Indicus Biological Consultants

Darwin City Waterfront
(Darwin Wharf) Redevelopment

Terrestrial fauna assessment
December 2003

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Introduction

Indicus Biological Consultants was commissioned by URS Pty. Ltd. to undertake a fauna survey for the proposed Darwin City Waterfront (Darwin Wharf) Redevelopment. The 25 ha study area includes the former Deck Chair Cinema site to the east, the former Stokes Hill Power Station site, Stokes Hill, and land occupied by industrial activities south of Kitchener Drive, including Fort Hill.

The fauna assessment of this site has been conducted as a component of an Environmental Impact Assessment (EIS) for the proposed project. The avian and terrestrial vertebrate fauna survey methodology and findings are presented in this report. Fauna species and habitats are identified, and the potential impacts of the proposed development and mitigation measures are discussed. The report has been prepared in accordance with the guidelines provided by the Department of Lands Planning and Environment (2003).

Survey Methods

The fauna survey methodology complies with the requirements of the EIS/PER guidelines developed by Northern Territory Department of Infrastructure, Planning and Environment - Environment and Heritage Division and is consistent with the Northern Territory Parks and Wildlife fauna survey standard methodology. The distributions of the highly disturbed vegetation on the site rendered the standard quadrat shape impractical, therefore three transect lines were constructed all approximately 300 m long.

Each transect consisted of four cage traps and 20 Elliot traps spaced evenly apart, with the exception of the Esplanade, which was trapped along its entirety (8 cage traps and 40 Elliots). The traps were baited with honey, oats and peanut butter. Bait for cages were also mixed with tuna to attract native carnivorous predators like the Northern Quoll. All traps were open for 3 nights, with traps checked and closed each morning and rebaited in the late afternoon. Survey throughout the remainder of the site consisted of active searches at varying times throughout the survey period. The site was surveyed from the 26-30 of November 2003. Weather conditions varied from mildly cloudy with little wind to moderately cloudy and a slight breeze, throughout the survey period.

Bird counts

Each transect was censored for birds three times in the morning and three times in the afternoon with an additional two nocturnal visits. Bird counts involved walking through the transect and were considered an instantaneous count of all the birds heard or observed utilising the transect recorded. Birds flying overhead were not included and raptors were only included if observed hunting overhead.

Active Searches

Each transect was actively searched three times for reptiles, mammals, scats and signs. Each active search lasted for ten minutes and involved turning rocks and logs, raking through leaf litter, looking under bark, in crevices, etc. Three searches were conducted during the day (morning, midday and late afternoon) with an additional two searches of each quadrat at night using spotlights.

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Incidental records

Other species seen in the general area that were not attributable to a transect were recorded separately on a list for the survey area. All incidental records were assigned to broad habitat categories.

Bat sampling

Using the Anabat system (Titley Electronics) ten minute recordings were undertaken in each transect during spotlighting and a three hour session was conducted at the entrance to one of the WWII oil storage tunnels along the esplanade. The recordings taken by the Anabat detector system were analysed by Mr Damian Milne from the Biodiversity section, Natural Systems, Department of Infrastructure, Planning and Environment for the presence of micro bats.

Taxonomy and Nomenclature

Common and scientific names used in this report follow Strahan (1998) for mammals, Christidis and Boles (1994) for birds, Cogger (2000) for reptiles and Tyler and Davies (1986) for frogs.

Limitations

The survey is limited by its extent and the time period over which the survey was conducted. Cryptic, seasonal and rare species may not have been recorded due to the relatively short sampling period, and further species may be detected if trapping were conducted over a longer period, or throughout different times of the year. However the heavily disturbed and fragmented condition of the small pockets of vegetation on the site are unlikely to contain rare species.

