutive year with below average rainfall. Consequently, some plants and animal species which may be present in years of average or above average rainfall may not have been present or recorded during the assessments.

Heavy livestock grazing pressure (sheep) in the project area over summer was, presumably, established by the landholder to reduce fuel loads as part of fire management actions. This also resulted in the removal of most of the native understorey plants, especially summer growing species. Consequently, it was impossible to accurately assess the species diversity present in the site.

The assessment has yet to undertake detailed trapping of some faunal groups, namely reptiles by pitfall trapping and micro-chiropteran bats by call recording and harp trapping. Applications for a Scientific Permit and Animal Ethics Approval have been provided to the Research Permits group of DEH for the former assessment program.

If these surveys are undertaken in future, then the results would be reported as an addendum or supplementary report. All works would be focused on the areas of habitat defined in Figure 1.

6 Results

This section provides a summary of all observations over the period August 2008 to January 2009.

Vegetation communities and flora species

There is a relatively large area of *Eucalyptus porosa* open woodland +/- *Acacia pycnantha* over *Dianella revoluta* and native grasses and herbs to the east of the property (Figure 1 and Appendix B). The area of this community is associated with low hills, rock outcrops and relatively shallow soils. Some areas have a similar density of mature trees as would be expected to have occurred in the past and areas with a partially intact understorey are also present. Many of the trees being large and mature i.e. estimated to be over 150 years old. Despite continued grazing pressure and weeds infestations, these areas are in reasonably good condition with a relatively high diversity in sections of the understorey (refer to photographs in Appendix B).

The distribution of all trees in the site, especially significant trees as defined under the *Development Act 1993* is recorded in Steinwedel (2007).

Some of the areas in between larger trees appear to have been revegetated, using Mallee box and some native, but not indigenous species, such as *E. albopurpurea* (Port Lincoln mallee).

A total of 102 vascular plant species was recorded on the site of which 41 were native and 61 were introduced (refer to Appendix C). Additional species in both groups expected to be distinguished during the late spring and summer surveys were not detected, primarily due to the below average rainfall and heavy livestock grazing pressure.

Myosotis australis (Austral forget-me-not); a species rated as rare in the Southern Lofty botanical region (SLBR), is present. Regionally uncommon species in the SLBR were also recorded as *Lomandra sororia/densiflora* (Sword mat rush), *Euphorbia drummondii* (Euphorbia), *Pleurosorus rutifolius* (Blanket fern) and *Solenogyne dominii* (Smooth solenogyne).

The South Para River, which traverses the south western section of the property, includes areas of *Eucalyptus camaldulensis* (River red gum) tall woodland over *Typha domingensis* +/- *Phragmites australis*. Individual trees of River red gum are present along the eastern watercourse and along the South Para River, with occasional trees of *E. leucoxylon* elsewhere on the property (see Steinwedel 2007 for their distribution).

The remainder of the property is primarily anthropogenic, either as cultivated areas for grain crops or improved pasture, as a weedy herbland and grassland (+/- pasture species) and with occasional to larger areas of planted trees, especially around the quarry site as amenity plantings.

Heavy sheep grazing over summer has further degraded the vegetation communities and habitat recorded at the time of the initial surveys in 2008. Subsequently much of the groundstorey and shrubstorey vegetation has been damaged or destroyed and it has been impossible to undertake worthwhile surveys to determine the presence and distribution of additional native plant species. Comparative examples of the area

before and following grazing are in Figures 2 and 3. Additional site photographs from summer are in Appendix C.



Figure 1
Area of good quality native understorey August 2008



Figure 2
Area of good quality understorey January 2009 (south of the site in photo 1)

Fauna species and habitat areas

No DEH Biological Survey assessment sites occur at or near this location (Armstrong et al. 2003, NatureMaps 2008). DEH and SA Museum databases have records of 21

bird species and five frog species for the general region of the site. There are nil records of mammals and reptiles.

However, within the wider region i.e. an area of 10 km x 10 km from the centre of site, about 290 species from all faunal groups have been recorded from all sources in the literature. This also includes records from Birds Australia (Paton et al. 1994), Turner (2001) and assessments reported in DTEI (2007). The dominant native faunal group is birds (avifauna) with 210 species, followed by reptiles (40 species), mammals (20 species) and amphibians (6 species). The remainder of the species listed in other reports and the literature are introduced.