Relevant Literature

Relevant literature includes the *Territory Parks and Wildlife Conservation Act 2001* (Parks & Wildlife Commission of the Northern Territory 2001) and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia 1999) as well as the China-Australia Migratory Bird Agreement (CAMBA) 1987 and the Japan-Australia Migratory Birds Agreement (JAMBA) 1974. Species that are covered by these Treaties and Acts that were either recorded on site or could potentially occur on the site were noted. Potential impacts were identified and management recommendations proposed, where necessary.

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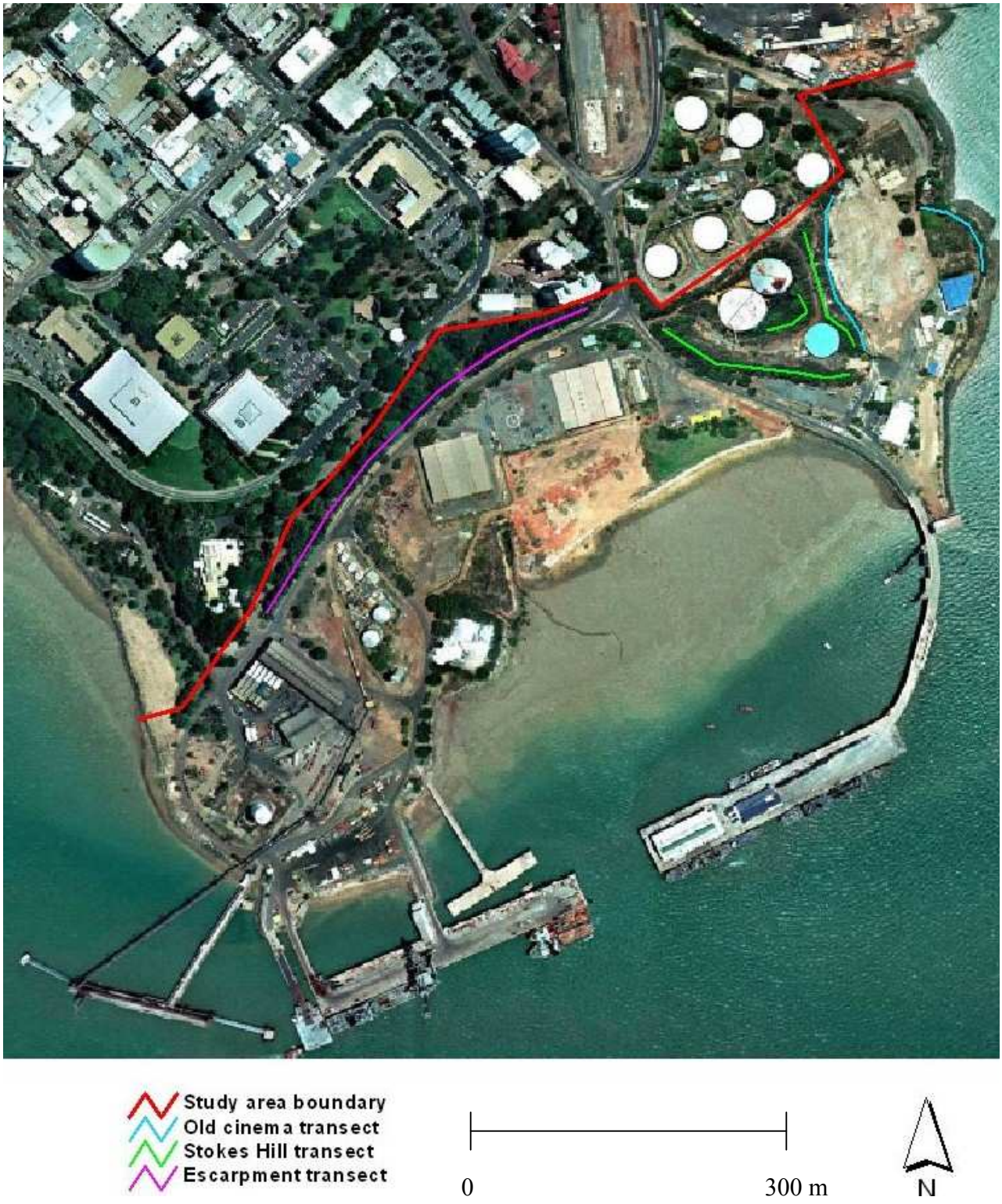
Figure 1. Map showing study area and location of transect sites



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Results

Previous surveys

Few studies have been recently conducted in the general area prior to the current assessment. However, a comprehensive management plan for Charles Darwin National Park (PWCNT 2003) provides some insight into species that may be present in the area. This study outlined many species of conservation significance present in the park, and those that could possibly be present in the study area are discussed briefly below.

Many species of conservation significance have been recorded in Charles Darwin National Park (see Table 1). However, the majority of species that are likely to inhabit the highly disturbed study area are migratory or widely foraging birds. Most would only utilize the coastline sections of the study area, predominantly foraging along the small mudflats adjacent to Stokes Hill Wharf during low tides. At present this habitat is abundant in Darwin Harbour and its surrounds. Other species including Rainbow Bee-eaters and Leaden flycatchers are still abundant in the Top End and similarly their habitats are just as plentiful.

The following threatened species are highly unlikely to inhabit the study area due to their habitat requirements and life history traits.

Mammals

False Water rats have been sparsely recorded in the Northern Territory (11 known records from only six sites). The latest record was from the Glyde River in 1999 (Woinarksi et al. 2000). There is no known habitat for this species throughout the site.

Ghost Bats have been recorded only once from the Darwin region. They require large caves, mines or deep rock fissures to roost in (Strahan 1998). Although there are some World War 11 oil storage tunnels present on the site, no Ghost Bats were recorded in this survey and due to their habitat requirements it is unlikely that they occur in the area.

Birds

Red Goshawks appear at low density in open forests in the Top End. They are listed as Vulnerable (Garnett and Crowley 2000) due to their apparent range contraction from increased habitat modification for agriculture in eastern Australia. This species is highly unlikely to utilize the study area.

Partridge Pigeons are listed as Vulnerable (Garnett and Crowley 2000) and populations have noticeably declined in some regions. This is possibly due to feral predators, altered fire regimes, grazing and hunting. However, there is no habitat present for this species on the site.

Gouldian Finches were once distributed throughout the tropical savannas of northern Australia. They are now restricted to isolated areas mostly within the Northern Territory and the Kimberley (PWCNT 2001). There are no recent records of Gouldian Finches around the Darwin area and there is no habitat for this species present in the study area.

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Table 1. Threatened species that may inhabit the Wharf Precinct study area

	Common name	Species	Status	Recorded
	Mammals			
	Ghost Bat	*Macroderma gigas*	Near Threatened (DIPE)	
	False Water Rat	*Xeromys myoides*	Vulnerable (EPBC)	
	Birds			
*	Great Egret	*Ardea alba*	J C	
*	Eastern Reef Egret	*Egretta sacra*	C	
*	White-bellied Sea-eagle	*Haliaeetus leucogaster*	C	
	Red Goshawk	*Erythrotriorchis radiatus*	Vulnerable (EPBC)	
	Black-tailed Godwit	*Limosa limosa*	J	
*	Bar-tailed Godwit	*Limosa lapponica*	J C B	
*	Whimbrel	*Numenius phaeopus*	J C B	
*	Eastern Curlew	*Numenius madagascariensis*	J C B	•
*	Common Sandpiper	*Actitis hypoleucos*	J C B	•
*	Grey-tailed Tattler	*Heteroscelus brevipes*	J C B	
	Great Knot	*Calidris tenuirostris*	J	
	Sanderling	*Calidris alba*	J	
*	Sharp-tailed Sandpiper	*Calidris acuminata*	J C B	
*	Beach Stone-curlew	*Esacus neglectus*	V	
	Bush Stone-curlew	*Burhinus grallarius*	Near Threatened (DIPE)	•
*	Greater Sand Plover	*Charadrius leschenaultii*	J C B	
	Oriental Pratincole	*Glereola maldivarum*	J	
	Partridge Pigeon (eastern)	*Geophaps smithii smithii*	Vulnerable (EPBC)	
*	Fork-tailed Swift	*Apus pacificus*	J C	