The main faunal habitat areas present in the site are:

- *Eucalyptus porosa* open woodland, especially where it occurs over rocky outcrops
- *Eucalyptus camaldulensis* open woodland over tall sedgeland and grassland along riparian areas
- South Para River and the unnamed eastern drainage line and especially the rock outcrops associated with these watercourses
- quarry precinct
- anthropogenic cropping and pasture areas.

From a fauna habitat perspective, there is limited habitat complexity remaining on the site, with the better quality areas, which are most prospective for fauna, associated with:

- the large, mature trees, particularly those with hollows for birds, micro-chiropteran bats and some reptiles and spider burrows associated with some of the small areas of native grassland
- riparian areas for aquatic fauna, especially some birds, plus as a water source for fauna generally. This includes steep, sandy banks suitable for nesting by some bird species
- rocky outcrops for reptiles.

These habitat areas are of moderate to high value.

The remaining areas are anthropogenic would be expected to be used by common and cosmopolitan native and introduced species only, especially avifauna. It is possible that the mining faces in the quarry provide suitable habitat for some species. Fairy martin and welcome swallow were recorded breeding in this area, along with feral bird species.

Rocky areas

Western grey kangaroo and echidna were recorded as two and one individuals respectively on the site and both species were present along the gullies.

The rocky areas represent habitat for a suite of reptile species including the nationally vulnerable Flinders Ranges worm-lizard (*Aprasia pseudopulchella*). Active searching recorded this species within the rocky creek line; however, its presence and population numbers requires confirmation by further formal survey.

Other species recorded in the site included juvenile and adult Eastern brown snake (*Pseudonaja textilis*), Eastern bearded dragon (*Pogona barbata*), Sleepy lizard (*Tiliqua rugosa*), Eastern bluetongue (*Tiliqua scincoides*), Dwarf skink (*Menetia greyii*), *Morethia* sp., Earless skink (*Hemiergis peronii*) and Adelaide snake-lizard (*Delma molleri*). Tiger snake was reported as occurring in the past on the lower lying areas of the site by the residents living in the site (just north of the South Para River).

Woodlands

The riparian woodland habitat, namely *Eucalyptus camaldulensis* and very open Mallee box woodland, provided habitat for a wide range of bird species. Common bird species such as Australian magpie, White plumed honeyeater Galah Willie wagtail, Red wattlebird and Crested pigeon were recorded throughout the site during most site assessments.

Species of particular conservation significance recorded included:

- Rainbow bee-eater. Present in December as up to 10 individuals. Hawking for insects from Eucalypts, with a preference for riparian areas in December. Nest sites not recorded, but may occur.
- Peregrine falcon. Adult female recorded on the northern edge of the quarry with rock dove (feral pigeon) kill. The site is well within the range of the pair of falcons that nest at RAAF Edinburgh.
- Elegant parrot. Recorded as two individuals in a small flock of red-rumped parrots.
- Red-capped robin. Present as one sub-adult male.

By observation during earlier evening, bats are present in the site and expected to be present in most of the woodland and riparian areas.

A survey of the Gawler River west of the Gawler township was undertaken by the SA Museum in 2006 (SA Museum 2006) and recorded various species in and adjacent to the *E. camaldulensis* woodland that surrounds the watercourse.

A total of seven bat species were recorded during the survey, which included two bat species not previously recorded for the region. Prior to the survey, few previous records existed for the Gawler River and for the surrounding region.

White-striped freetail bat (*Tadarida australis*), Southern freetail bat (*Mormopterus* sp), Gould's wattled bat (*Chalinolobus goudii*), Chocolate wattled bat (*Chalinolobus morio*), Lesser long-eared bat (*Nyctophilus geoffroyi*), Large forest bat (*Vespadelus darlingtoni*) and Southern forest bat (*Vespadelus regulus*) were recorded by calls and/or trapping. Yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*) was recorded by an earlier survey around Gawler. The latter is a rare species with relatively few records for the State.

Any large trees present in the site which are hollow bearing will provide roosting, and, possibly, maternal colony habitat for a number of the bat species. Remnant pools along the South Para River will provide an important source of drinking water.

Under the current plan for development of the site, key habitat areas are to be conserved; therefore a bat survey will not be required. If future development of the