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	Common name	Species	Status	Recorded
*	Rainbow Bee-eater	*Merops ornatus*	J	
*	Leaden Flycatcher	*Myiagra rubecula*	B	
*	Yellow-rumped Mannikin	*Lonchura flaviprymna*	Least Concern (Action Plan)	
	Gouldian Finch	*Erythrura gouldiae*	Endangered (EPBC)	
	Barn Swallow	*Hirundo rustica*	J	

EPBC= Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
J= Japan- Australia migratory bird agreement.
C= China- Australia migratory bird agreement.
B= Convention on the Conservation of Migratory Species of Wild Animals 1991.
DIPE= Threatened Species List for the Northern Territory.
Action Plan= Action Plan for Australian Birds 2000
•= recorded during the present survey
*= species recorded in Charles Darwin National Park (PWCNT 2003)

Study Area

A total of four mammal species (two introduced), 30 bird species, three amphibian species and six reptile species (one introduced) were recorded during the survey. Transect locations and their vegetation descriptions are given in Table 2. Table 3 lists all fauna species recorded during the survey and all records from the Department of Conservation and Natural Resources fauna database for the Darwin CBD.

The only species recorded that are listed as threatened were the Eastern Curlew and Common Sandpiper. Both of these species are migratory. The Eastern Curlew is considered abundant around the NT coast, while the Common Sandpiper is considered to be widespread in the Northern half of the Top End (Chatto 2003).

Introduced Species

The only introduced fauna species recorded on site were the Asian house gecko *Hemidactylus frenatus*, the Black Rat *Rattus rattus* and feral cat *Felis catus*.

Significant terrestrial fauna species

The majority of species recorded within the study area are widespread in tropical Australia however there are many birds (mostly migratory waders) that have been recorded in the general area. Many of

these species are covered by international migratory bird agreements (CAMBA, JAMBA, or Bonn Convention) and the migratory provisions of the EPBC Act. These species could occur sporadically along the coastline edges at different times of the year. However, the habitats the study area provides for these species are well represented in both the local and the regional area.

The Bush Stone-Curlew is listed as Near Threatened by the New Threatened Species List of the Northern Territory (DIPE 2002) and a pair was recorded breeding on the Old Deckchair Site during this survey. A taxon is designated Near Threatened when it has been evaluated against the IUCN selection criteria but does not qualify for Critically Endangered, Endangered or Vulnerable at present, but is close to qualifying for or is likely to qualify for a threatened category in the near future (IUCN 2001). There are many records of Bush Stone Curlew around the Top End in the NT Bird Atlas database and the site probably does not support more than a few pairs of this species. Therefore the impacts on this species from this development are not considered significant at a regional level.

Significance of habitats to terrestrial and avian wildlife

Old Deck Chair Site

This site consists of predominantly cleared land with introduced species growing amongst old building foundations and rubble (Figure 2). Two bird species were recorded breeding on this site; Bush Stone Curlew and Masked Lapwing. Both of these species are ground dwelling and common at present in the Darwin area and in the region. The only varanid recorded during the survey was found utilizing this site and (presumably the same individual) the adjacent Stokes Hill Site. This site provides breeding and roosting habitat to a few locally and regionally common species, but overall is of very little significance to native fauna.

Stokes Hill Site

The introduced Coffee Bush (*Leucaena luecocephala*) dominates this site and there is very little habitat for native species. This is evidenced by the conspicuous lack of skink species, a usually abundant component of local woodland habitats that contain substantial leaf litter. One widespread and common species was noted to be breeding on this site; Masked Lapwing.

Escarpment Site

The escarpment site contains some remnant vegetation and the most species were recorded from this site. However, the vast majority of these were locally common birds. The site provides little habitat for ground dwelling species such as skinks. Only one arboreal species was recorded, the Brushtail Possum. The site probably provides roosting/breeding and foraging sites for many bird species throughout different times of the year.

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Potential and Anticipated Impacts

Although the study area is heavily degraded and modified, the fauna of the area are typical of those found in the Top-End coast. However, some areas such as the escarpment probably provide habitat for many bird species throughout different times of the year. With this in mind, the clearing of vegetation should be kept to a minimum, and weed populations should be controlled.

Major Impacts

The primary impact from the proposed development will be the loss of habitat as a direct result of vegetation clearance. However, the habitat on the site is of poor quality in relation to its surrounds (eg. Charles Darwin National Park), but probably provides some patches of habitat for locally common species.

Nightlighting

The effects of night lighting have been shown to be hazardous to migratory birds in other places (Evans Ogden 1996), however this is not considered to be a threat in northern Australia at present. Night lighting can also seriously affect the survivorship of marine turtle hatchlings, but as there are no sandy beaches present along the coast (a requirement for them to nest), this is not considered to be an issue at this site.

Risks and seriousness of impacts

Although the clearance of the majority of the vegetation (excluding the escarpment) is unavoidable for the development of this project, the seriousness of this impact is only at a local scale. In a regional context, many of the species are widespread and represented in many parks and reserves.

Management Recommendations

General management issues

Particular attention should be paid to developing ways of retaining vegetation that are consistent with road design and traffic engineering requirements.

Recommendations

- The installation of temporary fencing of adjacent vegetation (eg. escarpment) prior to any road works; and
- Avoid the widespread dumping of soil and other materials from construction.

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Weeds

Spread of introduced weed species can be facilitated by disturbances such as land clearance, and construction works (particularly by using machinery that are carrying weeds from other areas).

Recommendations

- Monitoring of management actions, notably weed control, and changes in vegetation condition should be used to guide future management decisions. Establishment of permanent photo points is a simple method of monitoring such changes; and

- Any new gardens that are developed should be planted with native flora species endemic to the area to enhance the habitat values of the site. This will also provide for further attractants to native species.

Fauna Reporting Protocols

The likelihood of encountering fauna of conservation significance during the construction or operation phases of the project is very low. As discussed, this is primarily due to the lack of suitable habitat within the study area to support the specialized resource requirements of these species. Any fauna of conservation significance that are likely to be encountered will probably be primarily transitory (eg birds).

A register of significant fauna that may from time to time be encountered within the study area should be maintained. Construction staff should be notified of the importance of recording such fauna in the register. This register should be available to the Department of Lands, Planning and Environment (DLPE). However, only fauna that are obviously resident (breeding or foraging) should be reported to DLPE. Transitory species, such as sea eagles, should be recorded on the register as sightings but not reported to DLPE unless these species take up residence.

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Table 2. Transect localities and brief habitat descriptions (UTM WGS84)

Site	Easting	Northing	Description
Escarpment Site Start	52700487	8620974	Highly disturbed remnant monsoon vine forest patch, predominantly introduced plant species on a very steep slope.
Escarpment Site End	52700778	8621226	
Stokes Hill Site	52700993	8621204	Principally introduced Coffee Bush *Leucaena luecocephala* around old oil storage tanks.
Old Deck Chair Site	52701087	8621234	Introduced grasses interspersed with old building foundations and young Coffee Bush *Leucaena luecocephala*.

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Table 3. Fauna species list for Darwin Wharf Precinct 26-30 November 2003.

Species	Site 1 ESC	Site 2 SH	Site 3 DC	Incidental	Darwin CBD
Mammals					
Common Brushtail Possum, *Trichosurus vulpecula*	#				
Ghost Bat, *Macroderma gigas*					*
Northern Blossom-bat, *Macroglossus minimus*					*
Black Flying-fox, *Pteropus alecto*				#	
Black Rat, *Rattus rattus*	#				
Cat, *Felis catus*				#	
Birds					
Orange-footed Scrubfowl, *Megapodius reinwardt*	#	#			
Brown Quail, *Coturnix ypsilophora*					*
Pied Cormorant, *Phalacrocorax varius*					*
Australian Pelican, *Pelecanus conspicillatus*				#	
Grey Teal, *Anus gracilis*					*
Great Egret, *Ardea alba*				#	
Intermediate Egret, *Ardea intermedia*				#	
Black Bittern, *Ixobrychus flavicollis*					*
Australian White Ibis, *Threskiornis*					*
Osprey, *Pandion haliaetus*					*
Whistling Kite, *Haliastur sphenurus*			#		
Brahminy Kite, *Haliastur indus*		#	#	#	
White-bellied Sea-eagle, *Haliaeetus leucogaster*				#	
Chestnut Rail, *Eulabeeornis castaneoventris*					*
Eastern Curlew, *Numenius madagascariensis*				#	
Common Sandpiper, *Actitis hypoleucos*				#	
Bush Stone-curlew, *Burhinus grallarius*			#		
Masked Lapwing, *Vanellus miles*	#	#	#		
Silver Gull, *Larus novaehollandiae*				#	
Bar-shouldered Dove, *Geopelia humeralis*	#	#	#		
Red-tailed Black-Cockatoo, *Calyptorhynchus*					*
Sulphur-crested Cockatoo, *Cacatua galerita*					*
Rainbow Lorikeet, *Trichoglossus haematodus*	#	#	#		
Varied Lorikeet, *Psitteuteles versicolor*					*
Red-winged Parrot, *Aprosmictus erythropterus*					*

Species	Site 1 ESC	Site 2 SH	Site 3 ODC	Incidentals	Darwin CBD
Northern Rosella, *Platycercus venustus*					*
Brush Cuckoo, *Cacomantis variolosus*					*
Little Bronze-Cuckoo, *Chrysococcyx minutillis*					*
Pheasant Coucal, *Centropus phasianinus*					*
Barking Owl, *Ninox connivens*		#		#	
Tawny Frogmouth, *Podargus strigoides*				#	
Australian Owlet-nightjar, *Aegotheles cristatus*					*
Azure Kingfisher, *Alcedo azurea*					*
Collared Kingfisher, *Todiramphus chloris*					*
Rainbow Bee-eater, *Merops ornatus*					*
Dollarbird, *Eurystomus orientalis*					*
Red-backed Fairy-wren, *Malurus melanocephalus*					*
Striated Pardalote, *Pardalotus striatus*					*
Mangrove Gerygone, *Gerygone levigaster*					*
Large-billed Gerygone, *Gerygone magnirostris*					*
Green-backed Gerygone, *Gerygone chloronotus*	#	#			
Helmeted Friarbird, *Philemon buceroides*					*
Silver-crowned Friarbird, *Philemon argenticeps*	#	#			
Little Friarbird, *Philemon citreogularis*	#	#	#		
White-gaped Honeyeater, *Lichenostomus unicolor*	#	#			
Brown Honeyeater, *Lichmera indistincta*	#		#		
Rufous-banded Honeyeater, *Conopophila*	#	#	#		
Dusky Honeyeater, *Myzomela obscura*					*
Red-headed Honeyeater, *Myzomela erythrocephala*					*
Lemon-bellied Flycatcher, *Microeca flavigaster*					*
Mangrove Robin, *Eopsaltria pulverulenta*					*
Grey Whistler, *Pachycephala simplex*					*
Little Shrike-thrush, *Colluricincla megarhyncha*					*
Leaden Flycatcher, *Myiagra rubecula*					*
Shining Flycatcher, *Myiagra alecto*					*
Magpie-lark, *Grallina cyanoleuca*	#			#	
Northern Fantail, *Rhipidura rufiventris*		#			
White-bellied Cuckoo-shrike, *Coracina papuensis*	#				
White-winged Triller, *Lalage sueurii*	#	#			
Varied Triller, *Lalage leucomela*					*
Yellow Oriole, *Oriolus flavocinctus*	#				
Figbird, *Sphecotheres viridis*	#				
Black-faced Woodswallow, *Artamus cinereus*					*
Little Woodswallow, *Artamus minor*					*

Species	Site 1 ESC	Site 2 SH	Site 3 ODC	Incidentals	Darwin CBD
Black Butcherbird, *Cracticus quoyi*					*
Grey Butcherbird, *Cracticus torquatus*					*
Pied Butcherbird, *Cracticus nigrogularis*					*
Great Bowerbird, *Chlamydera nuchalis*					*
Double-barred Finch, *Taeniopygia bichenovii*		#	#		
Masked Finch, *Peophila personata*					*
Crimson Finch, *Neochmia phaeton*	#	#			
Mistletoebird, *Dicaeum hirundinaceum*					*
Tree Martin, *Hirundo nigricans*					*
Golden-headed Cisticola, *Cisticola exilis*					*
Reptiles					
Asian House Gecko, *Hemidactylus frenatus*	#	#	#		
Bynoes Gecko; *Heteronotia bynoei*		#			
Tropical Dragon; *Amphibolurus temporalis*			#		
Arboreal Snake-Eyed Skink, *Cryptoblepharus*		#			
Floodplain Monitor, *Varanus panoptes*		#	#		
Brown Tree Snake, *Boiga irregularis*					*
Slaty-grey Snake, *Stegonotus cucullatus*				#	
Amphibians					
Green Tree-frog, *Litoria caerulea*	#		#		
Red Tree-frog, *Litoria rubella*			#		
Marbled Frog, *Limnodynastes convexiusculus*			#		

ESC = Escarpment Site SH = Stokes Hill Site ODC = Old Deck Chair Site

Incidentals = Species not recorded at the other sites # = Species recorded during this survey

* = Species records obtained from Conservation & Natural Resources, NT

Table 4. Micro bats recorded at the Wharf Precinct during the 26-27 of November 2003.

Site	Common name	Species name
Oil Tunnel entrance	Little Northern Freetail Bat	*Mormopterus "loriae"*
	Large-footed Myotis	*Myotis macropus*
	Little Broad-nosed Bat/ Northern Broad-nosed Bat/ Hoary Wattled Bat	*Scotorepens greyii / S. sanborni / Chalinolobus nigrogriseus*
Escarpment transect	Little Northern Freetail Bat	*Mormopterus "loriae"*
	Large-footed Myotis	*Myotis macropus*
	Northern Pipistrelle/ Common Bent-wing Bat	*Pipistrellus westralis / Miniopterus schreibersii*
	Little Broad-nosed Bat/ Northern Broad-nosed Bat/ Hoary Wattled Bat	*Scotorepens greyii / S. sanborni / Chalinolobus nigrogriseus*
Stokes Hill	Little Northern Freetail Bat	*Mormopterus "loriae"*
Wharf	Northern Pipistrelle/ Common Bent-wing Bat	*Pipistrellus westralis / Miniopterus schreibersii*

Figure 2. Old Deck Chair Site, showing native *Acacia auriculiformis* on the Stokes Hill slope and weedy ground storey for the remainder of the site.

Figure 3. Stokes Hill Site, showing abundant introduced *Leucaena luecocephala*, typical of the majority of the site.

Figure 4. Escarpment Site, a narrow band of predominantly introduced vegetation.